Dominant Currency Pricing and Currency Risk Premia*

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Abstract

We ask whether currency risk premia arise endogenously from the joint dollarization of export prices and financial liabilities. Empirically, we extract common risk factors from excess currency returns using principal components and relate countries' factor exposures to observable macroeconomic characteristics, with export dollar invoicing emerging as a predictor of carry-trade exposure. A small open-economy model with dominant-currency pricing and dollar-denominated liabilities explains why. Dollar export invoicing weakens the exchange rate's stabilizing effect on external demand, while dollar debt makes depreciation costly for leveraged intermediaries. When the two frictions interact, depreciations occur in bad states, local-currency assets become risky, the currency premium rises, and the risk-adjusted neutral rate increases. Under a standard Taylor rule, this mechanism generates persistently higher inflation.

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1 Introduction

One of the salient features of the international monetary system is the asymmetric use of currencies in global trade and finance. The U.S. dollar is the dominant vehicle currency in international trade, as documented by Goldberg and Tille (2008) and Gopinath, Boz, Casas, Díez, Gourinchas and Plagborg-Møller (2020). The dollar is also central to global financial intermediation and to the denomination of cross-border liabilities. These two forms of dollar dominance are typically studied separately. Trade invoicing affects pass-through and expenditure switching, while liability dollarization affects balance sheets and financial fragility. This paper's hypothesis is that their interaction is central to the risk properties of exchange rates.

The cross section of currency returns provides a natural testing ground for this hypothesis. If the international price system and global balance sheets are disproportionately dollar denominated, then exchange rates need not be merely relative prices; but they also affect the state-contingent payoff of nominal assets, the tightness of financial constraints, and the severity of downturns. We therefore ask whether dominant-currency pricing and liability dollarization shape currencies' exposure to global risk, the cross section of currency risk premia, and the transmission of monetary policy in small open economies.

In particular, the paper asks three questions. First, do dollar export invoicing and dollar-denominated liabilities help explain why some currencies are more exposed to global currency risk than others? Second, through what mechanism do these structural features make local-currency assets pay off poorly in bad states and thereby raise currency risk premia? Third, what are the implications for inflation and monetary policy in small open economies?

We begin empirically. We construct monthly excess currency returns for 25 countries from 2003:02 to 2018:11 using FX4Casts and IMF IFS data, together with the invoicing measures in Gopinath, Boz, Casas, Díez, Gourinchas and Plagborg-Møller (2020). Following Lustig, Roussanov and Verdelhan (2011), we extract common factors from currency excess returns. The first factor is a broad dollar factor that comoves with global equity returns, while the second is a carry-trade factor associated with global risk aversion. We then relate each currency's exposure to these factors to country characteristics, focusing on export dollar invoicing, foreign-currency liabilities in the banking system, and net foreign asset positions.

The main empirical result is that countries' exposure to currency risk is systematically shaped by their trade and financial structures. Greater dollar invoicing of exports is strongly associated with higher exposure to the carry-trade risk factor, and this relationship remains robust after controlling for additional country characteristics, including country size, reserves, trade-network centrality, and NFA-to-GFP. Banking-sector foreign liability exposure and net debtor positions also help explain cross-country differences in factor loadings. These exposures are priced in currency markets: currencies with higher loadings on global risk factors earn higher average excess returns, and the same exposures are associated with higher average inflation. Taken together, the evidence points to a macro-financial risk channel. In economies with dollarized trade and balance sheets, local-currency assets tend to lose value in adverse global states, leading investors to demand compensation for holding them.

Figure 1 summarizes this empirical pattern. Panel (a) shows that export dollar invoicing is a strong predictor of carry-trade exposure. Panel (b) shows that currencies with greater carry-trade exposure earn higher average excess returns. Panel (c) shows that these exposures are also associated with higher average inflation. Together, the panels motivate the paper's central mechanism by showing that the same structural features that make a currency risky for investors also shape monetary transmission.

To interpret the empirical evidence, we develop a small open-economy model with dominant-currency pricing, dollar-denominated bank liabilities, and segmented international asset markets. The model builds on the literature on open-economy financial intermediation with foreign-currency liabilities, including Aoki, Benigno and Kiyotaki (2020), Ozhan (2020), and Benhima, Blengini and Merrouche (2025). In the model, exporters set prices in dollars, imported goods are priced in dollars, domestic intermediaries borrow partly in dollars, and foreign investors require compensation for holding local-currency assets when exchange-rate risk rises.

The analytical results from the model show that the risk channel operates through the interaction of invoicing currency of trade and currency composition of balance sheets. Dollar liabilities make depreciation costly by raising the domestic value of foreign-currency debt and weakening intermediary net worth. Dollar export invoicing limits the offsetting benefit of depreciation because sticky dollar prices prevent exports from becoming immediately more competitive abroad. As a result, the exchange rate no longer works as a clean shock absorber. It weakens balance sheets while providing only delayed support to external demand. This explains why the same dollar-debt exposure

commands a larger currency premium in economies with sticky dollar export prices, where local-currency assets lose value precisely when output, credit, and domestic absorption are already under pressure.

We then quantify the mechanism. We calibrate the model to a small open emerging-market economy and study a foreign interest-rate shock across economies that differ in two dimensions: the degree of dollar export invoicing and the share of dollar liabilities. The largest UIP deviation arises when both frictions are present. High dollar debt without high dollar invoicing generates a sizable premium, but a smaller one, because the exchange rate can still work more effectively through export prices. High invoicing without high dollar debt generates only a modest premium, because depreciation does not impose large valuation losses on intermediary balance sheets. The interaction is therefore the central quantitative force because dollar liabilities make depreciation financially costly, while sticky dollar export prices prevent depreciation from delivering sufficient real stabilization.

The impulse responses also clarify the role of the exchange rate. In economies with limited dollar invoicing of exports and low financial-sector dollar debt, depreciation acts more like a shock absorber. It improves external competitiveness without generating large balance-sheet losses. In vulnerable economies, where a large share of exports is invoiced in dollars and the financial sector carries substantial dollar debt, depreciation instead becomes a macro-financial state variable. It raises the domestic price of imports, increases the local-currency burden of dollar liabilities, tightens financial constraints, and raises the premium investors require to hold local-currency assets. Although exports may rise after the shock, this expansion does not reflect the frictionless expenditure-switching mechanism of the textbook model. It is achieved through a larger depreciation, a higher UIP premium, and a sharper compression of domestic absorption.

The stochastic steady-state results show that this mechanism also has long-run implications for inflation and monetary policy. Following Benigno, Benigno and Nisticò (2012) and Ghironi and Ozhan (2025), we solve the model using a higher-order approximation and find that greater export-price stickiness raises exchange-rate volatility in the stochastic steady state. As a result, local-currency assets become riskier, and the UIP premium remains elevated even in the long run. This premium acts like an increase in the risk-adjusted neutral interest rate. Under a conventional Taylor rule with a fixed intercept, the policy rate is too low relative to the return required by investors, causing average inflation to rise above target. A rule that responds more robustly to movements

in the neutral rate, in the spirit of Orphanides and Williams (2006), can stabilize inflation, but only by sustaining higher interest-rate spreads.

The paper contributes to three related literatures. First, it contributes to the literature on trade invoicing, which studies how vehicle-currency use and nominal rigidities shape exchange-rate pass-through, expenditure switching, and monetary transmission (Obstfeld and Rogoff, 1995; Betts and Devereux, 2000; Devereux and Engel, 2003; Goldberg and Tille, 2008; Gopinath, Boz, Casas, Díez, Gourinchas and Plagborg-Møller, 2020; Gopinath and Stein, 2021; Mukhin, 2022; Egorov and Mukhin, 2023). The paper connects this literature to currency asset pricing by showing that the currency in which exports are priced affects the payoff of local-currency assets in global bad states. Second, it contributes to the literature on the determinants of currency risk premia and the UIP puzzle, which links currency excess returns to global risk factors, country characteristics, trade networks, financial intermediation, external positions, and limits to international risk sharing (Hassan, 2013; Della Corte, Riddiough and Sarno, 2016; Ready, Roussanov and Ward, 2017a,b; Richmond, 2019; Wiriadinata, 2021; Jiang, 2021, 2022; Hassan and Zhang, 2021; Goldberg and Krogstrup, 2023; Liao and Zhang, 2025; Bocola and Lorenzoni, 2023; Dao, Gourinchas and Itskhoki, 2025). Relative to this work, the paper identifies dollar export invoicing and foreign-currency liabilities as observable structural sources of exposure to global currency risk. Third, it contributes to work on exchange rate volatility and monetary policy by showing how dollar liabilities and dollar export invoicing jointly determine inflation dynamics (Benigno, Benigno and Nisticò, 2012; Aoki, Benigno and Kiyotaki, 2020; Auclert, Rognlie, Souchier and Straub, 2021; Bacchetta, Benhima and Berthold, 2023a; Bacchetta, Cordonier and Merrouche, 2023b). The central contribution is to connect these literatures through a single macro-financial mechanism in which the currency risk premium is determined by the interaction between the currency denomination of liabilities and the currency denomination of export prices.

The rest of the paper is organized as follows. Section 2 describes the data and presents the empirical analysis. Section 3 presents the small open-economy model. Section 4 analytically derives the expressions for the model's key mechanism. Section 5 takes the analytical mechanism to the quantitative model and studies the transmission of foreign monetary shocks. Section 6 concludes.

2 Empirical Analysis

We identify two principal sources of currency market risk—the Dollar Risk Factor, tied to global asset prices, and the Carry Trade Risk Factor, linked to global risk aversion (Section 2.1). Both represent priced risks that command higher average excess returns (Table 1). The underlying macroeconomic channel for this risk is the co-movement between GDP and the exchange rate (Section 2.4); currencies that depreciate during recessions are inherently riskier to hold.

Crucially, we link these cyclical co-movements and risk exposures directly to observable structural frictions (Sections 2.3 and 2.5). High dollar invoicing, significant banking-sector foreign liabilities (FL/FA), and a net debtor position (low NFA/GDP) jointly exacerbate this risky GDP-ER correlation and determine a country's exposure to both global factors. Furthermore, professional forecast data confirms that investors ex-ante price the higher returns associated with these structural vulnerabilities (Section 2.6). Ultimately, the empirical finding that dollar debt and trade invoicing jointly shape a currency's risk profile directly motivates our theoretical framework.

2.1 Currency Returns

Our primary dataset consists of monthly data for 25 countries from 02/2003 to 11/2018, sourced from FX4casts.[1] We define the realized excess currency return (RX_{t+1}) for a USD based investor as:

$$RX_{t+1} \equiv R_t^L \frac{S_t}{S_{t+1}} - R_t^{US} \tag{1}$$

where S_t is the spot exchange rate (LCU per USD), and R_t^L and R_t^{US} are the respective local and US gross short-term interest rates from t to $t+1$. This formula represents the ex-post profit from borrowing in USD, investing in the local currency, and converting the proceeds back to USD one period later.

From a macroeconomic perspective, our primary object of interest is the unconditional

[1] Australia, Canada, Switzerland, Czech Rep., Denmark, Euro Area, United Kingdom, Hungary, Indonesia, India, Japan, Korea, Mexico, Norway, New Zealand, Poland, Sweden, Thailand, Turkey, South Africa, Russia, Brazil, Colombia, Chile

average of these returns, which forms the currency risk premium:

$$\mathbb{E}[RX] \equiv \mathbb{E}\left[R_t^L \frac{S_t}{S_{t+1}} - R_t^{US}\right]$$

We aim to understand the cross-sectional determinants of this premium. To expand our sample for the cross-sectional analysis, we augment this dataset with data for an additional 7 countries using forward returns.[2] The derivation of currency returns using forward contracts is detailed in Appendix Section C.

2.2 Global Risk Factors

Following Lustig, Roussanov and Verdelhan (2011), we use principal component analysis to extract the common factors from our panel of currency returns. We identify two key components, which we label the "Dollar Risk Factor" (Component 1) and the "Carry Trade Risk Factor" (Component 2), in line with the literature.

Table 1 presents the cross-sectional results, testing whether these risk exposures are priced. The results confirm they are. In the full specification (Column 3), both the Dollar Risk Exposure (0.011^{**}) and the Carry Trade Risk Exposure (0.007^{***}) show a positive and statistically significant relationship with average excess returns. This confirms that both factors represent priced risks in the currency market.

Table 2 demonstrates the time-series explanatory power of these factors for a selection of five countries. The high R^2 values for Turkey (0.599), Chile (0.460), Mexico (0.553), and the Euro Area (0.876) indicate that these two common factors drive a significant portion of currency return variation. The notable exception is Japan ($R^2 = 0.097$), whose currency is well-known to follow distinct safe-haven dynamics.

Finally, Table 3 provides a clear economic interpretation for these abstract factors. We regress the Dollar Risk Factor (Component 1) and the Carry Trade Risk Factor (Component 2) on standard macro-financial variables. The results show that the Dollar Risk Factor (Col 1) is strongly and positively correlated with S&P 500 returns (1.533^{***}) and is not significantly related to changes in the VIX. This identifies it as a global equity prices. The Carry Trade Risk Factor (Col 2), in contrast, is not correlated with the S&P 500 but is significantly and negatively correlated with changes in the VIX (-0.085^{**}). This identifies the second factor as global risk aversion.

[2] Romania, Iceland, Kenya, Israel, Tunisia, Morocco, and Pakistan

	Dependent variable:		
	Excess Returns		
	(1)	(2)	(3)
Dollar Risk Exposure	0.012*		0.011**
	(0.006)		(0.005)
Carry trade Risk Exposure		0.007***	0.007***
		(0.002)	(0.002)
Constant	0.0001	0.002***	0.0003
	(0.001)	(0.0003)	(0.001)
Observations	25	25	25
R^2	0.136	0.458	0.571
Adjusted R^2	0.098	0.435	0.532
Residual Std. Error	0.002 (df = 23)	0.002 (df = 23)	0.001 (df = 22)
Note:			*p<0.1; **p<0.05; ***p<0.01

Table 1: Average excess returns vs component loadings

Data source: FX4Casts. Left hand variable is the average monthly currency returns of 25 countries between 02/2003 - 11/2018. Right hand variables are the coefficients of each country for the two principal component of currency returns. Both components are scaled such that a positive coefficient means positive covariance with the returns.

2.3 Determinants of Component Exposures

In this Section, we aim to understand what determines a currency's exposure to these global risk factors. We consider several variables established in the literature as key determinants of excess currency returns and regress our estimated risk exposures on them (Table 4).[3]

The regression results presented in Table 4 demonstrate that both risk factors are jointly determined by the economy's underlying financial and trade frictions.

Examining the Dollar Risk Factor (Columns 1 and 2), exposure is driven by a combination of financial leverage and trade invoicing practices. The ratio of foreign liabilities to foreign assets (FL/FA) in the banking system serves as a positive and significant predictor (0.043^{**} in the full specification). This indicates that economies relying more heavily on foreign-currency funding exhibit greater vulnerability to the global financial cycle. Conversely, when controlling for these financial vulnerabilities, a higher share of dollar

[3]External balance (Della Corte, Riddiough and Sarno (2016)), foreign assets in the banking system (Yeyati (2006); Christiano, Dalgic and Nurbekyan (2021)), Dollar invoicing (Gopinath and Stein (2020)), size(Hassan (2013)) and trade network centrality (Richmond (2019)). In Appendix Section A, we verify that these determinants also explain average currency returns directly.

	Dependent variable:				
	Turkey	Chile	Mexcio	Euro Area	Japan
	(1)	(2)	(3)	(4)	(5)
Dollar Risk Exposure	0.258***	0.167***	0.167***	0.191***	0.035
	(0.025)	(0.016)	(0.014)	(0.005)	(0.028)
Carry trade Risk Exposure	0.406***	0.118***	0.156***	−0.219***	−0.130**
	(0.093)	(0.028)	(0.041)	(0.029)	(0.051)
Constant	0.005**	0.003***	0.001	0.0005	−0.001
	(0.002)	(0.001)	(0.001)	(0.001)	(0.002)
Observations	190	190	190	190	190
R^2	0.599	0.460	0.553	0.876	0.097
Adjusted R^2	0.595	0.454	0.548	0.874	0.087
Residual Std. Error (df = 187)	0.033	0.024	0.021	0.010	0.027
Note:					*p<0.1; **p<0.05; ***p<0.01

Table 2: Excess returns vs Risk Factors

Data source: FX4Casts. Left hand variable is the returns of selected currencies between 02/2003 - 11/2018. Right hand variables are the two principal component of currency returns. Both components are scaled such that a positive coefficient means positive covariance with the returns.

invoicing correlates with lower exposure to this specific risk factor, as evidenced by the significant negative coefficient (-0.095^{**}).

The dynamics differ when evaluating the Carry Trade Risk Factor (Columns 3 and 4), though exposure remains anchored by both trade and financial variables. In this case, the dollar invoicing share emerges as the strongest predictor, yielding a positive and highly significant coefficient (0.457^{***}). This implies that the currencies of high-invoicing countries are notably more exposed to global risk-off shocks, a pattern consistent with carry trade dynamics. Furthermore, financial structure continues to play a role: net debtor countries, indicated by a lower Net Foreign Assets to GDP ratio, show significantly higher exposure to the Carry Trade factor in the baseline specification (-0.190^{***}).

Ultimately, these estimates confirm that observable frictions—specifically dollar-denominated debt and dollar invoicing—jointly shape an economy's vulnerability to global shocks. This observation directly motivates the frictions we integrate into our theoretical model.

