Online Appendices to "Transmission of Global Financial Shocks: Which Capital Flows Matter?"

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Appendix A. Data Appendix

I denote sources of other data used in the regressions:

- International Investment Position: International Monetary Fund
- Exchange Rates and Stock Indices: Bloomberg
- Other Controls
  - Trade Openness: World Bank
  - Financial Openness: Chinn and Ito website (http://web.pdx.edu/~ito/Chinn-Ito_website.htm)
  - Oil Prices: International Monetary Fund (IMF) Commodity Data Portal Crude Oil Price Index
  - Commodity Prices: IMF Commodity Data Portal Non-Fuel Commodity Price Index
  - Short-Term Interest Tates: Three-month Treasury-bill rates from CEIC database (Brazil, Colombia, Czech Republic, Hungary, India, Mexico, the Philippines, Russia, South Africa, and Thailand), three-month interbank interest rates from CEIC database (Indonesia, Peru, Poland, Romania, and Turkey), and three-month interbank interest rates from IMF International Financial Statistics (IFS) (Argentina, Bulgaria, and Chile)
  - Real Effective Exchange Rates: Bank for International Settlements (BIS) Effective Exchange Rate Indices

  - Inflation: IMF IFS[1]
  - Industrial Production: CEIC database
  - M2 Monetary Aggregate: CEIC database
- Korean Financial Institution Balance Sheet Data: financial supervisory service in Korea (https://fisis.fss.or.kr)

Appendix B. Portfolio of Global Investors

Global investors are the international financial intermediaries who purchase LC-denominated equities and bonds in the small open economy. Like other components in the model, I model the global investors in a simple way, but also aim at capturing key features in reality. Since this paper studies impacts of risk-appetite shocks to global investors, the global investors in the model need to be risk averse. While there are different ways, I model the global investors as international financial intermediaries under a VaR constraint, following Miranda-Agrippino and Rey (2020).

Global investor in the model at time t has her own capital W_t^G and can raise outside financing in FC in the form of one-period debt to invest in different assets indexed by $j \in \{1, 2, \ldots, N\}$. Let $\mathbf{p}_t$ and $\mathbf{R}_{t+1}$ be the vectors of the global investor portfolio and the excess return of the risky assets over the safe asset, respectively. The optimization problem of the global investor is formulated as follows:

$$\max_{\mathbf{x}_t} \mathbb{E}_t \left[\mathbf{p}_t'\big(\mathbf{R}_{t+1} - \mathbf{1_N} \cdot \mathrm{R}^{\mathrm{f}}_{\mathrm{t+1}}\big)\right] \quad \textit{subject to} \;\; \mathrm{VaR_t} \leq \mathrm{W}_t^G,$$

where $\mathrm{VaR_t} = \alpha \left[\mathbb{V}ar\left[\mathbf{p}_t'\mathbf{R}_{t+1}\right]\right]^{\frac{1}{2}}$. The solution to the problem is

$$\mathbf{p}_t = \frac{\mathrm{W}_t^G}{\alpha\lambda_t}\left[\mathbb{V}ar\left(\mathbf{R}_{t+1}\right)\right]^{-1}\mathbb{E}_t\left(\mathbf{R}_{t+1} - \mathbf{1}_N \cdot \mathrm{R}^{\mathrm{f}}_{\mathrm{t+1}}\right), \tag{B.1}$$

where $\lambda_t = \Big[\mathbb{E}_t\left(\mathbf{R}_{t+1} - \mathbf{1}_N \cdot \mathrm{R}^{\mathrm{f}}_{\mathrm{t+1}}\right)'\left[\mathbb{V}ar\left(\mathbf{R}_{t+1}\right)\right]^{-1}\mathbb{E}_t\big(\mathbf{R}_{t+1} - \mathbf{1}_N \cdot \mathrm{R}^{\mathrm{f}}_{\mathrm{t+1}}\big)\Big]^{-1/2}$[2] and $\mathbb{V}ar\left(\mathbf{R}_{t+1}\right)$ denotes the variance.

[1]Monthly inflation in Argentina since 2015 is not available anywhere. Hence, I extrapolated using nominal and real effective exchange rates from BIS effective exchange rate indices.

[2]Hence λ_t is the Sharpe ratio.

Hence, the solution is identical to the optimal portfolio of a mean-variance investor. Also, notice that any shock to the capital of the global investor W_t^G or expected volatility of the world risky assets $\mathbb{V}ar\left(\mathbf{R}_{t+1}\right)$ leads to changes in the risky asset holdings of the global investor.

To study the optimal portfolio of the global investor more specifically, let's formulate the problem as a consideration of an investment in a "marginal" asset: The investor had already formed a market portfolio composed of N–1 different assets, hence all the available risky assets except for i. Further, the marginal asset i follows $R_t^i \backsim N\left(\overline{R_t}^i, \sigma_i^2 + \theta^i \sigma_{m_{-i}}^2\right)$ and $Cov\left(R_t^i, R_t^{m_{-i}}\right) = \theta^i \sigma_{m_{-i}}^2$. Hence, θ^i is the "market beta" for asset i.

The share of asset i, denoted by x_t^i, is given by

$$x_t^i = \frac{\left(\overline{R}^i - R^f\right) / \left(R^{m_{-i}} - R^f\right) - \theta^i}{\begin{array}{c}\sigma_i^2/\sigma_{m_{-i}}^2 + \left(\overline{R}^i - R^f\right) / \left(R^{m_{-i}} - R^f\right) \\ -\theta^i \left(\left(\overline{R}^i - R^f\right) / \left(R^{m_{-i}} - R^f\right) + 1\right)\end{array}}. \tag{B.2}$$

It is easy to show that x_i decreases in θ^i if $p_i \overline{R}^i < \left(1 - p_i\right) R^{m_{-i}}$.

We have two different assets in the model small open economy—capital and government bond. However, I assume that the share of the two assets in the total portfolio is small enough so that I can apply the results in Equation (B.2) to both the capital and the bonds.

Now, let $\mathrm{W}_t^G = \mathrm{W}^G e^{-v_t}$. Hence, I interpret the risk-on/off shocks as shocks to the capital of the global investors.[3] V_t corresponds to VIX and therefore it is a measure of the risk appetite of the investors. In addition, I assume that V_t follows a mean-reverting process similarly with VIX. Thus

$$v_t = \rho v_{t-1} + \nu_t, \tag{B.3}$$

where $\nu_t \sim N\left(0, \sigma_\nu^2\right)$ and $\rho_v \in (0,1)$. As noted in Section 3 of the paper, $\nu_t > 0$ "risk-off" shock and $\nu_t < 0$ "risk-on" shock.

[3]This interpretation is in line with Bruno and Shin (2015) and Miranda-Agrippino and Rey (2020).

I need to simplify the specification in Equation (B.2) to make it suitable for quantitative analysis. I can reasonably assume $\overline{R}^i \simeq R^{m-i}$, i.e., $\frac{\overline{R}^i - R^f}{R^{m-i} - R^f} \simeq 1$. Then, taking a first-order approximation around $\overline{R}^i \simeq R^{m-i}$ gives me the approximation of p_t^i, $\widetilde{p}_t^i$:

$$\begin{aligned}\widetilde{x}_t^i &= \frac{1}{\sigma_i^2/\sigma_{m-i}^2 + 1 - 2\theta^i} + \left(1 - \frac{1-\theta^i}{\sigma_i^2/\sigma_{m-i}^2 + 1 - 2\theta^i}\right)\left(\frac{\overline{R}^i - R^{m-i}}{R^{m-i} - R^f}\right) \\ &\simeq \frac{1}{\sigma_i^2/\sigma_{m-i}^2 + 1 - 2\theta^i} \\ &\quad + \frac{1}{s^{m-i}}\left(1 - \frac{1-\theta^i}{\sigma_i^2/\sigma_{m-i}^2 + 1 - 2\theta^i}\right)\left(\overline{R}^i - R^{m-i}\right), \qquad \text{(B.4)}\end{aligned}$$

where s^{m-i} is a constant close to $R^{m-i} - R^f$. s^{m-i} denotes the spread of the global portfolio over the return to the safe asset. This approximation is to reduce the number of parameters I need to estimate for the calibration.

To make it even more tractable, I assume that the parameters regarding the risk properties σ_i^2, σ_m^2, and θ^i are invariant in the short run. We can think of investors who update their belief sporadically.[4] Then I finally get

$$\widetilde{x}_t^i \simeq \chi_0^i + \chi_1^i\left(\overline{R}^i - R^{m-i}\right). \qquad \text{(B.5)}$$

Then, let's denote the money invested in the asset i by p_t^i. It is

$$p_t^i = \frac{\mathrm{W}^G}{\chi_0^i e^{v_t}}\left[1 + \frac{\chi_0^i}{\chi_0^i}\left(\overline{R}^i - R^{m-i}\right)\right].$$

[4] I implicitly assume that the investors update their beliefs of expected returns more frequently. We can think the information needed to predict the expected return is more available or cheaper.

Once I replace $\frac{W^G}{\chi_0^i}$ with $\frac{1}{\Gamma^i}$ and fully express the terms, the demand from the global investors for the equity and government bonds in the small open economy are given by[5]

$$p_t^k = Q_t k_t^f \varepsilon_t^{-1} = \frac{1}{\Gamma^k e^{v_t}} \left[1 + \frac{\chi_0^k}{\chi_0^k} \mathbb{E}_t \left[\frac{\varepsilon_t}{\varepsilon_{t+1}} R_{t+1}^k \right] - R_{t+1}^m (v_t) \right] \quad \text{(B.6)}$$

$$p_t^b = q_t b_t^f \varepsilon_t^{-1} = \frac{1}{\Gamma^b e^{v_t}} \left[1 + \frac{\chi_0^b}{\chi_0^b} \mathbb{E}_t \left[\frac{\varepsilon_t}{\varepsilon_{t+1}} R_{t+1}^b \right] - R_{t+1}^m (v_t) \right]. \quad \text{(B.7)}$$

Appendix C. Estimation of the Parameters

First, I describe how I estimated the parameters $\frac{\chi_k^0}{\chi_k^1}$ and $\frac{\chi_b^0}{\chi_b^1}$ in Equations (B.6) and (B.7).

A serious estimation of $\frac{\chi_k^1}{\chi_k^0}$ and $\frac{\chi_b^1}{\chi_b^0}$ poses a challenge. As I emphasized, these parameters matter only to the extent that it matters for capital flows. Thus, I estimate the parameters from the capital flow data in Korea. The statistics portal of the Financial Supervisory Service (FSS) provides monthly data on foreign investors' holdings of public equities and bonds issued in domestic financial markets in Korea. The data on the equity holdings and the bond holdings begin from January 2005 and January 2006, respectively. However, it is observed in the bonds data that the foreign investors' holdings of bonds in Korean markets have been on a "stable trend" since 2010, before which they had kept rising except for global financial crisis.[6] Therefore, for the bonds, I only use the data after 2009.

First, I take the log of the data on the public equity and bond holdings by foreign investors, and then remove the linear trend. Let's denote the detrended portfolio investment by $\widetilde{p}_t^j$, and let the growth of $\widetilde{p}_t^j$ be $g_{\widetilde{p}_t^j}$.

[5]The seminal paper Gabaix and Maggiori (2015) and the papers following Gabaix and Maggiori (2015) derive similar forms from agency frictions between global financial intermediaries and investors. If $\chi_0^i = 0$, then, Equation (B.5) becomes identical to Gabaix and Maggiori (2015).

[6]One way to understand the period is to think of the time as a transitional period like a transitional path from one steady state to another steady state.

Define the growth of the portfolio investment $g_{p_t^j} \equiv {p_t^j}/{p_{t-1}^j}$. Then, I have

$$ln\left(g_{p_t^j}\right) = -\left(v_t - v_{t-1}\right) + ln\left(1 + \frac{\chi_j^1}{\chi_j^0}\mathbb{E}_t\left[\frac{\varepsilon_t}{\varepsilon_{t+1}}R_{t+1}^k - R_{t+1}^m\left(v_t\right)\right]\right) - ln\left(1 + \frac{\chi_j^1}{\chi_j^0}\mathbb{E}_t\left[\frac{\varepsilon_t}{\varepsilon_{t+1}}R_{t+1}^k - R_{t+1}^m\left(v_t\right)\right]\right), \quad (C.1)$$

where $\frac{\varepsilon_t}{\varepsilon_{t+1}}R_{t+1}^k$ and $\frac{\varepsilon_t}{\varepsilon_{t+1}}R_{t+1}^b$ are the returns on the Korean Stock Market Index (KOSPI), measured in U.S. dollars, and the returns on three-year maturity government bond, also measured in U.S. dollars, and the return on the alternative investment, $R_{t+1}^m\left(v_t\right)$, is the quarterly yields on the BAA-grade corporate bonds in the United States. Now I have two moment conditions to estimate $\frac{\chi_j^1}{\chi_j^0}$:

$$\mathbb{E}_{t-1}\left[g_{p_t^j} - g_{\widetilde{p}_t^j}\right] = 0 \quad (C.2)$$

$$\mathbb{E}_{t-1}\left[\left(v_t - v_{t-1}\right)\left(g_{p_t^j} - g_{\widetilde{p}_t^j}\right)\right] = 0. \quad (C.3)$$

The intuition of using the difference in VIX is that the difference between the theoretical moment and empirical moment should be uncorrelated with the growth of VIX once the model is correctly specified under the parameter values close to the true value.

One difficulty in this GMM estimation is the limited number of observations. To circumvent the problem, I compute the changes in the portfolio investment from a quarter ago in every month, and accordingly in the returns. That is, for every month, I compute the changes in the portfolio investments and VIX in "the most recent three months," and spreads in the U.S. dollar between portfolio investments in Korean markets and the alternative assets, also in three months. Then, I estimate the parameters from the "quarterly" changes every month. I can thereby increase the number of samples to 174 and 112 for the equities and bonds, respectively. The results of the estimation are reported in Table C.1. The estimation should be understood as a way to calibrate the model to the Korean economy in the context of this paper.

Table C.1. GMM Estimation Results

	χ_k^1/χ_k^0	χ_b^1/χ_b^0
Estimated Values	4.621*** (0.124)	9.785*** (0.015)
Observations P-value of J-test	174 0.411	112 0.932

Next, I illustrate the estimation of χ_m and χ_*. I can simply estimate the parameters by running the OLS regressions.

$$ln(r_t^j) = \alpha_j + \widehat{\beta}_j VIX_t + e_t^j \tag{C.4}$$

r^m and r^* are the BAA corporate bond yields in the United States and the JP Morgan Emerging Market Bond Index.[7] Notice that the purpose of the regression is to estimate the realized sensitivity of the yields on the risky bonds to the risk appetite, measured by VIX. One of the issues in the regression above is the autocorrelation in the error terms, which are possibly correlated with VIX. The regressions are probably plagued by the autocorrelations. To see how much it matters, I run another regression as follows:

$$ln(r_t^j) = \alpha_j + \rho_j ln(r_{t-1}^j) + \widehat{\widehat{\beta}}_j \nu_t + e_t^j, \tag{C.5}$$

where $\nu_t = ln\left(\mathrm{VIX_t}\right) - \mathbb{E}_{t-1}\left[ln\left(\mathrm{VIX_t}\right)\right]$.[8] The estimation results are introduced below.

Notice that the results of (C.4) and (C.5) in Table C.2 are similar once we consider estimated autocorrelation coefficients ρ_j. A tricky part is that, in the calibration, I implicitly assumed that the global risk-appetite process is a part of VIX. In other words, VIX includes the risk appetite and some noise. That means if I directly use the parameter value, I will underestimate the impact of risk-appetite shocks on interest rates. Thus, I adjust the coefficient values so that one standard deviation of risk-on/off shocks in the model changes the

[7] I used the spread on BAA corporate bonds and similarly do not convert the EMBI to the yields on the sovereign bonds of EMEs. In fact, in the sample period, the real return on U.S. government bonds is close to zero.

[8] ν_t is estimated from the AR (1) model. Extending the AR (1) model to ARMA (1) does not significantly change the results.

Table C.2. Sensitivity of the Interest Rates to VIX

	(1)	(2)	(3)	(4)
VIX_t	0.506***		0.643***	
	(0.132)		(0.090)	
v_t		0.203***		0.475***
		(0.060)		(0.045)
$ln(r^j_{t-1})$		0.934***		0.859***
		(0.037)		(0.034)
Observations	83	83	83	82
R-square	0.154	0.892	0.388	0.903

interest rates by the magnitudes identical to the regression results. The standard deviation of v_t in the calibrated model is 0.089, while the standard deviation of VIX in the sample period is 0.353. The converted parameter values for the BAA corporate bond and EMBI index are 2.010 and 2.636, respectively.

Appendix D. Tables in Section 2

D.1 Notations in the Tables

Before introducing the results, I list the notations used in the tables:

- $\Delta\varepsilon_{t-1}$: Lag of percentage changes in exchange rates.
- Δq_{t-1}: Lag of percentage changes in stock indices.
- ΔP^{com}_t: Log difference in the commodity price index.
- $\mathbf{I}^{G_x} \times \Delta P^{oil}_t$: Interaction terms between log difference in oil price and group dummies. Group 1 is the oil exporters: Brazil, Colombia, Mexico, and Russia. Group 2 is the group of countries whose oil exports and imports are balanced: Argentina, Indonesia, and Malaysia. Group 3 is the oil importers (the rest of the countries).
- $i^j_t - i^{us}_t$: Short-term interest rate [9] differentials between country j and the United States.

[9]To avoid possible endogeneities, I used short-term interest rates. Ideally, I can use three-month Treasury-bill rates for each of the countries. However, not all the EMEs in the sample have a three-month Treasury-bill rate and accordingly I opt to use proxies for the bill rates.

- i_t^j: Short-term interest rates in country j.
- IP_t^j: Industrial production index percentage changes from the same month in a previous year (year to year).
- $M2_t^j$: M2 monetary aggregate percentage changes from the same month in a previous year (year to year).
- $Inflation_t^j$: CPI percentage changes from a previous month (month to month).
- $ln\,(REER)_{t-1}^{\,j}$: Lag of log real effective exchange rates.
- $Fin.\ open_{-1}$: Chin-Ito financial openness index in the last year of each observation.

