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Demand for Dollars

Evidence from Survey Expectations

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ABSTRACT: We study the determinants of US dollar demand across market participants and traded instruments using survey-based exchange rate and macroeconomic expectations. To empirically establish the relevance of survey-based expectations for currency flows, we leverage granular foreign exchange trading data and present three main findings. First, end-user investors increase their dollar purchases when they expect the US dollar to appreciate. Investment funds and non-dealer banks adjust their synthetic dollar borrowing in the FX swap market in response to forecasted changes in synthetic dollar funding costs. Second, cross-sectionally, investors rebalance along the factor structure of currency risk into dollars following an expected dollar appreciation. Third, the predictive power of survey forecasts weakens when forecaster disagreement or uncertainty rises. Overall, our findings show that long-horizon expectations predict dollar demand across spot, forward, and swap currency markets.

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WORKING PAPERS

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Evidence from Survey Expectations

Prepared by Benedikt Ballensiefen, Fabricius Somogyi, and Hannah Winterberg[1]

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1. Introduction

The US dollar is the linchpin of the global monetary and financial system, serving as the dominant currency for investment, funding, and hedging. For example, foreign investors hold 30% of US Treasuries outstanding according to the Federal Reserve System, whereas foreign banks borrow around 230 billion US dollars via foreign exchange (FX) swaps each day (Kloks, Mattille, and Ranaldo, 2024), and more than 90 percent of bond mutual funds use currency forwards for hedging (Sialm and Zhu, 2024). These examples point to the heterogeneous nature of dollar demand across traded instruments and market participants.

The composition and determinants of dollar demand are of first order importance to policymakers and academics alike. This is because the resilience of dollar funding markets, the cross-border transmission of US monetary policy, and the financial-stability risks that surface when global investors rebalance all hinge on which participants are demanding dollars, through which instruments, and why. Despite the dollar's pivotal role, empirical evidence on these determinants of US dollar demand remains relatively scarce. This paper helps to fill this gap by providing a comprehensive empirical account of the drivers of dollar demand across various groups of market participants as well as traded instruments.[1]

In canonical models of international finance (e.g., Gabaix and Maggiori, 2015; Itskhoki and Mukhin, 2021), currency demand is pinned down by investors' expectations about future currency returns. However, these expectations are not directly observable. We address this challenge by confronting actual dollar demand with what investors say they expect: we combine granular FX trading data across spot, forward, and swap markets with survey-based forecasts for exchange rates and macroeconomic variables. Whether such survey expectations are useful for predicting dollar demand is not obvious since survey expectations are known to be weak predictors of exchange rates (e.g., Dahlquist and Söderlind, 2022; Nagel and Xu, 2023). In contrast to this earlier literature, Kremens, Martin, and Varela (2025) show that *long-horizon* exchange rate forecasts predict realised currency returns. Encouraged by this result, we ask whether the same forecasts also predict currency flows across market participants (i.e.,

[1] To fix ideas, we focus on the role of FX dealer banks as liquidity providers rather than cross-market arbitrageurs and hence, measure dollar demand as currency transactions that either involve the purchase or borrowing of US dollars by investors (i.e., clients) from dealer banks.

banks, corporations, investment funds, and non-bank financials) and traded instruments (i.e., spot and derivatives such as swaps and forwards).

To guide our empirical analysis, we develop a model of currency demand that builds on the line of work by Gabaix and Maggiori (2015), Itskhoki and Mukhin (2021), Vayanos and Vila (2021), and Kekre and Lenel (2024). We augment these models by the fact that exchange rates follow a strong factor structure (Lustig, Roussanov, and Verdelhan, 2011; Verdelhan, 2017), that is, a small set of common factors explain a large share of the variation in exchange rates. The core idea is that investors incorporate publicly available predictions made by professional forecasters when forming expectations about future currency returns. More specifically, the investor universe is populated by two groups. *Directional traders* take unhedged dollar positions in the spot and forward markets, whereas *dollar borrowers* finance the acquisition of dollar assets via FX swaps, and hence are only concerned with the price of synthetic dollar funding rather than exchange rate changes. A single dealer sector intermediates all three markets using a single balance sheet. In equilibrium, both the cost of warehousing directional risk and the cost of supplying synthetic dollar funding are jointly determined.

The model makes three core predictions. First, *directional traders* buy more dollars via spot and forward markets if they expect a dollar appreciation. At the same time, *dollar borrowers* engage in less synthetic dollar borrowing via FX swaps. In contrast, the dealer sector takes the opposite side of these trades and provides liquidity across all three markets. Second, in the cross-section of currencies, investors rebalance from foreign currencies into US dollars (USD) along the factor structure of currency risk. Following an expected appreciation of the dollar, investors sell more high risk foreign currencies (e.g., Australian dollar) and fewer low risk foreign currencies (e.g., Japanese yen). Third, investors respond less to professional forecasters' predictions about exchange rates and macroeconomic fundamentals when forecaster dispersion increases and/or in times of higher uncertainty.

To provide empirical support for these three predictions, we employ quantity data on dollar demand and forward-looking forecast expectations. More precisely, we use a granular and comprehensive dataset on global FX spot, forward, and swap trading activity from CLS Group (CLS). CLS operates the world's largest currency cash settlement system, handling over 50% of the global spot, forward, and swap FX transaction volume. Our cross-section includes the G10 currencies against the US dollar, which comprise more than 60% of global FX trading volume (BIS, 2025). To measure forward-looking expectations about exchange rates as well as macroeconomic variables, we use monthly surveys of finance professionals conducted by Consensus Economics. The forecasters interviewed are global banks, research institutes, and investors who actively participate in the currency market. With these data and the theoretical foundation in place, our empirical findings can be summarized along three dimensions, corroborating the theoretical predictions.

Regarding the first prediction, we provide two pieces of evidence that are in line with the idea that forward-looking expectations matter for exchange rate flows. First, we focus on directional trades, that is, spot and forward transactions, which directly expose investors to currency risk. Specifically, we show that an expected appreciation of the dollar over the horizon of the next two years predicts that investment funds and non-dealer banks buy dollars and sell foreign currency over the next month using both spot and forward transactions. The evidence for forward contracts is consistent with speculative and also hedging motives since purchasing dollars via forward contracts is both a bet on future dollar appreciation and a way to hedge foreign non-dollar currency exposures.[2] Consistent with our model, we find that dealer banks and non-bank financial institutions (NBFIs) are predicted to take the opposite side of these trades by providing currency liquidity.

Comparing across forecast horizons, we find that long-horizon exchange rate expectations explain short-run currency flows much better than short horizon expectations. This result complements Kremens et al. (2025), who show that long-horizon exchange rate expectations also have a much stronger predictive power for realised short-run currency returns. Kremens and Varela (2026) provide a possible explanation for the poor performance of short-term forecasts. In particular, they decompose forecasts into a component shared with long-term expectations and a component that loads on lagged forecast errors. The former component strongly predicts exchange rates even at short horizons, while the latter predicts currency returns with the wrong sign, thereby offsetting the informative component contained in the overall short-term forecast. We observe a similar pattern for currency flows. Specifically, short-term (3-month) FX forecasts have only limited predictive power for spot

[2]Note that our goal is not to disentangle hedging from speculative trading motives, as this would require strong assumptions about investors' preferences.

currency flows; however, the common component of short-term and long-term FX forecasts accurately predicts currency flows.

Second, to assess synthetic dollar funding currency flows in the FX swap market, we construct forecast-based expectations of covered interest parity (CIP) deviations. Consistent with our conceptual framework, we find that when synthetic dollar funding becomes cheaper investment funds and non-dealer banks engage in more synthetic dollar borrowing. Furthermore, we find that the borrowing decisions of both funds and non-dealer banks are driven by exchange rate expectations: they reduce USD borrowing when the dollar is expected to appreciate, consistent with a widening of the basis. Notably, smaller non-dealer banks increase synthetic dollar borrowing when US interest rates rise relative to foreign rates, which is in line with synthetic dollar funding becoming cheaper. In contrast, funds exhibit the opposite pattern, increasing USD lending following a rise in US interest rates. This divergence suggests that investment funds' FX swap trading is not purely funding-driven. Dealer banks, on the other hand, again take the opposite side of the market and provide liquidity.

Regarding the second theoretical prediction, we study the cross-sectional heterogeneity across G10 currencies against the USD. We consider two key currency factor models: (i) the two-factor model by Lustig et al. (2011) and Verdelhan (2017) that includes both the dollar and the carry factor and (ii) the one-factor model by Chernov, Dahlquist, and Lochstoer (2023) that builds an unconditional mean variance efficient portfolio. To measure the riskiness of foreign currencies with respect to each of these factors, we consider their factor loading (i.e., betas). Focusing on the interaction terms between currency risk exposures (e.g., carry betas) and our forecast variables, we find that, conditional on expecting the USD to appreciate, investors exchange riskier currencies more heavily for USD than safe ones. With respect to funding US dollar via FX swaps, we find that, conditional on an expected increase in the cost of synthetic dollar funding, funds reduce their dollar funding less via high-carry-beta currencies (e.g., Australian dollar) than via low-carry-beta currencies (e.g., Japanese yen).

Regarding the third prediction of our theoretical framework, that is, investors place less weight on public forecasts when they become less informative, we first examine the role of forecaster disagreement, which directly captures the degree of consensus among professional forecasters. We find that the predictive power of survey expectations for currency flows declines significantly as forecaster disagreement increases, consistent with investors placing less weight on public signals when their informational content is more uncertain. We then complement this analysis using the VIX as a broader measure of market uncertainty and obtain qualitatively similar evidence. Overall, our results suggest that the influence of survey expectations on currency demand weakens in periods of elevated disagreement and uncertainty.

In sum, we provide evidence that expectations about exchange rates and the economic prospects of the US relative to foreign economies accurately predict dollar demand across various traded instruments. The paper is structured as follows: After providing an overview of the related literature below, we introduce our theoretical framework in Section 2. We then introduce our data in Section 3 and test our model empirically in Section 4. Section 5 provides robustness results and Section 6 concludes.

Related literature. Our paper contributes to research that aims to understand the determinants of dollar demand. First, there is a large literature in currency markets that studies the role of buying and selling pressure (i.e., order flow) in explaining exchange rates. This literature has been pioneered by Evans and Lyons (2002) and Evans (2002), inspiring a series of papers on exchange rates and currency flow dynamics (see, e.g., Froot and Ramadorai, 2005; Bacchetta and van Wincoop, 2006; Rime, Sarno, and Sojli, 2010; Menkhoff, Sarno, Schmeling, and Schrimpf, 2016; Ranaldo and Somogyi, 2021; Cespa, Gargano, Riddiough, and Sarno, 2021). The core focus of these papers is to contemporaneously explain exchange rates using order flows or to illustrate the contemporaneous link between order flows and macroeconomic news. In recent work, Stavrakeva and Tang (2025) show that FX survey expectations also align with aggregate open interest positions in FX futures. We contribute to this strand of research by showing that not only exchange rate expectations but also expectations about macroeconomic fundamentals strongly predict global dollar demand across a granular set of market participants in spot, swap, and forward markets alike.

Second, our work relates to a broad literature that explores the determinants of synthetic dollar funding in the context of covered interest rate parity deviations. Due to the paucity of quantity data, this literature has so far largely focused on explaining CIP deviations with intermediary and funding constraints[3] and only recently has started to jointly study prices

[3] See, for example, Baba, Packer, and Nagano (2008); Mancini-Griffoli and Ranaldo (2011); Du, Tepper, and

(the CIP basis) and quantities (the amount of synthetic dollar borrowing).[4] We add to this literature by showing that an expected increase in the cost of synthetic dollar funding is associated with less synthetic dollar borrowing by investment funds and smaller non-dealer banks. Moreover, in the cross-section, we find that investment funds reduce synthetic dollar borrowing less via currencies that are more exposed to systematic currency risk.