2.4 Comovement between GDP and Exchange Rate

We measure the cyclical co-movement between the economy and the exchange rate by calculating, for each country, the correlation between log real GDP growth and log real

	Dependent variable:	
	Component 1	Component 2
	(1)	(2)
$S\&P$ 500 Returns	1.533***	−0.080
	(0.341)	(0.110)
Δlog(VIX)	−0.070	−0.085***
	(0.053)	(0.032)
ΔGFC	−0.013	0.001
	(0.009)	(0.004)
Observations	190	190
R^2	0.306	0.045
Adjusted R^2	0.299	0.035
Residual Std. Error (df = 187)	0.105	0.058
Note:	*p<0.1; **p<0.05; ***p<0.01	

Table 3: Risk Factors

Data source: FX4Casts, Ken French dataset, CBOE. Right hand variables are the two principal components of currency returns of 25 countries between 02/2003 - 11/2018. Left hand variables are the returns of S&P500 and log change in VIX index.

exchange rate changes. The real exchange rate (RER) is defined as the nominal dollar exchange rate divided by CPI (S_t/P_t). This correlation, ρ, is estimated via the following regression of standardized variables:

$$\frac{\Delta \log(GDP_t)}{\sigma_{\Delta \log(GDP)}} = \alpha + \rho \frac{\Delta \log(S_t/P_t)}{\sigma_{\Delta \log(S/P)}} + \epsilon_t$$

The estimate $\hat{\rho}$ corresponds to the correlation coefficient. This approach is well-suited for our dataset, as countries have widely different volatilities in GDP growth and exchange rates, and the correlation coefficient suitably scales the variables by their respective standard deviations. Another benefit is that the correlation is direction-invariant, meaning which variable is used as the left-hand-side variable does not change the estimate. We do not claim any causality here; the correlation coefficient is simply our appropriate measure for co-movement.

A negative correlation ($\rho < 0$) is the core of our risk mechanism. It indicates that the currency depreciates (loses value) precisely when the economy is in recession (when income is low). This makes the local currency a poor hedge and thus "risky" from the perspective of local residents. In these economies, dollar assets provide better insurance against business cycle fluctuations, lowering the relative demand for local currency as-

	Dependent variable:			
	Dollar Risk Exposure		Carry Risk Exposure	
	(1)	(2)	(3)	(4)
FL/FA	0.035*	0.043**	0.016	0.037
	(0.018)	(0.019)	(0.030)	(0.059)
Net Foreign Assets/GDP	−0.029	−0.049	−0.190***	−0.090
	(0.029)	(0.032)	(0.071)	(0.060)
Reserves/GDP	−0.079	−0.161	−0.157	−0.384
	(0.219)	(0.138)	(0.330)	(0.360)
Dollar Invoicing	−0.098**	−0.095**	0.490***	0.457***
	(0.043)	(0.040)	(0.086)	(0.075)
GDP(Nominal USD)	0.006		0.018	
	(0.018)		(0.026)	
Average Centrality		−6.345		−7.729
		(10.384)		(14.102)
Constant	0.213***	0.228***	−0.285***	−0.280**
	(0.053)	(0.076)	(0.088)	(0.119)
Observations	20	14	20	14
R^2	0.496	0.743	0.615	0.533
Adjusted R^2	0.316	0.582	0.477	0.242
Residual Std. Error	0.063 (df = 14)	0.047 (df = 8)	0.154 (df = 14)	0.167 (df = 8)
Note:				*p<0.1; **p<0.05; ***p<0.01

Table 4: Determinants of Exposures

Data source: IFS, Datastream, FX4Casts, Gopinath, Boz, Casas, Díez, Gourinchas and Plagborg-Møller (2020), Richmond (2019), Ken French dataset. Risk factors are the two principal components of currency returns of 25 countries between 02/2003 - 11/2018. FL/FA denotes the ratio of foreign liabilities to foreign assets in the banking system.

sets. Consequently, local residents demand a risk premium—in the form of higher expected returns—to hold local currency assets (Christiano, Dalgic and Nurbekyan (2021); Dalgic (2024)).

Figure 2 tests this hypothesis directly. The plot of average excess returns against the GDP-ER correlation reveals a strong, negative relationship (R^2 = 0.172). This visually confirms our mechanism: countries with a more negative correlation (e.g., Brazil, Turkey, Chile, Peru) are precisely those with riskier currencies, and investors are, on average, compensated with significantly higher excess returns. Conversely, countries with a positive correlation (e.g., Japan, Switzerland, Denmark), where the currency acts as a hedge, have near-zero or negative excess returns.

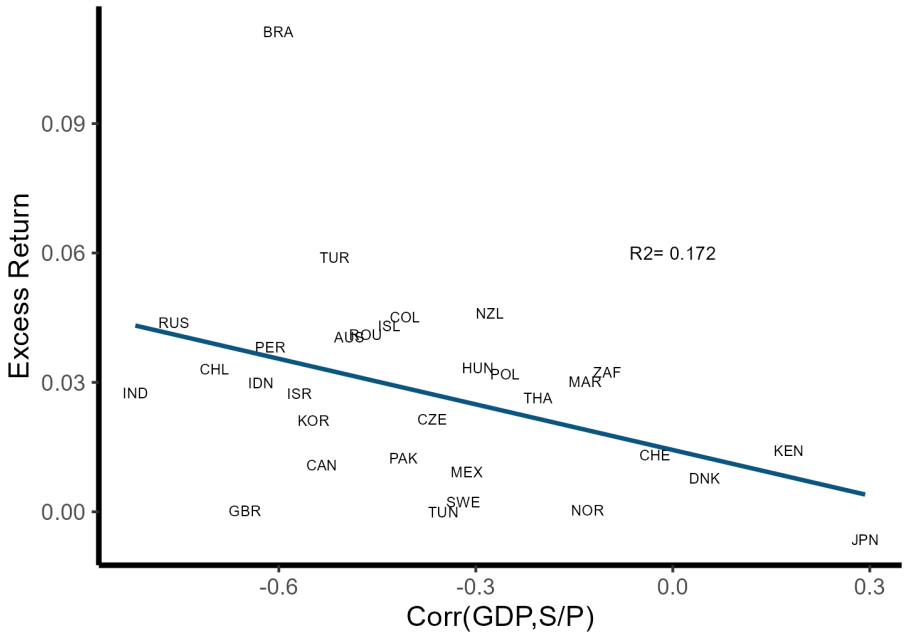


Figure 2: GDP-ER Comovement and excess returns

Data source: FX4Casts, IMF IFS. Y-axis variable is the average currency return of 25 countries between 02/2003 - 11/2018. X-axis variable is comovement between GDP and Exchange Rate

2.5 Macroeconomic Transmission Channel

This section explores the mechanism through which dollar frictions shape a country's risk profile. A key determinant of currency risk is the cyclical co-movement between GDP and the exchange rate (Dalgic (2024)). When this co-movement is negative—meaning the currency depreciates during domestic recessions—the currency loses value when income is lowest, making it a poor hedge and "risky" for an investor.

We test the drivers of this co-movement in Table 5. The regression results show that our proposed dollar frictions are significant determinants of this relationship. Dollar Invoicing has a negative and highly significant coefficient (-0.396^{***}), confirming that a higher share of dollar invoicing is strongly associated with a more countercyclical exchange rate (a more negative correlation). Similarly, net foreign assets/GDP has a significant positive coefficient (0.203^{**}). This indicates that being a net debtor (having a low or negative NFA/GDP) is associated with a significantly more negative GDP-ER correlation.

Thus, the evidence shows that both high dollar invoicing and a net debtor position make

	Dependent variable:
	GDP-ER Correlation
Dollar Invoicing	-0.396^{***}
	(0.138)
FL/FA	-0.033
	(0.030)
Net Foreign Assets/GDP	0.203^{**}
	(0.093)
Constant	-0.023
	(0.149)
Observations	19
R^2	0.430
Adjusted R^2	0.316
Residual Std. Error	0.194 (df = 15)
Note:	*p<0.1; **p<0.05; ***p<0.01

Table 5: The Role of Dollar Frictions in GDP-Exchange Rate Co-movement
Data source: IFS, Datastream, FX4Casts, Gopinath, Boz, Casas, Díez, Gourinchas and Plagborg-Møller (2020)

the exchange rate fundamentally riskier.

2.6 Currency Return Expectations

In this section, we construct a measure of expected returns using quarterly exchange rate expectations from FX4Casts. Our sample spans the period 2003Q1-2018Q4. This dataset has been used by Ince and Molodtsova (2017) to evaluate forecast accuracy and by **?** to construct UIP premium series.

We define the expected excess currency return ($\mathbb{E}_t UIP_t$) as:

$$\mathbb{E}_t UIP_t = R_t^L \frac{S_t}{\mathbb{E}_t\left(S_{t+1}\right)} - R_t^{US} \tag{2}$$

where $\mathbb{E}_t S_{t+1}$ is the one-quarter-ahead professional forecast for the spot rate.

Similar to our analysis of realized returns, we apply principal component analysis (PCA) to the panel of expected currency returns to extract common factors. We then test if these factors price the cross-section of expected returns.

Table 6 presents the results from regressing average expected excess returns on the loadings for the first two factors. Column (3) shows that while the "Dollar Risk Factor" load-

ing is not statistically significant, the "Carry Trade Risk Factor" loading is. The coefficient is positive and highly significant ($+0.031^{***}$). This finding indicates that, according to these professional forecasts, currencies with a higher exposure to the carry trade risk factor are associated with higher average expected returns, consistent with investors demanding a premium for bearing this risk.

Table 6: Average Expected excess returns vs component loadings

	Dependent variable:		
	Excess Returns		
	(1)	(2)	(3)
Dollar Risk Factor	0.008		−0.007
	(0.011)		(0.008)
Carry Trade Risk Factor		0.028***	0.031***
		(0.005)	(0.005)
Constant	0.009***	0.005***	0.004**
	(0.002)	(0.001)	(0.002)
Observations	26	26	26
R^2	0.028	0.467	0.484
Adjusted R^2	−0.012	0.445	0.439
Residual Std. Error	0.007 (df = 24)	0.006 (df = 24)	0.006 (df = 23)
Note:			*p<0.1; **p<0.05; ***p<0.01

Data source: FX4Casts, Ken French dataset, CBOE. Left hand variables are the two principal components of currency returns of 25 countries between 02/2003 - 11/2018. Right hand variable is the average expected excess returns.

3 Model

The empirical evidence points to a joint role for trade invoicing and balance-sheet structure in shaping currency risk. Countries with high dollar invoicing tend to have currencies that are more exposed to global risk factors and more countercyclical with respect to output. These same economies also tend to display persistently higher inflation. To rationalize these patterns, we use a small open-economy New Keynesian model with dominant-currency pricing in trade, foreign-currency borrowing by financial intermediaries, and segmented international asset markets.

Two mechanisms are central. First, export prices are set in dollars. The parameter θ_x denotes the Calvo probability that an export-price setter cannot adjust its dollar price in a given period. When θ_x is high, export dollar prices are sticky, so a depreciation

does not quickly lower the dollar price paid by foreign buyers. The usual expenditure-switching channel is therefore weak.[4] Second, the domestic banking system borrows in both local currency and dollars. The variable ϕ_t denotes the share of bank liabilities denominated in dollars, and $\bar{\phi}$ is the target dollar-liability share. When ϕ_t is high, a depreciation raises the local-currency value of dollar liabilities, reduces intermediary net worth, and tightens credit.

The interaction of these two frictions determines whether a depreciation is stabilizing or contractionary. With flexible export prices and little dollar debt, a depreciation can support exports and absorb foreign shocks. With sticky dollar export prices and high dollar debt, the depreciation fails to generate a quick export response while simultaneously weakening bank balance sheets. In that case, local-currency assets pay off badly in bad states, and investors require an endogenous risk premium to hold them. We now turn to the model that formalizes this mechanism.

3.1 Households

A representative household consumes C_t, supplies labor l_t, and saves in one-period local-currency and dollar deposits. The nominal exchange rate is S_t, measured as local currency per dollar, so an increase in S_t is a depreciation. The gross local-currency interest rate is R_t, and the gross dollar interest rate is R_t^*. Household preferences are

$$\mathbb{E}_0 \sum_{t=0}^{\infty} \beta^t \left[u(C_t) - \xi \frac{l_t^{1+\varphi_l}}{1+\varphi_l} - \frac{\gamma_\Theta}{2} (\Theta_t - \Upsilon_t)^2 \right]. \tag{3}$$

The parameter β is the discount factor, φ_l is the inverse Frisch elasticity, and ξ governs the disutility of labor. The variable Θ_t is the household dollar-asset share, while Υ_t is its preferred or target dollar-asset share. The last term captures a preferred-habitat motive: households can change their currency exposure, but it is costly to move far away from the target.

The household budget constraint is

$$D_t + S_t D_t^* + P_t^c C_t = R_{t-1} D_{t-1} + S_t R_{t-1}^* D_{t-1}^* + W_t l_t + T_t. \tag{4}$$

[4] McLeay and Tenreyro (2025) show that dominant-currency pricing need not dampen the expenditure-switching channel when export prices are flexible. Since our analysis focuses on manufactured tradable goods rather than commodities, the assumption of sticky prices is more applicable in our setting.

Here D_t is local-currency deposits, D_t^* is dollar deposits, P_t^c is the consumer price index, W_t is the nominal wage, and T_t denotes transfers and profits rebated to the household.

Let CPI inflation be $\Pi_{t+1}^c \equiv P_{t+1}^c / P_t^c$. The real stochastic discount factor is

$$m_{t+1} \equiv \beta \frac{u_C(C_{t+1})}{u_C(C_t)} \frac{1}{\Pi_{t+1}^c}. \tag{5}$$

Household optimality implies the local-currency and dollar Euler equations

$$1 = R_t \mathbb{E}_t[m_{t+1}], \tag{6}$$

$$1 = R_t^* \mathbb{E}_t \left[m_{t+1} \frac{S_{t+1}}{S_t} \right]. \tag{7}$$

The first equation prices a one-period local-currency payoff. The second prices a one-period dollar payoff after converting next period's dollar repayment back into local currency. Because S_{t+1}/S_t is high when the domestic currency depreciates, dollar assets are valuable insurance when depreciations occur in bad states.

The intratemporal labor condition is

$$\frac{W_t}{P_t^c} = \frac{\xi l_t^{\varphi_l}}{u_C(C_t)}. \tag{8}$$

The real wage equals the marginal rate of substitution between labor and consumption. Higher marginal utility of consumption raises the value of income and therefore raises desired labor supply for a given real wage.

If total real household savings are denoted by A_t, and $s_{t+1} \equiv S_{t+1}/S_t$ is the gross depreciation rate, the household portfolio-share condition can be written as

$$\gamma_\Theta(\Theta_t - \Upsilon_t) = \beta A_t \mathbb{E}_t \left[\frac{u_C(C_{t+1})}{\Pi_{t+1}^c} \left(R_t - s_{t+1} R_t^* \right) \right]. \tag{9}$$

The left-hand side is the marginal cost of moving the portfolio away from the target dollar share. The right-hand side is the expected marginal value of changing the currency composition of savings. When dollar assets hedge bad states, the term involving $s_{t+1} R_t^*$ becomes attractive and households tilt toward dollar assets.

3.2 Domestic Production and Price Setting

The domestic homogeneous good Y_t is produced by a competitive aggregator using differentiated intermediate varieties $Y_{i,t}$:

$$Y_t = \left[\int_0^1 Y_{i,t}^{\frac{\varepsilon-1}{\varepsilon}} i\right]^{\frac{\varepsilon}{\varepsilon-1}}, \qquad \varepsilon > 1. \tag{10}$$

The elasticity of substitution across varieties is ε. Cost minimization gives

$$Y_{i,t} = Y_t \left(\frac{P_{i,t}}{P_t}\right)^{-\varepsilon}, \tag{11}$$

$$P_t = \left[\int_0^1 P_{i,t}^{1-\varepsilon} i\right]^{\frac{1}{1-\varepsilon}}, \tag{12}$$

where P_t is the domestic-good price index. A firm that charges a higher relative price sells less, and the elasticity ε determines how sensitive demand is to relative prices.

The domestic homogeneous good is used as an input in final consumption, investment, and export production. Its market-clearing condition is

$$Y_t = C_t^d + I_t^d + X_t^d, \tag{13}$$

where C_t^d, I_t^d, and X_t^d are the domestic inputs used in consumption, investment, and exports.

Intermediate firms produce with capital and labor according to

$$Y_{i,t} = K_{i,t-1}^{\alpha} (A_t l_{i,t})^{1-\alpha}, \tag{14}$$

where $K_{i,t-1}$ is predetermined capital, A_t is technology, and α is capital's share. Let mc_t denote real marginal cost in units of the domestic good. Domestic intermediate firms face Calvo price stickiness: with probability $1-\theta_p$ a firm can reset its price, and with probability θ_p it keeps its previous price.

The optimal reset price is summarized by

$$\widetilde{p}_t \equiv \frac{\widetilde{P}_t}{P_t} = \frac{\mathcal{K}_t^p}{\mathcal{F}_t^p}, \tag{15}$$

where $\widetilde{P}_t$ is the newly chosen nominal price, and the two pricing sums satisfy

$$\mathcal{K}_t^p = \frac{u_C(C_t)}{P_t^c} Y_t \frac{\varepsilon}{\varepsilon - 1} mc_t + \beta\theta_p \mathbb{E}_t \left[(\Pi_{t+1})^{\varepsilon} \mathcal{K}_{t+1}^p \right], \tag{16}$$

$$\mathcal{F}_t^p = \frac{u_C(C_t)}{P_t^c} Y_t + \beta\theta_p \mathbb{E}_t \left[(\Pi_{t+1})^{\varepsilon - 1} \mathcal{F}_{t+1}^p \right], \tag{17}$$

with $\Pi_{t+1} \equiv P_{t+1}/P_t$. The numerator $\mathcal{K}_t^p$ is the discounted value of expected marginal costs, adjusted for the desired markup $\varepsilon/(\varepsilon - 1)$. The denominator $\mathcal{F}_t^p$ is the discounted value of expected demand. A firm chooses a price that balances today's markup against the possibility that the same price remains in place in future periods.

