Exchange Rate and Interest Rate Disconnect: The Role of Capital Flows and Risk Premia

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Abstract

Using survey based measures of exchange rate expectations from a large set of advanced countries and emerging markets during 1996–2018, we document new facts on excess returns and on the determination of exchange rates. We find that positive interest rate differentials imply expected depreciation as predicted by the uncovered interest parity (UIP) condition. However, the expected depreciation is not enough to offset the interest rate differentials, leading to UIP deviations and excess returns over time. In emerging markets, 78% of these deviations are explained by the movements in interest rate differentials, whereas in advanced countries, exchange rate fluctuations explain the entire variation in the UIP deviations. Capital flows driven by fluctuations in global risk, country risk and country fundamentals explain the UIP deviations. In advance countries, the spot exchange rate reacts more than the expected exchange rate, whereas in emerging markets, the spot exchange rate reacts less than the expected exchange rate to capital flows. Although the interest rate differentials shrink with inflows and expand with outflows, this is not enough to offset the fluctuations in the exchange rate in emerging markets, whereas the large reaction of the spot exchange rate in advance countries to capital flows offsets the interest rate differentials on average but not over time. We show that country-political risk explains the persistence in the UIP deviations in emerging markets, where higher country risk leads to an increase in the interest rate differentials and expected depreciation. While, currency risk can be more important for the advanced country UIP deviations, political risk is the key factor underlying the UIP deviations for emerging markets.

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1 Introduction

The uncovered interest rate parity (UIP) condition implies that investors are indifferent between the returns on unhedged interest-bearing bank deposits in two currencies. Under the UIP, the home currency is expected to depreciate if the home interest rate is higher than the foreign rate, offsetting this interest rate differential. The UIP condition is a central concept in international finance incorporated into almost all of the theoretical models. Finding evidence for this condition has been elusive and the reasons for the lack-of-evidence are still debated.

Starting with the influential work of Fama (1984), a large literature documents that high interest rate currencies do not depreciate but appreciate in the future, the Fama/UIP puzzle. The puzzle is also known as the forward premium puzzle when instead of the interest rate differential, the difference between the forward rate and the spot exchange rate is used, assuming that covered interest parity (CIP) holds. A negative relation in this regression shows the forward premium's inability to predict exchange rate depreciations but rather this premium being associated with appreciations. This finding implies that there are large excess returns for currencies that offer higher interest rates.

We argue that global investors' risk appetite that is correlated with currency risk, country fundamentals and country-political risk is key to understanding the UIP puzzle. Gross capital flows act as a reduced form measure for the effects of changes in investors' risk perceptions. Low (high) global risk and better (worse) fundamentals drive capital inflows (outflows). Exchange rate appreciates (depreciates) and interest rate differentials go down (up) with capital inflows (outflows), however, these two forces may not fully offset each other—leading to an exchange rate and interest rate disconnect—in the presence of currency risk and political risk.

We use survey data on exchange rate expectations and a large sample composed of both advanced and emerging countries. Our sample consists of 33 countries — 11 advanced economies and 22 emerging markets – over the period 1996q2–2018q4. We follow Stavrakeva and Tang (2018b) in using survey forecast data on exchange rates, drawing parallels with the macro literature who mostly rely on such survey data for inflation and consumer expectations.[1]

We construct a measure of UIP deviations at quarterly frequency at 12 month horizon.[2] We start with the UIP condition, $E_t(S_{t+1})(1+i_t^*) = S_t(1+i_t)$, where i_t and i_t^* are the domestic and the foreign (the U.S.) interest rates. E denotes expectations over next horizon and S is the spot exchange rate of a given economy vis-a-vis the USD. Denoting logs with lower case letters, we can

[1]First papers that argued for the use of expectations of exchange rates from survey data are Dominguez (1986), Frankel and Froot (1987), Froot and Frankel (1989), and Ito (1990). Chinn and Frankel (1999) and Chinn and Frankel (2016) also use survey data on expectations and find that although UIP still fails, UIP based on expectations do much better than the one based on actual exchange rate changes, implying a failure of rational expectations. Sarno, Valente, and Leon (2006) using survey data on expectations of exchange rates argue that there is a failure in the forward market due to limits to speculation, and Bussiere, Chinn, Ferrara, and Heipertz (2018) who also uses exchange rate expectations, argue that UIP condition does not hold due to errors in the expectations but starts holding after 2008 since these errors become small. Although Burnside (2019) did not use expectations, he finds a similar structural break in UIP deviations after the crisis due to narrowing down of interest rate differentials across advanced economies.

[2]For robustness, we also use 3 and 1 month horizons.

write the UIP deviation/excess returns $-\lambda_t-$ in logs as follows:

$$\lambda_t = \underbrace{(i_t - i_t^*)}_{\text{IR Differential}} + \underbrace{(s_t - s_{t+1}^e)}_{\text{ER Adjustment}}$$

Hence, when $\lambda_t = 0$, there is no UIP deviation. Using this expression, we can see that the UIP deviation has two terms: an interest rate differential term (IR Differential) that accounts for the difference between the domestic and the foreign rates, and an exchange rate adjustment term (ER Adjustment) that captures the difference between the spot and the expected exchange rates. For there to be no deviation if one term moves, the other term has to move in the opposite direction by the same amount. This is equivalent to testing for a coefficient of 1 in the "Fama-type" regression that regresses changes in the exchange rate on the interest rate differential, though here we have *expected* change in the exchange rate.

We start by documenting that, over the sample period 1996–2018, there is no expected excess returns in advanced economies, as λ is zero, but there are positive returns in emerging markets that reach 3.3 percentage points on average. We also run "Fama" regressions and "Excess Return" regressions, using expected exchange rates, leading to same qualitative result. In the Fama regression, we regress $s_{t+k}^e - s_t$ on $i_t - i_t^*$. The benefits of using expectations data become clear in these regressions, where the sign on the interest rate differential coefficient is correctly positive that says high interest rate currencies are expected to depreciate. The coefficient is still different than 1 in emerging markets, which is the same as a less than full offset in our decomposition exercise. The coefficient is 1 in advanced countries. This means that, on average, there is not excess return during our sample period in advanced economies, but the UIP condition might still not hold in every point in time.[3] For the excess return regression, we regress the excess return (i.e. $\lambda_t \equiv i_t - i_t^* + s_t - s_{t+k}^e$) on the interest rate differential, $i_t - i_t^*$. This exercise leads a positive coefficient which is less than 1 for emerging markets and a coefficient of zero for advanced countries.

