Dollar Risk and Dollar Insurance: Hedging Supply and Forward Risk Taking *

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Abstract

In 2025-26, the USD exchange rate risk rose and financial intermediaries' balance sheets were stressed by arbitraging deviations from UIP. And yet, the quantity of FX hedging rose and the cost of hedging stayed small. This paper proposes an explanation: intermediaries take uncovered FX positions. When the currency is depreciating (appreciating) taking these positions leads them to endogenously increase (reduce) the supply of forwards, which causes CIP deviations to fall (rise). We find evidence in the trade-level micro data that supports this hypothesis, and show that it can explain the time-series correlations between wedges in CIP, UIP, the quantity of hedging, and the change in the exchange rate. By taking FX risk, financial intermediaries attenuate the depreciation and the flow of capital away from the US during USD sell-offs.

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1 Introduction

During both the US financial crisis of 2007-08 and the pandemic of 2020-21, the exchange rate risk associated with the US dollar (USD) – measured by the option-implied volatility index from G7 currency pairs – rose sharply. Correspondingly, the price of insuring against this risk – measured by the cross-currency basis – spiked as well. And yet, while the USD risk rose in a similar way in 2025-26, the price of insuring that risk has been stable (or even falling).

A natural answer to this puzzle is to look at the supply side of this insurance market. The seminal work of Gabaix and Maggiori (2015) and Itskhoki and Mukhin (2021) emphasized the role that financial intermediaries play in managing exchange rate risk. In 2007-08 and 2020-21, the deviations from uncovered interest parity (UIP) for the USD widened, so this class of models would predict that intermediaries likely faced higher risk preventing them from closing these apparent profitable opportunities. Again though, the 2025-26 experience is puzzling: UIP deviations also widened, and yet the costs of hedging did not rise in tandem. In fact, as we will show, even the quantity of foreign exchange (FX) hedging increased significantly, which goes against the idea that intermediaries became more constrained during this time.

This paper makes sense of the 2025-26 episode (and the ones before it) by putting forward the claim that the financial intermediaries that sell FX forward contracts are not just covered interest parity arbitrageurs that provide insurance, but rather they are taking directional risky positions on the movements of the exchange rate when supplying forwards. We model intermediaries as being able and willing to take uncovered FX positions. On net, they buy USD forward when the dollar is depreciating, because they expect to make profits if the USD is expected to appreciate as dictated by UIP. Conversely, they sell USD forward when the dollar is appreciating. Because these actions expand (or contract) the supply of hedges against a dollar depreciation (appreciation), they move the deviation from covered interest parity.

A consequence of this behavior is that intermediaries became less willing to insure

against a dollar depreciation even as investors fly to the dollar, but their willingness rises when there is a flight from it. We show empirically that the cost of insuring against a USD depreciation rises when investors are flying to USD, but falls during times of flight from the dollar. In 2025-26, the USD depreciated as there was a flight from USD, and intermediaries kept the cost of hedging down. This effect dominated the effect of higher dollar risk, or that the depreciation came with a relative rise in US interest rates. During these flight episodes, CIP deviations move in the opposite direction relative to deviations from uncovered interest parity. The cost of insuring against USD risk rises when the dollar is appreciates and falls when it depreciates.

We then integrate this view of intermediaries in a two-country international general equilibrium model of exchange rates where arbitrageurs trade exchange rate risk with inelastic foreign investors. There is a two-layer financial system in which households choose total saving, household-facing funds allocate this saving between domestic bonds and covered and uncovered foreign positions in a preferred habitat manner, and distinct UIP, CIP, and naked-forward arbitrageurs absorb the residual imbalances. This separation lets exchange rates, relative rates, basis measures, and aggregate hedge quantities move jointly without forcing all financial shocks through a single wedge in the uncovered interest parity condition.

We start by showing this endogenous forward supply response by intermediaries in partial equilibrium, taking the interest rates and countries net financial asset positions as given. Naked forward positions drive a positive supply response to an increase in hedging demand when dollar risk rises. When there is a pull back in the willingness of intermediaries to bear uncovered risk in a deficit country, naked-forward arbitrageurs find it profitable to take the other side of the market, increasing forward supply and reducing the residual demand that must be met through covered-interest arbitrage. The immediate implication is that the cross-currency basis remains compressed even when exchange rates and interest differentials signal capital outflows. Hedging quantities rise as a result. In contrast, a pure CIP-capacity shock does not deliver the relative movements

in exchange rates and interest rates consistent with the patterns seen in the data.

We then extend our model to the full general equilibrium setting and show that this behavior by intermediaries attenuates the capital flight and the depreciation of a currency when there is a fall in the demand for that currency. An innovation that causes the dollar to depreciate contemporaneously with a relative rise in US rates (and fall in consumption), systematically leads to a rise in hedging quantities and a compression in the dollar cross-currency basis. This is the hallmark of a shock to the UIP condition as in Kekre and Lenel (2024) and it leads to an expansion in credit supply.

We turn to the data to test the central mechanisms of the model. We bring to the table a granular panel of dollar hedging demand constructed from the regulatory EMIR FX derivatives data. This allows us to move beyond price-based evidence and study quantities in the forward market directly. We use these data, together with exchange rates, interest differentials, relative consumption, and the cross-currency basis, to ask whether the joint behavior of the dollar and hedging markets is best explained by macro demand and supply shocks, by exogenous shifts in hedging demand or hedging supply, or by shocks to uncovered risk-bearing capacity. The evidence points strongly to the last mechanism. In particular, the shocks that depreciate the dollar and widen dollar interest differentials also tend to compress the basis toward zero and raise hedging quantities, exactly as the model predicts when intermediaries respond endogenously by taking more uncovered forward positions.

This interpretation changes how one reads the major dollar episodes of the last two decades. The sharp rise in the cost of dollar insurance during 2020, and similarly during 2008, is not well described as a pure contraction in intermediaries' willingness or ability to write forwards. Rather, our evidence suggests that these moves were, to an important extent, an endogenous response to a capital flight to the dollar. The same force that raised the dollar risk premium also created incentives for dealers to absorb that risk in forward markets, linking UIP and CIP deviations rather than separating them.

The broader message is that fluctuations in CIP deviations should not be interpreted

as pure measures of financial frictions facing intermediaries. They are equilibrium objects shaped jointly by hedging demand, uncovered risk, and the interaction between spot and forward markets. More generally, the paper shows that UIP and CIP deviations are tightly connected because uncovered positions in the forward market transmit shocks between them. As a result, the amount of international risk sharing delivered by FX markets may be greater than one would infer from the basis alone.

The related literature: Our contributes to a broader literature studying exchange rates in segmented financial markets. We build on Gabaix and Maggiori (2015) and Itskhoki and Mukhin (2021), who show how shocks constraints on financial institutions that intermediate crossborder capital flows can generate volatile exchange rates and predictable deviations from UIP. To model hedging demand we also draw on a literature that studies asset prices through inelastic demand of specialised, preferred habitat investors. In this respect, Gourinchas et al. (2025) and Greenwood et al. (2023) are especially relevant: they emphasize how such institutions jointly move long term yields and exchange rates. Relative to those papers, however, our focus is not on the relationship between term premia and exchange rates, but rather on the joint determination of exchange rates, hedging costs, and hedging quantities where the key distinction lies between covered and uncovered cross border positions rather than assets of different maturities.

Our paper is also close in spirit to Kekre and Lenel (2024), who bring this segmented markets perspective to the time series and show that persistent demand shocks, reflected in persistent interest rate differentials, account for much of lower-frequency exchange rate variation, while intermediation shocks remain important at higher frequencies and in crises. We likewise argue that time series comovements between exchange rates and financial variables are informative about the underlying shocks. Our contribution is to bring that logic to FX hedging market. Using aggregate hedging quantities together with exchange rates, interest differentials, and the cross-currency basis, we study how hedging demand, covered-arbitrage capacity, and uncovered risk-bearing jointly determine the supply of FX insurance and connect UIP and CIP deviations in equilibrium.

Our paper also links to the rapidly growing literature on deviations from covered interest parity (CIP) and the financial frictions that drive them.[1] Early work in this area identifies regulatory constraints and balance sheet costs as the primary drivers of the post-crisis basis. Du et al. (2018) document large and systematic cross-currency bases that exhibit quarter-end patterns consistent with regulatory constraints, while Andersen et al. (2019) link these wedges to debt overhang frictions associated with the expansion of bank balance sheets. At a market-wide level, Avdjiev et al. (2019) establish the co-movement of the basis with global dollar funding conditions and intermediary leverage. These constraints appear to be priced risk factors: Du et al. (2023) show that forward-CIP strategies load on balance sheet scarcity risk, and Augustin et al. (2024) find that non-risk-based regulatory constraints explain a significant fraction of long-tenor deviations.

Recent micro-evidence deepens this perspective by illustrating dealer behavior and market segmentation. Cenedese et al. (2021) link CIP deviations to dealer-level leverage ratio constraints, while Wallen (2022) argues that basis spikes can be attributed to dealer price discrimination. Furthermore, Hacioglu-Hoke et al. (2024) provide granular evidence on the FX derivatives market structure and positioning of different types of institutions. A related strand connects these deviations to heterogeneous access to USD funding. Rime et al. (2022) show that essentially risk-free CIP trades are scarce once realistic funding costs are considered, and are limited to a narrow group of market participants that have access to direct dollar funding at attractive terms. Similarly, recent studies such as Kloks et al. (2024), Khetan (2026), and Du et al. (2025) demonstrate how non-US institutions amplify CIP deviations by substituting toward FX swaps when wholesale funding tightens. Such frictions have real consequences for capital flows: Kubitza et al. (2025) connect CIP deviations to the dollar bond holdings of Euro area investors, highlighting how hedging costs distort international capital allocation.[2]

Related to our paper, Moskowitz et al. (2026) provide micro evidence that banks meet-

[1] For a comprehensive survey, see Du and Schreger (2022).

[2] Moreover, Sushko et al. (2016) emphasize the role of FX hedging demand, while Iida et al. (2018) highlight counterparty-risk constraints. Liao (2020) further documents the relationship between CIP deviations and corporate credit spread differentials.

ing synthetic dollar demand do not fully hedge these positions with maturity-matched foreign safe assets. Their evidence on imperfectly hedged intermediaries motivates our inclusion of arbitraguers who take naked-forward position. In our model, these agents expand forward supply and can cause the supply of dollar insurance to respond counter-intuitively to changes in the dollar risk premium. Also related is Liao and Zhang (2024) who show that hedging demand interacting with constrained intermediaries can connect countries' net financial positions to CIP deviations. We share their emphasis on hedging demand, but consider distinct arbitrageurs that supply the hedge. This allows UIP wedges to affect hedging supply in a general equilibrium environment, and lets us use aggregate hedging quantities as a central identifying series for the joint behavior of exchange rates, hedging costs, hedging quantities, and countries' financial positions. Dao et al. (2025) also study the joint determination of UIP and CIP in a framework centered on intermediary balance sheet constraints. Relative to their approach, we embed client hedging demand in a two-country general-equilibrium model with distinct covered, uncovered, and naked-forward intermediation margins, which is what generates the endogenous forward-supply response that is our focus.

The remainder of this paper is organized as follows. Section 2 presents stylized facts from the key episodes of interest in the FX market. Section 3 presents our theoretical model, while Section 4 shows analytical results linking innovations to the UIP wedge to naked-forward supply. Section 5 provides our baseline empirical results before we conclude in Section 6.

2 Stylised Facts: 2020 versus 2025

This section isolates the empirical pattern that motivates the paper. Both the 2020 pandemic episode and the 2025 dollar depreciation featured a rise in dollar risk and a joint movement in exchange rates and short-term interest differentials consistent with a financial shock. The key difference is that in 2025 hedging quantities rose while CIP deviations remained muted, whereas in 2020 CIP deviations were large and hedging positions con-

tracted.