3.3 Final Consumption and Investment Goods

Final consumption combines domestic goods and imported goods:

$$C_t = \left[(1 - \omega_c)^{1/\eta_c} (C_t^d)^{\frac{\eta_c - 1}{\eta_c}} + \omega_c^{1/\eta_c} (C_t^m)^{\frac{\eta_c - 1}{\eta_c}} \right]^{\frac{\eta_c}{\eta_c - 1}}. \tag{18}$$

The parameter ω_c is the import share in consumption, while η_c is the elasticity of substitution between domestic and imported consumption goods. The associated CPI is

$$P_t^c = \left[(1 - \omega_c) P_t^{1 - \eta_c} + \omega_c (P_t^m)^{1 - \eta_c} \right]^{\frac{1}{1 - \eta_c}}, \qquad P_t^m = S_t P_t^f. \tag{19}$$

Imported goods are priced in dollars at P_t^f, so their local-currency price is $P_t^m = S_t P_t^f$. Thus, a depreciation directly raises the local-currency price of imports. When η_c is low, households cannot easily substitute away from imported goods, so the depreciation sharply raises the CPI and reduces real purchasing power.

The implied input demands are

$$C_t^d = (1 - \omega_c) \left(\frac{P_t}{P_t^c} \right)^{-\eta_c} C_t, \tag{20}$$

$$C_t^m = \omega_c \left(\frac{P_t^m}{P_t^c} \right)^{-\eta_c} C_t. \tag{21}$$

These equations show that expenditure shifts toward the input whose relative price falls, with the strength of substitution governed by η_c.

Final investment is produced analogously from domestic and imported investment inputs:

$$I_t = \left[\gamma_I^{1/\nu_I}(I_t^d)^{\frac{\nu_I-1}{\nu_I}} + (1-\gamma_I)^{1/\nu_I}(I_t^m)^{\frac{\nu_I-1}{\nu_I}}\right]^{\frac{\nu_I}{\nu_I-1}}. \tag{22}$$

Here γ_I is the domestic share in investment and ν_I is the substitution elasticity between domestic and imported investment inputs. Capital evolves according to

$$K_t = (1-\delta)K_{t-1} + \left[1 - \mathcal{S}\left(\frac{I_t}{I_{t-1}}\right)\right] I_t, \tag{23}$$

where δ is depreciation and $\mathcal{S}(\cdot)$ is an investment adjustment-cost function. Because investment uses imported inputs, exchange-rate movements affect the cost of building capital. Adjustment costs then make the investment response gradual rather than instantaneous.

3.4 Exports and Dominant-Currency Pricing

Final exports combine a domestic export input X_t^d and an imported input X_t^m:

$$X_t = \left[\gamma_x^{1/\eta_x}(X_t^d)^{\frac{\eta_x-1}{\eta_x}} + (1-\gamma_x)^{1/\eta_x}(X_t^m)^{\frac{\eta_x-1}{\eta_x}}\right]^{\frac{\eta_x}{\eta_x-1}}. \tag{24}$$

The parameter γ_x is the domestic-input share in exports, and η_x is the substitution elasticity between domestic and imported export inputs. Foreign demand for the final export good is

$$X_t = \left(\frac{P_t^x}{P_t^f}\right)^{-\eta_f} Y_t^*, \tag{25}$$

where P_t^x is the dollar price of the final export good, P_t^f is the dollar price of foreign goods, Y_t^* is foreign demand, and η_f is the foreign demand elasticity.

The domestic export input is assembled from differentiated export varieties:

$$X_t^d = \left[\int_0^1 X_{i,t}^{\frac{\varepsilon_x-1}{\varepsilon_x}} i\right]^{\frac{\varepsilon_x}{\varepsilon_x-1}}, \tag{26}$$

$$X_{i,t} = X_t^d \left(\frac{P_{i,t}^{d,x}}{P_t^{d,x}}\right)^{-\varepsilon_x}, \tag{27}$$

$$P_t^{d,x} = \left[\int_0^1 (P_{i,t}^{d,x})^{1-\varepsilon_x} i\right]^{\frac{1}{1-\varepsilon_x}}. \tag{28}$$

The key feature is that $P_{i,t}^{d,x}$ is set in dollars. Export-input producers face Calvo stickiness in dollar prices: with probability $1-\theta_x$ a firm resets its dollar price, and with probability θ_x it keeps the previous dollar price.

A resetting exporter chooses the relative dollar price

$$\widetilde{p}_t^{d,x} \equiv \frac{\widetilde{P}_t^{d,x}}{P_t^{d,x}} = \frac{\mathcal{K}_t^x}{\mathcal{F}_t^x}, \tag{29}$$

where $\mathcal{K}_t^x$ and $\mathcal{F}_t^x$ are the export-sector analogues of the domestic Calvo pricing sums. The export price index evolves as

$$(P_t^{d,x})^{1-\varepsilon_x} = (1-\theta_x)(\widetilde{P}_t^{d,x})^{1-\varepsilon_x} + \theta_x (P_{t-1}^{d,x})^{1-\varepsilon_x}. \tag{30}$$

This block is where dominant-currency pricing enters the model. If $\theta_x = 0$, firms reset their dollar prices every period. A depreciation then lowers the dollar price implied by domestic costs and supports export demand. If θ_x is high, export dollar prices barely move on impact. The depreciation improves competitiveness only slowly, so the trade balance cannot adjust through a rapid expansion of exports.

3.5 Bankers and Financial Intermediation

Banks intermediate between savers and firms. They borrow from households and foreign financiers in local currency and dollars, purchase claims on capital, and earn the gross return R_{t+1}^k. Let $N_{j,t}$ be bank j's net worth, Q_t the price of capital, and $\mathcal{A}_{j,t}$ the quantity of capital claims held by the bank. End-of-period net worth is

$$N_{j,t+1} = R_{t+1}^k Q_t \mathcal{A}_{j,t} - R_t B_{j,t}^{LC} - R_t^* \frac{S_{t+1}}{S_t} B_{j,t}^{FC}. \tag{31}$$

The term $B_{j,t}^{LC}$ is local-currency borrowing and $B_{j,t}^{FC}$ is dollar borrowing, measured in local-currency units at time t. A depreciation raises S_{t+1}/S_t, increasing the local-currency burden of dollar debt and reducing bank net worth.

The bank's dollar-liability share is $\phi_{j,t}$. Leverage is allowed to differ by funding currency:

$$B_{j,t}^{FC} = (L_{j,t}^{FC} - 1)\phi_{j,t} N_{j,t}, \tag{32}$$

$$B_{j,t}^{LC} = (L_{j,t}^{LC} - 1)(1 - \phi_{j,t})N_{j,t}. \tag{33}$$

Using these definitions, the growth rate of bank net worth can be written as

$$\begin{aligned}\frac{N_{j,t+1}}{N_{j,t}} = {} & L_{j,t}^{LC}(1 - \phi_{j,t})(R_{t+1}^{k} - R_t) + L_{j,t}^{FC}\phi_{j,t}\left(R_{t+1}^{k} - R_t^{*}\frac{S_{t+1}}{S_t}\right) \\ & + (1 - \phi_{j,t})R_t + \phi_{j,t}R_t^{*}\frac{S_{t+1}}{S_t}.\end{aligned} \tag{34}$$

This expression isolates the balance-sheet channel. Local-currency borrowing exposes the bank to the spread between the capital return and the local funding rate. Dollar borrowing adds exchange-rate risk because the funding cost is multiplied by S_{t+1}/S_t.

Bankers survive with probability θ_b. Their value is

$$V_{j,t} = \mathbb{E}_t \sum_{i=0}^{\infty}(1 - \theta_b)\theta_b^i\beta^{i+1}\Lambda_{t,t+i+1}N_{j,t+i+1}, \tag{35}$$

where $\Lambda_{t,t+i+1}$ is the household discount factor between dates t and $t+i+1$. Recursively,

$$V_{j,t} = \mathbb{E}_t\left[\beta(1 - \theta_b)N_{j,t+1} + \beta\theta_b\Lambda_{t,t+1}V_{j,t+1}\right]. \tag{36}$$

Banks are subject to an incentive constraint. If a banker can divert a fraction λ_b of assets, lenders provide funds only if the continuation value of banking is large enough. For funding currency $k \in \{LC, FC\}$, define the value per unit of allocated net worth as $\psi_t^k \equiv V_t^k/N_t^k$. When the incentive constraint binds,

$$\psi_t^k = \lambda_b L_t^k. \tag{37}$$

Solving the banker problem gives leverage as

$$L_t^{FC} = \frac{\nu_t^{FC}}{\lambda_b - \eta_t^{FC}}, \tag{38}$$

$$L_t^{LC} = \frac{\nu_t^{LC}}{\lambda_b - \eta_t^{LC}}. \tag{39}$$

The objects η_t^k and ν_t^k are discounted continuation-value terms. The first captures the value of levered excess returns, while the second captures the value of the unlevered funding return. A higher continuation value relaxes the effective leverage constraint,

whereas greater exchange-rate risk in dollar funding makes foreign-currency leverage more fragile.

The bank also chooses the currency composition of liabilities. Its dollar share solves

$$\max_{\phi_t}(1-\phi_t)\psi_t^{LC}+\phi_t\psi_t^{FC}-\frac{\chi_\phi}{2}(\phi_t-\bar{\phi})^2, \tag{40}$$

where χ_ϕ is the cost of deviating from the target dollar-liability share $\bar{\phi}$. The first-order condition is

$$\psi_t^{FC}-\psi_t^{LC}=\chi_\phi(\phi_t-\bar{\phi}). \tag{41}$$

Using $\psi_t^k=\lambda_b L_t^k$, this becomes

$$\phi_t-\bar{\phi}=\frac{\lambda_b}{\chi_\phi}(L_t^{FC}-L_t^{LC}). \tag{42}$$

Thus banks shift toward dollar liabilities when the value of foreign-currency funding rises relative to local-currency funding. The quadratic term prevents the currency composition from jumping costlessly to a corner.

3.6 Foreign Financiers and Financial Market Clearing

Foreign financiers borrow in dollars and lend to the domestic economy in local currency. Let B_t^* be the dollar amount they invest in local-currency assets, and let $B_t^F \equiv S_t B_t^*$ denote its local-currency value. Following the segmented-market logic, their supply of local-currency lending is upward sloping in expected excess returns and downward sloping in exchange-rate risk:

$$B_t^*-\bar{B}^*=\frac{\mathbb{E}_t^j\left(R_t\frac{S_t}{S_{t+1}}\right)-R_t^*}{\lambda_f\left(\mathrm{Var}_t(s_{t+1})\right)}. \tag{43}$$

Here $\lambda_f(\mathrm{Var}_t(s_{t+1}))$ is increasing in exchange-rate risk. Foreigners require a larger expected return to hold more local-currency assets, especially when the exchange rate is volatile.

Local-currency and dollar financial markets clear according to

$$B_t^F+D_t=B_t^{LC}, \tag{44}$$

$$B_t^{F,*} + D_t^* = B_t^{FC}. \tag{45}$$

The first condition says that bank local-currency borrowing is funded by household local-currency deposits and foreign local-currency lending. The second says that bank dollar borrowing is funded by domestic and foreign dollar positions.

3.7 Balance of Payments

The home economy's net foreign asset position is

$$NFA_t = -\left(B_t^F + B_t^{F,*}\right). \tag{46}$$

Net exports must equal the change in this position after interest payments:

$$X_t - M_t = -\left(B_t^{F,*} - R_{t-1}^* \frac{S_t}{S_{t-1}} B_{t-1}^{F,*}\right) - \left(B_t^F - R_{t-1} B_{t-1}^F\right). \tag{47}$$

This identity is central to the model. If the economy loses external financing or must repay more because dollar liabilities become expensive, the external adjustment must occur through higher exports, lower imports, a larger depreciation, or some combination of all three. Dominant-currency pricing makes the export margin slow, so adjustment is pushed toward import compression and a sharper depreciation.

3.8 Monetary Policy and Shocks

The central bank follows an inertial Taylor rule:

$$\log\left(\frac{R_t}{\bar{R}}\right) = \rho_R \log\left(\frac{R_{t-1}}{\bar{R}}\right) + r_\pi \log\left(\frac{\pi_t}{\bar{\pi}}\right) + r_y \log\left(\frac{y_t}{\bar{y}}\right) + \varepsilon_{R,t}. \tag{48}$$

The coefficients r_π and r_y govern the response to inflation and output, and ρ_R captures interest-rate smoothing. The target is domestic-good inflation rather than CPI inflation. Holding this rule fixed across calibrations isolates how changes in invoicing and balance-sheet structure alter equilibrium inflation and spreads.

The foreign interest rate follows

$$R_t^* = (1 - \rho_{R^*})\bar{R}^* + \rho_{R^*} R_{t-1}^* + \sigma_{R^*} \varepsilon_{R^*,t}. \tag{49}$$

Foreign monetary conditions also affect export demand:

$$Y_t^* = (1 - \rho_{Y^*})\bar{Y}^* + \rho_{Y^*} Y_{t-1}^* + \gamma_R(R_t^* - \bar{R}^*) + \sigma_{Y^*}\varepsilon_{Y^*,t}. \tag{50}$$

Thus a foreign tightening works through both financial and trade channels: it raises dollar funding costs and can reduce external demand.

4 Dollar Borrowing, Export-Price Stickiness, and the UIP Wedge

This section derives a semi-reduced-form expression for the model's SDF-weighted UIP wedge in terms of the bank's dollar-borrowing share, ϕ_t, and the degree of export-price stickiness in dollars, θ_x. The main result is that ϕ_t enters the UIP wedge directly through the bank's currency-choice problem, whereas θ_x enters indirectly by changing the general-equilibrium strength of the balance-sheet channel.

Define the weighted UIP wedge as

$$UIP_t \equiv \mathbb{E}_t\left[\beta\Lambda_{t,t+1}\Omega_{t+1}\left(R_t - R_t^*\frac{S_{t+1}}{S_t}\right)\right]. \tag{51}$$

This object is the discounted expected excess return on local-currency funding relative to dollar funding. A positive wedge means that, after weighting by the household stochastic discount factor and the banker's continuation value, local-currency funding is expensive relative to foreign-currency funding.

Banks choose the dollar share of borrowing, ϕ_t, subject to a quadratic cost of deviating from a reference share $\bar{\phi}$. The reduced-form currency-choice problem implies

$$\psi_t^{FC} - \psi_t^{LC} = \chi(\phi_t - \bar{\phi}), \tag{52}$$

where ψ_t^{FC} and ψ_t^{LC} are the values of foreign-currency and local-currency funding and $\chi > 0$ governs the cost of changing the currency composition. Under the binding incentive constraint, funding value is proportional to leverage:

$$\psi_t^k = \lambda_b L_t^k, \qquad k \in \{LC, FC\}. \tag{53}$$

Hence

$$L_t^{FC} - L_t^{LC} = \frac{\chi}{\lambda_b}(\phi_t - \bar{\phi}). \tag{54}$$

The economic content of (54) is simple. A higher dollar-borrowing share reveals that foreign-currency funding supports more balance-sheet capacity than local-currency funding. Thus, $\phi_t - \bar{\phi}$ is a sufficient statistic for the bank's revealed leverage advantage from dollar funding.

The bank's leverage under currency k is

$$L_t^k = \frac{\nu_t^k}{\lambda_b - \eta_t^k}, \qquad k \in \{LC, FC\}, \tag{55}$$

where ν_t^k is the return component and η_t^k is the continuation-value component. Linearizing around a symmetric steady state with common leverage L, return term ν, and continuation value η gives

$$L_t^{FC} - L_t^{LC} \approx \frac{L-1}{\lambda_b - \eta} UIP_t. \tag{56}$$

This equation is the balance-sheet amplification step. A UIP wedge changes the relative value of borrowing in the two currencies. Because banks are leveraged, a small expected currency-return wedge changes the amount of balance-sheet capacity associated with each funding currency. The factor $(L-1)/(\lambda_b - \eta)$ captures that amplification: the effect is stronger when leverage is high and the incentive constraint is close to binding.

Combining (54) and (56) yields

$$UIP_t = \frac{\chi(\lambda_b - \eta)}{\lambda_b(L-1)}(\phi_t - \bar{\phi}). \tag{57}$$

Thus, on the banker side, the UIP wedge is affine in the dollar-borrowing share. If $L > 1$ and $\lambda_b - \eta > 0$, the slope is positive: when banks tilt more heavily toward dollar funding, the model requires a larger discounted parity wedge to rationalize the associated leverage differential.

The export-price stickiness parameter θ_x does not appear directly in the bank's first-order condition. Instead, it enters through general equilibrium. A higher θ_x means that export prices set in dollars adjust less frequently. When export prices are sticky in the dominant currency, a depreciation does less to lower foreign-currency export prices and

therefore does less to stimulate foreign demand. Exchange-rate adjustment then provides weaker expenditure switching. External tightening is transmitted more strongly into output, capital returns, banker continuation values, and leverage.

Accordingly, the steady-state terms in (57) should be interpreted as functions of θ_x:

$$\eta = \eta(\theta_x), \qquad \nu = \nu(\theta_x), \qquad L(\theta_x) = \frac{\nu(\theta_x)}{\lambda_b - \eta(\theta_x)}. \tag{58}$$

Substituting these objects into (57) gives the central semi-reduced-form representation:

$$UIP_t = \Gamma(\theta_x)(\phi_t - \bar{\phi}) \tag{59}$$

with

$$\Gamma(\theta_x) \equiv \frac{\chi[\lambda_b - \eta(\theta_x)]}{\lambda_b[L(\theta_x) - 1]} = \frac{\chi[\lambda_b - \eta(\theta_x)]^2}{\lambda_b[\nu(\theta_x) - \lambda_b + \eta(\theta_x)]}. \tag{60}$$

Equation (59) separates the two mechanisms. Dollar borrowing moves the UIP wedge directly through the bank's portfolio margin. Export-price stickiness changes the slope of that relationship by changing how exchange-rate movements feed into exports, output, capital returns, and bank continuation values. In calibrations where dominant-currency pricing weakens expenditure switching and tightens balance sheets, $\Gamma'(\theta_x) > 0$: dollar liabilities become more macro-financially fragile precisely because the exchange rate is less able to stabilize external demand.