In the time series, there are UIP deviations both in advanced economies and emerging markets. To understand the drivers of these *dynamic* deviations, we first test which component (IR Differential or ER Adjustment) of the UIP deviation explains a larger fraction of the dynamic variation in the UIP deviations and then we test the underlying drivers of the deviations and each component. We show that in advanced economies the UIP deviation and the exchange rate adjustment overlap

[3]If we use actual exchange rate changes, then the sign on the same coefficient is negative especially in advanced economies as found by the previous literature that says high interest rate currencies are expected to appreciate. Notice, however, that this is a joint test of the UIP condition and the rational expectations hypothesis, whereas our benchmark framework only aims to test the UIP. Interestingly, the coefficient stays positive for emerging markets even when we use actual exchange rate changes instead of expectations. Since the previous literature almost exclusively relied on advanced country data, we believe this difference was in general overlooked in the literature. Two exceptions are Frankel and Poonawala (2010) who find that in emerging markets the relation between interest rate differentials and exchange rate changes is positive as expected. Focusing on a sample of emerging markets and advanced countries like us, Bansal and Dahlquist (2000) shows that, forward premium puzzle exists only for advanced economies not for emerging markets and only when US interest rates are higher than foreign rates. Hassan and Mano (2014) do not focus on emerging markets but show that forward premium puzzle is not a robust result since they do not reject depreciations for high interest rate currencies.

most of the time period, while the role of interest rate differentials in explaining the deviations is negligible. In contrast, in emerging markets, interest rate differentials significantly explain the UIP deviations. These differentials are systematic and are highly correlated with the UIP deviations, specially during periods of high financial instability as the late 1990s, early 2000s and the global financial crisis. Since under the null of "no-deviation" the IR term and the ER term should fully offset each other, we can investigate the response of each component of the UIP deviation to changes in global risk, country fundamentals and country-political risk. We perform this in a panel regression framework with country fixed effects, identifying from within country variation over time.

Our panel regression exercise reveals that, in response to changes in global risk aversion and country fundamentals, capital flows in and out, driving the UIP deviations. However, the deviations in emerging markets are higher and more persistent than those in advanced countries. Emerging markets and advanced countries both receive capital inflows when global risk is low and country fundamentals are good, captured by high GDP growth. What is different in two sets of countries is the response of the exchange rate. In advance countries, the spot exchange rate reacts more than the expected exchange rate, that is, it appreciates more than the expected rate with capital inflows and it depreciates more than the expected rate with capital outflows. In emerging markets, on the other hand, the spot exchange rate reacts less than the expected exchange rate: during inflows spot exchange rate appreciates less than expected. During outflows, the spot rate and the expected exchange rate do not react at all in emerging markets. As a result the UIP deviations in emerging markets are larger than those in the advanced economies. The interest rate differentials do not respond much to capital flows in advanced countries, whereas they shrink with inflows and expand with outflows in emerging markets. The response of interest rate differentials in emerging markets is not enough to kill the UIP deviations, however. This is due to country-political risk in emerging markets. We show that higher country risk leads to a large expected depreciation and an increase in the interest rate differentials. There is no affect of country-political risk on the UIP deviations in advanced countries.

Our paper relates to a very large literature.[4] Understanding drivers of λ—UIP deviations/excess returns—is important not only because this condition underlies our standard open economy models but also because λ is an important determinant of exchange rates, a deep understanding of drivers of λ will help us build better models of exchange rate determination. Our paper aims to inform theory papers about the sources of UIP deviations and the necessary ingredients that models should incorporate to account for the persistence and time series dimensions of these deviations.

The empirical literature on UIP finds a negative correlation with the interest rate differentials and future changes in exchange rates regardless of running the standard Fama regression[5], or grouping currencies into carry-trade porfolios and showing excess returns for portfolios with cur-

[4] See Engel (2014) for an extensive survey of this literature.

[5] See Burnside, Eichenbaum, and Rebelo (2007), Burnside, Eichenbaum, and Rebelo (2008), Chinn and Quayyum (2012), Sarno, Schneider, and Wagner (2012), Sarno and Schmeling (2014), Chinn and Meredith (2005), and Ito and Chinn (2007).

rency appreciations.[6] Another finding of this literature is low R^2 in the standard Fama regressions.[7]

The theory literature that is set to explain UIP deviations/excess returns can be divided into three groups. The first group of papers are affine models of exchange rate determination and non-CRRA preferences that explains the deviations/excess returns via a currency risk premium such as Lustig and Verdelhan (2007), Lustig, Roussanov, and Verdelhan (2011), Colacito and Croce (2013), Siemer, Verdelhan, and Gourio (2015), Backus, Foresi, and Telmer (2001), Maggiori (2017), Hassan (2013), Salomao and Varela (2018). The second group of papers introduce agent heterogeneity and/or financial frictions. In Alvarez, Atkeson, and Kehoe (2009), each agent have a different cost of accessing the international markets, leading to the UIP puzzle. Agents can also be heterogenous in their information or expectations such as in models of Bacchetta and Wincoop (2006), Bacchetta and van Wincoop (2010), Devereux and Engel (2002), Evans and Lyons (2008). Also known as market structure/order flow literature, this literature argues that exchange rates can be driven by noise or the way currency traders aggregate information that affects their FX trade and exchange rates and hence the UIP deviations. The papers that rely on financial frictions such as Gabaix and Maggiori (2015) and Farhi and Gabaix (2016) feature an international market imperfection to explain the deviations. Recent work by Gopinath and Stein (2018) and Akinci and Queralto (2018) also introduce financial frictions that can generate UIP deviations endogenously.

The final group of papers assume deviations from rational expectations, where market participants expectations differ from rational expectations, such as $s^r_{t+1} - s_t = s^e_{t+1} - s_t + \mu$, where under rational expectations $s^e_{t+1} = s^r_{t+1}$. The variance of μ must be large in these models to generate the UIP puzzle. Burnside et al. (2011) presents such a model, where agents put too much weight on the news about monetary policy leading to expectational errors. In Gourinchas and Tornell (2002), market expectations are different than rational expectations, where market participants expect that a persistent monetary policy shock to be temporary and hence when $i - i^*$ rises, exchange rate appreciates on spot but then expected to depreciate, consistent with our empirical findings. As we use data from surveys on exchange rate expectations, these expectations might differ from rational expectations. In recent work, Stavrakeva and Tang (2019) show that the heterogeneity in the beliefs of both derivative and spot market participants lead to UIP deviations, due to deviations from FIRE and document that survey exchange rate expectations are consistent with the positions of the average FX trader.

