Journal of Futures Markets

WILEY

RESEARCH ARTICLE

The Dollar's Double Life: Not All Dollar Appreciations Are Born Equal for the Cross-Currency Basis

Daniel Felix Ahelegbey[1,2] | Oyakhilome Wallace Ibhagui[2,3] | Florian Gerth[4]

[1]School of Mathematics, Statistics, and Actuarial Science, University of Essex, Wivenhoe Park, Colchester, Essex, UK | [2]Financial Research Unit, BAUM TenPers Institute, Arlington, Virginia, USA | [3]Department of Financial Economics, Johns Hopkins University, Baltimore, Maryland, USA | [4]Stephen Zuellig Graduate School of Development Management, Asian Institute of Management, Legazpi Village, Makati City, Metro Manila, Philippines

Correspondence: Daniel Felix Ahelegbey (d.f.ahelegbey@essex.ac.uk)

Received: 14 October 2025 | **Revised:** 5 January 2026 | **Accepted:** 11 January 2026

Keywords: basis swap spreads | cross-currency basis swaps | currency hedging | currency markets | dollar appreciation hedging demand and supply | exchange rate regimes

ABSTRACT

This paper revisits the relationship between the US dollar and cross-currency basis (XCB) swap spreads. We show that the strength and direction of this relationship depend on the prevailing regime of the broad dollar. The evidence suggests that the well-documented "dollar appreciates, basis widens" result holds primarily when the dollar is in a low or intermediate regime. However, once the dollar transitions into a high regime, this association either weakens or reverses: a stronger dollar no longer widens the basis and may tighten it. Our findings reveal that not all dollar appreciations are created equal. For the same magnitude of dollar appreciation, basis spreads tend to widen significantly more in low- or intermediate-dollar regimes than in high-dollar regimes. We explain these results through a theoretical framework grounded in hedging demand and supply imbalances and validate them empirically using the term structure of XCB swap spreads of G10 currencies.

JEL Classification: F31, F36, G15, G13, E44, E58

1 | Introduction

The US dollar plays a central role in the international financial system. It serves not only as a medium of exchange and a reserve currency but also as the backbone of global funding and hedging activities. A growing body of research has documented that fluctuations in the broad dollar index are closely linked to stress in global funding markets. This is particularly evident through deviations from the covered interest parity (CIP) condition, a no-arbitrage principle that links interest rate differences to forward and spot exchange rates when full hedging is possible. This linkage is well established in the literature on global dollar funding markets and CIP deviations (see Baba and Packer 2009; Coffey et al. 2009; Bruno and Shin 2015; Du et al. 2018; Avdjiev et al. 2019). A stronger dollar is generally associated with wider cross-currency basis (XCB) spreads, reflecting increased pressure on dollar funding and reduced arbitrage capacity among global financial institutions.

This stylized fact, however, conceals deeper complexity. While the link between dollar appreciation and CIP deviations is well documented, much of the literature assumes that this relationship is stable and linear. In reality, various frictions introduce important nonlinearities that shape arbitrage behavior. Structural barriers such as bank balance-sheet constraints, capital and liquidity regulations, transaction costs, and unequal access to dollar funding have been shown to limit the ability of institutions to engage in arbitrage (Y. Liao 2016; Sushko et al. 2016; Du et al. 2018). As a result, CIP arbitrage may not be truly riskless, and basis spreads can persist even when standard no-arbitrage conditions appear to be violated.

Recent studies show that persistent structural frictions play a key role in driving CIP deviations. Researchers such as Du et al. (2018) and Cerutti et al. (2021) highlight that deviations persist due to factors, such as limited arbitrage capital, regulatory constraints, and intermediary risk tolerance. These frictions are often amplified during periods of US dollar strength, reinforcing the correlation between dollar appreciation and wider basis spreads. Subsequent work traced persistent basis wedges to funding-liquidity constraints (Mancini-Griffoli and Ranaldo 2010), segmented money markets (Rime et al. 2017), and outright dollar shortages (McGuire and von Peter 2012). Regulatory divergence makes wholesale dollar funding even costlier (Iida et al. 2016), and global banks ration credit accordingly (Ivashina et al. 2015). Corporate arbitrage issuance exploits basis gaps (Y. Liao 2016), while Wu and Xia (2016) show that shadow-rate easing mitigates but does not eliminate dollar tightness.

Other studies link CIP deviations to macroeconomic fundamentals: for example, Ibhagui (2021c) finds that stronger eurozone output narrows deviations while rising money supply and currency depreciation widen them. Coşkun and Ibhagui (2022) explore the role of technology shocks in emerging markets, and Ibhagui (2020) presents a monetary model linking long-term basis movements to output and money growth. Several papers also highlight the role of Federal Reserve interventions, such as extending dollar swap lines to ease dollar funding pressures and reducing deviations (Goldberg et al. 2011; Moessner and Allen 2013; Allen et al. 2017; Avdjiev et al. 2020; Cerutti and Zhou 2024). Broader factors like global financial linkages and investor sentiment matter as well. Ahelegbey and Ibhagui (2020) show that basis markets are highly interconnected during stress, supporting a regime-switching approach. Related studies by Ibhagui (2021b, 2021a, 2021d) find that inflation gaps, sovereign risk, equity returns, and investor sentiment all influence basis dynamics. Together, these studies depict a system in which shifts in the trade-weighted dollar instantly re-price hedging services, redistribute scarce balance-sheet capacity, and propagate through cross-border liquidity, which points precisely to the triangular link documented by Avdjiev et al. (2019).

A critical dimension often overlooked is regime dependence. Most research assumes a stable, linear relationship between the dollar and basis spreads. However, we show that this link is asymmetric and changes across different dollar regimes. The widely observed "dollar appreciates, basis widens" holds mainly in low-dollar regimes, when the dollar is relatively weak, that is, when the broad dollar index is below a certain threshold. In contrast, during high-dollar regimes, this relationship weakens or may even reverse, with further dollar strength linked to narrower basis spreads. This regime-dependent behavior supports intermediary asset pricing theories (Bernanke and Gertler 1989; Holmström and Tirole 1997; Brunnermeier and Pedersen 2009), which argue that arbitrage capacity and risk taking change in nonlinear ways along the global dollar cycle.

We illustrate in Figure 1 this regime-dependent relationship by plotting the broad dollar index (in red) against the average XCB (10-year maturity, in blue) for the G10 currencies. In some periods, a rising dollar coincides with a widening basis, while in others it aligns with a narrowing spread, suggesting nonlinear regime-dependent dynamics, which apply to both dollar-based and nondollar-based agents. We define dollar-based investors as those whose base currency is the USD but who invest in foreign assets and often face currency risk. The reverse is true for nondollar investors.

In traditional models (e.g., Avdjiev et al. 2019), the relationship between the US dollar and XCB swap spreads is typically framed as follows: when the dollar appreciates, the cost of hedging dollar liabilities for nondollar, foreign investors and institutions increases. This heightened cost leads to higher demand for dollar liquidity in the currency swap market, which subsequently widens basis spreads. This dynamic is often observed during periods of global financial stress when the dollar strengthens, and arbitrage constraints limit market participants' ability to neutralize CIP deviations (Du et al. 2018).

Unlike much of the existing literature that interprets basis movements primarily through the lens of borrower-side funding costs, we adopt an asset-side perspective in which regime-dependent shifts in global investors' currency-hedging activity, particularly by large institutional asset managers, are central to the dynamics of the XCB.

For nondollar agents taking dollar asset positions, some conventional narratives also implicitly rest on mean reversion, whereby dollar appreciation is expected to be followed by a depreciation, prompting these investors to hedge against a reversal. So a rising dollar strengthens hedging by these investors to protect themselves from potential dollar depreciation or appreciation of their currencies. This expected reversal drives up demand for dollar liquidity in the currency swap market and expands the basis.

This paper presents a regime-dependent perspective that refines the traditional narrative without the implicit assumption of dollar mean reversion. In what we term high-dollar regimes, when the dollar is already strong and expected to stay that way

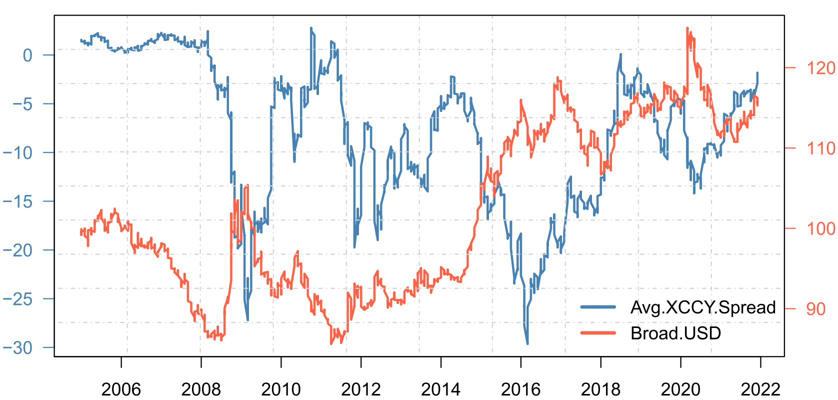

FIGURE 1 | Broad dollar index (in red) and average cross-currency basis (10-year maturity in blue). [Color figure can be viewed at wileyonlinelibrary.com]

or appreciate further, this traditional relationship weakens and, in some cases, reverses. As we demonstrate in this paper, when foreign investors expect the dollar to remain strong or appreciate further, they may reduce their hedging activity. Rather than entering costly foreign exchange (FX) swaps to hedge currency exposure, they may prefer to hold unhedged dollar-denominated assets. This shift reduces demand for dollar liquidity in the swap market, resulting in a stable or even tightening basis despite continued dollar strength.

We formalize this intuition through both a theoretical and empirical model in which investor hedging behavior is driven by expectations of future dollar movements. In low-dollar regimes, market participants typically expect the dollar to depreciate, leading to a reduction in hedging demand by dollar agents: In low-dollar regimes, market participants, for example, dollar-based investors holding foreign assets often expect the dollar to depreciate. If these positions are left unhedged, dollar depreciation boosts their returns in USD terms. As a result, such investors may reduce hedging activity, leading to lower dollar supply in the swap market and a more pronounced widening of basis spreads. To these investors, any dollar appreciation in these regimes is overshadowed by depreciation expectation, which exerts stronger negative or downward pressure on the basis, resulting in a more pronounced widening given lower dollar supply to swaps. In contrast, in high-dollar regimes, the expectation of continued dollar strength increases the incentive for dollar agents with foreign-currency asset positions to hedge. As a result, the swap market sees an increase in dollar supply due to increased hedging demand, which moderates the impact of dollar appreciation on the basis. The model thus predicts, and our empirical findings confirm, that basis spreads respond more strongly to dollar appreciations in low-dollar regimes than in high-dollar regimes.

To test this prediction, we employ the threshold regression methodology of Hansen (2000) on a panel of XCB swap spreads for G10 currency pairs. Using the broad US dollar index as the regime-defining threshold variable and controlling for both global and currency-specific factors, we find strong and statistically significant evidence of asymmetric basis responses across dollar regimes. We document evidence that shifts in hedging behavior correspond with observed changes in investor positioning and forward premium dynamics, lending empirical support to the mechanism proposed in our theoretical framework.

This paper contributes to several strands of international finance and asset pricing research. First, we build on the work of Bruno and Shin (2015), Du et al. (2018), and Avdjiev et al. (2018) by introducing regime-dependent, nonlinear dynamics into the relationship between dollar movements and CIP deviations. By explicitly modeling how regime shifts in the broad dollar influence the hedging decisions of large institutional asset managers, our analysis reframes the XCB as a barometer of global portfolio-hedging flows, not solely as an indicator of dollar funding stress. To our knowledge, no existing study has documented the regime-dependent asymmetry we uncover, namely, that the sensitivity of the XCB to dollar movements weakens or reverses in high-dollar regimes. This nonlinearity challenges standard arbitrage-based models and suggests a dominant role for asset-side hedging flows in shaping basis dynamics. Our framework shows that basis spreads do not respond uniformly to dollar appreciation, and that the strength and direction of this response depends critically on the dollar regime. Second, we contribute to the literature on strategic hedging and financial frictions (e.g., Y. Liao 2016), showing that shifts in hedging demand and supply, driven by expectations, volatility, and regime conditions, can amplify or dampen arbitrage conditions. By modeling intermediaries as agents who both demand and supply dollar hedges, we extend intermediary-based asset pricing theories (Gârleanu and Pedersen 2011; He and Krishnamurthy 2013; Adrian et al. 2014) into a global context. Finally, our findings provide a new interpretive lens for understanding the behavior of XCB spreads during episodes of global dollar tightening. In doing so, we extend the insights of Gabaix and Maggiori (2015) and G. Y. Liao and Zhang (2025), showing that arbitrage and hedging pressures respond nonlinearly to the dollar's international role across regimes, with important implications for monetary policy spillovers and financial stability.

