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Abstract

We study exchange rate expectations in surveys of financial professionals and find that they successfully forecast currency appreciation at the two-year horizon, both in and out of sample. Exchange rate expectations are also interpretable, in the sense that three macro-finance variables—the risk-neutral covariance between the exchange rate and equity market, the real exchange rate, and the current account relative to GDP—explain most of their variation. Moreover, there is no "secret sauce" in expectations: after controlling for the three macro-finance variables, the residual information in survey expectations does not forecast currency appreciation in our sample.

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In a risk-neutral world, a currency with a high interest rate would be expected to depreciate against a currency with a low interest rate in order to equate their expected returns. This is the celebrated prediction of uncovered interest parity (UIP). It is well known that UIP fails empirically, however: a large literature, starting from Hansen and Hodrick (1980) and Fama (1984), has found that currencies with high interest rates earn higher returns, on average, than currencies with low interest rates.[1]

What explains the failure of UIP—that is, the gap between expected currency appreciation and the interest-rate differential? Assuming frictionless trade in the currencies and interest rates is possible, this gap represents an expected excess return, or risk premium. On the traditional view of international financial markets, this risk premium should reflect the covariation of currency returns with a stochastic discount factor (SDF) whose variation reflects movements in investors' marginal utilities across states.

A recent literature has argued that currency markets are profoundly influenced by financial intermediaries who face balance-sheet (or other) constraints. On this view, movements in currencies reflect, at least in part, shadow prices on financier constraints, so that expected currency movements are importantly influenced by variation in these shadow prices and cross-currency flows.

Another part of the recent literature has emphasized the importance of subjective expectations. In the case of equity markets, for example, Greenwood and Shleifer (2014) argue that investor expectations move in the *opposite* direction to the forecasts of a rational person, so that investors become more bullish at times when they should be bearish, and vice versa. In our context, this raises the possibility that realized currency movements do not reflect ex ante expectations. If so, the failure of UIP may simply reflect investor errors. This explanation has a long history: Frankel and Froot (1987) and Froot and Frankel (1989) use survey expectations and find that investors make systematic forecast errors at short horizons.

In this paper, we also study expectations drawn from surveys of finance professionals and

[1]Some papers even find that high-interest currencies *appreciate* on average. Hassan and Mano (2019) find that, in more recent data, high-interest currencies depreciate, but not enough to offset interest-rate differentials.

draw two major conclusions.

First, survey expectations successfully forecast exchange rate movements over a two-year horizon both in and out of sample. (By contrast, they are considerably less successful in predicting exchange rate appreciation over shorter horizons.) In sample, survey expectations are strongly significant predictors, with an estimated coefficient close to (and insignificantly different from) one, consistent with the view that survey forecasts are rational.

Interest rate differentials alone explain 3.1% of the variation in realized currency appreciation; for comparison, interest rate differentials and survey forecasts together explain 16.9% of the variation. We go on to compare survey expectations to various predictor variables proposed by the literature—the quanto-implied risk premium of Kremens and Martin (2019), which measures the risk-neutral covariance of the exchange rate with the S&P 500 index; the real exchange rate; the VIX index; the dollar and carry betas of Lustig, Roussanov, and Verdelhan (2011, 2014); interest-rate differentials; the current account balance-to-GDP ratio; capital inflows-to-GDP ratio; primary balance-to-GDP ratio; industrial production; and net foreign assets-to-GDP ratio—and find that survey expectations are the best-performing univariate predictor in an R^2 sense.

Second, survey expectations are *interpretable*, in the sense that they load heavily on a small number of macro/finance predictor variables that have been studied in prior literature. Specifically, three variables explain more than half of the variation in survey expectations. These are the quanto-implied risk premium (QRP, Kremens and Martin (2019)), the real exchange rate (RER, e.g., Dahlquist and Penasse (2022)), and the ratio of current account balance to GDP (CA-to-GDP, e.g., Gabaix and Maggiori (2015)).

It is natural then to wonder whether there is any "secret sauce" in survey expectations. We regress survey expectations onto the three variables, and view the residuals—the components of expectations *not* explained by QRP, RER, or CA-to-GDP—as (potentially) the secret sauce. But it turns out that these residuals have essentially no predictive power for returns. That is, there is no secret sauce.

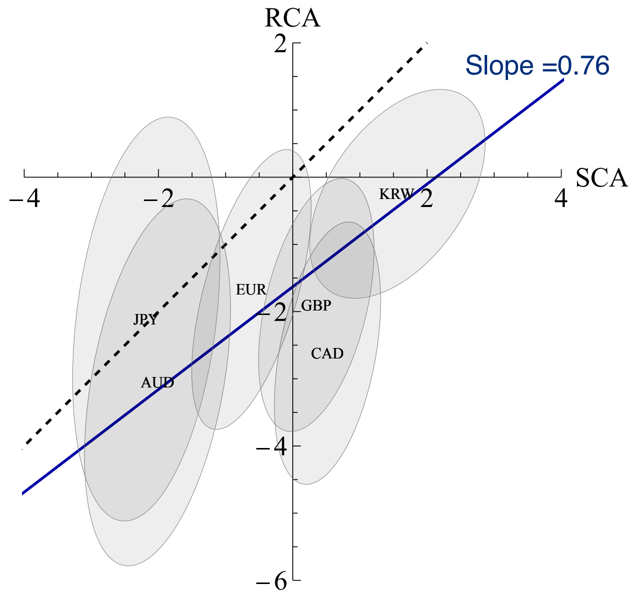
Section 1 outlines the data on survey expectations and macro-finance variables. We obtain monthly survey expectations from *Consensus Economics*. These particular surveys have been used in various other studies in international finance and asset pricing. Stavrakeva and Tang (2020) and De Marco, Macchiavelli, and Valchev (2021) argue that these forecasts are consistent with market participants' positioning in, respectively, over-the-counter currency markets and sovereign bond markets. Kalemli-Özcan and Varela (2022) study forecast errors in advanced and emerging economies and their relationship with UIP violations. Candian and De Leo (2023) use these forecasts to estimate model of under- and overreaction to interest rates, which matches the observed reversal of UIP deviations over longer horizons.[2] Della Corte, Gao, and Jeanneret (2023) use the relationship between Consensus expectations and quanto-implied risk premia to estimate risk-aversion parameters at different horizons. In contrast, we (i) study both the information that is and is *not* shared between quantos and surveys, and (ii) assess how each component fairs in predicting realized currency returns. In contemporaneous, independent work Beckmann and Reitz (2023) also find that exchange rate Consensus forecasts correlate strongly with the quanto-implied risk premium and argue that the quanto-implied risk premium proxies for intermediary capital ratios (see also Section 3.3.2). Nagel and Xu (2023) use forecast horizons up to one year and find that survey-based expected returns are substantially less cyclical than "objective" risk premia based on in-sample regressions. Instead, we find that long-horizon forecasts move almost one-for-one with ex-post realizations.[3]

In Section 2, we test the predictive power of survey expectations in and out of sample. Figure 1 below visualizes the in-sample result. Survey expectations of currency appreciation (SCA, in the horizontal axis) move almost one-for-one with realizations (RCA, in the vertical axis) at 24-month horizon. Expectations and realizations are positively and highly correlated by 76%, indicating that surveys perform *quanlitatively* and *quantitatively* well at forecasting the exchange rate at long horizons. Importantly, this result is true both across currencies

[2]See, e.g., Froot and Thaler (1990); Bacchetta and van Wincoop (2010, 2021); Engel (2016); Valchev (2020) for evidence and explanations of UIP-reversal and related patterns frequently tied to underreaction and overshooting.

[3]Lloyd and Marin (2020) use Consensus Economics forecasts on GDP growth and inflation to assess their relationship with the slope of the yield curve.

Figure 1: Realized currency appreciation (RCA) vs. survey expectations (SCA)



Note: For each currency, the figure plots mean realized currency appreciation (RCA) against survey expectations (SCA) surrounded by a confidence ellipse whose orientation reflects the time-series correlation between RCA and SCA, and whose size reflects their volatilities (scaled to contain 10% of the observations under joint normality). The solid blue line represents a univariate panel regressions, while the dotted line is the 45° line on which realizations equal survey expectations. Six high income currencies: Australian dollar (AUD), Canadian dollar (CAD), Euro (EUR), Great British Pound (GBP), Japanese Yen (JPY) and Korean Won (KRW).