We are related to Engel (2016), Engel and Wu (2018) and Valchev (2016) who recently focused on the dynamic comovement between the UIP deviations and the interest rate differentials as oppose to the static relation which is the focus of most of the literature. These papers rely on time-varying risk premia to explain the UIP deviations. We are also related to the papers that

[6] See Lustig and Verdelhan (2006), Lustig and Verdelhan (2007), Brunnermeier, Nagel, and Pedersen (2009), Lustig, Roussanov, and Verdelhan (2011).

[7] Engel and West (2005) and West (2012) shows that, under certain conditions, even if UIP holds, the Fama regression will have a low R^2 if exchange rates are unforcastable. There is evidence that exchange rates can be forecastable in long-horizons and UIP holds in long horizons (Chinn 2006). Engel (2014) argues that with a stationary persistent deviation from UIP, one can have exchange rate unforcastability in the short-run and forecastability in the long-run.

use currency risk premia to explain exchange rate disconnect puzzle. In the standard textbook Mundell-Fleming model, Dornbusch (1976), the UIP condition holds. In this sticky price model, a monetary expansion leads to an exchange rate depreciation and a monetary contraction leads to an exchange rate appreciation, delivering a negative relation between the interest rate differentials and exchange rates. Eichenbaum and Evans (1995) show that a contractionary monetary policy leads to higher interest rates and the appreciation of the exchange rate in the short-run, however, appreciation occurs with a delay of 2 years, known as "delayed overshooting." Although there is a literature that still debates the robustness of the "delated overshooting" result, Engel (2014) argues that this result can explain the UIP and forward bias puzzles. With delayed overshooting, spot exchange rate, s_t falls with the contractionary monetary policy but next period realized exchange rate $-s^r_{t+1}-$ falls even more, creating a negative relation between the interest rate differentials and change in the exchange rate. This interpretation assumes monetary policy shocks are the only drivers of the interest rate differentials which may not be true in the data and it also assumes rational expectations where expected exchange rate equals realized. In our paper we deviate from the latter assumption so even it is the case that there is a negative correlation between $s^r_{t+1} - s_t$ and $i_t - i^*_t$, the correlation between s^e_{t+1} and $i_t - i^*_t$ might be positive as we have documented.

The New Keynesian models (Obstfeld and Rogoff 1995) based on optimizing behavior of agents deliver the same negative relation between interest rates and exchange rates based on endogenous monetary policy, though have trouble with accounting for persistence and volatility in real exchange rates.[8] The exchange-rate disconnect literature argues that correlation of exchange rates with economic fundamentals is low and models cannot predict exchange rates (Obstfeld and Rogoff 2001). Itskhoki and Mukhin (2017) present a model where a financial shock to net foreign asset position can explain both the UIP and exchange rate disconnect puzzles.

In general the relation between capital flows and exchange rates can be different given the specifics of the model. In the standard New Keynesian model, a current account surplus (capital outflows on net) implies that country wealth increases which will push inflation up and hence call for a contractionary monetary policy, leading to exchange rate appreciation. If UIP does not hold then a portfolio balance channel can be present where changes in wealth affects relative demand for risky assets (Cavallo and Ghironi 2002 and Ghironi 2008). In fact starting with the influential work of Kouri (1981), several models put capital flows at the heart of exchange rate determination such as Blanchard et al (2005), Adrian, Etula, and Groen (2010), Gabaix and Maggiori (2015) and Malamud and Schrimpf (2018), Camanho, Hau, and Rey (2018), Itskhoki and Mukhin (2019), and Stavrakeva and Tang (2018a). Providing some evidence for such models, Gourinchas and Rey (2007) show that a cumulated and valuated net foreign asset position can predict dollar exchange rates linking capital flows to exchange rates. Hau and Rey (2005) also show that equity flows can affect exchange rates. In terms of the role of global risk, which is a key determinant of capital flows, Sarno, Schneider, and Wagner (2012) and Bussiere, Chinn, Ferrara, and Heipertz (2018) show an

[8]Due to forward looking behavior in these models, there cannot be an endogenous persistence in exchange rates. The models that incorporates an exogenous shock to the UIP condition such as Kollmann (2001) performs better in accounting for exchange rate volatility.

effect of VIX on exchange rate fluctuations. We show that, once we account for capital flows or the determinants of capital flows that are global risk and country risk, then exchange rates react to fundamentals such as growth differential, unlike what the empirical literature on exchange rate disconnect typically finds.

The remainder of this paper is organized as follows. Section 2 describes the data. Section 3 documents UIP deviations and excess returns. Section 4 introduces a decomposition analysis to assess the drivers of UIP deviations. Section 5 presents our empirical estimations. Section 6 concludes.

2 Data

We employ quarterly data from International Monetary Fund, Bloomberg and Consensus Economics to construct the UIP condition. We obtain deposit interest rates from Bloomberg, the spot exchange rate from IMF International Financial Statistics (IFS) and the exchange rate forecasts survey from Consensus Economics. This survey provides information on expected exchange rate at 1-month and 12-months horizons that together with the respective deposit rate, we use to construct the UIP condition at 1 and 12 month horizons. We let the U.S dollar be our reference currency. There is large literature discussing the use of survey data on expectations. In Appendix B, we discuss some of the potential concerns that could be present in our data.[9]

Additionally, we obtain data on capital inflows from Avdjiev, Hardy, Kalemli-Özcan, and Servén (2018), who provide disaggregated data by borrower sector on capital flows per country-quarter. As a measure of global risk, we employ the VIX index, which is obtained from Federal Reserve Economic Data (FRED). To account for countries' fundamentals, we use –GDP growth differential– indicating the growth rate differential with respect to the U.S. We use a measure of political risk, investment profile, obtained from ICRG Risk Guide to account for countries' risk. We control for inflation by measuring the difference in inflation rate with U.S. inflation differential. The GDP and CIP date are downloaded from IMF-IFS at quarterly frequency. We exclude countries that have a fixed exchange rate regime using the classification of Ilzetzki, Reinhart, and Rogoff (2017). In fixed exchange rate regime countries, the exchange rate does not vary and hence there is no relationship between domestic interest rate differentials and the exchange rates. After these considerations, our sample consist of 33 countries – 11 advanced economies and 22 emerging markets – over the period 1996q2–2018q4. Table A.1 in Appendix A presents the list of countries considered in this paper.