Finally, we add to a growing body of literature that studies the prevalence and determinants of currency hedging for investment funds. Du and Huber (2023) show that mutual funds hedge on average only 21% of their foreign currency denominated asset holdings. Bräuer and Hau (2022, 2024) explore the relation between aggregate currency hedging positions and exchange rate movements based on FX derivatives data from CLS and EMIR, respectively. In addition, several other studies also analyse currency hedging behaviour at the fund-level, namely, Czech, Huang, Lou, and Wang (2021), Opie and Riddiough (2023), Sialm and Zhu (2024), and Cheema-Fox and Greenwood (2024). Contemporaneously, Hacıoğlu-Hoke, Ostry, Rey, Planat, Stavrakeva, and Tang (2025) leverage regulatory data for the UK and show that pension and investment funds, insurers, and non-financial corporations use FX derivatives primarily to hedge. In contrast to this evidence on advanced economy currencies, De Leo, Keller, and Zou (2024); De Leo, Keller, Simoncelli, Villamizar-Villegas, and Williams (2025) focus on FX derivatives against emerging market currencies, where trading activity is dominated by speculative rather than hedging motives. We add to this literature by providing empirical evidence that funds buy dollars in forward contracts if professional forecasters expect that the dollar will appreciate over the course of the next two years.

2. Theoretical Framework

We present a model of currency demand with heterogeneous investors and intermediaries. The model builds on Gabaix and Maggiori (2015), Itskhoki and Mukhin (2021), Vayanos and Vila (2021), and Kekre and Lenel (2024), augmented by the fact that FX returns follow a factor

Verdelhan (2018b); Du, Im, and Schreger (2018a); Avdjiev, Du, Koch, and Shin (2019); Andersen, Duffie, and Song (2019); Cenedese, Della Corte, and Wang (2021); Jiang, Krishnamurthy, and Lustig (2021); Rime, Schrimpf, and Syrstad (2022); Augustin, Chernov, Schmid, and Song (2024); Georgievska, Karner, and Syrstad (2026).

[4]See, e.g., Ivashina, Scharfstein, and Stein (2015); Puriya and Bräuning (2020); Correa, Du, and Liao (2020); Becker, Schmeling, and Schrimpf (2023); Kloks, Mattille, and Ranaldo (2023); Kloks et al. (2024); Krohn and Sushko (2022); Kubitza, Sigaux, and Vandeweyer (2024); Ben Zeev and Nathan (2024); Du, Strasser, and Verdelhan (2025); Moskowitz, Ross, Ross, and Vasudevan (forthcoming 2025).

structure. Investors fall into two groups. *Directional traders* (D) take views on the dollar and express them in the spot and forward markets, bearing the associated currency risk. *Dollar borrowers* (B) hold dollar assets and use FX swaps to finance them, and are therefore only concerned with the price of synthetic dollar funding rather than FX risk. A single dealer sector intermediates all three markets using a single balance sheet. The cost of warehousing directional risk and the cost of supplying synthetic dollar funding are jointly determined.

2.1. Environment

Directional traders. There are J types of directional traders (e.g., funds, NBFIs, and smaller non-dealer banks), indexed by $j \in \{1, \ldots, J\}$, with market shares θ_j and $\sum_{j=1}^{J} \theta_j = 1$. Directional traders allocate wealth across N currencies, with the US dollar being the home currency for all. A position taken at horizon h is a view on the currency excess return over $[t, t+h]$, $\mathbf{r}^{fx}(h) \equiv \sum_{k=1}^{h} \mathbf{r}_{t+k}^{fx}$, with covariance $\mathbf{\Sigma}(h)$. Each type j maximizes expected utility over their investment portfolio:

$$\max_{\mathbf{W}_j} \; E_j \left[-\frac{1}{\gamma_j} e^{-\gamma_j \mathbf{W}_j' \mathbf{r}^{fx}(h)} \right], \tag{1}$$

where $\mathbf{W}_j$ is a vector of dollar positions across currencies, $\gamma_j > 0$ is constant absolute risk aversion, and $\mathbf{r}^{fx}(h)$ is the vector of currency excess returns.

Instruments. Directional traders take views either using spot (SPT) or forward (FWD) contracts, whereas dollar borrowers use FX swaps (SWP). Let $\Delta s_{t,t+h}$ denote the change in the log exchange rate over $[t, t+h]$, expressed as the price of the US dollar, so $\Delta s_{t,t+h} > 0$ is a dollar appreciation, and let $i_t - i_t^*$ be the US-minus-foreign interest differential. Specifically, a spot position earns the valuation change,

$$r^{SPT}(h) = \Delta s_{t,t+h}, \tag{2}$$

whereas a forward position, settling the dollar bought forward against its realized value, earns the currency excess return adjusted by the cross-currency basis x_i,

$$r^{FWD}(h) = \Delta s_{t,t+h} + (i_t - i_t^*) + x_i. \tag{3}$$

Both $r^{SPT}(h)$ and $r^{FWD}(h)$ are increasing in the value of the dollar, providing a natural vehicle to express a directional view on exchange rates. In contrast, an FX swap nets out the currency exposure and yields the interest differential up to the cross-currency basis x_i. As a result, the swap position is a funding decision rather than a directional bet on exchange rates.

Dollar borrowers. A unit mass of dollar borrowers aim to hold dollar assets, which they finance either directly in the cash market or synthetically via an FX swap. Relative to direct dollar funding, synthetic dollar funding is more or less expensive depending on the sign of the CIP basis x_i. In particular, the dollar borrower solves the following funding problem:

$$\max_{B_i} \, (x_i + c)\, B_i - \tfrac{\kappa}{2} B_i^2, \tag{4}$$

where B_i is the amount of synthetic dollar borrowing. In addition to the basis x_i, we also include a funding-access premium $c \geq 0$, reflecting that some borrowers have costly or limited direct access to dollar funding. One implication of this premium is that dollar borrowers may borrow synthetically even if the basis is negative (i.e., when direct funding is cheaper). κ captures the cost of running a larger synthetic dollar position (e.g., due to rollover risk).

Intermediaries. A dealer sector intermediates all three markets from one balance sheet. It runs a *directional book* $\mathbf{Q}^{fx}$ in spot and forward, taking the opposite side of directional traders and bearing the associated currency risk $\mathbf{\Sigma}$, and a *funding book* $\mathbf{Q}^{funding}$ in swaps, supplying synthetic dollars to dollar borrowers. The funding book is free of valuation risk but, like the directional book, it consumes balance sheet space: leverage constraints (e.g., the SLR) apply to the *gross* size of the book, so the two books draw on a common capacity at an increasing marginal cost. Letting $\|\mathbf{Q}^{fx}\| + \|\mathbf{Q}^{funding}\|$ denote gross intermediation, the dealer sector solves

$$\max_{\mathbf{Q}^{fx},\, \mathbf{Q}^{funding}} \; \mathbf{Q}^{fx\prime} E_D[\mathbf{r}^{fx}] \;+\; \mathbf{Q}^{funding\prime}(-\mathbf{x}) \;-\; \tfrac{\gamma_D}{2} \mathbf{Q}^{fx\prime} \mathbf{\Sigma} \mathbf{Q}^{fx} \;-\; \tfrac{\tau}{2} \big(\|\mathbf{Q}^{fx}\| + \|\mathbf{Q}^{funding}\| \big)^2, \tag{5}$$

where $E_D[\mathbf{r}^{fx}]$ are the dealer's return expectations, γ_D its risk aversion, and $\tau > 0$ the balance-sheet cost. The revenue term $\mathbf{Q}^{funding\prime}(-\mathbf{x})$ reflects that supplying synthetic dollars earns the funding wedge borrowers pay, $-x_i$ per unit, which is positive when the basis is negative.

Heterogeneous beliefs. Directional traders form expectations about currency risk premia by combining private information with public survey forecasts. Type j forms

$$E_j[\boldsymbol{\lambda}(h)] = (1-\omega_j)\,\boldsymbol{\lambda}^j(h) + \omega_j\,\boldsymbol{\lambda}^F(h), \tag{6}$$

where $\boldsymbol{\lambda}^j$ is the private belief, $\boldsymbol{\lambda}^F$ the consensus forecast, and $\omega_j \in [0,1]$ the weight on public information, which may vary across types.

2.2. *Optimal Choices*

Directional traders. Under the first two moments the objective is mean-variance, and type j solves the standard maximisation problem $\mathbf{W}_j' E_j[\mathbf{r}^{fx}] - \frac{\gamma_j}{2}\mathbf{W}_j'\boldsymbol{\Sigma}\mathbf{W}_j$, with first-order condition

$$\mathbf{W}_j^* = \tfrac{1}{\gamma_j}\boldsymbol{\Sigma}^{-1}E_j[\mathbf{r}^{fx}]. \tag{7}$$

Demand takes the same form at every horizon, so the equilibrium holds horizon by horizon and we suppress h. Directional traders tilt toward currencies expected to appreciate against the dollar, which yields the first prediction. Because both r^{SPT} and r^{FWD} are increasing in the value of the dollar, it applies to both spot and forward markets.

Proposition 1a (Directional flows: spot and forward): *Directional traders buy more US dollars through spot and forward instruments when they expect the dollar to appreciate, since $\mathbf{W}^*$ is increasing in $E[\mathbf{r}^{fx}]$ and both the spot and the forward returns increase with the value of the dollar.*

Dollar borrowers. The first-order condition of Eq. (4) yields the optimal dollar borrowing:

$$B_i^*(x_i) = \frac{x_i + c}{\kappa}, \tag{8}$$

which is increasing in the cross-currency basis: cheaper synthetic dollar funding (a higher, less negative x_i) attracts more synthetic dollar borrowing.

Intermediaries. In equilibrium, dealers must absorb both directional trading demand for dollars and synthetic dollar borrowing/lending on their balance sheet. In particular, both first-order conditions in Eq. (5) share the same shadow cost $\tau(\|\mathbf{Q}^{fx}\| + \|\mathbf{Q}^{funding}\|)$:

$$\text{directional:} \quad E_D[\mathbf{r}^{fx}] - \gamma_D \mathbf{\Sigma} \mathbf{Q}^{fx} = \tau(\|\mathbf{Q}^{fx}\| + \|\mathbf{Q}^{funding}\|), \tag{9}$$

$$\text{funding:} \quad -x_i = \tau(\|\mathbf{Q}^{fx}\| + \|\mathbf{Q}^{funding}\|). \tag{10}$$

Eq. (10) states that the cross-currency basis must equal the shadow cost of the dealer's balance sheet capacity. Since the shadow cost is common to both books, the compensation the dealer requires for supplying synthetic dollars is governed by how heavily the *combined* book consumes balance sheet space.

2.3. *Market Clearing and Endogenous Cross-Currency Basis*

Directional market. In equilibrium, dealers must absorb the aggregate directional demand and hence, $\sum_{j=1}^{J} \theta_j \mathbf{W}_j^* + \mathbf{Q}^{fx} = \mathbf{0}$. Put simply, when directional traders expect the dollar to appreciate and buy dollars, dealers take the opposite side and sell. Defining aggregate risk tolerance $\Gamma \equiv \sum_j \theta_j / \gamma_j$ and the belief-weighted expectation $\bar{E}[\mathbf{r}^{fx}] \equiv \frac{1}{\Gamma} \sum_j (\theta_j/\gamma_j) E_j[\mathbf{r}^{fx}]$, aggregate directional demand is $\mathbf{W}^{fx} = \Gamma \mathbf{\Sigma}^{-1} \bar{E}[\mathbf{r}^{fx}]$. On the dealer side, the directional and funding first-order conditions (Eqs (9) and (10)) share the same shadow cost $\tau(\|\mathbf{Q}^{fx}\| + \|\mathbf{Q}^{funding}\|)$; substituting the funding condition into the directional one yields the dealer's position in the directional book as,

$$\mathbf{Q}^{fx} = (\gamma_D \mathbf{\Sigma})^{-1} \left(E_D[\mathbf{r}^{fx}] + \mathbf{x} \right). \tag{11}$$

Imposing market clearing, that is, in equilibrium it must hold that $\mathbf{W}^{fx} + \mathbf{Q}^{fx} = \mathbf{0}$, pins down the equilibrium relation between dealer and investor beliefs,

$$\Gamma \mathbf{\Sigma}^{-1} \bar{E}[\mathbf{r}^{fx}] + (\gamma_D \mathbf{\Sigma})^{-1} \left(E_D[\mathbf{r}^{fx}] + \mathbf{x} \right) = \mathbf{0} \Rightarrow E_D[\mathbf{r}^{fx}] = -\left(\gamma_D \Gamma \, \bar{E}[\mathbf{r}^{fx}] + \mathbf{x} \right). \tag{12}$$

For dealers to willingly absorb directional traders' order flows, their beliefs must be negatively related to aggregate investor beliefs. The intuition here directly follows from Gabaix and Maggiori (2015); when investors buy US dollars, the dollar appreciates on impact beyond its fundamental value. This overshooting generates expected dollar depreciation in the future, which compensates intermediaries for absorbing customer flows.