(the relative positions of the currency means in Figure 1) and across time within currency (the orientation of the individual confidence ellipses).

Surveys provide ex ante forecasts in-sample estimation of free parameters. This makes them ideally suited for out-of-sample tests. Survey expectations beat the random walk benchmark of Meese and Rogoff (1983) both in terms of bilateral exchange rate predictions against the dollar and in terms of dollar-neutral relative forecasts of other currencies.

Section 3 unpacks the model underlying survey expectations. Only three macro-financial variables –RER, QRP and CA-to-GDP– explain the majority of the variation in survey expectations and the international finance literature has tied each of these variables to different economic mechanisms. The real exchange rate tracks trends in nominal exchange rates as well as inflation differentials and has often been linked to currency excess returns (e.g., Asness, Moskowitz, and Pedersen (2013); Koijen, Moskowitz, Pedersen, and Vrugt (2018); Dahlquist and Penasse (2022)). The quanto-implied risk premium measures equity-market risk exposure (e.g., Campbell, Serfaty-De Medeiros, and Viceira (2010); Lettau, Maggiori, and Weber (2014); Cenedese, Payne, Sarno, and Valente (2016); Kremens and Martin (2019)) and the economics broadly resemble arguments rooted in consumption risk (e.g., Lustig and Verdelhan (2007); Verdelhan (2010); Burnside (2011)). The current account balance has been associated with (expected) exchange rate movements (e.g., Kouri (1976); Dornbusch (1976); Gourinchas and Rey (2007)), and cross-border flows with constraints of global financial intermediaries (e.g., Gabaix and Maggiori (2015) and Bianchi, Bigio, and Engel (2022)).

We then ask whether the correlation of survey expectations—intended or otherwise—with these predictor variables improves the forecasts. The bivariate combination of QRP and RER is a powerful prediction model outperforming the univariate survey forecast (at least in-sample). That is, these two variables capture meaningful variation in realized currency excess returns and, indeed, survey forecasts mirror much of that variation.

The current account, on the other hand, is not a strong predictor of currency movements in our sample. Instead, the optimal (in an R^2-sense) trivariate forecast incorporates time-series variation in the VIX. Notably, the VIX measures 30-day implied equity-market volatility and is therefore often associated with *short-term* market stress. The fact that this variable is helpful in predicting *long-horizon* currency returns may point towards explanations relating to slow-moving capital and intermediation capacity. In that sense, a possible rationalization of this finding is not entirely distinct from the flow-based mechanisms that survey participants may associate with the current account and trade imbalances.

Section 4 concludes. Our finding that *some* survey forecasts are broadly rational and comprehensible in terms of a few commonly studied variables does not identify the economic mechanism underlying excess returns. Nor does it rule out that irrational expectations of *other* agents influence exchange rate determination. Much like the formation of the broadly unsuccessful short-term forecasts, these questions leave room for further research.

1 Data and definitions

Our sample includes six high income currencies (Australian dollar, Canadian dollar, Euro, Great British Pound, Japanese Yen and Korean Won) against the U.S. dollar. We observe survey expectations from Consensus Economics, which provides monthly information on expected exchange rates at 1-, 3-, 12- and 24-month horizons from the early 1990s. The forecasters interviewed are principally global banks and investors that actively participate in the FX market. We extend the quanto-implied risk premium of Kremens and Martin (2019) until September 2019 using quanto data from Markit.[4] We obtain forward discounts from Reuters and use the terms forward discount and interest-rate differential interchangeably. Accordingly, these interest-rate differentials are consistent with derivatives prices and, hence, they do not violate covered interest parity (CIP). We use the 30-day S&P implied volatility index VIX reported by Federal Reserve Economic Data (FRED) to proxy for global risk perception. We construct the dollar carry factor ($\beta^{\$}$) following Lustig, Roussanov, and Verdelhan (2014) and extract the high-minus-low factor (HML) from Lustig, Roussanov, and Verdelhan (2011) (β^{HML}). We use various measures of cross-country flows, including the current account balance and capital inflows, both obtained from International Financial Statistics (IFS) of the International Monetary Fund (IMF) that we scale by the GDP. Capital inflows are constructed from total debt inflows (as the sum of direct investment, portfolio investment and other investment). We also employ net foreign asset positions over GDP from Lane and Milesi-Ferreti (2018). We obtain the real exchange rate (RER) from the Bank for International Settlements to proxy for inflation differentials.

As the quanto data from Markit is only reported since December 2009, our baseline specification spans forecasts from 12/2009 to 9/2019 (realizations until 9/2021), and we

[4] We follow Kremens and Martin (2019) and construct the quanto-implied risk premium from quotes on 24-month conventional and quanto forwards on the S&P500 obtained from Markit. Denote the spot and forward prices of the S&P500 by P_t and F_t, and the quanto forward price by $Q_{i,t}$. The quanto-implied risk premium then reveals the risk-neutral covariance between the S&P return (R_{t+1}) and currency appreciation, $\text{cov}_t^*(\frac{e_{i,t+1}}{e_{i,t}}, R_{t+1})$. Specifically, $QRP_{i,t} = \frac{Q_{i,t} - F_t}{R^i_{f,t} P_t} = \frac{1}{R^{\$}_{f,t}} \text{cov}_t^*(\frac{e_{i,t+1}}{e_{i,t}}, R_{t+1})$, where $R^i_{f,t}$ and $R^{\$}_{f,t}$ are 24-month interest rates.

conduct robustness exercises for a longer sample since 1/1994 where the quanto data is not needed. Table A1 in Appendix A describes the data sources.

To set up some notation, write M_{t+h} for the h-period stochastic discount factor (SDF) which prices payoffs denominated in US dollars, and $R^{\$}_{f,t,h}$ for the US riskless rate. The fundamental asset pricing equation states that for any h-period gross dollar return R_{t+h}, we have

$$\mathbb{E}_t \left(M_{t+h} R_{t+h} \right) = 1 \tag{1}$$

or, equivalently,

$$\mathbb{E}_t \, R_{t+h} - R^{\$}_{f,t,h} = R^{\$}_{f,t,h} \operatorname{cov}_t \left(-M_{t+h}, R_{t+h} \right) . \tag{2}$$

We are interested in a particular type of return R_{t+h}, namely the return on a currency trade which takes a US dollar at time t, converts it to foreign currency i, invests at the gross h-period riskless rate in currency i, $R^{i}_{f,t,h}$, and then converts back to US dollars at time $t+h$. This is a dollar-denominated trading strategy: starting from one dollar at time t, it returns $R_{t+h} = R^{i}_{f,t,h} e_{i,t+h} / e_{i,t}$ dollars at time $t+h$, where $e_{i,t}$ is the nominal exchange rate in US dollars per unit of currency i. Substituting this return into the fundamental asset pricing equation (2) and rearranging, we have

$$\mathbb{E}_t \, \frac{e_{i,t+h}}{e_{i,t}} - 1 = \underbrace{\frac{R^{\$}_{f,t,h}}{R^{i}_{f,t,h}} - 1}_{\text{UIP}} + \underbrace{R^{\$}_{f,t,h} \operatorname{cov}_t \left(-M_{t+h}, \frac{e_{i,t+h}}{e_{i,t}} \right)}_{\text{residual}} . \tag{3}$$

This identity expresses the (net) exchange rate appreciation of currency i in terms of the (net) interest rate differential and a covariance term which captures the risk premium associated with currency i. If the risk premium adjustment is ignored, the above equation reduces to the traditional prediction of UIP.