The UIP condition can be expressed as follows:

$$E_t(S_{t+k})(1 + i_t^*) = S_t(1 + i_t), \tag{1}$$

where t denotes time and k is the month-horizon considered. S_t and $E_t(S_{t+k})$ are the spot and

[9] We use quarter average for the 1 and 12 months deposit rates. In the few cases where the deposit rate was not available, we filled in the series with the money market rate.

expected exchange rate for k-month-ahead.[10] The exchange rate is denominated in units of local currency per U.S. dollar, such that an increase implies a domestic depreciation. i_t and i_t^* are the domestic and U.S interest rates with the same time of horizon of the expected exchange rate. Using equation (2), we express the UIP deviation in logs as

$$\lambda_t \equiv i_t - i_t^* + s_t - s_{t+k}^e, \tag{2}$$

where λ_t denotes the UIP deviation with respect to the U.S. dollar and k is the time horizon consider in the UIP condition. Under this specification, a λ_t equal to zero implies that the UIP condition holds and interest rate differentials and expected exchange rate movements offset each other. Otherwise, there are expected excess returns. In particular, $\lambda_t > 0$ implies expected excess returns on the domestic currency, such that there are profitable returns from going short in the U.S. dollar and long in the domestic currency.

Table 1 presents summary statistics of the main variables employed in this paper. The UIP deviation at 12 months horizon indicates an average expected excess returns across counties and time of 2.5 percentage points with a standard deviation of 4.8 percentage points. The average quarterly GDP growth and inflation differential with respect to the U.S. is 0.23 percentage points and 0.5 percentage points. Net foreign inflows are on average 0.5% of GDP.

Table 1: Summary Statistics: All Countries

	All countries				
	Mean (1)	Median (2)	Std Dev (3)	p25 (4)	p75 (5)
UIP Deviation (12 months, log)	0.025	0.024	0.048	-0.006	0.052
GDP Growth differential	0.002	0.003	0.011	-0.003	0.008
VIX (log)	2.931	2.902	0.343	2.633	3.175
Inflation Differential	0.464	0.146	1.593	-0.356	0.809
Net Debt Flows/ GDP	0.005	0.001	0.016	-0.004	0.008
Number of Observations	1,972				

Notes: 33 countries, 22 Emerging Markets, 11 Advanced Economies. Period 1996q2: 2018q4. Source: Avdjiev, Hardy, Kalemli-Özcan, and Servén (2018), Consensus Forecast, IMF, Bloomberg.

These patterns in data suggest the presence of UIP deviations. In the next sections, we assess the sources of deviations across time and countries.

[10] We will drop the k subscript moving forward since we report results only with 12-month horizon in the main text.

3 UIP Deviations

We start our empirical analysis by assessing the UIP condition in two steps. We first estimate the "Fama regression" and next the correlation between excess returns and interest rate differential. By assuming rational expectations, the literature assumes $s^e = s^r$ and runs the "Fama regression" with the realized changes in the exchange rate instead of expected changes in the exchange rate.[11] This is equivalent to testing the UIP condition and the assumption of full information rational expectations (FIRE). Since we use survey data on exchange rate expectations, we will be testing only the UIP condition.

To assess the Fama regression, we rewrite equation (1) in logs, ignoring the horizon k subscript, and estimate the following OLS regression

$$s^e_{t+1} - s_t = \alpha^F + \beta^F(i_t - i^*_t) + \mu_i + \epsilon_{t+1}, \tag{3}$$

where s^e_{t+1} and s_t denote the expected exchange rate 12-periods ahead and the spot rate. i_t and i^*_t are the domestic and U.S. deposit rates for 12-months, and μ_i are country fixed effects. Estimating this equation using country fixed effects allows us to test whether the UIP condition holds within counties across time. β^F captures the impact of changes in the interest rate differential on the expected change in the exchange rate. If the UIP condition holds $\alpha^F = 0$ and $\beta^F = 1$ and expected depreciations move one-to-one with increases in the interest rate differential. If $\beta^F < 1$, the expected depreciation is lower than implied and the UIP does not hold.

The UIP condition not holding would imply expected excess returns. To test this, we regress the UIP deviation from equation (2), on the interest rate differentials[12]

$$\lambda_t = \alpha + \beta(i_t - i^*_t) + \epsilon_{t+1}, \tag{4}$$

where $\beta = 1 - \beta^F$. The λ_t is the expected excess return. Hence, if $\beta > 0$ there is a positive correlation between the expected excess return on the local currency and domestic interest rate differential.

Panel A in Table 2 presents the estimated coefficients of equations (3) and (4) at 12-months horizon for emerging markets and advanced economies. The coefficient of the Fama regression for emerging markets is reported in column 1. The estimated coefficient is positive, but it is lower and statistically different than one, indicating that increases in the interest rate differential lead less than proportional expected depreciations and that the UIP does not hold on average in emerging markets. Column 2 reports the result of equation (4) and confirms the presence of expected excess returns. In particular, the estimated coefficient is positive and statistically significant, and indicates that a one percent increase in the interest rate differential raises expected excess returns by 0.56 percent.

[11]There can still be an error in the Fama regression such that $s^e = s^r + \epsilon$. The assumption is that, under FIRE, ϵ is uncorrelated with the interest rate differential.

[12]Section Appendix C describes the link between the Fama and the excess return regressions.

Results change significantly for advanced economies. The estimated coefficient for the Fama regression –reported in column 3– is 1.10 and non-statistically different than one, indicating that –on average– the UIP condition holds in advanced economies. Confirming the absence of expected excess returns in advanced economies, column 4 shows that the estimated coefficient for the excess return regression is non-statistically different from zero.[13]

These results indicate an asymmetry between emerging markets and advanced economies currencies. While the former offer expected excess returns, the latter do not present expected excess returns. For comparison, we estimate equations (3) and (4) using realized exchange rate –instead of expectations– and present the results in Panel B in Table 2. Just like the previous trends, columns 1 and 2 show that emerging markets' currencies offer ex-post/realized excess returns. Notably, the results change for advanced economies, whose currencies have ex-post/realized excess return. As found in the previous literature, the coefficient β^F in equation (3) is negative –albeit non-statistically significant–, and the coefficient on realized excess returns is positive and highly statistically significant.[14]

Note that the two panels of the table tests different things: Panel A tests the UIP condition and whether the excess returns arise from deviating from the UIP conditions correlates with the interest rate differentials. Panel B, on the other hand, tests the same condition jointly with the assumption of full information rational expectations (FIRE). As a result, it is not straightforward to compare the results and to know whether the failure of the test in panel B implies a failure of the UIP condition or a failure of the FIRE.