The magnitude of this relation in Eq. (12) is governed by dealer risk aversion and aggregate investor risk tolerance, $\gamma_D \Gamma$. Moreover, the basis $\mathbf{x}$ enters this expression additively, capturing intermediation frictions. Specifically, a more negative basis that, for instance, arises due to an increase in dealer balance sheet costs τ (see Eq. (14)) is associated with an attenuation of dealers' expected return. This result stems from the fact that the dealer sector earns the basis when supplying synthetic dollars, while both trading books share the same balance sheet. In particular, the additional funding revenue $-\mathbf{x}$ loosens the shared balance-sheet constraint, so dealers require a smaller expected return to warehouse directional currency risk.

Our model, just like Gabaix and Maggiori (2015) or Itskhoki and Mukhin (2021), is silent on the high-frequency market-making activities of currency trading desks in investment banks which intermediate hundreds of billions of dollars every day. Although these microstructure effects are interesting and have received considerable attention following the influential line of research started by Evans and Lyons (2002), we abstract away from such issues and assume instantaneous and perfect risk sharing across intermediaries. Therefore, we are only concerned with the ultimate risk, which is only a small share of total trading volume but which intermediaries have to bear over time due to global demand imbalances.[5]

Proposition 1b (Directional flows: liqudity provision): *When dealers act as pure liquidity providers they take positions opposite to aggregate directional demand. If directional traders expect the dollar to appreciate and purchase dollars, dealers sell dollars to accommodate this demand.*

Funding market. To characterize the basis, take the directional book as given by the directional equilibrium and measure its size by $\|\mathbf{Q}^{fx}\|$, which is proportional to $\Gamma\, \bar{E}[\mathbf{r}^{fx}]$ and hence, increasing in expected dollar appreciation. The first-order condition for synthetic dollar funding (see Eq. (10)) implies that the dealer sector needs to provide the following

$$\|\mathbf{Q}^{funding}\|(x) = -\tfrac{x}{\tau} - \|\mathbf{Q}^{fx}\|, \tag{13}$$

which is *decreasing* in the directional book: the more balance sheet is committed to warehousing directional risk, the less remains for supplying synthetic dollars. Clearing the funding

[5]For example, from Table 7 we see that a 1 pp appreciation of the dollar predicts that dealer banks are \$744 mn short over the next month, which is less than 1 percent of daily spot FX turnover settled by CLS.

market, $\mathbf{W}^{funding}(x) = \|\mathbf{Q}^{funding}\|(x)$, i.e. $(x+c)/\kappa = -x/\tau - \|\mathbf{Q}^{fx}\|$, pins down the basis as

$$x^* = -\frac{\tau\left(\kappa\,\|\mathbf{Q}^{fx}\| + c\right)}{\tau + \kappa}. \tag{14}$$

Two implications follow from Eq. (14). First, the basis widens as balance sheet costs increase since $\partial x^*/\partial\tau < 0$. Second, related to the expected change in the value of the dollar:

$$\frac{\partial x^*}{\partial \bar{E}[\mathbf{r}^{fx}]} = \underbrace{\frac{\partial x^*}{\partial\|\mathbf{Q}^{fx}\|}}_{<0}\underbrace{\frac{\partial\|\mathbf{Q}^{fx}\|}{\partial \bar{E}[\mathbf{r}^{fx}]}}_{>0} < 0. \tag{15}$$

An expected dollar appreciation enlarges the dealer's directional book, crowding out capacity to supply synthetic dollars, and thereby widens the basis. The relationship between dollar strength and the basis is supported empirically by Avdjiev et al. (2019). Conversely, feeding Eq. (14) into funding demand, it is clear that $\mathbf{W}^{funding} = (x^* + c)/\kappa$ declines as x^* becomes more negative.

Proposition 1c (Funding flows: swaps): *The cross-currency basis equals the shadow cost of dealers' balance sheet capacity. An expected dollar appreciation increases the dealer's directional book and thereby widens the basis, which in turn reduces synthetic dollar borrowing via FX swaps. Dealer banks take the opposite side of this trade and supply dollars synthetically.*

2.4. Factor Structure and Cross-Sectional Predictions

To shed light on the cross-sectional differences across currencies, we follow the empirical literature (e.g., Lustig et al., 2011; Verdelhan, 2017) and assume that expected currency excess returns follow a factor structure, that is, $E_j[\mathbf{r}^{fx}] = \boldsymbol{\beta}' E_j[\boldsymbol{\lambda}]$, where $\boldsymbol{\beta}$ is an $N \times K$ matrix of factor loadings (e.g., dollar beta, carry beta, UMVE beta) and $E_j[\boldsymbol{\lambda}]$ is investor j's expectation of factor risk premia. Since $E_j[\mathbf{r}^{fx}]$ is increasing in $\boldsymbol{\beta}$, Eq. (7) implies that directional traders rebalance from foreign currencies into dollars along the factor structure of FX risk ($\frac{\partial \mathbf{W}^*}{\partial \boldsymbol{\beta}} > 0$).

Turning to the FX swap market, we assume that the factor structure is the same but that it enters through the cross-currency basis rather than through the expected return. This assumption is supported by the data: Du et al. (2018b) show that low-interest-rate currencies (e.g., Japanese yen) exhibit the most negative bases, whereas for high-interest-rate currencies the basis is much less negative (e.g., Australian dollar). Since the carry factor is defined on the interest-rate differential, the basis also inherits a carry-factor structure.

Proposition 2 (Cross-section of flows): *In the cross-section of currencies, currency flows propagate through the factor structure of currency risk. For directional flows, following an expected dollar appreciation investors sell more out of higher-risk (large $\boldsymbol{\beta}$) and less out of safer (small $\boldsymbol{\beta}$) foreign currencies. For FX funding flows, following an expected increase in the cost of synthetic funding investors reduce synthetic dollar borrowing more in low- relative to high-interest rate currencies.*

2.5. *State-Dependent Attention to Public Forecasts*

Directional traders form expectations about currency premia based on both private information and publicly available survey forecasts (see Eq. (6)). The weight that they put on public forecasts relative to their own expectations is time-varying. Specifically, we assume that this weight depends on the prevailing level of macroeconomic uncertainty (ξ), investors' risk aversion (γ_j), and the dispersion across professional forecasters ($\sigma(\boldsymbol{\lambda}^F)$). More formally, $\omega_j = \omega_j(\xi, \gamma_j, \sigma(\boldsymbol{\lambda}^F))$, where we impose two restrictions on the partial derivatives of ω_j. First, $\partial\omega_j/\partial\sigma(\boldsymbol{\lambda}^F) < 0$, that is, greater forecaster dispersion reduces the weight investors place on public forecasts. Second, the sign of $\partial\omega_j/\partial\xi$ depends on investors' level of risk aversion: $\partial\omega_j/\partial\xi < 0$ for sufficiently risk-averse investors and $\partial\omega_j/\partial\xi > 0$ otherwise. The first restriction reflects the notion that a noisier public signal carries less informational value. The second restriction captures heterogeneity of investors' responsiveness to public forecasts given their risk tolerances. Next, we substitute Eq. (6) into Eq. (7) and derive the marginal effect of the public forecasts on currency demand as:

$$\frac{\partial W^*_{ji}}{\partial \boldsymbol{\lambda}^F} = \frac{\omega_j(\xi, \gamma_j, \sigma(\boldsymbol{\lambda}^F))}{\gamma_j \sigma_i^2} \boldsymbol{\beta}'_i. \tag{16}$$

The corresponding cross-partials, which determine how this sensitivity varies with forecaster dispersion and macroeconomic uncertainty, respectively, are:

$$\frac{\partial^2 W^*_{ji}}{\partial \boldsymbol{\lambda}^F \, \partial\sigma(\boldsymbol{\lambda}^F)} = \frac{1}{\gamma_j \sigma_i^2} \frac{\partial \omega_j}{\partial \sigma(\boldsymbol{\lambda}^F)} \boldsymbol{\beta}'_i < 0, \tag{17}$$

$$\frac{\partial^2 W_{ji}^*}{\partial \boldsymbol{\lambda}^F \partial \xi} = \frac{1}{\gamma_j \sigma_i^2} \frac{\partial \omega_j}{\partial \xi} \boldsymbol{\beta}_i' \lessgtr 0. \tag{18}$$

The first cross-partial is unambiguously negative, whereas the second inherits the sign of $\partial\omega_j/\partial\xi$, which depends on γ_j.

Proposition 3 (Disagreement and uncertainty): *Investors place a lower weight on professional forecasters' expectations when forecaster disagreement rises. By contrast, the response to macroeconomic uncertainty depends on investors' risk aversion. Consequently, the response of currency flows to public forecasts weakens with forecaster disagreement and, conditional on risk aversion, with macroeconomic uncertainty.*

3. Data

We begin our empirical analysis by introducing our data on currency flows, survey forecasts, exchange rates, and forward contracts that we employ for the empirical analysis in Section 4.

3.1. Currency flow data

Our data on currency flows by market participants come from CLS Group (CLS), which operates the world's largest FX settlement system, mitigating both principal and operational risks by simultaneously settling both sides of the FX transaction (Hasbrouck and Levich, 2018). The majority of the 72 existing settlement members are large multinational banks. Additionally, there are more than 25,000 "third-party" clients of these settlement members, encompassing other banks, funds, non-bank financial firms, and corporations.

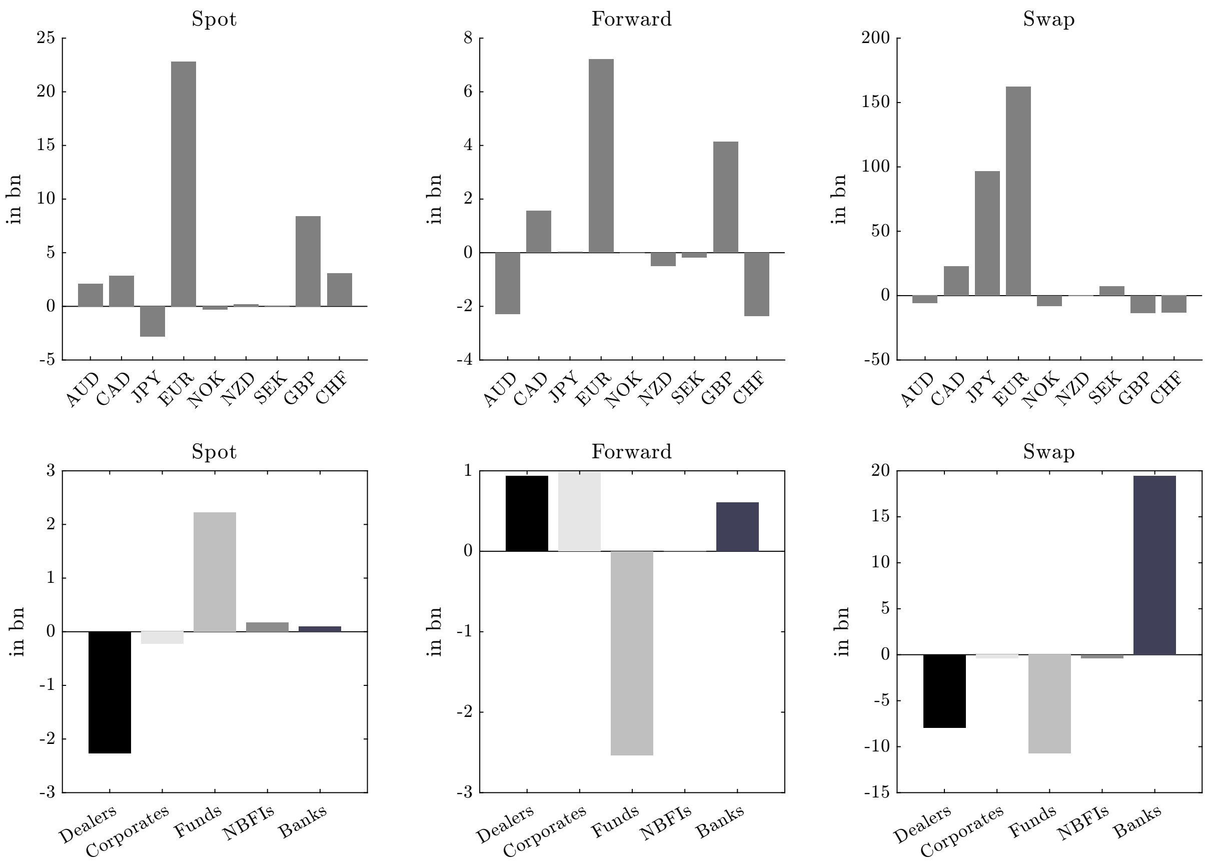
This dataset possesses several characteristics that make it well-suited for research on currency flows. First, CLS accurately records the buy and sell trading volume in the base currency alongside the number of transactions on an hourly basis, spanning from Sunday at 9 pm to Friday at 9 pm (London time, GMT), thereby covering the full FX trading week. Second, as mentioned before, CLS covers different groups of currency market participants: corporates, funds, non-bank financial firms (NBFIs), and banks. Third, the data cover spot, swap, and forward currency flows and account for approximately 50% of global FX trading volume as reported in the BIS Triennial Surveys.