Exchange rate risk rose sharply in both episodes, as demonstrated in Figure 1. In 2025, the JPMorgan VXY G7 index, a measure of option-implied currency volatility, rose at the time of the presidential inauguration and again around the Liberation Day tariff announcements. In 2020, the same index spiked during the pandemic in March; increasing threefold in five weeks. The two episodes also share a similar, if mirrored, pattern regarding interest differentials and exchange rates. In 2025, the dollar depreciated in the six months following the inauguration of President Trump (see Figure 2), while short-term U.S. rates rose relative to foreign rates (with Japan being the exception), as shown in Panel B of Figure 3. In 2020, the dollar appreciated against major currencies in the months following the pandemic onset, while short-term interest rate differentials rose as the Federal Reserve cut rates aggressively and foreign central banks followed more gradually (see Panel A of Figure 3). These relative movements in interest differentials and exchange rates point to financial shock that generated a deviation from uncovered interest parity, (see e.g. Kekre and Lenel (2024)).

The key contrast appears in covered markets. CIP deviations behaved differently across the two periods (Figure 4). In 2025, 1-month CIP deviations for EUR and GBP remained close to zero on average, with low volatility. In 2020, by contrast, covered interest parity deviations widened sharply and became volatile, with deviations reaching up to 200 basis points (see Figure 1). Hedging activity also moved in opposite directions, as shown in Figure 5, which is based on our granular EMIR TR transaction data (see Appendix B.1). In 2025, demand for protection against a dollar depreciation rose sharply. Beginning in late January, net notional positions increased quickly across the major currency pairs, led by hedging client sectors such as pension funds, insurers, and asset managers. These investors typically hedge because their portfolios contain dollar-denominated assets while their liabilities are largely in domestic currency. In 2020, by contrast, hedging positions contracted as the high cost of hedging (as measured by the CIP deviation) appeared to have fed back into a reduction in the volume of hedging.[3]

[3]Note that the JPY/USD net notional positions did not contract to the same extent as other currencies in

Taken together, these facts suggest a puzzle. The 2025 episode combines a rise in currency volatility with the exchange-rate and rate-differential pattern usually associated with a financial disturbance. Yet there is a muted response in the cross currency basis and rising hedge quantities, which looks like an improvement in the ability of the financial sector to supply insurance against a dollar depreciation. This is the empirical pattern our model is designed to explain.

3 Model

We develop a two-country, two-period endowment economy with Home and Foreign households, two traded goods, and a rich but tractable financial sector. Goods are freely traded, while home bias in consumption generates a time-varying real exchange rate. Households do not trade assets directly. Instead, they choose only total financial wealth and delegate portfolio allocation to a fund sector. In each country, funds allocate wealth across domestic bonds and foreign bonds, on either a covered or uncovered basis. Residual imbalances created by these fund positions are absorbed by a separate arbitrage sector consisting of three representative arbitrageurs: a UIP arbitrageur that warehouses uncovered bond positions, a CIP arbitrageur that supplies forward hedges and offsets them through bond markets, and a naked-forward arbitrageur that takes outright forward positions and bears forward-to-spot risk directly. This structure lets the model separate shifts in end-user demand for hedging from changes in the financial system's willingness to supply it, which is the key distinction needed to study the joint behavior of exchange rates, interest differentials, and CIP deviations. We denote the Home country as the United States and the Foreign country as Europe when discussing the economic interpretation.

2020, but this could be driven by our limited coverage of this market relative to the more comprehensive coverage of the EUR/USD and GBP/USD amounts.

3.1 Endowments, prices and financial assets

Each household has an endowment of their own good, respectively $y_{H,t}$ and $y_{F,t}$. To introduce risk, period-1 endowments are uncertain with a log normal distribution: $\log y_{H,1} \sim \mathcal{N}\left(\log \bar{y}_{H,1} - \frac{1}{2}\sigma_y^2, \sigma_y^2\right)$, and $\log y^*_{F,1} \sim \mathcal{N}\left(\log \bar{y}^*_{F,1} - \frac{1}{2}\sigma_y^2, \sigma_y^2\right)$.

Let P_t and P_t^* denote the Home and Foreign consumption price indices, and let $p_{H,t}$, $p_{F,t}$ and $p^*_{H,t}$, $p^*_{F,t}$ denote the corresponding good prices in the two countries. Frictionless trade implies the law of one price, $p^*_{H,t} = \mathcal{E}_t p_{H,t}$, and $p^*_{F,t} = \mathcal{E}_t p_{F,t}$, where $\mathcal{E}_t$ is the nominal exchange rate, defined so that $\mathcal{E}_t \uparrow$ is a Home (dollar) appreciation.

The real exchange rate is

$$q_t \equiv \frac{\mathcal{E}_t P_t}{P_t^*},$$

which is the price of the Home consumption bundle in units of the Foreign bundle. Similarly, $q_t \uparrow$ is a Home (dollar) appreciation. There are no nominal rigidities. We assume monetary policy stabilizes the price levels so that $P_0 = P_1 = P_0^* = P_1^* = 1$. Therefore $q_t = \mathcal{E}_t$, and we work entirely in real terms.

In each country there is a market for one-period bonds in local currency. A home-currency bond costs one unit of the home consumption bundle in period 0 and pays $1 + r$ units of the home bundle in period 1. Foreign currency bonds are defined symmetrically with gross return $1 + r^*$. Both bonds are risk free in local currency terms, but cross border positions are exposed to exchange rate risk. A forward market also exists. Let f denote the date-0 forward exchange rate, in units of foreign bundles per home bundle delivered in period 1.

3.2 Households

Period home consumption is a CES aggregator over Home and Foreign goods,

$$C_t = \left[(1-\iota)^{1/\sigma} c_{H,t}^{\frac{\sigma-1}{\sigma}} + \iota^{1/\sigma} c_{F,t}^{\frac{\sigma-1}{\sigma}}\right]^{\frac{\sigma}{\sigma-1}},$$

where ι is a weight on foreign goods and σ captures the degree of substitutability. Aggregate consumption in foreign, C_t^* is defined symmetrically with a parameter ι^* pinning down home bias in consumption.

The associated period utility is given by $u(C_t) = \frac{C_t^{1-1/\psi}}{1-1/\psi}$ (foreign utility is symmetric with the same elasticity of intertemporal substitution). The Home household has a discount factor β, the foreign discount factor is β^*. We assume $\beta < \beta^*$, so that Home is the natural borrower.

The Home household chooses date-0 financial wealth A and consumption allocations $\{c_{H,t}, c_{F,t}\}_{t=0,1}$ to solve

$$\begin{aligned} \max_{\{c_{H,t},c_{F,t}\}_t, A} \quad & u(C_0) + \beta \, \mathbb{E}_0 \left[u(C_1) \right] \\ \text{s.t.} \quad & p_{H,0} c_{H,0} + p_{F,0} c_{F,0} + A = p_{H,0} y_{H,0}, \\ & p_{H,1} c_{H,1} + p_{F,1} c_{F,1} = p_{H,1} y_{H,1} + \mathcal{R}_1 A + T_1. \end{aligned}$$

Financial wealth is invested in the fund sector, where it generates the stochastic payoff $\mathcal{R}_1$. The Foreign household chooses A^* and $\{c_{H,t}^*, c_{F,t}^*\}_{t=0,1}$ to solve its symmetric problem. Expenditure minimization implies the standard CES demand system.

Households receive date-1 transfers, T_1 and T_1^*, from the profits of the financial sector. We will consider alternative transfer rules and discuss them below.

Because of the price level normalisation, total consumption expenditure is equivalent to total consumption, hence

$$C_t = p_{H,t} c_{H,t} + p_{F,t} c_{F,t}, \qquad C_t^* = p_{H,t}^* c_{H,t}^* + p_{F,t}^* c_{F,t}^*.$$

Using the indirect utility representation in terms of the CES price indices, the household Euler equations become

$$C_0^{-1/\psi} = \beta \, \mathbb{E}_0 \left[\mathcal{R}_1 C_1^{-1/\psi} \right], \qquad (C_0^*)^{-1/\psi} = \beta^* \, \mathbb{E}_0 \left[\mathcal{R}_1^* (C_1^*)^{-1/\psi} \right]. \tag{1}$$

3.3 Funds

There is a client-facing fund sector in each country. It receives household savings and channels resources into domestic and foreign bond markets. When household financial wealth is negative, the same sector acts as a financing arm and raises funds on behalf of households. There are two funds in each country: an uncovered and a covered fund. Households allocate a fixed fraction ω of wealth to the uncovered fund and $1-\omega$ to the covered fund; Foreign analogously uses ω^* and $1-\omega^*$. The uncovered fund allocates resources between the domestic bond and an uncovered foreign bond position. The covered fund allocates resources between the domestic bond and a covered foreign bond position. In each fund, the domestic bond plays the role of the safe asset. Fund demands for the foreign position (covered or uncovered) are imperfectly elastic, in the spirit of preferred-habitat demand.

For Home, let λ_U and λ_H denote the shares of the uncovered and covered funds invested in the Foreign bond. We assume

$$\lambda_U = \bar{\lambda}_U + \alpha_U \left(\mathbb{E}_0 \left[(1+r^*) \frac{q_0}{q_1} \right] - (1+r) \right), \tag{2}$$

$$\lambda_H = \bar{\lambda}_H + \alpha_H \left((1+r^*) \frac{q_0}{f} - (1+r) \right), \tag{3}$$

with parameters chosen so that $\lambda_U, \lambda_H \in (0,1)$ in equilibrium.

The Home uncovered and covered funds therefore hold the following positions in the Foreign and Home bond markets

$$\text{Foreign bond holdings:} \qquad D_U = \lambda_U \, \omega A q_0, \qquad D_H = \lambda_H (1-\omega) A q_0, \tag{4}$$

$$\text{Home bond holdings:} \qquad B_U = (1-\lambda_U)\omega A, \qquad B_H = (1-\lambda_H)(1-\omega)A. \tag{5}$$

The corresponding gross returns are

$$\mathcal{R}_{U,1} = (1-\lambda_U)(1+r) + \lambda_U (1+r^*) \frac{q_0}{q_1}, \qquad \mathcal{R}_{H,1} \quad = (1-\lambda_H)(1+r) + \lambda_H (1+r^*) \frac{q_0}{f}, \tag{6}$$

so that total Home household wealth earns

$$\mathcal{R}_1 = \omega \mathcal{R}_{U,1} + (1-\omega)\mathcal{R}_{H,1}. \tag{7}$$

The two foreign funds solve a symmetric problem: given ω^* and A^* as well as prevailing interest rates and exchange rates, they choose foreign bond shares λ_U^*, λ_H^* resulting in positions $D_U^*, D_H^*, B_U^*, B_H^*$.

The motivation for this structure is closely related to the preferred-habitat view of asset markets. The fund sector captures client-facing demand that is not fully price elastic due to mandates or other restrictions on investment behaviour. The setup is analogous to **?**, where preferred-habitat investors demand specific assets and maturities, and arbitrageurs smooth the resulting demand shocks. Here we apply the same logic to FX markets: covered and uncovered funds generate client demand for foreign bond and forward positions, and distinct arbitrage desks absorb the residual covered, uncovered, and naked-forward exposures. Framing the model this way makes it possible to distinguish movements in end-user hedging demand from changes in the financial system's willingness to supply those positions.

Local bond-market stability. A sufficient condition to keep bond markets well-behaved in response to local changes in parameters when $A < 0$ is

$$(1-\omega)\alpha_H \leq (1-\omega^*)\alpha_H^*(1+r^*)\frac{1+r}{(1+r-x)^2}.$$

When interest rates and the basis are small this is well approximated by $(1-\omega)\alpha_H \leq (1-\omega^*)\alpha_H^*$. We will impose this condition when generating analytical results and it will also emerge from our quantitative analysis.

3.4 Arbitrage sector

The financial system is also populated by three different types of representative arbitrageurs (sometimes referred to as desks). UIP arbitrageurs take long-short uncovered

bond positions in both currencies and absorb deviations from uncovered interest parity subject to reduced-form capacity constraints. CIP arbitrageurs take long-short covered bond positions in both currencies, pocketing deviations from covered interest parity and thereby supplying forwards to covered funds. Last, naked-forward arbitrageurs sell currency in the forward market, profiting when the forward price differs sufficiently from the expected future spot rate. All three arbitrageurs carry out these trades subject to reduced-form capacity constraints. In the case of risky arbitrage trades these constraints could be interpreted as arising from arbitrageurs solving an underlying CARA portfolio choice problem where the underlying variance is assumed to be exogenous (as in Itskhoki and Mukhin (2021)); for risk-less CIP arbitrage, it is sufficient to assume the arbitrageur is subject to a diversion problem (as in Gabaix and Maggiori (2015)).