4 UIP Deviations: A Decomposition Analysis

Last section reported that, over the last two decades, emerging markets' currencies offered expected excess returns. In this section, we assess the sources of UIP deviations by decomposing them between exchange rates adjustments and interest rate differentials. In particular, we break down the UIP deviation as follows

$$\lambda_t \equiv \underbrace{i_t - i_t^*}_{\text{IR Differential}} + \underbrace{s_t - s_{t+k}^e}_{\text{ER Adjustment}}. \tag{5}$$

Table 3 reports the summary statistics of each of the components of the UIP deviations for emerging markets and advanced economies separately. Column 1 in Panel A shows that, in emerging markets, the average UIP deviation at 12-months horizons is 3.3 percentage points. Notably, this high deviation is not driven by extreme values, as the median UIP deviation is still 3.3. Interestingly, the interest rate differential is the key component in accounting for the positive expected excess returns in emerging markets (column 2). The mean interest rate differential is 4.7 percentage

[13]This result is close to Bussiere, Chinn, Ferrara, and Heipertz (2018), who estimate the Fama regression for eight advanced economies also find that the UIP condition holds when using survey data.

[14]For further references on recent studies on Fama regressions see Engel (2016), Bussiere, Chinn, Ferrara, and Heipertz (2018), Chinn and Frankel (2016), Hassan and Mano (2014), among others.

Table 2: Fama Regression and Excess Returns

	Emerging Markets		Advanced Economies	
	(1)	(2)	(3)	(4)
	Panel A. Ex-ante			
	$s^e_{t+k} - s_t$	λ_t	$s^e_{t+k} - s_t$	λ_t
$i_t - i^*_t$	0.596***	0.563***	1.107***	-0.103
	(0.103)	(0.093)	(0.164)	(0.164)
P-value ($H0 : \beta = 1$)	0.0007		0.5257	
R^2	0.1314	0.1356	0.1632	0.0017
	Panel B. Ex-Post			
	$s^r_{t+k} - s_t$	λ^r_t	$s^r_{t+k} - s_t$	λ^r_t
$i_t - i^*_t$	0.463*	0.665***	-0.366	1.362***
	(0.240)	(0.248)	(0.447)	(0.445)
P-value ($H0 : \beta = 1$)	0.0358		0.0099	
R^2	0.0112	0.0226	0.0028	0.0381
Observations	1226	1226	770	770
Number of Countries	22	22	12	12
Country FE	yes	yes	yes	yes

Notes: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Newey-West Standard errors in parentheses. The excess return is $\lambda_t \equiv i_t - i^*_t + s_t - s^e_{t+1}$ and λ^r_t is the realized excess return. 12-months horizon. Source: IFS, IMF, Consensus Forecast.

points. Inversely, the exchange rate adjustment term is small and negative by 1.4 percentage points, reducing UIP deviations (column 3). These figures contrast substantially with that of advanced economies (columns 4-6). In these economies, the mean UIP deviation is lower –1 percentage point– and is mainly driven by the exchange rate adjustment term, which reaches 0.8 percentage points. As expected, the interest rate differential term is low and only reaches 0.2 percentage points.

These figures indicate that emerging markets show 2.4 percentage points higher UIP deviations than advanced economies. These higher deviations are explained by interest rate differentials, and contrasts notably with advanced economies where UIP deviations are mainly explained by the exchange rate adjustment term.[15]

To illustrate the evolution of UIP deviations across time, we plot in Figure 1 the UIP deviations for advanced economies and emerging markets over the last two decades. A first glance at the data reveals two important facts. First, the expected excess returns reported above for emerging markets at 12-months horizon are not driven by a particular time period, but they are a characteristic feature of these economies. Panel A of Figure 1 (right panel) shows that their UIP deviation is systematically positive for the entire sample period and, hence, their currencies offer consistently

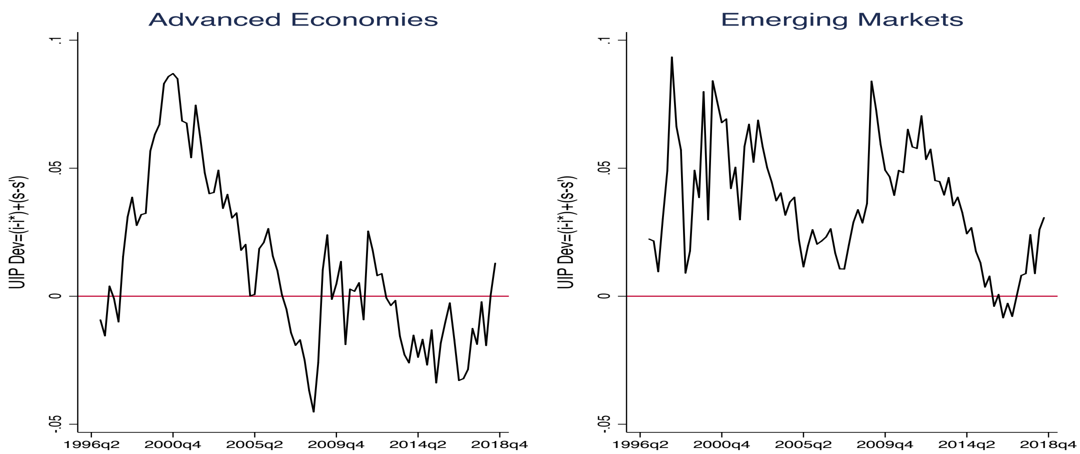
[15] Table A.2 in Appendix A presents the summary statistics for the 1-month horizon and shows that UIP deviations decline substantially for shorter periods. Over the last two decades, the mean UIP deviation is close to zero in both emerging markets and advanced economies. The decline in emerging markets is mainly driven by the drop in the interest rate differential, which becomes 0.4 percentage points. This result is not surprising as –as discussed below– since political risk decreases substantially at monthly frequency.