D.2 Full Tables in Section 2

Table D.1. Exchange Rate_Aggregate FC

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$\Delta\varepsilon^{j}_{t-1}$	–0.136**	–0.137**	–0.134**	–0.135**	–0.134**	–0.134**	–0.070	–0.072
	(0.058)	(0.057)	(0.058)	(0.058)	(0.058)	(0.058)	(0.072)	(0.072)
$\Delta ln(VIX)_t$	0.037***	0.036***	0.035***	0.034***	0.031**	0.034***		
	(0.012)	(0.013)	(0.012)	(0.012)	(0.013)	(0.012)		
$ln(VIX)_{t-1}$	0.006	0.006	$0.007^{\dagger}$	$0.007^{\dagger}$	$0.007^{\dagger}$	$0.007^{\dagger}$		
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)		
$(FCD/GDP)^{j}_{EOY-1} \times \Delta ln(VIX)_t$	0.015				0.015		0.019	
	(0.030)				(0.031)		(0.036)	
$(LCE/GDP)^{j}_{EOY-1} \times \Delta ln(VIX)_t$		0.034						
		(0.031)						
$(LCD/GDP)^{j}_{EOY-1} \times \Delta ln(VIX)_t$			0.075**					
			(0.030)					
$(LCB/GDP)^{j}_{EOY-1} \times \Delta ln(VIX)_t$				0.103**	0.100**	0.102**	0.112**	0.115**
				(0.050)	(0.050)	(0.050)	(0.051)	(0.052)
$(NFCD/GDP)^{j}_{EOY-1} \times \Delta ln(VIX)_t$						–0.004		–0.002
						(0.022)		(0.027)
$(Reserve/GDP)^{j}_{t-1} \times \Delta ln(VIX)_t$	–0.052**	–0.048**	–0.057**	–0.052**	–0.058**	–0.052**	–0.052*	–0.043*
	(0.023)	(0.023)	(0.022)	(0.024)	(0.025)	(0.023)	(0.029)	(0.025)
$Fin.\ open._{EOY-1} \times \Delta ln(VIX)_t$	0.001	0.001	0.001	0.002	0.002	0.002	0.002	0.002
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
$(FCD/GDP)^{j}_{EOY-1} \times \Delta ln(VIX)_t$	0.020				0.007		0.017	
	(0.025)				(0.025)		(0.023)	
$(LCE/GDP)^{j}_{EOY-1} \times \Delta ln(VIX)_t$		0.006						
		(0.022)						
$(LCD/GDP)^{j}_{EOY-1} \times \Delta ln(VIX)_t$			0.049					
			(0.037)					
$(LCB/GDP)^{j}_{EOY-1} \times \Delta ln(VIX)_t$				0.088*	0.085*	0.088*	0.041	$0.051^{\dagger}$
				(0.047)	(0.045)	(0.046)	(0.032)	(0.035)

(continued)

Table D.1. (Continued)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$(NFCD/GDP)^j_{EOY-1} \times \Delta ln(VIX)_t$						–0.001		–0.008
						(0.012)		(0.014)
$(Reserve/GDP)^j_{t-1} \times \Delta ln(VIX)_t$	–0.006	0.000	–0.018	–0.014	–0.015	–0.014	–0.023	–0.024
	(0.012)	(0.011)	(0.016)	(0.012)	(0.014)	(0.015)	(0.014)	(0.017)
$Fin.\ open._{EOY-1} \times \Delta ln(VIX)_t$	0.001	0.001	0.001	0.002	0.001	0.002	0.001	0.001
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
$i^j_t - -i^{us}_t$	0.001	0.001	0.001*	0.001	0.001	0.001	0.001*	0.001*
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)
IP^j_t	0.005	0.005	0.006	0.006	0.006	0.006	0.007	0.007
	(0.011)	(0.011)	(0.011)	(0.011)	(0.010)	(0.011)	(0.008)	(0.009)
$M2^j_t$	0.042	0.035	0.038	0.039	0.041	0.039	0.044	0.041
	(0.039)	(0.032)	(0.034)	(0.035)	(0.040)	(0.036)	(0.036)	(0.033)
$Inflation^j_t$	0.010***	0.010***	0.010***	0.010***	0.010***	0.010***	0.008***	0.008***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
$ln(REER)^j_{t-1}$	0.047**	0.046**	0.050***	0.051***	0.051***	0.051***	0.072***	0.071***
	(0.019)	(0.019)	(0.018)	(0.017)	(0.017)	(0.017)	(0.017)	(0.016)
ΔP^{com}_t	–0.440***	–0.441***	–0.430***	–0.428***	–0.428***	–0.428***		
	(0.098)	(0.097)	(0.094)	(0.093)	(0.094)	(0.093)		
$\mathbf{I}^{G1} \times \Delta P^{oil}_t$	–0.117***	–0.115***	–0.118***	–0.118***	–0.119***	–0.118***	–0.128***	–0.126***
	(0.041)	(0.042)	(0.041)	(0.041)	(0.040)	(0.041)	(0.025)	(0.025)
$\mathbf{I}^{G2} \times \Delta P^{oil}_t$	0.010	0.012	0.011	0.011	0.010	0.010		
	(0.042)	(0.043)	(0.042)	(0.042)	(0.041)	(0.041)		
$\mathbf{I}^{G3} \times \Delta P^{oil}_t$	0.013	0.013	0.012	0.012	0.013	0.012		
	(0.027)	(0.027)	(0.027)	(0.027)	(0.027)	(0.027)		
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	No	No	No	No	No	No	Yes	Yes
R-squared	0.094	0.091	0.100	0.095	0.092	0.090	0.090	0.396
Observations	1,660	1,660	1,615	1,615	1,615	1,615	1,615	1,615
Number of Groups	0.229	0.230	0.234	0.232	0.233	0.232	0.099	0.099

Note: ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$, $^{\dagger}p < 0.15$. LCD: local currency debt, LCB: local currency bond, LCE: local currency equity, FCD: foreign currency debt, FCD_A: foreign currency external debt assets (debt instrument), and FEC_A: foreign currency equity assets. NFCD: net foreign currency debt assets, excluding central bank international reserve. EOY_{-1} indicates the value at the end of last year of time t. Robust standard errors are Driscoll-Kraay standard errors.

Table D.2. Stock Indices_Aggregate FC

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Δq^j_{t-1}	–0.022	–0.021	–0.021	–0.025	–0.027	–0.001	–0.004	–0.005
	(0.034)	(0.035)	(0.035)	(0.034)	(0.034)	(0.029)	(0.029)	(0.029)
$\Delta ln(VIX)_t$	–0.082***	–0.069***	–0.073***	–0.071***	–0.068***			
	(0.015)	(0.016)	(0.016)	(0.016)	(0.017)			
$ln(VIX)_{t-1}$	–0.021***	–0.021***	–0.021**	–0.024***	–0.025***			
	(0.008)	(0.008)	(0.008)	(0.007)	(0.007)			
$(FCD/GDP)^j_{EOY-1} \times \Delta ln(VIX)_t$	0.015		0.023	0.026		0.028	0.030	
	(0.028)		(0.028)	(0.027)		(0.029)	(0.028)	
$(LCE/Mkt.\ Cap.)^j_{EOY-1} \times \Delta ln(VIX)_t$		–0.063**	–0.066**	–0.074*	–0.071*	–0.064*	–0.075*	–0.069*
		(0.032)	(0.032)	(0.039)	(0.039)	(0.037)	(0.041)	(0.040)
$(LCB/GDP)^j_{EOY-1} \times \Delta ln(VIX)_t$				0.032	0.034		0.051	0.052
				(0.090)	(0.091)		(0.099)	(0.100)
$(NFCD/GDP)^j_{EOY-1} \times \Delta ln(VIX)_t$					–0.005			0.001
					(0.032)			(0.034)
$(Reserve/GDP)^j_{t-1} \times \Delta ln(VIX)_t$	0.062**	0.086***	0.076***	0.063***	0.074***	0.055**	0.044†	0.057**
	(0.025)	(0.019)	(0.022)	(0.021)	(0.018)	(0.025)	(0.027)	(0.025)
$Fin.\ open._{EOY-1} \times \Delta ln(VIX)_t$	–0.001	–0.004	–0.004	–0.004	–0.004	–0.002	–0.003	–0.003
	(0.003)	(0.003)	(0.003)	(0.004)	(0.003)	(0.003)	(0.003)	(0.003)
$(FCD/GDP)^j_{EOY-1}$	0.014		0.012	0.031			0.038	
	(0.028)		(0.029)	(0.026)			(0.026)	
$(LCE/Mkt.\ Cap.)^j_{EOY-1}$		–0.021	–0.018	0.026	0.042	0.005	0.036	0.046
		(0.049)	(0.049)	(0.057)	(0.057)	(0.045)	(0.053)	(0.054)
$(LCB/GDP)^j_{EOY-1}$				–0.165***	–0.156***		–0.150**	–0.133**
				(0.048)	(0.049)		(0.067)	(0.064)
$(NFCD/GDP)^j_{EOY-1}$					–0.034**			–0.034*
					(0.015)			(0.018)

(*continued*)

Table D.2. (Continued)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$(Reserve/GDP)^j_{t-1}$	–0.002	0.000	–0.003	0.019	0.013	0.006	0.022	0.015
	(0.014)	(0.014)	(0.014)	(0.016)	(0.016)	(0.014)	(0.018)	(0.017)
$Fin.\ open._{EOY-1}$	–0.010***	–0.009***	–0.010***	–0.010***	–0.010***	–0.009***	–0.010***	–0.010***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
i^j_t	–0.001	–0.000	–0.000	–0.001	–0.001	–0.000	–0.001	–0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
IP^j_t	–0.016	–0.015	–0.016	–0.015	–0.016	–0.020	–0.021	–0.022
	(0.022)	(0.022)	(0.022)	(0.023)	(0.023)	(0.021)	(0.023)	(0.023)
$M2^j_t$	–0.007	–0.011	–0.007	–0.002	–0.003	–0.003	0.009	0.007
	(0.017)	(0.017)	(0.017)	(0.018)	(0.018)	(0.015)	(0.015)	(0.015)
$Inflation^j_t$	0.002	0.002	0.002	0.002	0.002	0.003	0.003	0.003
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
ΔP^{com}_t	0.364***	0.365***	0.365***	0.349***	0.354***			
	(0.129)	(0.129)	(0.129)	(0.124)	(0.123)			
$\mathbf{I}^{G1} \times \Delta P^{oil}_t$	0.045	0.046	0.044	0.050	0.052	0.059*	0.049*	0.052**
	(0.041)	(0.041)	(0.041)	(0.040)	(0.039)	(0.033)	(0.028)	(0.026)
$\mathbf{I}^{G2} \times \Delta P^{oil}_t$	–0.016	–0.013	–0.014	–0.012	–0.013			
	(0.049)	(0.049)	(0.049)	(0.048)	(0.048)			
$\mathbf{I}^{G3} \times \Delta P^{oil}_t$	0.004	0.003	0.004	0.005	0.005	0.016		
	(0.042)	(0.042)	(0.043)	(0.042)	(0.041)	(0.042)		
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	No	No	No	No	No	Yes	Yes	Yes
R-squared	0.076	0.062	0.080	0.074	0.069	0.046	0.046	0.322
Observations	1,660	1,660	1,660	1,615	1,615	1,660	1,615	1,615
Number of Groups	20	20	20	20	20	20	20	20

Note: ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$, $^{\dagger}p < 0.15$. LCD: local currency debt, LCB: local currency bond, LCE: local currency equity, FCD: foreign currency debt, FCD_A: foreign currency external debt assets (debt instrument), and FEC_A: foreign currency equity assets. NFCD: net foreign currency debt assets, excluding central bank international reserve. EOY_{-1} indicates the value at the end of last year of time t. Robust standard errors are Driscoll-Kraay standard errors.

Appendix E. Analytical Results with Algebras and Proofs

Analytical results and the proofs follow from Section 3.2 in the paper.

PROPOSITION 1. *(Capital Market Channel) Assume* $\chi_k^1 = \chi_b^1 = 0$. *Then, we have the following:*

(i) Risk-off (on) shocks cause falls (booms) in capital markets. That is, $\frac{dQ_t}{d\nu_t} < 0$.

(ii) If $(\sigma + \xi) z_t k_{t-1}^d < \sigma R_t d_{t-1}$, *then capital demands from domestic banks increase in the capital price. That is,* $\frac{dk_t^d}{dQ_t} > 0$, *and therefore* $\frac{dk_t^d}{d\nu_t} < 0$.

(iii) Assume $\varphi \left(\phi (\sigma + \xi) k_{t-1}^d + K_{t-1} \left(\varphi^{-1} - 1\right)\right)^2 > 4K_{t-1} \left(\sigma R_t d_{t-1} - (\sigma + \xi) z_t k_{t-1}^d\right)$. *Then, the impact of risk-appetite shock increases in the share of global investors in the capital market* $\widehat{\theta}_t = \frac{p_t^k \varepsilon_t}{N_t L + p_t^k \varepsilon_t}$, *given exchange rate* ε_t. *That is,* $\frac{\partial^2 Q_t}{\partial \nu_t \partial \widehat{\theta}_t} |_{\varepsilon_t} < 0$. *Therefore, we have* $\frac{\partial^2 k_t^d}{\partial \nu_t \partial \widehat{\theta}_t} |_{\varepsilon_t} < 0$.

To prove the statements in the proposition, I find the lemma below is useful.

LEMMA 1. *The equilibrium of the small open economy is represented by the equations below, which shows the capital market clearing condition, the foreign exchange market clearing condition, and the law of motion for the risk appetite of global investors, respectively.*

$$Q_t = f_1 (\varepsilon_t, v_t)$$
$$0 = f_2 (Q_t, \varepsilon_t, v_t)$$

Proof. First, remember that I assume $\chi_i^1 = 0$ so that the capital inflows from global investors, p_t^k and p_t^b, are determined regardless of the expectation. The resource constraint of this economy is as follows:

$$AK_{t-1}^{\alpha}L^{1-\alpha} = C_t^d + I_t + \frac{\varphi}{2}\left(\frac{I_t}{K_{t-1}}\right)^2 K_{t-1} + G + Ex_t.$$

The optimality condition of the capital producer, $1 + \varphi I_t = Q_t$, pins down the investment given the capital price, Q_t. From Equation (25), we know Q_t is a function of the states, v_t and ε_t. Real exchange rate ε_t determines the exports, Ex_t. Since the output in this economy is determined from the previous period, K_{t-1}, capital price Q_t and real exchange rate ε_t determine the domestic goods consumption c_t^d.

The real exchange rate ε_t is determined by the foreign exchange market clearing condition (27). Note that the imported goods consumption is determined given domestic goods consumption and the real exchange rate by the equation below.

$$C_t^m \varepsilon_t = C_t^d \left(\frac{\omega}{1-\omega}\right) \tag{E.1}$$

Thus, C_t^m is a function of Q_t, ε_t, and v_t. In Equation (27), ε_t is determined by C_t^m, and the investments by global investors, p_t^k and p_t^b, which are solely determined by v_t. This tells me that Q_t and v_t uniquely determine ε_t. ■

Now we prove the proposition. Plugging $N_t = \sigma((z_t + Q_t)k_{t-1}^d - R_t d_{t-1}) + \xi(z_t + Q_t)k_{t-1}^d$ into Equation (25) yields

$$Q_t = \frac{\varphi\left(\varphi^{-1} + \phi\left(\sigma+\xi\right)\frac{k_{t-1}^d}{K_{t-1}} - 1\right) + \sqrt{\varphi^2\left(\varphi^{-1} + \phi\left(\sigma+\xi\right)\frac{k_{t-1}^d}{K_{t-1}} - 1\right)^2 + 4\varphi\frac{p_t^k\varepsilon_t + \phi\left((\sigma+\xi)z_t k_{t-1}^d - \sigma R_t d_{t-1}\right)}{K_{t-1}}}}{2} \tag{E.2}$$

$$\frac{dQ_t}{d\nu_t} = \frac{\varepsilon_t\left(-1+\frac{d\varepsilon_t/d\nu_t}{\varepsilon_t}\right)}{\sqrt{\begin{array}{c}\left(\phi\left(\sigma+\xi\right)\frac{k^d_{t-1}}{p^k_t\varepsilon_t}+\varphi^{-1}\frac{K_{t-1}}{p^k_t\varepsilon_t}-\frac{K_{t-1}}{p^k_t\varepsilon_t}\right)^2\\ +4\varphi^{-1}\frac{K_{t-1}}{p^k_t\varepsilon_t}\left(1+\phi\left(\frac{(\sigma+\xi)z_tk^d_{t-1}-\sigma R_td_{t-1}}{p^k_t\varepsilon_t}\right)\right)\end{array}}}. \quad \text{(E.3)}$$

To prove $\frac{dQ_t}{d\nu_t} > 0$, I need to show $\frac{d\varepsilon_t/d\nu_t}{\varepsilon_t} < 1$.

Plugging Equation (E.1) into the foreign exchange market clearing condition yields

$$\frac{1}{1-\omega}Y^*_t\varepsilon^\gamma_t - \frac{\omega}{1-\omega}\left(Y_t - I_t - \frac{\varphi}{2}\left(\frac{I_t}{K_{t-1}}\right)^2K_{t-1} - G\right)$$
$$= R^k_{t-1}k^f_{t-1} + R^b_{t-1}b^f_{t-1} - \varepsilon_t\left(p^k_t + p^b_t\right).$$

By the implicit function theorem, I have

$$\frac{d\varepsilon_t/d\nu_t}{\varepsilon_t} = \frac{p^k_t\left(1+\frac{dQ_t}{d\left(p^k_t\varepsilon_t\right)}\left(\frac{\omega}{1-\omega}\left(\varphi^{-1}+I_t\right)-k^f_{t-1}\right)\right)+p^b_t}{\frac{Y^*_t}{1-\omega}\gamma\varepsilon^{\gamma-1}_t+p^k_t\left(1+\frac{dQ_t}{d\left(p^k_t\varepsilon_t\right)}\left(\frac{\omega}{1-\omega}\left(\varphi^{-1}+I_t\right)-k^f_{t-1}\right)\right)+p^b_t}. \quad \text{(E.4)}$$

It is obvious that $\frac{d\varepsilon_t/d\nu_t}{\varepsilon_t} < 1$. This proves the first statement in the proposition.