CIP arbitrageur. A representative arbitrageur supplies forward hedges and offsets those positions with bond trades. Let (a, a^*) denote bond positions and let X denote the forward position, measured in Home-currency notional delivered at date 1. The arbitrageur satisfies

$$a + q_0^{-1} a^* = 0, \qquad a^* = -q_0 a,$$

and chooses the forward hedge so that exchange-rate risk is eliminated:

$$fX = (1 + r^*)a^*, \qquad X = -\frac{q_0(1 + r^*)}{f} a.$$

Date-1 profits in Home units are

$$\Pi_1^{CIP} = \left((1 + r) - \frac{q_0(1 + r^*)}{f} \right) a.$$

Define the gross-return CIP deviation

$$x \equiv (1 + r) - \frac{q_0(1 + r^*)}{f}. \tag{8}$$

We follow Gabaix and Maggiori (2015) and assume that the arbitrageur is subject to a balance sheet constraint that limits the size of its borrowed position. Specifically, we impose $xa \geq \kappa |a|^2$, so that

$$|x| = \kappa |a|. \tag{9}$$

UIP arbitrageur. A separate arbitrageur absorbs residual *uncovered* cross-border bond demand. Let U denote the date-0 Home-currency value of the intermediary's net uncovered position in the Foreign bond. A positive U means the desk is long the Foreign bond and short the Home bond by the same date-0 Home-currency amount. The date-1 payoff in Home units is

$$\Pi_1^{UIP} = U \left((1+r^*) \frac{q_0}{q_1} - (1+r) \right).$$

For symmetry with the CIP arbitrageur, we summarize UIP supply by the linear reduced-form condition

$$(1+r^*) q_0 \, \mathbb{E}_0[q_1^{-1}] - (1+r) = \gamma U. \tag{10}$$

Naked-forward arbitrageur. A third intermediary takes uncovered forward positions and bears forward-to-spot risk directly. Let M denote the Home-currency notional supplied to the client sector at date 0 for delivery at date 1. A positive M means the arbitrageur sells Home currency forward and receives Foreign currency forward.

The date-1 payoff in Home units is

$$\Pi_1^M = M \left(\frac{f}{q_1} - 1 \right).$$

It is convenient to define the expected naked-forward return

$$V \equiv \mathbb{E}_0 \left[\frac{f}{q_1} - 1 \right]. \tag{11}$$

We summarize naked-forward supply by the linear reduced-form condition

$$V = \phi M, \tag{12}$$

where $\phi > 0$ is the slope of naked-forward supply.

3.5 Market clearing and Equilibrium

Forward market clearing The Home covered fund holds Foreign bonds of size D_H, so it wishes to hedge the Foreign-currency payoff $(1+r^*)D_H$. The Foreign covered fund holds Home bonds of size D_H^*, so it wishes to hedge the Home-currency payoff $(1+r)D_H^*$.

Measured in Home-currency notional delivered at date 1, define total *client hedging demand* as

$$H \equiv \frac{1+r^*}{f} D_H, \qquad H^* \equiv (1+r)D_H^*. \tag{13}$$

The two sources of *hedging supply* are the CIP desk, which supplies X, and the naked-forward desk, which supplies M. Noting that the covered funds demand forwards in different directions, forward-market clearing is therefore

$$H - H^* = X + M. \tag{14}$$

This separation between total demand (H, H^*) and total supply (X, M) is useful. It makes clear that the naked-forward arbitrageur does not change client hedging demand directly; it changes how much of that demand must be absorbed by the CIP desk and therefore how much basis is needed to clear the market. As a matter of signs, note that a decrease in M or X is equivalent to an *increase* in supply to the foreign covered fund.

Using (8), (9), and (12), as well as $X = -(1+r-x)a$ the forward block can be written as

$$X = H - H^* - M, \qquad -(1+r-x)x = \kappa X, \qquad V = \phi M. \tag{15}$$

Equivalently,

$$0 = H - H^* - M + \kappa^{-1}(1+r-x)x. \tag{16}$$

Bond-market clearing Net bond supply is zero in both countries. The Foreign bond market clears when

$$B_U^* + B_H^* + D_U + D_H + u^* + a^* = 0. \tag{17}$$

The Home bond market clears when

$$B_U + B_H + D_U^* + D_H^* + u + a = 0. \tag{18}$$

Global financial wealth and aggregate transfers. Adding the two bond-market clearing conditions implies the global financial-wealth identity

$$q_0 A + A^* = 0. \tag{19}$$

Intermediary profits are rebated to households, but their cross-country allocation is left unspecified for now. The aggregate date-1 transfer constraint is

$$T_1 + q_1^{-1} T_1^* = \Pi_1^{UIP} + \Pi_1^{CIP} + \Pi_1^M, \tag{20}$$

where

$$\Pi_1^{UIP} = U\left((1+r^*)\frac{q_0}{q_1} - (1+r)\right), \qquad \Pi_1^{CIP} = xa, \qquad \Pi_1^M = M\left(\frac{f}{q_1} - 1\right).$$

Thus the aggregate transfer budget equals total intermediary profits, measured in home-consumption units. Note that as there are no intermediary profits in the first period, there are no transfers.

Goods-market clearing Goods markets clear in each period:

$$y_{H,t} = c_{H,t} + c_{H,t}^*, \qquad y_{F,t}^* = c_{F,t} + c_{F,t}^*,$$

with CES intratemporal demand and the law of one price we have

$$c_{H,t} = (1-\iota) p_{H,t}^{-\sigma} C_t, \qquad c_{F,t} = \iota\, p_{F,t}^{-\sigma} C_t,$$

$$c_{H,t}^* = \iota^* (q_t^{-1} p_{H,t})^{-\sigma} C_t^*, \qquad c_{F,t}^* = (1-\iota^*)(q_t^{-1} p_{F,t})^{-\sigma} C_t^*.$$

Under the normalization $P_t = P_t^* = 1$, total consumption and total expenditure coincide, so C_t and C_t^* can be interpreted directly as consumption aggregates. Goods-market clearing therefore implies

$$y_{H,t} = p_{H,t}^{-\sigma}\left((1-\iota)C_t + \iota^* q_t^{\sigma} C_t^*\right), \qquad y_{F,t}^* = p_{F,t}^{-\sigma}\left(\iota C_t + (1-\iota^*) q_t^{\sigma} C_t^*\right). \tag{21}$$

Under symmetric home bias, $\iota = \iota^*$, the real exchange rate is proportional to the terms of trade. In general, under CES preferences, (21) determines $(C_t, C_t^*, q_t, p_{H,t}, p_{F,t})$ jointly.

Equilibrium An equilibrium consists of allocations, goods prices, the real exchange rate, interest rates, the forward rate, fund allocations, and intermediary positions such that households optimize, fund and arbitrage conditions hold, and all goods and asset markets clear.

4 Analysis

We start with a simplified version of the model to produce analytical results linking innovations to the UIP wedge and naked-forward supply. We then solve the model numerically and discuss comparative statics with respect to alternative parameters.

4.1 A simplified analytical version

To simplify the model to the point where we can obtain analytical results, we make the following assumptions: we assume households have Cobb-Douglas preferences ($\sigma = 1, \psi = 1$) and there is symmetric home bias $\iota = \iota^* < 1/2$. In addition, we impose a transfer rule so that there is a closed-form expression for the date-1 real exchange rate. In particular, impose a state-contingent transfer rule that makes Home's non-endowment income at date 1 proportional to the same Cobb–Douglas aggregator that appears in the goods block. In particular, we choose transfers so that

$$T_1 = \frac{\iota}{1-2\iota}\left[K^{\frac{\iota}{1-2\iota}} - K^{-\frac{1-\iota}{1-2\iota}}\right] y_{H,1}^{1-\iota}\left(y_{F,1}^*\right)^{\iota} - R_1 A.$$

The Foreign transfer is pinned down by the aggregate transfer budget constraint. Under this rule, the date-1 real exchange rate is

$$q_1 = K \left(\frac{y^*_{F,1}}{y_{H,1}} \right)^{1-2\iota}, \tag{22}$$

so the period-1 exchange rate is also lognormally distributed. For simplicity we set $K = 1$. Throughout this subsection, we focus on the case where Home is the borrower, in which case $A < 0$, the corresponding UIP position satisfies $U < 0$ and the basis, x, is negative.

We next show how a widening of the UIP differential, which can be interpreted as a rise in γ, generates an increase in forward supply in a partial-equilibrium setup where fund demand, H, H^*, U, is held at fixed values. Similarly, we take interest rates to be exogenous. This has parallels to the setup considered in Liao and Zhang (2024), who focus on a forward market where investors hedge an exogenous stock of wealth.

Proposition 1. *Consider a version of the model in which the fund side, H, H^*, U, is held fixed, interest rates are exogenous, and the period-1 exchange rate is given by equation (22). A rise in γ widens the UIP deviation, depreciates the currency, lowers the forward premium, lowers M, expands naked-forward supply to foreigners, and compresses the basis. We have*

$$\frac{dx}{d\gamma} > 0, \qquad \frac{dM}{d\gamma} < 0.$$

Proof. All proofs are in the appendix. □

This exercise isolates the role of naked forwards. Holding positions fixed, a rise in γ increases the UIP wedge: for a given negative U, the Home currency must depreciate today to satisfy the UIP condition. If the basis is held fixed on impact, this lower spot rate translates directly into a lower forward rate. A lower forward rate makes buying Home currency forward more attractive, so naked-forward supply shifts toward more negative positions, that is, toward greater supply of insurance against a Home depreciation. Because client hedging demand is fixed, this additional naked-forward supply reduces the

residual imbalance that must be absorbed by the CIP desk. Once the basis is allowed to adjust, the result is compression of the basis toward zero. Hence, the arbitrageurs' willingness to supply forwards moves in the opposite direction to their willingness to bear uncovered interest-rate risk.

This logic holds exactly in our partial-equilibrium setup. In general equilibrium things are more complicated, as interest rates can also adjust. When $U < 0$, a wider UIP wedge can manifest as a depreciation of the currency, which lowers the forward premium and, as described, lowers M. But a wider wedge can also manifest through an increase in the interest differential $r - r^*$, which raises the forward premium. Which force dominates determines whether M rises or falls with γ. Formally, the appendix provides a sufficient condition under which the partial-equilibrium sign continues to hold in general equilibrium:

Proposition 2. *Consider the full simplified model, with $U < 0$, and assume the local bond-market stability condition holds. A rise in γ lowers M provided the induced general-equilibrium movements are such that the spot-depreciation effect dominates the countervailing effect of a rise in rates. In that case,*

$$\frac{dM}{d\gamma} < 0.$$

These analytical results show the interplay between UIP and forward supply. However, they leave a couple of questions open. First, does an increase in γ, generating a UIP wedge, lower the forward premium in a typical calibration? If an increase in dollar risk simultaneously increases hedging demand and curtails arbitrageurs' willingness to take uncovered risk, can that still generate a situation where a risk increase compresses the x towards zero? Last, we have focused so far on changes in γ; are there other forces in our model that could explain the patterns in the data? To dig deeper, we explore our model numerically.

4.2 Numerical Analysis

For our numerical analysis we restore the full version of the model and drop the Cobb-Douglas structure. We continue to focus on an environment where $A < 0$, $U < 0$ and $x < 0$ follows as a consequence. We no longer impose the transfer rule that ensures q_1 is exogenous; instead we assume that all intermediary profits are transferred to Foreign as the ultimate lender in the economy (as in the rest of the literature, this transfer rule is not material to the results). We calibrate the remaining parameters as follows.