Table 3: UIP Deviation Decomposition

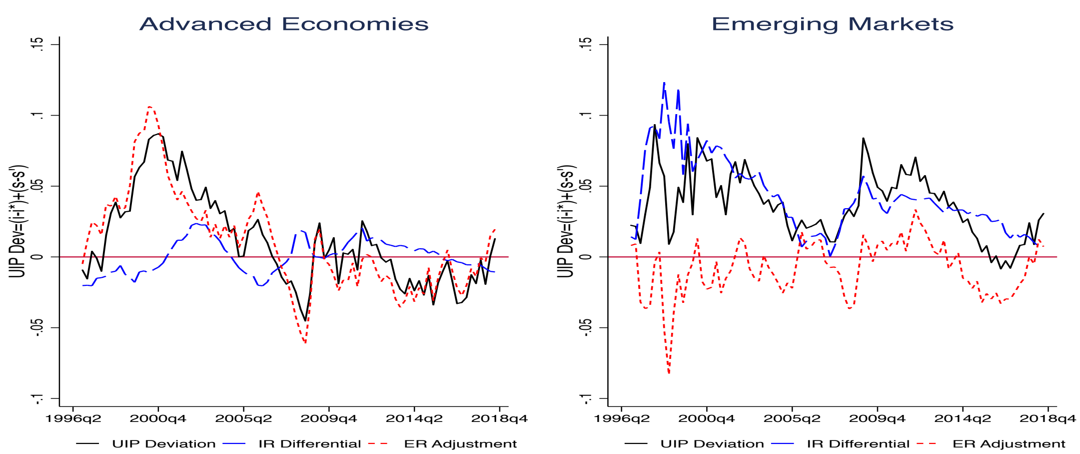
	Emerging Markets			Advanced Economies		
	UIP Deviation (1)	IR Differential (2)	ER Adjustment (3)	UIP Deviation (4)	IR Differential (5)	ER Adjustment (6)
Mean	0.033	0.047	-0.014	0.010	0.002	0.008
Median	0.033	0.035	-0.007	0.006	0.001	0.004
Std Dev	0.049	0.054	0.062	0.042	0.019	0.045
p25	0.004	0.012	-0.036	-0.020	-0.009	-0.022
p75	0.061	0.066	0.021	0.033	0.014	0.036
N of Observations	1240	1240	1240	732	732	732

Notes: 33 countries, 22 Emerging Markets, 11 Advanced Economies. Period 1996q2: 2018q4. All variables are in logs.

expected excess returns. This pattern contrasts with advanced economies where the UIP deviations are both positive and negative and, as shown above, cancel out across time.



A) UIP Deviation



B) Interest Rate Differential and Exchange Rate Adjustment Terms

Figure 1: UIP Deviation in Advanced and Emerging Markets

Note: This figure shows the UIP deviation and its decomposition between interest rate differential and exchange rate adjustment, at 12 month horizon.

Second, the source of the UIP deviations differs greatly between advanced economies and emerging markets. While in the former exchange rate adjustments move closely with UIP deviations, in latter interest rate differentials play a key role. The left graph on Panel B shows that in advanced economies the UIP deviation (continuous back line) and the exchange rate adjustment (red dotted line) overlap most of the time period, while interest rate differentials are very small. In contrast, in emerging markets interest rate differentials significantly explain UIP violations. The right graph shows first that these economies display systematic interest rate differentials over the sample period. Additionally, the interest rate differential (dashed blue line) and the UIP deviations (continuous black line) are highly correlated across time, specially on periods of high financial instability as the late 1990s and early 2000s or the during the Global financial crisis.[16]

To formalize this analysis, we conduct a decomposition exercise and quantify the impact of the interest differentials in UIP deviations. Table 4 presents the main results.[17] The estimated coefficients report how much of the variation in the UIP deviation is explained by the interest rate differential, once the exchange rate adjustment term and the covariance between the exchange rate adjustment and interest rate differentials are taken into account. The coefficient for emerging markets is highly statistically statistically significant and indicates that 79% of movements in the UIP deviations are explained by the interest rate differentials (column 1) This figure contrasts substantially for advance economy where coefficient is non-statistically different from zero.

Table 4: UIP Deviation Decomposition

	UIP Deviation ($\Delta\lambda_t$)	
	Emerging Markets	Advanced Economies
	(1)	(2)
$\Delta(i_t - i_t^*)$	0.7868***	0.0941
	(0.1341)	(0.3154)
R^2	0.2797	0.4533
Country FE	yes	yes
Time FE	yes	yes
Observations	1199	719

Notes: * p < 0.10, ** p < 0.05, *** p < 0.01. Robust standard errors.

The results presented in this section indicate that emerging markets' currencies offer on average 3.3 percentage point expected excess returns. These expected returns are not driven by outliers nor specific time periods. Remarkably, these returns are mainly accounted by interest rate differentials, which not only explain the systematic excess returns (in levels), but their time series evolution. In contrast, expected excess returns in advanced economies' are close to nil and their time series evolution is mainly explained by movements in the exchange rate. In the next section, we assess the factors that determine UIP deviations, and each of its components.

[16]Figure A.1 in Appendix A plot the evolution of the UIP deviations, interest rate differentials and exchange rate adjustments at 1-month horizons. The patterns describe above become more striking. In advanced economies, UIP deviations move one-to-one with the exchange rate adjustment term, and interest rate differential term almost vanishes. In emerging markets, interest rate differentials decrease their importance at short time horizons and exchange adjustment gain significance at accounting for UIP violations. These figures show clearly that, at shorter horizons, exchange rate adjustments are key drivers of UIP violations in both advanced economies and emerging markets, and suggest the importance of political-country risk in accounting for these deviations in emerging markets.

[17]Appendix D reports the analytical decomposition in detail and full table of econometric results.

5 Sources of UIP Deviations

In this section, we evaluate econometrically the factors affecting UIP deviations. We start by assessing the role of global risk and fundamentals (Section 5.1), capital inflows (Section 5.2), and country/political risk (Section 5.3).

5.1 Baseline Results

This section assesses the role of global risk and fundamentals in creating UIP deviations and studies how these affect each of the components of the UIP separately. We analyze the drivers of UIP deviations by estimating the following OLS regression:

$$\lambda_{ct} = \beta_1 \ln(VIX_{t-1}) + \beta_2 \,\text{GDP Diff}_{ct-1} + \mu_c + \varepsilon_{ct}, \tag{6}$$

where $\lambda_{ct,n}$ is the UIP deviation in country c at quarter t and at 12 month horizon. VIX_{t-1} is the VIX index, GDP Diff_{ct-1} is the growth rate differential with respect to the U.S., and μ_c are country fixed effects. To disentangle how fundamentals and global risk can affect UIP deviations, we replace in equation (6) each UIP component –interest rate differential, exchange rate adjustment, spot exchange rate and expected exchange rate– and evaluate each component separately.

Columns 1-3 in Panel A of Table 5 present the results for emerging markets. The estimated coefficients for the VIX and GDP growth differential are statistically significant, indicating that both global risk and fundamentals increase UIP deviations. In particular, a one percent increase in the VIX leads to a 0.04 percentage points increase in the UIP deviation. This implies that if the VIX increases as it did after the collapse of Lehman Brothers (2008q3-2004q4) by 133%, the UIP deviation in emerging markets increases by 5.1 percentage points. Declines in country's GDP growth also increase UIP deviations. A one percentage point decrease in GDP growth leads to a 0.44 increase in the UIP deviation.