Next, I show $\frac{\partial^2 Q_t}{\partial\nu_t\partial\widehat{\theta}_t}\,|_{\varepsilon_t} < 0$. To derive the desired results, I need to show $\frac{\partial Q_t}{\partial\nu_t}\,|_{\varepsilon_t}$ decreases in $p^k_t\varepsilon_t$. For the purpose, I find it is convenient to denote $\frac{K_{t-1}}{p^k_t\varepsilon_t}$ by x_t. Then the term in the denominator turns out to be the following quadratic equation:

$$H(x_t) = \left(\left(\phi\left(\sigma+\xi\right)\frac{k^d_{t-1}}{K_{t-1}}+\left(\varphi^{-1}+1\right)\right)^2\right.$$
$$\left.+4\varphi^{-1}\phi\left(\frac{\left(\sigma+\xi\right)z_tk^d_{t-1}-\sigma R_td_{t-1}}{K_{t-1}}\right)\right)^2x^2_t + 4\varphi^{-1}x_t.$$

Since x_t is inverseIy related with $p_t^k \varepsilon_t$, I want to show $H^{'} > 0$ for $x_t > 0$. It is equivalent to

$$x_t > \frac{-4\varphi^{-1}}{2\left(\left(\phi\left(\sigma+\xi\right)\frac{k_{t-1}^d}{K_{t-1}}+\left(\varphi^{-1}+1\right)\right)^2 + 4\varphi^{-1}\phi\left(\frac{(\sigma+\xi)z_t k_{t-1}^d - \sigma R_t d_{t-1}}{K_{t-1}}\right)\right)}.$$

Since $x_t > 0$, the sufficient condition for the inequality is

$$\left(\phi\left(\sigma+\xi\right)\frac{k_{t-1}^d}{K_{t-1}}+\left(\varphi^{-1}+1\right)\right)^2 > -4\varphi^{-1}\phi\left(\frac{\left(\sigma+\xi\right)z_t k_{t-1}^d - \sigma R_t d_{t-1}}{K_{t-1}}\right),$$

as I assumed in the proposition.

Lastly, I prove the third statement. It is trivial. Notice $k_t^d = \frac{N_t}{Q_t}\phi$ and furthermore

$$\frac{N_t}{Q_t} = \left(\sigma+\xi\right)k_{t-1}^d + \frac{\left(\sigma+\xi\right)z_t k_{t-1}^d - \sigma R_t d_{t-1}}{Q_t}.$$

It is straightforward that $\frac{N_t}{Q_t}$ increases in Q_t if $\left(\sigma+\xi\right)z_t k_{t-1}^d - \sigma R_t d_{t-1} < 0$. ■

Corollary 1. *If $K_{t-1} \approx K_t, k_{t-1}^d \approx k_t^d$, and $Q_t \approx 1$, then I can approximate $\frac{\partial Q_t}{\partial \nu_t} |_{\varepsilon_t}$ as follows:*

$$\frac{\partial Q_t}{\partial \nu_t} |_{\varepsilon_t} \approx \frac{\varepsilon_t\left(-1+\frac{dS_t^k/d\nu_t}{S_t^k}\right)}{\sqrt{\left(\phi\left(\sigma+\xi\right)\left(\frac{1-\theta_t}{\theta_t}\right)+\frac{\varphi^{-1}}{\theta_t}-\frac{1}{\theta_t}\right)^2 + 4\frac{\varphi^{-1}}{\theta_t}\left(1+\phi\left(\frac{1-\theta_t}{\theta_t}\right)\left(\left(\sigma+\xi\right)z_t - \sigma R_t\left(\frac{\phi-1}{\phi}\right)\right)\right)}}.$$

It is easy to see that, given the value of $\frac{dS_t^k/d\nu_t}{S_t^k}$, approximated $\frac{\partial Q_t}{\partial \nu_t} |_{\varepsilon_t}$ does increase in θ_t if $\left(\phi\left(\sigma+\xi\right)\left(\frac{1-\theta_t}{\theta_t}\right)+\left(\varphi^{-1}+1\right)\right)^2 > -4\varphi^{-1}\phi\left(\frac{1-\theta_t}{\theta_t}\right)\left(\left(\sigma+\xi\right)z_t - \sigma R_t\left(\frac{\phi-1}{\phi}\right)\right)$. Corollary 1 provides a comparative statics matching the empirical results from the cross-country panel regressions. ■

PROPOSITION 2. *Let* $\chi_k^0 = \chi_b^0 = 0$ *and assume* $\frac{dR_t^{k^*}}{d\nu_t} > \frac{dR_{t+1}^m}{d\nu_t} > \frac{dR_t^{b^*}}{d\nu_t}$, $\frac{\gamma\varepsilon_t^{\gamma-1}}{1-\omega} > -\frac{dS_t^b/d\nu_t}{S_t^b}\eta_t^b$, *and* $p_t^b\left(1-\frac{dS_t^b/d\nu_t}{S_t^b}\right) > -p_t^k\left(1+\frac{dQ_t}{d\left(p_t^k\varepsilon_t\right)}\left(\frac{\omega}{1-\omega}\varphi^{-1}-k_{t-1}^f\right)\right)\left(1-\frac{dS_t^k/d\nu_t}{S_t^k}\right)$. *Then we have the following:*

(i) For a small enough $\frac{dS_t^k/d\nu_t}{S_t^k}$, $\frac{dQ_t}{d\nu_t} < 0$.

(ii) Risk-off (on) shocks depreciate (appreciate) the local currency. That is, $\frac{d\varepsilon_t}{d\nu_t} > 0$.

(iii) Given $\frac{dS_t^k/d\nu_t}{S_t^k}$, $\frac{dS_t^b/d\nu_t}{S_t^b}$, *and* ε_t, *the marginal impact of the risk-appetite shock on exchange rates increases in the LC debts-to-GDP ratio, but the marginal impact can either increase or decrease in the equity external liability-to-GDP ratio. In addition, the marginal impact is always larger for LC debts. That is, if I define* $\frac{d\varepsilon_t/d\nu_t}{\varepsilon_t} \equiv h_t\left(\eta_t^b,\eta_t^k\right)$.

$$\frac{\partial h_t}{\partial \eta_t^b} > 0 > \frac{\partial h_t}{\partial \eta_t^k} \quad or \quad \frac{\partial h_t}{\partial \eta_t^b} > \frac{\partial h_t}{\partial \eta_t^k} > 0$$

Proof. See if $\chi_k^0 = \chi_b^0 = 0$, then

$$\frac{dQ_t}{d\nu_t} = \frac{\varepsilon_t\left(-1+\frac{dS_t^k/d\nu_t}{S_t^k}+\frac{d\varepsilon_t/d\nu_t}{\varepsilon_t}\right)}{\sqrt{\begin{array}{c}\left(\phi\left(\sigma+\xi\right)\frac{k_{t-1}^d}{p_t^k\varepsilon_t}+\varphi^{-1}\frac{K_{t-1}}{p_t^k\varepsilon_t}-\frac{K_{t-1}}{p_t^k\varepsilon_t}\right)^2\\ +4\varphi^{-1}\frac{K_{t-1}}{p_t^k\varepsilon_t}\left(1+\phi\left(\frac{(\sigma+\xi)z_tk_{t-1}^d-\sigma R_td_{t-1}}{p_t^k\varepsilon_t}\right)\right)\end{array}}} \tag{E.5}$$

$$\frac{d\varepsilon_t/d\nu_t}{\varepsilon_t} = \frac{\begin{array}{c}p_t^k\left(1+\frac{dQ_t}{d\left(p_t^k\varepsilon_t\right)}\left(\frac{\omega}{1-\omega}\left(\varphi^{-1}+I_t\right)-k_{t-1}^f\right)\right)\left(1-\frac{dS_t^k/d\nu_t}{S_t^k}\right)\\ +p_t^b\left(1-\frac{dS_t^b/d\nu_t}{S_t^b}\right)\end{array}}{\begin{array}{c}\frac{Y_t^*}{1-\omega}\gamma\varepsilon_t^{\gamma-1}+\left(p_t^k+p_t^b\right)+p_t^k\frac{dQ_t}{d\left(p_t^k\varepsilon_t\right)}\\ \left(\frac{\omega}{1-\omega}\left(\varphi^{-1}+I_t\right)-k_{t-1}^f\right)\left(1-\frac{dS_t^k/d\nu_t}{S_t^k}\right)\end{array}}. \tag{E.6}$$

It is easy to see that under the assumptions in the proposition, $0 < \frac{d\varepsilon_t/d\nu_t}{\varepsilon_t} < 1$. By the assumption that $p_t^b\left(1-\frac{dS_t^b/d\nu_t}{S_t^b}\right) > -p_t^k\left(1+\frac{dQ_t}{d\left(p_t^k\varepsilon_t\right)}\left(\frac{\omega}{1-\omega}\varphi^{-1}-k_{t-1}^f\right)\right)\left(1-\frac{dS_t^k/d\nu_t}{S_t^k}\right)$, $\frac{d\varepsilon_t/d\nu_t}{\varepsilon_t} > 0$ and, moreover, by the assumption that $\frac{\gamma\varepsilon_t^{\gamma-1}}{1-\omega} > -\frac{dS_t^b/d\nu_t}{S_t^b}\eta_t^b$, $\frac{d\varepsilon_t/d\nu_t}{\varepsilon_t} < 1$.

Backing to $\frac{dQ_t}{d\nu_t}$, see

$$\frac{dQ_t}{d\nu_t} = \frac{\varepsilon_t\left(-1+\frac{dS_t^k/d\nu_t}{S_t^k}+\frac{d\varepsilon_t/d\nu_t}{\varepsilon_t}\right)}{\sqrt{\begin{array}{c}\left(\phi\left(\sigma+\xi\right)\frac{k_{t-1}^d}{p_t^k\varepsilon_t}+\varphi^{-1}\frac{K_{t-1}}{p_t^k\varepsilon_t}-\frac{K_{t-1}}{p_t^k\varepsilon_t}\right)^2\\ +4\varphi^{-1}\frac{K_{t-1}}{p_t^k\varepsilon_t}\left(1+\phi\left(\frac{(\sigma+\xi)z_tk_{t-1}^d-\sigma R_td_{t-1}}{p_t^k\varepsilon_t}\right)\right)\end{array}}}.$$

As $\frac{dS_t^k/d\nu_t}{S_t^k} \to 0$, $-1+\frac{dS_t^k/d\nu_t}{S_t^k} \to -1$, but $\frac{d\varepsilon_t/d\nu_t}{\varepsilon_t}$ is strictly smaller than 1. This proves that $\frac{dQ_t}{d\nu_t} < 0$ for $\frac{dS_t^k/d\nu_t}{S_t^k}$ small enough.

Lastly, I show

$$\frac{\partial h_t}{\partial\eta_t^b} > 0 > \frac{\partial h_t}{\partial\eta_t^k} \quad or \quad \frac{\partial h_t}{\partial\eta_t^b} > \frac{\partial h_t}{\partial\eta_t^k} > 0,$$

where $h\left(\eta_t^b,\eta_t^k\right) = \frac{d\varepsilon_t/d\nu_t}{\varepsilon_t}$, and $\eta_t^b = \frac{p_t^b}{Y_t^*}$ and $\eta_t^k = \frac{p_t^k}{Y_t^*}$. I transform Equation (E.6) to

$$\frac{d\varepsilon_t/d\nu_t}{\varepsilon_t} = \frac{\eta_t^k\left(1+\frac{dQ_t}{d\left(p_t^k\varepsilon_t\right)}\left(\frac{\omega}{1-\omega}\varphi^{-1}-k_{t-1}^f\right)\right)\left(1-\frac{dS_t^k/d\nu_t}{S_t^k}\right)+\eta_t^b\left(1-\frac{dS_t^b/d\nu_t}{S_t^b}\right)}{\frac{\gamma\varepsilon_t^{\gamma-1}}{1-\omega}+\eta_t^b+\eta_t^k\left(1+\frac{dQ_t}{d\left(p_t^k\varepsilon_t\right)}\left(\frac{\omega}{1-\omega}\varphi^{-1}-k_{t-1}^f\right)\left(1-\frac{dS_t^k/d\nu_t}{S_t^k}\right)\right)}. \tag{E.7}$$

Since $1 - \frac{dS_t^b/d\nu_t}{S_t^b} > 1$ and $0 < 1 - \frac{dS_t^b/d\nu_t}{S_t^b} < 1$, but $0 < \frac{d\varepsilon_t/d\nu_t}{\varepsilon_t} < 1$, it is straightforward that $\frac{\partial h_t}{\partial \eta_t^b} > 0$, and $\frac{\partial h_t}{\partial \eta_t^b} > \frac{\partial h_t}{\partial \eta_t^k}$.

Furthermore, $\frac{d\varepsilon_t/d\nu_t}{\varepsilon_t} < 1$ and the "coefficient" of η_t^k in the numerator is smaller than the denominator. That is,

$$\left(1 + \frac{dQ_t}{d\left(p_t^k \varepsilon_t\right)}\left(\frac{\omega}{1-\omega}\varphi^{-1} - k_{t-1}^f\right)\right)\left(1 - \frac{dS_t^k/d\nu_t}{S_t^k}\right)$$
$$< 1 + \frac{dQ_t}{d\left(p_t^k \varepsilon_t\right)}\left(\frac{\omega}{1-\omega}\varphi^{-1} - k_{t-1}^f\right)\left(1 - \frac{dS_t^k/d\nu_t}{S_t^k}\right).$$

Therefore, it can be either $\frac{\partial h_t}{\partial \eta_t^k} > 0$ or $\frac{\partial h_t}{\partial \eta_t^k} < 0$. ■

COROLLARY 2. *Assume that* $\frac{dI_t}{d\nu_t} + \frac{\partial EX_t}{\partial \varepsilon_t}\frac{d\varepsilon_t}{d\nu_t} > 0$. *Risk-off (on) shocks lower (raise) investments and raise (lower) net exports. That is,*

$$\frac{dI_t}{d\nu_t} < 0 \quad \textit{and} \quad \frac{d\left(NX_t\right)}{d\nu_t} > 0.$$

Proof. $\frac{dI_t}{d\nu_t} < 0$ is trivial. To show $\frac{d(NX_t)}{d\nu_t} > 0$, let's recall that net exports are $\varepsilon_t^{\gamma-1}Y_t^* - c_t^m$. The exports obviously increase in ν_t as I showed $\frac{d\varepsilon_t}{d\nu_t} > 0$ under the conditions. Then I only need to show $\frac{dC_t^m}{d\nu_t} < 0$. See $(1-\omega)\,C_t^m \varepsilon_t = \omega C_t^d$. From the resource constraint,

$$C_t^m \varepsilon_t = \left(\frac{\omega}{1-\omega}\right)\left(Y_t - I_t - G - EX_t\right).$$

By the assumption $\frac{dI_t}{d\nu_t} + \frac{\partial EX_t}{\partial \varepsilon_t}\frac{d\varepsilon_t}{d\nu_t} > 0$, $C_t^m \varepsilon_t$ decreases in ν_t. Since $\frac{d\varepsilon_t}{d\nu_t} > 0$ by the proposition 1, $\frac{dC_t^m}{d\nu_t} < 0$. ■

E.1 Discussion of Forward-Looking Leverage Constraint

Remark. Suppose the leverage ϕ in the model increases in the expected investment profitability. More precisely, the leverage ϕ_t is characterized as follows:[10]

$$\phi_t = \frac{R_{t+1}}{R_{t+1} - \theta R^k_{t+1}}.$$

Suppose $\frac{dk^f_t}{d\nu_t} < 0$. Then under the leverage constraint:

(i) Risk-off (on) shocks cause falls (booms) in capital markets. That is, $\frac{dQ_t}{d\nu_t} < 0$.

(ii) Risk-off (on) shocks lower (raise) the net worth N_t, but raise (lower) the leverage ϕ_t. That is, $\frac{dN_t}{d\nu_t} < 0$ and $\frac{d\phi_t}{d\nu_t} > 0$.

(iii) If the risk-appetite shock is persistent enough—that is, ρ is large enough—then risk-off (on) shocks lower (raise) the capital demand from domestic banks. That is, $\frac{dN_t}{d\nu_t}\phi_t + N_t\frac{d\phi_t}{d\nu_t} < 0$.

The claims in this remark are hard to show in a robust way, as many general equilibrium effects are going in the model. Thus, I illustrate how we expect the predictions in the remark. Before proceeding to the illustration, note that the leverage ratio can be formulated as follows:

$$\phi_t = \frac{1}{1 - \theta \mathbb{E}_t\left[R^k_{t+1}/R_{t+1}\right]}.$$

To see how we expect to see the first prediction, let me show how the opposite claim induces a contradiction. Suppose there exists a state in which $\frac{dQ_t}{d\nu_t} < 0$. Since $\frac{\partial p^k_t}{\partial \nu_t} < 0$, it is very likely that we have $\frac{dp^k_t}{d\nu_t} < 0$ and $\frac{dk^f_t}{d\nu_t} < 0$ if $\frac{dQ_t}{d\nu_t} < 0$. Since $\frac{dk^f_t}{d\nu_t} < 0$, it is necessary to

[10]This specification can be understood as a simple version of Gertler and Kiyotaki (2010) in the sense that the banks can collateralize their future cash revenues, but just the revenues in one period ahead, whereas all future cash flows, discounted by the discount rate of the banks, are collateralized in Gertler and Kiyotaki (2010).

have $\frac{dk_t^d}{d\nu_t} > 0$ for $\frac{dQ_t}{d\nu_t} > 0$. For the domestic bank to increase its demands for capital, the expected return R_{t+1}^k/R_{t+1} must increase. The capital return R_t^k falls in Q_t. See how $R_t = \mathbb{E}_t\left[\beta\frac{c_t^d}{c_{t+1}^d}\right]$ and c_t^d decrease as investment increases and exports increase because a higher Q_t increases the capital outflows (hence, more depreciation), while c_{t+1}^d increases as the capital held by domestic agents increases. However, if R_t cannot change drastically as in the New Keynesian model or consumption of the households cannot change by a large margin due to consumption smoothing, then R_t^k/R_t will fall. That is, the leverage falls and this gives a contradiction.

Once I have $\frac{dQ_t}{d\nu_t} > 0$, it is easy to see what we should expect to see the second claim.