For empirical or local analytical use, expand $\Gamma(\theta_x)$ around a reference value $\bar{\theta}_x$:

$$\Gamma(\theta_x) \approx \Gamma_0 + \Gamma_1(\theta_x - \bar{\theta}_x), \qquad \Gamma_0 \equiv \Gamma(\bar{\theta}_x), \quad \Gamma_1 \equiv \Gamma'(\bar{\theta}_x). \tag{61}$$

Then

$$UIP_t \approx \Gamma_0(\phi_t - \bar{\phi}) + \Gamma_1(\theta_x - \bar{\theta}_x)(\phi_t - \bar{\phi}). \tag{62}$$

The first term is the direct dollar-debt channel. The second term is the interaction between dominant-currency export pricing and dollar debt. It says that the same dollar-borrowing position generates a different UIP wedge depending on how strongly the exchange rate can move relative prices and stabilize external demand.

5 Model Calibration and Simulations

This section takes the analytical mechanism to the quantitative model. The exercise is not intended as a full structural estimation. Instead, the calibration disciplines the main trade, financial, and policy margins of a small open emerging-market economy and then asks how the economy behaves when dollar pricing and dollar liabilities interact. We proceed in three steps. First, we describe the baseline calibration. Second, we compare impulse responses to a foreign monetary tightening in a vulnerable economy and in a benchmark economy without the key frictions. Third, we vary export-price stickiness and study how the stochastic steady state changes with currency risk.

5.1 Calibration

The baseline calibration represents a small open economy exposed to foreign monetary conditions, imported inputs, and balance-sheet dollarization. Parameters governing preferences, production, and capital accumulation, including β, α, and δ, are assigned conventional business-cycle values. Parameters governing international transmission—trade elasticities, nominal rigidities, and financial frictions—are chosen to generate plausible emerging-market responses to foreign monetary tightening. The structural estimates in Camara, Christiano and Dalgic (2024) provide a benchmark for the response of an average emerging-market economy to U.S. monetary policy shocks.

Three aspects of the calibration are central for the quantitative mechanism. First, the economy is highly exposed to foreign prices and foreign demand. The investment home-bias parameter is set to a low value, $\gamma_I = 0.290$, and the domestic-input share in exports is set to $\gamma_x = 0.500$. The elasticity of substitution between domestic and imported consumption goods is $\eta_c = 0.410$. Since $\eta_c < 1$, domestic and imported goods are complements rather than close substitutes. A depreciation therefore raises the cost of imported consumption goods and inputs without generating a large substitution response. This real-income channel amplifies the contractionary effect of depreciations, as in Auclert, Rognlie, Souchier and Straub (2021).

Second, foreign monetary tightening affects the home economy through both financial conditions and export demand. The export-demand shifter is set to $\gamma_R = -20$, so an increase in the foreign interest rate is associated with weaker external demand for home exports. This parameterization captures the idea that U.S. monetary tightening is not

only a funding shock for emerging markets, but also a global-demand shock. Export-price stickiness is set to $\theta_x = 0.800$ in the baseline, implying that dollar export prices adjust slowly after the exchange rate moves.

Third, the calibration builds in the balance-sheet exposure that is central to the model. The banker incentive parameter is set to $\lambda_b = 0.300$, implying steady-state leverage of approximately eight. The steady-state foreign-currency liability share is $\bar{\phi} = 0.250$. This corresponds to a moderate but quantitatively meaningful degree of liability dollarization. Taken together, the trade and financial blocks make the exchange rate a double-edged adjustment margin: depreciation helps only slowly through exports, while immediately raising import costs and the local-currency value of dollar liabilities. Table 7 summarizes the full baseline calibration.

Variable	Description	Value
β	Discount Factor	0.995
α	Capital Share	0.340
δ	Depreciation	0.020
φ	Inverse Frisch	1.000
r_π	Taylor Inflation Coefficient	1.500
r_y	Taylor Output Coefficient	0.100
r_S	Taylor Exchange Rate Coefficient	0.020
ϵ	Elasticity of Substitution, intermediate goods	6.000
θ	Calvo Parameter, intermediate goods	0.750
ϵ^x	Elasticity of Substitution, export goods	6.000
γ	Target Portfolio Cost (UIP Friction)	2.560
θ^x	Export Calvo Stickiness	0.800
κ	Investment Adjustment Cost	5.850
η_c	C, Elasticity of Substitution	0.410
$1-\omega_c$	Home Bias, C	0.830
ω_i	Home Bias, I	0.290
γ_x	Home Bias, X	0.500
η^f	Elasticity of Demand, Exports	1.530
η_i	I, Elasticity of Substitution	0.910
η_x	X, Elasticity of Substitution	0.700
ρ_R	MP Persistence	0.900
ϕ	Target Credit Dollarization	0.250
Υ	Target Deposit Dollarization	0.200
$\frac{d^*}{Y}$	Dollar Deposit/GDP	0.500
γ_R	Export Demand Shifter	-20.000
θ	Banker survival	0.972
W_b	Banker startup	0.030
λ	Banker constraint	0.300
λ^f	Financier Constraint	1.000

Table 7: Parameter Values

5.2 Response to a Foreign Interest Rate Shock

Figure 3 compares the response to a foreign monetary tightening across four economies obtained by varying two structural features: the degree of dollar export invoicing and the share of bank liabilities denominated in dollars. The monetary policy rule and the foreign interest rate shock are held fixed across all economies. Differences in domestic interest rates, exchange rates, output, and UIP spreads are therefore equilibrium outcomes, not the result of changing the policy rule.

The figure provides the quantitative counterpart to the analytical result derived above. The largest UIP deviation arises when the economy combines high dollar export invoicing with high dollar liabilities. Dollar liabilities are the direct source of balance-sheet exposure: a depreciation raises the local-currency value of intermediaries' dollar debt and lowers bank net worth. Dollar export invoicing changes the real payoff to that balance-sheet exposure. When export prices are sticky in dollars, the depreciation does not translate quickly into lower dollar prices for foreign buyers. The exchange rate therefore becomes less effective at stabilizing external demand precisely when it is most damaging for domestic balance sheets.

This interaction is visible in the UIP-spread panel. The economy with both high dollar invoicing and high dollar debt displays the largest currency-risk premium. The economy with high dollar debt but low dollar invoicing also generates a sizable spread, but the spread is smaller. By contrast, the two low-debt economies generate only small UIP deviations. The result is consistent with the analytical decomposition: dollar debt moves the UIP wedge directly, while dollar export invoicing raises the marginal riskiness of a given dollar-liability position by weakening expenditure switching.

The real effects mirror this pricing result. In the high-invoicing, high-debt economy, the foreign tightening produces the largest depreciation, the sharpest decline in consumption, and the most severe initial contraction in investment and output. The depreciation raises the domestic price of imported consumption goods and imported investment inputs, reducing real purchasing power and the effective return to capital accumulation. At the same time, it revalues dollar liabilities, weakens intermediary net worth, and tightens credit. Local-currency assets therefore pay off poorly in states in which domestic absorption and intermediary balance sheets are already under pressure. Investors require a larger premium to hold those assets, and the UIP spread rises.

The export response should be interpreted carefully. Exports rise on impact in the

high-debt economies, including the high-invoicing case. But this is not the benign expenditure-switching mechanism of the textbook small open economy. It is a costly external adjustment generated by a much larger depreciation and a sharp movement in the external accounts. The right panel of Figure 5 shows that low-invoicing economies obtain a larger immediate decline in dollar export prices. High-invoicing economies adjust dollar export prices more sluggishly. Thus, for a given exchange-rate movement, dollar invoicing weakens the improvement in export competitiveness. The observed export expansion in the vulnerable economy occurs only because the exchange rate and the risk premium move much more.

The benchmark low-debt economies behave differently. When dollar liabilities are limited, depreciation does not impose large valuation losses on intermediary balance sheets. When export invoicing is low, the exchange rate also works more effectively through relative prices. The exchange rate is then closer to a shock absorber: it supports external adjustment without simultaneously generating a large deterioration in domestic financial conditions. Output and investment fall less, and the UIP wedge remains small.

The same interaction creates a monetary-policy trade-off. CPI inflation rises because depreciation passes through into import prices, while output and investment contract because of balance-sheet losses and the costly external adjustment. Under the common Taylor rule, the central bank cannot remove the structural source of the UIP premium. A stronger anti-inflation response would tighten domestic financial conditions further, while a more accommodative response would validate part of the depreciation. The policy problem is therefore endogenous to the economy's trade and financial structure: the exchange rate no longer simply absorbs the foreign shock, but prices the risk created by the joint presence of dollar liabilities and sticky dollar export prices.

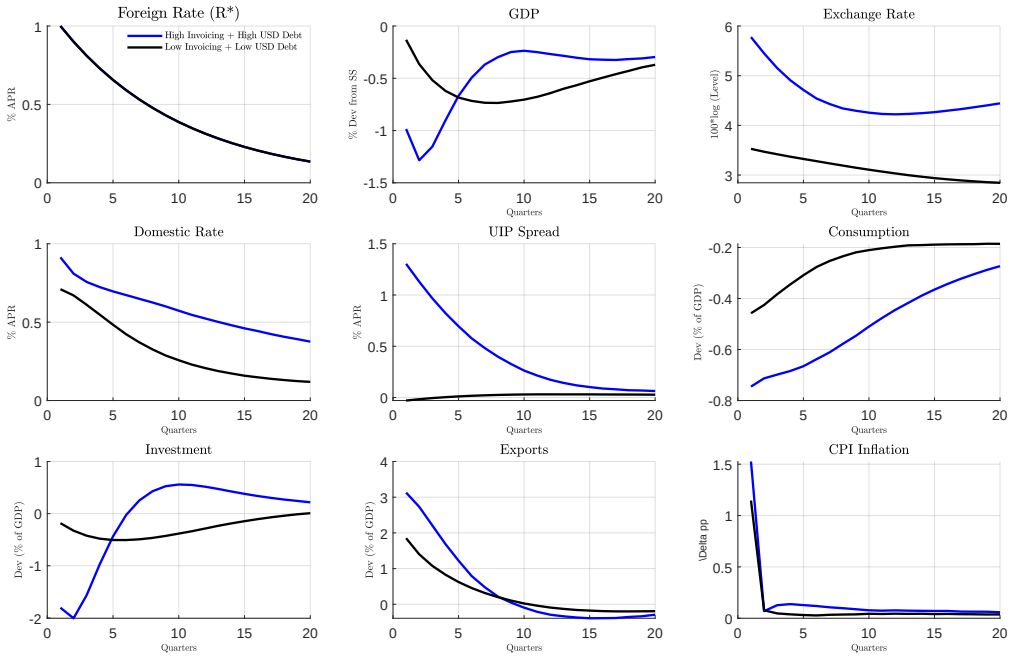


Figure 3: Impulse responses to a foreign interest-rate shock

Notes: High invoicing denotes a higher degree of dollar export invoicing, whereas low invoicing denotes producer-currency pricing. High USD debt denotes a higher share of bank liabilities denominated in dollars, whereas low USD debt denotes a lower dollar-liability share.

5.3 Mechanism

The impulse responses isolate why the interaction between dollar liabilities and dollar export invoicing is the central determinant of the UIP deviation. A foreign interest rate shock raises dollar funding costs and puts downward pressure on the domestic currency. When intermediaries have dollar liabilities, the depreciation immediately increases the local-currency value of their debt. This valuation loss reduces bank net worth, raises leverage, and tightens credit. Dollar debt therefore makes the exchange rate financially fragile.

Dollar export invoicing determines whether the economy can absorb this financial loss through the trade account. Under producer-currency pricing or flexible dollar export prices, depreciation lowers the foreign-currency price of exports and stimulates foreign demand. The trade account can then help offset the balance-sheet loss. Under sticky dollar export pricing, this relative-price channel is weaker. Dollar export prices adjust only

gradually, so the same depreciation produces less immediate improvement in export competitiveness. External adjustment must then occur through a more costly combination of larger depreciation, import compression, and lower domestic absorption.

Figure 4 shows this adjustment in the external accounts. In the high-invoicing, high-debt economy, the current account deteriorates sharply on impact and then reverses into surplus. The initial deterioration reflects the financial pressure created by the depreciation and the higher burden of dollar liabilities. The subsequent surplus reflects the economy's forced external adjustment. The trade balance improves strongly at first, but this improvement is not a sign of a frictionless expenditure-switching channel. It is achieved in an economy experiencing a large depreciation, a high UIP premium, and a sharp contraction in domestic demand.

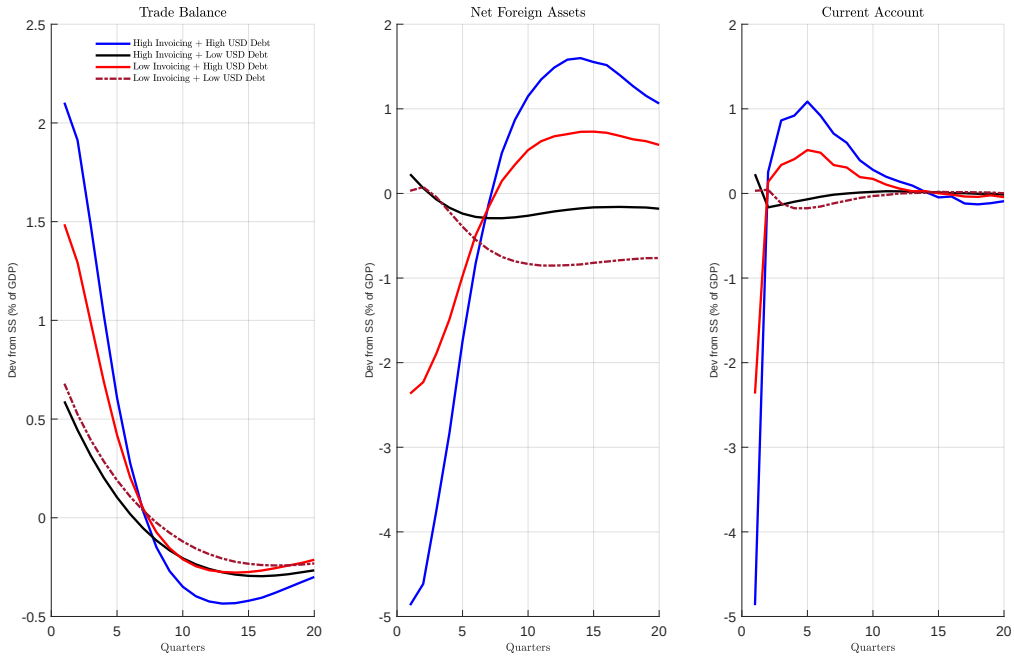


Figure 4: Current Account Dynamics following a foreign interest rate shock

Figure 5 presents the same mechanism from the perspective of currency returns. The left panel shows that the UIP spread is largest when high dollar debt is combined with high dollar export invoicing. High dollar debt alone generates a substantial spread, but the spread is amplified when exports are also invoiced in dollars. High invoicing without high dollar debt generates only a small UIP deviation. This pattern is exactly

the interaction emphasized by the analytical section: the dollar-liability share is the direct balance-sheet exposure, while export-price stickiness changes the riskiness of that exposure.

The right panel explains why. Low-invoicing economies experience a larger initial decline in dollar export prices, so the depreciation works more directly through export competitiveness. High-invoicing economies exhibit a more muted and delayed dollar-price adjustment. The exchange rate therefore has to do more work to restore external balance. In the high-debt economy, this larger exchange-rate movement simultaneously worsens intermediary balance sheets. The financial channel and the trade-pricing channel reinforce each other: dollar liabilities make depreciation costly, and sticky dollar export prices make depreciation less effective as a stabilizer.

The central implication is that the exchange rate changes role. In the low-debt or low-invoicing economies, it remains closer to a relative price that reallocates demand and absorbs foreign shocks. In the high-invoicing, high-debt economy, it becomes a macro-financial state variable. It raises import costs, revalues dollar liabilities, tightens intermediary balance sheets, and increases the compensation investors require for holding local-currency assets. This is why the joint presence of dollar liabilities and dollar export invoicing generates the largest UIP deviation and why these two margins are central to the economy's shock-absorption capacity.