The findings have practical implications for policymakers and market participants. They suggest that interpreting basis spreads as a uniform signal of funding stress may be misleading, especially during prolonged periods of dollar strength. Understanding the regime context of the dollar is crucial for evaluating risk transmission channels in global financial markets.

The remainder of the paper is structured as follows. Section 2 presents the theoretical model and the econometric methodology. Section 3 reports the empirical findings. Section 4 concludes and offers directions for future research.

2 | Methodology: Theoretical Framework and Empirical Strategy

To understand the asymmetric relationship between the US dollar and the XCB, we develop a regime-based framework where investors' hedging decisions depend on the dollar regime and expectations about the dollar's future trajectory. This gives rise to what we refer to as the "double life" of the dollar: the same appreciation can have opposite implications depending on whether the dollar is currently in a strong or weak regime. We begin with some relevant definitions.

Dollar agent (USD-based investor)

We define a *dollar agent* or *USD-based investor* as a dollar-denominated entity whose balance sheet is primarily in US dollars, but which has exposure, either through assets or liabilities, to positions denominated in foreign (non-USD) currencies. For example, a US pension fund that invests in euro-denominated sovereign bonds, or a US bank that issues loans in yen to Japanese corporates, would both qualify as dollar agents. In both cases, the entity's core funding, reporting, and accounting currency is the USD, but its cross-currency positions create exposure to exchange rate fluctuations and the need for hedging or funding in non-USD currencies. The hedging motive is such that a dollar agent with foreign-currency assets (liabilities) will seek to hedge against foreign-currency depreciation (appreciation).

Nondollar agent (foreign-currency-based investor)

We define a *nondollar agent* or *foreign-currency-based investor* as an entity whose balance sheet is primarily denominated in a non-USD currency, such as the euro, yen, pound sterling, or Australian dollar, but which has exposure, either through assets or liabilities, to positions denominated in US dollars. For example, a European insurance company holding USD-denominated corporate bonds, or a Japanese bank funding itself in US dollars to make loans in domestic yen, would both qualify as nondollar agents. In both cases, the entity's core funding, reporting, and accounting currency is a foreign currency, but its cross-currency positions create exposure to USD exchange rate movements and the need for hedging or funding in US dollars. The hedging motive is such that a nondollar agent with dollar assets (liabilities) will seek to hedge against USD depreciation (appreciation).

This classification reflects our focus on the asset side of balance sheets: the framework is built around how holders of foreign-currency assets manage FX risk, rather than around the cost of issuing and rolling over liabilities in foreign currency.

2.1 | Model Perspective: Asset-Side Hedging Rather Than Borrower Funding Costs

Our theoretical and empirical framework relies on the perspective of global investors managing currency risk on asset holdings, rather than on the funding cost dynamics faced by borrowers issuing liabilities in foreign currencies. We explicitly model two types of investors: USD-based investors holding foreign-currency assets, and non-USD-based investors holding USD-denominated assets. The key mechanism operates through changes in their hedging demand and supply in response to dollar regime shifts, which alter the net flow of USD in cross-currency swap markets. This focus on the asset side is distinct from the traditional borrower-centric interpretation of the XCB, which views basis movements primarily as changes in the cost of raising swapped foreign-currency funding. While both perspectives affect swap market conditions, our results, presented in the latter part of this paper, especially the maturity profile and regime asymmetry, are more consistent with portfolio-hedging flows by large institutional asset managers than with funding stress.

In what follows, we focus on the asset side in which the agents are investors.

2.2 | Investor Types and Dollar Regimes

We distinguish two representative agents in the market. The first is the USD-based investor, allocating capital to foreign assets (e.g., euro-denominated bonds), who hedges FX risk by supplying dollars in the swap market. The second is the non-dollar (EUR-based) investor, allocating capital to dollar-denominated assets, who hedges FX risk by demanding dollars in the swap market and supplying euros in return.

We assume the existence of two regimes in the currency market: a low-dollar regime and a high-dollar regime. In the low-dollar regime, the USD is perceived as weak and expected to depreciate, whereas in the high-dollar regime, it is viewed as strong and expected to appreciate. In both cases, agents' hedging behavior is shaped not only by the prevailing level of the dollar but also by expectations regarding its future trajectory. These expectations determine whether a given appreciation of the dollar prompts increased or decreased hedging activity, thereby inducing regime-dependent effects on the basis spread.

To motivate the analysis, Figure 2 illustrates the mechanism by which expectations about future dollar movements influence hedging behavior across regimes. It highlights how differing reactions between USD-based and non-USD-based investors generate asymmetric pressures on the basis, depending on whether the dollar is in a strong or weak regime.

2.2.1 | *USD-Based Investor*

In a low-dollar regime: If the dollar is weak and expected to remain so, the USD-based investor is likely to be hesitant or even unwilling to hedge FX risk when investing in European assets. A temporary dollar appreciation is interpreted as a short-term fluctuation rather than a structural shift in the weak-dollar regime. The investor prefers to remain unhedged, anticipating future dollar depreciation. This results in reduced demand for hedging and lowers the supply of USD in the swap market in exchange for the foreign currency, the euro.

In a high-dollar regime: If the dollar is strong and expected to stay strong, the USD-based investor becomes more inclined to hedge FX risk when taking positions in foreign fixed income markets. In this scenario, the dollar's appreciation is seen as reinforcing the prevailing trend, prompting investors to hedge

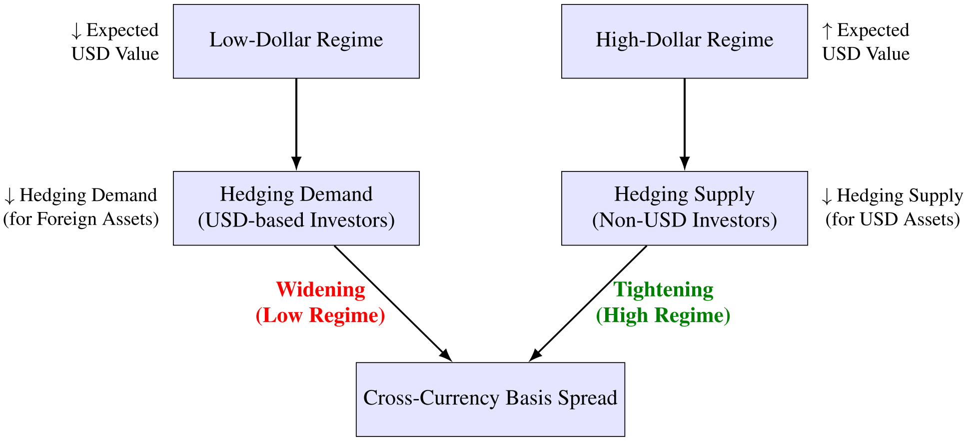

FIGURE 2 | Regime-dependent effects of dollar expectations on cross-currency basis spreads. [Color figure can be viewed at wileyonlinelibrary.com]

to preserve returns. This leads to an increase in hedging demand, or the supply of USD in the swap market in exchange for the euro.

2.2.2 | *EUR-Based Investor*

In a low-dollar regime: If the dollar is weak and will generally remain weak, the EUR-based investor taking dollar asset positions is more likely to hedge the FX risk through the cross-currency swap market. A brief dollar appreciation is viewed as temporary, prompting the agent to protect against future dollar depreciation. This raises the hedging supply, that is, the supply of euros in demand for dollars in the swap market.

In a high-dollar regime: If the dollar is perceived as strong and expected to remain strong, the EUR-based investor is less inclined to hedge. In this case, appreciation of the dollar aligns with their expectations, making them exchange euros for dollars in the spot market and going unhedged, thereby lowering demand for dollars in the swap market. This leads to a contraction in hedging supply and a lower demand for USD via the cross-currency swap market.

2.3 | Demand for Hedging

We now formalize the regime-based hedging behavior in terms of hedging demand. We assume agents adjust their hedging activity based on current dollar values and future expectations of dollar movements within each regime. Let $\theta \in \{l, h\}$ denote the prevailing dollar regime, where l and h correspond to low- and high-dollar regimes, respectively. We model the demand for hedging, denoted by HD_t, as a linear function of the current dollar value, D_t, and the regime-dependent expected future value, $\mathbb{E}_\theta[D_{t+1}]$:

$$\mathrm{HD}_t = \alpha_{\mathrm{d}}^{\theta} + \beta_{\mathrm{d}}^{\theta} D_t + \gamma_{\mathrm{d}}^{\theta} \mathbb{E}_\theta[D_{t+1}] + U_{\mathrm{d},t}, \tag{1}$$

where $\alpha_{\mathrm{d}}^{\theta}$ is an intercept, $\beta_{\mathrm{d}}^{\theta}$ and $\gamma_{\mathrm{d}}^{\theta}$ capture sensitivities to the current dollar and its expected future dollar value, respectively, and $U_{\mathrm{d},t}$ captures other influences on hedging demand.

For simplicity, we can take the expectation $\mathbb{E}_\theta[D_{t+1}]$ to be the long-run value of USD in each regime θ. Thus, assuming $\mathbb{E}_\theta[D_{t+1}] = \bar{D}_\theta$, we obtain

$$\mathrm{HD}_t = \alpha_{\mathrm{d}}^{\theta} + \beta_{\mathrm{d}}^{\theta} D_t + \gamma_{\mathrm{d}}^{\theta} \bar{D}_\theta + U_{\mathrm{d},t}. \tag{2}$$

We define a threshold dollar level $\mathcal{D}_\tau$ that separates the two regimes. Specifically, if the current dollar level D_t falls below $\mathcal{D}_\tau$, the market is considered to be in the low-dollar regime ($\theta = l$); if $D_t \geq \mathcal{D}_\tau$, the market is in the high-dollar regime ($\theta = h$). Thus, HD_t becomes

$$\mathrm{HD}_t = \begin{cases} \alpha_{\mathrm{d}}^{l} + \beta_{\mathrm{d}}^{l} D_t + \gamma_{\mathrm{d}}^{l} \bar{D}_l + U_{\mathrm{d},t} & \text{if } D_t < \mathcal{D}_\tau, \\ \alpha_{\mathrm{d}}^{h} + \beta_{\mathrm{d}}^{h} D_t + \gamma_{\mathrm{d}}^{h} \bar{D}_h + U_{\mathrm{d},t} & \text{if } D_t \geq \mathcal{D}_\tau. \end{cases} \tag{3}$$

In the low-dollar regime, agents expect the dollar to remain weak and to gradually converge toward the long-run expectation $\bar{D}_l$. As a result, dollar agents' positioning in foreign assets has little or no incentive to hedge FX risk when taking positions in EUR assets. A temporary dollar appreciation is seen as insignificant as agents anticipate future depreciation. This results in a reduction in hedging demand, where β_{d}^{l} is small, zero, or even negative.

In contrast, during the high-dollar regime, agents expect the dollar to remain strong and to gradually converge to a high value $\bar{D}_h$. In this case, an appreciation of the dollar strengthens their expectation of further strength, leading to a greater incentive to hedge the risk of FX when investing in EUR assets. This significantly increases hedging demand as the dollar appreciates, with β_{d}^{h} being large, moderately large, or at worst zero, but never negative.

This asymmetry implies that hedging demand responds more strongly to movements in the dollar when it is in the high regime. Consistent with our narrative, we assume $\beta_{\mathrm{d}}^{h} > \beta_{\mathrm{d}}^{l}$ and $\gamma_{\mathrm{d}}^{h} > \gamma_{\mathrm{d}}^{l}$, indicating that agents' sensitivity to both the current dollar level and its expected future value is greater when the dollar is strong than when it is weak.

2.4 | XCB Swap Spread and Hedging Demand

It is well established that hedging demand directly affects the XCB swap spreads (Avdjiev et al. 2019; Du et al. 2018; Baba and Packer 2009). Specifically, an increase in hedging demand by USD-based investors leads to an excess supply of dollars in the swap market, which in turn tightens the basis spread, regardless of the prevailing regime.