To show the third claim, notice that as the shock becomes more persistent, with a higher ρ, the capital price in the future falls more since the given other states, and the capital demands from global investors fall more. That is, $R_t^k = \frac{Q_{t+1}+r_{t+1}}{Q_t}$ falls in ρ. Notice that the capital demands from the domestic banks are as follows:

$$\begin{aligned}\frac{d\left(Q_t k_t^d\right)}{d\nu_t} &= \frac{dN_t}{dQ_t}\frac{dQ_t}{d\nu_t}\phi_t + N_t\frac{d\phi_t}{d\nu_t}\\ &= \frac{dN_t}{dQ_t}\frac{dQ_t}{d\nu_t}\phi_t + N_t\left(\frac{\partial\phi_t}{\partial Q_t}\frac{dQ_t}{d\nu_t} + \frac{\partial\phi_t}{\partial Q_{t+1}}\frac{\partial Q_{t+1}}{\partial\nu_{t+1}} + \frac{\partial\phi_t}{\partial\nu_{t+1}}\right).\end{aligned}$$

See that $\frac{\partial Q_{t+1}}{\partial\nu_{t+1}}$ increases in ρ and $\frac{\partial\phi_t}{\partial Q_{t+1}} < 0$. Thus, $\frac{d\left(Q_t k_t^d\right)}{d\nu_t}$ falls in ρ and it shows the third claim.

Appendix F. Exchange Rate Channel

The theoretical environments in this section are identical to Subsection 3.2 except for the ones I describe below. I study the traditional exchange rate transmission channel. In environments where financial corporations have sizable net FC debts, risk-off shocks naturally lead to LC depreciation so as to dampen the balance sheets of the corporations in EMEs. The exchange rate channel has long been studied in the literature and is at the core of recent influential papers.[11] Although the key mechanism is the same in this paper, the LC depreciation, and the subsequent deleveraging of domestic banks, is initiated by capital outflows in the form of equities or LC debts. Moreover, the exchange rate channel interacts with the capital market channel, forming a negative loop mechanism of the risk-appetite shocks.

To add foreign currency debts to the model, I now assume that domestic banks can borrow from abroad in the form of foreign currency debt. Let's denote LC debt and FC debt by d_t and d_t^*, respectively. In addition, R_{t+1}^* denotes the borrowing rate on FC debt. Then, the bank balance sheet is

$$Q_t k_t^d = N_t + d_t + \varepsilon_t d_t^*. \tag{F.1}$$

For notational convenience, I define

$$D_t \equiv d_t + \varepsilon_t d_t^*$$
$$\widetilde{R}_{t+1}\left(\varepsilon_{t+1}\right) \equiv R_{t+1}\frac{d_t}{d_t + \varepsilon_t d_t^*} + \frac{\varepsilon_{t+1}}{\varepsilon_t} R_{t+1}^* \frac{\varepsilon_t d_t^*}{d_t + \varepsilon_t d_t^*}.$$

Then, the net worth is

$$\begin{aligned} N_t = {} & (\sigma + \xi)\left(z_t + Q_t\right) k_{t-1}^d \\ & - \sigma\left(\widetilde{R}_t\left(\varepsilon_t\right) D_{t-1} + \Theta\left(\varepsilon_{t-1} d_{t-1}^*, D_{t-1}\right)\right), \end{aligned} \tag{F.2}$$

where $\Theta\left(\varepsilon_{t-1} d_{t-1}^*, D_{t-1}\right)$ is the management cost of FC debt, which I will describe below.

See that $\widetilde{R}_t\left(\varepsilon_t\right)$ does increase in the exchange rate. That is, the debt burden after the realization of the exchange rate rises as the LC depreciates. Then from Equation (F.2), it is easy to see that LC

[11] See Aoki, Benigno, and Kiyotaki (2018), Akinci and Queralto (2019), and Bocola and Lorenzoni (2020).

depreciation (higher ε_t) dampens the net worth of the bank. The marginal impact of a risk-appetite shock on the capital price is

$$\frac{dQ_t}{d\nu_t} = \underbrace{\left(\frac{\left(p_t^k - \sigma R_{t+1}^* d_t^* \phi\right)}{\Xi_t\left(N_t, p_t^k \varepsilon_t\right)} \left(\frac{d\varepsilon_t}{d\nu_t}\right) + \frac{\varepsilon_t}{\Xi_t\left(N_t, p_t^k \varepsilon_t\right)} \left(\frac{dp_t^k}{d\nu_t}\right) \right)}_{First\ Foreign\ Demand\ Shock}$$

$$\cdot \underbrace{\left(1 - \frac{(\sigma + \xi)\, k_{t-1}^d \phi}{\Xi_t\left(N_t, p_t^k \varepsilon_t\right)}\right)^{-1}}_{Second\ Fire\ Sale} < 0, \tag{F.3}$$

where $\Xi_t(\cdot) = \sqrt{(\varphi - 1)^2 + 4\varphi \frac{N_t \phi +}{K_{t-1}^{-1}}}$. If $p_t^k - (1 - \sigma) R_{t+1}^* d_t^* \phi < 0$, LC depreciations dampen the net worth of domestic banks so as to expedite a fall in capital prices.

Similarly, I can characterize the impacts of risk-appetite shocks on the exchange rate in environments where domestic banks have net FC debts. The equilibrium exchange rate is characterized as follows:

$$\varepsilon_t = \left(\frac{\begin{array}{c} \varepsilon_t c_t^m + R_t^k k_{t-1}^f + R_t b_{t-1}^f - \varepsilon_t \left[p_t^k + p_t^b\right] \\ - \varepsilon_t \left[d_t^* \left(Q_t\left(v_t\right), v_t \right) - R_t^* d_{t-1}^* \right] \end{array}}{Y_t^*} \right)^{\frac{1}{\gamma}}. \tag{F.4}$$

In Equation (F.4), it is important to notice that the FC borrowing d_t^* depends on Q_t. Intuitively, lower capital prices induce deleveraging of the banks and, accordingly, less borrowing abroad. To see it more clearly, let's consider the optimal borrowing decision of domestic banks. Because of the leverage constraint, the only optimal decision of the domestic banks is to choose between domestic deposits and FC debts. To characterize the FC borrowing explicitly, I borrow an assumption from Aoki, Benigno, and Kiyotaki (2018). Suppose that the domestic banks face the management cost of FC borrowing.

$$\Theta\left(\varepsilon_t d_t^*, D_t\right) = \frac{\psi}{2} x_t^2 D_t \tag{F.5}$$

$\Theta(\cdot)$ is the management cost and x_t is the FC debt ratio $\frac{\varepsilon_t d_t^*}{d_t+\varepsilon_t d_t^*}$. To make it more tractable, I assume the management cost will be paid in the next period. Thus, $\Theta\left(\varepsilon_t d_t^*, Q_t k_t^d\right)$ is paid in time t+1. Then the FC borrowing will be

$$d_t^* = N_t(\phi - 1)\frac{\mathbb{E}_t\left[R_{t+1} - \frac{\varepsilon_{t+1}}{\varepsilon_t}R_{t+1}^*\right]}{\psi\varepsilon_t}. \tag{F.6}$$

Therefore, FC borrowing increases in N_t. Intuitively, as the bank deleverages due to negative shocks to its own capital, the bank does not need to borrow from either depositors or foreign investors, thereby reducing FC borrowing. That means there will be less foreign currency supplies to the foreign exchange market. Now we can derive the comparative statics $\frac{d\varepsilon_t}{d\nu_t}$.

$$\frac{d\varepsilon_t/d\nu_t}{\varepsilon_t} = \frac{Y_t^*\left[\eta_t^b\left(1 - \frac{dS_t^b/d\nu_t}{S_t^b}\right) + \eta_t^k + \frac{\varepsilon_{t-1}}{\varepsilon_t}\frac{dR_t^k}{d\nu_t}g_t^{Y^*}\eta_{t-1}^k\right] + \frac{dc_t^m}{d\nu_t} - \left(\frac{\partial d_t^*}{\partial Q_t}\frac{dQ_t}{d\nu_t}\right)}{Y_t^*\left(\gamma\varepsilon_t^{\gamma-1} + \eta_t^k + \eta_t^b\right) - C_t^m + \left(d_t^* - R_t^* d_{t-1}^*\right) - \varepsilon_t\left(\frac{\partial d_t^*}{\partial \nu_t}\right)} > 0 \tag{F.7}$$

Since $\frac{\partial d_t^*}{\partial Q_t} > 0$ and $\frac{dQ_t}{d\nu_t} < 0$, the falls in the capital price due to risk-off shocks amplify LC depreciation.[12]

As a result, the falling capital price and rising exchange rate interact with each other, forming a negative loop mechanism. I summarize this finding in Proposition 3.

PROPOSITION 3. *Suppose domestic banks have positive net foreign currency debts, that is $d_t^* > 0$. Then we have the following:*

(i) Local currency depreciation (appreciation) lowers (raises) the net worth of domestic banks. That is, $\frac{\partial N_t}{\partial \varepsilon_t} < 0$.

(ii) The impact on the capital price is amplified through the exchange rate, and the impact on the exchange rate is

[12] This should be understood as meaning effects other than those through the capital price, the term $\left(\frac{dQ_t}{d\nu_t}\right)k_{t-1}^f$.

amplified through the capital price. That is, given $p_t^k - (1-\sigma) R_{t+1}^* d_t^* L < 0$ *and holding other states,* $\mid \frac{dQ_t}{d\nu_t} \mid$ *increases in* $\frac{d\varepsilon_t}{d\nu_t}$*, and* $\frac{d\varepsilon_t / d\nu_t}{\varepsilon_t}$ *increases in* $\mid \frac{\partial d_t^*}{\partial Q_t} \frac{dQ_t}{d\nu_t} \mid$.

Proof. See the discussion above.

Appendix G. Pricing to Markets and Exchange Rate Channel

In this appendix, I introduce an simple model to illustrate how resilient non-financial corporations in EMEs can be to local currency depreciations so that the seemingly large amounts of net foreign currency debts of non-financial corporations do not show a significance in the cross-country regressions. For tractability and simplicity, in this section, I treat domestic banks as a conglomeration of financial and non-financial corporations. This is a way to illustrate the desired mechanism, while keeping consistency in modeling techniques.

While maintaining simplicity even in the extended model, I make one change to the simple model. I adopt monopolistic competition in the model. Following the standard in the literature, final goods are produced from a variety of differentiated goods $y_{i,t}, i \in [0,1]$ under perfect competition according to CES technology as below.

$$Y_t = \left(\int_0^1 y_{i,t}^{\frac{\eta-1}{\eta}} di \right)^{\frac{\eta}{\eta-1}},$$

where $\eta > 1$. Each differentiated intermediate good is by the standard Cobb-Douglas technology.

$$y_{i,t} = A_t \left(k_{i,t}\right)^{\alpha} \left(l_{i,t}\right)^{1-\alpha},$$

where subscript i denotes inputs used by producer i.

Following the standard in the literature, I assume that the intermediate goods producers are under monopolistic competitions and thus face a downward-sloping demand curve as follows:

$$y_{i,t} = \left(\frac{p_{i,t}}{P_t}\right)^{-\eta} Y_t,$$

where $p_{i,t}$ is the nominal price of goods i and P_t is the aggregate price index as follows:

$$P_t = \left(\int_0^1 p_{i,t}^{1-\eta} di \right)^{\frac{1}{1-\eta}}.$$

Notice I do not introduce nominal rigidity; in each period, the intermediate goods producers can set their prices optimally. The producers can separately set their prices in foreign markets, as argued in local currency pricing (LCP) hypothesis.[13] However, while the producers can optimally change their prices in local markets, producers who export to foreign markets take foreign market prices as given. This is a way to keep the model simple, while capturing observed empirical features. As it is well known, exchange rate pass-through into export prices is usually low in reality. Also, for many exporting goods, the exporting prices are determined under strategic considerations of the exporters, from which I abstract here, or the prices are determined in large international markets, like some commodities in reality.

Then the two different prices in domestic and foreign markets are determined as follows:

$$p_{i,t} = \frac{\eta}{\eta - 1} mc_t \quad \text{and} \quad p_{i,t}^* = p_t^* \left(\epsilon_t p_t^* > mc_t \right).$$

Please notice that the price in the foreign markets is assumed to be higher than the marginal costs, and therefore local currency depreciation will gift higher markups to the exporters if the marginal costs in local currency are fixed.

Since the price is higher than the marginal costs, the monopolistic producer can have some profits, as follows:

$$\pi_{i,t} = \underbrace{\frac{1}{\eta} Y_t^d}_{Dometic\ Profit} + \underbrace{Y_t^* \left(p_t^* \right)^{-\eta^*} \left(e_t - mc_t \right)}_{Export\ Profit},$$

[13]See Betts and Devereux (2000) for LCP.

where $Y_t^d = c_t^d + I_t + G$ and e_t is the real exchange rate. $mc_t = \frac{1}{A_t}(\alpha z_t)^{\alpha}((1-\alpha)w_t)^{1-\alpha}$ and z_t and w_t are the real rental cost of capital and the real wage in terms of the "domestic price of the final goods." In other words, the marginal cost of the producers is denominated in local currency.

Now I show how the "economic" profits of the corporations whose revenues are partially denominated in foreign currency move opposite to the risk appetite of global investors. That is, risk-off (on) shocks increase (decrease) the profits of the corporations. I highlight this in the following lemma.

LEMMA 2. *Risk-off (on) shocks increase (decrease) corporate profits* π_t. *That is,* $\frac{d\pi_t}{d\nu_t} > 0$.

Proof. The result comes from the allocation of the output. Notice

$$Y_t = C_t + I_t + G + EX_t.$$

I factorize the aggregate ouput into domestic demands and foreign demands. That is,

$$Y_t^d = C_t + I_t + G = \left(\int_0^1 \left(y_{i,t}^d\right)^{\frac{\eta-1}{\eta}} di\right)^{\frac{\eta}{\eta-1}}$$

$$EX_t = \left(\int_0^1 \left(y_{i,t}^*\right)^{\frac{\eta-1}{\eta}} di\right)^{\frac{\eta}{\eta-1}}.$$

$y_{i,t}^d$ and $y_{i,t}^*$ are the intermediate inputs for domestic demands and foreign demands (exports), respectively.

By assumption, the price of export goods in the foreign market is fixed. Then, the demand from the foreign market EX_t is invariant to the risk-on/off shock ν_t. Then, accordingly, domestic demand is invariant as well. The value of the total output in terms of the domestic price is

$$\left(\int_0^1 \left(y_{i,t}^d\right)^{\frac{\eta-1}{\eta}} di\right)^{\frac{\eta}{\eta-1}} + \frac{p_t^*\varepsilon_t}{p_t}\left(\int_0^1 \left(y_{i,t}^*\right)^{\frac{\eta-1}{\eta}} di\right)^{\frac{\eta}{\eta-1}}$$
$$= w_t L + z_t K_{t-1} + \pi_t. \qquad \text{(G.1)}$$

See that $\left(\int_0^1 \left(y_{i,t}^d\right)^{\frac{\eta-1}{\eta}} di\right)^{\frac{\eta}{\eta-1}}$ and $\left(\int_0^1 \left(y_{i,t}^*\right)^{\frac{\eta-1}{\eta}} di\right)^{\frac{\eta}{\eta-1}}$ are invariant to the risk-on/off shocks. Furthermore, p_t^* and p_t are invariant as well because

$$p_t = \frac{\eta}{\eta - 1} mc_t.$$

Notice that the marginal cost mc_t is invariant as well because there is no technological shock.

In the same way, w_t and z_t are invariant as well. In Equation (G.1), the LHS increases in ν_t since a risk-off (on) shock raises (lowers) ε_t. To hold the equality between the LHS and the RHS in Equation (G.1), the profit π_t has to change accordingly. This gives me the desired results.

To see it another way, the real profit measured by the domestic price is

$$\pi_t = \underbrace{\frac{1}{\eta} Y_t^d}_{Dometic\ Profit} + \underbrace{Y_t^* \left(p_t^*\right)^{-\eta^*} \left(\frac{p_t^* \varepsilon_t}{p_t} - \frac{1-\eta}{\eta}\right)}_{Export\ Profit}.$$

Since Y_t^d is given, it is easy to see that π_t increases in ν_t. ■

Therefore, the profits of corporations increase when the risk appetite of global investors unexpectedly falls, despite negative impacts on capital markets. This is a particular case because I abstract from some features in reality, like nominal rigidity, which generates aggregate demand externality. The implications from the lemma should be understood as such that profits of the exporting corporations are affected less than others, or the profits are relatively stable from the risk-appetite shocks. Of course, in reality, profits of export-oriented firms in EMEs can even increase even if the economy falls into a recession.

How are the corporates in the model benefiting from the risk-off shocks? Recall the costs of the corporates are denominated in local currency in the sense that real wages and rental costs are measured by marginal products in domestic markets. On the contrary, parts of the revenues are denominated in foreign currency. Therefore, local currency depreciations raise markups for the corporations.

While local currency depreciation benefits the corporations on the profit side, the depreciation should raise the real debt burden of foreign currency debts if the corporations have foreign currency debts. Thus, the positive effects and negative effects offset each other, and which effect is dominating depends on the amounts of foreign currency debts and the magnitude of the positive impacts on profits, which, again, depend on different conditions, such as the share of exports in the outputs of the corporations, i.e., trade openness of the economy for the country representative firm.

To see it more clearly, let's look at the impacts of local currency depreciation on the net worth.[14] Recall that the exchange rate channel works through the impact of the exchange rate on the net worth of the domestic banks, which include non-financial corporations here.

$$\frac{\partial N_t}{\partial \varepsilon_t}\frac{d\varepsilon_t}{d\nu_t} = \left(1 - \frac{\partial Q_t}{\partial N_t}k_{t-1}^d\right)^{-1}\left[\frac{\partial \pi_t}{\partial \varepsilon_t} + \frac{\partial Q_t}{\partial\left(p_t^k\varepsilon_t\right)}\frac{\partial\left(p_t^k\varepsilon_t\right)}{\partial \varepsilon_t} - R_t^* d_{t-1}^*\right] \tag{G.2}$$

In Equation (G.2), the conventional balance sheet effects are captured by $R_t^* d_{t-1}^*$, negative effects of local currency depreciation. On the other hand, there are positive effects of the depreciation, and the impacts on the profits are captured by $\frac{\partial \pi_t}{\partial \varepsilon_t}$. Because of the different effects offseting each other, the sign of $\frac{\partial N_t}{\partial \varepsilon_t}\frac{d\varepsilon_t}{d\nu_t}$ is inconclusive.

In my regression, I have no proper measure of the impacts of exchange rate movements on corporate profits, $\frac{\partial \pi_t}{\partial \varepsilon_t}$. If $\frac{\partial \pi_t}{\partial \varepsilon_t}$ is positively correlated with foreign currency debt d_{t-1}^*, as is likely in reality, then, consistently with the empirical results, more net foreign currency debts in non-financial corporate sectors do not necessarily mean higher fragility to local currency depreciations.