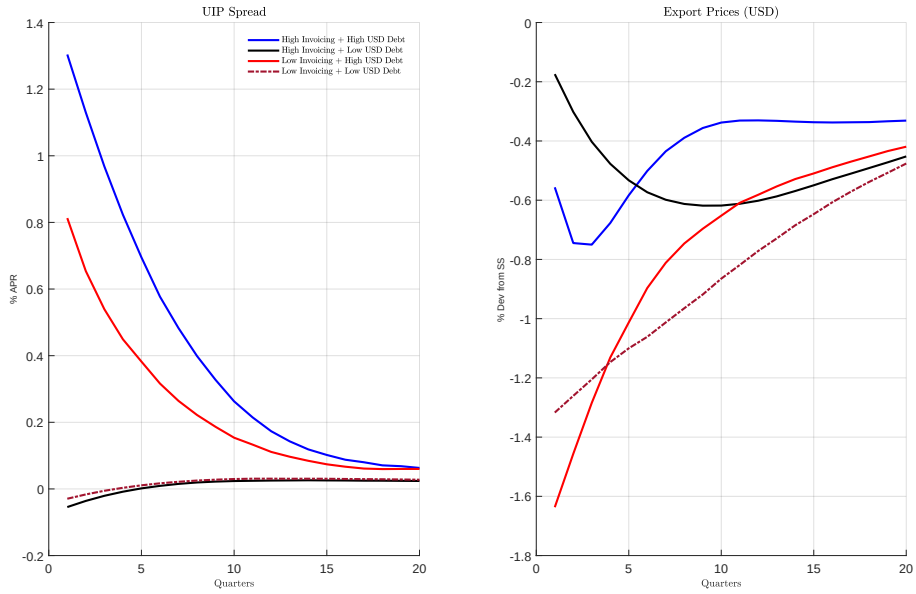


Figure 5: UIP Spread and Export Prices

5.4 Stochastic Steady-State Results

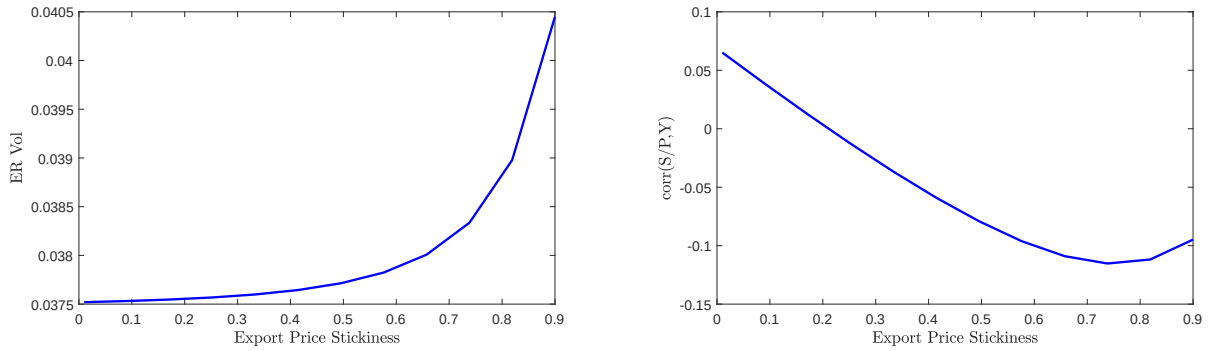
The impulse responses describe the transmission of a single shock. We now ask how the economy's stochastic steady state changes as export-price stickiness, θ_x, increases. The model is solved using a third-order approximation around the non-stochastic steady state, which allows risk to affect simulation averages.

The main result is that greater export-price stickiness makes the currency both more volatile and more countercyclical. When dollar export prices adjust slowly, external shocks require larger exchange-rate movements to satisfy the balance-of-payments constraint. Those depreciations occur precisely when output is weak, because dollar liabilities reduce intermediary net worth and import prices compress domestic absorption. As a result, the exchange rate is structurally a poor hedge for domestic activity.

Volatility, Cyclicality, and the UIP Premium

Figure 6 shows that increasing θ_x raises exchange-rate volatility and strengthens the negative comovement between output and the exchange rate. The economic logic fol-

lows directly from the mechanism above. Stickier dollar export prices make expenditure switching weaker. The exchange rate must therefore move more to induce the same external adjustment. With dollarized balance sheets, these larger depreciations worsen financial conditions and make output fall at the same time that the currency depreciates.



(a) Exchange rate volatility (θ_x)

(b) Output and exchange rate comovement (θ_x)

Figure 6: Stochastic Steady-State Volatility and Export-Price Stickiness

This change in cyclicality has an asset-pricing implication. Dollar assets appreciate in domestic downturns and therefore provide insurance to domestic agents, as emphasized by Christiano, Dalgic and Nurbekyan (2021). Local-currency assets do the opposite: they lose value in states in which domestic income is already low. Households therefore demand compensation to hold local-currency exposure. Foreign financiers also require a larger expected excess return when exchange-rate volatility rises, as in Equation 43. Figure 7 shows that the stochastic steady-state UIP premium rises with export-price stickiness. The result is the quantitative counterpart of Equation 59: dollar debt creates the direct exposure, while dominant-currency pricing raises the price of that exposure by making the exchange rate less stabilizing.

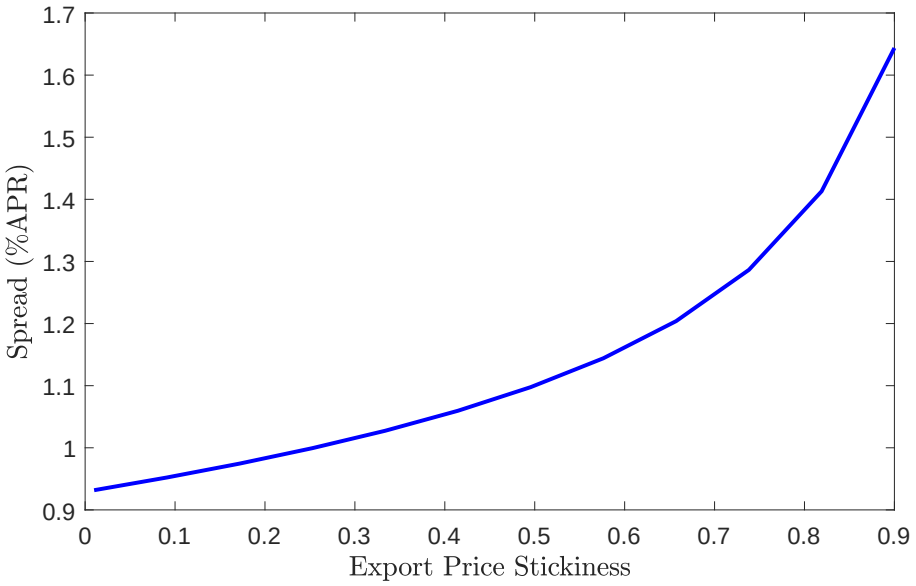


Figure 7: UIP Premium and Export Dollar Price Stickiness (θ_x)

Inflation and Policy Trade-offs

The rise in the UIP premium also has a monetary implication. In an open economy with segmented international asset markets, the domestic nominal interest rate must compensate investors for currency risk. When the premium rises, the risk-adjusted neutral interest rate rises with it. A conventional Taylor rule with a fixed intercept, such as Equation 48, does not automatically internalize this shift. At the inflation target, the policy rate is then too low relative to the return required to clear currency markets. In equilibrium, inflation rises above target so that the Taylor rule generates a higher nominal and real interest rate. Figure 8 shows that steady-state inflation therefore increases with export-price stickiness.

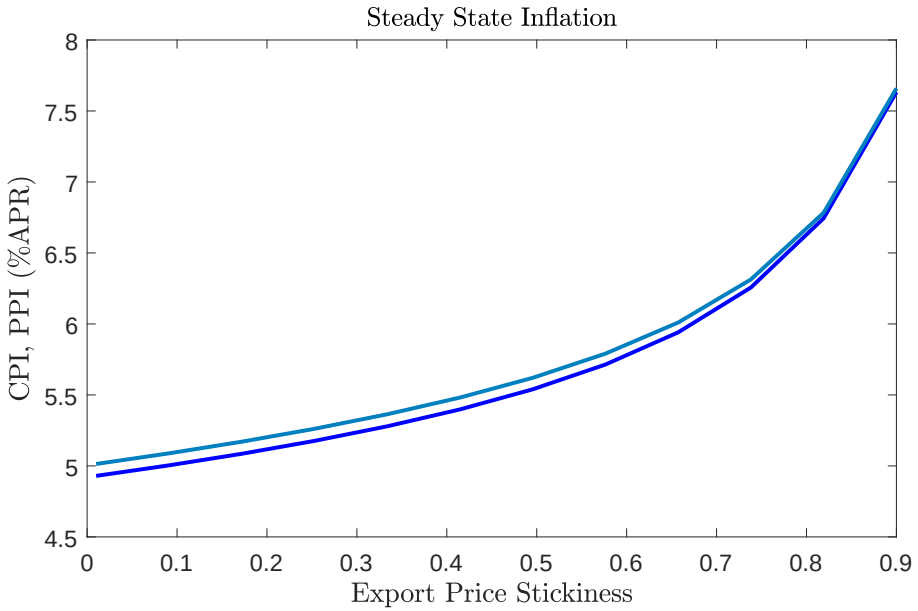
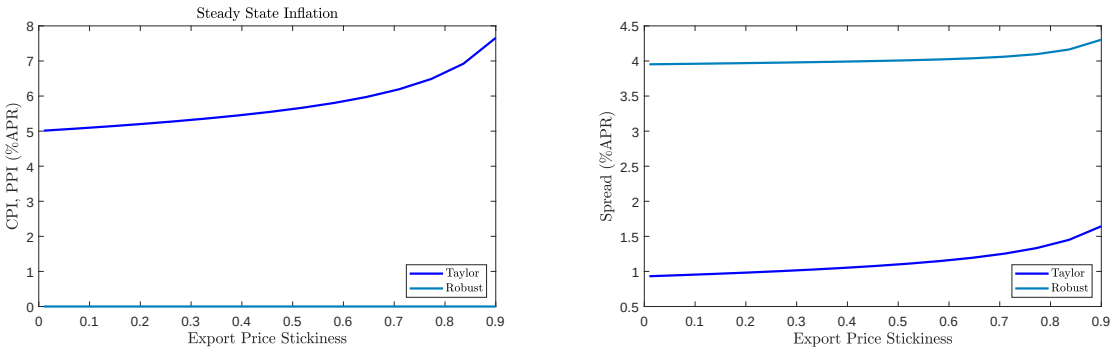


Figure 8: Steady State Inflation and Export Price Stickiness

To illustrate the policy trade-off, we also consider a rule that responds to inflation in interest-rate changes rather than in levels, following the logic of policy rules that are robust to changes in the neutral rate in Orphanides and Williams (2006):

$$R_t - R_{t-1} = r^{\pi} \log\left(\frac{\pi_t}{\bar{\pi}}\right). \tag{63}$$

This rule allows the long-run level of the nominal interest rate to adjust to the risk premium while still anchoring inflation around its target.



(a) Steady State Inflation

(b) Steady State Interest Rate Spread

Figure 9: Inflation and Risk Premium under Different Monetary Policy Rules

Figure 9a shows that the robust rule stabilizes inflation across values of θ_x. Figure 9b shows the cost of doing so: the domestic economy must sustain a higher interest-rate spread when the currency risk premium is high. The policy conclusion is therefore not that a different rule eliminates the underlying friction. Rather, the rule changes the form in which the friction appears. Under the standard rule, the premium shows up partly as higher average inflation. Under the robust rule, inflation is anchored, but the economy absorbs the premium through higher real rates and tighter financial conditions. The trade-off is structural: as long as dollar pricing and dollar liabilities make the exchange rate risky, monetary policy must either accommodate part of the premium or impose the real-rate adjustment required to offset it.

6 Conclusion

This paper develops a mechanism through which trade invoicing and financial structure jointly determine currency risk. The core argument is that dominant-currency pricing and foreign-currency liabilities are mutually reinforcing frictions. Dollar export pricing weakens the expenditure-switching benefit of depreciation. Dollar liabilities make depreciation costly for financial intermediaries. When the two frictions operate together, the exchange rate no longer behaves as a stabilizing relative price. Depreciations occur in bad states, tighten balance sheets, compress domestic absorption, and make local-currency assets risky.

The model formalizes this mechanism in a small open economy with sticky dollar export prices, dollar borrowing by intermediaries, and segmented international asset markets. The analytical results show that the UIP wedge is directly linked to the dollar-borrowing share of intermediaries, while export-price stickiness changes the equilibrium price of that exposure. The quantitative results show the same mechanism at work. Following a foreign monetary tightening, the vulnerable economy experiences a larger depreciation, a sharper decline in consumption and investment, and a higher UIP spread than a benchmark economy without dominant-currency pricing and dollar debt. The reason is not any single friction in isolation, but their interaction: the depreciation fails to stimulate exports quickly while immediately worsening balance sheets.

The stochastic steady-state results extend this logic from impulse responses to risk premia and inflation. As export-price stickiness rises, exchange-rate volatility increases and

depreciations become more strongly associated with downturns. Dollar assets become better insurance, local-currency assets become riskier, and the UIP premium rises. Because this premium raises the risk-adjusted neutral interest rate, a conventional Taylor rule with a fixed intercept generates higher average inflation. A rule that accommodates movements in the neutral rate can stabilize inflation, but only by sustaining higher real rates and interest-rate spreads.

The policy implication is that monetary policy alone cannot undo the structural source of currency risk. Central banks in economies with dollar pricing and dollar liabilities face a genuine trade-off between inflation stabilization and financial tightening. Macroprudential policies that limit unhedged foreign-currency borrowing can reduce the balance-sheet amplification of depreciations. Policies that encourage more flexible or local-currency export pricing can restore part of the expenditure-switching role of the exchange rate. More generally, the framework suggests that the riskiness of a currency is not an exogenous country characteristic. It is an equilibrium outcome shaped by how goods are priced, how liabilities are denominated, and how international investors absorb currency exposure.

Future work could investigate whether exchange-rate risk also depends on the domestic allocation of credit, beyond the foreign-currency denomination of liabilities and the currency invoicing of trade. In economies where nontradable sectors are especially dependent on bank credit, depreciation-induced balance-sheet stress may tighten credit supply, compress domestic demand, and amplify exchange-rate volatility through an additional feedback mechanism.

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A Determinants of Currency Returns

In this section, we look at determinants of excess currency returns discussed in the literature. We consider external balance (Della Corte, Riddiough and Sarno (2016)), foreign assets in the banking system (Yeyati (2006); Christiano, Dalgic and Nurbekyan (2021)), Dollar invoicing (Gopinath and Stein (2020), size(**?**) and trade network centrality (Richmond (2019)). Across currencies, foreign liabilities (external debt, NFA) and export dollar invoicing emerge as the robustly significant determinants of currency returns. Below, we look at each of these variables in isolation. Table 8 runs a regression of average returns on the variables discussed. Similar to Hassan and Zhang (2021), including GDP to the regression makes trade centrality insignificant, this is in line with Richmond (2019) which argues that either size or connectedness makes an economy central to international trade. Data on dollar invoicing, especially for EMEs, do not exist for many countries so in order to increase the number of countries, we added 13 more countries using Forward returns.

	Dependent variable:			
	Average Return			
	(1)	(2)	(3)	(4)
FL/FA	0.010***		0.009**	0.008**
	(0.004)		(0.004)	(0.004)
Net Foreign Assets/GDP	−0.031***		−0.027***	−0.028***
	(0.009)		(0.003)	(0.005)
GDP(Share of US)	0.006			0.003
	(0.005)			(0.007)
Reserves/GDP	0.060	0.003	0.015	0.033
	(0.048)	(0.026)	(0.025)	(0.042)
Export USD Invoicing	0.036*	0.018**	0.017***	0.019**
	(0.019)	(0.008)	(0.006)	(0.009)
Trade Centrality		−4.304**	−0.983	−2.774
		(2.011)	(1.088)	(4.387)
Constant	−0.004	0.029*	−0.003	0.013
	(0.011)	(0.016)	(0.011)	(0.035)
Observations	20	17	14	14
R^2	0.560	0.335	0.805	0.810
Adjusted R^2	0.402	0.182	0.683	0.648
Residual Std. Error	0.020 (df = 14)	0.016 (df = 13)	0.010 (df = 8)	0.011 (df = 7)
Note:				*p<0.1; **p<0.05; ***p<0.01

Table 8: Determinants of Returns

Data source: IFS, Datastream, FX4Casts, Gopinath, Boz, Casas, Díez, Gourinchas and Plagborg-Møller (2020), Richmond (2019)

A.1 Foreign Assets and Liabilities of the Banking System

First variable we consider is the ratio of foreign liabilities over foreign assets in the banking system (FL/FA). FL/FA is found to be a good predictor of banking crises (Yeyati (2006); **?**). High foreign liabilities can make the banking system susceptible to panics and roll-over problems, which will be accompanied by currency depreciation and low returns for investors ; against which the investors will ask for higher returns(Bocola and Lorenzoni (2020)). In 10, we plot average excess returns against average FL/FA. In economies where the banking system carries high foreign debt, we see higher expected currency returns.