Let XCB_t denote the XCB swap spread at time t. We model it as a linear function of hedging demand HD_t, with regime-dependent sensitivity:

$$\mathrm{XCB}_t = \delta_{\mathrm{d}}^{\theta} + \psi_{\mathrm{d}}^{\theta} \mathrm{HD}_t + V_{\mathrm{d},t}, \tag{4}$$

where $\delta_{\mathrm{d}}^{\theta}$ is a regime-specific intercept, $\psi_{\mathrm{d}}^{\theta} > 0$ reflects the tightening effect of increased hedging demand, and $V_{\mathrm{d},t}$ captures regime-invariant factors influencing the basis. Since the effect of hedging demand is assumed to be consistent across regimes, we set $\delta_{\mathrm{d}}^{\theta} = \delta_{\mathrm{d}}$ and $\psi_{\mathrm{d}}^{\theta} = \psi_{\mathrm{d}} > 0$ for all θ. The model then simplifies to

$$\mathrm{XCB}_t = \delta_{\mathrm{d}} + \psi_{\mathrm{d}} \mathrm{HD}_t + V_{\mathrm{d},t}. \tag{5}$$

2.5 | Supply of Hedging

We consider the EUR-based agent as the supplier of hedging on the counterparty side of the transaction. The agent requires USD and obtains it through the currency swap market by supplying euros in exchange for dollars.

As with hedging demand, we assume that the agent's decision to supply hedging is influenced by the current dollar value, D_t, and the expected future value, $\mathbb{E}_\theta[D_{t+1}]$, conditional on the prevailing dollar regime. Formally, the hedging supply denoted by HS_t is given by

$$\mathrm{HS}_t = \alpha_{\mathrm{s}}^{\theta} + \beta_{\mathrm{s}}^{\theta} D_t + \gamma_{\mathrm{s}}^{\theta} \mathbb{E}_\theta[D_{t+1}] + U_{\mathrm{s},t}, \tag{6}$$

where $\alpha_{\mathrm{s}}^{\theta}$ is a constant term, $\beta_{\mathrm{s}}^{\theta}$ and $\gamma_{\mathrm{s}}^{\theta}$ capture regime-specific sensitivities to the current and expected dollar values, respectively, and $U_{\mathrm{s},t}$ accounts for other supply-side factors.

Assuming that expectations align with long-run regime-specific dollar values, that is, we simplify the expression to

$$\mathrm{HS}_t = \alpha_s^\theta + \beta_s^\theta D_t + \gamma_s^\theta \bar{D}_\theta + U_{s,t}. \tag{7}$$

Using the regime threshold dollar value $\mathcal{D}_\tau$, the supply function becomes

$$\mathrm{HS}_t = \begin{cases} \alpha_s^l + \beta_s^l D_t + \gamma_s^l \bar{D}_l + U_{s,t} & \text{if } D_t < \mathcal{D}_\tau, \\ \alpha_s^h + \beta_s^h D_t + \gamma_s^h \bar{D}_h + U_{s,t} & \text{if } D_t \geq \mathcal{D}_\tau. \end{cases} \tag{8}$$

2.6 | XCB Swap Spread and Hedging Supply

From the EUR-based agent's perspective, a rise in hedging supply means supplying euros via the swap market to demand USD, an action that increases hedging supply. In general, a rise in hedging supply, which reflects greater demand for USD through the swap market by swapping euros, will tend to widen the XCB swap spread.

Let HS_t denote the EUR-based agent's hedging supply at time t. On the supply side, we model the basis spread XCB_t as a linear function of HS_t, with regime-dependent sensitivity:

$$\mathrm{XCB}_t = \delta_s^\theta + \psi_s^\theta \mathrm{HS}_t + V_{s,t}, \tag{9}$$

where δ_s^θ is a regime-specific intercept, and $\psi_s^\theta < 0$ captures the negative relationship between hedging supply and the basis. The term $V_{s,t}$ represents other factors affecting the basis, assumed invariant across regimes.

Since the relationship between hedging supply and the basis is preserved across regimes, we expect the marginal effect of HS_t on XCB_t to be negative in both regimes. That is, we set $\delta_s^\theta = \delta_s$ and $\psi_s^\theta = \psi_s < 0$ for all θ. This yields a regime-invariant supply-side specification:

$$\mathrm{XCB}_t = \delta_s + \psi_s \mathrm{HS}_t + V_{s,t}. \tag{10}$$

2.7 | XCB Swap Spread and Net Hedging Demand

We assume that hedging demand and hedging supply exert symmetric but opposite effects on the XCB swap spread. Specifically, we consider a constant pass-through coefficient $\psi > 0$ that is common across regimes, while allowing hedging demand and supply themselves to vary by regime. This assumption reflects a stable market sensitivity to net hedging pressure, with regime-dependent shifts arising from changes in investor behavior rather than from changes in the pricing mechanism.

Under this assumption, the XCB swap spread can be modeled as

$$\mathrm{XCB}_t = \delta + \psi(\mathrm{HD}_t - \mathrm{HS}_t) + V_t, \tag{11}$$

where δ is a constant, and V_t is another market factor assumed to be regime-invariant.

This formulation implies that the basis responds directly to regime-varying net hedging pressure; that is, an increase in net hedging demand tightens the basis (i.e., reduces its magnitude), while an increase in net hedging supply leads to a widening of the basis.

Building on the theoretical foundation established in Equations (2)–(11), we now present the following core implications in the form of formal propositions:

Proposition 1. *The XCB widens more significantly in the low-dollar regime than in the high-dollar regime for the same appreciation in the US dollar. That is, for a given positive change in ΔD_t, the dollar level*

$$\Delta\mathrm{XCB}_t^l < \Delta\mathrm{XCB}_t^h. \tag{12}$$

See Section A.1 for a formal derivation.

As documented in Proposition 1, our regime-dependent findings are inconsistent with the implicit constant-slope predictions in the literature, for example, Avdjiev et al. (2019), suggesting that funding-based explanations alone cannot account for the dynamics of the basis. We evidence this in the empirical section.

Proposition 2. *As the probability of transitioning into the high-dollar regime increases, the XCB is expected to tighten accordingly. That is,*

$$\frac{\partial \mathbb{E}\left[\mathrm{XCB}_t\right]}{\partial \mathbb{P}_t(h)} > 0, \tag{13}$$

where $\mathbb{P}_t(h)$ denotes the probability of being in the high-dollar regime at time t, and $\mathbb{E}\left[\mathrm{XCB}_t\right]$ is the expected basis conditional on regime probabilities. See Section A.2.

2.8 | Econometric Methodology

To test our theoretical model and provide empirical evidence for our main proposition, we estimate a threshold regression following Hansen (2000). This approach allows the effect of dollar movements on basis swap spreads to vary across regimes, depending on whether the dollar is relatively strong or weak. Standard linear models, like those employed so far in the literature, implicitly assume a constant relationship between the dollar and basis swap spreads. However, theory suggests that this effect may change with the regime level of the dollar. For example, when the dollar is in a weak regime, hedging demand may increase from nondollar agents taking dollar asset positions due to expectations of dollar weakness, leading to wider basis spreads following a contemporaneous dollar appreciation. When the dollar is in a strong regime, the same appreciation may have a muted or opposite effect on the basis.

To capture the regime-dependent dynamics, we specify a model that splits the sample based on the level of the USD index. The estimated threshold $\mathcal{D}_\tau$ defines these regimes:

$$\Delta\mathrm{XCB}_t = \beta_0 + \beta_1 \Delta D_t \cdot \mathbf{1}(D_t < \mathcal{D}_\tau) + \beta_2 \Delta D_t \cdot \mathbf{1}(D_t \geq \mathcal{D}_\tau) + \delta' \mathrm{CONTR}_t + U_t, \tag{14}$$

where $\Delta\mathrm{XCB}_t$ denotes the weekly change in the basis spread, ΔD_t is the weekly change in the USD index, and $\mathbf{1}(\cdot)$ is the indicator function. The vector of control variables, CONTR_t, includes financial market factors such as the volatility index (VIX), along with currency-specific variables, like, implied volatility, risk reversal, yield spread, and term spread. The key hypothesis is that $\beta_1 < \beta_2$, implying that XCB widens more in response to dollar appreciation when the dollar is in the low (weak) regime than when it is in the high (strong) regime.

3 | Empirical Results

We investigate the asymmetric impact of dollar appreciation on XCB swap spreads across different dollar regimes. Specifically, we test whether the sensitivity of basis spreads to dollar movements varies between periods of dollar strength and dollar weakness, consistent with the regime-switching framework developed in the theoretical section.

3.1 | Data Description

Our empirical analysis relies on a weekly panel data set from the Bloomberg Terminal, covering the period from January 2005 to December 2021. The sample includes XCB swap spreads for the G10 currencies: EUR, JPY, GBP, AUD, NZD, CAD, DKK, CHF, SEK, and NOK, quoted against the US dollar. To capture both short-, belly-, and long-term hedging dynamics, we analyze swap maturities ranging from 1 to 30 years.

As a measure of the dollar's relative strength, we use the Broad US dollar index as the threshold variable for regime classification. We define periods of high- and low-dollar strength based on this index, allowing us to test for asymmetric responses in basis spreads to dollar movements under different dollar regimes.

Following Avdjiev et al. (2019), we include several controls to account for global risk sentiment and FX market conditions. These include changes in the S&P 500 implied volatility index, ΔVIX_t, to capture variations in global risk sentiment. To account for developments in FX markets, we include the change in the implied volatility of FX options, ΔIV_t, which reflects shifts in the risk-neutral volatility of exchange rate movements. Additionally, the change in the 25-delta FX option risk reversal, ΔRR_t, is included to capture variations in the cost of hedging against large currency depreciations, or tail risk, in FX markets. We further control for bond market conditions by including two additional indicators. First, we include the change in the sovereign yield spread, defined as the difference between the 10-year government bond yield in country i and the 10-year US Treasury yield: $\Delta\text{YSPRD}_t = \Delta\left(y_t - y_t^{\text{US}}\right)$. Second, we include the change in the term spread differential, which measures the relative steepness of the yield curves between country i and the United States: $\Delta\text{TSPRD}_t = \Delta\left(ts_t - ts_t^{\text{US}}\right)$. These controls help account for differences in monetary policy stances and interest rate paths.

We restrict our sample to the pre-London Interbank Offered Rate (pre-LIBOR) transition period to avoid distortions arising from benchmark reform. Since 2021, XCB quotes increasingly reflect alternative reference rates, such as the Secured Overnight Financing Rate. Including post-2021 data would introduce structural breaks due to changes in benchmark conventions, complicating the interpretation of basis spread dynamics. Limiting the sample to the LIBOR era ensures consistency and comparability over time.

3.2 | Dollar Movements and XCB Swap Spreads

Dollar fluctuations play a crucial role in shaping global liquidity conditions and the functioning of the currency market. We explore how movements in the US dollar influence XCB swap spreads across the G10 currencies. The basis spreads reflect the cost of swapping foreign currency for US dollars in the funding markets and are sensitive to shifts in dollar strength. Figure 3

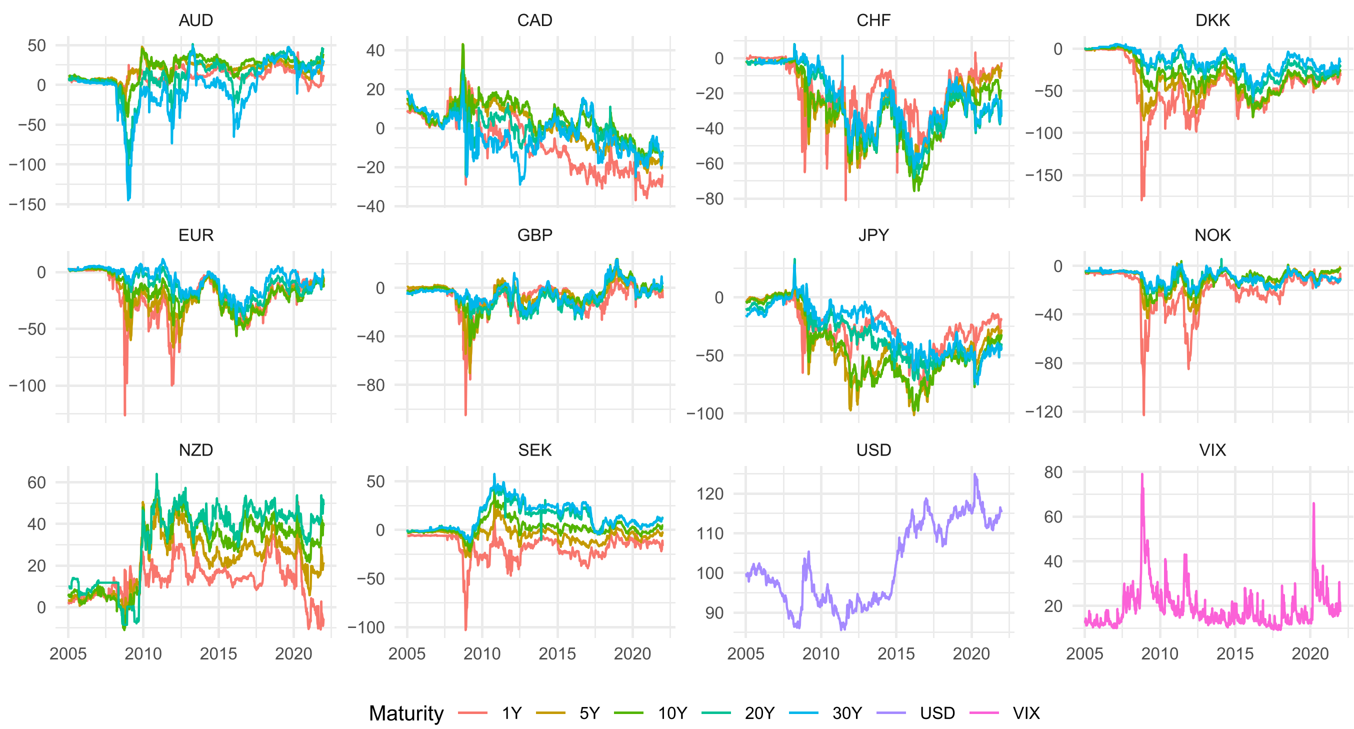

FIGURE 3 | Time series of cross-currency basis swap spreads across maturities, with the USD and VIX. VIX, volatility index; Y, year. [Color figure can be viewed at wileyonlinelibrary.com]

TABLE 1 | Mean and standard deviation (in parentheses) of G10 cross-currency basis swap spreads (in basis points) across maturities, with the USD and VIX.