To put it another way, let's imagine that one looks at different EMEs with different levels of foreign currency debts in non-financial corporate sectors, and estimates correlations between the foreign currency debts and fragility measures, such as changes in

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14 $\frac{\partial N_t}{\partial \varepsilon_t}\frac{\partial \pi_t}{\partial \varepsilon_t} = \frac{Y_t^*\left(p_t^*\right)^{1-\eta^*}}{P_t}$ and $\frac{\partial Q_t}{\partial N_t} = \frac{\varphi \phi_t}{\sqrt{\left(\varphi K_{t-1}-1\right)^2+4\varphi\left(N_t\phi_t+p_t^k\varepsilon_t\right)}}$.

stock indices. If $\frac{\partial \pi_t}{\partial \varepsilon_t}$ is not properly controlled due to some unobservable features like different pricing in exports, then it is hard for the correlation $corr\left(\frac{\partial N_t}{\partial \varepsilon_t}\frac{d\varepsilon_t}{d\nu_t}, d^*_{t-1}\right)$ to be meaningfully high.

Then the following question is whether the positive impacts on the profits are positively correlated with the foreign currency debts. Theoretically, one can build a model where desires to stabilize cash flows lead corporations to borrow more in foreign currency when they export more; leverage constraint from the tail risk, like VaR constraint, incentivizes exporters to issue more foreign currency debts since exporters have less risk from foreign currency debts as their profits increase in local currency depreciation. Empirically, finding relevant evidence is challenging, and it is beyond the scope of this paper. Recently, Dalgic (2020) documents that in Turkey foreign currency debts are centered on large exporters.

The central message in this paper is the decline of risk from foreign currency debts in EMEs but the rise of the new risk from equity and local currency portfolio investment capital flows. To focus on the new channel uncovered in this paper, I do not pioneer more about the assessment of foreign currency debt risks of non-financial corporations in EMEs. Instead, I highlight the findings in the following remark.

Remark. In different types of models where profits of exporters increase in local currency depreciation, the exporters whose profits increase more in local currency depreciation will borrow more in foreign currency. Then more foreign currency debts do not necessarily lead to higher fragility: during a risk-off event, the positive effects on profits largely offset the negative impacts on foreign currency debts.

G.1 Discussion of the Implications

Broadly speaking, the implications here are that profits of the exporters are likely to increase in local currency depreciations. To the best of my knowledge, such effects have not been extensively studied. However, all the underlying assumptions are in line with recent progress in the international macroeconomics literature. As revealed in influential papers of dominant currency pricing (DCP)—for example, Gopinath and Stein (2020)—most tradable goods are denominated in dominant currency, in fact, the U.S. dollar. On the contrary, the "domestic" costs of corporations in EMEs are local currency denominated and rigid in the short run. The obvious example is wages in EMEs, and wage rigidity in EMEs has been discussed in many papers. Then, it is clear that local currency depreciation itself boosts the profitability of exporters in EMEs, as their revenues are denominated in foreign currency like the U.S. dollar, whereas much of their costs are denominated in local currency.

One assumption that can alter the conclusion above is positive covariance between the risk-appetite shocks and foreign demands for exports from EMEs. In other words, if the trade shocks substantially move together with the risk-appetite shocks, then exporters will be hit harder. Certainly, the two different shocks are positively correlated with each other to some extent, but many specific cases of risk-off shocks do not accompany trade shocks. For instance, risk-off shocks driven by U.S. Federal Reserve (the Fed) monetary policy normalization do not necessarily cause negative trade shocks, as the Fed would roll back the expansionary monetary policy, conditioning on whether the Fed judges that the U.S. economy is resilient enough. However, a global crisis like the 2008 global financial crisis or the recent COVID-19 crisis can be accompanied by both large trade shocks and risk-appetite shocks.[15] To accommodate such tail risks, I need more informative data and need to conduct a more sophisticated theoretical analysis. These are beyond the scope of this paper.

One straightforward prediction from the model is a positive correlation between trade openness and net foreign currency debts of the non-financial corporate sector. In my 20 sample EMEs, the observed correlation is 0.31. In reality, where pricing in exports and price elasticities of exporting goods are different among EMEs, the sensitivity of corporate profits to exchange rates depends on many factors other than trade openness. Identification of the factors is also beyond the scope of this paper.

[15] Extreme crises must dampen the profitability of the exporters in EMEs, but the role of exchange rates in this context is unclear. Besides the negative demand shocks, higher exchange rates still help exporters with a lessening of the negative impacts.

Last, I emphasize that the conclusion here does not imply net foreign currency debts of non-financial corporations in EMEs are efficient from the viewpoint of financial stability. Rather, the statement should be understood as positive correlations between countercyclical components in non-financial corporate profits and foreign currency debts in the sectors: thus, more foreign currency debts do not necessarily lead to higher fragility in the data. The foreign currency debts in reality may be determined by the risk-hedging desires of the corporations, but the foreign currency debts in the first-best equilibrium should be determined taking account of pecuniary externalities and aggregate demand externalities.[16] Since the focus in this paper is on the channels through which risk appetite shocks are transmitted, I do not further analyze the efficiency of foreign currency debts.[17]

Appendix H. Discussion of Endogeneity in the Regressions

One possible interpretation of the results of the regressions in Section 2 is that some EMEs issue more local-currency-denominated securities to foreign investors because the EMEs are more fragile to global financial cycle. The idea follows from a typical risk-sharing argument. Both equity and LC debt have properties that payments to foreign investors are countercyclical to global financial cycle; payments decrease when there is a negative shock to the risk appetite of global investors. If there is an EME whose business cycles follow the global financial cycle, then the EME, given other conditions, is

[16]For a more serious analysis, I need more detailed information about different features of exporters in the EMEs, such as different pricing or price elasticities of the exports.

[17]My presumption is the net foreign currency debt levels observed in the data are still higher than the first-best equilibrium levels. This is because the risk-on/off shocks impact EMEs not only through foreign currency debts but also through the capital market channel, which I uncover and highlight in this paper. To stabilize the economy from the global financial cycles, the net worth of the corporations needs to be procyclical to exchange rates. Higher exchange rates (local currency depreciations) increase the cash flows of the corporations, as higher (lower) exchage rates follow risk-off (on) shocks. To explain more, the net worth of the corporations is stabilized from exchange rates with some foreign currency debts, but without the foreign currency debts the local currency depreciation can strengthen the net worth so as to cover the negative impacts of risk-off shocks through the capital price.

incentivized to issue more equities or LC debts to global investors if the global investors are risk neutral.

Although I cannot completely rule out the chance of such endogeneity since the data used is not rich enough, I show that at least the results above are unlikely to come from the endogeneity. The empirical results are not because some EMEs with higher exposures issue more equities and LC debts to foreign investors.

First of all, the interpretation that fragile EMEs sell more equities and LC debts to global investors misses that the risk-appetite shock is a global systemic shock. As typically argued, VIX is a measure of a co-factor of risky assets in the world. Hence, risks measured by VIX are the risks to every investor, and it is the same for the global investors, who manage different assets in different countries all over the world. Therefore, assets in EMEs whose business cycles are positively correlated with risk-appetite shocks are less attractive to global investors in terms of risk sharing. Then it is straightforward that such EMEs need to provide higher premiums if they want to sell equities and LC debts to global investors. On the other hand, the issuers in EMEs are indifferent between sharing country specific risks and sharing systemic global risks as long as both risks are their own risks. In contrast, global investors would not care much about country-specific risks. As a result, in the argument of the frictionless risk sharing, EMEs whose fundamentals are less or negatively correlated with global financial cycle are more incentivized to issue more equities or LC debts to global investors because they can share their risks at lower costs. Altogether, if the risk-sharing argument in a frictionless economy works, the signs of the coefficients must be opposite from the two tables.[18]

Second, historical evidence is unfavorable for the risk-sharing argument that more fragile EMEs issue more equities and LC debts to global investors. If EMEs that were fragile to external financial shocks have issued more local-currency-denominated external liabilities—equities and LC debts—to foreign investors, then we should see positive correlations between the fragilities in the past

[18]The overall argument here is related to Hassan, Mertins, and Zhang (2021) in that risk properties of a currency can attract more or less foreign capital in the country.

(from 1995 to 2001)[19] and local-currency-denominated external liabilities in the present. To check this while avoiding possible complexities, I first estimate the "beta" of each currency and stock indices in the 1990s as follows:

$$y_t^j = \alpha^j + \beta^j vix_t + \epsilon_t^j, \tag{H.1}$$

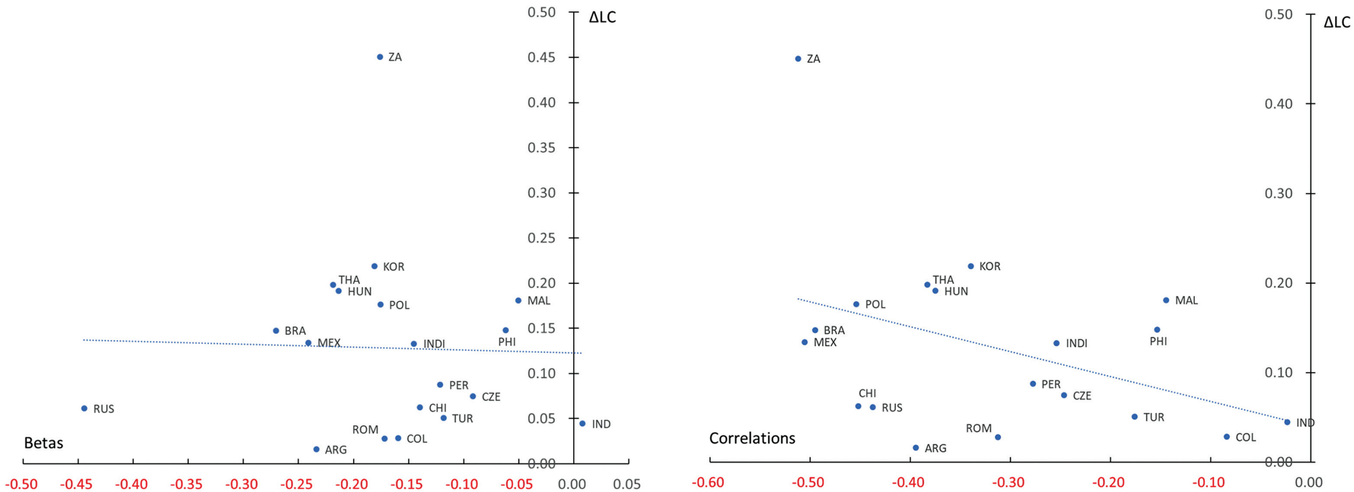
where y_t^j is monthly percentage changes in either exchange rates or stock indices, and vix is the percentage changes in CBOE VIX. I run the regression for each country so that I have 20 betas of exchange rate for 19 EMEs, the 20 EMEs except for Bulgaria, and the same for the stock indices. Then I plot the betas against the amounts of local currency liabilities, including both equities and LC debts, in the 19 EMEs. For exchange rates, for most EMEs, the betas are not significant, reflecting the fact that many of the EMEs were under fixed exchange rate regimes. Hence, on the left panel in Figure H.1, I plot the stock index betas against the increase in local currency liabilities. On the right panel, I add a figure where I replace the betas with the correlations between the stock index percentage changes and VIX percentage changes.

As one can easily see, there is no clear relationship between the two variables. Although the exercise is a little crude, upon investigations that have been done so far, there is no clear relationship between the fragility in the past and the current distribution of local-currency-denominated external liabilities.

Then, what kind of fundamentals show a significant relationship with the distributions of the equity external liabilities and LC external debts? In the companion paper Han (2022), I show that the depth of capital markets—stock and bonds markets— are correlated with the external liabilities of LC equities and bonds. That is, EMEs that have larger stock markets tend to borrow more abroad in the form of equity, and, similarly, EMEs that have larger bond markets tend to borrow more in LC bonds.

[19]This time period is to avoid the eras of hyperinflation in Latin American countries and the time that relative LC external liabilities among the EMEs are similar to the present distribution.

Figure H.1. Stock Index Betas and the Increase in LC External Liabilities



Note: $\Delta LC = LC$ external liabilities (equities and LC debts) to GDP ratios in 2018 minus the same ratios in 2001. Both left and right panels include all the 20 EMEs in the sample, except for Bulgaria.

Appendix I. Regressions with Sector-Level Currency Mismatches

Similarly with the regressions with aggregate-level currency mismatches, I first introduce the results of the exchange rate regressions in Table I.1. Again, for brevity, I introduce only the estimated coefficients of the key variables. The results for the other control variables are relegated to Appendix K. I denote net foreign currency assets (foreign currency assets of debt instruments minus foreign currency debts) by NFC, and denote households, deposit-taking financial corporate sector, non-financial corporate sector, and government by HH, $Bank$, NFC, and G, respectively. Hence, HH_NFC indicates net foreign currency debt assets of households.[20]

First, notice that the local currency bond loses much of the statistical significance when net foreign currency debt assets of households, which are mostly FC deposits held by HHs, are included. However, the significance is restored once the time-fixed effects are included.[21] The coefficients of the net FC debt assets of households are negative and strongly significant in regressions (3) and (5); more FC debt assets of the households seem to be associated with lower sensitivities of exchange rates to global financial shock. The FC debt assets of deposit-taking financial corporations, banks, seem to be associated with higher sensitivities of exchange rates to global financial shock in regressions (2) and (5); hence, the opposite of the household net foreign currency debt assets. A possible interpretation is that it reflects different exposures of the sectors to exchange rate risk. For example, suppose the households need to hedge all the risk related to drastic changes in exchange rates, whereas the banks care more about the exchange rate risk related to global financial shock. Then, the results in Table I.1 are straightforward: more FC

[20] Unlike the regressions of the aggregate-level currency mismatches, I use net positions rather than including foreign currency assets and liabilities separately. Net foreign currency assets allow for more straightforward interpretations, as I focus on foreign currency asset and debt valuation effects due to exchange rate changes. However, the results introduced below are highly consistent although I include foreign currency assets and debts separately. The results are omitted due to limited space.

[21] The significance is also restored when I add time dummies to the regressions (5) and (6).

Table I.1. Exchange Rate Regressions_Sector Level

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
$\Delta ln(VIX)_t$	0.051***	0.049***	0.054***	0.048***	0.051***	0.051***	
	(0.010)	(0.010)	(0.009)	(0.011)	(0.014)	(0.011)	
$(LCB/GDP)^j_{EOY-1} \times \Delta ln(VIX)_t$	0.099**	0.095**	0.043	0.097***	0.010	0.010	0.098**
	(0.039)	(0.042)	(0.046)	(0.031)	(0.043)	(0.122)	(0.035)
$(LCE/GDP)^j_{EOY-1} \times \Delta ln(VIX)_t$	–0.020	–0.020	–0.019	–0.014	–0.016	–0.016	–0.013
	(0.016)	(0.013)	(0.018)	(0.020)	(0.028)	(0.031)	(0.027)
$(NFC\_NFC/GDP)^j_{EOY-1} \times \Delta ln(VIX)_t$	0.016				–0.044	–0.044	0.000
	(0.033)				(0.050)	(0.045)	(0.048)
$(Bank\_NFC/GDP)^j_{EOY-1} \times \Delta ln(VIX)_t$		0.096**			$0.090^{\dagger}$	0.090	0.055
		(0.041)			(0.053)	(0.125)	(0.055)
$(HH\_NFC/GDP)^j_{EOY-1} \times \Delta ln(VIX)_t$			–0.103**		–0.173**	–0.173	–0.039
			(0.046)		(0.070)	(0.135)	(0.072)
$(Govt\_NFC/GDP)^j_{EOY-1} \times \Delta ln(VIX)_t$				–0.009	0.007	0.007	0.019
				(0.045)	(0.057)	(0.042)	(0.042)
$(Reserve/GDP)^j_{t-1} \times \Delta ln(VIX)_t$	–0.053*	–0.057*	–0.030	–0.056**	–0.022	–0.022	–0.038*
	(0.026)	(0.028)	(0.030)	(0.025)	(0.030)	(0.042)	(0.022)
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	No	No	No	No	No	No	Yes
# of Obs.	1,532	1,532	1,532	1,532	1,532	1,532	1,532
R-squared	0.085	0.086	0.089	0.085	0.091	0.091	0.438

Note: ***p < 0.01, **p < 0.05, *p < 0.1, †p < 0.15. LCD: local currency debt, LCB: local currency bond portfolio, LCE: local currency equity, NFC_NFC: net foreign currency assets of non-financial corporate sector, Bank_NFC: net foreign currency assets of deposit-taking financial corporate sector (banks), HH_NFC: net foreign currency assets of household sector, and Govt_NFC: net foreign currency assets of government sector. EOY_{-1} indicates the value at the end of last year of time t. Robust standard errors clustered at the country level. Regression (6) used the Driscoll-Kraay standard errors. Regression (7) omits the VIX variables, as it includes time fixed effects. I excluded Argentina, as the Argentine sectoral-level data, especially the non-financial corporate sector in Argentina, might reflect asset concealments of the Argentine households. See Han (2021) for the related discussion. However, the results are much similar even when including Argentina.

debt assets of both the households and banks can help EMEs with stabilizing exchange rates, but the sign is opposite for the banks, as more foreign currency debt assets of the banks in an EME are likely to reflect higher sensitivities of the EME's currency to global financial shock; thus, a reverse causality. Of course, it is but one interpretation among many others, and the exact interpretation is beyond the scope of this paper.

Next, I introduce the results of stock indices regressions in Table I.2. The net foreign currency debt assets of financial and non-financial corporate sectors in the regressions are denominated as a ratio to the capital of the corresponding sector. By taking the leverage ratios to the currency mismatches, I can better capture the potential effects of exchange rate changes on the corporate sectors.

Just as with the exchange rate regressions with sector-level net foreign currency assets, the core results are similar to the results of aggregate-level currency mismatch: the foreign investor share is still negative with little more significance. However, unlike the aggregate FC measures, the net FC debt assets of non-financial corporations and households show some significance, depending on the specification. Higher FC debt asset to capital ratios of non-financial corporate sectors are positively associated with higher sensitivities of the stock indices to global financial shock, whereas more FC debt assets of the households seem to be associated with lower sensitivities of the stock indices to global financial shocks, similarly with the exchange rate regressions. Interpretations might be similar to the exchange rate regressions: more FC debt assets can of course help the sectors with weathering fluctuations driven by global financial shock, but more net FC debt assets of the non-financial corporate sectors reflect the desires of the corporations to protect themselves from the risk related to global financial shocks.