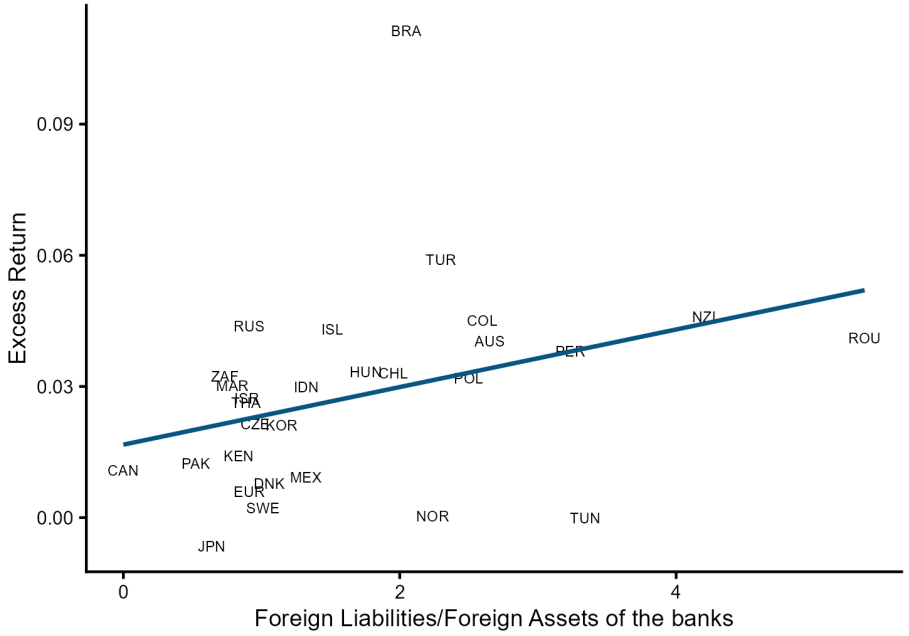


Figure 10: FL/FA and excess returns

Data source: FX4Casts, IMF IFS. Y-axis variable is the average currency return of 25 countries between 02/2003 - 11/2018. X-axis variable is the ratio of foreign liabilities to foreign assets in the banking system

A.2 Reserves

Against foreign borrowing, central banks can hold reserves, which should reduce the risk of rollover crises. However, we do not see a significant relationship between reserves and average excess returns. In figure 11, we plot average excess returns against reserves as a share of GDP

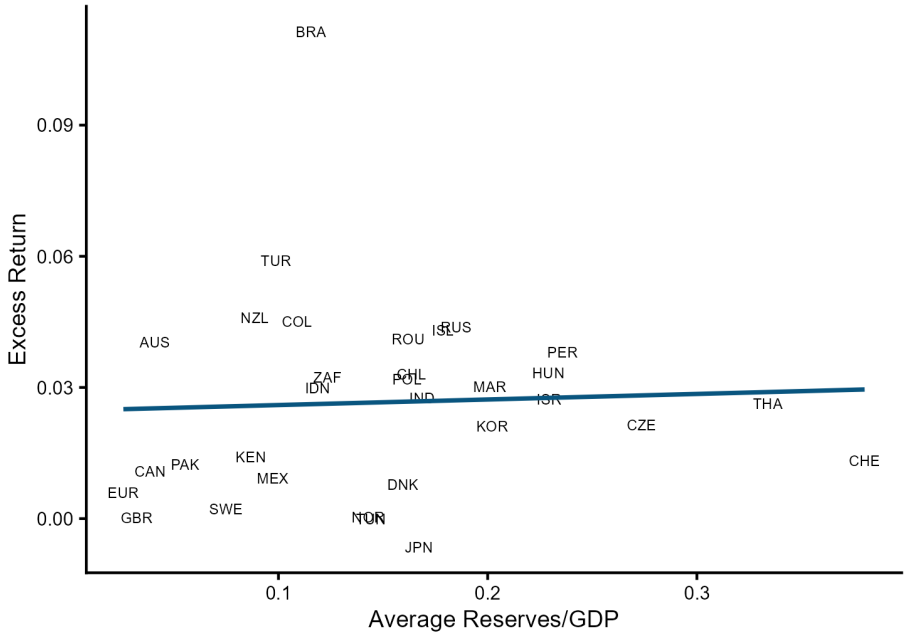


Figure 11: Reserves and excess returns

Data source: FX4Casts, IMF IFS. Y-axis variable is the average currency return of 25 countries between 02/2003 - 11/2018. X-axis variable is the reserves as a share of GDP

A.3 External Balance

The third variable we consider is external balance as a share of GDP, which is a proxy for net investment position of a country which is found to be an important determinant of currency returns(Della Corte, Riddiough and Sarno (2016)) . There is a clear negative relationship between

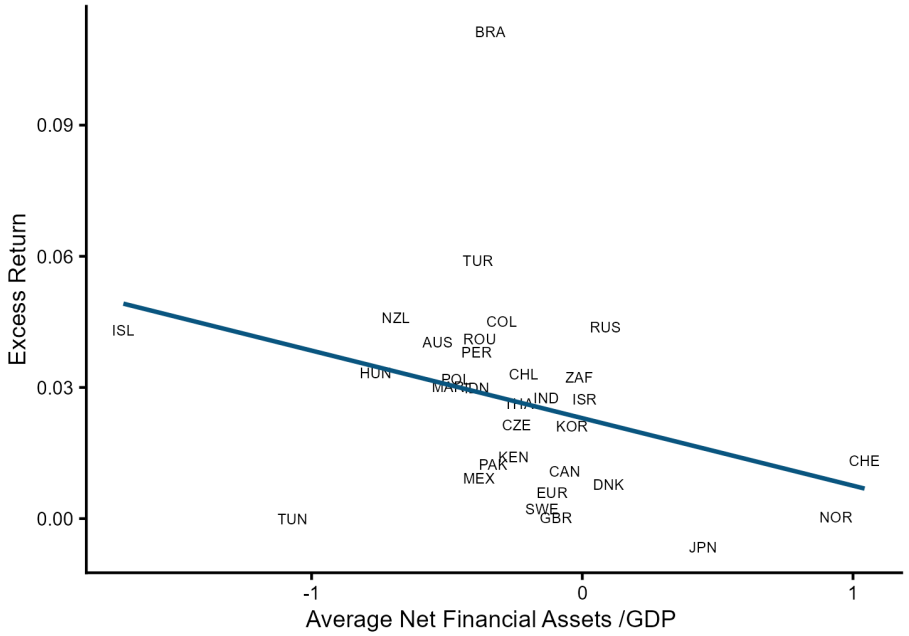


Figure 12: NFA and excess returns

Data source: FX4Casts, IMF IFS. Y-axis variable is the average currency return of 25 countries between 02/2003 - 11/2018. X-axis variable is the average net external balance as a share of GDP,

A.4 Size and Trade Centrality

Country size (**?**) and trade network centrality (Richmond (2019)) is found to be significant determinants of excess currency returns. Shocks to larger and/or to more central economies affect smaller economies but shocks to smaller economies do not spill over to larger economies. Then, assets of larger or more central economies provide insurance not only against country specific shocks, but also against global shocks. Thus, local currency assets of larger and/or more central economies should provide lower returns since there is high demand for them. Figure 13

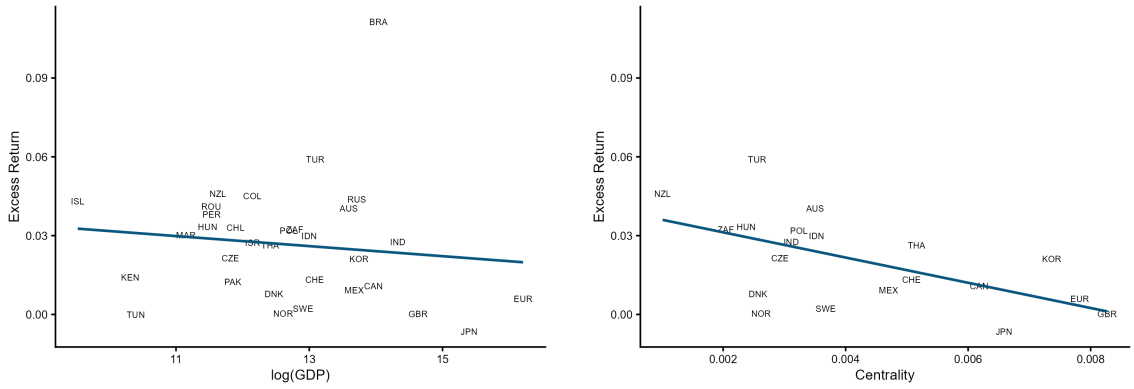


Figure 13: Size, centrality and excess returns

Data source: FX4Casts, IMF IFS, Richmond (2019). Y-axis variable is the average currency return of 25 countries between 02/2003 - 11/2018. X-axis variables is the average log nominal GDP and average trade network centrality

A.5 Financial Depth and Currency Returns

Figure 14 plots total foreign assets and liabilities as a share of GDP, a proxy for financial depth, against excess returns. Maggiori (2017) argues that countries whose financial system is deep can intermediate large amounts of flows and carry a safety premium. Net external balance and financial depth are highly correlate, one is that the financial depth is driven mostly by assets rather than liabilities which are accumulated by giving large external surpluses

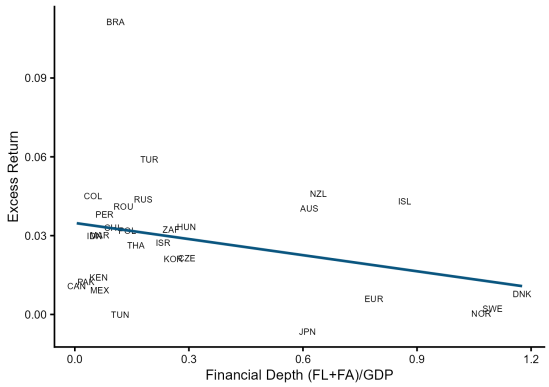
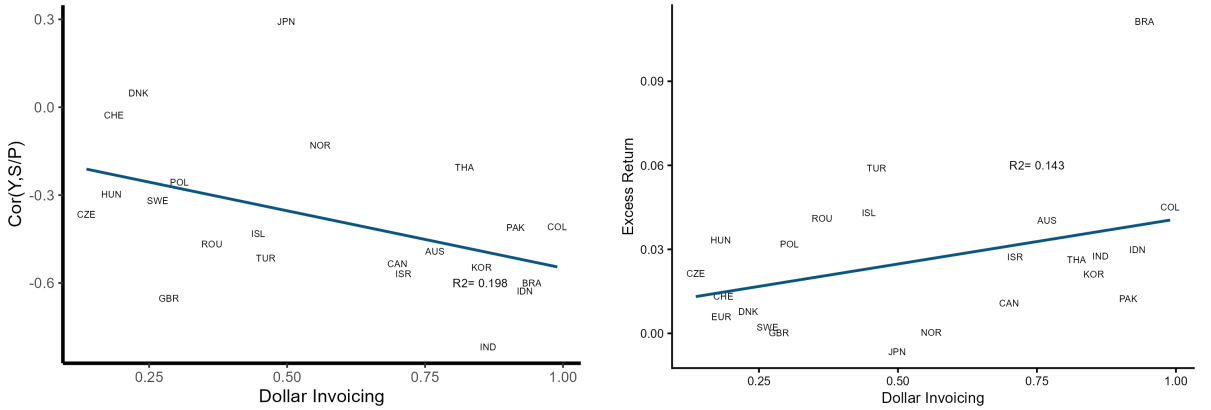


Figure 14: Excess returns vs Financial Depth

Data source: FX4Casts. Y-axis variable is the average currency return of 25 countries between 02/2003 - 11/2018. X-axis variables is the sum of foreign assets and liabilities of the banking system as a share of GDP, proxy for financial depth.

A.6 Dollar Invoicing and Currency Returns

Figure 15a provides a clear visual illustration of this two-part mechanism. Panel (a) plots the strong, negative relationship between Dollar Invoicing and the GDP-ER correlation ($R^2 = 0.198$). This visually confirms our first finding: as invoicing increases, the exchange rate becomes more countercyclical.Panel (b) completes the story by showing that this risk is priced. It plots average Excess Returns against Export Invoicing, revealing a positive relationship ($R^2 = 0.143$).



(a) Correlation of the exchange rate with GDP

(b) Average excess returns

Figure 15: Currency Cyclicality and Returns, and Dollar Invoicing

Data source: IMF, FX4Casts, Gopinath, Boz, Casas, Díez, Gourinchas and Plagborg-Møller (2020). Y-axis variables the comovement between GDP-ER and the average currency return of 25 countries between 02/2003 - 11/2018. X-axis variable is the average dollar invoicing share of exports.

B Inflation and GDP-ER Co-movement

In countries where the exports are mostly invoiced in USD, expenditure switching channel is muted. In these economies, the monetary policy faces a dilemma following external shocks. Economies with flexible export prices can respond to external shocks that cause exchange rate depreciations (capital flight, foreign interest rate shock etc.) by increasing exports which stimulates the economy. On the other hand, in countries with sticky export prices, external shocks are more contractionary because of weak response of exports.

Figure 16 plots average inflation against GDP-ER correlation. In countries with high inflation we tend to see countercyclical exchange rate

Figure 17 plots average inflation against average excess returns. In countries with high average inflation, demand for local currency assets is low, which drives up local currency interest rates.

Figure 18 plots export dollar invocing against average inflation. In line with our theory, in countries with high dollar invoicing, monetary policy cannot react sharply against external shocks because exchange rate shcoks are recessionary. In these economies, we see high average inflation.

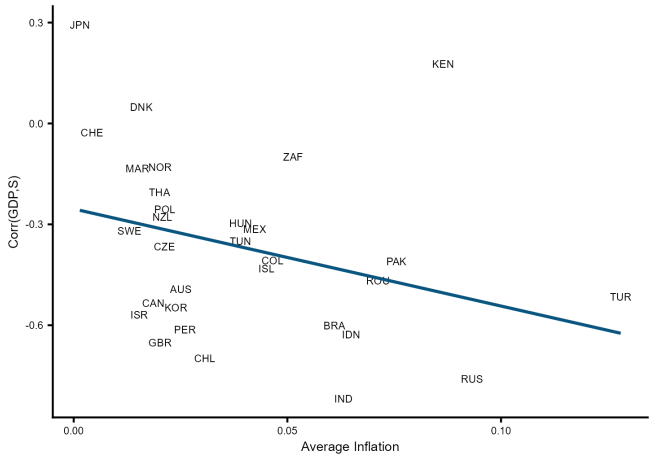


Figure 16: Average Inflation vs GDP-ER Correlation

Data source: FX4Casts, IMF IFS. Y-axis variable is the average currency return of 25 countries between 02/2003 - 11/2018. X-axis variables are Δ logGDP and $\Delta \log \frac{S}{P}$. S is the Dollar exchange rate and P is the CPI.

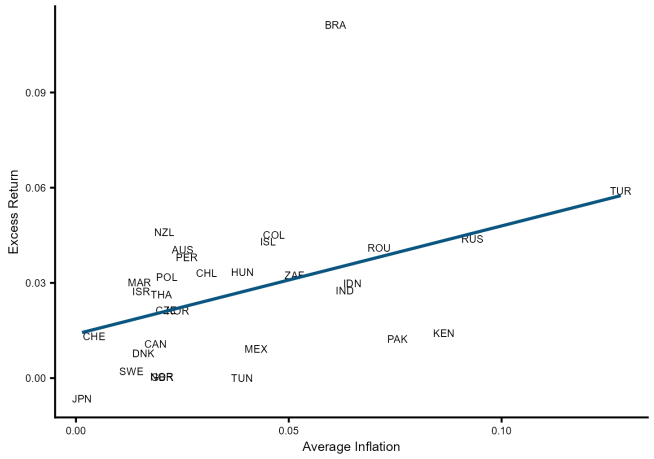


Figure 17: Average Inflation vs Average Excess Returns

Data source: FX4Casts, IMF IFS. Y-axis variable is the average currency return of 25 countries between 02/2003 - 11/2018. X-axis variables are Δ logGDP and $\Delta \log \frac{S}{P}$. S is the Dollar exchange rate and P is the CPI.

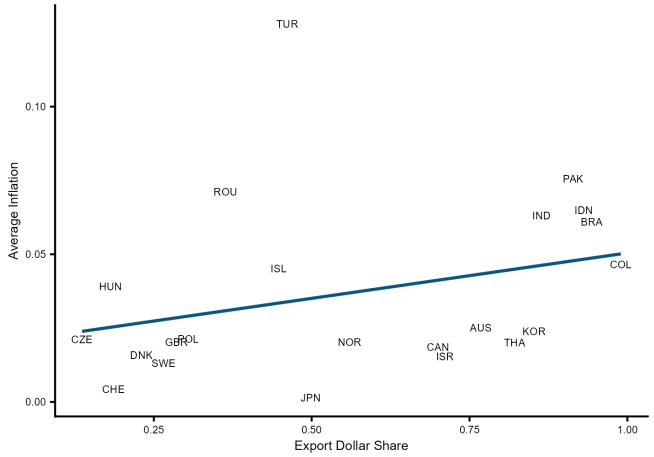


Figure 18: Average Inflation vs Dollar invoicing in exports

Data source: IMF, IFS, Gopinath, Boz, Casas, Díez, Gourinchas and Plagborg-Møller (2020). Y-axis variables are Δ logGDP and $\Delta \log \frac{S}{P}$. S is the Dollar exchange rate and P is the CPI. X-axis variable is the average dollar invoicing share of imports.

In addition to average inflation, we also look at price level volatility[5]. The results are virtually the same.

[5]we estimate price level volatility as the standard deviation of $\log(P_t)$, where P_t is the CPI index

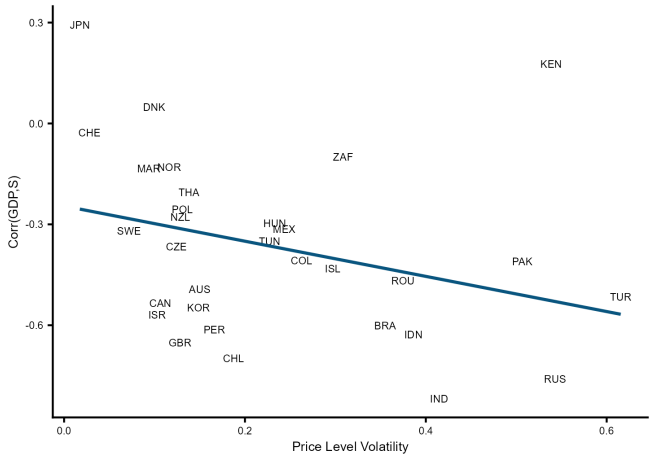


Figure 19: Price Level Volatility vs GDP-ER Correlation

Data source: FX4Casts, IMF IFS. Y-axis variable is the average currency return of 25 countries between 02/2003 - 11/2018. X-axis variables are Δ logGDP and $\Delta \log \frac{S}{P}$. S is the Dollar exchange rate and P is the CPI.

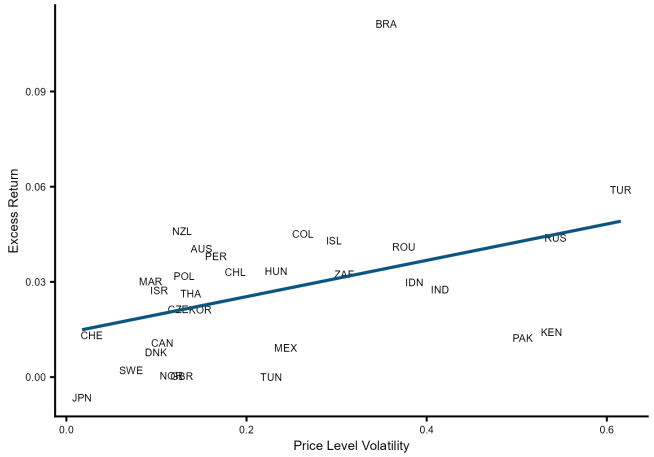


Figure 20: Price Level Volatility vs Average Excess Returns

Data source: FX4Casts, IMF IFS. Y-axis variable is the average currency return of 25 countries between 02/2003 - 11/2018. X-axis variables are Δ logGDP and $\Delta \log \frac{S}{P}$. S is the Dollar exchange rate and P is the CPI.