Based on the identity (3), we define the interest-rate differential (IRD), realized currency appreciation (RCA), and realized currency excess return (RXR) at horizon h as follows:

$$IRD_{i,t,h} = \frac{R^{\$}_{f,t,h}}{R^{i}_{f,t,h}} - 1 \tag{4}$$

$$RCA_{i,t,h} = \frac{e_{i,t+h}}{e_{i,t}} - 1 \tag{5}$$

$$RXR_{i,t,h} = RXR_{i,t,h} - IRD_{i,t,h}. \tag{6}$$

Note that IRD is *negative* for high-interest currencies (for which UIP would predict depreciation). Analogously, we define survey-based expectations of currency appreciation (SCA) and currency excess returns (SXR) as

$$SCA_{i,t,h} = \tilde{\mathbb{E}}_t \frac{e_{i,t+h}}{e_{i,t}} - 1 \tag{7}$$

$$SXR_{i,t,h} = SCA_{i,t,h} - IRD_{i,t,h}, \tag{8}$$

where $\tilde{\mathbb{E}}$ denotes the survey expectations operator.

2 Surveys and Exchange Rate Predictability

Do survey expectations predict exchange rates? We start by assessing whether survey expectations accurately capture the empirical excess returns at the heart of the well-documented empirical failure of the UIP condition. This amounts to an *in-sample* test of exchange rate predictability (Section 2.1). We then benchmark the forecasting power of survey expectations against other common predictors of currency excess returns (Section 2.2). Finally, we conduct an out-of-sample test, in which we let survey expectations compete with the random walk benchmark and the quanto index (Section 2.3).

2.1 In-Sample Predictions

We start our analysis by adding survey-based excess return expectations to the UIP regression of currency appreciation on interest-rate differentials. In parallel, we estimate an alternative specification with the forecasting regression for realized excess returns. That is, we estimate

$$RCA_{i,t,h} = \alpha + \gamma_1 SXR_{i,t,h} + \gamma_2 IRD_{i,t,h} + \varepsilon_{i,t}, \quad (9)$$

$$RXR_{i,t,h} = \alpha + \gamma_1 SXR_{i,t,h} + \gamma_2 IRD_{i,t,h} + \varepsilon_{i,t}. \quad (10)$$

We are interested in two key objects. First, we are interested in the estimate of γ_1, which will be mechanically identical in equations (9) and (10). If this coefficient is positive and significantly different from zero, survey expectations are qualitatively successful exchange rate predictors. If it is close to one, surveys are *quantitatively* successful in that they predict not just the right direction but also the right magnitude of exchange rate movements and excess returns. Second, we are interested in the R^2 of equations (9) and (10) compared to a univariate regression with IRD only as a regressor, as an alternative measure of survey's predictability.

As an alternative to the panel intercept, α, we estimate equations (9) and (10) with, respectively, currency- (α_i) and time (α_t) fixed effects. Our baseline exercise tests long-horizon forecasts over a relatively short post-crisis sample. We address the resulting challenges to statistical inference by estimating standard errors using a nonparametric block-bootstrap to account for overlapping observations in the long-horizon forecasting regressions, as in Kremens and Martin (2019).[5]

-Long-Term Expectations. Column 1 in Table 1 presents the results for the 24-month horizon expectations, and shows —in line with the existing literature— that the R^2 of a

[5]We draw, with replacement, blocks with a time-series length equal to the forecasting horizon and random cross-sectional width. We reconstitute these blocks to form 10,000 bootstrap samples with the same size as our original sample and re-estimate the regressions. The bootstrapped standard errors are the standard deviations of the coefficient estimates across bootstrap samples. They are typically more conservative (that is, larger) than standard errors based on Hansen and Hodrick (1980).

Table 1: In-sample Forecast Performance

	RCA				RXR			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
SXR		0.726	0.837	0.523		0.726	0.837	0.523
		[0.212]	[0.251]	[0.213]		[0.212]	[0.251]	[0.213]
IRD	0.577	1.065	1.147	0.693	-0.423	0.065	0.147	-0.307
	[0.599]	[0.601]	[0.674]	[0.548]	[0.599]	[0.601]	[0.674]	[0.548]
Fixed effects	None	None	Currency	Time	None	None	Currency	Time
R^2	0.031	0.169	0.192	0.564	0.017	0.157	0.180	0.558
Within R^2	0.031	0.169	0.165	0.117	0.017	0.157	0.130	0.174
N	672	672	672	672	672	672	672	672

Note: This table reports forecasting regressions (9) and (10) of 24-month realized currency appreciation (RCA) and currency excess returns (RXR) on survey-based expectations of currency excess returns and interest-rate differentials (IRD). The sample is 12/2009 – 9/2019 (realizations until 9/2021) and includes AUD, CAD, EUR, GBP, JPY and KRW against USD. In brackets, we report standard errors obtained from a nonparametric block-bootstrap to account for overlapping observations in long-horizon forecasts.

univariate regression of RCA on the interest rate differential is close to zero and, hence, interest rates have low predictive power for currency appreciation. Given our relatively short sample and overlapping observations in long-horizon forecasts, the coefficient is imprecisely estimated and, hence, we do not statistically reject UIP in our sample.

In columns 2 and 6, we add the survey excess returns as a regressor and show in three results that they are successful exchange rate predictors. First, the coefficient on SXR is positive and statistically significant, which indicates that surveys predict the direction of the currency movement (even in the short sample). Importantly, the coefficient is also both statistically and economically close to one, which indicates that forecasters are successful at predicting the magnitude of the appreciation. Second, the R^2 increases more than five-fold for both currency appreciation and more than ten-fold for excess returns, to 16.9% and 15.7%, respectively. Finally, these results are valid both in the time series of individual currencies and in the cross section. In particular, columns 3 and 7 show that surveys predict within-currency appreciation and excess returns with a point estimate of 0.837. Columns 4 and 8 show the same for predictions across currencies. The high R^2 from the panel results in columns 2 and 6 is echoed in the cross-sectional and time-series results.

-Long Sample (1/1994-9/2019). To assess whether the predictive power of the survey-based expectations is a specific feature of the post-Global Financial Crisis period or a more general feature of survey expectations, we extend our analysis to the period starting in January 1994 and re-estimate Regressions (9) and (10). Table A2 in Appendix A confirms our results: (i) the coefficient of the survey-based currency appreciation is statistically significant in all specifications—panel, within currencies, and across currencies—and is statistically indistinguishable from one in the panel and time-series. R^2 is similarly high as in the shorter sample.

-Short-Horizon Expectations. We now assess whether the predictive success in Table 1 is specific to long-horizon forecasts. We estimate Regressions (9) and (10) for $h = \{1, 3, 12\}$ months (we also report the 24-month results for ease of comparison). Table A3 in Appendix A shows that the predictive power of the surveys increases with the horizon, as (i) the positive coefficient on SXR increases in the horizon, (ii) the coefficient on IRD becomes closer to one in columns 1-4 and closer to zero in columns 5-8 for longer forecasts, and (iii) the R^2 increases in the horizon. In particular, in Panel A, the estimated coefficient drops from 0.726 at 24-month horizon to 0.237, 0.093 and 0.088 at 12, 3 and 1 month-horizons. Similarly, the R^2 drops from 16.9% to 1.5%, 0.4% and 0.8%, respectively. Panels B and C for the within and across currency regressions present similar results. These results are consistent with the lower forecasting performance of short-horizon survey expectations documented in previous studies (e.g., Nagel and Xu, 2023; Dahlquist and Söderlind, 2023). The point of this exercise is to contrast the surprisingly strong predictability from long-run expectations from the disappointing results found previously for shorter horizons.

2.2 Alternative In-Sample Predictors

The international finance literature has shown various financial and macro variables that help predict currency excess returns in-sample. We now compare the predictive success of surveys with other predictors of excess returns previously found in the literature. We consider six other candidate excess returns predictors, which we describe in detail below: the quanto-implied risk premium, the real exchange rate, implied equity-market volatility, capital flows, and factor loadings on dollar and carry.

-*Quanto-implied risk premia (QRP).—* Rewriting equation (3), Kremens and Martin (2019) show that expected currency risk premia perceived by an unconstrained investor satisfy the following model-free identity

$$\mathbb{E}_t \frac{e_{i,t+1}}{e_{i,t}} - \frac{R^{\$}_{f,t}}{R^{i}_{f,t}} = \underbrace{\frac{1}{R^{\$}_{f,t}} \text{cov}^*_t \left(\frac{e_{i,t+1}}{e_{i,t}}, R_{t+1} \right)}_{\text{QRP}} + \underbrace{\text{cov}_t \left(-M_{t+1} R_{t+1}, \frac{e_{i,t+1}}{e_{i,t}} \right)}_{\text{residual}}. \tag{11}$$

The above holds for any arbitrary return R but choosing the gross return on the S&P 500 makes the first term in (11) directly observable from the prices of quanto forwards. In the most aggressive benchmark, in which exchange rates a priced by a rational investor with log utility who is fully invested in the S&P 500, the residual term is zero.[6] Kremens and Martin (2019) show that QRP predicts currency excess returns in- and out-of-sample.