Despite the statistical significance in some regressions, overall no clear relationship between net FC debts of the corporate sectors and the sensitivities to global financial shock is found. A plausible explanation for the result is that FC assets or revenues of corporate sectors match the foreign currency debts of the corporate sectors. To explain a little more, let's think of the financial corporate sectors that borrow abroad in foreign currency and supply the foreign currency to domestic foreign exchange markets. A risk-off shock can cause local currency depreciations so as to dampen the balance sheets of the

Table I.2. Stock Indices Regressions_Sector Level

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
$\Delta ln(VIX)_t$	–0.070***	–0.079***	–0.075***	–0.078***	–0.008***	–0.068***	
	(0.013)	(0.015)	(0.012)	(0.016)	(0.019)	(0.014)	
$(LCE/Mkt.\ Cap.)^j_{EOY-1} \times \Delta ln(VIX)_t$	–0.060**	–0.054*	–0.070***	–0.059**	–0.108**	–0.108*	–0.111**
	(0.028)	(0.028)	(0.024)	(0.026)	(0.039)	(0.060)	(0.042)
$(LCB/GDP)^j_{EOY-1} \times \Delta ln(VIX)_t$	0.060	0.073	0.137***	0.081†	0.169***	0.169	0.165**
	(0.051)	(0.050)	(0.043)	(0.051)	(0.050)	(0.149)	(0.059)
$(NFC\_NFC/NFC\_Cap)^j_{EOY-1} \times \Delta ln(VIX)_t$		–0.048*		–0.047†	0.041	0.041	0.051
		(0.025)		(0.029)	(0.060)	(0.064)	(0.065)
$(Bank\_NFC/Bank\_Cap)^j_{EOY-1} \times \Delta ln(VIX)_t$	–0.004			–0.004	–0.004	–0.004	–0.003
	(0.005)			(0.005)	(0.005)	(0.005)	(0.005)
$(OFC\_NFC/OFC\_Cap)^j_{EOY-1} \times \Delta ln(VIX)_t$					–0.140	–0.140	–0.126
					(0.243)	(0.271)	(0.239)
$(HH\_NFC/GDP)^j_{EOY-1} \times \Delta ln(VIX)_t$			0.125**		0.197	0.197	0.207†
			(0.052)		(0.117)	(0.158)	(0.128)
$(Govt\_NFC/GDP)^j_{EOY-1} \times \Delta ln(VIX)_t$					–0.058	–0.058	–0.069
					(0.042)	(0.067)	(0.044)
$(Reserve/GDP)^j_{t-1} \times \Delta ln(VIX)_t$	0.046	0.040	0.017	0.040	0.010	0.010	0.001
	(0.047)	(0.035)	(0.033)	(0.037)	(0.036)	(0.048)	(0.036)
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	No	No	No	No	No	No	Yes
# of Obs.	1,532	1,449	1,532	1,449	1,449	1,449	1,449
R-squared	0.120	0.120	0.120	0.122	0.126	0.126	0.344

Note: ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$, $^\dagger p < 0.15$. LCD: local currency debt, LCB: local currency bond portfolio, LCE: local currency equity, NFC_NFC: net foreign currency assets of non-financial corporate sector, Bank_NFC: net foreign currency assets of deposit-taking financial corporate sector (banks), HH_NFC: net foreign currency assets of household sector, OFC_NFC: net foreign currency assets of financial corporate sector excluding deposit-taking financial corporations, and Govt_NFC: net foreign currency assets of government sector. EOY_{-1} indicates the value at the end of last year of time t. Robust standard errors clustered at the country level. Regression (6) used the Driscoll-Kraay standard errors. Regression (7) omits the VIX variables, as it includes time fixed effects. I excluded Argentina, as the Argentine sectoral-level data, especially the non-financial corporate sector in Argentina, might reflect asset concealments of the Argentine households. See Han (2021) for the related discussion. However, the results are much similar even when including Argentina. The data on capital of the non-financial corporate sector in Philippines is only for 2018 and thus regressions (2), (4), (5), (6), and (7) exclude data of Philippines.

financial corporations, which in turn results in less foreign currency supplies due to the deleveraging of the financial intermediaries. However, such a scenario can be realized only when the financial corporate sectors have large enough net foreign currency debts, and it is documented in the companion paper Han (2022) that financial corporate sectors in many EMEs have squared positions in foreign currency debt: their foreign currency debt liabilities are matched by the corresponding FC debt assets. Similarly, I already discussed in Appendix G that the depreciation following a risk-off shock might cause positive effects on the profitability of exporters in the EME, given other impacts through foreign currency debts, because the revenues from exports are fixed in the foreign currency (hence higher in the local currency), but much of the costs—for example, wages—are fixed in local currency. These positive effects on the operational profits substantially offset (or even overwhelm) the negative valuation effects of FC debts of the corporations. If the FC debts of the nonfinancial corporations are positively correlated with more exports of the corporations, then we will not see a clear relationship between more FC debts and fragilities of the corporations to global financial shock.

Besides the main results, a noteworthy difference from the regressions of aggregate currency mismatch data is that in stock indices regressions (3), (5), and (7), the coefficients of local currency bonds become positively significant. Higher local currency bond portfolio to GDP ratios are associated with more resilient stock markets to global financial shocks.

To interpret the results, recall the results in the exchange rate regressions: currencies in EMEs having more local currency debts in the form of bond portfolio investment tend to be more sensitive to risk-on/off shocks. That is, a risk-off shock depreciates currencies of EMEs, and the depreciation is larger for an EME if the EME was receiving more local currency bond portfolio flows. There are two mechanisms by which the currency depreciation caused by LC bond portfolio investment outflows help the stock markets to be more resilient from risk-on/off shocks.

First, the depreciation discounts the stock prices in foreign currency so as to attract more investors. Second, as discussed above, the depreciation might cause positive effects on the profitability of exporters in the EME, given other impacts through foreign currency debts, because the revenues from exports are fixed in the foreign currency (hence higher in the local currency), but much of the costs—for example, wages—are fixed in local currency.

As one can easily see, the second reasoning also explains why I do not have significant results for net foreign currency assets of non-financial corporate sectors. If the positively significant coefficient captures the positive effects of local currency depreciations on the profits of the non-financial corporations, then it suggests that increases in the profits following local currency depreciations can offset the negative valuation effects of foreign currency debts.

Appendix J. Quantitative Results of Exporter Phillips Curve

In this appendix, I report the quantitative results of setting up the exporter Phillips curve. Suppose there is a CES aggregate in the foreign market who imports the exported goods from the small open economy. Thus, exporters in the DSGE model can set their prices in foreign market, but face Calvo-type nominal rigidity. I linearized the solution of the exporters, following Itskhoki and Mukhin (2021). The exporter Phillips curve is

$$\widehat{\pi}_t^* = \kappa_p \left[\widehat{mc}_t - \widehat{\varepsilon}_t\right] + \beta \widehat{\pi}_{t+1}^*,$$

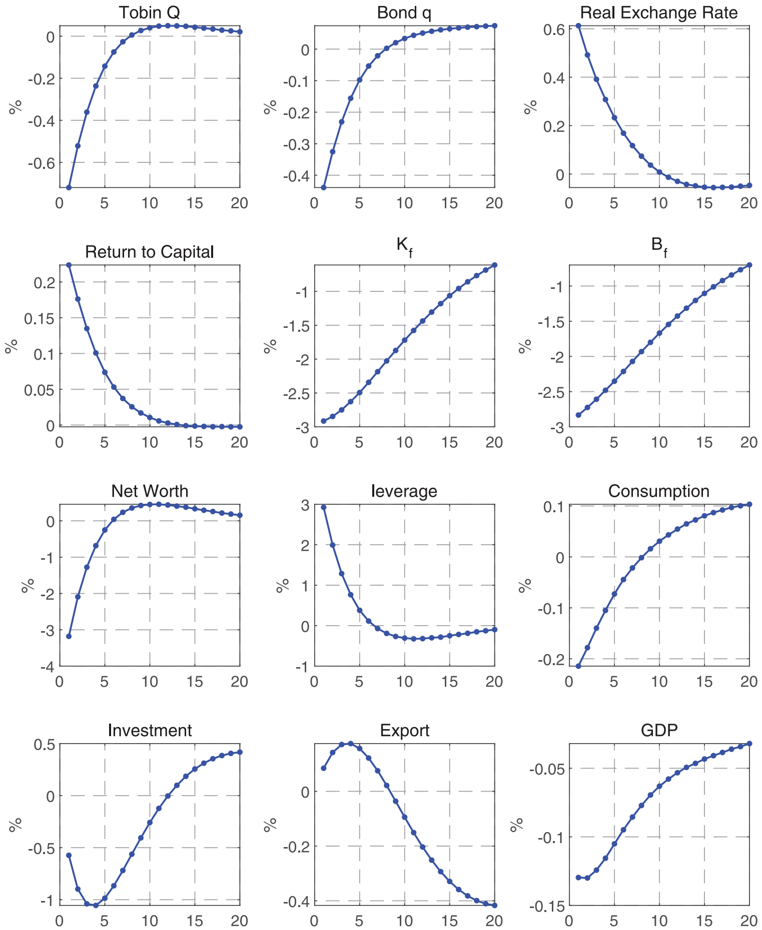
where $\kappa_p = \frac{(1-\beta\kappa^*)(1-\kappa^*)}{\kappa^*}$[22] and $\widehat{x}_t$ indicates the log-deviation from the non-stochastic steady state.

I adjusted some parameter values, as the introduction of the exporter Phillips curve generates different dynamics of exports from the reduced-form approach in the baseline model. First, I introduce the impulse response function with the comparison to baseline results, the reduced-form modeling of dominant currency pricing.

It is clear that the responses of the financial variables and real macroeconomic aggregates are much similar to the baseline results, as in Figure J.1. However, despite the similarities between the two different approaches, the different responses of exports are noteworthy. The response of exports to the one-standard-deviation risk-off

[22] κ^* indicates the Calvo parameter for exporters, which is different from the same parameter in the "domestic" Phillips curve.

Figure J.1. Impulse Response Functions, Exporter Phillips Curve



shock is slightly less in the model of the exporter Phillips curve, as the export price is more responsive to the shock when the export price follows the exporter phillips curve. This suggests that proper modeling of export pricing is important in quantitative studies of open economies, but this is clearly beyond the scope of this paper.

Then, as the export price is more responsive, the exports are less correlated with global financial cycles in the exporter Phillips-curve

Table J.1. Selected Second Moments

	σ_C	σ_I	σ_{Ex}	σ_Y	$\rho_{V,C}$	$\rho_{V,I}$	$\rho_{V,Ex}$	$\rho_{V,Y}$	$\rho_{\Delta V,\Delta Q}$	$\rho_{\Delta V,\Delta \varepsilon}$
Data	0.012	0.037	0.033	0.011	0.308	0.388	0.478	0.527	0.620	0.665
Model	0.013	0.037	0.033	0.011	0.427	0.599	0.214	0.529	0.810	0.921

Note: All variables are detrended using HP filter. The sample period is 2000:Q1–2019:Q4. I do not extend the sample period back to the 1990s, as the East Asian crisis in 1997 seriously changed the business cycle properties in Korea; in other words, there was a structural break during the crisis. The correlation is computed in the sample period 2004:Q1–2019:Q1. Since 2004, the Korean won-denominated equity investment liabilities to GDP ratio of Korea has been around 0.25–28. The sample period ends at 2019:Q1, as the global factor series ends at 2019:Q1. The consumption is the total consumption expenditure, including both the government and private consumption, and the investment is the gross capital formation by private sectors.

Table J.2. Variance Decomposition

	Q_t	q_t	ε_t	R_t^k	R_t^b	C_t	I_t	E_{xt}	Y_t^{net}
Global Financial Shock	**53.9**	**38.3**	**27.9**	**69.1**	**56.2**	**28.3**	**38.3**	**17.6**	**10.7**
Export Shock	1.2	11.2	67.4	2.5	6.9	26.0	2.4	74.8	26.4
TFP Shock	6.8	31.0	2.3	3.3	3.1	40.1	20.9	6.6	61.0
Monetary Policy Shock	15.4	9.2	1.2	21.8	29.1	1.5	7.5	0.6	1.2
Investment Shock	22.7	10.4	1.1	3.3	4.6	4.1	30.7	0.3	0.8

Note: All shocks are independent of each other.

specification. Please note that the correlations in Table J.1 are computed, assuming that GFS and trade shocks are positively correlated; the correlation between the two shocks is 0.5. Then, one can easily notice that the low correlation reflects relatively weak responses of exports to trade shocks—export demand shocks. I raised the correlation to 0.7, but the correlation between exports and the global financial cycle is still short of the data.

As one can easily expect, the low response of exports to trade shocks leads to low contribution of export shocks to GDP variations in Table J.2. Because I need more volatile TFP shocks to the model to match the observed GDP volatility once trade shocks cannot explain much of GDP volatility, the most important shock to explain GDP dynamics is the TFP shock. Thus, the variance decomposition results are substantially different in that, compared with the baseline results, much more GDP volatility is attributable to TFP shocks, while less GDP volatility is attributable to trade shocks. However, parts of the variations attributable to global financial shocks are very similar to the baseline. The key results in the variance decomposition analysis—the dominance of global financial shocks in financial market movements and the relatively low importance of movements in real macroeconomic aggregates— survive and turn out to be robust to the different modeling of export pricing.

To summarize, the introduction of the exporter Phillips curve does not alter the key results in the quantitative studies. The modeling incomplete exchange rate pass-through using a Phillips curve does a poor job of generating realistic correlations between the global financial cycle and exports from Korea. However, this is not related to the core model mechanism in this paper and does not imply that the simple reduced-form approach is better than setting up another Phillips curve.

Appendix K. Additional Tables

K.1 Notations in the Tables

Before introducing the results, I list the notations used in the tables:

- $\varDelta\varepsilon_{t-1}$: Lag of percentage changes in exchange rates.
- $\varDelta q_{t-1}$: Lag of percentage changes in stock indices.
- $\varDelta P_t^{com}$: Log-difference in the commodity price index.
- $\mathbf{I}^{G_x} \times \varDelta P_t^{oil}$: Interaction terms between log-difference in oil price and group dummies. Group 1 is the oil exporters: Brazil, Colombia, Mexico, and Russia. Group 2 is the group of countries whose oil exports and imports are balanced. Group 3 is the oil importers (rest of the countries).
- $i_t^j - i_t^{us}$: Short-term interest rate[23] differentials between country j and the United States.
- i_t^j: Short-term interest rates in country j.

[23]To avoid posible endogeneities, I used short-term interest rates. Ideally, I can use three-month Treasury-bill rates for each of the countries. However, not all the EMEs in the sample have a three-month Treasury-bill rate and accordingly I opt to use proxies to the bill rates. See data Appendix A.

- IP_t^j: Industrial production index percentage changes from the same month in a previous year (year to year).
- $M2_t^j$: M2 monetary aggregate percentage changes from the same month in a previous year (year to year).
- $Inflation_t^j$: CPI percentage changes from a previous month (month to month).
- $ln\,(REER)_{t-1}^{j}$: Lag of log real effective exchange rates.
- $Fin.\ open_{-EOY}^{j}$: Chin-Ito financial openness index in the last year of each observation.
- $Trade.\ open_{-EOY}^{j}$: Trade openness index in the last year of each observation.
- $\left(\frac{Govt:Debt}{GDP}\right)_{-EOY}^{j}$: Government debt-to-GDP ratio in the last year of each observation.
- $\mathbf{I}^{EUR}$: Dummy of EMEs near the euro zone. The countries in the group are the Czech Republic, Hungary, Poland, Romania, Russia, and Turkey.

K.2 Full Tables in Appendix E

Table K.1. Exchange Rates_Sector FC

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$\Delta\varepsilon^j_{t-1}$	0.025	0.027	0.025	0.026	0.026	0.027	0.027	0.013
	(0.047)	(0.048)	(0.048)	(0.047)	(0.047)	(0.047)	(0.049)	(0.045)
$\Delta ln(VIX)_t$	0.051***	0.049***	0.054***	0.048***	0.053***	0.051***	0.051***	
	(0.010)	(0.010)	(0.009)	(0.011)	(0.012)	(0.014)	(0.011)	
$ln(VIX)_{t-1}$	0.014***	0.014***	0.016***	0.014***	0.014***	0.016***	0.016**	
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.008)	
$(LCB/GDP)^j_{EOY-1} \times ln(VIX)_{t-1}$	0.099**	0.095**	0.043	0.097***	0.087**	0.010	0.010	0.098**
	(0.039)	(0.042)	(0.046)	(0.031)	(0.042)	(0.043)	(0.122)	(0.035)
$(LCE/GDP)^j_{EOY-1} \times ln(VIX)_{t-1}$	–0.020	–0.020†	–0.019	–0.014	–0.026	–0.016	–0.016	–0.013
	(0.016)	(0.013)	(0.018)	(0.020)	(0.026)	(0.028)	(0.031)	(0.027)
$(NFC\_NFC/GDP)^j_{EOY-1} \times ln(VIX)_{t-1}$	0.016				0.026	–0.044	–0.044	0.000
	(0.033)				(0.030)	(0.050)	(0.045)	(0.048)
$(Bank\_NFC/GDP)^j_{EOY-1} \times ln(VIX)_{t-1}$		0.096**			0.111***	0.090†	0.090	0.055
		(0.041)			(0.052)	(0.053)	(0.125)	(0.055)
$(HH\_NFC/GDP)^j_{EOY-1} \times ln(VIX)_{t-1}$			–0.103**			–0.173**	–0.173	–0.039
			(0.046)			(0.070)	(0.135)	(0.072)
$(Govt\_NFC/GDP)^j_{EOY-1} \times ln(VIX)_{t-1}$				–0.009	0.002	0.007	0.007	0.019
				(0.045)	(0.051)	(0.057)	(0.042)	(0.042)
$(Reserve/GDP)^j_{t-1} \times ln(VIX)_{t-1}$	–0.053*	–0.057*	–0.030	–0.056**	–0.053*	–0.022	–0.022	–0.038*
	(0.026)	(0.028)	(0.030)	(0.025)	(0.027)	(0.030)	(0.042)	(0.022)
$(LCB/GDP)^j_{EOY-1}$	0.094**	0.095**	0.128**	0.108*	0.107†	0.130**	0.130†	0.053
	(0.044)	(0.044)	(0.048)	(0.059)	(0.065)	(0.060)	(0.084)	(0.049)
$(LCE/GDP)^j_{EOY-1}$	–0.004	–0.005	–0.013	–0.007	–0.006	–0.014	–0.014	–0.035**
	(0.017)	(0.017)	(0.020)	(0.019)	(0.020)	(0.020)	(0.044)	(0.015)
$(NFC\_NFC/GDP)^j_{EOY-1}$	–0.005				–0.005	–0.004	–0.004	–0.015
	(0.028)				(0.040)	(0.038)	(0.035)	(0.034)