CLS constructs its final dataset in two steps. In a first step, CLS reports transactions between corporates/banks, funds/banks, and non-bank financial firms/banks. This categorization is purely based on the identity of the trading counterparties and provides no information on who initiated the transaction and implicitly assumes that banks act as liquidity providers. In a second step, CLS performs a proprietary network analysis that allows it to categorize all market participants into price takers (buyside) and market makers (sellside). Given the two-tier market structure of the currency market (see, e.g., Schrimpf and Sushko, 2019), it appears fair to assume that almost all sellside market participants will be composed of either large FX dealer banks (e.g., UBS) or non-bank liquidity providers (e.g., XTX). In contrast, the buyside market participants will mainly consist of corporates, funds, non-bank financial firms plus smaller, non-dealer banks acting as price takers. CLS does not directly report transactions between price taker banks and market maker banks. However, the reporting structure above allows us to indirectly infer these transactions by computing the difference between total buyside trading activity and transactions between banks and corporates, funds, and non-bank financial firms, respectively. Note that this approximation will generally *underestimate* the trading activity between price taker banks (in the following classified as smaller, non-dealer banks and market maker or dealer banks since the three aforementioned groups may trade with both buyside and sellside banks. More precisely, CLS only reports aggregate trading activity between say funds and banks but not a separate breakdown of funds trading with buyside and sellside banks, respectively.

In each hourly interval, CLS logs buy volume as the amount of the base currency acquired by price takers from market makers. Conversely, the sell volume denotes the amount of base currency sold by price takers to market makers. Note that whenever we study flows between the aggregate buyside and sellside market participants, we take the perspective of the liquidity providers (that is, we compute net flows as sellside minus buyside flows). Online Appendix A provides further institutional insights and details on CLS's classification of market participants into price takers and market makers.

Our main variable of interest is the net currency flow (i.e., total buy volume less total sell volume), denominated in billions of USD (positive values indicate net purchases of USD). Our sample period spans from September 2012 to May 2025, and we focus on G10 currency pairs: the USD versus AUD, CAD, CHF, EUR, GBP, JPY, NOK, NZD, and SEK. Figure 1 reports the average monthly net currency volumes by currency pair and trading counterparty for spot transactions, forwards, and short-term FX swaps. Table B.1 in Online Appendix B tabulates the corresponding average monthly net trading volumes of each currency pair by market participant and traded instruments, as well as the standard deviations of the currency flows. Spot and forward transactions represent directional flows and are reported across all maturities. By contrast, short-term swaps primarily reflect currency funding needs (see, e.g., Kloks et al., 2023; Ranaldo, 2023), accordingly, our empirical analysis focuses on FX swaps with maturities of less than 35 days to capture synthetic USD funding flows.

Figure 1: Summary Statistics - Monthly Net Currency Trading Volume



Note: This figure reports the average monthly net currency flows (in billions of USD) by instrument. The top panel shows average net flows by currency pair against the USD for spot transactions, forwards, and FX swaps. The bottom panel reports the corresponding average net flows by trading counterparty, distinguishing dealer banks, corporates, funds, non-bank financial institutions (NBFIs), and smaller non-dealer banks. Positive (negative) values indicate net purchases (sales) of USD. For FX swaps, the reported flows correspond to the second leg of the transaction. Spot and forward flows include transactions across all maturities, whereas FX swap flows include transactions with maturities of less than 35 days. The sample covers G10 currencies quoted against the USD. The data are monthly and span the period from September 2012 to May 2025.

Figure 1 reveals substantial heterogeneity in average net currency volumes across both instruments and market participants. FX swaps exhibit by far the largest net flow imbalances, which is consistent with the dominant role of the swap market in international dollar funding. Spot FX transactions exceed forward transactions in terms of average net flows but are an order of magnitude smaller compared to FX swaps. Forward transactions comprise the smallest part of the market, which is consistent with the evidence in the BIS Triennial Surveys. Comparing across different groups of market participants, directional currency flows are dominated by dealer and non-dealer banks as well as investment funds. In contrast, corporates and NBFIs account for a relatively modest share of aggregate net currency flows.

3.2. FX and economic forecasts

We obtain forecasts from Consensus Economics. The data contain monthly forecasts covering exchange rates and macroeconomic fundamentals, such as interest rates, current account balances, consumer prices, and real GDP growth. Our sample spans from September 2012 to May 2025. Again, we focus on the G10 currencies and the corresponding economies. For exchange rates, we obtain forecasts for 3-, 12-, and 24-month horizons.[6] Interest rate projections for three-month interest rates and ten-year government bond yields cover 3- and 12-month forecast periods.[7] Forecasts for key economic indicators such as consumer price changes, current account balances, and real GDP growth are for the current and subsequent year-end.[8]

Data for macroeconomic fundamentals are at the individual forecaster-level. We construct *consensus* forecasts by aggregating individual forecaster-level data, providing an average forecast that reflects the collective outlook of multiple forecasters. Measures of forecaster disagreement, such as the highest and lowest forecasts and the standard deviation of predictions, help us to assess the level of uncertainty in economic projections. For the main part of our analysis, we focus on consensus forecasts, however, we also look at individual forecaster-level

[6] Note that survey forecasts for CHF, NOK, and SEK are expressed relative to the EUR rather than the USD. Since, for any dollar currency pair USD/X, it holds that $\mathbb{E}[S_{USD/X}] = \mathbb{E}[S_{USD/EUR} \cdot S_{EUR/X}] = \mathbb{E}[S_{USD/EUR}] \cdot \mathbb{E}[S_{EUR/X}] + \text{Cov}(S_{USD/EUR}, S_{EUR/X})$, we convert these forecasts to dollar expectations using the prevailing USDEUR spot rate and we account for the covariance term using expanding historical covariances starting in January 2000.

[7] Since there are no specific forecasts for euro area interest rates, German interest rate forecasts are used as a proxy for euro interest rate predictions.

[8] Consensus Economics provides forecasts for current account *balances* which we scale by the previous year's GDP to ensure comparability across countries and over time.

outcomes, for example, with regard to forecaster disagreement.

Based on those forecasts, we construct our key forecast measures to assess the predictive power of forecasts for currency flows. Motivated by Kremens et al. (2025), who document the higher predictive power of longer-term exchange rate forecasts for currency returns, we mainly focus on longer-term horizon forecasts. Since FX transactions always involve two currencies and relate to the economic conditions in two countries, we express our forecast measures as differentials. For example, the FX rate change is calculated as the percentage change in the exchange rate over 24 months, using the USD as the base currency. Accordingly, the interest rate differential is computed as the difference between 3-month (annualized) interest rates in the US and the corresponding foreign rates projected 12 months ahead. The current account to GDP (CA to GDP) differential, consumer price differential, and real GDP growth differential are calculated as the differences between US and foreign forecasts for CA to GDP, consumer prices, and real GDP growth, respectively, at the end of the subsequent year. To assess the importance of shorter-term horizon forecasts, we apply the same methodology to construct corresponding measures over shorter horizons (e.g., three months).

The price of synthetic dollar borrowing is measured by the CIP basis. In line with Du et al. (2018b), we define the CIP basis as $CIP = i_{us} - (i_{foreign} - FD_{annualized})$, where FD is the forward discount annualized according to the maturity between the forward rates. If CIP > 0 ($CIP < 0$), the direct USD interest rate is higher (*lower*) than the synthetic dollar interest rate, implying that synthetic dollar funding is cheaper (*more expensive*) relative to the cash market. Our innovation is to consider a *forward-looking (forecasted) CIP basis*, that is, the CIP deviation implied for a 3-month investment beginning three months ahead. To construct this measure, we combine Consensus Economics forecasts of 3-month interest rates three months ahead with the implied 3-month forward discount for the period from $t + 3$ to $t + 6$. The forward discount is computed from the 3-month and 6-month forward exchange rates as $(\log(F_{0,6}) - \log(F_{0,3})) \times \frac{360}{90} \times 100$ while the forecast interest rate differential is given by the difference between the expected 3-month interest rates in the US and the quote country three months ahead. Importantly, this measure captures the *expected* arbitrage opportunity over the period from $t + 3$ to $t + 6$, while being fully determined and funded at time t.[9]

[9] As an alternative, we could also employ FX rate forecasts to derive the forecasted forward discount. However, those forecasts are only available at 3- and 12-month horizons, hence, we would need to interpolate any forecasts

Table 1: Summary Statistics - Forecast Variables

Currency	FX Rate Change in PP	Interest Rate Diff. in PP	CA to GDP Diff. in PP	Cons. Prices Diff. in PP	GDP Diff. in PP	CIP Basis in PP
AUD	−0.909	−0.398	−1.526	−0.199	−0.277	−0.100
CAD	−2.366	0.141	−1.163	0.197	0.142	−0.065
CHF	1.686	1.915	−12.592	1.594	0.590	−0.454
EUR	−1.286	1.230	−5.425	0.603	0.599	−0.393
GBP	−1.983	0.233	0.220	−1.042	0.374	−0.207
JPY	−1.608	1.600	−6.053	1.146	1.070	−0.637
NOK	−7.090	−0.092	−12.834	0.183	0.238	−0.319
NZD	−0.056	−1.002	1.502	0.189	−0.313	−0.135
SEK	−6.368	0.912	−8.228	0.423	0.134	−0.378

Note: FX Rate Change is defined as $(\mathrm{FX}_{24mo} - \mathrm{FX})/\mathrm{FX} \times 100$, with USD as the base currency. Interest Rates, CA to GDP, Consumer Prices, and real GDP growth are differentials between the US and the quote country, forecasted 12 months ahead (for interest rates) or at the end of the subsequent year (for the other variables), measured in percentage points. The CIP deviation is defined as the difference between the annualized forward discount and the annualized interest rate differential between the quote country and the US, with the USD being the base currency. The forward discount is computed as $(\log(F_{0,6}) - \log(F_{0,3})) \times \frac{360}{90} \times 100$. The interest rate differential embedded in the CIP deviation is based on 3-month interest rates forecasted three months ahead. The sample covers G10 currencies quoted against the USD. The data are monthly from September 2012 to May 2025.

Table 1 tabulates the average values of our forecast variables across currencies. On average, all foreign currencies in our sample are expected to appreciate against the USD over the subsequent 24 months with the exception of the Swiss franc. The predicted 3-month interest rate differentials are mostly small and positive, indicating slightly higher US interest rates. Notable exceptions are Australia and New Zealand, which are high-interest-rate currencies that frequently end up in the long leg of the carry trade. The current-account-to-GDP differentials are negative for most currencies, reflecting the fact that the US is projected to run negative CA / GDP balances. Consumer-price and GDP differentials are slightly positive, on average, indicating higher real growth and inflation forecasts for the US. Finally, the CIP basis is typically negative, which implies that, in accordance with existing literature (e.g., Du et al., 2018b), the cost of synthetic dollar funding is more expensive relative to the cash market.[10] Online Appendix Section C provides detailed graphical illustrations of survey-based forecasts for exchange rate changes and CIP deviations, respectively, alongside their realization.