-*Real exchange rates (RER).—* Asness, Moskowitz, and Pedersen (2013), Koijen, Moskowitz, Pedersen, and Vrugt (2018), and Chernov, Dahlquist, and Lochstoer (2023) show that the real exchange rate is a persistent predictor of currency excess returns. Dahlquist and Penasse (2022) further argue that the real exchange rate captures a "missing risk premium" distinct from information in interest-rate differentials.

-*Implied equity-market volatility (VIX).—* Kalemli-Özcan (2019) and Kalemli-Özcan and

[6] If the investor is more risk averse than log, the residual is increasing in QRP (see Della Corte, Gao, and Jeanneret, 2023) and the slope coefficient of (realized or expected) excess returns on QRP exceeds one. Kremens and Martin (2019) show that this is true for realized returns, Table 4 and Della Corte, Gao, and Jeanneret (2023) show that it is true for survey expectations.

Varela (2022) show empirically that the VIX correlates with currency excess returns in advanced and emerging market economies. While VIX has no cross-sectional dimension, it is often used as a broad uncertainty proxy that drives risk premia in the time series. Martin (2017) argues that a close relative of the VIX ("SVIX", the risk-neutral variance of the S&P 500) represents a lower bound on the equity premium.

-Factor loadings on "Dollar" and "Carry" ($\beta^{\$}, \beta^{HML}$).— Lustig, Roussanov, and Verdelhan (2011, 2014) show that the factor structure of exchange rates is well summarized by the returns to two trading strategies, termed Dollar and Carry. The former goes long (short) the dollar against a basket of currencies when dollar interest rates are high (low) relative to the rest of the world, the latter goes long high-interest currencies against low-interest currencies.

-Current account balance over GDP (CA/GDP).— The international macro-finance literature has shown that the current account balances are tightly linked to exchange rates (e.g., Kouri, 1976; Dornbusch, 1976; Obstfeld and Rogoff, 2005; Gourinchas and Rey, 2007). A recent literature emphasizes the importance of capital flows in the presence of constraints on global financial intermediaries (e.g., Gabaix and Maggiori, 2015; Bianchi, Bigio, and Engel, 2022). Given the connection between trade balances and capital flows, both literatures hypothesize a role for the current account in exchange rate determination. We employ alternative measures of cross-border financial operations, including the capital inflows-to-GDP ratio and the net foreign asset position-to-GDP ratio in robustness tests.

We estimate univariate regressions of realized excess returns on each of these alternative predictors, the interest-rate differential, and survey-based excess returns. Our interest is in comparing the univariate R^2, which we report in Table 2. Survey expectations of excess returns have the highest explanatory power with an R^2 of 15.7%, more than one third higher than the second-best predictor (QRP with 11.6%). The third-best univariate predictor is the real exchange rate with an R^2 of 10.4%. Other financial variables have substantially lower explanatory power with R^2 of 8.5% for the VIX, 7.2% for the β^{HML}, 1.7% for the interest-rate differential, 0.9% for the $\beta^{\$}$ and essentially 0 for the current account.[7]

[7]The current account is a proxy of net capital flows. Table A4 in Appendix A presents results using related

Table 2: R^2 of Alternative Predictors

	R^2 of RXR on each variable:								
	SXR	QRP	RER	VIX	β^{HML}	$\beta^{\$}$	IRD	CA/GDP	LRV (β^{HML} & $\beta^{\$}$)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Univariate R^2	0.157	0.116	0.104	0.085	0.072	0.009	0.017	0.000	0.085

Note: This table reports the univariate R^2 of regressions of 24-month realized currency excess returns (RXR) onto each candidate predictors: SXR, IRD, the real exchange rate (RER), QRP, VIX, the dollar and carry betas of Lustig, Roussanov, and Verdelhan (2011, 2014), and the current account-to-GDP ratio (CA/GDP). The last column treats the dollar and carry betas of Lustig, Roussanov, and Verdelhan (2011, 2014) as a single model and reports the bivariate R^2.

2.3 Out-of-Sample Predictions

Survey expectations predict exchange rates *in-sample*, but the literature has struggled to overturn the result from Meese and Rogoff (1983) that the random walk process is a better out-of-sample predictor of exchange rates than many macro models. Survey expectations are well-suited for out-of-sample forecasting and a natural competitor of the random walk, because they express ex ante predictions without the need to estimate free parameters. Coincidentally, the second-best in-sample univariate predictor, QRP, is also well-suited for out-of-sample testing: it describes the ex ante prediction of an unconstrained, rational investor with log utility who holds the stock market. Since QRP beats the random walk in dollar-neutral out-of-sample forecasts (Kremens and Martin, 2019), we add it as a second competitor model.

We define the survey-based forecast error as the difference between the realized appreciation and SCA: $\epsilon^{S}_{i,t,t+h} = (RCA_{i,t,h} - SCA_{i,t,h})$. For the random walk, the currency appreciation forecast is zero so the error is $\epsilon^{RW}_{i,t,t+h} = RCA_{i,t,h}$. For the quanto theory, the forecast

proxies, such as the net foreign asset position-to-GDP ratio and capital inflows-to-GDP ratio, as well as other macro and fiscal variables like industrial production and the primary balance-to-GDP. All of them result in low R^2.

error is $\epsilon^{Q}_{i,t,t+h} = RCA_{i,t,h} - (QRP_{i,t,h} + IRD_{i,t,h})$. Focusing again on the 24-month horizon, we compute the out-of sample R^2_{OS} as in Goyal and Welch (2008):

$$R^2_{OS} = 1 - \frac{\sum_i \sum_t (\epsilon^S_{i,t,t+h})^2}{\sum_i \sum_t (\epsilon^C_{i,t,t+h})^2}, \tag{12}$$

for competitor model $C = \{RW, Q\}$. A positive R^2_{OS} indicates a smaller mean-squared error of the surveys relative to the competitor model. We term this quantity the "dollar-based" measure, as it computes errors in bilateral exchange rate forecasts against the dollar. Since the dollar has strengthened substantially over the relatively short post-crisis sample, we also test the forecast accuracy across currencies—that is, for example, the *relative* performance of dollar-yen versus dollar-euro. We then define the "dollar-neutral" R^2_{OS} measure as:

$$\tilde{R}^2_{OS} = 1 - \frac{\sum_i \sum_j \sum_t (\epsilon^S_{i,t,t+h} - \epsilon^S_{j,t,t+h})^2}{\sum_i \sum_j \sum_t (\epsilon^C_{i,t,t+h} - \epsilon^C_{j,t,t+h})^2}. \tag{13}$$

The results of this exercise are reported in Table 3. Column 1 shows that surveys outperform the random walk in dollar-based ($R^2_{OS} = 19.15\%$) and dollar-neutral ($\tilde{R}^2_{OS} = 14.99\%$) forecasts. We run Diebold–Mariano tests (Diebold and Mariano, 1995) of the null hypothesis that the forecasts perform equally well for all currencies, and additionally compute p-values from the bootstrap procedure outlined in Footnote 5. In either case, the outperformance relative to the random walk in dollar-based forecasts is at the margins of statistical significance at conventional levels. It is stronger in cross-sectional (i.e., dollar-neutral) predictions, where survey expectations beat the random walk with a p-value of 4.74%. To assess whether these results are driven by any particular currency, we additionally estimate individual $R^2_{OS,i}$ and $\tilde{R}^2_{OS,i}$ for each currency, as $R^2_{OS,i} = 1 - \frac{\sum_t (\epsilon^S_{i,t,t+h})^2}{\sum_t (\epsilon^C_{i,t,t+h})^2}$ and $\tilde{R}^2_{OS,i} = 1 - \frac{\sum_j \sum_t (\epsilon^S_{i,t,t+h} - \epsilon^S_{j,t,t+h})^2}{\sum_j \sum_t (\epsilon^C_{i,t,t+h} - \epsilon^C_{j,t,t+h})^2}$. Results presented in rows 2-7 confirm that both the dollar-based and the dollar-neutral are positive for all currencies except the Canadian dollar. Survey expectations also beat the quanto-theory forecast with $R^2_{OS} = 20.95\%$ and $\tilde{R}^2_{OS} = 5.40\%$, and significantly so for dollar-based predictions with a p-value of 2.78%. The bootstrapped p-values yield similar results.