(continued)

Table K.1. (Continued)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$(Bank\_NFC/GDP)^j_{EOY-1}$		0.001			–0.007	–0.003	–0.003	–0.017
		(0.031)			(0.046)	(0.046)	(0.050)	(0.034)
$(HH\_NFC/GDP)^j_{EOY-1}$			0.095*			0.090	0.090	0.049
			(0.047)			(0.061)	(0.071)	(0.062)
$(Govt\_NFC/GDP)^j_{EOY-1}$				0.037	0.036	0.015	0.015	–0.048
				(0.061)	(0.068)	(0.077)	(0.065)	(0.047)
$(Reserve/GDP)^j_{t-1}$	–0.012	–0.012	–0.013	–0.010	–0.011	–0.013	–0.013	–0.026*
	(0.018)	(0.019)	(0.019)	(0.020)	(0.020)	(0.022)	(0.018)	(0.014)
$i^j_t - i^{us}_t$	0.001*	0.001*	0.001**	0.001**	0.001*	0.001**	0.001	0.001*
	(0.000)	(0.000)	(0.001)	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)
IP^j_t	–0.006	–0.006	–0.003	–0.005	–0.006	–0.003	–0.003	0.008
	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.008)	(0.011)	(0.008)
$M2^j_t$	0.022	0.022	0.022	0.018	0.019	0.020	0.020	0.036
	(0.036)	(0.034)	(0.034)	(0.036)	(0.040)	(0.041)	(0.036)	(0.034)
$Inflation^j_t$	0.004	0.004	0.004	0.004	0.004	0.004	0.004*	0.005*
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.002)	(0.003)
$ln(REER)^j_{t-1}$	0.057***	0.058***	0.071***	0.058***	0.058***	0.071***	0.071***	0.068***
	(0.008)	(0.008)	(0.012)	(0.007)	(0.007)	(0.013)	(0.017)	(0.014)
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	No	No	No	No	No	No	No	Yes
R-squared	0.072	0.072	0.063	0.070	0.072	0.064	0.064	0.438
Observations	1,532	1,532	1,532	1,532	1,532	1,532	1,577	1,577
Number of Groups	19	19	19	19	19	19	19	19

Note: ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$, $^{\dagger}p < 0.15$. LCD: local currency debt, LCB: local currency bond portfolio, LCE: local currency equity, NFC_NFC: net foreign currency assets of non-financial corporate sector, Bank_NFC: net foreign currency assets of deposit-taking financial corporate sector (banks), HH_NFC: net foreign currency assets of household sector, and Govt_NFC: net foreign currency assets of government sector. EOY_{-1} indicates the value at the end of last year of time t. Robust standard errors clustered at the country level. Regression (7) used the Driscoll-Kraay standard errors. Regression (8) omits the VIX variables, as it includes time fixed effects. I excluded Argentina, as the Argentine sectoral-level data, especially the non-financial corporate sector in Argentina, might reflect asset concealments of the Argentine households. See Han (2021) for the related discussion. However, the results are much similar even when including Argentina. The data on capital of the non-financial corporate sector in the Philippines is only for 2018 and thus regressions (2), (4), (5), (6), and (7) exclude data of the Philippines.

Table K.2. Stock Indices_Sector FC

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Δq^j_{t-1}	0.034	0.030	0.035	0.030	0.027	0.027	0.027	0.019
	(0.030)	(0.032)	(0.031)	(0.032)	(0.031)	(0.031)	(0.038)	(0.029)
$\Delta ln(VIX)_t$	–0.070***	–0.079***	–0.075***	–0.078***	–0.077***	–0.068***	–0.068***	
	(0.013)	(0.015)	(0.012)	(0.016)	(0.018)	(0.019)	(0.014)	
$ln(VIX)_{t-1}$	–0.025***	–0.026***	–0.025***	–0.026***	–0.027***	–0.027***	–0.027***	
	(0.004)	(0.003)	(0.004)	(0.004)	(0.004)	(0.004)	(0.010)	
$(LCE/Mkt.\ Cap.)^j_{EOY-1} \times ln(VIX)_{t-1}$	–0.060**	–0.054*	–0.070***	–0.059**	–0.062*	–0.108**	–0.108*	–0.111**
	(0.028)	(0.028)	(0.024)	(0.026)	(0.034)	(0.039)	(0.060)	(0.042)
$(LCB/GDP)^j_{EOY-1} \times ln(VIX)_{t-1}$	0.060	0.073	0.137***	0.081†	0.078†	0.169***	0.169	0.165**
	(0.051)	(0.050)	(0.043)	(0.051)	(0.050)	(0.050)	(0.149)	(0.059)
$(NFC\_NFC/NFC\_Cap.)^j_{EOY-1} \times ln(VIX)_{t-1}$		–0.048*		–0.047†	–0.047†	0.041	0.041	0.051
		(0.025)		(0.029)	(0.031)	(0.060)	(0.064)	(0.065)
$(Bank\_NFC/Bank\_Cap.)^j_{EOY-1} \times ln(VIX)_{t-1}$	–0.004			–0.004	–0.004	–0.004	–0.004	–0.003
	(0.005)			(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
$(OFC\_NFC/OFC\_Cap.)^j_{EOY-1} \times ln(VIX)_{t-1}$					–0.034	–0.140	–0.140	–0.126
					(0.230)	(0.243)	(0.271)	(0.239)
$(HH\_NFC/GDP)^j_{EOY-1} \times ln(VIX)_{t-1}$						–0.058	–0.058	–0.069
						(0.042)	(0.067)	(0.044)
$(Govt\_NFC/GDP)^j_{EOY-1} \times ln(VIX)_{t-1}$			0.125**			0.197	0.197	0.207
			(0.052)			(0.117)	(0.158)	(0.128)
$(Reserve/GDP)^j_{t-1} \times ln(VIX)_{t-1}$	0.046	0.040	0.017	0.040	0.040	0.010	0.010	0.001
	(0.047)	(0.035)	(0.033)	(0.037)	(0.036)	(0.036)	(0.048)	(0.036)
$(LCE/Mkt.\ Cap.)^j_{EOY-1}$	0.007	0.049	0.017	0.022	0.032	0.035	0.035	0.064
	(0.063)	(0.052)	(0.069)	(0.057)	(0.054)	(0.058)	(0.058)	(0.068)
$(LCB/GDP)^j_{EOY-1}$	–0.145***	–0.157***	–0.139**	–0.148***	–0.143**	–0.151***	–0.151**	–0.083
	(0.048)	(0.049)	(0.053)	(0.048)	(0.054)	(0.050)	(0.074)	(0.068)

(*continued*)

Table K.2. (Continued)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$(NFC\_NFC/NFC\_Cap.)^{j}_{EOY-1}$		0.021		0.010	0.023	0.024	0.024	0.038
		(0.047)		(0.047)	(0.046)	(0.048)	(0.027)	(0.048)
$(Bank\_NFC/Bank\_Cap.)^{j}_{EOY-1}$	–0.003*			–0.003**	–0.003**	–0.003***	–0.003	–0.003**
	(0.002)			(0.001)	(0.001)	(0.001)	(0.002)	(0.001)
$(OFC\_NFC/OFC\_Cap.)^{j}_{EOY-1}$					–0.009**	–0.011*	–0.011**	–0.007
					(0.003)	(0.005)	(0.006)	(0.005)
$(HH\_NFC/GDP)^{j}_{EOY-1}$						–0.059	–0.059	–0.013
						(0.101)	(0.091)	(0.095)
$(Govt\_NFC/GDP)^{j}_{EOY-1}$			0.031			0.039	0.039	–0.008
			(0.064)			(0.069)	(0.111)	(0.102)
$(Reserve/GDP)^{j}_{t-1}$	0.010	0.023	0.025	0.009	0.009	0.010	0.010	0.006
	(0.023)	(0.019)	(0.020)	(0.020)	(0.019)	(0.018)	(0.022)	(0.018)
i^{j}_{t}	–0.000	–0.000	–0.000	–0.000	–0.001	–0.001	–0.001	–0.001
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)
IP^{j}_{t}	0.015	0.019	0.014	0.022	0.019	0.018	0.018	0.014
	(0.013)	(0.013)	(0.013)	(0.013)	(0.014)	(0.015)	(0.019)	(0.014)
$M2^{j}_{t}$	–0.026	–0.022	–0.031	–0.017	–0.015	–0.010	–0.010	0.006
	(0.022)	(0.026)	(0.023)	(0.025)	(0.023)	(0.026)	(0.022)	(0.017)
$Inflation^{j}_{t}$	0.005**	0.006**	0.005**	0.006**	0.006**	0.006**	0.006**	0.004
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	No	No	No	No	No	No	No	Yes
R-squared	0.094	0.098	0.095	0.102	0.101	0.093	0.093	0.344
Observations	1,532	1,449	1,532	1,449	1,449	1,449	1,449	1,449
Number of Groups	19	19	19	19	19	19	19	19

Note: ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$, $^{\dagger}p < 0.15$. LCD: local currency debt, LCB: local currency bond portfolio, LCE: local currency equity, NFC_NFC: net foreign currency assets of non-financial corporate sector, Bank_NFC: net foreign currency assets of deposit-taking financial corporate sector (banks), HH_NFC: net foreign currency assets of household sector, and Govt_NFC: net foreign currency assets of government sector. EOY_{-1} indicates the value at the end of last year of time t. Robust standard errors clustered at the country level. Regression (7) used the Driscoll-Kraay standard errors. Regression (8) omits the VIX variables, as it includes time fixed effects. I excluded Argentina, as the Argentine sectoral-level data, especially the non-financial corporate sector in Argentina, might reflect asset concealments of the Argentine households. See Han (2021) for the related discussion. However, the results are much similar even when including Argentina. The data on capital of the non-financial corporate sector in the Philippines is only for 2018 and thus regressions (2), (4), (5), (6), and (7) exclude data of the Philippines.

K.3 Robustness Check

K.3.1 Global Financial Shock Uncorrelated with Export Shock

Table K.3. Selected Second Moments: Global Financial Shock Uncorrelated with Export Shock

	σ_C	σ_I	σ_{Ex}	σ_Y	$\rho_{V,C}$	$\rho_{V,I}$	$\rho_{V,Ex}$	$\rho_{V,Y}$	$\rho_{\Delta V,\Delta Q}$	$\rho_{\Delta V,\Delta \varepsilon}$
Data	0.012	0.037	0.033	0.011	–0.308	–0.388	–0.478	–0.527	–0.620	0.665
Model	0.010	0.037	0.035	0.011	–0.221	–0.394	0.096	–0.188	–0.729	0.842

Note: All variables are detrended using HP filter. The sample period is 2000:Q1–2019:Q4. I do not extend the sample period back to the 1990s, as the East Asian crisis in 1997 seriously changed the business cycle properties in Korea; in other words, there was a structural break during the crisis. The correlation is computed in the sample period 2004:Q1–2019:Q1. Since 2004, the Korean won-denominated equity external liabilities to GDP ratio of Korea has been around 0.25–27. The sample period ends at 2019:Q1, as the global factor series ends at 2019:Q1. The consumption is the total consumption expenditure, including both the government and private consumption, and the investment is the gross capital formation by private sectors. The correlation between risk-on/off shock and the export shock is set to be zero.

K.3.2 Additional Controls

Table K.4. Exchange Rates_Additional Controls

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$\Delta\varepsilon^j_{t-1}$	–0.134**	–0.134**	–0.133**	–0.134**	–0.131**	–0.070	–0.071	–0.068
	(0.058)	(0.058)	(0.056)	(0.059)	(0.056)	(0.069)	(0.073)	(0.069)
$\Delta ln(VIX)_t$	0.033**	0.032**	0.045***	0.034**	0.045***			
	(0.013)	(0.013)	(0.016)	(0.013)	(0.016)			
$ln(VIX)_{t-1}$	0.009*	0.009*	0.008	0.007	0.007			
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)			
$(LCB/GDP)^j_{EOY-1}\times ln(VIX)_{t-1}$	0.100**	0.095**	0.152*	0.101*	0.086	0.160*	0.113**	0.144**
	(0.050)	(0.042)	(0.087)	(0.052)	(0.082)	(0.091)	(0.053)	(0.067)
$(FCD/GDP)^j_{EOY-1}\times ln(VIX)_{t-1}$	0.015	0.015						
	(0.032)	(0.032)						
$(FCD\_A/GDP)^j_{EOY-1}\times ln(VIX)_{t-1}$	–0.006	–0.009						
	(0.038)	(0.037)						
$(FCE\_A/GDP)^j_{EOY-1}\times ln(VIX)_{t-1}$		0.008						
		(0.029)						
$(NFCD/GDP)^j_{EOY-1}\times ln(VIX)_{t-1}$			–0.007	0.002	–0.014	–0.005	0.006	0.001
			(0.023)	(0.020)	(0.023)	(0.028)	(0.024)	(0.029)
$(Reserve/GDP)^j_{t-1}\times ln(VIX)_{t-1}$	–0.057*	–0.054	–0.060**	–0.055**	–0.114***	–0.051**	–0.047*	–0.065†
	(0.029)	(0.033)	(0.023)	(0.024)	(0.035)	(0.025)	(0.026)	(0.041)
$(Fin.\ open.)^j_{EOY-1}\times ln(VIX)_{t-1}$	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
$(Trade\ open.)^j_{EOY-1}\times ln(VIX)_{t-1}$					0.000*			0.000
					(0.000)			(0.000)

(*continued*)

Table K.4. (Continued)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$(Govt\_Debts/GDP)^j_{EOY-1} \times ln(VIX)_{t-1}$			–0.000		–0.000	–0.000		–0.000
			(0.000)		(0.000)	(0.000)		(0.000)
$(LCB/GDP)^j_{EOY-1}$	0.073*	0.079*	0.011	0.089*	0.007	–0.004	0.052	–0.017
	(0.043)	(0.045)	(0.045)	(0.046)	(0.048)	(0.036)	(0.035)	(0.037)
$(FCD/GDP)^j_{EOY-1}$	0.002	0.003						
	(0.026)	(0.028)						
$(FCD\_A/GDP)^j_{EOY-1}$	0.057	0.062*						
	(0.036)	(0.036)						
$(FCE\_A/GDP)^j_{EOY-1}$		–0.023						
		(0.032)						
$(NFCD/GDP)^j_{EOY-1}$			0.007	–0.001	0.010	0.001	–0.008	0.004
			(0.010)	(0.012)	(0.010)	(0.011)	(0.014)	(0.012)
$(Reserve/GDP)^j_{t-1}$	–0.010	–0.011	0.000	–0.014	–0.001	–0.010	–0.024	–0.015
	(0.014)	(0.015)	(0.014)	(0.015)	(0.014)	(0.017)	(0.017)	(0.016)
$(Fin.\ open.)^j_{EOY-1}$	0.001	0.001	0.001	0.002	0.001	0.001	0.001	0.001
	(0.002)	(0.002)	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
$(Trade\ open.)^j_{EOY-1}$					0.000			0.000***
					(0.000)			(0.000)
$(Govt\_Debts/GDP)^j_{EOY-1}$			0.001***		0.001***	0.001***		0.001***
			(0.000)		(0.000)	(0.000)		(0.000)
$\mathbf{I}^{EUR} \times \Delta ln(VIX)_t$				0.003	–0.006		0.005	0.003
				(0.012)	(0.011)		(0.012)	(0.014)

(*continued*)

Table K.4. (Continued)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$i_t^j - i_t^{us}$	0.001*	0.001*	0.000	0.001	0.000	0.001	0.001*	0.001
	(0.001)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)
IP_t^j	0.006	0.007	0.003	0.006	0.004	0.006	0.007	0.006
	(0.011)	(0.011)	(0.010)	(0.011)	(0.010)	(0.008)	(0.009)	(0.008)
$M2_t^j$	0.043	0.044	0.044	0.039	0.043	0.044	0.041	0.040
	(0.041)	(0.041)	(0.037)	(0.036)	(0.037)	(0.034)	(0.033)	(0.034)
$Inflation_t^j$	0.010***	0.010***	0.009***	0.010***	0.009***	0.008***	0.008***	0.008***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
$ln(REER)_{t-1}^j$	0.060***	0.059***	0.060***	0.051***	0.062***	0.073***	0.071***	0.081***
	(0.015)	(0.015)	(0.017)	(0.017)	(0.018)	(0.017)	(0.016)	(0.017)
ΔP_t^{com}	–0.431***	–0.431***	–0.428***	–0.428***	–0.425***	0.000	0.000	0.000
	(0.092)	(0.092)	(0.090)	(0.093)	(0.090)	(0.000)	(0.000)	(0.000)
$\mathbf{I}^{G1} \times \Delta P_t^{oil}$	–0.121***	–0.121***	–0.120***	–0.119***	–0.124***	–0.127***	–0.127***	–0.130***
	(0.040)	(0.039)	(0.041)	(0.041)	(0.041)	(0.024)	(0.025)	(0.024)
$\mathbf{I}^{G2} \times \Delta P_t^{oil}$	0.011	0.010	0.009	0.010	0.010			
	(0.040)	(0.040)	(0.039)	(0.041)	(0.039)			
$\mathbf{I}^{G3} \times \Delta P_t^{oil}$	0.013	0.014	0.012	0.013	0.012			
	(0.027)	(0.028)	(0.027)	(0.027)	(0.027)			
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	No	No	No	Yes	No	Yes	Yes	Yes
R-squared	0.172	0.235	0.235	0.204	0.233	0.098	0.100	0.099
Observations	1,615	1,615	1,615	1,615	1,615	1,615	1,615	1,615
Number of Groups	20	20	20	20	20	20	20	20

Note: ***p < 0.01, **p < 0.05, *p < 0.1, †p < 0.15. LCD: local currency debt, LCB: local currency bond portfolio, LCE: local currency equity, FCD: foreign currency debt, FCD_A: foreign currency external debt assets (debt instrument), and FCE_A: foreign currency equity assets. NFCD: net foreign currency debt assets. EOY_{-1} indicates the value at the end of last year of time t. Standard errors are Driscoll-Kraay standard errors.