Consensus Economics forecasts are widely used by policymakers, investors, and busi-

to match the interest rate horizon.

[10] The basis is negative in more than 90% of the sample observations, with heterogeneity across currencies.

nesses to inform decision-making and strategic planning.[11] A common criticism of survey forecasts is that they are biased by strategic incentives (see, e.g., Coibion and Gorodnichenko (2012), Coibion and Gorodnichenko (2015), Bordalo, Gennaioli, Ma, and Shleifer (2020), De Marco, Macchiavelli, and Valchev (2021), and Gemmi and Valchev (2026)). Our results do not imply that the forecasts themselves are rational, but rather that the trading flows of the marginal investor in currency markets are predicted by consensus forecasts.[12]

3.3. *Exchange Rates and Forward Contracts*

We collect hourly data on spot mid quotes and daily forward prices for various maturities from Bloomberg. We denote the spot price for country i at time t by $S_{i,t}$ and forward prices by $F_{i,t}$. An increase in F or S corresponds to an appreciation of the US dollar relative to the foreign currency, i.e., F and S are quoted with the USD as the base currency. We use mid prices when calculating exchange rate changes $\Delta \log S_{i,t}$.

In normal times, forward rates satisfy the covered interest rate parity condition (Du et al., 2018b). Under this condition, interest rate differentials approximate the forward discount, the difference of the log forward price from the log spot price. We use 2-year forward rates and spot prices to compute interest rate differentials: $r_{i,t} - r_{US,t} \approx \log F_{i,t} - \log S_{i,t}$.

3.4. *Measures of currency risk*

To study the cross-sectional differences across currencies, we construct measures of currency risk (i.e., currency betas) based on two factor models: (i) the bivariate model by Lustig et al. (2011) and Verdelhan (2017) that includes the dollar and the carry factor and (ii) the one-factor model by Chernov et al. (2023) that builds an unconditional mean-variance efficient portfolio. The currency betas quantify an asset's exposure to currency risk factors.

Verdelhan (2017) shows that the dollar and carry factors jointly account for the majority of variation in bilateral FX rates relative to the dollar, explaining between 19 and 91 percent of the exchange rate variation among developed countries. We construct the dollar and carry factors from currency excess returns, which we define as $\log S_t - \log F_{t-1,t}$, and hence, a higher factor

[11] Consider, for example, Devereux, Smith, and Yetman (2012).

[12] An alternative to survey forecasts would be to use option-implied expectations, which reflect beliefs under risk-neutral pricing. However, since our goal is to capture investors' subjective beliefs under the physical measure, we employ survey-based forecasts.

return corresponds to an appreciation of the dollar. The dollar factor is the average change in all currencies with respect to the US dollar. It is akin to the capital asset pricing model's market portfolio. The carry factor mimics the returns of a self-financing long-short trading strategy that borrows in low-interest-rate currencies to invest in high-interest-rate ones. We create this portfolio by sorting, every month, currencies into five portfolios based on the one-month forward discount relative to the USD prevailing over the previous month. The "long" portfolio consists of currencies with the highest interest rates relative to the US, whereas low-interest-rate currencies constitute the "short" portfolio.

We consider the same cross-section of 39 countries as in Verdelhan (2017) but exclude euro area countries; this leaves us with 28 countries to construct the risk factors. Specifically, we estimate dollar β_i^{DOL} and carry β_i^{CAR} betas using a 60-month rolling window regression of log changes in currency i's exchange rate $S_{i,t}$ on either the dollar or the carry factor:

$$\Delta \log S_{i,t} = a_i + \beta_i^{DOL} Dollar_t + \epsilon_{i,t}, \tag{19}$$

$$\Delta \log S_{i,t} = a_i + \beta_i^{CAR} Carry_t + \epsilon_{i,t}. \tag{20}$$

Dollar and carry betas summarize the assortment of a country's characteristics that collectively determine its currency's risk. For example, countries with large carry betas tend to be on the periphery of the global trade network (Richmond, 2019) and typically export commodities and import finished goods (Ready, Roussanov, and Ward, 2017). Carry betas align with interest rate differentials (Lustig et al., 2011). Countries with large dollar betas typically face large trade costs in goods, which relates, for instance, to the gravity equation in international trade. These economic sources of currency risk are not mutually exclusive. Thus, the carry and dollar betas are useful as they proxy for deeper economic phenomena but are defined by their ability to capture a currency's exposure to these FX risk factors.

In addition to the dollar and carry betas, we also consider the beta on the unconditional mean-variance efficient (UMVE) portfolio of currencies that we create following Chernov et al. (2023). UMVE is constructed such that it solely accounts for the priced risk component of currency returns. As for the carry and dollar factor, we similarly estimate the currency beta with respect to the UMVE factor from a rolling window regression:

$$\Delta \log S_{i,t} = a_i + \beta_i^{\text{UMVE}} \text{UMVE}_t + \epsilon_{i,t}. \tag{21}$$

Table D.1 in the Online Appendix summarizes the betas by currency pair. Analogous to a stock market beta, dollar betas record the incremental systematic currency risk that a US investor takes on when investing in foreign currency i. Carry and UMVE betas measure currency i's exposure to the carry and UMVE factor, respectively.[13]

4. Empirical Analysis

We now turn to the empirical analysis that aims to test our theoretical predictions.

4.1. *Currency flow predictability*

We begin by exploring whether survey expectations about FX rates have predictive power for currency flows. For this, we estimate predictive regressions of currency flows on survey forecasts. In doing so, we consider spot, forward, and swap currency flows. To ease the interpretation of the sign of the point estimates, we leverage our theoretical framework. The framework predicts that higher expected US dollar returns are associated with investors buying more US dollars in the future (either via spot or forward contracts, see Proposition 1a), dealer banks take the opposite position to aggregate investor demand and provide liquidity (see Proposition 1b). A similar intuition applies to synthetic dollar borrowing via currency swaps: an expected appreciation of the US dollar is associated with a widening of the CIP basis, making synthetic dollar funding more expensive and thus reducing net dollar borrowing by investors via FX swaps (i.e., selling fewer dollars forward, see Proposition 1c).

Directional flows: The FX spot market facilitates the immediate exchange of one currency for another at the prevailing market rate. For instance, investors can use spot FX transactions to obtain foreign currencies for portfolio allocation and investment purposes. The FX spot market, therefore, enables investors to gain direct exposure to foreign assets and to adjust

[13] Since, by construction, dollar betas average to one in the cross-section, we rescale them to have zero mean and unit standard deviation, to ease the interpretation of our regression coefficients.

their currency holdings in response to market conditions. Currency forwards are a second form of directional currency flows. An FX forward is a contractual agreement to buy or sell a specific amount of foreign currency at a predetermined exchange rate on a future date. By locking in this forward rate, market participants can take positions based on their exchange rate expectations or eliminate uncertainty about future exchange rate movements.

As a first step, we explore how currency flows in the spot FX market are related to forecasts of exchange rates. Panel (a) in Table 2 reports the results of regressing spot FX flows at time $t+1$ on a set of forecasts formed at time t. Specifically, we run regressions of the form:

$$SPT_{i,t+1} = \mu_i + \alpha_t + \beta' \mathbf{X}_{i,t} + \epsilon_{i,t}, \tag{22}$$

where the dependent variable is the spot FX flow ($SPT_{i,t+1}$) from CLS in currency pair i and month $t+1$. The key regressor is in $X_{i,t}$, which contains forecasts of FX rate changes over the following 24 months ("FX Change"). In line with empirical asset pricing literature on subjective risk premia (e.g., Nagel and Xu, 2023; Kremens et al., 2025), we focus on the forecasted level of the expected change in the exchange rate in the main part of the analysis rather than on forecast revisions or innovations. The rationale for this choice is that in our framework (see Section 2), portfolio allocations across currencies are driven by the level of expected currency returns rather than innovations.[14]

In all regression specifications, we include currency μ_i and time α_t fixed effects. Currency fixed effects control for time-invariant unobserved heterogeneity at the currency level, while time fixed effects absorb variation in global factors common to all currencies (e.g., US monetary policy cycle, general market uncertainty). As a result, the β coefficient in Eq. (22) captures the *relative* sensitivity of dollar demand to expected exchange rate changes. In particular, within a given period, it tells us whether foreign currencies whose expected depreciation against the dollar exceeds the cross-sectional average see differentially higher outflows relative to what global factors alone would predict.

Panel (a) shows a clear difference between customer flows (i.e., funds and non-dealer banks) on the one hand and dealer banks on the other. The coefficients on customer flows,

[14]In Section G repeat our baseline specification using forecast revisions instead of levels and find largely consistent results. Specifically, positive forecast revisions predict dollar demand from end-user investors.

Table 2: Forecasting Spot and Forward Currency Flows

	Dealer Banks	Corporates	Funds	NBFIs	Non-Dealer Banks
(a) Spot flows					
FX Change	−0.744***	−0.029*	0.323***	−0.085***	0.539***
	(0.225)	(0.015)	(0.097)	(0.024)	(0.192)
Overall R^2	0.335	0.240	0.319	0.182	0.266
(b) Forward flows					
Excess FX Change	−0.305***	0.026	0.279***	0.023	0.105*
	(0.080)	(0.033)	(0.087)	(0.015)	(0.055)
Interest Rate Diff.	−0.196***	0.106***	0.265***	0.086***	−0.041
	(0.068)	(0.035)	(0.076)	(0.018)	(0.050)
Overall R^2	0.263	0.478	0.531	0.345	0.226
Total # of Obs.	1′368	1′368	1′368	1′368	1′368
# of Currencies	9	9	9	9	9
Currency FE	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes

Note: This table reports forecasting regressions of spot and forward currency flows by trading counterparty (in billions of USD) at $t+1$ on the set of forecasts available at t. Panel (a) examines spot market currency flows using forecasts of FX rate changes over the next twenty-four months. Panel (b) examines forward market currency flows using forecasts of excess FX rate changes and the current twenty-four-month interest rate differential between the foreign country and the US. Excess FX rate changes are defined as the forecasted FX rate change over the next twenty-four months minus the corresponding twenty-four-month interest rate differential. All regressions include currency and time fixed effects. Standard errors in parentheses are computed using the spatial estimator of Driscoll and Kraay (1998), which allows for cross-sectional and serial correlation as well as heteroskedasticity. Stars indicate significance at the 10% (*), 5% (**), and 1% (***) levels. The sample covers G10 currencies quoted against the USD. The data are monthly from September 2012 to May 2025.

particularly for funds and non-dealer banks, are positive and significant, reflecting directional trading behaviour. In other words, an expected appreciation of the USD over the horizon of the next two years is associated with a positive demand for USD in FX spot markets. For example, when the consensus forecast indicates an appreciation of 1% of the USD, then trading volume for buying USD and selling foreign currency by non-dealer banks increases, on average, by 0.54 billion USD over the following month. In contrast, dealer banks display the opposite behaviour, that is, the coefficient is negative and significant, indicating that they sell USD when the USD is expected to appreciate. This is consistent with dealer banks acting as liquidity providers in the currency market. Similarly, the coefficient for NBFIs is negative and significant, revealing that NBFIs also provide liquidity to investors. Comparing the economic magnitude of point estimates, a clear ranking emerges. Through the prism of our model, this ranking may arise from the fact that investors' demand for US dollars increases with their level of risk tolerance (see Eq. (7)). Hence, Table 7 implies that investment funds and smaller non-dealer banks have a higher risk tolerance compared to corporates.

As a second step, we seek to understand how currency flows in the FX forward market are related to exchange rate forecasts. Our model predicts that, in contrast to FX spot transactions, which generate returns solely through exchange rate movements, the payoff from an FX forward reflects the currency excess return, that is, the exchange rate change plus the corresponding interest rate differential. Consequently, our theoretical framework predicts that forward demand is driven by investors' expectations of future currency excess returns rather than exchange rate changes alone. Accordingly, we regress forward FX flows on survey-based forecasts of currency excess returns while controlling for the contemporaneous 24-month interest rate differential. Specifically, we run regressions of the form:

$$FWD_{i,t+1} = \mu_i + \alpha_t + \beta' \mathbf{X}_{i,t} + \gamma' \mathbf{IRD}_{i,t,24m} + \epsilon_{i,t}, \tag{23}$$

where the dependent variable is the forward FX flow ($FWD_{i,t+1}$) from CLS in currency pair i and month $t+1$. The key regressor is in $X_{i,t}$, which contains forecasts of excess FX rate changes ("Excess FX Change") and the current twenty-four-month interest rate differential between the foreign country and the US ("Interest Rate Differential"). Excess FX rate changes are defined as the forecasted FX rate change over the next twenty-four months minus the corresponding twenty-four-month interest rate differential.