Table 3: Out-of-sample Forecast Performance

Benchmark	Random Walk		Quantos	
Dollar-based/-neutral	R^2_{OS}	$\tilde{R}^2_{OS}$	R^2_{OS}	$\tilde{R}^2_{OS}$
All	0.1915	0.1499	0.2095	0.0540
AUD	0.3125	0.2257	0.2522	0.1268
CAD	-0.0054	-0.0639	0.0274	-0.1421
EUR	0.3553	0.0711	0.4511	0.0028
GBP	0.0841	0.0102	0.1473	-0.0738
JPY	0.2024	0.1444	0.1753	0.0395
KRW	0.0098	0.4740	0.1604	0.3775
Diebold-Mariano p-value	0.0809	0.0474	0.0278	0.3468
Bootstrapped p-value	0.0881	0.0337	0.0382	0.2446

Note: This table reports out-of-sample R^2 measures following Goyal and Welch (2008). The different measures for dollar-based and dollar-neutral returns are defined in Equations (12) and (13). The last line of the table reports p-values for a Diebold-Mariano test of the null hypothesis that survey expectations and the competitor model perform equally well for all currencies.

This section presents three novel results about exchange rate surveys. First, surveys predict exchange rate realizations *qualitatively* well (sign) and, maybe more interestingly, *quantitively* well (magnitude) in-sample. Both the unconditional and country-conditional correlations between surveys and realizations are close to one, which indicates that the predicted appreciation rate of the survey is not statistically different from the observed appreciation ex post at the 24-month horizon. Second, survey expectations are the best—in an R^2-sense—univariate predictor among a large group of potential financial and macro variables found in the existing literature. Third, they beat the random walk and the second-best univariate predictor with statistical significance in out-of-sample predictions. In short, surveys contain useful information about long-run exchange rate movements, raising the question: What informs these survey expectations? We address this question in the next section.

3 What informs expectations?

We estimate reduced-form regressions of survey-based excess returns on the interest-rate differential and the various candidate covariates described in the previous section. We focus on 24-month forecasts—the horizon at which surveys perform well—and accordingly drop the h subscript for notational convenience. In particular, we estimate

$$SXR_{i,t} = \alpha + \gamma_1 X_{i,t} + \gamma_2 IRD_{i,t} + \varepsilon_{i,t}, \tag{14}$$

where $X_{i,t}$ is a vector containing a subset of the following contemporaneous covariates: quanto-implied risk-premium, real exchange rate, VIX, current account over GDP, $\beta^{\$}$ and β^{HML}. We first assess these covariates individually (or in pairs in the case of $\beta^{\$}$ and β^{HML}) and then jointly. We cluster the standard errors by time and currency and standardize the independent variables for ease of comparison.

Table 4 presents the results. Column 1 shows a univariate regression on the interest-rate differential and shows that, although this variable accounts for almost 14% of the variation in survey excess returns, the coefficient is not statistically significant.

Column 2 includes the quanto-implied risk premium, which correlates strongly and positively with survey-based excess returns. Importantly, the R^2 increases by almost three-fold to 40.2%, indicating that surveys and QRP share a substantial amount of variation. In column 3, we regress surveys on the real exchange rate. We find a significantly negative coefficient and, albeit slightly less than the quanto-implied risk premium, and a large R^2 of 38.7%.

Other financial variables explain less of the variation in survey-based excess returns. The VIX is not significantly correlated with surveys (column 4), nor is the dollar-beta (column 6). The carry beta is positively related to SXR (column 6) but does not add much R^2 and is driven out by QRP in the joint regression (column 7). The current account balance is not individually correlated with survey-based excess returns (column 5) but negatively so in the joint regression (column 7). That is, accounting for variation related to market risk and the

Table 4: What informs exchange rate expectations?

	Survey Excess Returns (SXR)							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
IRD	-0.020	0.009	-0.035**	-0.019	-0.019	-0.019	0.003	
	(0.011)	(0.006)	(0.009)	(0.012)	(0.015)	(0.012)	(0.009)	
QRP		0.037***					0.031***	0.031***
		(0.005)					(0.002)	(0.005)
RER			-0.031**				-0.018**	-0.018**
			(0.009)				(0.007)	(0.006)
VIX				0.007			0.001	
				(0.008)			(0.003)	
CA/GDP					-0.003		-0.013**	-0.013***
					(0.014)		(0.004)	(0.003)
$\beta^{\$}$						-0.002	-0.003	
						(0.009)	(0.008)	
β^{HML}						0.011***	0.003	
						(0.002)	(0.003)	
R^2	0.138	0.402	0.387	0.155	0.140	0.175	0.536	0.528
N	672	639	672	672	672	672	639	639

Note: This table presents regressions of survey expectations of currency excess returns on various financial and macroeconomic variables: the interest-rate differential (IRD), the quanto-implied risk premium (QRP), the real exchange rate (RER), the 30-day S&P implied volatility index (VIX), the current account-to-GDP ratio (CA/GDP), and the 24-month rolling monthly beta of the exchange rate on the dollar and carry factors of Lustig, Roussanov, and Verdelhan (2011, 2014), respectively ($\beta^{\$}$, β^{HML}). Standard errors in parentheses are clustered at the currency and time level. We report asterisks indicating significance at 10%, 5%, and 1%, respectively, for convenience given the large number of columns and regressors.

real exchange rate (and only then), survey expectations vary with the current account. In the joint regression, only three variables are significant contemporaneous covariates of SXR—the quanto-implied risk premium, the real exchange rate, and the current account balance.[8] All variables jointly explain 53.6% of the variation in survey expectations of currency excess returns, almost entirely due to QRP, RER, and CA-to-GDP (trivariate R^2 of 52.8%, column 8).

Table A5 in Appendix A presents analogous results with currency and time fixed effects, closely echoing the relations in panel variation. QRP and RER are significant individual

[8] We compare the current account balance to other proxies, such as capital inflows over GDP and net foreign assets over GDP and find that surveys correlate most strongly with the current account balance over GDP.

covariates with high R^2 both within and across currencies. Again, the current account balance is only significant jointly with other regressors. In the multivariate cross-sectional regression, the loadings on dollar and carry also become significantly positively correlated with survey expectations of excess returns. We note that time fixed effects explain a larger portion of survey variation than currency fixed effects, indicating that dollar-related elements that are unspanned by these covariates play a larger role in the panel of currency return expectations than currency-specific unspanned components.

3.1 Do Survey Respondents Have A "Secret Sauce"?

The previous section showed that survey forecasts load heavily on QRP, RER and CA-to-GDP. We now ask whether they include additional information not spanned by these variables—a secret sauce—that allows them to better forecast currency appreciation?

We compute the fitted values $\widehat{SXR}$ and, respectively, residuals $\varepsilon(SXR)$ from Regression (14) (trivariate specification in column 8 of Table 4) and use them to forecast currency appreciation and excess returns.

Column 1 of Table 5 reproduces our previous finding of a regression of RCA on interest rate differentials and survey excess returns, which we compare with our fitted values and residuals of column 2.[9] The results are revealing: the explanatory power R^2 of surveys expectations increases from 17% to 26.5% when only considering QRP, RER and CA-to-GDP into the analysis. To assess whether surveys contain a secret sauce, in column 3, we only include the fitted value in the regression, removing the residual (which, in principle, would represent the secret sauce). Importantly, the residuals do not contain any predictive information about excess returns, as the R^2 in column 2 is not meaningfully higher than that in column 3. Survey expectations aggregate useful predictive information from a few predictors that make them the best univariate predictor, but contain little information with predictive power beyond this set of variables. That is, there is no secret sauce.