Table 1: Baseline calibration

Parameter	Value	Interpretation
β	0.99708	Home discount factor
β^*	0.99758	Foreign discount factor
ι, ι^*	0.07	Symmetric import shares in expenditure
$\omega, \omega^*, \bar{\lambda}_U, \bar{\lambda}_H, \bar{\lambda}^*_U, \bar{\lambda}^*_H$	0.5	Portfolio shares and fund-demand intercepts
$\alpha_U, \alpha_H, \alpha^*_U, \alpha^*_H$	20	Fund demand slopes
γ	6×10^{-4}	UIP arbitrageur risk-bearing parameter
κ	6×10^{-4}	CIP balance-sheet slope
ϕ	6×10^{-4}	Naked-forward supply slope
σ_y	0.10	Date-1 output volatility
σ	0.9	Intratemporal elasticity of substitution
ψ	1	Intertemporal elasticity parameter

Calibration Table 1 reports the baseline calibration used in the numerical analysis. Wherever possible, parameter values are taken from Kekre and Lenel (2024). We depart from their calibration in two ways that are natural for the present two-period environment. First, we reverse the ordering of the discount factors so that Home is the relatively impatient country, consistent with the borrower benchmark developed above. Second, we impose symmetric home bias and set $\iota = \iota^* = 0.07$, which is the benchmark import share used in the related Itskhoki and Mukhin (2021) environment. For intermediary capacity, we take the Kekre and Lenel (2024) value for arbitrage risk pricing, $\gamma = 6 \times 10^{-4}$, and im-

pose $\kappa = \phi = \gamma$. This keeps the UIP desk, CIP desk, and naked-forward desk at the same scale and assumes they face similar constraints. The remaining portfolio-share objects are normalized to 0.5 in order to keep the benchmark neutral. Finally, the preferred-habitat slopes $\alpha_U, \alpha_H, \alpha_U^*, \alpha_H^*$ are set at 20 so that a 5bp return differential is sufficient to shift the portfolio allocation by 1%. These parameters lack direct analogues in the literature, but they primarily scale the magnitude of responses rather than determine the qualitative mechanisms that are our focus.

We now turn to comparative statics regarding how the model responds to shocks in the baseline calibration. We focus on how calibrated values of the period-0 exchange rate (q_0), the interest differential ($r - r^*$), relative consumption ($C - C^*$), the cross currency basis (x) and the quantity of hedging (H^*) react to a change in parameters.[4] Our discussion so far has focused on a simple change in γ: as described above this depreciates the currency and raises the interest differential, which also lowers home consumption on a relative basis. In the calibration, the forward premium declines, which leads to an expansion in hedging supply and a (positive) movement in x towards zero.

We now consider a richer shock which we refer to as a dollar risk shock: here we increase hedging demand (ω^*) and then simultaneously raise γ to the point where $r - r^*$ rises. In this way, we consider both a simultaneous increase in foreign households' demand for hedging and uncovered arbitrageurs' willingness to bear the risk. This can be interpreted as a representation of 2025.

The first column in table 2 presents the output from this exercise. The key point is that the shock is able to generate a situation where home consumption falls on a relative basis, the total foreign position shrinks, the quantity hedged rises and the basis compresses (i.e. x moves towards zero). The reason why the basis compresses when hedging quantities rise is exactly the endogenous response to naked-forward arbitrageurs.

The remaining columns spell out the responses to alternative shocks.

[4] Total hedging demand is given by $H^* - H$, this responds in the same manner as H^*.

Table 2: Comparative Statics Sign Table

Variable/shock	dollar risk	$\beta \downarrow$	$y_{H,0} \uparrow$	hedging supply $(\kappa, \phi \uparrow)$	hedging demand $(\bar{\lambda}_H^*, \omega^* \uparrow)$
q_0	$-$	$+$	$-$	$-$	$-$
$r - r^*$	$+$	$+$	$-$	$-$	$-$
$C - C^*$	$-$	$+$	$+$	$-$	$-$
x	$+$	$-$	$-$	$-$	$-$
H^*	$+$	$+$	$-$	$-$	$+$

Demand and supply shocks ($\beta \downarrow, y_{H,0} \uparrow$). A fall in β is a home demand shock, while a change in $y_{H,0}$ is a supply shock (symmetric effects are apparent for their foreign equivalent). Demand shocks cause Home to front-load consumption, so it borrows more, pushing up $r - r^*$ and appreciating q_0. The counterpart is a larger foreign saving position, part of which is intermediated through the foreign covered fund, raising hedge demand and making the basis more negative. In the case of a supply shock, the extra goods are absorbed through a weaker home terms of trade, so the equilibrium response is a depreciation of the home real exchange rate, $q_0 \downarrow$. That depreciation reduces the relative value of home output in expenditure terms and, in this calibration, is strong enough that home net financial wealth falls rather than rises, so $A < 0$. The weaker home currency is accompanied by a lower interest-rate differential, lower hedge demand, and a more negative basis.

Hedging supply $(\kappa, \phi \uparrow)$ An increase in κ or ϕ directly makes hedged dollar investment less attractive to foreigners by pushing the basis more negative. The lower hedging demand shows up as a fall in H^*. The smaller foreign covered position tends to depreciate the dollar due both to an increase in the portion of the Home deficit that is funded uncovered (raising the UIP wedge) and to a contraction in Foreign's willingness to fund Home borrowing (a rise in A). Whether the dollar interest differential rises or falls is then a general-equilibrium question. In this calibration, the change in the overall NFA dominates the substitution to uncovered financing so interest differentials fall.

Hedging demand $\left(\bar{\lambda}_H^*, \omega^* \uparrow\right)$ A rise in hedging demand in general equilibrium plays out similarly to a contraction in supply. Foreigners are less willing to provide uncovered

funding to Home and that contracts the home NFA position. The main distinction between demand and supply is the relative movements in the basis versus hedging quantities. The demand shock both increases the quantity of hedging and pushes the basis even further from zero.

We turn next to ask whether dollar risk shocks conform to the same pattern in the data, and whether the episodes we highlight align with these patterns.

5 Empirical Results

This section tests the central empirical implication of the model: the same shocks that move the dollar through UIP can also move the supply of forwards and hence the cross-currency basis. The key challenge is that prices alone are not enough to distinguish this mechanism from alternative stories based on exogenous shifts in hedging demand or dealer balance-sheet capacity. We therefore use data on end-user hedging quantities from regulatory FX derivatives records and study its joint behavior with exchange rates, interest differentials, relative demand measures, and CIP deviations.

5.1 Methodology and Data Sources

To decompose the time series patterns we see in the data we estimate a five-variable Bayesian VAR and identify structural shocks via the sign restrictions derived from the model. Our baseline specification uses the EUR/USD currency pair and we use a 3-month tenor to compute forward prices and interest rates.We use monthly data over the sample September 2019 to December 2025. Aligning with our model, the vector of observables is

$$\mathcal{Y}_t = \begin{pmatrix} q_{0,t} \\ (r - r^*)_t \\ (C - C^*)_t \\ x_t \\ H_t^* \end{pmatrix}, \tag{23}$$

where all variables follow the model's sign conventions. Specifically, the exchange rate is $q_{0,t} = \log(\text{foreign per USD})$, so $q_{0,t} \uparrow$ means dollar appreciation (where foreign here is the Euro/Euro Area in our baseline). The interest differential $(r - r^*)_t$ is the USD deposit rate minus the foreign deposit rate (percentage points per annum), so positive values indicate a higher USD rate. We proxy consumption using monthly retail sales so, the relative consumption term $(C - C^*)_t = \log c_{\text{US},t} - \log c_{\text{foreign},t}$ is the log US minus log foreign retail consumption index, both rebased to 2023 = 100. The CIP deviation $x_t \equiv (1 + r) - q_0(1 + r^*)/f$ follows the two-period model definition, with $x_t > 0$ indicating that the USD is expensive via FX derivatives. Finally, $H_t^* = \log(\text{net long EUR forward position of client sectors})$, constructed from the regulatory FX derivatives dataset; $H_t^* > 0$ means client sectors hold a net long EUR, net short USD position in FX derivatives.

The sources for these data are described in Appendix B. Most are standard. However, the main new time series we bring to the table is a measure of H^*: the net long euro position of sectors other than dealer banks in the London forward market, measured from EMIR regulatory data. We construct this series from daily DTCC trade-state reports under UK EMIR, which record all outstanding trades each day, and clean and deduplicate the underlying FX swap and forward reports to infer net currency positions by sector. After these steps, the final dataset contains roughly 2–3 million outstanding FX swaps and forwards per day. This "client" sector captures the activities of insurers, pension funds, asset managers, and related institutions that play the role of the preferred-habitat investors in our model. A net long euro position implies that these institutions have sold dollars forward and therefore are hedged against dollar depreciation. In line with our model's calibration, H^* is positive in the data because these institutions hedge large dollar-denominated investments. Likewise, we mostly have $x_t < 0$, compensating dealers for providing this insurance by allowing them to profit from the cross-currency basis. For more details on the data, see Appendix B.1.

5.2 Movements in UIP and Hedging Supply.

We start with a simple question: UIP shocks that depreciate the dollar should also raise dollar interest differentials and lower consumption on a relative basis. This is a prediction of our model. Do such shocks also have the hallmarks of increases in hedging supply: that is, does x_t move towards zero and does H_t^* increase?

To test this, we identify a shock that has a signature of an innovation in the UIP wedge. However, we leave unrestricted the responses of x and H^*.

Specifically, we impose that one of the shocks in our model has the following sign restrictions

$$\text{sign}\big(Y_t - \mathbb{E}_{t-1}(Y_t)\big) = \begin{pmatrix} -1 \\ +1 \\ -1 \\ ? \\ ? \end{pmatrix}, \tag{24}$$

and leave the remaining four shocks unrestricted so the system is only partially identified.

Figure 7 shows the posterior median impulse responses and Bayesian credible intervals of all five variables to the identified shock. By construction the on-impact responses of q_0, $r - r^*$, and $C - C^*$ satisfy the sign restrictions: the dollar depreciates, the rate differential widens, and relative US consumption falls. The key diagnostic variables, x and H^*, have positive median on-impact responses but with credible intervals spanning zero. Still, the pattern aligns with our theory and is inconsistent with the a claim that a shock to UIP contracts hedging supply causing a positive comovement with UIP.

Figure 8 shows the contribution of this shock to the forecast error variance across horizons $h = 1, \ldots, 24$ months. The dynamic effects are muted, the UIP shock accounts for a substantial share of EUR/USD exchange rate variance, roughly 40% at $h = 1$, rising gradually to around 44% at $h = 24$. This is consistent with the literature (e.g. Itskhoki and Mukhin (2021)) and the notion of the exchange rate disconnect – that exchange rates are generally not driven by fundamental macroeconomic factors. Of more interest, for

our purposes, is that the same UIP shock also explains a similar portion of the variance of both the cross currency basis (x) and the size of overall dollar hedging positions (H^*). Our results suggest not only that CIP and UIP deviations can move in opposite directions, but also that a single shock can drive both.

5.3 A Fully Identified System

The results above are based on a partially identified system. We next move to a fully identified specification by mapping the model-implied sign patterns in Table 2 into the empirical VAR. That is, for each structural shock, we impose on-impact sign restrictions on $(q_0, r - r^*, C - C^*, x, H^*)$ that match the comparative statics of the corresponding shock in the model. This delivers a five-shock decomposition consisting of: (i) a UIP shock associated with a rise in hedging supply; (ii) macro demand and supply shocks; and (iii) hedging-demand and hedging-supply shocks.

Using this system, we can ask whether there is an alternative force driving the time series and whether the results above still hold once more structure is imposed. Figure 9 presents the corresponding forecast error variance decomposition.

Several things stand out from this figure. First, in line with the exchange rate disconnect, the UIP shock explains most of the variation in exchange rates. Second, in the fully identified system, UIP shocks still explain around a third of the variance in hedging quantities and the cross currency basis but less than the 50% seen in figure 8. Last, the fundamental macro shocks explain about half the variance in both H^* and x. The macro shocks influence hedging markets through a shifting the countries net financial asset position and, hence, hedging demand. This is similar to the channel emphasised by Liao and Zhang (2024) whereby financial imbalances and hedging needs pin down the CIP deviation. This leaves us with the conclusion that exogenous shocks to hedging supply, i.e. pure financial shocks that generate CIP deviations due to constraints on the ability of intermediaries to write forward contracts, seem to explain only a relatively small share of the overall variance of CIP deviations.

Last, figures 10 shows the historical decomposition of the EUR/USD exchange rate

during the pandemic and during the depreciation in 2025. UIP shocks contributed positively to the USD in 2020 but had a negative contribution during the 2025, when the dollar weakened and dollar risk spiked. This is consistent with the narrative in Section 2 that both episodes had opposite patterns regarding deviations from covered parity. The model assigns little weight to shocks to hedging in explaining exchange rates during these episodes.