Panel (b) in Table 2 reports the results. Investment funds and smaller non-dealer banks significantly increase their purchases of US dollar in the forward market when they expect higher future dollar excess returns. In contrast, dealer banks take the opposite side of these trades by selling dollars forward. These results are consistent with those for the spot FX market and suggest that investment funds and non-dealer banks use forward contracts either to take directional positions or to hedge non-USD exposures when they expect the US dollar to appreciate by more than what is implied by the interest rate differential alone. Overall, these findings suggest that forward currency trading reflects both investors' expectations about future currency excess returns as well as the incentives created by interest rate differentials. Note that replacing the survey-based excess return expectations in Eq. (23) with the FX forecast would only change the point estimate on the interest rate differential but not on the exchange rate forecast (see Kremens et al., 2025).

Short-term forecasts: Next, we replicate our spot currency flow analysis in Table 2 with short-term forecasts. Specifically, we focus on 3-months ahead exchange rate forecasts. Kremens et al. (2025) show that long-term FX forecasts tend to be more accurate predictors of short-term FX returns than short-term FX forecasts. Table 3 provides complementary evidence to their findings for currency flows.

In particular, in panel (a), when we use 3-month ahead forecasts for FX rates, we find no evidence of predictability of currency flows over the subsequent month. In panel (b), we decompose the short-term forecasts into two components: one that is common with the long-term forecast and a residual component, which is orthogonal to it. We obtain a similar result to Kremens et al. (2025) for quantities rather than prices. Short-term forecasts have no predictive power for currency flows because the residual component predicts flows with the opposite sign, thereby offsetting the predictive content it shares with long-term forecasts.

In sum, our evidence on directional FX flows indicates that there is heterogeneity in the way currency flows of various groups of market participants relate to expectations about future exchange rates. Specifically, investment funds and non-dealer banks tend to purchase USD when the USD is expected to appreciate, both in the spot and forward market. Dealer banks' currency flows similarly correlate with survey forecasts but with the opposite sign, that is, dealer banks supply dollar liquidity to clients.

Funding flows: Currency swaps enable the simultaneous exchange of two currencies at the spot rate and the agreement to reverse the transaction at a predetermined forward rate in the future. Unlike directional FX transactions, which are frequently used for portfolio allocation and investment motives, FX swap markets are primarily used for short-term funding. In particular, financial institutions such as non-dealer banks, but also investment funds, rely on FX swaps to obtain dollar funding (Ranaldo, 2023). For instance, a Dutch investment fund could borrow US dollars and lend euros by engaging in an FX swap that exchanges euros for dollars today and receives euros in the "forward leg." This mechanism allows investors to "synthetically" borrow in foreign currencies without accessing foreign funding markets (e.g., repo markets) directly (Borio, McCauley, and McGuire, 2022).

The price of synthetic dollar borrowing is typically measured by the CIP basis. In brief,

Table 3: Forecasting Spot Currency Flows with Short-term Forecasts

	Dealer Banks	Corporates	Funds	NBFIs	Non-Dealer Banks
(a) Exchange rate forecasts (3 months)					
FX Change (3m)	−0.136	0.049*	−0.052	−0.017	0.155
	(0.281)	(0.027)	(0.167)	(0.033)	(0.236)
Overall R^2	0.322	0.240	0.312	0.160	0.256
(b) Exchange rate forecasts (3 months): shared and residual components					
FX Change (3m): shared with 24m	−3.308***	−0.159***	1.493***	−0.376***	2.365***
	(0.949)	(0.056)	(0.402)	(0.096)	(0.801)
FX Change (3m): residual	1.063***	0.127***	−0.636***	0.118***	−0.681**
	(0.387)	(0.038)	(0.223)	(0.032)	(0.319)
Overall R^2	0.340	0.247	0.324	0.191	0.270
Total # of Obs.	1'368	1'368	1'368	1'368	1'368
# of Currencies	9	9	9	9	9
Currency FE	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes

Note: This table reports forecasting regressions of spot currency flows by trading counterparty (in billions of USD) at $t+1$ on the set of forecasts available at t. Panel (a) includes forecasts of FX rate changes over the next three months. Panel (b) adds the shared and residual components of the forecasted FX rate changes over the 3-month horizon with the forecasted FX rate changes over the 24-month horizon. To obtain those, we regress the forecasted FX rate changes over the 3-month horizon on the forecasted FX rate changes over the 24-month horizon and collect the fitted value (shared component) and residual (short-horizon specific component). All regressions include currency and time fixed effects. Standard errors in parentheses are computed using the spatial estimator of Driscoll and Kraay (1998), which allows for cross-sectional and serial correlation as well as heteroskedasticity. Stars indicate significance at the 10% (*), 5% (**), and 1% (***) levels. The sample covers G10 currencies quoted against the USD. The data are monthly from September 2012 to May 2025.

CIP states that the interest rate differential between two countries should equal the forward–spot exchange rate differential, ensuring that a hedged foreign investment earns the same return as a domestic investment. In frictionless markets, CIP holds because arbitrage capital can freely exploit any pricing gap across markets. However, since the Global Financial Crisis, persistent CIP deviations have emerged (see, e.g., Du et al., 2018b). Specifically, synthetic dollar funding via FX swaps has become more expensive relative to direct funding via the cash market. We define the CIP basis as $CIP = i_{us} - (i_{foreign} - FD_{annualized})$. Interest rates and forward discount are annualized. If CIP > 0 ($CIP < 0$), the direct USD interest rate is higher (*lower*) than the synthetic dollar interest rate, implying that synthetic dollar funding is cheaper (*more expensive*) relative to the cash market. As has been shown in Table 1, and in line with Du et al. (2018b), the CIP basis is mostly negative.

Given our interest in understanding how expectations predict currency flows, we construct a forward-looking measure of CIP. Specifically, we use three-month-ahead forecasts of US and foreign three-month cash market interest rates, together with the three-to-six-month forward discount implied by today's forward rates, to compute the expected CIP basis.[15] We use these implied CIP forecasts to predict future swap currency flows. Our prior is that an expected increase in the CIP basis (i.e., synthetic dollar funding becomes cheaper) is associated with more synthetic USD borrowing via FX swaps.

Table 4 reports the results of regressing swap currency flows at time $t+1$ on CIP forecasts formed at time t. Specifically, we run regressions of the form:

$$SWP_{i,t+1} = \mu_i + \alpha_t + \beta CIP_{i,t} + \epsilon_{i,t}, \tag{24}$$

where the dependent variable is the swap currency flow ($SWP_{i,t+1}$) in a given foreign currency i and month $t+1$. Note that CLS records the second leg of the swap, hence a negative currency flow corresponds to borrowing USD in the first leg and repaying it in the second leg. Therefore, a negative swap flow implies that the amount of synthetic dollar borrowing exceeds the amount of lending. The key regressor is the CIP forecast $CIP_{i,t}$. As before, we include both currency μ_i and time α_t fixed effects.

Panel (a) includes forecasts of the CIP deviation over the next six months ("CIP Deviation") as regressor. The point estimate for funds is negative and economically large, amounting to an additional 55 billion (bn) USD synthetic borrowing for a 1 percentage point (pp) expected tightening of the CIP basis. Note that CLS records the second leg of the swap and hence, a negative coefficient means that, conditional on the cost of synthetic dollar funding decreasing (i.e., the basis becomes less negative), investment funds sell more USD forward, which is equivalent to doing more synthetic dollar borrowing. The same holds true for smaller non-dealer banks that might be restricted from accessing direct dollar funding. In contrast, dealer banks supply dollars to meet swap funding demand as they have a large positive coefficient with respect to the expected CIP basis of 131 bn USD, which amounts to almost the entire demand by funds and non-dealer banks.

[15] Bertaut, Faia, Kalemli-Özcan, Marchesini, Paetzold, and Schmitz (2025) and Du, Hébert, and Huber (2022) construct similar measures of forward looking CIP deviations by combining survey data and forward rates.

Table 4: Forecasting Swap Currency Flows

	Dealer Banks	Corporates	Funds	NBFIs	Non-Dealer Banks
(a) CIP forecasts					
CIP Deviation	130.899***	0.016	−55.198***	1.259	−85.192**
	(29.645)	(0.346)	(14.584)	(1.201)	(34.592)
Overall R^2 in	0.699	0.637	0.387	0.187	0.637
(b) FX and interest rate forecasts					
FX Change	−3.449***	−0.002	0.429**	0.003	3.037***
	(1.044)	(0.011)	(0.195)	(0.070)	(1.021)
Interest Rates	11.402	0.123	12.669***	0.974**	−22.627***
	(8.246)	(0.081)	(1.798)	(0.413)	(7.992)
Overall R^2	0.698	0.637	0.392	0.189	0.640
Total # of Obs.	1'368	1'368	1'368	1'368	1'368
# of Currencies	9	9	9	9	9
Currency FE	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes

Note: This table reports forecasting regressions of swap currency flows (swap flows with maturities shorter than 35 days) by trading counterparty (in billions of USD) at $t+1$ on the set of forecasts available at t. Panel (a) includes the forecasted CIP deviation over the next six months. The forecasted CIP deviation is defined as the difference between the annualized forward discount and the annualized interest rate differential between the quote country and the US, with the USD being the base currency. The forward discount is computed as $(\log(F_{0,6}) - \log(F_{0,3})) \times \frac{360}{90} \times 100$. The interest rate differential embedded in the CIP deviation is based on 3-month interest rates forecasted three months ahead. Panel (b) replaces the forecasted CIP deviation with forecasted FX rate changes at the 3-month horizon and forecasted three-month interest rate differentials 3-month ahead. All regressions include currency and time fixed effects. Standard errors in parentheses are computed using the spatial estimator of Driscoll and Kraay (1998), which allows for cross-sectional and serial correlation as well as heteroskedasticity. Stars indicate significance at the 10% (*), 5% (**), and 1% (***) levels. The sample covers G10 currencies quoted against the USD. The data are monthly from September 2012 to May 2025.

Panel (b) replaces the expected CIP basis with its individual components — forecasted exchange rate changes at the three-month horizon ("FX Change") and expected three-month interest rate differentials between the US and the foreign country 3-month ahead ("Interest Rate"). An expected appreciation of the US dollar is associated with a widening of the CIP basis (i.e., a more negative basis), which raises the cost of synthetic dollar funding and, in turn, reduces net USD borrowing via FX swaps by both funds and non-dealer banks (i.e., selling fewer dollars forward). In contrast, responses to expected interest rate differentials differ across investor types. Non-dealer banks increase synthetic dollar borrowing when US interest rates rise relative to foreign rates. Funds, however, exhibit the opposite behaviour and increase USD lending following a rise in US interest rates, suggesting that their activity in FX swap markets is not solely driven by funding considerations.

4.2. *Heterogeneity across currencies*

Next, we explore how the predictive power of survey forecasts for currency flows varies across currencies. Our theoretical framework suggests that, in the cross-section of currencies, investors rebalance from foreign currencies into US dollars along the factor structure of currency risk (see Proposition 2). Hence, we want to explore empirically if (predicted) currency flows indeed propagate through the exchange rate factor structure, that is, whether riskier currencies experience larger outflows following an expected appreciation of the US dollar relative to safer currencies. More precisely, we consider currencies' exposure to three tradeable risk factors, the dollar, carry, and UMVE, respectively. We estimate the following regression:

$$y_{i,t+1} = \mu_i + \alpha_t + \beta' \mathbf{X}_{i,t} + \varphi(\mathbf{X}_{i,t} \times \mathbf{Z}_{i,t}) + \delta' \mathbf{Z}_{i,t} + \epsilon_{i,t}, \tag{25}$$

where the dependent variable is either the spot or swap currency flow in currency pair i and month t. The key regressor is $X_{i,t}$, containing forecasts of exchange rates, and $Z_{i,t}$, containing the respective FX risk factor betas by currency pair. Our main coefficient of interest is φ, which identifies the cross-sectional differences across currency pairs through the interaction term. A positive coefficient implies that, for instance, an expected appreciation of the dollar is associated with larger outflows from riskier relative to safer currencies into US dollar.[16]

Directional flows: We start by regressing future spot currency flows on exchange rate forecasts as well as the interaction of exchange rate forecasts and currency betas. Table 5 reports the results of regressing spot FX flows at time $t+1$ on FX forecasts at time t and their interaction with currency betas (i.e., dollar, carry, and UMVE betas).[17]

Panel (a) confirms our earlier result: following an expected dollar appreciation, funds and smaller non-dealer banks buy US dollars, whereas dealer banks provide liquidity by selling dollars. Turning to the interaction between expected dollar appreciation (i.e., "FX Change") and carry betas, we find that funds, NBFIs, and non-dealer banks exchange riskier, high-

[16] Again, in all regression specifications, we include both currency μ_i and time α_t fixed effects. As before, the inference is based on Driscoll and Kraay's (1998) robust covariance matrix.