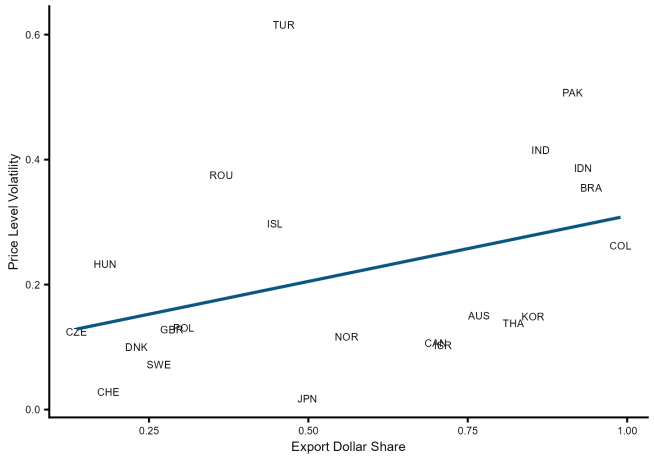


Figure 21: Price Level Volatility vs Dollar invoicing in exports

Data source: IMF, IFS, Gopinath, Boz, Casas, Díez, Gourinchas and Plagborg-Møller (2020). Y-axis variables are Δ logGDP and $\Delta \log \frac{S}{P}$. S is the Dollar exchange rate and P is the CPI. X-axis variable is the average dollar invoicing share of imports.

C Forward Returns

Covered interest rate parity gives us an alternative measure for currency returns. Denote F_t as the price of a forward contract. No arbitrage condition requires that the return to a hedged currency position financed by USD should be equal to the return to USD returns.

$$\frac{S_t}{F_t} R_t^L = R_t^{US} \tag{64}$$

We can replace R_t^L inside the equation 1 using the equation 64,

$$R_t^{US} \left(\frac{F_t}{S_{t+1}} - 1 \right) \tag{65}$$

Equation 65 allows us to overcome the problem of finding compatible interest rates across countries as well as accounting for trading costs using different ask/bid prices. One big potential issue with the forward returns is there are documented large CIP deviations. Verdelhan (2018) notes that in CIP holds most of the time in the monthly data. Still, buying forward contracts is the most straightforward strategy to invest in other currencies. Forward returns are by themselves valid returns, irrespective of whether they are a good proxy for actually borrowing in USD and investing in local currency interest rates.

D Details of the Model

D.1 Household First-Order Conditions

Work with the real budget constraint

$$d_t + d_t^* + p_t^c C_t = R_{t-1} d_{t-1} + s_t R_{t-1}^* d_{t-1}^* + w_t l_t + T_t, \qquad s_t \equiv \frac{S_t}{S_{t-1}}. \tag{66}$$

Let μ_t be the multiplier on (66). The FOC for consumption is

$$u_C(C_t) - \mu_t p_t^c = 0, \qquad \mu_t = \frac{u_C(C_t)}{p_t^c}. \tag{67}$$

The FOC for labor is

$$-\xi l_t^{\varphi_l} + \mu_t w_t = 0. \tag{68}$$

Substituting (67) into (68) gives

$$\frac{w_t}{p_t^c} = \frac{\xi l_t^{\varphi_l}}{u_C(C_t)}. \tag{69}$$

Define total real savings $A_t = d_t + d_t^*$ and dollar share $\Theta_t = d_t^*/A_t$. The portfolio return chosen at time t is

$$(1 - \Theta_t) R_t + \Theta_t s_{t+1} R_t^*. \tag{70}$$

The FOC for total savings is

$$u_C(C_t) = \beta_t \left[\frac{u_C(C_{t+1})}{\Pi_{t+1}^c} \left((1 - \Theta_t) R_t + \Theta_t s_{t+1} R_t^* \right) \right]. \tag{71}$$

For a pure local-currency asset this reduces to

$$1 = R_{tt}[m_{t+1}], \tag{72}$$

and for a pure dollar asset it reduces to

$$1 = R_{t\,t}^* \left[m_{t+1} \frac{S_{t+1}}{S_t} \right]. \tag{73}$$

The FOC for the dollar share is

$$-\gamma_\Theta(\Theta_t - \Upsilon_t) + \beta A_{tt}\left[\frac{u_C(C_{t+1})}{\Pi^c_{t+1}}\left(s_{t+1}R^*_t - R_t\right)\right] = 0. \tag{74}$$

Rearranging gives

$$\gamma_\Theta(\Theta_t - \Upsilon_t) = \beta A_{tt}\left[\frac{u_C(C_{t+1})}{\Pi^c_{t+1}}\left(R_t - s_{t+1}R^*_t\right)\right]. \tag{75}$$

D.2 CES Demand Systems

For a generic two-input CES aggregator

$$Q = \left[a^{1/\eta} q_1^{\frac{\eta-1}{\eta}} + (1-a)^{1/\eta} q_2^{\frac{\eta-1}{\eta}}\right]^{\frac{\eta}{\eta-1}}, \tag{76}$$

a competitive producer solves

$$\min_{q_1,q_2} P_1 q_1 + P_2 q_2 \tag{77}$$

subject to (76). The FOCs imply

$$\frac{P_1}{P_2} = \left(\frac{a}{1-a}\right)^{1/\eta}\left(\frac{q_2}{q_1}\right)^{1/\eta}. \tag{78}$$

Raising both sides to the power η and rearranging gives

$$\frac{q_1}{q_2} = \frac{a}{1-a}\left(\frac{P_1}{P_2}\right)^{-\eta}. \tag{79}$$

The demand functions and price index are therefore

$$q_1 = a\left(\frac{P_1}{P_Q}\right)^{-\eta} Q, \tag{80}$$

$$q_2 = (1-a)\left(\frac{P_2}{P_Q}\right)^{-\eta} Q, \tag{81}$$

$$P_Q = \left[aP_1^{1-\eta} + (1-a)P_2^{1-\eta}\right]^{\frac{1}{1-\eta}}. \tag{82}$$

The consumption, investment, and export demand systems in the main text follow by assigning Q to C_t, I_t, or X_t and choosing the appropriate share parameter and elasticity.

For the continuum CES aggregator

$$Y_t = \left[\int_0^1 Y_{i,t}^{\frac{\varepsilon-1}{\varepsilon}} i \right]^{\frac{\varepsilon}{\varepsilon-1}}, \tag{83}$$

cost minimization gives

$$Y_{i,t} = Y_t \left(\frac{P_{i,t}}{P_t} \right)^{-\varepsilon}, \qquad P_t = \left[\int_0^1 P_{i,t}^{1-\varepsilon} i \right]^{\frac{1}{1-\varepsilon}}. \tag{84}$$

D.3 Domestic Calvo Pricing

A domestic intermediate firm that can reset its price at time t chooses $\widetilde{P}_t$ to maximize

$$_t\sum_{j=0}^{\infty} (\beta\theta_p)^j \frac{u_C(C_{t+j})}{P_{t+j}^c} \left(\widetilde{P}_t - P_{t+j} mc_{t+j} \right) Y_{t+j} \left(\frac{\widetilde{P}_t}{P_{t+j}} \right)^{-\varepsilon}. \tag{85}$$

Differentiating with respect to $\widetilde{P}_t$ gives

$$_t\sum_{j=0}^{\infty} (\beta\theta_p)^j \frac{u_C(C_{t+j})}{P_{t+j}^c} P_{t+j}^{\varepsilon} Y_{t+j} \left[\frac{\widetilde{P}_t}{P_{t+j}} - \frac{\varepsilon}{\varepsilon-1} mc_{t+j} \right] = 0. \tag{86}$$

Collecting the terms that multiply the reset price and the terms involving marginal cost yields

$$\widetilde{p}_t = \frac{\mathcal{K}_t^p}{\mathcal{F}_t^p}, \tag{87}$$

with the recursive sums reported in (16) and (17). The aggregate price index satisfies

$$P_t^{1-\varepsilon} = (1-\theta_p)\widetilde{P}_t^{1-\varepsilon} + \theta_p P_{t-1}^{1-\varepsilon}. \tag{88}$$

D.4 Export Pricing in Dollars

The export-input aggregator implies the demand curve

$$X_{i,t} = X_t^d \left(\frac{P_{i,t}^{d,x}}{P_t^{d,x}} \right)^{-\varepsilon_x}. \tag{89}$$

A resetting export producer chooses a dollar price $\widetilde{P}_t^{d,x}$ to maximize the discounted value of local-currency profits:

$$ {}_t\sum_{j=0}^{\infty}(\beta\theta_x)^j \frac{u_C(C_{t+j})}{P_{t+j}^c}\left[S_{t+j}\widetilde{P}_t^{d,x} - P_{t+j}\right] X_{t+j}^d \left(\frac{\widetilde{P}_t^{d,x}}{P_{t+j}^{d,x}}\right)^{-\varepsilon_x}. \tag{90}$$

The term $S_{t+j}\widetilde{P}_t^{d,x}$ is local-currency revenue from a dollar price, while P_{t+j} is the local-currency marginal cost of the domestic input. Differentiating gives the export-sector reset-price condition

$$\widetilde{p}_t^{d,x} = \frac{\mathcal{K}_t^x}{\mathcal{F}_t^x}, \tag{91}$$

where the numerator contains discounted marginal costs and the denominator contains discounted demand. The export dollar-price index evolves according to

$$(P_t^{d,x})^{1-\varepsilon_x} = (1-\theta_x)(\widetilde{P}_t^{d,x})^{1-\varepsilon_x} + \theta_x(P_{t-1}^{d,x})^{1-\varepsilon_x}. \tag{92}$$

Dividing by $(P_t^{d,x})^{1-\varepsilon_x}$ gives

$$1 = (1-\theta_x)(\widetilde{p}_t^{d,x})^{1-\varepsilon_x} + \theta_x(\Pi_t^{d,x})^{\varepsilon_x-1}, \tag{93}$$

where $\Pi_t^{d,x} \equiv P_t^{d,x}/P_{t-1}^{d,x}$. This equation links reset prices to export dollar-price inflation and makes clear that θ_x governs the degree of dominant-currency pricing.

D.5 Banker Leverage and Currency Choice

The banker value function is

$$V_{j,t} =_t \left[\beta(1-\theta_b)N_{j,t+1} + \beta\theta_b\Lambda_{t,t+1}V_{j,t+1}\right]. \tag{94}$$

Using the scaled net-worth law, the value per unit of net worth for foreign-currency borrowing can be written as

$$\psi_t^{FC} = \max_{L_t^{FC}} {}_t\left[\beta\Lambda_{t,t+1}\Omega_{t+1}^{FC}\left(L_t^{FC}\left(R_{t+1}^k - R_t^*\frac{S_{t+1}}{S_t}\right) + R_t^*\frac{S_{t+1}}{S_t}\right)\right], \tag{95}$$

where

$$\Omega_{t+1}^{FC} = (1-\theta_b) + \theta_b\psi_{t+1}^{FC}. \tag{96}$$

Define

$$\eta_t^{FC} \equiv_t \left[\beta \Lambda_{t,t+1} \Omega_{t+1}^{FC} \left(R_{t+1}^k - R_t^* \frac{S_{t+1}}{S_t}\right)\right], \tag{97}$$

$$\nu_t^{FC} \equiv_t \left[\beta \Lambda_{t,t+1} \Omega_{t+1}^{FC} R_t^* \frac{S_{t+1}}{S_t}\right]. \tag{98}$$

Then

$$\psi_t^{FC} = \eta_t^{FC} L_t^{FC} + \nu_t^{FC}. \tag{99}$$

Under the binding incentive constraint $\psi_t^{FC} = \lambda_b L_t^{FC}$,

$$\lambda_b L_t^{FC} = \eta_t^{FC} L_t^{FC} + \nu_t^{FC}, \qquad L_t^{FC} = \frac{\nu_t^{FC}}{\lambda_b - \eta_t^{FC}}. \tag{100}$$

The local-currency formulas are analogous:

$$L_t^{LC} = \frac{\nu_t^{LC}}{\lambda_b - \eta_t^{LC}}, \tag{101}$$

$$\eta_t^{LC} =_t \left[\beta \Lambda_{t,t+1} \Omega_{t+1}^{LC} (R_{t+1}^k - R_t)\right], \tag{102}$$

$$\nu_t^{LC} =_t \left[\beta \Lambda_{t,t+1} \Omega_{t+1}^{LC} R_t\right]. \tag{103}$$

The bank chooses its dollar-liability share by solving

$$\max_{\phi_t} (1 - \phi_t)\psi_t^{LC} + \phi_t \psi_t^{FC} - \frac{\chi_\phi}{2}(\phi_t - \bar{\phi})^2. \tag{104}$$

The FOC is

$$-\psi_t^{LC} + \psi_t^{FC} - \chi_\phi(\phi_t - \bar{\phi}) = 0, \tag{105}$$

or

$$\psi_t^{FC} - \psi_t^{LC} = \chi_\phi(\phi_t - \bar{\phi}). \tag{106}$$

Using $\psi_t^k = \lambda_b L_t^k$ gives

$$\phi_t - \bar{\phi} = \frac{\lambda_b}{\chi_\phi}(L_t^{FC} - L_t^{LC}). \tag{107}$$

D.6 UIP Wedge

For the banker-side expression, linearize around a symmetric steady state where

$$L_t^{LC} \approx L_t^{FC} \approx L, \qquad \eta_t^{LC} \approx \eta_t^{FC} \approx \eta, \qquad \nu_t^{LC} \approx \nu_t^{FC} \approx \nu. \tag{108}$$

From $L_t^k = \nu_t^k/(\lambda_b - \eta_t^k)$,

$$L_t^{LC} - L_t^{FC} \approx \frac{1}{\lambda_b - \eta}\left[(\nu_t^{LC} - \nu_t^{FC}) + L(\eta_t^{LC} - \eta_t^{FC})\right]. \tag{109}$$

Define the SDF-weighted UIP wedge

$$\widehat{\ } _t \equiv_t \left[\beta \Lambda_{t,t+1} \Omega_{t+1}\left(R_t - R_t^* \frac{S_{t+1}}{S_t}\right)\right]. \tag{110}$$

Then

$$\nu_t^{LC} - \nu_t^{FC} \approx \widehat{\ } _t, \qquad \eta_t^{LC} - \eta_t^{FC} \approx -\widehat{\ } _t. \tag{111}$$

Substitute (111) into (109):

$$\begin{aligned} L_t^{LC} - L_t^{FC} &\approx \frac{1}{\lambda_b - \eta}\left[\widehat{\ } _t + L(-\widehat{\ } _t)\right] \\ &= \frac{1 - L}{\lambda_b - \eta}\widehat{\ } _t. \end{aligned} \tag{112}$$

Multiplying by -1 gives

$$L_t^{FC} - L_t^{LC} \approx \frac{L - 1}{\lambda_b - \eta}\widehat{\ } _t. \tag{113}$$

Equating this with the currency-choice condition (107) gives

$$\frac{\chi_\phi}{\lambda_b}(\phi_t - \bar{\phi}) = \frac{L - 1}{\lambda_b - \eta}\widehat{\ } _t. \tag{114}$$

Solving for the wedge,

$$\widehat{\ } _t \approx \frac{\chi_\phi(\lambda_b - \eta)}{\lambda_b(L - 1)}(\phi_t - \bar{\phi}). \tag{115}$$

D.7 Reducing the UIP Wedge to θ_x and ϕ_t

The export-pricing parameter θ_x affects the UIP wedge through equilibrium quantities rather than by entering the banker FOC directly. In particular, it changes export demand, output, exchange-rate volatility, bank net worth, and the expected return to capital. These changes feed into the continuation-value objects η and ν and therefore into leverage L.