Remarkably, in emerging markets, changes in UIP deviations are only explained by movements in the interest rate differential term (column 2). In particular, a one percent increase in the VIX leads to an increase of 0.03 percentage points in the interest rate differential. This implies an increase of 4.6 percentage points upon the collapse of Lehman Brothers in the third quarter of 2008. Similarly, a one percentage point decrease in GDP growth leads to an increase of 0.83 percentage points in the interest rate differential. This coefficient implies that, if the GDP differential increases from the country with the 25 percentile of GDP differential over the sample period to the country with the 75 percentile GDP differential, the interest rate differential drops by 0.8 percentage points. Notably, the VIX and GDP growth do not affect the exchange rate adjustment term (column 3). The reason is that, while both variables affect the spot and expected exchange, they change in similar magnitude, canceling out both effects (Panel B).

Columns 4-6 in Panel A report the estimated coefficients for advanced economies. Similarly, both the VIX and growth differential increase UIP deviations (column 4). The difference with emerging markets arises from the underlying mechanism. While in the later interest rate differential drive changes in the UIP deviations, in advanced economies these deviations are mainly explained by exchange rate adjustments. Column 6 reports the estimated coefficients for the exchange rate adjustment term. It shows that a one percent increase in the VIX leads to a 0.03 percentage points raise in the exchange rate adjustment term. This increase is driven by the higher response of the spot rate relative to the expected exchange rate (panel B). In particular, a one percent increase in the VIX leads to a current depreciation of 11%, and a one-year ahead expected depreciation of 8%. In a similar vein, the GDP growth affects the UIP deviation through exchange rate movements. A one percentage point decrease in GDP growth leads to an increase of 0.5 percentage points in the exchange rate adjustment. This rise stems from the larger depreciation of the spot rate relative to the one year expected depreciation. These results show that, in advanced economies, the differential response of the spot and expected rate becomes a source of excess returns.

Table 5: Sources of UIP Deviations

	Emerging Markets			**Advanced Economies**		
	(1)	(2)	(3)	(4)	(5)	(6)
	Panel A. UIP Deviation Decomposition					
	λ_t	$i_t - i_t^*$	$s_t - s_{t+k}^e$	λ_t	$i_t - i_t^*$	$s_t - s_{t+k}^e$
Log(VIX) (t-1)	0.0385***	0.0346***	0.0039	0.0397***	0.0106***	0.0290***
	(0.0035)	(0.0029)	(0.0041)	(0.0040)	(0.0014)	(0.0043)
Growth Differential (t-1)	-0.4372*	-0.8253***	0.3881	-0.4859**	0.0107	-0.4966**
	(0.2383)	(0.1837)	(0.3417)	(0.2072)	(0.0844)	(0.2140)
R^2	0.2951	0.6617	0.4001	0.2665	0.4926	0.1715
	Panel B. Exchange Rate Adjustment					
	s_t	s_{t+k}^e		s_t	s_{t+k}^e	
Log(VIX) (t-1)	-0.0631***	-0.0669***		0.1129***	0.0836***	
	(0.0191)	(0.0178)		(0.0155)	(0.0131)	
Growth Differential (t-1)	-2.8398**	-3.1724***		-4.0172***	-3.5149***	
	(1.3136)	(1.0208)		(0.8287)	(0.6775)	
R^2	0.9916	0.9920		0.9884	0.9920	
Observations	1200	1200	1200	729	729	729
Number of Countries	22	22	22	11	11	11
Country FE	yes	yes	yes	yes	yes	yes

Notes:* $p < 0.10$ ** $p < 0.05$ *** $p < 0.01$. Robust standard errors. The UIP deviation is $\lambda_t \equiv i_t - i_t^* + s_t - s_{t+1}^e$. 12-months horizon. Source: IFS, IMF, Consensus Forecast.

Table A.3 in Appendix A presents results after controlling for inflation differential. Column 1 shows the estimated coefficients for emerging markets and confirms that both the VIX and GDP growth remain statistically significant and similar in magnitude than previous estimates. As above, the excess return is driven by changes in the interest rate differential term (column 2). Columns 4-6 confirm the previous results on advanced economies and that the excess returns in their currencies are driven by valuation effects on the exchange adjustment term.

Results presented in this section indicate that fluctuations in the VIX and GDP growth generate UIP deviations in both emerging markets and advanced economies. Yet the mechanism underlying these deviations differ. While in emerging markets the VIX and GDP growth increase the interest rate differential and –through them– create excess returns, in advanced economies they affect the spot and the expected exchange rate differentially, creating valuation effects.

5.2 The Role of Capital Flows

In this section, we turn to study the role of capital flows in UIP deviations. With this end, we include net debt flows over GDP in equation 6 as a covariate.

Columns 1-3 in Table 6 report the coefficients for emerging markets. The estimated coefficient for net flows is positive and statistically significant suggesting that net capital flows increase UIP deviations in these economies (column 1). Two distinctive forces lead to this result. As expected, capital flows lower the interest rate differential. In particular, a one percentage point increase in net capital flows leads to a 0.05 percentage point decrease in the interest rate differential (column 2). Yet capital flows trigger a second force: an increase the exchange rate adjustment term (column 3). This increase is explained by the larger movement in the expected exchange rate. Net capital flows lead to a current appreciation, but the future exchange rate is expected to appreciate relatively more (panel B). This differential effect on the future exchange rate generates an increase in the exchange rate adjustment term and is the valuation effect that creates excess returns in emerging markets following net capital flows.

Columns 4-6 present the results for advanced economies. In contrast with emerging markets, net capital flows lower excess returns in advanced economies. This reduction arises from the decrease in the exchange rate adjustment term. As expected, capital flows lead to currency appreciations but, since the spot exchange rate responds more than the expected exchange rate, the exchange rate adjustment term decreases. Hence, in these economies, it is the higher response of the spot rate that lowers excess returns. In particular, a one percentage point increase in net capital flows over GDP lowers the exchange rate adjustment term by 0.08 percentage points and the UIP deviation by 0.06 percentage points.

In Appendix A, we present a series of robustness tests. First, Table A.4 reports the impact of capital inflows and outflows separately. In emerging markets, capital inflows increase UIP deviations, as the exchange rate adjustment term increases due to higher future expected appreciations. Instead, capital outflows lower excess returns. In advanced economies, capital inflows lower excess returns as the spot rate appreciates more, and capital outflows increase excess returns due to a larger current depreciation. Second, for robustness, Table A.5 reports total net inflows constructed using IMF Balance of Payment data. So far we used debt flows and using total flows from IMF will also include equity flows. Using this data, the estimated coefficient for emerging markets is positive, but it is not significant, suggesting that total net flows do not create excess returns in emerging markets since excess return comes from bonds in emerging markets. For advanced economies, the estimate coefficient on net capital flows remains negative and statistically significant confirming that capital flows reduce excess returns in these economies.