[17] Throughout the paper, we estimate the full regression specifications but, for ease of presentation, we only report the main interaction coefficients of interest.

carry-beta currencies more heavily for US dollars than safer ones. One consistent explanation is that end-user investors unwind their exposure to the carry factor by increasing their dollar purchases in times when survey forecasts predict a dollar appreciation and, in turn, reduce their exposure to high-risk currencies (e.g., Australian dollar and New Zealand dollar).

Panels (b) and (c) extend the analysis by examining how dollar and UMVE betas, respectively, shape spot currency flows. Panel (b) shows that the interaction terms with dollar betas are also positive and significant across most investor groups, indicating that an expected dollar appreciation predicts a larger outflow from foreign currencies (into dollars) that are more exposed to the dollar factor. Panel (c) shows a consistent pattern for the UMVE beta, implying that the priced component of currency returns also plays an important role in shaping global currency flows across countries.

Overall, our findings complement recent empirical work on the factor structure of exchange rates. An and Huber (2024) show that the priced component of currency flows follows a traded-risk-factor structure, which explains the bulk of non-diversifiable risk that intermediaries have to bear. Similarly, Loualiche, Pecora, Somogyi, and Ward (2026) provide evidence that, following an unexpected easing of US monetary policy, investment funds rebalance from safe to risky currencies, while banks serve as liquidity providers as in Roussanov and Wang (2023). Complementing this line of research, we show that the same currency factor structure also governs the flow-expected return relationship.

Funding flows: Next, we repeat our analysis above but replace the dependent variable with short-term FX swap flows. Table 6 reports the results of regressing swap currency flows at time $t + 1$ on CIP forecasts at time t in currency pair i and the interaction with various measures of currency risk (i.e., dollar, carry and UMVE betas).

Panels (a)–(c) examine how synthetic US dollar borrowing responds to expected changes in the CIP basis across currencies with different risk exposures. Specifically, investment funds exhibit positive and significant interaction coefficients with the carry and UMVE betas, respectively. Hence, when synthetic US dollar funding is expected to become more expensive (i.e., the forecasted CIP basis becomes more negative), funds reduce their synthetic dollar borrowing more strongly via low-risk currencies (e.g., the Japanese yen) than via high-risk currencies (e.g., the Canadian or Australian dollar). This result is intuitive, given that the size

Table 5: Spot Currency Flows and the FX Factor Structure

	Dealer Banks	Corporates	Funds	NBFIs	Non-Dealer Banks
(a) Exchange rate forecasts and carry beta					
FX Change	−0.495**	−0.038**	0.288***	−0.089***	0.339*
	(0.205)	(0.016)	(0.100)	(0.025)	(0.183)
FX Change × Carry Beta	−0.819***	−0.033***	0.362***	0.073***	0.406***
	(0.117)	(0.012)	(0.086)	(0.023)	(0.101)
Overall R^2	0.354	0.249	0.325	0.195	0.285
(b) Exchange rate forecasts and dollar beta					
FX Change	−0.644***	−0.023*	0.263***	−0.091***	0.499***
	(0.207)	(0.013)	(0.089)	(0.024)	(0.180)
FX Change × Dollar Beta	−0.477***	−0.011*	0.231***	0.037***	0.216***
	(0.075)	(0.006)	(0.049)	(0.010)	(0.071)
Overall R^2	0.355	0.264	0.341	0.202	0.273
(c) Exchange rate forecasts and UMVE beta					
FX Change	−0.672***	−0.064***	0.297***	−0.033	0.478**
	(0.231)	(0.015)	(0.095)	(0.020)	(0.195)
FX Change × UMVE Beta	−0.109	−0.061**	0.198	0.120***	−0.148
	(0.243)	(0.027)	(0.167)	(0.034)	(0.188)
Overall R^2	0.336	0.248	0.323	0.203	0.267
Total # of Obs.	1’368	1’368	1’368	1’368	1’368
# of Currencies	9	9	9	9	9
Currency FE	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes

Note: This table reports forecasting regressions of spot currency flows by trading counterparty (in billions of USD) at $t+1$ on the set of forecasts available at t, interacted with common FX risk factor betas by currency pair. Panel (a) includes forecasts of FX rate changes over the next twenty-four months and its interaction with the carry beta. Panel (b) replicates Panel (a) with the dollar beta. And Panel (c) replicates Panel (a) with the UMVE beta. The dollar beta is standardized by the cross-sectional mean and standard deviation. We estimate the full regression specification, but for ease of presentation, we only report the main interaction coefficients of interest. All regressions include currency and time fixed effects. Standard errors in parentheses are computed using the spatial estimator of Driscoll and Kraay (1998), which allows for cross-sectional and serial correlation as well as heteroskedasticity. Stars indicate significance at the 10% (*), 5% (**), and 1% (***) levels. The sample covers G10 currencies quoted against the USD. The data are monthly from September 2012 to May 2025.

of the CIP basis is correlated with the level of interest rates, which in turn is correlated with carry betas. Specifically, low interest rate currencies tend to exhibit the most negative bases and high interest rate currencies tend to have less negative or sometimes even positive bases (Du et al., 2018b). The results therefore suggest that investment funds actively incorporate expectations of future funding costs into their FX swap borrowing decisions, while exhibiting a weaker response in currencies with greater risk exposure. By contrast, we find no corresponding interaction with the dollar beta, which is consistent with our conceptual framework. Unlike the carry and UMVE factors, the dollar factor primarily captures common variation in exchange rate returns rather than cross-sectional differences in funding conditions and is, therefore, not expected to systematically affect the relative attractiveness of synthetic US dollar funding across currencies. Dealer banks, in turn, accommodate this demand by providing relatively more synthetic US dollar funding in low-risk currencies where the sensitivity of funding demand is strongest.

Table 6: Swap Currency Flows and the FX Factor Structure

	Dealer Banks	Corporates	Funds	NBFIs	Non-Dealer Banks
(a) Forecasts of CIP deviations and carry beta					
CIP Deviation	135.286***	0.065	−57.435***	1.276	−87.299***
	(28.929)	(0.353)	(14.512)	(1.368)	(32.638)
CIP Deviation × Carry Beta	−136.356**	−1.692***	74.283***	−0.069	59.929
	(63.584)	(0.628)	(19.257)	(3.652)	(63.844)
Overall R^2	0.712	0.643	0.392	0.201	0.655
(b) Forecasts of CIP deviations and dollar beta					
CIP Deviation	135.689***	−0.074	−60.893***	1.471	−85.723**
	(30.324)	(0.335)	(14.662)	(1.244)	(34.991)
CIP Deviation × Dollar Beta	42.106*	0.083	−3.079	−0.407	−41.185*
	(21.877)	(0.158)	(7.227)	(0.798)	(21.176)
Overall R^2	0.702	0.644	0.423	0.189	0.639
(c) Forecasts of CIP deviations and UMVE beta					
CIP Deviation	139.074***	−0.357	−23.541*	2.243	−123.498***
	(37.022)	(0.377)	(13.090)	(1.839)	(37.938)
CIP Deviation × UMVE Beta	52.869	−1.127	96.858***	0.829	−140.712*
	(75.429)	(0.832)	(24.095)	(5.148)	(71.752)
Overall R^2	0.701	0.643	0.409	0.193	0.638
Total # of Obs.	1’368	1’368	1’368	1’368	1’368
# of Currencies	9	9	9	9	9
Currency FE	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes

Note: This table reports forecasting regressions of swap currency flows (swap flows with maturities shorter than 35 days) by trading counterparty (in billions of USD) at $t+1$ on the set of forecasts available at t, interacted with common FX risk factor betas by currency pair. Panel (a) includes the forecasted CIP deviations over the next six months and its interaction with the carry beta. Panel (b) replicates Panel (a) with the dollar beta. And Panel (c) replicates Panel (a) with the UMVE beta. The dollar beta is standardized by the cross-sectional mean and standard deviation for ease of interpretation. All regressions include currency and time fixed effects. We estimate the full regression specification, but for ease of presentation, we only report the main interaction coefficients of interest. Standard errors in parentheses are computed using the spatial estimator of Driscoll and Kraay (1998), which allows for cross-sectional and serial correlation as well as heteroskedasticity. Stars indicate significance at the 10% (*), 5% (**), and 1% (***) levels. The sample covers G10 currencies quoted against the USD. The data are monthly from September 2012 to May 2025.

4.3. *Macroeconomic forecasts and forecaster disagreement*

Having established the predictive power of exchange rate expectations, we next examine whether survey-based forecasts of macroeconomic variables contain additional information for predicting currency flows.

Macroeconomic forecasts: We consider survey-based forecasts of relative economic conditions in the US and the corresponding foreign economy. Specifically, our explanatory variables include forecasts of interest rates, the current-account balance relative to GDP, consumer price inflation, and real GDP growth. These variables capture complementary dimensions of macroeconomic fundamentals: expected economic activity, inflationary pressures, and external financing needs. Because FX transactions involve two currencies, we express each forecast as the difference between the expected US outcome and that of the respective foreign country. We include these macroeconomic forecasts jointly with exchange rate expectations to assess whether expectations about relative economic fundamentals contain incremental information for future currency demand.

Several remarks are in order. The link between macroeconomic variables (e.g., interest rates and GDP growth) and exchange rates is both theoretically and empirically ambiguous (see, e.g., Obstfeld and Rogoff, 2000). Hence, we interpret the regression coefficients as the revealed preferences of the marginal investor who may trade currencies for various reasons (e.g., investment, speculation, or hedging). For example, if we find that an expected increase in these macroeconomic variables is associated with a given investor group buying more US dollars, then, through the prism of our theoretical framework, this indicates that the group views these expectations as a sign of future dollar appreciation.

Table 7 reports forecasting regressions of spot currency flows by trading counterparty at $t+1$ on the set of forecasts available at t. $X_{i,t}$ includes forecasts of FX rate changes over the following 24 months ("FX Change"), the forecasted interest rate differentials between the US and a given foreign country i (e.g., Canada for the USDCAD exchange rate) in 12 months ("Interest Rate"), and the forecasted difference in the CA / GDP ratio ("CA / GDP"), inflation ("Inflation"), and real GDP growth ("GDP") between the US and a given foreign country i at the end of the subsequent year. This setup allows the underlying macroeconomic variables to capture different economic dimensions. For example, the CA / GDP ratio likely reflects more persistent, structural differences across economies, whereas GDP growth and inflation capture more cyclical, short-run conditions.[18]

Table 7: Forecasting Spot Currency Flows with Macroeconomic Variables

	Dealer Banks	Corporates	Funds	NBFIs	Non-Dealer Banks
FX Change	−0.747***	−0.019	0.432***	−0.065***	0.385**
	(0.222)	(0.017)	(0.122)	(0.020)	(0.188)
Interest Rates	0.181	0.138*	0.781	0.151*	−1.391*
	(0.941)	(0.078)	(0.592)	(0.084)	(0.735)
CA / GDP	0.611***	0.017	−0.157*	−0.100***	−0.343**
	(0.207)	(0.022)	(0.093)	(0.023)	(0.173)
Inflation	−0.442	0.313***	1.237*	−0.148	−0.846
	(1.023)	(0.112)	(0.716)	(0.103)	(0.942)
GDP	1.673**	0.625***	−1.512***	−0.077	−0.644
	(0.812)	(0.121)	(0.501)	(0.087)	(0.715)
Overall R^2	0.341	0.278	0.333	0.199	0.271
Total # of Obs.	1’368	1’368	1’368	1’368	1’368
#Currencies	9	9	9	9	9
Currency FE	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes

Note: This table reports forecasting regressions of spot currency flows by trading counterparty (in billions of USD) at $t+1$ on the set of forecasts available at t. It includes forecasts of FX rate changes over the next twenty-four months, the forecasted interest rate differential between the US and the foreign country in twelve months, and the forecasted differentials in CA / GDP, inflation, and real GDP growth between the US and the foreign country at the end of the subsequent year. All regressions include currency and time fixed effects. Standard errors in parentheses are computed using the spatial estimator of Driscoll and Kraay (1998), which allows for cross-sectional and serial correlation as well as heteroskedasticity. Stars indicate significance at the 10% (*), 5% (**), and 1% (***) levels. The sample covers G10 currencies quoted against the USD. The data are monthly from September 2012 to May 2025.