The bank chooses ϕ_t according to

$$\max_{\phi_t}(1-\phi_t)\psi_t + \phi_t\psi_t - \frac{\chi}{2}(\phi_t - \bar{\phi})^2. \tag{116}$$

The first-order condition is

$$-\psi_t + \psi_t - \chi(\phi_t - \bar{\phi}) = 0, \tag{117}$$

so

$$\psi_t - \psi_t = \chi(\phi_t - \bar{\phi}). \tag{118}$$

Using $\psi_t^k = \lambda_b L_t^k$,

$$\lambda_b L_t - \lambda_b L_t = \chi(\phi_t - \bar{\phi}), \tag{119}$$

$$\lambda_b(L_t - L_t) = \chi(\phi_t - \bar{\phi}), \tag{120}$$

and therefore

$$L_t - L_t = \frac{\chi}{\lambda_b}(\phi_t - \bar{\phi}). \tag{121}$$

Linearized leverage spread

The leverage formula is

$$L_t^k = \frac{\nu_t^k}{\lambda_b - \eta_t^k}, \qquad k \in \{,\}. \tag{122}$$

Linearize around a symmetric steady state

$$L_t \approx L_t \approx L, \qquad \eta_t \approx \eta_t \approx \eta, \qquad \nu_t \approx \nu_t \approx \nu. \tag{123}$$

The first-order expansion is

$$L_t - L_t \approx \frac{1}{\lambda_b - \eta} \left[(\nu_t - \nu_t) + L(\eta_t - \eta_t) \right]. \tag{124}$$

The model's UIP linearization implies

$$\nu_t - \nu_t \approx_t, \qquad \eta_t - \eta_t \approx -_t. \tag{125}$$

Substitute these into (124):

$$L_t - L_t \approx \frac{1}{\lambda_b - \eta} \left[_t + L(-_t) \right] \tag{126}$$

$$= \frac{1}{\lambda_b - \eta} \left[(1 - L)_t \right] \tag{127}$$

$$= \frac{1 - L}{\lambda_b - \eta} _t. \tag{128}$$

Multiplying by -1 gives

$$L_t - L_t \approx \frac{L - 1}{\lambda_b - \eta} _t. \tag{129}$$

Solving for the UIP wedge

Equate (121) and (129):

$$\frac{\chi}{\lambda_b} (\phi_t - \bar{\phi}) = \frac{L - 1}{\lambda_b - \eta} _t. \tag{130}$$

Multiplying by $\lambda_b - \eta$ gives

$$\frac{\chi(\lambda_b - \eta)}{\lambda_b} (\phi_t - \bar{\phi}) = (L - 1)_t. \tag{131}$$

Dividing by $L - 1$ yields

$$_t = \frac{\chi(\lambda_b - \eta)}{\lambda_b (L - 1)} (\phi_t - \bar{\phi}). \tag{132}$$

Substituting the θ_x-dependent leverage expression

Let

$$L(\theta_x) = \frac{\nu(\theta_x)}{\lambda_b - \eta(\theta_x)}. \tag{133}$$

Then

$$L(\theta_x) - 1 = \frac{\nu(\theta_x)}{\lambda_b - \eta(\theta_x)} - 1 \tag{134}$$

$$= \frac{\nu(\theta_x)}{\lambda_b - \eta(\theta_x)} - \frac{\lambda_b - \eta(\theta_x)}{\lambda_b - \eta(\theta_x)} \tag{135}$$

$$= \frac{\nu(\theta_x) - \lambda_b + \eta(\theta_x)}{\lambda_b - \eta(\theta_x)}. \tag{136}$$

Therefore

$$\Gamma(\theta_x) = \frac{\chi[\lambda_b - \eta(\theta_x)]}{\lambda_b[L(\theta_x) - 1]} \tag{137}$$

$$= \frac{\chi[\lambda_b - \eta(\theta_x)]}{\lambda_b \left(\frac{\nu(\theta_x) - \lambda_b + \eta(\theta_x)}{\lambda_b - \eta(\theta_x)} \right)} \tag{138}$$

$$= \frac{\chi[\lambda_b - \eta(\theta_x)]^2}{\lambda_b[\nu(\theta_x) - \lambda_b + \eta(\theta_x)]}. \tag{139}$$

Hence the semi-reduced-form UIP wedge is

$$_t = \frac{\chi[\lambda_b - \eta(\theta_x)]^2}{\lambda_b[\nu(\theta_x) - \lambda_b + \eta(\theta_x)]}(\phi_t - \bar{\phi}). \tag{140}$$

Local centered approximation

Around a reference point $\bar{\theta}_x$,

$$\Gamma(\theta_x) \approx \Gamma_0 + \Gamma_1(\theta_x - \bar{\theta}_x), \qquad \Gamma_0 = \Gamma(\bar{\theta}_x), \qquad \Gamma_1 = \Gamma'(\bar{\theta}_x). \tag{141}$$

Substitution gives

$$_t \approx \left[\Gamma_0 + \Gamma_1(\theta_x - \bar{\theta}_x)\right](\phi_t - \bar{\phi}) \tag{142}$$

$$= \Gamma_0(\phi_t - \bar{\phi}) + \Gamma_1(\theta_x - \bar{\theta}_x)(\phi_t - \bar{\phi}). \tag{143}$$

This centered representation preserves the structural interpretation: ϕ_t is the direct dollar-borrowing margin, and θ_x changes the strength of that margin through the export-pricing and balance-sheet transmission mechanism.

D.8 Response to Foreign Interest Rate Shocks

Figure 22 decomposes the transmission mechanism by simulating the foreign interest rate shock across four distinct economy profiles, varying both the level of dollar-denominated debt and the degree of dollar invoicing.

The key observation: the amplification effect of trade frictions is highly contingent on the presence of financial frictions. When foreign currency debt is low, the choice of invoicing currency has a negligible impact on real macroeconomic outcomes; the output and investment trajectories remain largely insulated regardless of the invoicing regime.

Conversely, when the economy has high foreign currency debt, dollar invoicing severely amplifies the shock. In this highly dollarized economy, high dollar invoicing drastically exacerbates the downturn, roughly doubling the peak declines in both investment and GDP compared to an identical low dollar debt economy with low dollar invoicing.

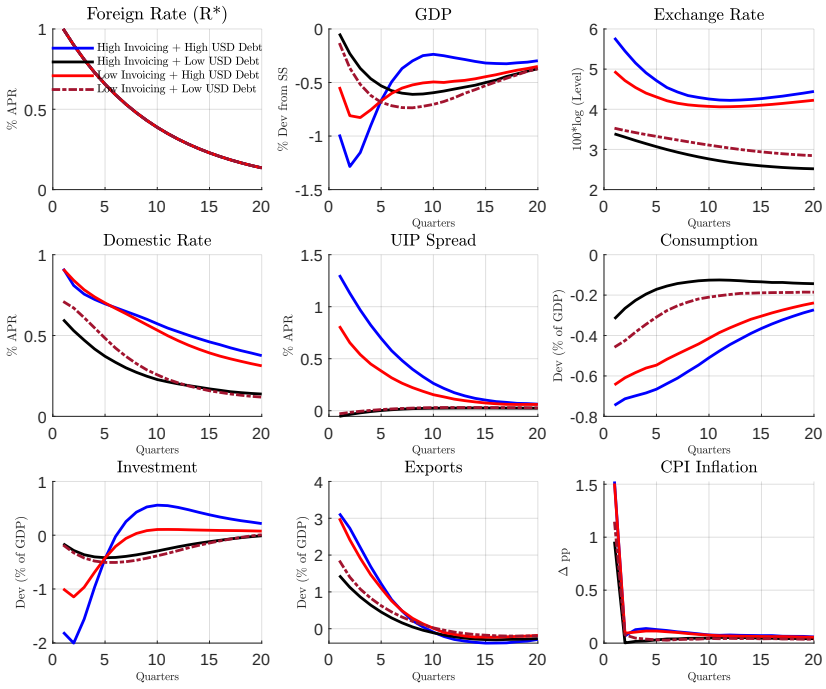


Figure 22: Response to Foreign Interest Rate Shock

Figure 23 shows how financial system moves following foreign interest rate shock. Under high dollar debt, leverage goes up to rebuild balance sheets that have been deteriorated. Local residents decrease savings because they want to smooth consumption

so the economy needs to attract foreign capital both in local currency (panel 1,1) and foreign currency (panel 2,1)

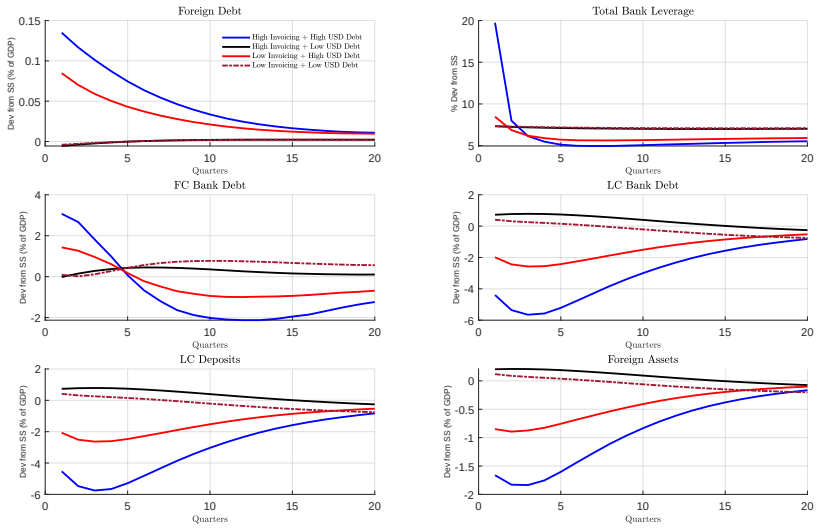
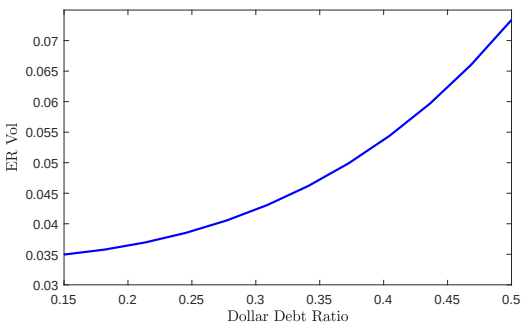


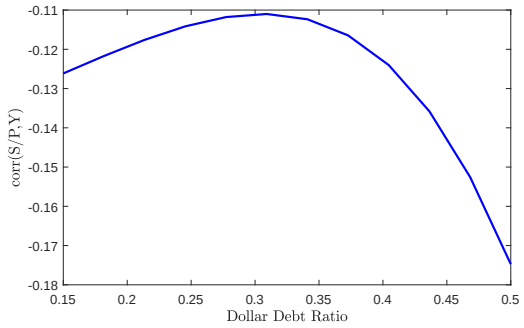
Figure 23: Financial Flows

D.9 Varying Dollar Debt in the Steady State

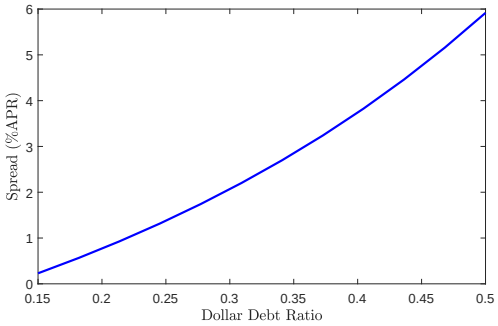
In this Section, we replicate results in Section 5.4 by varying dollar debt in the steady state by changing target portfolio of bankers $\bar{\phi}$. Figure 24 plots the increase in ER volatility, and rising UIP premium and inflation following increasing target dollar ratio.



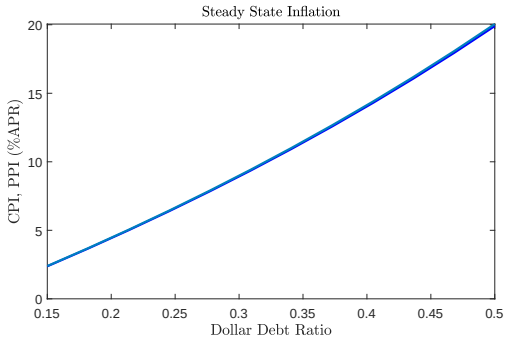
(a) Exchange rate volatility (ϕ)



(b) Output and exchange rate comovement (ϕ)



(c) UIP premium (ϕ)

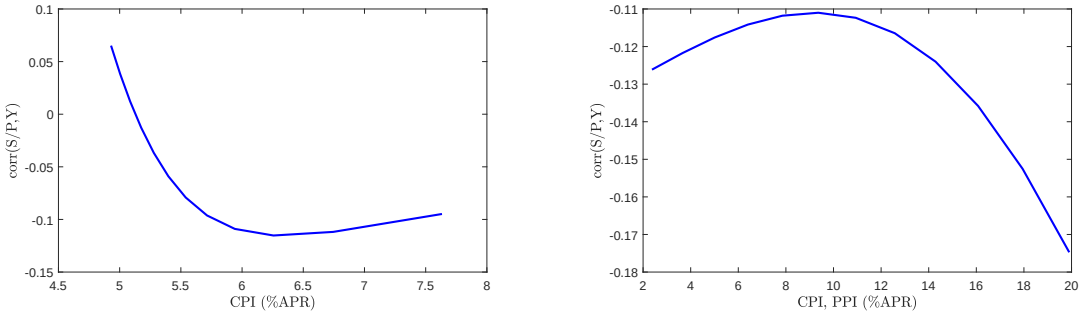


(d) Steady state inflation

Figure 24: Steady State with respect to Dollar Debt (ϕ)

D.10 Inflation and GDP-ER Co-movement

In this section, we use above simulations to generate the realtionship between GDP-ER comovement and inflation. Figure 25 is able to capture the negative relationship between average inflation and the comovement between output and the exchange rate along both dollar debt and dollar invoicing. In countries with negative comovement between GDP and ER, exchange rate is not able to insulate the economy against external shocks; which makes inflation and output more volatile. As a response, both local and foreign investors demand risk premium and if the central bank does not address this premium, inflation increases.



(a) Along export prices stickiness (θ^x) (b) Along Dollar Debt ($\bar{\phi}$)

Figure 25: Inflation and GDP-ER Co-movement

D.10.1 Equity Premium

In this section, we look at what happens to equity premium as the macro risk increases with higher dollar invoicing. Equity premium,

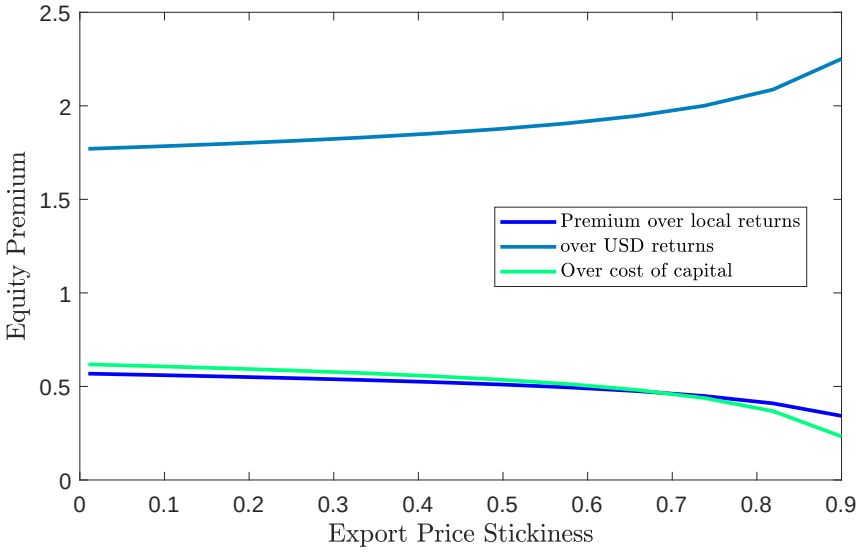
$$\mathbb{E}_t(R^k_{t+1}) - R_t$$

where return to capital is defined as marginal product of capital (r^k_t) and undepreciated capital priced at current price of capital ($(1-\delta)P^k_t$) divided by price of capital previous period (P^k_{t-1})

$$R^k = \frac{r^k_t + (1-\delta)P^k_t}{P^k_{t-1}}$$

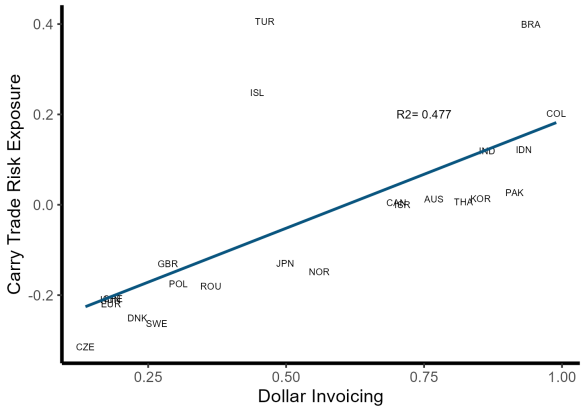
We define equity premium as the difference between return to capital and local interest rates. This is slightly misleading because actual cost of capital is defined as the weighted average of funding sources, which also include dollar financing.

Figure 26a plots what happens to equity premium as dollar invoicing and dollar debt increase. Equity premium falls. This is because both R^k_t and R_t increase but R_t increases more. Capital gains part of return to capital provides cushion against global shocks because, as real assets, their value increases with pass through inflation generated by exchange rate depreciations. On the other hand, local interest rates become unattractive investment because they lose value following adverse global shocks, which makes investors require premium to invest.

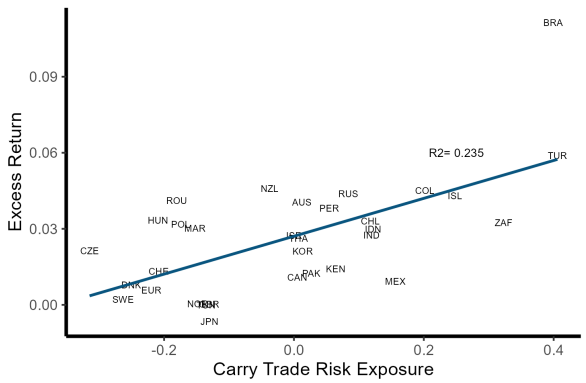


(a) Equity Premium and export dollar price stickiness (θ^x)

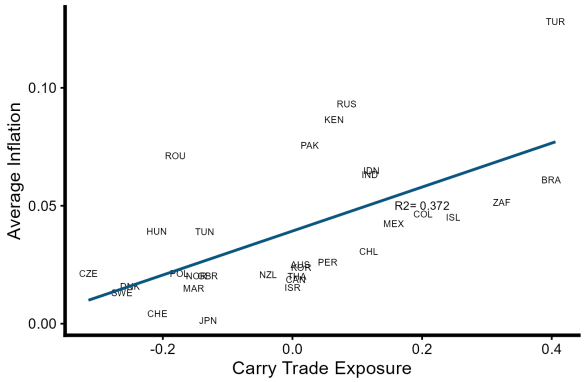
Figure 26: Steady State Equity Premium



(a) Carry-trade exposure and dollar invoicing



(b) Carry-trade exposure and excess returns



(c) Carry-trade exposure and inflation

Figure 1: Carry-trade risk, currency returns, and inflation

Notes: Carry-trade exposure is the loading on the second principal component of currency excess returns, following Lustig, Roussanov and Verdelhan (2011). Currency returns cover 25 countries from 2003:02 to 2018:11. Data sources are FX4Casts, IMF IFS, and Gopinath, Boz, Casas, Díez, Gourinchas and Plagborg-Møller (2020).