6 Conclusion

The recent period of volatility in FX markets in 2025–26 shows that movements in the cross currency basis cannot be attributed solely to shifts in intermediaries' balance sheet capacity. Unlike earlier periods such as 2008 and 2020 – when rising dollar risk premia coincided with sharp increases in hedging costs – the recent episode features rising dollar risk alongside a depreciating dollar, expanding hedge quantities, and a compressed basis. We argue that this pattern reflects intermediaries' willingness to take uncovered forward positions. When the dollar weakens and UIP deviations widen, intermediaries expand forward supply because expected returns on directional positions rise, stabilizing hedging costs even in the face of heightened exchange rate volatility.

Embedding this mechanism in a two country international general equilibrium model shows how uncovered risk bearing capacity shapes the joint behavior of exchange rates, interest differentials, the basis, and hedging flows. Using regulatory derivatives data, we find clear empirical support for this channel: shocks that depreciate the dollar and widen UIP deviations tend to raise hedging quantities and compress the basis, exactly as predicted by our model. These findings imply that CIP deviations are equilibrium objects shaped jointly by hedging demand and intermediaries' risk absorption, rather than only symptoms of financial frictions. More broadly, they underscore the tight connection between UIP and CIP wedges and suggest that FX markets provide more international risk sharing than the basis alone would indicate.

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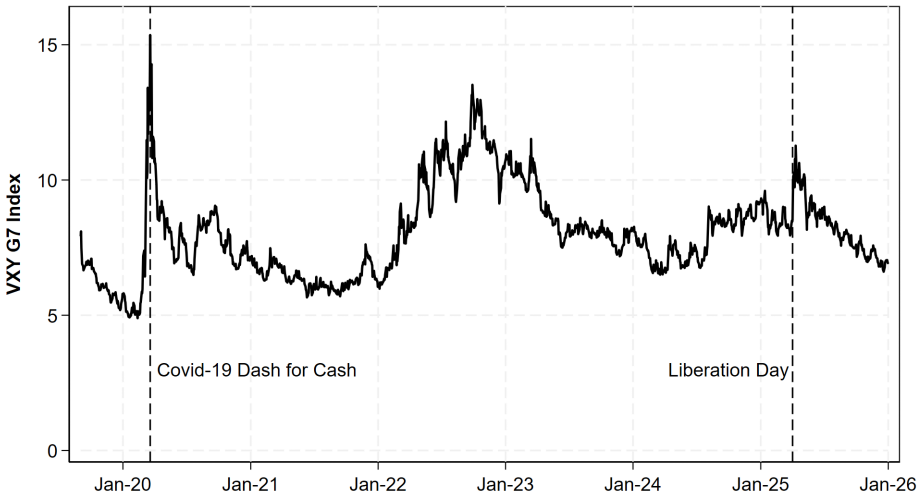
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Figure 1: VXY G7 Index



This figure plots the JPMorgan VXY G7 implied-volatility index. Higher values indicate greater implied volatility in G7 currency pairs. Source: Bloomberg.

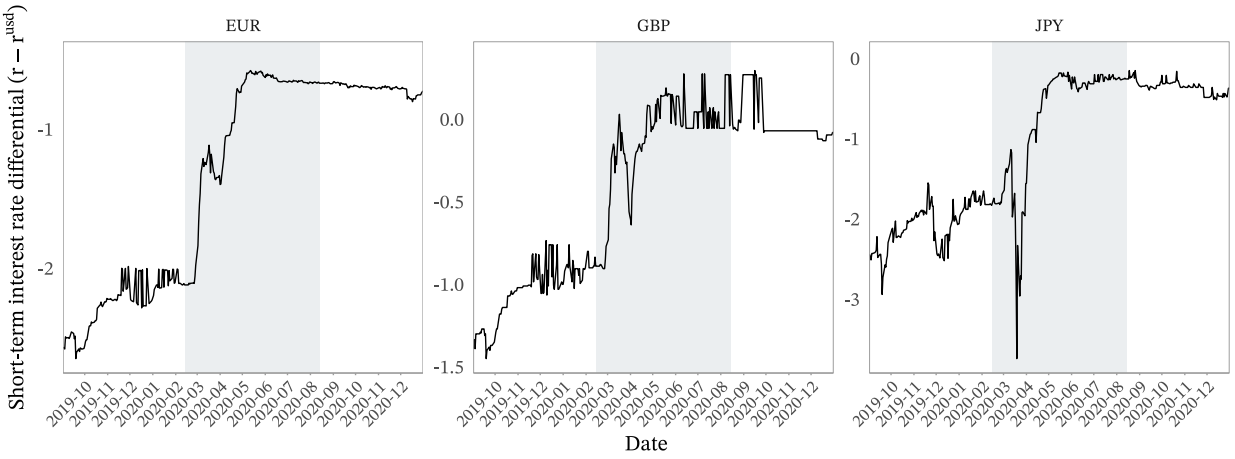
Figure 2: U.S. Dollar (DXY) Index



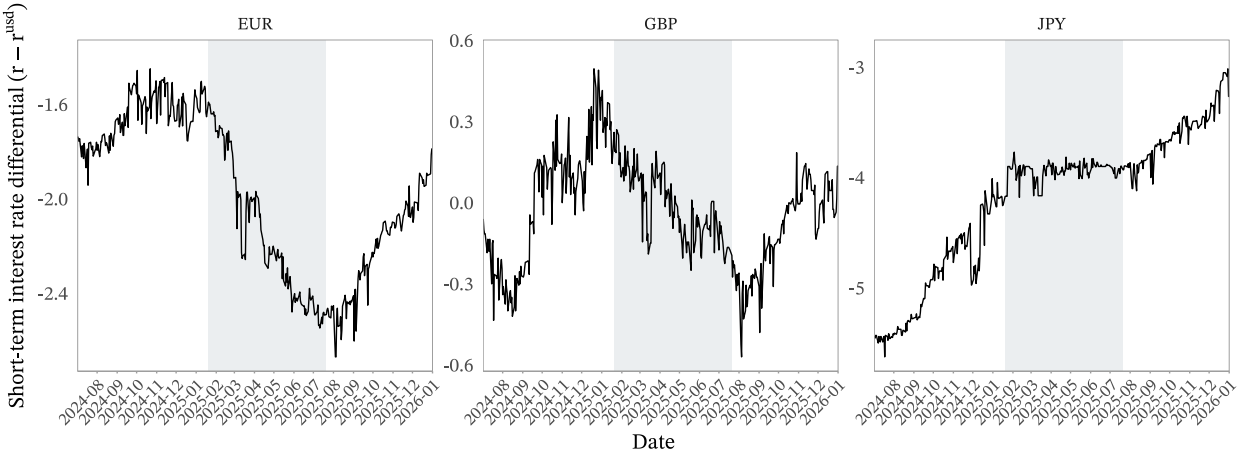
This figure plots the broad U.S. dollar index (DXY). An increase indicates dollar appreciation. Source: Bloomberg.

Figure 3: Short-term interest rate differentials

(a) Panel A: 2020

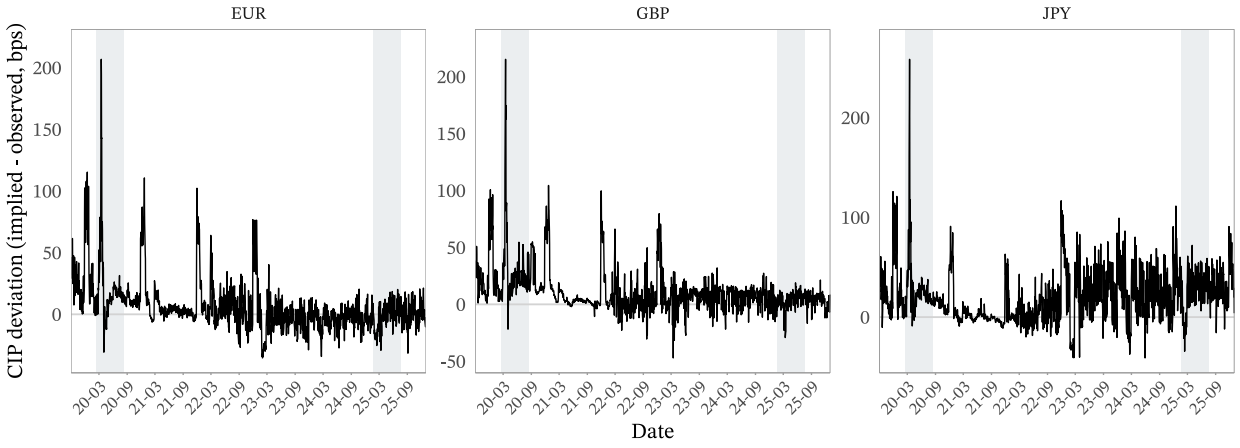


(b) Panel B: 2025



The figures show the evolution of short-term interest rate differentials for selected currencies. Higher differentials indicate tighter unsecured term funding conditions for currency i relative to the USD. The series correspond to the one-month unsecured money-market rate for each currency: for EUR, the benchmark is Euribor; for USD, GBP, and JPY, post-IBOR series are Refinitiv GS deposit-rate fixings designed to proxy unsecured wholesale term deposit funding costs. All rates are quoted as annualised money-market yields using currency-specific day-count conventions. The first panel focuses on the 2020 pandemic episode, with the shaded region spanning six months beginning on 2020-02-14. The second panel focuses on the 2025 episode, with the shaded region spanning six months beginning on 2025-01-20, the date of the inauguration of U.S. President Donald Trump. Source: Bloomberg.

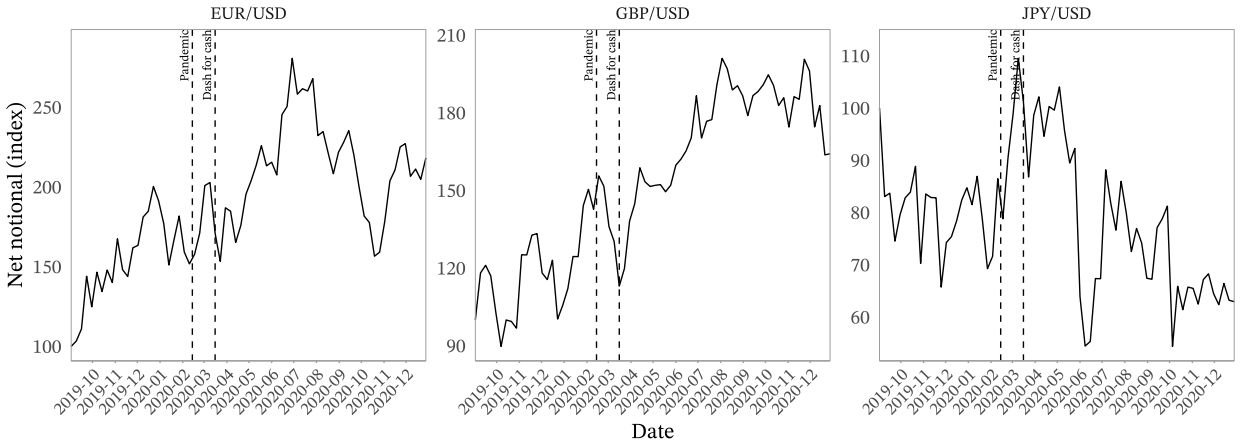
Figure 4: CIP deviation (bps) for the 1-month tenor



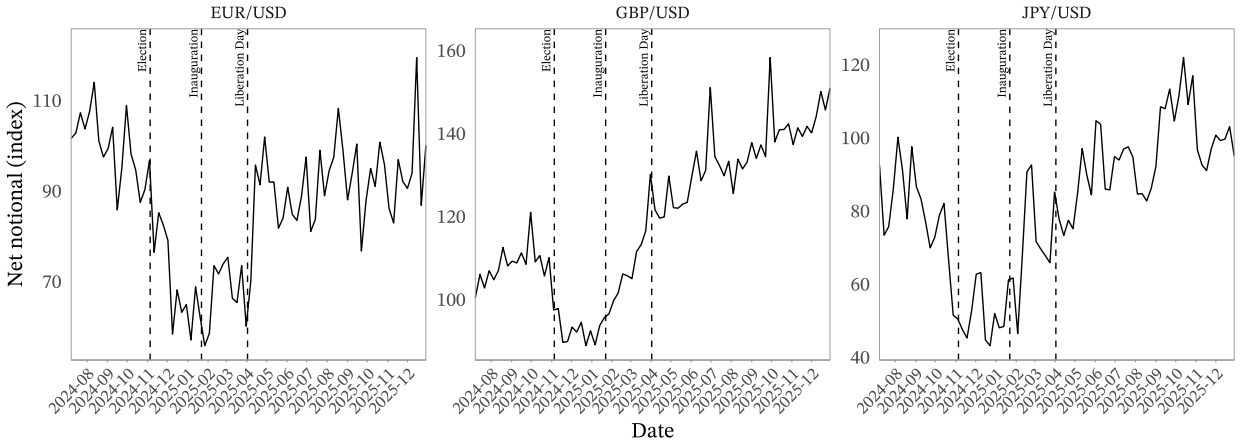
CIP deviations are computed as the difference between the forward-implied USD interest rate and the observed USD money-market rate at the 1-month tenor. We plot CIP deviations for the dollar crosses against the euro, pound sterling, and yen.