XCB	1Y	5Y	10Y	20Y	30Y
AUD	10.84 (8.54)	19.24 (9.91)	21.14 (14.69)	10.96 (23.75)	−3.03 (30.24)
CAD	−8.91 (13.74)	0.72 (10.94)	4.29 (9.33)	0.63 (8.15)	−3.76 (9.77)
CHF	−19.50 (15.51)	−24.93 (17.73)	−28.42 (19.51)	−26.03 (18.15)	−23.66 (16.82)
DKK	−45.18 (29.35)	−36.27 (21.86)	−30.57 (19.24)	−19.36 (14.76)	−14.51 (12.49)
EUR	−21.44 (19.07)	−20.21 (15.73)	−17.33 (13.76)	−10.73 (11.33)	−6.77 (10.41)
GBP	−8.44 (12.35)	−5.83 (11.17)	−5.68 (10.45)	−7.32 (8.98)	−4.30 (8.22)
JPY	−26.52 (18.49)	−42.32 (27.95)	−42.69 (27.89)	−32.66 (21.43)	−27.02 (20.24)
NOK	−20.34 (16.42)	−11.69 (8.89)	−10.00 (6.88)	−10.10 (5.52)	−9.40 (5.22)
NZD	12.99 (8.94)	22.20 (12.74)	28.06 (16.12)	32.77 (17.69)	—
SEK	−17.77 (12.55)	−5.03 (7.21)	2.50 (8.33)	11.69 (12.33)	14.48 (14.09)
USD	102.07 (10.23)	—	—	—	—
VIX	18.95 (9.22)	—	—	—	—

Abbreviations: VIX, volatility index; XCB, cross-currency basis; Y, year.

illustrates the time series dynamics of basis swap spreads across selected maturities, along with movements in the broad US dollar index and the VIX. Notably, episodes of sharp dollar appreciation coincide with significant widening or compression of the basis, depending on the maturity and currency involved. These shifts point to asymmetric pressures in funding markets and underline the importance of dollar liquidity during periods of stress.

Descriptive statistics reported in Table 1 further confirm substantial cross-sectional heterogeneity, suggesting that both maturity structure and currency-specific factors condition the transmission of dollar movements to basis swap spreads.

3.2.1 | *Rolling Correlation Stability and Sign-Switching*

We examine the stability of the correlation between USD movements and XCB swap spreads across time and maturity dimensions. Two matrices are computed for this purpose: the number of rolling windows available for each currency–maturity pair, and the number of sign switches in the rolling correlation coefficients. The latter captures the frequency of directional changes in the relationship, serving as a proxy for regime shifts in underlying dynamics.

The matrix of rolling window counts indicates that most currency–maturity pairs have a full set of observations (836 windows), reflecting high data availability and reliable inference over the sample. However, there are exceptions. Certain long-maturity tenors, such as NZD 30Y, exhibit missing data, rendering them unusable, while others, like, AUD 30Y, contain slightly fewer windows due to intermittent data gaps.

Figure 4 presents the rolling correlations between the USD and XCB at the 1Y, 10Y, and 20Y maturities. These correlations are calculated over 52-week rolling windows to capture evolving patterns in comovement.

To quantify the instability of these correlations, we compute the frequency with which their sign changes over successive windows. Specifically, for each currency i and maturity j, the number of sign switches is defined as

$$\text{Switches}_{ij} = \sum_{k=2}^{n_w} \mathbb{I}\left[\text{sign}\left(C_{ij}^{k}\right) \neq \text{sign}\left(C_{ij}^{k-1}\right)\right],$$

where C_{ij}^{k} is the rolling correlation coefficient at window k, and $\mathbb{I}[\cdot]$ is the indicator function. This allows us to isolate periods of directional reversal in the correlation structure.

Table 2 provides a summary of the number of sign switches and the number of rolling correlation windows for each currency and tenor. Some currency–maturity pairs exhibit remarkable stability. For instance, EUR 5Y and DKK 5Y each register only 12 sign switches, indicating a consistently positive or negative relationship with the USD throughout the sample. These patterns support the use of standard linear dependence models that assume a stable direction of comovement.

In contrast, other pairs show significant instability. AUD 20Y, SEK 20Y, and CHF 20Y are among the most volatile, with sign-switching frequencies ranging from 24 to 29. This frequent flipping of correlation signs suggests that these relationships are more sensitive to changes in global liquidity, macroeconomic regimes, or monetary policy expectations. For these unstable cases, linear modeling is likely insufficient. Regime-switching or threshold models would be more suitable for capturing the state-dependent nature of their dynamics.

Furthermore, there is clear evidence of heterogeneity across currencies. Core currencies such as EUR, GBP, and JPY tend to display more stable correlation patterns across maturities. In contrast, currencies such as NZD and AUD exhibit more erratic behavior, especially at the long end of the curve. These findings highlight the importance of tailoring modeling approaches to both currency-specific features and maturity profiles.

3.3 | Regime-Dependent Dollar Effects on Basis Spreads

This section presents empirical evidence on whether the relationship between changes in the US dollar and basis spreads (XCB) varies across dollar regimes. Specifically, we

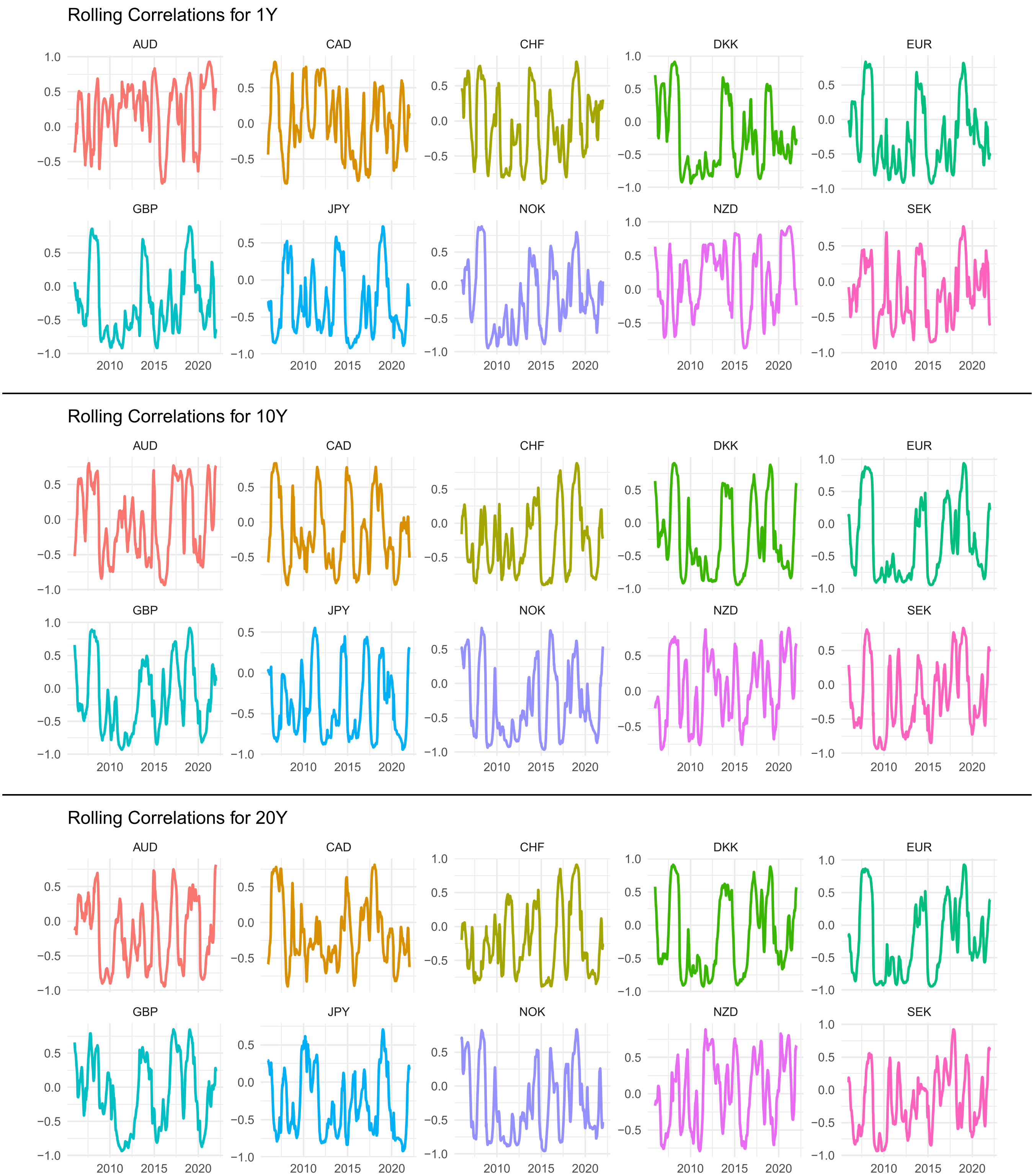

FIGURE 4 | Rolling correlations between USD and XCB at 1Y, 10Y, and 20Y maturities. XCB, cross-currency basis; Y, year. [Color figure can be viewed at wileyonlinelibrary.com]

assess whether basis responses differ between periods of relative dollar weakness and strength. To formally test for asymmetric behavior, we estimate a threshold regression model. The results, summarized in Tables 3–7, span the G10 currencies across maturities of 1, 5, 10, 20, and 30 years. Across all tenors, we find that the widening impact of dollar appreciation on basis spreads is consistently stronger in low-dollar regimes. This supports the view that funding pressures and hedging incentives vary systematically with the broader dollar regimes.

TABLE 2 | Sign-switching frequencies and number of valid rolling correlation windows across maturities and currencies. Sign switches indicate the number of times the sign of the correlation between USD and XCB changes direction within the rolling window analysis.

	Sign switches					Number of rolling correlations				
XCB	1Y	5Y	10Y	20Y	30Y	10Y	1Y	20Y	30Y	5Y
AUD	23	21	21	29	18	836	836	836	804	836
CAD	25	19	18	20	24	836	836	836	836	836
CHF	22	12	20	24	19	836	836	836	809	836
DKK	13	12	16	14	11	836	836	836	809	836
EUR	16	12	16	15	13	836	836	836	836	836
GBP	17	17	12	20	24	836	836	836	836	836
JPY	14	16	16	18	20	836	836	836	836	836
NOK	20	14	16	21	24	836	836	836	834	836
NZD	21	21	23	23	0	836	836	820	0	836
SEK	24	18	20	26	19	836	836	836	809	836

Abbreviations: XCB, cross-currency basis; Y, year.

TABLE 3 | USD regime effects on 1-year cross-currency basis (XCB) swap responses.