Several results emerge: First, the coefficient concerning exchange rate forecast retains its significance, while the three-month interest rate differential is only borderline significant. Second, we find that expected changes in the current account to GDP ratio differential have a strong predictive power for currency flows. Note that an increase in the CA / GDP differential is associated with a relatively smaller US current account deficit compared to abroad, implying an associated decrease in the US financial account. During our sample period, the US has experienced a current account deficit which the US government has financed by the issuance of new debt. The fact that institutional investors (i.e., NBFIs, and smaller banks)

[18]Again, we control for currency and time fixed effects. The inference is based on Driscoll and Kraay’s (1998) robust covariance matrix which allows for cross-sectional and serial correlation.

purchase USD as the US current account deficit is expected to increase is consistent with foreign investors playing an important role in US Treasury markets (Somogyi, Wallen, and Xu, 2025). For example, a one percentage point expected decrease in the CA / GDP differential is associated with non-dealer banks purchasing an additional 0.34 billion USD over the next month. Dealer banks are predicted to take the other side of these trades and sell USD when current account deficits in the US are expected to rise relative to abroad.

Turning to corporates, we see that the CA / GDP differential has no predictive power for their currency flows. Instead, an expected increase in US inflation and GDP growth is associated with corporates buying dollars over the next month. This result is intuitive, since corporate trading is largely driven by the import and export prices denominated in foreign currency. For example, a European firm that exports to the US may find it optimal to buy dollars today to insure itself against a depreciation of the dollar in response to rising inflation expectations. Other investor groups follow such business cycle dynamics less closely.

Overall, our results here suggest that macroeconomic variables contain additional information for spot FX flows that goes beyond exchange rate expectations. This is in line with Kremens et al. (2025) who find that FX forecasts have lower predictive power for exchange rates when controlling for variation in the current account and the real exchange rate.

Forecaster disagreement: Following our theoretical framework (see Proposition 3), investors form expectations about currency premia by combining their own expectations with professional forecasters' expectations about exchange rates and macroeconomic variables. The weight that investors put on their own relative to the public signal depends on the precision of the public signal and the level of global uncertainty. To test this empirically, we focus on spot currency flows and construct measures of forecaster disagreement. Forecaster disagreement may arise from differing views about US fundamentals or those of the foreign country, and may vary across forecast variables. To capture these dimensions, we measure disagreement as the difference between the 90th and 10th percentiles of the cross-sectional distribution of forecasts, computed separately (i) for each variable and (ii) for the US and the foreign country. We then extract the first principal component of the absolute differences for the US and the foreign country, separately for each forecast variable. Based on this, we define a dummy variable ("High Disagr") that equals one when the corresponding first principal component exceeds its sample median.[19]

For the empirical analysis, we augment our baseline regression setup in Table 7 to include interaction terms between macroeconomic forecast differentials and our measures of forecaster disagreement ("High Disagr").[20] Table 8 documents how spot currency flows relate to expected macroeconomic conditions and how these relations vary with the degree of forecaster disagreement. Two main findings emerge. First, for most investor groups such as funds, NBFIs, and smaller non-dealer banks, the interaction terms are statistically significant and exhibit signs opposite to the baseline effects of the forecasts on currency flows. For instance, non-dealer banks tend to sell USD when (i) US interest rates are expected to rise, (ii) the US current account deficit is expected to narrow, (iii) US inflation is expected to increase, and (iv) US real GDP growth is expected to decline. However, during periods of elevated disagreement, these relations are substantially muted, suggesting that these investor groups mainly rely on consensus forecasts in periods of *low* uncertainty. Second, the effects of forecast variables on currency flows during periods of low disagreement are stronger and more precisely estimated than in Table 7 as most macroeconomic variables now predict next periods currency flows. This is consistent with the notion that, when pooling across regimes, the opposing effects across low- and high-disagreement periods partially offset each other.

Forecast errors: We also examine how individual forecasters' past performance (i.e., forecast error) correlates with the trading behaviour of different investor groups. Specifically, we move beyond the consensus-based analysis and estimate forecaster-level regressions. This approach allows us to capture how each investor group's currency flows are related to the forecasting performance of specific forecasters. Overall, and in line with the previous results, we show that the forecasts made by forecasters with larger past errors have less predictive power for investors' currency flows. The detailed results can be found in Online Appendix E.

Global uncertainty: To study how spot currency flows relate to expected exchange rate changes and how this relation varies during periods of heightened uncertainty, we construct

[19] For exchange rate forecasts we do *not* have access to individual, forecaster level expectations and hence, cannot compute measures of forecast dispersion / disagreement.

[20] In all regression specifications, we follow the same set-up and include both currency μ_i and time α_t fixed effects to control for unobserved heterogeneity at the currency-level and for time variation in global factors. The inference is based on Driscoll and Kraay's (1998) robust covariance matrix.

Table 8: Forecasting Spot Currency Flows under Forecaster Disagreement

	Dealer Banks	Corporates	Funds	NBFIs	Non-Dealer Banks
FX Change	−0.694***	−0.023	0.415***	−0.062***	0.349*
	(0.222)	(0.017)	(0.126)	(0.020)	(0.185)
Interest Rates	0.008	−0.049	1.509*	0.142	−1.696*
	(1.324)	(0.116)	(0.842)	(0.114)	(0.912)
Interest Rates × High Disagr (=1)	0.529	0.205***	−0.927**	0.020	0.111
	(0.608)	(0.077)	(0.412)	(0.077)	(0.478)
CA / GDP	0.966***	0.023	−0.243**	−0.108***	−0.609***
	(0.242)	(0.024)	(0.113)	(0.028)	(0.194)
CA / GDP × High Disagr (=1)	−0.543***	−0.005	0.199***	0.008	0.339***
	(0.136)	(0.013)	(0.072)	(0.018)	(0.112)
Inflation	1.037	0.340**	1.900**	−0.344**	−2.769**
	(1.366)	(0.137)	(0.859)	(0.169)	(1.125)
Inflation × High Disagr (=1)	−1.972**	−0.037	−0.538	0.228	2.259***
	(0.943)	(0.106)	(0.490)	(0.138)	(0.787)
GDP	−0.148	0.813***	−2.844***	0.052	2.240**
	(1.348)	(0.197)	(0.870)	(0.134)	(1.088)
GDP × High Disagr (=1)	2.135	−0.219	1.689*	−0.147	−3.536***
	(1.430)	(0.194)	(0.897)	(0.144)	(1.169)
Overall R^2	0.354	0.285	0.345	0.206	0.285
Total # of Obs.	1'368	1'368	1'368	1'368	1'368
#Currencies	9	9	9	9	9
Currency FE	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes

Note: This table reports forecasting regressions of spot currency flows by trading counterparty (in billions of USD) at $t+1$ on the set of forecasts available at t, interacted with measures of forecaster disagreement. It includes forecasts of FX rate changes over the next twenty-four months as well as forecasted differentials in interest rate, CA / GDP, inflation, and real GDP growth between the US and the foreign country in twelve months (for interest rates) and at the end of the subsequent year for the other variables. In addition, we measure forecaster disagreement as the first principal component of the absolute differences between the 90th and 10th percentiles of the cross-sectional distribution of forecasts for the US and the foreign country, respectively, calculated separately for each variable. We then define a dummy variable that is one when the first principal component (for each variable) is above its sample median. We estimate the full regression specification, but for ease of presentation, we only report the main interaction coefficients of interest. All regressions include currency and time fixed effects. Standard errors in parentheses are computed using the spatial estimator of Driscoll and Kraay (1998), which allows for cross-sectional and serial correlation as well as heteroskedasticity. Stars indicate significance at the 10% (*), 5% (**), and 1% (***) levels. The sample covers G10 currencies quoted against the USD. The data are monthly from September 2012 to May 2025.

an indicator variable equal to one when the VIX index is above its sample median.[21] We label this indicator variable "High VIX". Next, we replicate the forecaster disagreement regression but replace the forecaster disagreement dummy with the High VIX dummy as we want to examine the predictive power of macroeconomic forecasts during periods of macroeconomic

[21]The VIX is a forward-looking measure of expected stock market volatility, computed from S&P 500 index option prices following the methodology of the Chicago Board Options Exchange. Our approach builds on Kalemli-Özcan and Varela (2021), who link the survey-based UIP premium to global risk perceptions, which they proxy by the VIX index.

uncertainty. Table F.1 in Online Appendix F displays the regression results. Overall, our findings are both quantitatively and qualitatively comparable to what we found based on forecaster disagreement (see Table 8): the predictability of currency flows with financial and macroeconomic expectations is significantly weaker in times of high uncertainty. In sum, the evidence in Table 8 and Table F.1 corroborates the predictions in Proposition 3.

5. Robustness

Here we summarize robustness checks and additional analyses supporting our main findings. See the Online Appendix for further details.

Forecast revisions and reverse causality: We conduct two additional exercises to assess the robustness of our interpretation that survey expectations predict currency flows (see Section G and Section H). First, we investigate whether changes in survey expectations contain predictive information beyond the level of expectations. For both exchange rate and forecasted CIP deviations, we find that forecast revisions only exhibit incremental predictive power for the currency flows of some groups of market participants. We interpret this as evidence that some investors respond not only to the prevailing level of expected returns and funding conditions but also to meaningful updates of these expectations. Horse-racing forecast revisions against the level of survey forecasts, we find that the level of the survey forecast is the dominant predictor of currency flows, suggesting that trading decisions are primarily predicted by the expected future environment rather than by recent forecast updates. Second, we examine the direction of predictive causality using Granger-causality tests. Survey expectations robustly predict subsequent currency flows, whereas past currency flows do not predict subsequent revisions in survey forecasts, which is consistent with the limited availability of CLS data.

Alternative empirical specifications: We provide a range of robustness checks that confirm our baseline results across alternative empirical specifications (see Section I). First, we report several alternative fixed effects structures. For instance, we explore specifications that only include time fixed effects, which only control for variation in unobservable global factors. Across all specifications, we find qualitatively similar results relative to our baseline results. Second, we restrict the cross-section of currencies to align with prior work (e.g., Kremens et al., 2025) and find consistent results in terms of both statistical and economic significance. Third, our results are robust to controlling for countries' invoicing shares in international trade. And lastly, we show that our findings are also present in univariate regressions. Across these exercises, the main conclusions remain unchanged, indicating that survey expectations contain predictive information for currency flows that is not driven by alternative controls or model specifications.

6. Conclusion

This paper studies how survey expectations about exchange rates and macroeconomic fundamentals predict global demand for US dollars across market participants and traded instruments. Using detailed currency flow data for spot, swap, and forward markets combined with survey-based forecasts, we show that investors increase dollar purchases in spot and forward markets when they expect the dollar to appreciate. Dealer banks, in turn, take the opposite side of these trades, acting as liquidity providers. Cross-sectionally, investors rebalance along the factor structure of currency risk, reallocating from riskier foreign currencies into the dollar following an expected appreciation. However, currency flows respond less to forecasts during periods of greater disagreement among forecasters and elevated uncertainty. Beyond directional flows, we show that synthetic dollar borrowing via FX swaps declines as the forecasted cross-currency basis widens.

In sum, our results highlight that expectations play a pivotal role in shaping global currency flows across market participants and traded instruments. A better understanding of the determinants of currency flows is crucial, as these flows not only reflect investors' expectations but also shape how those expectations are incorporated into future exchange rate dynamics.

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