Figure 5: Net notional positions

(a) Panel A: 2020

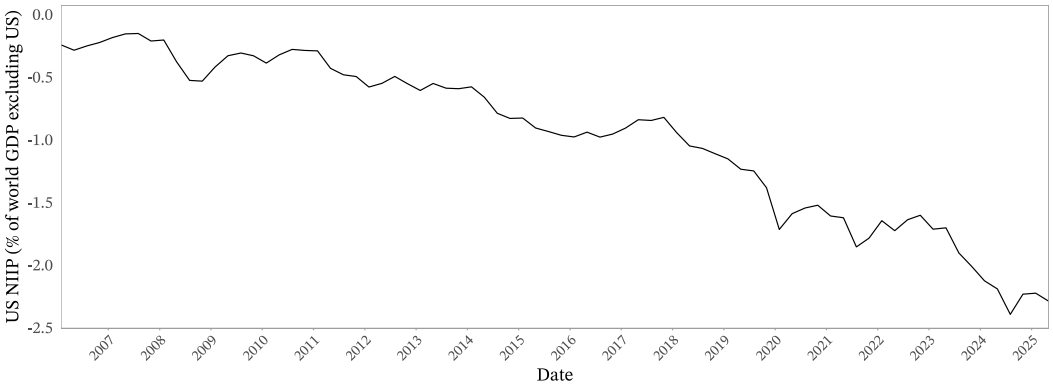


(b) Panel B: 2025



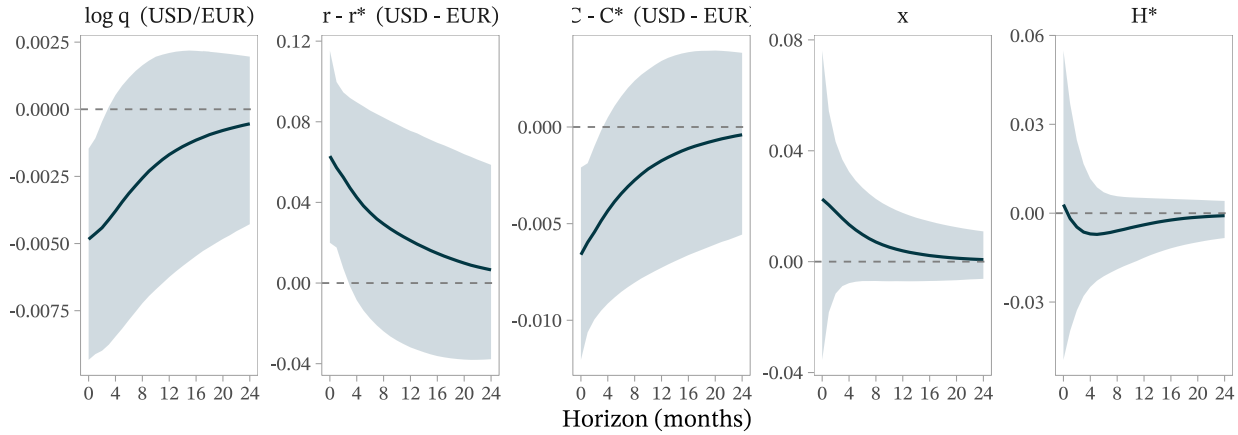
Net notional positions are constructed from EMIR transaction-level data and represent client net long USD exposure in FX forwards and swaps. Panel A covers the 2020 pandemic period; Panel B covers the 2025 inauguration period. Source: EMIR TR data.

Figure 6: U.S. Net International Financial Position



The figure shows the U.S. Net International Investment Position (NIIP) relative to rest-of-world GDP (excluding the United States). The U.S. NIIP series is taken from FRED and measures the quarterly net stock of U.S. external financial assets minus U.S. external liabilities. To express the NIIP relative to global economic activity, we construct rest-of-world GDP using quarterly GDP data from the IMF's World and Country Aggregates database. Country-level GDP is taken in domestic currency, converted into U.S. dollars using quarterly average market exchange rates from the IMF Exchange Rates database, and then aggregated across a broad set of major economies excluding the United States. The ratio plotted is U.S. NIIP divided by rest-of-world GDP. This measure captures the scale of the U.S. external position relative to the market-valued output of non-U.S. economies; because GDP is converted at market exchange rates, movements in the denominator reflect both changes in real activity and valuation effects from exchange-rate fluctuations.

Figure 7: Impulse Responses to a UIP shock.



Notes: Solid line: posterior median. Shaded band: Bayesian credible interval. The on-impact signs of q_0, $r - r^*$, and $C - C^*$ are imposed by the sign restrictions; the responses of x and H^* are unrestricted.

Figure 8: UIP shock contribution to forecast error variances (EUR/USD, 3-month tenor).

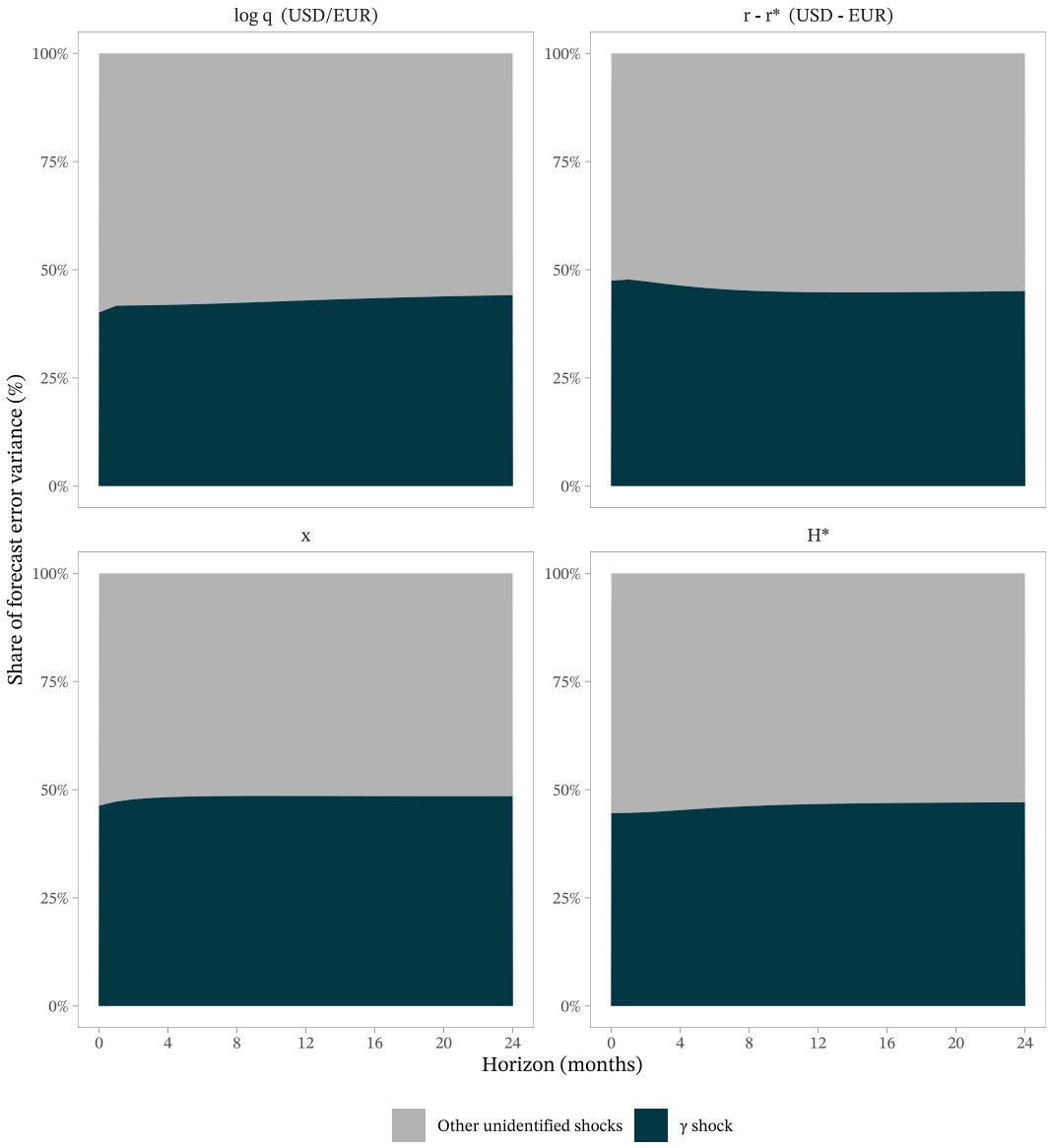


Figure 9: Forecast error variance decomposition in a fully identified system.