	EUR	JPY	GBP	AUD	NZD
USD_{τ}	(97.72, 103.49)	112.64	(95.29, 104.11)	—	—
USD_{Low}	−0.60	−0.70***	−0.25	—	—
USD_{Med}	−5.32***	—	−2.16***	—	—
USD_{High}	0.16	0.87***	0.01	0.08	−0.02
ΔVIX	−0.06	−0.25***	−0.08**	−0.09***	−0.02
ΔRR	−3.29***	0.78**	−1.05**	−1.23***	−0.30
ΔIV	−3.78***	0.38	−0.75***	−1.08***	−0.08
ΔYSPRD	3.68	2.03	4.68***	8.37***	2.76***
ΔTSPRD	−6.13***	0.15	−4.00***	−6.14***	—
Adjusted R^2	0.2974	0.1433	0.1301	0.1709	0.0094
	CAD	**DKK**	**CHF**	**SEK**	**NOK**
USD_{τ}	—	105.13	—	(91.04, 104.02)	101.07
USD_{Low}	—	−1.94***	—	0.16	−1.45***
USD_{Med}	—	—	—	−1.43***	—
USD_{High}	−0.04	0.30	−0.01	0.36*	0.46***
ΔVIX	0.06*	−0.12***	−0.16***	−0.09***	−0.03
ΔRR	−0.10	−1.14**	1.24*	0.23	1.33***
ΔIV	−0.50***	−0.67***	−1.06***	−0.77***	−0.66***
ΔYSPRD	−1.38	9.52***	9.18***	3.77***	3.53***
ΔTSPRD	−4.38***	−9.24***	−10.09***	−2.35**	—
Adjusted R^2	0.0210	0.1847	0.1205	0.1281	0.1070

Note: USD_{τ} indicates the estimated threshold(s) of the broad USD index used to identify regime transitions. For some currencies, a range (a, b) is reported, reflecting two thresholds that divide the sample into high, intermediate, and low USD regimes. For currencies with a single threshold, the sample is divided into high- and low-USD regimes. USD_{Low}, USD_{Med}, and USD_{High} denote the estimated coefficients for the low, intermediate, and high USD regimes, respectively. Control variables include: ΔVIX, change in the volatility index; ΔRR, change in risk reversal; ΔIV, change in implied volatility; ΔYSPRD, change in yield spread; ΔTSPRD, change in term spread. A dash (—) indicates no coefficient estimated for the corresponding regime.
$^{*}p < 0.10$; $^{**}p < 0.05$; $^{***}p < 0.01$.

3.3.1 | One-Year XCB Swap Spreads

We report the results for the 1-year maturity XCB in Table 3. As shown in the table, the broad dollar threshold values (USD_{τ}) for the EUR, JPY, GBP, DKK, SEK, and NOK are statistically significant. For currencies where USD_{τ} is reported as a range (a, b), this indicates two thresholds, dividing the sample into high-, intermediate-, and low-USD regimes, while a single threshold splits the sample into high- and low-USD regimes. All estimated thresholds are significant and confirm the presence of regime-dependent relationships between the broad dollar and XCB at the 1-year horizon.

In the low- and intermediate-USD regimes, the estimated coefficients are generally negative and statistically significant, indicating that a USD appreciation leads to a widening of the XCB spreads. This aligns with the theoretical expectation that in a low-USD regime, the demand (supply) for USD funding increases (decreases), leading to a higher premium for borrowing in USD via cross-currency swaps, thereby widening the basis.

However, in the high-USD regime, the coefficients are either insignificant, less negative, or even significantly positive, indicating a diminished impact of USD appreciation on XCB spreads. This supports the hypothesis that the sensitivity of XCB spreads to USD movements is asymmetric, being more pronounced in the low-USD regime.

3.3.2 | *Five-Year XCB Swap Spreads*

Table 4 presents the corresponding estimates for the 5-year maturity. While the broad patterns remain consistent with the 1-year maturity, some notable differences emerge. Except for NZD, the threshold values for all other currencies remain statistically significant, highlighting the presence of regime-dependent relationships between changes in the broad dollar and XCB in the 5-year maturity.

The estimated coefficients in the low- and intermediate-dollar regimes for most currencies are negative and statistically significant. This suggests that, as in the 1-year case, USD appreciation leads to a widening of the XCB. This is consistent with the theory that USD funding becomes more expensive when the dollar strengthens in a low-USD environment.

In contrast, the high-USD regime presents a more complex picture. While some currencies show insignificant or less negative coefficients, others show positive and statistically significant coefficients. For instance, the coefficient for JPY is positive (0.66) in the high-USD regime, suggesting that in times of a strong USD, the XCB narrows for JPY.

This observation contradicts the expectation that a stronger dollar should lead to tighter USD funding. The fact that some currencies exhibit a positive relationship in the high-USD regime suggests that the demand for USD via swaps may decline, or the demand for other currencies may rise, thereby tightening the basis. This underscores that not all regimes elicit the same response in basis spreads, reinforcing the hypothesis of asymmetric effects.

3.3.3 | *Ten-Year XCB Swap Spreads*

Table 5 shows results for the 10-year maturity, reinforcing earlier findings and highlighting the persistence of regime-dependent dynamics at intermediate horizons. Except for CAD, NZD, and NOK, the threshold values for all other currencies are statistically significant. This continues to demonstrate the regime-dependent behavior of XCB spreads in response to dollar movements.

TABLE 4 | USD regime effects on 5-year XCB basis swap responses.

	EUR	**JPY**	**GBP**	**AUD**	**NZD**
USD_τ	(97.72, 105.39)	111.77	105.58	(97.36, 102.10)	—
USD_{Low}	−1.06***	−0.72***	−1.03***	0.10	—
USD_{Med}	−2.18***	—	—	−1.41***	—
USD_{High}	0.33**	0.66***	0.12	0.26*	0.09
ΔVIX	−0.04	−0.04	−0.07***	−0.04	−0.08***
ΔRR	−0.53	0.26	−0.44	−1.25***	0.28***
ΔIV	−1.23***	−0.19	−0.40***	−1.13***	0.23***
ΔYSPRD	1.50	2.11	2.26**	5.80***	1.55***
ΔTSPRD	0.20	−1.72	−2.25**	−6.07***	
Adjusted R^2	0.2672	0.0499	0.1347	0.2490	0.0206
	CAD	**DKK**	**CHF**	**SEK**	**NOK**
USD_τ	(100.97, 111.09)	111.76	105.45	105.12	104.84
USD_{Low}	0.37***	−0.50***	−0.75***	−0.37***	−0.51***
USD_{Med}	−0.69***	—	—	—	—
USD_{High}	0.17	0.37**	−0.02	0.22*	0.01
ΔVIX	0.02	−0.03	−0.03	−0.04**	0.003
ΔRR	−1.00**	0.55	1.30	−0.31	0.62***
ΔIV	−0.50***	−0.88***	−0.23**	−0.28***	−0.27***
ΔYSPRD	1.98*	2.87**	2.03**	1.00	0.70
ΔTSPRD	−4.46***	−6.12***	−1.96**	−0.96	
Adjusted R^2	0.0916	0.0952	0.0688	0.0693	0.0503

Abbreviations: IV, implied volatility; RR, risk reversal; VIX, volatility index; XCB, cross-currency basis; YSPRD, yield spread.
*$p < 0.10$; **$p < 0.05$; ***$p < 0.01$.

TABLE 5 | USD regime effects on 10-year XCB basis swap responses.

	EUR	JPY	GBP	AUD	NZD
USD_{τ}	111.13	111.78	95.37	91.47	—
USD_{Low}	−0.55***	−0.66***	−0.89***	−1.00***	—
USD_{Med}	—	—	—	—	—
USD_{High}	0.62***	0.77***	−0.11	0.14	0.16*
ΔVIX	−0.02	0.02	−0.30	−0.01	−0.07***
ΔRR	−0.49*	0.47	−0.59**	−0.64**	0.18
ΔIV	−0.75***	0.03	−0.25**	−1.05***	0.15
ΔYSPRD	1.90**	1.57	0.98	3.54***	1.24**
ΔTSPRD	0.04	−1.82	−0.19	−2.83***	
Adjusted R^2	0.1694	0.0338	0.0532	0.1538	0.0117
	CAD	**DKK**	**CHF**	**SEK**	**NOK**
USD_{τ}	—	100.64	111.77	(96.30, 104.85)	—
USD_{Low}	—	−0.63***	−0.58***	−0.07	—
USD_{Med}	—	—	—	−0.69***	—
USD_{High}	0.01	0.13	0.19	0.22**	−0.25***
ΔVIX	0.08***	0.01	−0.04*	0.01	0.003
ΔRR	0.88*	0.73**	0.88***	−0.23	0.61***
ΔIV	−0.73***	−0.68***	−0.18*	−0.39***	−0.23***
ΔYSPRD	0.49	1.75	1.21	0.75	0.16
ΔTSPRD	−5.77***	−3.88***	−1.93**	−0.60	
Adjusted R^2	0.0500	0.0675	0.0610	0.0785	0.0257

Abbreviations: IV, implied volatility; RR, risk reversal; VIX, volatility index; XCB, cross-currency basis; YSPRD, yield spread.
*$p < 0.10$; **$p < 0.05$; ***$p < 0.01$.

In the low-dollar regime, the effect of a strengthening dollar on the basis is generally negative and statistically significant. For instance, the EUR exhibits a significant negative coefficient, reinforcing the view that under weaker dollar conditions, demand for USD liquidity intensifies, thereby widening the basis.

In contrast, in the high-dollar regime, this relationship breaks down. For several currencies, including the EUR, JPY, and SEK, the basis tightens, rather than widens, in response to further dollar appreciation. For others, such as the GBP, AUD, CAD, DKK, and CHF, the response becomes statistically insignificant, indicating that the well-documented basis widening in response to dollar strength no longer holds. Even where the negative relationship persists (e.g., the GBP), its magnitude declines sharply, in some cases by more than fivefold.

The failure of basis spreads to widen under elevated dollar conditions highlights a central insight: once the dollar is already strong, appreciation has a muted, or even reversed, effect on basis spreads. These findings reveal nonlinear, regime-dependent dynamics, suggesting that market participants, funding desks, and policymakers must recalibrate their expectations in high-dollar environments. What typically signals stress and widening in normal conditions may vanish, or flip direction, once the dollar breaches critical strength thresholds.

Taken together, these results highlight a striking asymmetry in how basis spreads respond to dollar appreciation across regimes, reinforcing the asymmetric nature of the dollar's influence on basis swap spreads as predicted by our model.

3.3.4 | *Twenty-Year XCB Swap Spreads*

Table 6 extends the analysis to 20-year maturities, revealing a continuation of the established patterns, albeit with increased complexity and variation across currencies. For most currencies, the estimated threshold values remain statistically significant, reaffirming the nonlinear relationship between the broad dollar and basis spreads.

In the low-USD regime, currencies such as EUR, JPY, GBP, DKK, and CHF display consistent behavior, where the estimated coefficients remain negative, indicating that basis spreads widen in response to dollar appreciation, consistent with the theory that demand for dollar liquidity intensifies when the dollar is relatively weak.

However, the high-USD regime introduces several notable deviations. While some estimated coefficients remain statistically insignificant, others shift direction, becoming strongly positive. This suggests that under conditions of broad dollar strength, further appreciation may no longer exert upward pressure on basis spreads. Instead, the basis tends to narrow, challenging the conventional view and emphasizing the need to interpret dollar movements within a regime-specific framework.

TABLE 6 | USD regime effects on 20-year XCB basis swap responses.

	EUR	JPY	GBP	AUD	NZD
USD_τ	111.77	111.77	93.52	—	—
USD_{Low}	−0.55***	−0.50***	−0.70***	—	—
USD_{Med}	—	—	—	—	—
USD_{High}	0.62***	0.60***	−0.04	−0.11	0.11
ΔVIX	−0.01	0.01	−0.02	0.04	−0.03
ΔRR	−0.20	0.47	−0.27	0.59	0.31
ΔIV	−0.48***	0.20	−0.18**	−1.28*	0.14
ΔYSPRD	0.29	0.85	0.57	2.73*	0.65
ΔTSPRD	0.57	−1.69	0.68	−5.56***	
Adjusted R^2	0.1064	0.0180	0.0303	0.1269	−0.0001
	CAD	**DKK**	**CHF**	**SEK**	**NOK**
USD_τ	—	111.77	105.45	—	—
USD_{Low}	—	−0.50***	−0.56***	—	—
USD_{Med}	—	—	—	—	—
USD_{High}	−0.03	0.46***	0.20	0.01	−0.17**
ΔVIX	0.06***	−0.03	−0.01	−0.02	0.01
ΔRR	0.74	0.13	0.41	0.17	0.40*
ΔIV	−0.56***	−0.33**	−0.17*	−0.40***	−0.16**
ΔYSPRD	0.98	2.54**	0.58	2.21*	1.66***
ΔTSPRD	−5.21***	−2.58**	−1.62*	−2.09*	
Adjusted R^2	0.0379	0.0614	0.0356	0.0219	0.0196

Abbreviations: IV, implied volatility; RR, risk reversal; VIX, volatility index; XCB, cross-currency basis; YSPRD, yield spread.
$^*p < 0.10$; $^{**}p < 0.05$; $^{***}p < 0.01$.