Table K.5. Stock Indices_Additional Controls

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Δq^j_{t-1}	–0.030	–0.030	–0.025	–0.027	–0.020	–0.004	–0.005	0.002
	(0.036)	(0.036)	(0.034)	(0.034)	(0.034)	(0.030)	(0.029)	(0.028)
$\Delta ln(VIX)_t$	–0.073***	–0.073***	–0.047**	–0.068***	–0.047**			
	(0.014)	(0.014)	(0.021)	(0.017)	(0.020)			
$ln(VIX)_{t-1}$	–0.027***	–0.028***	–0.024***	–0.025***	–0.025***			
	(0.007)	(0.007)	(0.007)	(0.007)	(0.008)			
$(LCE/Mkt.\ Cap.)^j_{EOY-1} \times \Delta ln(VIX)_t$	–0.072*	–0.072*	–0.080**	–0.071*	–0.058*	–0.073*	–0.070*	–0.062*
	(0.042)	(0.040)	(0.038)	(0.038)	(0.034)	(0.039)	(0.040)	(0.036)
$(LCB/GDP)^j_{EOY-1} \times \Delta ln(VIX)_t$	0.030	0.033	0.128	0.032	0.130	0.146	0.038	0.140
	(0.094)	(0.086)	(0.101)	(0.099)	(0.108)	(0.108)	(0.104)	(0.109)
$(FCD\_A/GDP)^j_{EOY-1} \times \Delta ln(VIX)_t$	0.007	0.008						
	(0.072)	(0.078)						
$(FCD/GDP)^j_{EOY-1} \times \Delta ln(VIX)_t$	0.025	0.025						
	(0.027)	(0.027)						
$(FCE\_A/GDP)^j_{EOY-1} \times \Delta ln(VIX)_t$		–0.002						
		(0.023)						
$(NFCD/GDP)^j_{EOY-1} \times \Delta ln(VIX)_t$				–0.005	–0.015	–0.003	0.001	–0.008
				(0.033)	(0.032)	(0.033)	(0.034)	(0.034)

(*continued*)

Table K.5. (Continued)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$(Reserve/GDP)^j_{t-1} \times \Delta ln(VIX)_t$	0.062*	0.061†	0.086**	0.073**	0.034	0.041†	0.046	0.013
	(0.035)	(0.040)	(0.041)	(0.031)	(0.035)	(0.026)	(0.038)	(0.045)
$(Fin.\ open.)^j_{EOY-1} \times \Delta ln(VIX)_t$	–0.004	–0.004	–0.004	–0.004		–0.003	–0.003	
	(0.003)	(0.004)	(0.003)	(0.003)		(0.003)	(0.003)	
$(Trade\ open.)^j_{EOY-1} \times \Delta ln(VIX)_t$				0.000	0.000		0.000	0.000
				(0.000)	(0.000)		(0.000)	(0.000)
$(Govt\_Debts/GDP)^j_{EOY-1} \times \Delta ln(VIX)_t$			–0.001***		–0.001***	–0.001***		–0.001***
			(0.000)		(0.000)	(0.000)		(0.000)
$(LCE/Mkt.\ Cap.)^j_{EOY-1}$	0.051	0.050	0.019	0.041	0.025	–0.007	0.050	0.029
	(0.056)	(0.056)	(0.062)	(0.058)	(0.073)	(0.060)	(0.056)	(0.080)
$(LCB/GDP)^j_{EOY-1}$	–0.155***	–0.145**	–0.184***	–0.155***	–0.149***	–0.175***	–0.133**	–0.136*
	(0.054)	(0.059)	(0.046)	(0.049)	(0.053)	(0.066)	(0.063)	(0.075)
$(FCD\_A/GDP)^j_{EOY-1}$	–0.090**	–0.083*						
	(0.039)	(0.043)						
$(FCD/GDP)^j_{EOY-1}$	0.039	0.040						
	(0.027)	(0.028)						
$(FCE\_A/GDP)^j_{EOY-1}$		–0.031						
		(0.040)						
$(NFCD/GDP)^j_{EOY-1}$			–0.028	–0.033**	–0.026		–0.035*	–0.019
			(0.017)	(0.016)	(0.018)		(0.018)	(0.023)
$(Reserve/GDP)^j_{t-1}$	0.013	0.011	0.018	0.012	0.010	0.035*	0.017	0.022
	(0.018)	(0.019)	(0.017)	(0.017)	(0.018)	(0.018)	(0.017)	(0.019)
$(Fin.\ open.)^j_{EOY-1}$	–0.010***	–0.009***	–0.010***	–0.010***		–0.009***	–0.010***	
	(0.002)	(0.002)	(0.002)	(0.002)		(0.002)	(0.002)	

(continued)

Table K.5. (Continued)

	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**
$(Trade\ open.)^j_{EOY-1}$				0.000	0.000		–0.000	–0.000
				(0.000)	(0.000)		(0.000)	(0.000)
$(Govt\_Debts/GDP)^j_{EOY-1}$			0.000		0.000	0.001*		0.000
			(0.000)		(0.000)	(0.000)		(0.000)
i^j_t	–0.001	–0.001	–0.001	–0.001	–0.001*	–0.001	–0.001	–0.001*
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
IP^j_t	–0.016	–0.015	–0.017	–0.016	0.004	–0.021	–0.023	–0.011
	(0.023)	(0.023)	(0.022)	(0.023)	(0.022)	(0.022)	(0.023)	(0.022)
$M2^j_t$	–0.008	–0.007	0.001	–0.004	–0.002	0.006	0.007	0.008
	(0.019)	(0.019)	(0.020)	(0.018)	(0.020)	(0.020)	(0.015)	(0.019)
$Inflation^j_t$	0.002	0.002	0.002	0.002	0.001	0.002	0.003	0.002
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
ΔP^{com}_t	0.358***	0.358***	0.353***	0.354***	0.347***			
	(0.122)	(0.122)	(0.124)	(0.123)	(0.124)			
$\mathbf{I}^{G1} \times \Delta P^{oil}_t$	0.052	0.052	0.051	0.052	0.053	0.053**	0.052*	0.054**
	(0.039)	(0.040)	(0.039)	(0.040)	(0.040)	(0.026)	(0.027)	(0.027)
$\mathbf{I}^{G2} \times \Delta P^{oil}_t$	–0.014	–0.014	–0.014	–0.013	–0.018			
	(0.049)	(0.049)	(0.048)	(0.048)	(0.047)			
$\mathbf{I}^{G3} \times \Delta P^{oil}_t$	0.004	0.004	0.005	0.005	0.004			
	(0.041)	(0.041)	(0.042)	(0.042)	(0.043)			
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	No	No	No	Yes	No	Yes	Yes	Yes
R-squared	0.073	0.071	0.104	0.090	0.103	0.022	0.020	0.013
Observations	1,615	1,615	1,615	1,615	1,615	1,615	1,615	1,615
Number of Groups	20	20	20	20	20	20	20	20

Note: ***p < 0.01, **p < 0.05, *p < 0.1, †p < 0.15. LCD: local currency debt, LCB: local currency bond portfolio, LCE: local currency equity, FCD: foreign currency debt, FCD_A: foreign currency external debt assets (debt instrument), and FCE_A: foreign currency equity assets. NFCD: net foreign currency debt assets. EOY_{-1} indicates the value at the end of last year of time t. Standard errors are Driscoll-Kraay standard errors.

K.3.3 Average External Liabilities

Table K.6. Exchange Rate_Aggregate FC

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$\Delta\varepsilon^j_{t-1}$	–0.136**	–0.138**	–0.134**	–0.133**	–0.132**	–0.132**	–0.070	–0.072
	(0.058)	(0.057)	(0.058)	(0.058)	(0.059)	(0.058)	(0.073)	(0.072)
$\Delta ln(VIX)_t$	0.037***	0.035***	0.035***	0.033***	0.031**	0.032**		
	(0.012)	(0.013)	(0.012)	(0.012)	(0.014)	(0.013)		
$ln(VIX)_{t-1}$	0.006	0.004	0.007	0.007	0.007	0.007		
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)		
$(FCD/GDP)^j_{AOY} \times \Delta ln(VIX)_t$	0.011				0.010		0.017	
	(0.036)				(0.038)		(0.041)	
$(LCE/GDP)^j_{AOY} \times \Delta ln(VIX)_t$		0.042						
		(0.031)						
$(LCD/GDP)^j_{AOY} \times \Delta ln(VIX)_t$			0.081**					
			(0.031)					
$(LCB/GDP)^j_{AOY} \times \Delta ln(VIX)_t$				0.115**	0.113**	0.115**	0.114**	0.116**
				(0.052)	(0.050)	(0.051)	(0.053)	(0.054)
$(NFCD/GDP)^j_{AOY} \times \Delta ln(VIX)_t$						–0.008		–0.003
						(0.028)		(0.029)
$(Reserve/GDP)^j_{t-1} \times \Delta ln(VIX)_t$	–0.047*	–0.048**	–0.056**	–0.052**	–0.056**	–0.052**	–0.049†	–0.042*
	(0.025)	(0.023)	(0.022)	(0.024)	(0.027)	(0.023)	(0.030)	(0.025)
$Fin.\ open._{AOY} \times \Delta ln(VIX)_t$	0.001	0.001	0.001	0.002	0.002	0.002	0.002	0.002
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
$(FCD/GDP)^j_{AOY} \times \Delta ln(VIX)_t$	0.020				0.012		0.033	
	(0.028)				(0.028)		(0.028)	
$(LCE/GDP)^j_{AOY} \times \Delta ln(VIX)_t$		–0.068*						
		(0.034)						
$(LCD/GDP)^j_{AOY} \times \Delta ln(VIX)_t$								
$(LCB/GDP)^j_{AOY} \times \Delta ln(VIX)_t$				–0.006	–0.012	–0.005	–0.040	–0.025
				(0.057)	(0.054)	(0.055)	(0.042)	(0.045)

(*continued*)

Table K.6. (Continued)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$(NFCD/GDP)^j_{AOY} \times \Delta ln(VIX)_t$						0.009		–0.017
						(0.017)		(0.021)
$(Reserve/GDP)^j_{t-1} \times \Delta ln(VIX)_t$	–0.005	–0.001	–0.016	0.001	–0.001	0.005	–0.015	–0.015
	(0.013)	(0.012)	(0.017)	(0.015)	(0.017)	(0.018)	(0.016)	(0.019)
$Fin.\ open._{AOY} \times \Delta ln(VIX)_t$	0.002	0.002	0.002	0.002	0.002	0.002	0.001	0.001
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
$i^j_t - i^{us}_t$	0.001	0.001	0.001	0.001	0.001	0.001	0.001*	0.001*
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)
IP^j_t	0.005	0.005	0.006	0.006	0.005	0.006	0.006	0.006
	(0.011)	(0.012)	(0.011)	(0.011)	(0.010)	(0.011)	(0.009)	(0.009)
$M2^j_t$	0.039	0.036	0.036	0.034	0.038	0.032	0.045	0.039
	(0.039)	(0.032)	(0.034)	(0.034)	(0.041)	(0.036)	(0.037)	(0.033)
$Inflation^j_t$	0.010***	0.010***	0.010***	0.010***	0.010***	0.010***	0.008***	0.008***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
$ln(REER)^j_{t-1}$	0.048**	0.046**	0.051***	0.051***	0.052***	0.052***	0.076***	0.073***
	(0.019)	(0.019)	(0.018)	(0.018)	(0.019)	(0.017)	(0.019)	(0.018)
ΔP^{com}_t	–0.440***	–0.439***	–0.430***	–0.430***	–0.429***	–0.430***	0.000	0.000
	(0.097)	(0.100)	(0.093)	(0.094)	(0.095)	(0.094)	(0.000)	(0.000)
$\mathbf{I}^{G1} \times \Delta P^{oil}_t$	–0.116***	–0.115***	–0.118***	–0.117***	–0.119***	–0.117***	–0.127***	–0.125***
	(0.041)	(0.042)	(0.041)	(0.041)	(0.041)	(0.040)	(0.025)	(0.025)
$\mathbf{I}^{G2} \times \Delta P^{oil}_t$	0.010	0.009	0.010	0.009	0.009	0.009		
	(0.042)	(0.044)	(0.042)	(0.042)	(0.041)	(0.041)		
$\mathbf{I}^{G3} \times \Delta P^{oil}_t$	0.013	0.012	0.012	0.011	0.012	0.011		
	(0.027)	(0.028)	(0.027)	(0.027)	(0.027)	(0.027)		
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	No	No	No	No	No	No	Yes	Yes
R-squared	0.224	0.200	0.232	0.222	0.221	0.219	0.100	0.098
Observations	1,660	1,660	1,615	1,615	1,615	1,615	1,615	1,615
Number of Groups	20	20	20	20	20	20	20	20

Note: ***p < 0.01, **p < 0.05, *p < 0.1, †p < 0.15. LCD: local currency debt, LCB: local currency bond portfolio, LCE: local currency equity, FCD: foreign currency debt, FCD_A: foreign currency external debt assets (debt instrument), and FCE_A: foreign currency equity assets. NFCD: net foreign currency debt assets, excluding central bank international reserve. *AOY* indicates the average value of the year of time *t*. Standard errors are Driscoll-Kraay standard errors.

Table K.7. Stock Indices_Aggregate FC

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Δq^j_{t-1}	–0.022	–0.019	–0.020	–0.024	–0.025	0.001	–0.002	–0.003
	(0.034)	(0.034)	(0.034)	(0.034)	(0.035)	(0.029)	(0.029)	(0.029)
$\Delta ln(VIX)_t$	–0.084***	–0.068***	–0.074***	–0.073***	–0.068***			
	(0.014)	(0.017)	(0.016)	(0.017)	(0.018)			
$ln(VIX)_{t-1}$	–0.023***	–0.022**	–0.022**	–0.025***	–0.026***			
	(0.008)	(0.008)	(0.008)	(0.008)	(0.007)			
$(FCD/GDP)^j_{AOY} \times \Delta ln(VIX)_t$	0.022		0.031	0.034		0.031	0.033	
	(0.031)		(0.030)	(0.029)		(0.033)	(0.031)	
$(LCE/Mkt.\ Cap.)^j_{AOY} \times \Delta ln(VIX)_t$		–0.067**	–0.070**	–0.078**	–0.076**	–0.066*	–0.078*	–0.074*
		(0.032)	(0.033)	(0.038)	(0.038)	(0.039)	(0.040)	(0.040)
$(LCB/GDP)^j_{AOY} \times \Delta ln(VIX)_t$				0.036	0.037		0.056	0.056
				(0.091)	(0.092)		(0.098)	(1.00)
$(NFCD/GDP)^j_{AOY} \times \Delta ln(VIX)_t$					–0.012			–0.006
					(0.034)			(0.035)
$(Reserve/GDP)^j_{t-1} \times \Delta ln(VIX)_t$	0.059**	0.086***	0.075***	0.062***	0.074***	0.057**	0.047*	0.059**
	(0.025)	(0.019)	(0.022)	(0.021)	(0.018)	(0.025)	(0.027)	(0.025)
$Fin.\ open._{AOY} \times \Delta ln(VIX)_t$	–0.001	–0.004	–0.004	–0.004	–0.004	–0.003	–0.003	–0.003
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
$(FCD/GDP)^j_{AOY}$	0.029		0.033	0.051		0.032	0.051	
	(0.034)		(0.034)	(0.032)		(0.037)	(0.034)	
$(LCE/Mkt.\ Cap.)^j_{AOY}$	0.029		0.033	0.051		0.032	0.051	
	(0.034)		(0.034)	(0.032)		(0.037)	(0.034)	
$(LCB/GDP)^j_{AOY}$		0.065	0.078	0.109*	0.132**		0.113**	0.129**
		(0.058)	(0.058)	(0.065)	(0.065)		(0.056)	(0.058)
$(NFCD/GDP)^j_{AOY}$				–0.147***	–0.137***		–0.120**	–0.110*
				(0.047)	(0.046)		(0.060)	(0.057)
$(Reserve/GDP)^j_{t-1}$					–0.053**			–0.052**
					(0.020)			(0.023)

(*continued*)

Table K.7. (Continued)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$Fin.\ open._{AOY}$	–0.013	–0.004	–0.014	0.004	–0.004	–0.008	0.007	–0.002
	(0.013)	(0.014)	(0.014)	(0.016)	(0.016)	(0.015)	(0.018)	(0.017)
i_t^j	–0.001	–0.001	–0.001	–0.001	–0.001	–0.001	–0.001	–0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
IP_t^j	–0.012	–0.011	–0.012	–0.011	–0.012	–0.017	–0.017	–0.019
	(0.022)	(0.021)	(0.021)	(0.022)	(0.021)	(0.022)	(0.022)	(0.022)
$M2_t^j$	0.005	–0.007	0.003	0.008	0.003	0.015	0.017	0.015
	(0.017)	(0.017)	(0.017)	(0.017)	(0.018)	(0.014)	(0.014)	(0.015)
$Inflation_t^j$	0.002	0.002	0.002	0.002	0.002	0.003	0.003	0.003
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
ΔP_t^{com}	0.366***	0.367***	0.368***	0.355***	0.360***			
	(0.129)	(0.129)	(0.130)	(0.124)	(0.124)			
$\mathbf{I}^{G1} \times \Delta P_t^{oil}$	0.043	0.044	0.041	0.046	0.049	0.055	0.046*	0.049*
	(0.040)	(0.041)	(0.040)	(0.039)	(0.039)	(0.033)	(0.028)	(0.026)
$\mathbf{I}^{G2} \times \Delta P_t^{oil}$	–0.014	–0.011	–0.012	–0.010	–0.011			
	(0.048)	(0.049)	(0.049)	(0.048)	(0.048)			
$\mathbf{I}^{G3} \times \Delta P_t^{oil}$	0.003	0.002	0.003	0.005	0.004	0.014		
	(0.043)	(0.043)	(0.043)	(0.043)	(0.042)	(0.041)		
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	No	No	No	No	No	Yes	Yes	Yes
R-squared	0.073	0.071	0.104	0.091	0.103	0.022	0.020	0.013
Observations	1,660	1,660	1,660	1,615	1,615	1,660	1,615	1,615
Number of Groups	20	20	20	20	20	20	20	20

Note: ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$, $^{\dagger}p < 0.15$. LCD: local currency debt, LCB: local currency bond portfolio, LCE: local currency equity, FCD: foreign currency debt, FCD_A: foreign currency external debt assets (debt instrument), and FCE_A: foreign currency equity assets. NFCD: net foreign currency debt assets, excluding central bank international reserve. *AOY* indicates the average value of the year of time *t*. Standard errors are Driscoll-Kraay standard errors.

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