[9]Note that the number of observations decreases slightly due to the lack of quanto data availability for some currency/time observations.

Table 5: Do survey respondents have a secret sauce?

	RCA		
	(1)	(2)	(3)
IRD	1.137	1.559	1.563
	[0.747]	[0.900]	[0.855]
SXR	0.740		
	[0.246]		
$\widehat{SXR}$		1.414	1.415
		[0.832]	[0.841]
$\varepsilon(SXR)$		0.177	
		[0.232]	
R^2	0.170	0.256	0.252
N	639	639	639

Note: This table reports forecasting regressions of 24-month realized currency appreciation (RCA) on interest-rate differentials (IRD), survey-based excess returns (SXR), its fitted values ($\widehat{SXR}$) and, respectively, residuals ($\varepsilon(SXR)$). Fitted values and residuals are obtained from the trivariate specification in column 8 of Table 4. The sample is 12/2009 – 9/2019 (realizations until 9/2021) and includes AUD, CAD, EUR, GBP, JPY and KRW against USD. In brackets, we report standard errors obtained from a nonparametric block-bootstrap to account for overlapping observations in long-horizon forecasts.

3.2 What are the best predictors?

Having shown that expectations predict well (Section 2) and correlate principally with three macro/finance quantities—QRP, RER and CA/GDP (Table 4)—we now ask whether these are the best variable to predict excess returns ex post.

Table 6 reports the results of forecasting regressions. Among the possible predictor combinations, we report the univariate, bivariate and trivariate specification that produces the highest R^2 in forecasting realized excess returns. Once we allow for two predictors, the quanto-implied risk premium and the real exchange rate outperform survey excess returns raising the R^2 to 26% (column 2) from the univariate, survey-based forecast (15.7%, column 1). The success of this combination of variables is consistent with our finding in Table 4 that QRP and the real exchange rate explain most of the variation in surveys that is spanned by the predictor variables. The R^2-maximizing trivariate regression adds the VIX but only raises R^2 by another 5.4 percentage points to 31.4%. The comparison of columns 4 and 5 show that the R^2-gain from adding surveys to the full set of predictors is very small. Survey excess returns do not add explanatory power beyond these variables.

3.3 Discussion

Broadly speaking, two views of exchange rate determination have emerged in the literature: a preference- or risk-based view, according to which risk premia reflect the covariation of currencies with macroeconomic risk factors, and a frictions-based view that emphasizes the importance of constraints on financial intermediaries.

Similar to constraint-based asset pricing models such as Gârleanu and Pedersen (2011) and Du, Hébert, and Huber (2022), we show in Appendix B that these two views can be nested in a unified framework via

$$\mathbb{E}_t \frac{e_{i,t+1}}{e_{i,t}} - \frac{R^{\$}_{f,t}}{R^{i}_{f,t}} = R^{\$}_{f,t} \left[\text{cov}_t \left(-M_{t+1}, \frac{e_{i,t+1}}{e_{i,t}} \right) + \lambda_t \theta_{i,t} \right], \tag{15}$$

Table 6: R^2-MAXIMIZING PREDICTORS

	R^2-maximizing specifications				
	Univariate	Bivariate	Trivariate	8-Variate	Excl. SXR
	(1)	(2)	(3)	(4)	(5)
$\beta^{\$}$	.	.	.	0.012	0.012
β^{HML}	.	.	.	0.061	0.062
CA/GDP	.	.	.	0.149	0.107
IRD	.	.	.	-0.993	-0.982
QRP	.	2.18	1.797	0.581	0.790
RER	.	-0.003	-0.004	-0.004	-0.005
SXR	0.713	.	.	0.116	.
VIX	.	.	0.005	0.006	0.006
R^2	0.157	0.260	0.314	0.359	0.357

Note: This table reports the R^2-maximizing univariate, bivariate, etc., specifications in regressions of 24-month realized currency excess returns (RXR) onto combinations of various candidate predictors: the dollar and carry betas of Lustig, Roussanov, and Verdelhan (2011, 2014), the current account-to-GDP ratio (CA/GDP), IRD, QRP, the real exchange rate (RER), SXR, and the VIX. The last column reports the specification with all variables except SXR.

where λ_t is the scaled shadow price of a portfolio constraint and $\theta_{i,t}$ is the derivative of the constraint with respect to the portfolio weight in currency i. In the absence of frictions, $\lambda = 0$ and M can be interpreted as an SDF; with frictions, M captures the marginal rate of substitution of a constrained agent.

We now discuss the results in Table 4 through these two different (although not incompatible) lenses: (i) a factor model of currency risk, and (ii) an intermediary-based view of exchange rate determination.

3.3.1 A Factor Model of Currency Risk

Suppose survey expectations, as a proxy for the left-hand side of Equation (15), are obtained from rational, unconstrained investors. Since these expectations (SXR) violate UIP, such investors must be risk averse, that is, their SDF M is volatile such that the covariance term on the right-hand side of (15) is large. One can then ask which sources of risk these investors price, that is, what factor model of currency risk they have in mind.

An obvious candidate is the empirically successful and widely cited dollar-plus-carry two-factor model à la Lustig, Roussanov, and Verdelhan (2011, 2014). Or a model with a "value" premium analogous to other asset classes (Asness, Moskowitz, and Pedersen, 2013; Koijen, Moskowitz, Pedersen, and Vrugt, 2018) in which real exchange rates correlate with the value loading (Dahlquist and Penasse, 2022; Chernov, Dahlquist, and Lochstoer, 2023). Another obvious candidate is the most influential risk model of all; the CAPM (Sharpe, 1964).[10]

The finding that QRP explains almost half of the variation in survey-based excess returns indeed points to a model reminiscent of the CAPM. Equation (11) expands the covariance

[10] Graham (2022) shows that surveys among corporate CFOs suggest that the CAPM is the predominant risk model employed by corporate decision makers. Gormsen and Huber (2023) find that this view is consistent with firms' perceived cost of capital implied by self-expressed investment criteria. Regarding the time-series dimension, Li, Ng, and Swaminathan (2013) find that aggregate implied cost of capital predicts market excess returns.

term in (15) into QRP and a residual covariance term:

$$\mathbb{E}_t \frac{e_{i,t+1}}{e_{i,t}} - \frac{R^{\$}_{f,t}}{R^{i}_{f,t}} = \underbrace{\frac{1}{R^{\$}_{f,t}} \operatorname{cov}^*_t \left(\frac{e_{i,t+1}}{e_{i,t}}, R_{t+1} \right)}_{\text{QRP}} + \underbrace{\operatorname{cov}_t \left(-M_{t+1} R_{t+1}, \frac{e_{i,t+1}}{e_{i,t}} \right)}_{\text{residual}} + R^{\$}_{f,t} \lambda_t \theta_{i,t}, \quad (16)$$

Under the log-investor benchmark of the quanto theory, that residual term is identically zero. That is, this benchmark case of the quanto theory is analogous to the CAPM in that excess returns are proportional to (risk-neutral) covariances with the stock market.[11] Further, QRP drives out interest differentials and carry- and dollar betas. That is, while currency loadings on equity market risk and the carry factor correlate, the former more closely describes survey expectations.

If the residual term in Equation (16) is not zero, the quanto theory accommodates other sources of risk premia, as do survey expectations. The real exchange rate spans a slightly smaller share of variation in surveys than QRP. Unlike QRP, however, it complements interest-rate differentials, consistent with real exchange rates signaling a risk premium distinct from carry (Dahlquist and Penasse, 2022) that enters the residual term in (16).

Lastly, survey expectations of currency excess returns correlate with current account balances, predominantly in the time series. When countries run trade deficits, their survey-implied currency risk premium goes up. Della Corte, Riddiough, and Sarno (2016) show that a 'global imbalance risk factor' captures cross-sectional variation in average realized currency excess returns. Currencies that load positively on this factor tend to be those of net-foreign-debtor countries. These currencies depreciate in times of high implied volatility. If volatility spikes are indeed associated with high marginal utility—for instance, because agents have recursive preferences as in Colacito, Croce, Gavazzoni, and Ready (2018)—these shocks enter the SDF and therefore the residual term in (16).