These findings further illustrate the asymmetric nature of XCB dynamics and highlight the increasing complexity of market behavior in high-dollar environments.

3.3.5 | *Thirty-Year XCB Swap Spreads*

Finally, Table 7 provides estimates for the 30-year basis, where the regime-dependent effects observed at shorter maturities remain evident. This final segment of the term structure analysis further highlights the persistent nonlinear relationship between the broad dollar and XCB spreads, reaffirming the enduring sensitivity of long-term funding markets to shifts in global dollar liquidity.

As in previous maturities, Table 7 reveals that under the low-USD regime, the estimated coefficients for most currencies remain negative and statistically significant. This is consistent with established theory that when the dollar is relatively weak, global demand for USD liquidity rises, driving up the cost of dollar funding via cross-currency swaps and thereby widening the basis. For example, the coefficients for EUR and DKK are negative (EUR, −0.40; DKK, −0.55), indicating that in a low-dollar environment, swap spreads expand as access to USD becomes costlier.

In stark contrast, the high-dollar regime reveals a pronounced breakdown of this pattern. For several currencies, including EUR, JPY, and DKK, the basis no longer widens in response to further dollar appreciation. Instead, the estimated coefficients become positive or statistically insignificant, except for GBP and NOK, suggesting a reversal or attenuation of the conventional response. In these cases, a stronger dollar no longer implies growing dollar funding pressures, and in some instances, the basis even tightens.

This regime-dependent behavior reinforces the key finding that the impact of dollar movements on XCB spreads is highly asymmetric and conditional on the prevailing dollar regime. Long-term funding markets, often assumed to be stable or less reactive, in fact exhibit considerable sensitivity to regime shifts, especially when the dollar enters historically strong territory. These results highlight the importance of incorporating dollar regime dynamics into models of international funding and hedging behavior.

3.3.6 | *Conformity of XCB Spreads to Dollar Regime Theory*

In terms of theoretical alignment, the XCB of EUR, JPY, and DKK demonstrates the strongest conformity across all maturities, as shown in Table 8. These currencies consistently exhibit statistically significant threshold effects and the expected negative relationship between the USD and basis spreads in the low-dollar regime.

By contrast, CAD and NZD display minimal or no conformity, supporting the theory in only one or none of the maturity segments, respectively.

TABLE 7 | USD regime effects on 30-year XCB basis swap responses.

	EUR	JPY	GBP	AUD	NZD
USD_{τ}	111.77	111.78	—	—	
USD_{Low}	−0.40***	−0.49***	—	—	
USD_{Med}	—	—	—	—	
USD_{High}	0.60***	0.50***	−0.20***	−0.04	
ΔVIX	−0.002	0.02	−0.02	0.09	
ΔRR	−0.12	0.27	−0.44*	1.87***	
ΔIV	−0.32***	0.06	−0.25***	−0.75***	
ΔYSPRD	1.09	1.14	1.16	3.93*	
ΔTSPRD	0.15	−0.95	1.89***	−6.86***	
Adjusted R^2	0.0591	0.0142	0.0317	0.0974	
	CAD	**DKK**	**CHF**	**SEK**	**NOK**
USD_{τ}	—	111.77	93.26	111.77	—
USD_{Low}	—	−0.55***	−1.10***	−0.14	—
USD_{Med}	—	—	—	—	—
USD_{High}	−0.003	0.62***	−0.002	0.22*	−0.19***
ΔVIX	0.03	−0.04	−0.03	−0.01	0.01
ΔRR	0.89	0.05	0.33	−0.03	0.27
ΔIV	−0.64***	−0.36**	−0.14	−0.24***	−0.12**
ΔYSPRD	1.14	2.33**	3.10***	0.76	0.86**
ΔTSPRD	−3.94***	−1.82	−1.78	−0.85*	
Adjusted R^2	0.0244	0.0748	0.0260	0.0320	0.0245

Abbreviations: IV, implied volatility; RR, risk reversal; VIX, volatility index; XCB, cross-currency basis; YSPRD, yield spread.
*$p < 0.10$; **$p < 0.05$; ***$p < 0.01$.

TABLE 8 | Conformity of cross-currency basis spreads to dollar regime theory across maturities.

Currency	1Y	5Y	10Y	20Y	30Y	% Conforming
EUR	✓	✓	✓	✓	✓	100
JPY	✓	✓	✓	✓	✓	100
DKK	✓	✓	✓	✓	✓	100
GBP	✓	✓	✓	✓	×	80
CHF	×	✓	✓	✓	✓	80
SEK	✓	✓	✓	×	✓	80
AUD	×	✓	✓	×	×	40
NOK	✓	✓	×	×	×	40
CAD	×	✓	×	×	×	20
NZD	×	×	×	×	×	0
% Conforming	60	90	70	50	50	—

Note: ✓ = Conforms to theory (significant threshold effect with expected sign); × = Does not conform. Percentages in rows (columns) indicate the share of maturities (currencies) conforming per currency (maturity).

Across maturities, the 5-year segment exhibits the broadest support: 9 out of 10 currencies show conformity to the theory. Even at the 30-year maturity, where regime sensitivity is weakest, 5 out of 10 currencies still conform, highlighting the robustness of the dollar regime-dependent pattern across the term structure.

These findings offer strong evidence that deviations from CIP across G10 currencies are deeply regime-dependent. The classic "dollar appreciates, basis widens" result holds primarily in low or intermediate USD regimes, but weakens, or even reverses, when the dollar is in a high regime, highlighting the asymmetric nature of global dollar liquidity.

While much of the literature interprets deviations from CIP as the result of arbitrage frictions and balance-sheet constraints, our findings point to a different and regime-dependent mechanism. We show that the sensitivity of the XCB to broad dollar movements is not stable: it is stronger in low-dollar regimes and attenuates, or even reverses, in high-dollar regimes. These dynamics are fundamentally inconsistent with linear arbitrage cost models, which predict a monotonic widening of the basis with dollar strength. Instead, our results suggest that asset-side hedging flows, particularly from long-horizon institutional investors, are the primary force behind observed basis dynamics. This reframes the XCB not as a pure measure of dealer balance-sheet tightness, but as a barometer of global portfolio rebalancing behavior.

3.4 | Robustness to Controls and the Role of Risk and Rate Differentials

Our main findings remain robust to the inclusion of a comprehensive set of control variables. Among these, changes in the VIX, when statistically significant, consistently enter with a negative coefficient. This suggests that increases in global risk aversion are associated with wider basis spreads, likely reflecting diminished global risk-bearing capacity and heightened demand for dollar funding.

The effects of changes in implied FX volatility and the 25-delta risk reversal are more complex and context-dependent. While both variables are statistically significant in some specifications, the sign of their coefficients varies across currencies and maturities. A negative relationship between changes in implied FX volatility and the basis suggests that rising uncertainty in currency markets may increase incentives to hedge currency risk via swap markets, thereby widening the basis. This could reflect a tightening of global dollar funding conditions. For instance, as discussed in Avdjiev et al. (2019), heightened volatility may lead to dollar appreciation, which tightens leverage constraints for globally active banks, reduces the supply of dollars in the swap market, and widens the basis. Alternatively, greater FX volatility may dampen expectations of further dollar appreciation, prompting investors to hedge currency exposure when taking positions in US fixed income instruments, thereby increasing demand for dollars and contributing to a wider XCB.

Similarly, a negative coefficient on changes in FX option risk reversal indicates that increased market perceptions of downside risk to the foreign currency, or equivalently, expectations of dollar appreciation, can also widen the basis. This may reflect shifts in hedging flows or speculative positioning in response to more asymmetric exchange rate expectations.

Where statistically significant, changes in yield spreads generally enter with a positive sign, indicating that larger nominal interest rate differentials are associated with a narrowing of the basis. In contrast, changes in the term spread differential tend to enter with a negative sign, suggesting that greater divergence in yield curve slopes across countries is associated with a widening of the basis, potentially due to increased hedging demand or policy-driven uncertainty.

Counterparty credit risk and funding-liquidity frictions are well-known determinants of deviations from CIP (e.g., Coffey et al. 2009; Baba and Packer 2009). However, our analysis differs in both focus and objective. Rather than decomposing the XCB into its underlying components, we study how the sensitivity of the basis to movements in the broad dollar varies across dollar regimes.

In our framework, measures of counterparty credit risk and liquidity risk are not modeled as separate regressors because they are already embedded in observed basis spreads, which reflect the equilibrium pricing of cross-currency funding under prevailing market conditions. Conditioning explicitly on these factors could absorb endogenous variation in the dependent variable and obscure the regime-dependent mechanism that is the focus of this paper.

Instead, our analysis focuses on how dollar regimes shape the transmission of existing credit and liquidity frictions through investor hedging behavior. From an asset-side perspective, shifts in hedging demand and supply drive the observed regime-dependent movements in the basis, rather than changes in the underlying pricing of risk. This conceptual approach allows us to isolate and interpret the asymmetric effects of dollar regimes on XCB spreads, complementing existing studies that emphasize credit and liquidity frictions in explaining deviations from CIP.

3.5 | Implications of Dollar Regime Dependence

To our knowledge, no prior study has shown that the sensitivity of the XCB to US dollar movements varies nonlinearly across dollar regimes, weakening or reversing in periods of elevated dollar strength. This regime-dependent dynamic is novel.

Taken together, the main findings solidify the central theme of this paper; thus, the impact of the broad dollar on cross-currency swap spreads is fundamentally dollar regime-dependent. The dollar's influence on XCB varies significantly across different regimes, and this dynamic is not limited to short- or intermediate-term maturities. The analysis across maturities broadly highlights that while USD appreciation typically leads to wider swap spreads in the low-USD regime, the high-USD regime can see a narrowing of basis swap spreads, challenging the traditional assumption that a stronger dollar always results in wider swap spreads.

The key takeaway is that interpreting the relationship between the dollar and cross-currency swap spreads requires a deeper, regime-sensitive framework that accounts for the shifts in the broad USD regime across different market conditions. The asymmetry in the response of different XCB across dollar regimes suggests that market dynamics are far more complex than previously assumed. This complexity highlights the importance of considering the broader regime context when analyzing the XCB swap market and the response to a broad dollar appreciation.

The results documented in this paper suggest that a substantial share of XCB fluctuations—particularly outside acute stress episodes—may be driven by global asset managers adjusting currency hedges on their international portfolios, rather than by funding frictions alone, leading to an asset-manager-driven basis dynamics in response to USD. In the low-dollar regime, non-USD investors holding USD-denominated assets (such as Japanese life insurers in US Treasuries or European insurers in US corporates) have stronger incentives to hedge against potential USD depreciation, while USD-based investors with foreign assets hedge less. This shift increases net USD demand in the swap market, widening the basis.

Conversely, in the high-dollar regime, non-USD investors often relax hedges on their USD assets, expecting continued dollar strength, while USD-based investors increase hedging on their foreign holdings, resulting in net USD supply in the swap market and a muted or even tightening basis response. The fact that these asymmetric effects are most consistent and statistically robust across intermediate maturities (5–10 years), where institutional asset managers such as pensions, insurers, and sovereign wealth funds are the dominant players, reinforces the interpretation that portfolio-hedging flows, not just dealer balance-sheet constraints, are a key driver of the basis. This perspective reframes the XCB as, at least in part, a barometer of global hedging flows from long-horizon investors, implying that policymakers and market participants should be cautious in treating basis movements as a pure signal of dollar funding stress.

This deeper understanding opens several avenues for future research. The observed differences in the responses across dollar regimes suggest that future studies should further explore the underlying macroeconomic factors and financial market conditions that drive these asymmetries. Moreover, the findings invite further examination into the dynamics of cross-currency funding risks, particularly during periods of high-dollar environments, which may present unique challenges for global liquidity management, and especially given the proposed deregulation of the financial industry as the United States becomes poised to dial back bank rules imposed in the wake of the global financial crisis in 2008.

Finally, the policy implications that emerge from these findings are clear. Policymakers, central banks, and financial institutions engaged in cross-border funding activities must consider the shifting dynamics of the XCB swap market in different dollar regimes. Recognizing the dollar's asymmetric effects on basis spreads can help better anticipate funding costs, manage liquidity risk, and design more effective intervention frameworks during episodes of market stress.