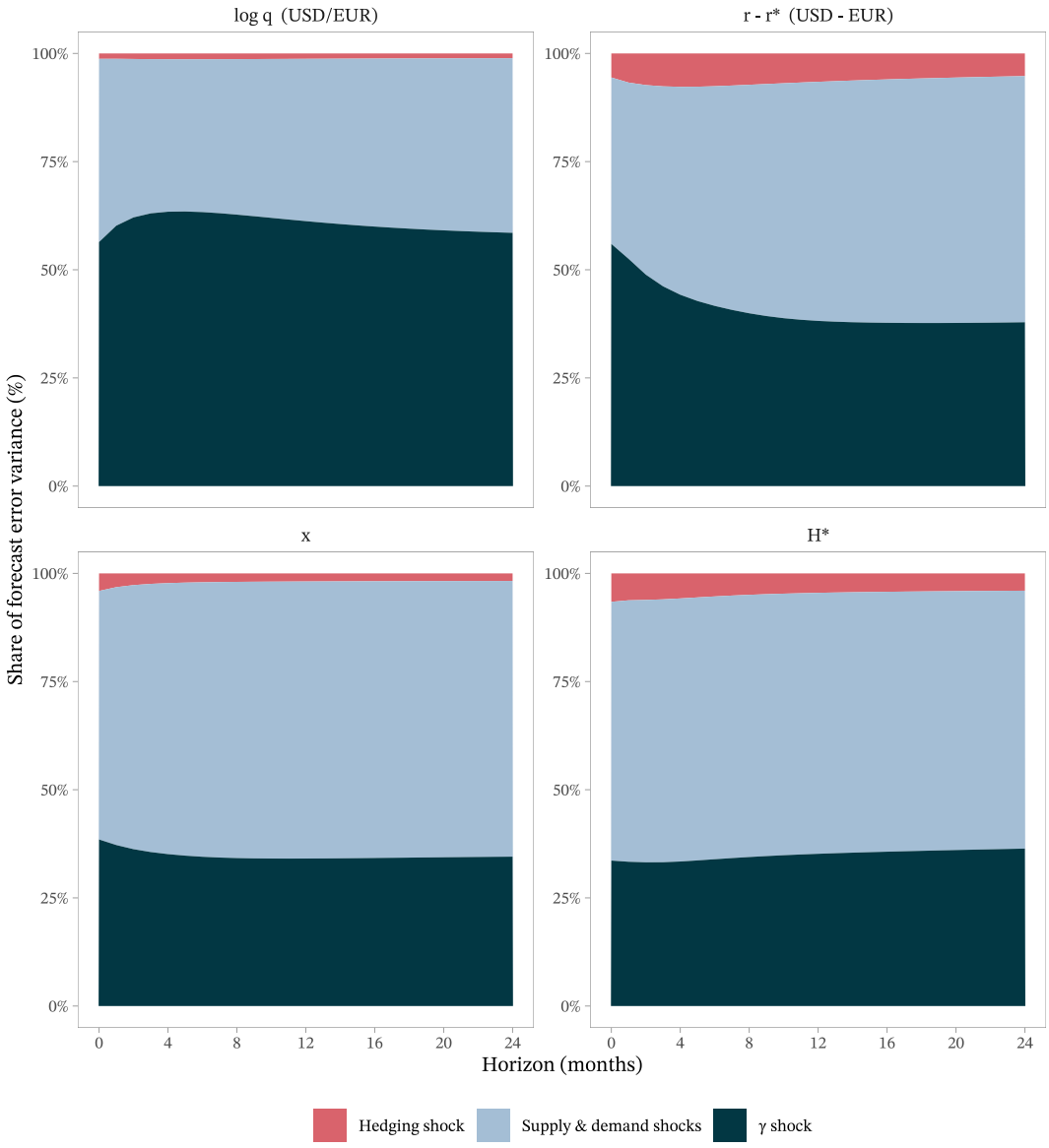
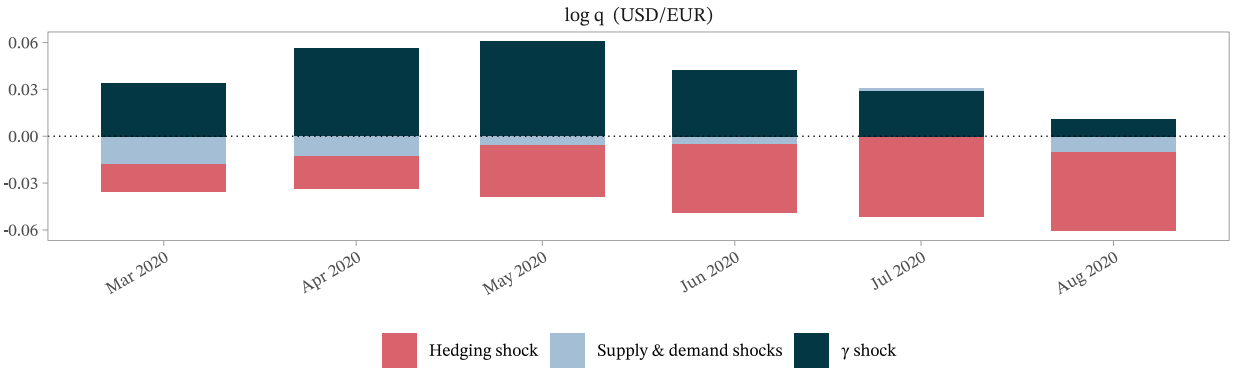
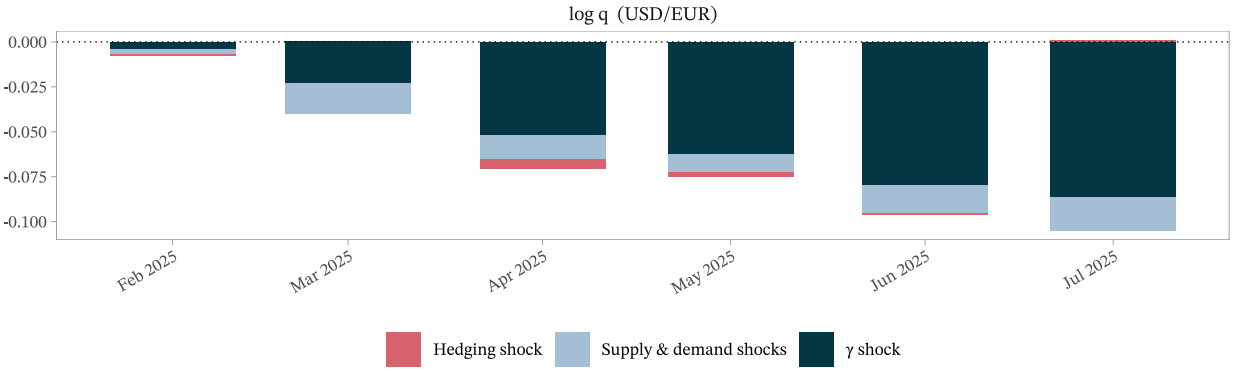


Figure 10: Historical decomposition of the USD/EUR exchange rate: 2020 vs 2025



(a) COVID-19 pandemic.



(b) Trump inauguration (2025).

Notes: Historical decompositions of the EUR/USD exchange rate. Panel (a) shows the decomposition during the COVID-19 pandemic. Panel (b) shows the decomposition around the Trump inauguration in 2025.

Internet Appendix

(not for publication)

Abstract

In the Internet Appendix, we present additional results which are not included in the main body of the paper.

A Proofs

A.1 Proof of Proposition 1

With U, r, r^*, and S fixed, the UIP condition

$$(1+r^*)q_0 S - (1+r) = \gamma U$$

implicitly determines q_0. Differentiating with respect to γ gives

$$(1+r^*)S\frac{dq_0}{d\gamma} = U.$$

Since $U < 0$, it follows that

$$\frac{dq_0}{d\gamma} = \frac{U}{(1+r^*)S} < 0.$$

So a rise in γ depreciates the Home currency today.

Next, from the reduced forward block,

$$x = \kappa(H - H^* - M), \qquad M = \frac{fS-1}{\phi}, \qquad f = \frac{(1+r^*)q_0}{1+r-x}.$$

Substituting out M and f yields one equation in (x, q_0):

$$x - \kappa(H - H^*) + \frac{\kappa}{\phi}\left(\frac{(1+r^*)q_0 S}{1+r-x} - 1\right) = 0.$$

Differentiating with respect to γ,

$$\left[1 + \frac{\kappa}{\phi}\frac{(1+r^*)q_0 S}{(1+r-x)^2}\right]\frac{dx}{d\gamma} + \frac{\kappa}{\phi}\frac{(1+r^*)S}{1+r-x}\frac{dq_0}{d\gamma} = 0.$$

Rearranging,

$$\frac{dx}{d\gamma} = -\frac{\frac{\kappa}{\phi}\frac{(1+r^*)S}{1+r-x}\frac{dq_0}{d\gamma}}{1 + \frac{\kappa}{\phi}\frac{(1+r^*)q_0 S}{(1+r-x)^2}}.$$

The denominator is strictly positive, and since $\frac{dq_0}{d\gamma} < 0$, it follows that

$$\frac{dx}{d\gamma} > 0.$$

Finally, using

$$x = \kappa(H - H^* - M),$$

with H and H^* fixed,

$$\frac{dx}{d\gamma} = -\kappa \frac{dM}{d\gamma}.$$

Hence

$$\frac{dM}{d\gamma} = -\frac{1}{\kappa}\frac{dx}{d\gamma} < 0.$$

This proves the result.

A.2 Proof of Proposition 2

In the reduced benchmark, the UIP position is

$$U(q_0, r, r^*; \gamma) = \frac{(1+r^*)q_0 S - (1+r)}{\gamma}, \qquad S \equiv \mathbb{E}_0[q_1^{-1}],$$

the Home household's net financial wealth is

$$A(q_0) = \frac{\iota}{1-2\iota}\left(q_0^{-\frac{1-\iota}{1-2\iota}} - q_0^{\frac{\iota}{1-2\iota}}\right),$$

and the net client bond imbalance is summarized by

$$\Xi(q_0, r, r^*, x) \equiv 1 - \omega\lambda_U - (1-\omega)\lambda_H - \omega^*\lambda_U^* - (1-\omega^*)\lambda_H^*,$$

where the fund shares satisfy

$$\lambda_U = \bar{\lambda}_U + \alpha_U\big((1+r^*)q_0 S - (1+r)\big), \qquad \lambda_H = \bar{\lambda}_H - \alpha_H x,$$

$$\lambda_U^* = \bar{\lambda}_U^* + \alpha_U^*\big((1+r)S/q_0 - (1+r^*)\big), \qquad \lambda_H^* = \bar{\lambda}_H^* + \alpha_H^*\big((1+r)f/q_0 - (1+r^*)\big),$$

with

$$f = \frac{(1+r^*)q_0}{1+r-x}.$$

Bond-market clearing can therefore be written as

$$0 = U(q_0, r, r^*; \gamma) - A(q_0)\,\Xi(q_0, r, r^*, x) - \frac{x}{\kappa}.$$

Differentiating with respect to γ, the direct effect of a rise in γ is

$$U_\gamma = -\frac{U}{\gamma} > 0,$$

since $U < 0$ at the borrower benchmark. Under the stability condition (**??**), this direct effect tends to raise x, that is, to compress the negative basis toward zero.

Naked-forward supply satisfies

$$M = \frac{fS - 1}{\phi}, \qquad f = \frac{(1+r^*)q_0}{1+r-x}.$$

Hence the sign of $dM/d\gamma$ is the sign of the induced change in the forward rate. A rise in γ affects f through two opposing channels. First, by making the Home currency depreciate on impact, it tends to reduce q_0 and hence reduce f. Second, by compressing the negative basis, it raises x, lowers $1 + r - x$, and therefore tends to increase f. Changes in r and r^* generate an additional general-equilibrium effect.

Therefore, $dM/d\gamma < 0$ whenever the first force dominates the latter two. In that case, the forward premium falls, buying Home currency forward becomes more attractive, and the naked-forward arbitrageur takes a more negative position, so M falls.

B Data Appendix

This appendix describes the datasets used in our empirical analysis.

B.1 Trade Repository Data

Our primary dataset comes from the UK EMIR Trade Repository (TR) reporting framework. Under UK EMIR, all UK-based financial and non-financial counterparties must report derivative transactions to an FCA-registered trade repository. Four repositories – DTCC, LSEG, Regis, and ICE – collect these reports and transmit them to the FCA and the Bank of England. Reporting covers both OTC and exchange-traded derivatives, capturing outstanding positions as well as intraday activity across commodities, credit, FX, equity, and rates.

Prior to Brexit, EMIR covered all derivatives involving UK and/or EU counterparties. Post-Brexit, the scope narrowed to trades in which at least one counterparty falls under UK jurisdiction, and EU-based reporting ceased in January 2021. A major reporting uplift on 30 September 2024 further enhanced data quality by adding new fields, removing obsolete ones, and refining existing attributes. Reporting entities were required to uplift historical open positions within six months, with full compliance by 31 March 2025.

Our sample covers September 2019 to December 2025 and consists of all transactions submitted to the DTCC repository – the largest trade repository with a market share of around 80% in FX derivatives. We rely on daily trade state reports, which record all outstanding trades each day. We retain all swap and forward reports, noting that EMIR does not always distinguish between the forward leg of a swap and a standalone forward.

We focus on FX derivatives involving USD, GBP, and EUR and their major crosses:

USD crosses: {USD/GBP, USD/EUR, USD/CAD, USD/NZD,
USD/CHF, USD/AUD, USD/INR, USD/KRW, USD/CNY, USD/JPY};
GBP crosses: {GBP/USD, GBP/EUR, GBP/CAD, GBP/NZD,
GBP/CHF, GBP/AUD, GBP/INR, GBP/KRW, GBP/CNY, GBP/JPY};
EUR crosses: {EUR/USD, EUR/GBP, EUR/CAD, EUR/NZD,
EUR/CHF, EUR/AUD, EUR/INR, EUR/KRW, EUR/CNY, EUR/JPY}.

B.1.1 Data Structure and Classification

For each transaction, the TR provides counterparty identifiers (LEIs) and standard contract characteristics (trade ID, notional, maturity, execution timestamp). We clean the data by removing trades with missing or invalid identifiers, timestamps, currency information, or incomplete FX fields, and excluding non-FX or operational records. We further drop inactive or implausible contracts based on key dates and notional bounds. Bilaterally reported trades are deduplicated by enforcing consistency in currencies, maturities, notional amounts, and exchange-rate bases, and we correct misreported bases when observed rates conflict with currency-pair conventions. Finally, we harmonize directionality across reporting regimes to infer long and short currency positions for each counterparty. After these steps, the final dataset contains roughly 2–3 million outstanding FX swaps and forwards per day.

We classify market participants into dealers and clients using LEIs. Our dealer set comprises 35 major global banks. Client trades are grouped into hedge funds, asset managers, pension funds, insurers, non-dealer banks (commercial banks, prime brokers, and non-bank trading firms), and a residual category (corporates, central banks, monetary authorities, and unclassified entities).