[11]If returns are conditionally lognormal, risk-neutral and physical covariances coincide for log returns. Unlike the CAPM, where the SDF is linear in the market return, the quanto theory is agnostic about return distributions and allows for higher-order risk premia.

3.3.2 Intermediaries

Other papers have linked exchange rate determination to the role of risk-neutral but constrained intermediaries as marginal bearers of currency risk. On that view, the covariance term in (15) is zero. Nonetheless, excess returns may look strikingly similar to those arising from unconstrained, risk-averse investors if the relevant constraints are sensitive to risk measures. For instance, the Lagrangian of a risk-neutral investor facing a constraint on portfolio variance looks like that of a risk-averse investor with mean-variance preferences.

Suppose this constraint is on risk-neutral (implied) portfolio variance. The first order condition then states that excess returns are proportional to implied covariances with the portfolio return. If that portfolio return is correlated with the market, excess returns line up with QRP. More generally, interpreting the correlation between survey-based excess returns and QRP through the lens of a risk-neutral but constrained investor suggests that the constraint binds more tightly or its shadow price is larger when the risk-neutral covariance of equity- and currency returns is high.[12]

Besides the sensitivity of the constraint to implied risk measures, the key driving force of excess returns in intermediary-based models such as Gabaix and Maggiori (2015) are cross-currency flows of global financial intermediaries. Global intermediaries act as counterparties to these flows and accordingly take on currency risk exposure. Through the lens of Equation (15), again assuming a constraint on portfolio variance, θ_i is increasing in the intermediary's existing position in currency i because adding to larger positions is particularly detrimental to diversification.

Flows belong to two broad categories: portfolio flows, in which investors seek exposure to foreign currency returns, and trade-induced capital flows through which international lenders finance current account deficits. Starting with portfolio flows, suppose US investors are more likely to seek exposure to the euro when (i) European real interest rates are high relative to US ones, and/or (ii) the euro has appreciated. Euro demand from US investors leaves

[12] In line with this interpretation, Beckmann and Reitz (2023) show that the first principal component driving the cross section of quanto-implied risk premia correlates with intermediary capital ratios.

intermediaries long the dollar. To induce intermediaries to take on and sustain this position, the dollar depreciates with the portfolio flows and appreciates subsequently (in expectation). If inflation differentials correlate with real interest rate differentials and are persistent, such portfolio flows are consistent with investors chasing realized (real) returns and lead on average to long intermediary positions in currencies with lower real exchange rates. Table 4 shows that intermediaries on average expect these currencies to appreciate going forward.

A similar argument applies to trade flows. Current account deficits imply borrowing from abroad. If foreign lenders do not want take on currency risk, intermediaries step in and take on long positions in currencies of net external debtor countries. These currencies then have to appreciate in expectation to compensate intermediaries for providing scarce space on their constrained balance sheet. The finding in Table 4 that the current account balance is negatively associated with survey expectations of excess returns (controlling for QRP and RER) is consistent with survey participants, that is, global intermediaries forming expectations about conditional excess returns along the lines of this mechanism.

4 Conclusion

We view our findings as cause for optimism on two fronts. First, the expectations of informed market participants are broadly rational. Second, the behavior of their expectations is comprehensible: expectations load on a small number of variables that have been studied by macroeconomists and financial economists.

That said, our findings do not identify *how* these variables determine (expected or realized) exchange rates and currency excess returns. QRP may correlate with excess returns because unconstrained investors demand a risk premium for equity-market risk, or because investor constraints are tighter at times when conditional market risk is high and/or for assets with larger exposures to it. The real exchange rate may proxy for a risk premium (Dahlquist and Penasse, 2022) or predict mean-reverting cross-currency flows tied to inflation differentials or reversal in nominal exchange rate trends. Current account deficits may indicate cross-currency flows that lead to tigher intermediary constraints (Gabaix and Maggiori, 2015) or a reliance on external financing that leaves the currency susceptible to depreciation in bad times, thus warranting a larger ex ante risk premium (Della Corte, Riddiough, and Sarno, 2016).

Similarly, we cannot rule out a role for irrational expectations in exchange rate determination: we find that *some* expectations are broadly rational but, in principle, these market participants may be correctly anticipating the irrational behavior of others.

Whatever the driving mechanisms, they take a while to play out in exchange rate realizations: The same survey predictions perform poorly at short horizons, indicating that even informed practitioners—like academics (Meese and Rogoff, 1983; Rossi, 2013)—struggle to understand higher-frequency exchange rate movements.

Even at longer horizons, survey expectations are not perfect. We find that the current account plays a role in shaping exchange rate expectations but does not predict realizations. Instead, the VIX—a measure of 30-day implied equity-market volatility and therefore an indicator of *short-term* market stress—improves forecasts of long-term exchange rate realizations relative to survey forecasts. The model underlying the broadly successful survey expectations could be improved by incorporating, say, mechanisms in which slow-moving capital and temporarily tightened constraints play a larger role, and which would predict a correlation between temporary market stress and excess returns.

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Appendix A Supplementary Tables and Figures

Table A1: Data Sources

Variable	Source	Description
Quanto risk premium	Markit	S&P 500 Quanto contracts with maturity 1, 3, 12 and 24 months
Interest rate differential	Markit	Risk-free rates with maturity with maturity 1, 3, 12 and 24 months
Spot exchange rate	Thomson Reuters	U.S. dollar per unit of foreign currency
Forward exchange rate	Thomson Reuters	Forward rate with maturity with maturity 1, 3, 12 and 24 months
Consensus forecast	Consensus Economics	Survey expectations with maturity 1, 3, 12 and 24 months
Dollar carry factor ($\beta^{\$}$)	Lustig, Roussanov, and Verdelhan (2014)	Own calculations
High-minus-low factor (β^{HML})	Lustig, Roussanov, and Verdelhan (2011)	Adrien Verdelhan's website
Current Account over GDP (CA/GDP)	IMF-IFS	
Capital Inflows over GDP	IMF-IFS	
Net Foreign Asset Position over GDP (NFA/GDP)	Lane and Milesi-Ferreti (2018)	
Primary Balance over GDP	IMF-IFS	
Real exchange rate (RER)	BIS	RER broad index
VIX	FRED	30-day S&P implied volatility index (VIX)

Table A2: In-sample Forecast Performance: Period 11/1996-9/2019

	RCA				RXR			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
SXR		0.865	1.066	0.601		0.865	1.066	0.601
		[0.294]	[0.269]	[0.198]		[0.294]	[0.269]	[0.198]
IRD	0.156	0.600	-0.020	0.615	-0.844	-0.400	-1.020	-0.385
	[0.575]	[0.631]	[0.707]	[0.423]	[0.575]	[0.631]	[0.707]	[0.423]
Fixed effects	None	None	Currency	Time	None	None	Currency	Time
R^2	0.002	0.145	0.185	0.628	0.058	0.192	0.231	0.649
Within R^2	0.002	0.145	0.173	0.115	0.058	0.192	0.188	0.193
N	1340	1340	1340	1340	1340	1340	1340	1340

Note: This table reports forecasting regressions (9) and (10) of 24-month realized currency appreciation (RCA) and currency excess returns (RXR) on survey-based expectations of excess returns (SXR) and interest-rate differentials (IRD). The sample is an unbalanced panek from 11/1996 – 9/2019 (realizations until 9/2021) and includes AUD, CAD, EUR, GBP, JPY and KRW against USD. In brackets, we report standard errors obtained from a nonparametric block-bootstrap to account for overlapping observations in long-horizon forecasts.