4 | Conclusion

This paper provides a pioneering and comprehensive analysis of the regime-dependent relationship between the broad US dollar and XCB swap spreads across multiple maturities for the G10 currencies versus the US dollar. We make a significant contribution to the literature on XCB by developing and empirically testing a framework that integrates regime-dependent dynamics of the US dollar. Unlike Du et al. (2018) and Avdjiev et al. (2019), who emphasize balance-sheet constraints, we propose how hedging behavior changes across dollar regimes. Our interpretation complements Y. Liao (2016) by shifting the emphasis from short-term arbitrage to long-term asset-side portfolio flows.

Our stylized model builds on the understanding that market participants' hedging decisions are influenced by their expectations of the dollar's trajectory regimes, giving rise to asymmetric effects of the broad USD in both low- and high-USD regimes. This offers a fresh perspective on the so-called "double life of the dollar," where similar movements in the currency have different implications depending on its prevailing regime.

The model introduces two agent types, dollar-based and nondollar-based investors, whose hedging behaviors determine fluctuations in cross-currency swap spreads. Building upon arguments related to demand and supply for hedging, we demonstrate that the hedging response in low- and high-USD regimes is distinct: in the low-USD regime, dollar-based investors hedge less in response to dollar appreciation, while nondollar-based investors hedge more, expecting dollar depreciation. Conversely, in the high-USD regime, dollar-based investors increase hedging demand, anticipating further dollar strength, while nondollar-based investors reduce hedging supply, benefiting from remaining unhedged amid continued dollar appreciation.

These regime-specific reactions to dollar movements determine the XCB swap spread, and we argue that hedging demand and supply play crucial roles in its tightening or widening in response to dollar appreciation in each dollar regime. The theoretical contributions lie in the integration of expectations-driven agent behavior into a framework that accounts for asymmetric responses to dollar movements in different regimes. By formalizing these dynamics, we offer new insights into how dollar movements influence financial market behavior in a nonlinear manner.

Empirically, through threshold regression models applied to currency-by-currency time series data, we uncover strong evidence of asymmetric dollar appreciation effects across regimes and maturities. Our findings highlight that the dollar's influence on an XCB is far from linear, with USD appreciation leading to wider spreads in low-USD regimes but to less pronounced or even narrower spreads in high-USD regimes for some currencies.

This challenges the conventional wisdom that a stronger dollar uniformly widens swap spreads and supports the theory of asymmetric market reactions. Confirming the "double life" of the dollar, our results underscore the importance of accounting for dollar regime shifts in models of cross-currency swaps and global liquidity.

Beyond theoretical advancement, this study opens several avenues for future research. Expanding the empirical framework to emerging markets with active currency swap markets could reveal how dollar regimes impact financial and currency risk management in developing economies. Incorporating additional macroeconomic factors, such as sovereign risk or interest rate differentials, as regime determinants may deepen understanding of basis spread drivers. Furthermore, leveraging AI and machine learning techniques could enhance granular analysis of market behaviors, especially during periods of volatility or financial stress.

While advancing knowledge of the dollar's impact on XCB, our study has limitations. The threshold regression approach, though robust, could benefit from incorporating more granular liquidity and institutional data. Additionally, focusing on major currencies excludes dynamics in smaller or less liquid markets, representing a potential area for future exploration.

In sum, our findings affirm that the relationship between the broad US dollar and cross-currency swap spreads is fundamentally regime-dependent. In low-USD regimes, dollar appreciation consistently widens swap spreads due to increased USD funding demand, whereas in high-USD regimes, the relationship is more complex, with some currencies showing reduced or reversed effects. The weakening or reversal of the dollar-basis link in high-dollar regimes directly challenges the predictions of standard arbitrage cost models. Recognizing these dynamics is essential for market participants and policymakers navigating the complexities of global currency and funding markets.

Author Contributions

Conceptualization: Oyakhilome Wallace Ibhagui. Data curation: Daniel Felix Ahelegbey and Oyakhilome Wallace Ibhagui. Formal analysis: Daniel Felix Ahelegbey, Oyakhilome Wallace Ibhagui, and Florian Gerth. Funding acquisition: Daniel Felix Ahelegbey, Oyakhilome Wallace Ibhagui, and Florian Gerth. Investigation: Daniel Felix Ahelegbey, Oyakhilome Wallace Ibhagui, and Florian Gerth. Methodology: Daniel Felix Ahelegbey and Oyakhilome Wallace Ibhagui. Project administration: Daniel Felix Ahelegbey and Oyakhilome Wallace Ibhagui. Resources: Daniel Felix Ahelegbey, Oyakhilome Wallace Ibhagui, and Florian Gerth. Software: Daniel Felix Ahelegbey and Oyakhilome Wallace Ibhagui. Supervision: Daniel Felix Ahelegbey and Oyakhilome Wallace Ibhagui. Validation: Daniel Felix Ahelegbey, Oyakhilome Wallace Ibhagui, and Florian Gerth. Visualization: Daniel Felix Ahelegbey, Oyakhilome Wallace Ibhagui, and Florian Gerth. Writing – original draft: Daniel Felix Ahelegbey, Oyakhilome Wallace Ibhagui, and Florian Gerth. Writing – review and editing: Daniel Felix Ahelegbey, Oyakhilome Wallace Ibhagui, and Florian Gerth. All authors have read and agreed to the published version of the manuscript.

Conflicts of Interest

The authors declare no conflicts of interest.

Data Availability Statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

References

Adrian, T., E. Etula, and T. Muir. 2014. "Financial Intermediaries and the Cross-Section of Asset Returns." *Journal of Finance* 69, no. 6: 2557–2596.

Ahelegbey, D., and O. W. Ibhagui. 2020. *Interconnected Deviations From Covered Interest Parity*. Technical Report 3693013. SSRN Electronic Journal. https://ssrn.com/abstract=3693013.

Allen, W. A., G. Galati, R. Moessner, and W. Nelson. 2017. "Central Bank Swap Lines and CIP Deviations." *International Journal of Finance & Economics* 22, no. 4: 394–402.

Avdjiev, S., W. Du, C. Koch, and H. S. Shin. 2019. "The Dollar, Bank Leverage, and Deviations From Covered Interest Parity." *American Economic Review: Insights* 1, no. 2: 193–208.

Avdjiev, S., E. Eren, and P. McGuire. 2020. *Dollar Funding Costs During the Covid-19 Crisis Through the Lens of the FX Swap Market*. Technical Report. Bank for International Settlements.

Avdjiev, S., C. Koch, P. McGuire, and G. VonPeter. 2018. "Transmission of Monetary Policy Through Global Banks: Whose Policy Matters?" *Journal of International Money and Finance* 89: 67–82.

Baba, N., and F. Packer. 2009. "Interpreting Deviations From Covered Interest Parity During the Financial Market Turmoil of 2007–08." *Journal of Banking and Finance* 33, no. 11: 1953–1962.

Bernanke, B., and M. Gertler. 1989. "Agency Costs, Net Worth, and Business Fluctuations." *American Economic Review* 79, no. 1: 14–31.

Brunnermeier, M. K., and L. H. Pedersen. 2009. "Market Liquidity and Funding Liquidity." *Review of Financial Studies* 22, no. 6: 2201–2238.

Bruno, V., and H. S. Shin. 2015. "Capital Flows and the Risk-Taking Channel of Monetary Policy." *Journal of Monetary Economics* 71: 119–132.

Cerutti, E., M. Obstfeld, and H. Zhou. 2021. "Covered Interest Parity Deviations and the US Dollar." *IMF Economic Review* 69, no. 1: 1–33.

Cerutti, E., and H. Zhou. 2024. "Uncovering CIP Deviations in Emerging Markets: Distinctions, Determinants, and Disconnect." *IMF Economic Review* 72, no. 1: 196–252.

Coffey, N., W. B. Hrung, and A. Sarkar. 2009. *Capital Constraints, Counterparty Risk, and Deviations from Covered Interest Rate Parity*. Staff Reports. Federal Reserve Bank of New York.

Coşkun, S., and O. Ibhagui. 2022. "Technology Shocks and Covered Interest Parity Deviations in Emerging Market Economies." *Empirical Economics* 63, no. 3: 1337–1374.

Du, W., A. Tepper, and A. Verdelhan. 2018. "Deviations From Covered Interest Rate Parity." *Journal of Finance* 73, no. 3: 915–957.

Gabaix, X., and M. Maggiori. 2015. "International Liquidity and Exchange Rate Dynamics." *Quarterly Journal of Economics* 130, no. 3: 1369–1420.

Gârleanu, N., and L. H. Pedersen. 2011. "Margin-Based Asset Pricing and Deviations From the Law of One Price." *Review of Financial Studies* 24, no. 6: 1980–2022.

Goldberg, L. S., C. Kennedy, and J. Miu. 2011. "Central Bank Dollar Swap Lines and Overseas Dollar Funding Costs." *Economic Policy Review* 17, no. May: 3–20.

Hansen, B. E. 2000. "Sample Splitting and Threshold Estimation." *Econometrica* 68, no. 3: 575–603.

He, Z., and A. Krishnamurthy. 2013. "Intermediary Asset Pricing." *American Economic Review* 103, no. 2: 732–770.

Holmström, B., and J. Tirole. 1997. "Financial Intermediation, Loanable Funds, and the Real Sector." *Quarterly Journal of Economics* 112, no. 3: 663–691.

Ibhagui, O. W. 2020. "Covered Interest Parity Deviations in Standard Monetary Models." *Journal of Economics and Business* 111: 105909.

Ibhagui, O. W. 2021a. "How Do Sovereign Risk, Equity and Foreign Exchange Derivatives Markets Interact?" *Economic Modelling* 97: 58–78.

Ibhagui, O. W. 2021b. "Inflation Differential as a Driver of Cross-Currency Basis Swap Spreads." *European Journal of Finance* 27, no. 6: 510–536.

Ibhagui, O. W. 2021c. "Real Output and Cross-Currency Basis Swap Spreads: Evidence From the Eurozone." *Journal of International Financial Markets, Institutions and Money* 75: 101304.

Ibhagui, O. W. 2021d. "Stock Market and Deviations From Covered Interest Parity." *Journal of International Financial Markets, Institutions and Money* 74: 101393.

Iida, T., T. Kimura, and N. Sudo. 2016. "Regulatory Reforms and the Dollar Funding of Global Banks: Evidence From the Impact of Monetary Policy Divergence." Working Paper Series 16-E-14. Bank of Japan.

Ivashina, V., D. S. Scharfstein, and J. C. Stein. 2015. "Dollar Funding and the Lending Behavior of Global Banks." *Quarterly Journal of Economics* 130, no. 3: 1241–1281.

Liao, G. Y., and T. Zhang. 2025. "The Hedging Channel of Exchange Rate Determination." *Review of Financial Studies* 38, no. 1: 1–38.

Liao, Y. 2016. "The Cross-Currency Basis: A Review of the Literature." *Journal of International Money and Finance* 67: 1–20.

Mancini-Griffoli, T., and A. Ranaldo. 2010. "Limits to Arbitrage During the Crisis: Funding Liquidity Constraints and Covered Interest Parity." Working Paper 2010-14. Swiss National Bank.

McGuire, P., and G. vonPeter. 2012. "The Dollar Shortage in Global Banking and the International Policy Response." *International Finance* 15, no. 2: 155–178.

Moessner, R., and W. A. Allen. 2013. "Central Bank Swap Line Effectiveness During the Euro Area Sovereign Debt Crisis." *Journal of International Money and Finance* 35: 167–178.

Rime, D., A. Schrimpf, and O. Syrstad. 2017. "Segmented Money Markets and Covered Interest Parity Arbitrage." Working Paper 651. Bank for International Settlements.

Sushko, V., C. Borio, R. McCauley, and P. McGuire. 2016. "Failure of Covered Interest Parity: FX Hedging Demand and Costly Balance Sheets." BIS Working Papers 594. Bank for International Settlements.

Wu, J. C., and F. D. Xia. 2016. "Measuring the Macroeconomic Impact of Monetary Policy at the Zero Lower Bound." *Journal of Money, Credit, and Banking* 48, no. 2–3: 253–291.