B.2 Variables

The table below describes all variables used in the empirical analysis, following the notation of the two-period hedging model. All exchange rate data are expressed in the convention $q_t > 0$, where q_t is the price of one unit of foreign currency in US dollars (1 FC $= q$ USD). A rise in q_t corresponds to a appreciation of the dollar.

Table A.1: Variable Definitions and Sources

Variable	Name	Description	Source
Exchange rates			

Continued on next page

Table A.1 continued

	Variable	Description	Source
q_t	Spot rate	Spot exchange rate expressed as USD per unit of foreign currency (1 FC = q USD). EUR and GBP sourced directly in this convention; JPY sourced as USDJPY and inverted. Mid price, daily frequency, 2006 to present.	Refinitiv FX spot rates (EUR=, GBP=, JPY=)
f_t	Forward rate	Outright forward exchange rate (1 FC = f USD), reconstructed from forward points: $f = q_{\text{raw}} + \text{fwdpt}/\text{scale}$, where scale = 10,000 for EUR/GBP and 100 for JPY. Bid and ask quotes available for no-arbitrage bound construction. Tenors: 1m, 3m, 1y, 2y, 5y, 10y. Mid prices, daily frequency, 2006 to present.	Refinitiv FX forward swap points (EUR1M=, GBP1M=, JPY1M=, etc)
Interest rates			
r_t	Foreign interest rate	Short-term unsecured money-market rate for the foreign currency, matched to the forward tenor (1m, 3m). We use the Refinitiv GS deposit-rate fixings proxy unsecured wholesale term deposit funding costs. Annualised using currency-specific day-count conventions (360 for EUR and JPY; 365 for GBP). Daily frequency, 2006 to present.	Refinitiv GS deposit-rate fixings

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Table A.1 continued

	Variable	Description	Source
r_t^{USD}	US interest rate	USD unsecured money-market deposit rate (Refinitiv GS fixing). Day-count basis: 360. Tenors: 1m, 3m. Daily frequency, 2006 to present.	Refinitiv GS deposit-rate fixings
r_t^{OIS}	OIS rate	Secured overnight risk-free rate for each currency. Daily official overnight benchmark published by the respective central bank. Used as a supplementary risk-free rate proxy. Daily frequency, 2019 to present (EUR), 2006 to present (GBP, JPY), 2014 to present (USD).	Refinitiv (USDSOFR=, EUROSTR=, SONIAOSR=, JPONMU=RR)
y_t^{τ}	Government yield	End-of-day benchmark sovereign yield at varying maturities. Annualised yield using currency-specific day-count convention. Daily frequency, 2006 to present.	Refinitiv benchmark government bond curve composites (for example, JP3MT=RR)
Derived variables			

Continued on next page

Table A.1 continued

	Variable	Description	Source
ρ_t	Forward premium	Annualised log forward premium: $\rho_t = \frac{d}{\tau} \times 100 \times \ln(f_t/q_t)$, where d is the day-count basis and τ is the tenor in days. Arbitrage bounds $[\rho_t^{\text{lower}}, \rho_t^{\text{upper}}]$ constructed from bid/ask forward quotes. Daily frequency, 2006 to present.	Computed
x_t	CIP deviation	Deviation from covered interest parity, in basis points p.a.: $x_t = (\rho_t - (r_t^{\text{USD}} - r_t)) \times 100$. $x_t < 0$ indicates a FX dollar funding premium (borrowing dollars through FX markets is costlier than the spot-market rate differential).	Computed
η_t	Realised FX change	Log change in the spot rate over tenor τ: $\eta_t = \ln q_{t+\tau} - \ln q_t$. Positive values indicate foreign currency appreciation (dollar depreciation).	Computed
μ_t	UIP deviation	Deviation from uncovered interest parity, in basis points: $\mu_t = \left(\eta_t - \frac{(r_t - r_t^{\text{USD}})}{100}\frac{\tau}{d}\right) \times 10{,}000$, where r_t is the foreign rate, r_t^{USD} the USD rate, τ the tenor in days, and d the day-count basis. $\mu_t > 0$ indicates the foreign currency appreciated by more than the foreign-minus-USD interest differential.	Computed

Continued on next page

Table A.1 continued

	Variable	Description	Source
Hedging demand			
h_t	Hedging demand (BoE)	Aggregate net long notional value of FX forward and swap contracts (USD millions), summed across all reporting sectors, to proxy for hedging demand. Constructed from daily trade repository data, covering OTC FX forwards and swaps (the vast majority of institutional FX hedging by volume). Covers EUR/USD, GBP/USD, and JPY/USD positions. Daily frequency, September 2019 to present.	Bank of England
h_t^{CFTC}	Hedging demand (CFTC)	Net position of Asset Managers in FX futures and options, from the CFTC Traders in Financial Futures (TFF) report, as a proxy for hedging demand. Weekly frequency (Tuesday close), June2006 to present.	CFTC, *Traders in Financial Futures* (CME)
Quantities: consumption			
c_t^{USD}	US consumption	US real retail and food services sales (seasonally adjusted), rebased to $2023 = 100$. Monthly frequency, 2006 to present. Weekly variant: Chicago Fed CARTS ex-auto retail and food services, constant 2017 dollars (SAMR), rebased to $2023 = 100$.	FRED (series: RRSFS); Chicago Fed CARTS

Continued on next page

Table A.1 continued

	Variable	Description	Source
c_t	Foreign consumption	Two series, one per foreign currency block. *UK*: ONS chained-volume retail sales index including fuel (SA, (J5EK)), 2023 = 100. Monthly frequency, 2006 to present. *Euro area*: Eurostat monthly retail sales index (net turnover, SA). Index 10/EA19 (1999–2017) chained with Index 21/EA21 (2015–2024) using overlap-period rescaling; rebased to 2023 = 100.	ONS (dataset: KPSA); Eurostat (series: `sts_trtu_m`)
b_t	US net foreign assets	US net international investment position (NIIP) in USD, normalised by world GDP excluding the United States: $b_t = \text{NIIP}_t / \text{GDP}_t^{\text{world}-\text{US}}$. World GDP converted to USD using IMF period-average exchange rates. Countries included: G10 plus major emerging markets. Quarterly frequency, 2006 to present.	FRED (IIPUSNETIQ); IMF World Economic Outlook

B.3 Sample Period

The main estimation sample runs from January 2006 to the most recent available observation. The BoE hedging demand variable h_t is available from September 2019 only, so specifications including h_t use the shorter sample. The CFTC hedging demand variable h_t^{CFTC} is available from 2006, providing a weekly series that matches the main sample for robustness analysis. All series are sourced at daily or higher frequency and aggregated to the estimation frequency as required.

B.4 Construction Notes

Forward points scaling. Refinitiv reports forward points in market convention: divide by 10,000 for EUR and GBP (four decimal places), and by 100 for JPY (two decimal places).

JPY quote inversion. JPY is quoted as USDJPY (yen per dollar) in market convention. All JPY series are inverted to JPYUSD $= 1/\text{USDJPY}$ to conform to the model convention $q > 0$ meaning 1 JPY $= q$ USD. For bid/ask forward rates, inversion reverses the spread: $f^{\text{bid}}_{\text{JPY}} = 1/f^{\text{ask}}_{\text{USDJPY}}$.

Interest rate day-count. The forward premium ρ_t uses currency-specific day-count bases ($d = 360$ for EUR, JPY, USD; $d = 365$ for GBP) to ensure comparability with the deposit rate convention.

Retail sales rebasing. All consumption indices are expressed on a $2023 = 100$ base. FRED retail sales (USD millions) are divided by the 2023 calendar-year average and multiplied by 100. The Eurostat series is similarly rebased. The ONS index is already published on a $2023 = 100$ scale. The base year cancels in log consumption ratios $\ln(c_t/c_t^*)$, so results are invariant to this choice.

Eurostat EUR retail sales chaining. Eurostat publishes two overlapping retail trade index series: Index 10 (base 2010, EA19 composition) covers 1999–2017, and Index 21 (base 2021, EA21 composition) covers 2015–present. The two series are spliced by scaling Index 21 so that its mean over the overlap period 2015–2017 equals the mean of Index 10 over the same period, then concatenating the non-overlapping portions.

CFTC TFF data. The CFTC Traders in Financial Futures report classifies reportable traders into four categories: Dealer/Intermediary, Asset Manager/ Institutional, Leveraged Money, and Other Reportable. We use the Asset Manager net position (long minus short contracts) as our primary hedging demand proxy, as this category encompasses institutional investors who hold foreign-currency assets and use FX futures to hedge currency risk. The data are downloaded as annual ZIP files from the CFTC historical compressed files page and cover the Futures-and-Options Combined series for EUR/USD (EURO FX),

GBP/USD (British Pound), and JPY/USD (Japanese Yen) contracts traded on the Chicago Mercantile Exchange.

B.5 Hedging Demand Data Sources

Bank of England trade repository data. The BoE hedging demand series h_t is constructed from transaction-level data submitted to the Bank of England under UK derivatives reporting obligations (EMIR and UK EMIR).

Under the UK EMIR, all UK-based counterparties (financial and non-financial counterparties) must report derivative contracts to an FCA-registered/recognised trade repository. Reporting obligations include both over-the-counter (OTC) and exchange-traded derivatives (ETD), covering trades that are outstanding as well as intraday activity. There are four UK based trade repositories - DTCC, LSEG, Regis, and ICE - that aggregate the data and transmit it to the FCA and Bank of England. For our analysis, we focus on forwards and swaps reported to DTCC, the largest repository in this asset class. For reference, around 75% of the reported trades came from DTCC on the 14/05/2025. We focus on a single repository to reduce risk of double counting positions reported to several repositories, and to ensure better data quality.

Before Brexit, EMIR data encompassed all derivative trades between counterparties operating under UK and/or EU jurisdictions. Following Brexit, the scope narrowed: the dataset now includes trades where at least one counterparty, either the reporting entity or the reported entity, is subject to UK jurisdiction. From January 2021 onwards, the data no longer includes reporting by EU-based entities. A significant development became effective on 30 September 2024, when the EMIR TR reporting regime was "uplifted" to enhance data quality and usability. The transition to the revised regime involved adding new fields, removing obsolete ones, and refining existing attributes. Reporting entities were granted a six-month window to uplift their historical open trades and positions, with full compliance required by 31 March 2025.

We aggregate net long notional values across all reporting sectors to construct a daily measure of aggregate hedging demand for each currency pair (EUR/USD, GBP/USD,

JPY/USD). The key advantage of this source over exchange-based alternatives is instrument breadth: OTC forwards and swaps account for the large majority of institutional FX hedging by notional value, so the BoE series is a more representative measure of aggregate demand, especially in the GBP/USD pair where UK has near complete coverage.

CFTC Traders in Financial Futures data. The CFTC Traders in Financial Futures (TFF) report provides a breakdown of each Tuesday's open positions for markets in which 20 or more traders hold positions at or above CFTC reporting thresholds. The report covers *exchange-traded* futures and options on futures only; OTC instruments are excluded. Because the TFF covers exchange-traded instruments only, it likely understates true institutional hedging demand relative to the BoE measure. Our sample focuses on EUR/USD (EURO FX), GBP/USD (British Pound), and JPY/USD (Japanese Yen) contracts. Standardised contract sizes are EUR 125,000, GBP 62,500, and JPY 12,500,000.

The TFF divides market participants into four categories based on their predominant business activity, as determined by CFTC staff using large trader Form 40 disclosures: (1) *Dealer/Intermediary*: sell-side participants (large banks, securities and derivatives dealers) that design and sell financial products to clients and offset their risk across markets; (2) *Asset Manager/Institutional*: buy-side institutional investors, including pension funds, endowments, insurance companies, and mutual funds; (3) *Leveraged Funds*: hedge funds, commodity trading advisors (CTAs), and commodity pool operators (CPOs) engaged in speculative or arbitrage strategies; (4) *Other Reportables*: all remaining reportable traders, predominantly using markets to hedge business risk (corporate treasuries, central banks, smaller banks, mortgage originators). We use the Asset Manager net position (long minus short contracts) as our primary hedging demand proxy, since this category captures institutional investors holding foreign-currency assets who use FX futures to manage currency exposure.