Table A3: In-sample Forecast Performance: Short-Term Horizons

	RCA				RXR			
	1M	3M	12M	24M	1M	2M	12M	24M
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Panel A. Without FE							
SXR	0.088	0.093	0.237	0.726	0.088	0.093	0.237	0.726
	[0.067]	[0.102]	[0.215]	[0.212]	[0.067]	[0.102]	[0.215]	[0.212]
IRD	-0.112	-0.066	0.311	1.065	-1.112	-1.066	-0.689	0.065
	[0.856]	[0.998]	[0.890]	[0.601]	[0.856]	[0.998]	[0.890]	[0.601]
R^2	0.008	0.004	0.015	0.169	0.011	0.014	0.038	0.157
N	672	672	672	672	672	672	672	672
	Panel B. With Currency FE							
SXR	0.088	0.090	0.240	0.837	0.088	0.090	0.240	0.837
	[0.068]	[0.106]	[0.218]	[0.251]	[0.068]	[0.106]	[0.218]	[0.251]
IRD	-0.040	-0.119	0.171	1.147	-1.040	-1.119	-0.829	0.147
	[1.843]	[1.591]	[1.596]	[0.674]	[1.843]	[1.591]	[1.596]	[0.674]
R^2	0.009	0.006	0.023	0.192	0.012	0.016	0.046	0.180
Within R^2	0.008	0.004	0.012	0.165	0.009	0.009	0.026	0.130
N	672	672	672	672	672	672	672	672
	Panel C. With Time FE							
SXR	0.056	0.110	0.114	0.523	0.056	0.110	0.114	0.523
	[0.045]	[0.086]	[0.196]	[0.213]	[0.045]	[0.086]	[0.196]	[0.213]
IRD	-0.269	-0.179	0.092	0.693	-1.269	-1.179	-0.908	-0.307
	[0.679]	[0.757]	[0.596]	[0.548]	[0.679]	[0.757]	[0.596]	[0.548]
R^2	0.548	0.534	0.548	0.564	0.549	0.539	0.559	0.558
Within R^2	0.004	0.008	0.005	0.117	0.009	0.023	0.048	0.174
N	672	672	672	672	672	672	672	672

Note: This table reports forecasting regressions of 1-, 3-, 12-, and 24-month realized currency appreciation (RCA) and currency excess returns (RXR) on survey-based expectations of excess returns (SXR) and interest-rate differentials (IRD). The sample is an unbalanced panel including observations between 12/2009 – 9/2019 (realizations until 9/2021) and includes AUD, CAD, EUR, GBP, JPY and KRW against USD. In brackets, we report standard errors, clustered at by currency and time for 1-month horizons, and obtained from a nonparametric block-bootstrap to account for overlapping observations in long-horizon forecasts.

Table A4: Robustness: R^2 of Alternative Predictors

	R^2 of RXR on each variable:			
	Net Foreign Asset/GDP (1)	Capital Inflows/GDP (2)	Industrial Production (3)	Primary Balance/GDP (4)
Univariate R^2	0.010	0.002	0.051	0.012

Note: This table reports the univariate R^2 of regressions of 24-month realized currency excess returns (RXR) onto each candidate predictors: net foreign assets-to-GDP (from Lane and Milesi-Ferreti 2018), capital inflows-to-GDP (from the IMF), industrial production year-to-year changes and primary balance-to-GDP (from IMF-IFS).

Table A5: What informs exchange rate expectations?

	Survey Excess Returns (SXR)							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
				Panel A. Currency FE				
IRD	-0.007	0.009	-0.021	-0.002	0.003	0.019**	0.017*	
	(0.012)	(0.007)	(0.013)	(0.010)	(0.010)	(0.005)	(0.008)	
QRP		0.027**					0.012**	0.019**
		(0.008)					(0.003)	(0.007)
RER			-0.026**				-0.020**	-0.018**
			(0.010)				(0.007)	(0.005)
VIX				0.011			0.006	
				(0.007)			(0.003)	
CA/GDP					-0.044		-0.019*	-0.021
					(0.025)		(0.009)	(0.016)
$\beta^{\$}$						-0.022**	-0.016**	
						(0.007)	(0.004)	
β^{HML}						0.002	0.000	
						(0.004)	(0.002)	
R^2	0.435	0.489	0.574	0.469	0.497	0.476	0.640	0.600
Within R^2	0.013	0.118	0.255	0.073	0.122	0.084	0.379	0.310
N	672	639	672	672	672	672	639	639
Fixed Effects	Currency	Currency	Currency	Currency	Currency	Currency	Currency	Currency
				Panel B. Time FE				
IRD	-0.029	0.006	-0.041**		-0.029	-0.023	-0.004	
	(0.018)	(0.009)	(0.012)	(0.018)	(0.019)	(0.014)	(0.011)	
QRP		0.038***					0.031***	0.031***
		(0.005)					(0.006)	(0.004)
RER			-0.033**				-0.019*	-0.017
			(0.011)				(0.009)	(0.009)
CA/GDP					0.000		-0.013**	-0.012***
					(0.011)		(0.003)	(0.003)
$\beta^{\$}$						-0.015	0.019**	
						(0.020)	(0.006)	
β^{HML}						0.010*	0.011**	
						(0.004)	(0.004)	
R^2	0.333	0.577	0.594	0.333	0.333	0.364	0.706	0.676
Within R^2	0.200	0.481	0.513	0.200	0.200	0.238	0.638	0.602
N	672	639	672	672	672	672	639	639
Fixed Effects	Time	Time	Time	Time	Time	Time	Time	Time

Note: This table presents regressions of survey expectations of currency excess returns on various financial and macroeconomic variables: the interest-rate differential (IRD), the quanto-implied risk premium (QRP), the real exchange rate (RER), the 30-day S&P implied volatility index (VIX), the current account balance relative to GDP (CA/GDP), and the 24-month rolling monthly beta of the exchange rate on the dollar and carry factors of Lustig, Roussanov, and Verdelhan (2011, 2014), respectively ($\beta^{\$}$, β^{HML}). Standard errors in parentheses are clustered at the currency and time level. We report asterisks indicating significance at 10%, 5%, and 1%, respectively, for convenience given the large number of columns and regressors.

Appendix B Derivation of Equation (15)

We set up the portfolio optimization problem of an investor with wealth W_t, Von Neumann-Morgenstern utility $u(\cdot)$ over next-period wealth W_{t+1}, and discount factor $\beta \leq 1$. Next-period wealth is $W_{t+1} = W_t R_{t+1}$ for gross portfolio return $R_{t+1} = \sum_i w_i R_{i,t+1}$, where w denotes portfolio weights and $\sum_i w_i = 1$. The investor solves

$$\max_w \mathbb{E}_t\, \beta u(W_{t+1}) \tag{17}$$

subject to a generic constraint on portfolio weights w. The constraint takes the form

$$f(w) \leq 0, \tag{18}$$

where $f(\cdot)$ is differentiable with respect to w. To ensure that the first-order condition identifies a maximum, we further assume that $u(\cdot)$ and $f(\cdot)$ are such that the problem is concave.

We denote excess returns by R^e and the multiplier on constraint (18) by $\tilde{\lambda}_t$, and define $\theta_{i,t} = f'(w_i)$. The first-order condition for w_i is

$$\begin{aligned} 0 &= \mathbb{E}_t\left[\beta u'(W_{t+1}) R^e_{i,t+1} W_t\right] - \tilde{\lambda}_t \theta_{i,t} \\ \implies \mathbb{E}_t\, R^e_{i,t+1}\, \mathbb{E}_t\, \beta u'(W_{t+1}) &= -\operatorname{cov}_t\left(\beta u'(W_{t+1}), R^e_{i,t+1}\right) + \frac{\tilde{\lambda}_t}{W_t}\theta_{i,t} \\ \implies \mathbb{E}_t\, R^e_{i,t+1} &= \left(\mathbb{E}_t\, M_{t+1}\right)^{-1}\left[\operatorname{cov}_t\left(-M_{t+1}, R^e_{i,t+1}\right) + \frac{\tilde{\lambda}_t}{W_t u'(W_t)}\theta_{i,t}\right]. \end{aligned} \tag{19}$$

The last step divides both sides by $u'(W_t)$ and defines the SDF, $M_{t+1} = \beta \frac{u'(W_{t+1})}{u'(W_t)}$. If we further assume that risk-free positions are frictionless, such that $\theta_{f,t} = 0$, then $(\mathbb{E}_t\, M_{t+1})^{-1} = R_{f,t}$ by the first-order condition for the risk-free asset. Lastly, defining $\lambda_t = \tilde{\lambda}_t/(W_t u'(W_t))$ yields an expression equivalent to (15) for a general rather than a currency excess return.

Disclaimer