Appendix A

Proofs of Propositions

A.1 | Proof of Proposition 1

For a given appreciation in the USD, the basis swap spread (XCB_t) widens more (i.e., becomes more negative) in the *low-dollar regime* than in the *high-dollar regime*. That is, for a given positive change in ΔD_t

$$\Delta\text{XCB}_t^l < \Delta\text{XCB}_t^h.$$

Proof. Let XCB_t^θ denote the model-implied basis spread under regime $\theta \in \{l, h\}$ at time t.

$$\text{XCB}_t^\theta = \delta_\text{d}^\theta + \psi_\text{d}^\theta \text{HD}_t + V_{\text{d},t}, \tag{A1}$$

$$\text{HD}_t = \alpha_\text{d}^\theta + \beta_\text{d}^\theta D_t + \gamma_\text{d}^\theta \bar{D}_\theta + U_{\text{d},t}, \tag{A2}$$

where δ_d^θ is a regime-specific intercept, $\psi_\text{d}^\theta > 0$ captures the sensitivity of the basis to hedging demand, $V_{\text{d},t}$ reflects regime-invariant influences, D_t represents the current dollar level, and $\bar{D}_\theta$ is the regime-specific expectation.

Substituting (A2) into (A1), we obtain

$$\text{XCB}_t^\theta = \delta_\text{d}^\theta + \psi_\text{d}^\theta\left(\alpha_\text{d}^\theta + \beta_\text{d}^\theta D_t + \gamma_\text{d}^\theta \bar{D}_\theta + U_{\text{d},t}\right) + V_{\text{d},t}. \tag{A3}$$

Taking first differences,

$$\Delta\text{XCB}_t^\theta = \psi_\text{d}^\theta\left(\beta_\text{d}^\theta \Delta D_t + \gamma_\text{d}^\theta \Delta\bar{D}_\theta\right) + \psi_\text{d}^\theta \Delta U_{\text{d},t} + \Delta V_{\text{d},t}. \tag{A4}$$

Assume $\Delta U_{\text{d},t}$ and $\Delta V_{\text{d},t}$ are zero in expectation. $\Delta\text{XCB}_t^h - \Delta\text{XCB}_t^l$ becomes

$$\begin{aligned}\Delta\text{XCB}_t^h - \Delta\text{XCB}_t^l = {} & \psi_\text{d}^h\left(\beta_\text{d}^h \Delta D_t + \gamma_\text{d}^h \Delta\bar{D}_h\right) \\ & - \psi_\text{d}^l\left(\beta_\text{d}^l \Delta D_t + \gamma_\text{d}^l \Delta\bar{D}_l\right).\end{aligned} \tag{A5}$$

To isolate regime differences in hedging demand sensitivities, we assume $\psi_\text{d}^h = \psi_\text{d}^l = \psi_\text{d}$. Then,

$$\Delta\text{XCB}_t^h - \Delta\text{XCB}_t^l = \psi_\text{d}\left[\left(\beta_\text{d}^h - \beta_\text{d}^l\right)\Delta D_t + \left(\gamma_\text{d}^h \Delta\bar{D}_h - \gamma_\text{d}^l \Delta\bar{D}_l\right)\right]. \tag{A6}$$

We define $\phi_1 = \beta_\text{d}^h - \beta_\text{d}^l > 0, \phi_2 = \gamma_\text{d}^h - \gamma_\text{d}^l > 0, \Delta K_t = \Delta\bar{D}_h - \Delta\bar{D}_l \geq 0$. Then,

$$\Delta\text{XCB}_t^h - \Delta\text{XCB}_t^l = \psi_\text{d}\left[\phi_1 \Delta D_t + \phi_2 \Delta\bar{D}_h + \gamma_\text{d}^l \Delta K_t\right].$$

This expression is strictly positive under the assumptions that: Hedging demand is more sensitive to both current dollar strength and expected future levels in the high-dollar regime than in the low-dollar regime ($\phi_1, \phi_2 > 0$); and expected future value of the dollar is higher in the high-dollar regime than in the low-dollar regime, with a premium $K_t > 0$. Therefore,

$$\Delta\text{XCB}_t^h > \Delta\text{XCB}_t^l.$$

Thus, for the same appreciation in the USD, the XCB swap spread widens less (or tightens more) in the high-dollar regime than in the low-dollar regime. □

A.2 | Proof of Proposition 2

As the probability of transitioning into the high-dollar regime increases, the XCB tightens. That is,

$$\frac{\partial \mathbb{E}\left[\text{XCB}_t\right]}{\partial \mathbb{P}_t(h)} > 0,$$

where $\mathbb{P}_t(h)$ denotes the probability of being in or entering the high-dollar regime at time t, and $\mathbb{E}\left[\text{XCB}_t\right]$ is the expected XCB.

Proof. Suppose we are in the low-dollar regime, and the market begins revising expectations toward the high-dollar regime. This implies an upward revision in the expected dollar level:

$$\mathbb{E}\left[D_{t+1} | \theta = h\right] > \mathbb{E}\left[D_{t+1} | \theta = l\right],$$

which leads USD-based investors to increase their hedging demand in anticipation of a stronger dollar. Simultaneously, EUR-based investors reduce their hedging supply, as the incentive to hedge USD exposures diminishes in a high-dollar environment. This regime shift results in

$$\text{HD}_t^h > \text{HD}_t^l \quad \text{and} \quad \text{HS}_t^h < \text{HS}_t^l,$$

so that the net hedging demand rises

$$\left(\text{HD}_t^h - \text{HS}_t^h\right) > \left(\text{HD}_t^l - \text{HS}_t^l\right).$$

Under our structural model of the basis,

$$\text{XCB}_t^\theta = \delta^\theta + \psi\left(\text{HD}_t^\theta - \text{HS}_t^\theta\right) + V_t.$$

Let $\mathbb{P}_t(h) = \mathbb{P}(\theta_t = h)$ denote the probability that the economy is in the high-dollar regime at time t. Then the expected value of the basis is given by the law of total expectation:

$$\begin{aligned}\mathbb{E}\left[\text{XCB}_t\right] &= \mathbb{P}_t(h)\mathbb{E}\left[\text{XCB}_t^h\right] + (1 - \mathbb{P}_t(h))\mathbb{E}\left[\text{XCB}_t^l\right] \\ &= \mathbb{P}_t(h)\left[\delta^h + \psi\left(\text{HD}_t^h - \text{HS}_t^h\right)\right] \\ &\quad + (1 - \mathbb{P}_t(h))\left[\delta^l + \psi\left(\text{HD}_t^l - \text{HS}_t^l\right)\right],\end{aligned} \tag{A7}$$

where $\mathbb{E}[V_t] = 0$ by assumption. Taking the derivative with respect to $\mathbb{P}_t(h)$, we obtain

$$\frac{\partial \mathbb{E}\left[\text{XCB}_t\right]}{\partial \mathbb{P}_t(h)} = (\delta^h - \delta^l) + \psi\left[\left(\text{HD}_t^h - \text{HS}_t^h\right) - \left(\text{HD}_t^l - \text{HS}_t^l\right)\right]. \tag{A8}$$

Assuming $\psi > 0$ and that the change in net hedging demand dominates any intercept shift (i.e., $(\delta^h - \delta^l) \approx 0$), the derivative is positive:

$$\frac{\partial \mathbb{E}\left[\mathrm{XCB}_t\right]}{\partial \mathbb{P}_t(h)} > 0.$$

As the probability $\mathbb{P}_t(h)$ of entering the high USD regime increases, the expected value $\mathbb{E}\left[\mathrm{XCB}_t\right]$ increases—that is, the XCB tightens (moves closer to zero). □

Appendix B

XCB: Definition and Intuition

B.1 | Definition

Fix a currency pair (foreign ↔ USD), a start date t, and tenor n. Let $y^{\$}_{t,t+n}$ denote the annualized USD funding cost over $[t, t+n]$ from the USD curve, and let $y^{\mathrm{fx}}_{t,t+n}$ denote the foreign funding cost over the same horizon. Define the *synthetic USD funding cost* obtained by borrowing in foreign currency and hedging the FX exposure with an n-maturity forward (or equivalently, the corresponding leg of an XCB swap) as $y^{\mathrm{fx}\to\$}_{t,t+n}$. The *XCB* is the difference:

$$x_{t,t+n} = y^{\$}_{t,t+n} - y^{\mathrm{fx}\to\$}_{t,t+n}. \tag{B1}$$

Equivalently, if C is the direct USD funding cost and S is the synthetic USD cost via foreign funding plus the FX hedge, then

$$x_{t,t+n} = D = C - S. \tag{B2}$$

This convention $(C - S)$ will be used throughout; some practitioners adopt the opposite sign, so clarity on the sign convention is essential.

B.2 | Link to CIP

Let S_t be the spot USD price of one unit of foreign currency and $F_{t,t+n}$ the corresponding m-period forward. Under CIP (no arbitrage with perfectly collateralized forwards),

$$\frac{F_{t,t+n}}{S_t} = \frac{\left(1 + y^{\$}_{t,t+n}\right)^n}{\left(1 + y^{\mathrm{fx}}_{t,t+n}\right)^n}. \tag{B3}$$

Rearranging shows that the synthetic USD cost equals the direct USD cost and hence $x_{t,t+n} = 0$. Deviations from (B3) imply $x_{t,t+n} \neq 0$; the forward market then embeds a nonzero *basis* that makes synthetic and direct USD funding costs differ.

B.3 | Measurement via Forward-Implied Synthetic USD Rate

A convenient operational form derives $y^{\mathrm{fx}\to\$}_{t,t+n}$ from observable forwards:

$$\begin{aligned}\left(1 + y^{\mathrm{fx}\to\$}_{t,t+n}\right)^n &= \frac{F_{t,t+n}}{S_t}\left(1 + y^{\mathrm{fx}}_{t,t+n}\right)^n \\ \Rightarrow x_{t,t+n} &= y^{\$}_{t,t+n} - y^{\mathrm{fx}\to\$}_{t,t+n}.\end{aligned} \tag{B4}$$

In log or continuously compounded form, this reduces to an additive relation between the USD yield, the foreign yield, and the forward premium.

B.4 | Economic Interpretation

In principle, for a given currency pair, tenor, and collateral set, $x_{t,t+n}$ is a *single number*; it does not depend on whether an agent is a borrower or a lender. Trading direction only determines which side of the bid/ask one transacts; the basis itself is the common mid-quote object.

- $x_{t,t+n} = 0$: Direct USD funding and synthetic USD funding are equal; CIP holds.
- $x_{t,t+n} > 0$: Synthetic USD is *cheaper* than direct USD $(S < C)$. Borrowing in foreign currency and swapping to USD lowers funding cost.
- $x_{t,t+n} < 0$: Synthetic USD is *more expensive* than direct USD $(S > C)$. This is often interpreted as a USD premium (tight USD funding relative to foreign).

B.5 | Why a Basis Exists

Nonzero $x_{t,t+n}$ can reflect institutional and risk considerations that push markets away from the idealized CIP benchmark: collateral conventions and haircuts, balance-sheet and regulatory costs, differential access to cash versus swap markets, credit and term premia embedded in curves, and episodic funding stress that shifts demand toward one currency. While such frictions are important in practice, our analysis adopts the in-principle definitions (B1)–(B4) as the model object and uses the chosen sign convention consistently.

B.6 | What Do "Basis Widening" and "Basis Tightening" Mean?

In our convention, the XCB $x_{t,t+n}$ measures the deviation from CIP over horizon n:

$$\left(1 + y^{\$}_{t,t+n}\right)^n = \left(1 + y^{\mathrm{f}}_{t,t+n} + x_{t,t+n}\right)^n \frac{S_t}{F_{t,t+n}},$$

so that $x_{t,t+n} = 0$ under exact CIP. Intuitively, $x_{t,t+n}$ is the *markup (or discount)* that aligns the synthetic USD rate (foreign rate swapped into USD) with the direct USD rate.

Definitions (Sign and direction).

- *Basis widening* means $|x_{t,t+n}|$ *increases*, meaning the negative basis moves farther away from zero and becomes much more negative. The swap-implied deviation from CIP becomes larger in magnitude (further from zero).
- *Basis tightening* means $|x_{t,t+n}|$ *decreases*, meaning the negative basis becomes less negative, moves toward zero from the negative side. The deviation shrinks toward zero; funding via the swap and via the cash market becomes closer substitutes.

Operational interpretation. *Let $C_{t,t+n}$ be the all-in cost (annualized) of borrowing USD directly, and $S_{t,t+n}$ the all-in cost of obtaining USD synthetically via an FX swap starting from currency f. Then, abstracting from fees and collateral frictions,*

$$x_{t,t+n} \approx C_{t,t+n} - S_{t,t+n}.$$

- *Widening toward more negative values* (x drops): the USD premium rises; securing USD through swaps becomes costlier relative to cash borrowing.
- *Widening toward more positive values* (x rises): synthetic USD becomes relatively cheaper; cross-currency swapping is more attractive.