Table 6: Sources of UIP Deviations: Net Capital Flows

	Emerging Markets			**Advanced Economies**		
	(1)	(2)	(3)	(4)	(5)	(6)
	Panel A. UIP Deviation Decomposition					
	λ_t	$i_t - i_t^*$	$s_t - s_{t+k}^e$	λ_t	$i_t - i_t^*$	$s_t - s_{t+k}^e$
Log (VIX) (t-1)	0.0383***	0.0298***	0.0086	0.0388***	0.0079***	0.0310***
	(0.0046)	(0.0037)	(0.0056)	(0.0049)	(0.0018)	(0.0054)
Growth Differential (t-1)	-0.2333	-0.5840**	0.3507	-0.6887***	-0.0059	-0.6829**
	(0.3927)	(0.2653)	(0.6236)	(0.2581)	(0.1026)	(0.2750)
Total Debt Net Flows/GDP(t-1)	0.1079***	-0.0488**	0.1567***	-0.0661**	0.0180	-0.0841**
	(0.0335)	(0.0217)	(0.0398)	(0.0314)	(0.0119)	(0.0348)
R^2	0.2397	0.6803	0.3490	0.3477	0.4899	0.2530
	Panel B. Exchange Rate Adjustment					
	s_t	s_{t+k}^e		s_t	s_{t+k}^e	
Log (VIX) (t-1)	0.0041	-0.0042		0.1428***	0.1116***	
	(0.0206)	(0.0181)		(0.0184)	(0.0156)	
Growth Differential (t-1)	-3.0468	-3.3154**		-4.5233***	-3.8183***	
	(2.2723)	(1.6298)		(1.0872)	(0.8995)	
Total Debt Net Flows/GDP(t-1)	-0.4046**	-0.5663***		-0.3225**	-0.2387**	
	(0.1665)	(0.1398)		(0.1397)	(0.1165)	
R^2	0.9910	0.9929		0.9911	0.9938	
Observations	727	727	727	480	480	480
Number of Countries	16	16	16	8	8	8
Country FE	yes	yes	yes	yes	yes	yes

Notes:* $p < 0.10$ ** $p < 0.05$ *** $p < 0.01$. Robust standard errors. The UIP deviation is $\lambda_t \equiv i_t - i_t^* + s_t - s_{t+1}^e$. 12-months horizon. Source: IFS, IMF, Consensus Forecast, Avdjiev, Hardy, Kalemli-Özcan, and Servén (2018).

These results indicate that capital inflows affect UIP deviations through valuation effects in the exchange rate. In emerging markets, it is the higher appreciation of the future expected exchange rate, which creates positive excess returns for these currencies. In contrast, in advanced economies, the higher response of the spot rate reduces excess returns.

5.3 The Role of Political Risk

In this section, we assess the role of political risk by testing whether it affects UIP deviations and its components. In particular, we include in equation (6) political risk as a covariate and re-estimate this equation.

Table 7 reports the results. Column 2 shows that an increase in political risk raises the interest rate differential in emerging markets. The estimated coefficient is highly statistically significant and indicates that a change from the 25 percentile to the 75 percentile of the political risk index increases the interest rate differential by 1.5 percentage points. It is worth noting on the coefficient for GDP growth differential, which decreases by a third and reaches -0.599. This shows that GDP growth was previously capturing part of the effect of the political risk in the interest rate differential.

Column 3 reports the coefficient on the exchange rate adjustment term, which is negative and statistically significant. This result is interesting and arises from the large expected depreciation of the future exchange rate. As shown in columns 1 and 2 in Panel B, political risk does not significantly affect the spot rate, but it creates large expectations of depreciation. This expected depreciation decreases the exchange rate adjustment term. Since the change in the future expected depreciation is higher than the increase in the interest rate differential, the expected excess return actually lowers. This illustrates that political risk acts as a pull factor in emerging market. Increases in political risk raise the domestic interest rate but, since agents expect a high depreciation, capital pulls out of the country and lowers the excess returns.

Finally, note that in advanced economies political uncertainty does not affect any of the components of the UIP deviations (neither the interest rate differential, exchange rate adjustment term, spot and expected exchange rate) and, hence, does not affect excess returns.

Table 7: Sources of UIP Deviations: Political Risk

	Emerging Markets			Advanced Economies		
	(1)	(2)	(3)	(4)	(5)	(6)
	Panel A. UIP Deviation Decomposition					
	λ_t	$i_t - i_t^*$	$s_t - s_{t+k}^e$	λ_t	$i_t - i_t^*$	$s_t - s_{t+k}^e$
Log(VIX) (t-1)	0.0409***	0.0304***	0.0106**	0.0415***	0.0087***	0.0329***
	(0.0039)	(0.0030)	(0.0042)	(0.0047)	(0.0016)	(0.0051)
Growth Differential (t-1)	-0.4871**	-0.5990***	0.1119	-0.5646**	-0.0345	-0.5301**
	(0.2461)	(0.1629)	(0.3376)	(0.2341)	(0.0884)	(0.2452)
Political Risk (t-1)	-0.0471*	0.0909***	-0.1380***	-0.0096	-0.0400	0.0305
	(0.0247)	(0.0141)	(0.0292)	(0.0548)	(0.0234)	(0.0725)
R^2	0.3123	0.6645	0.4301	0.2788	0.5283	0.1886
	Panel B. Exchange Rate Adjustment					
	s_t	s_{t+k}^e		s_t	s_{t+k}^e	
Log(VIX) (t-1)	-0.0416**	-0.0521***		0.1351***	0.1021***	
	(0.0183)	(0.0173)		(0.0173)	(0.0145)	
Growth Differential (t-1)	-2.0611	-2.0985*		-4.1448***	-3.6043***	
	(1.4888)	(1.1743)		(0.9285)	(0.7577)	
Political Risk (t-1)	0.1120	0.2584**		-0.1430	-0.1715	
	(0.1203)	(0.1007)		(0.2026)	(0.1480)	
R^2	0.9923	0.9929		0.9889	0.9923	
Observations	991	991	991	632	632	632
Number of Countries	20	20	20	10	10	10
Country FE	yes	yes	yes	yes	yes	yes

Notes:* $p < 0.10$ ** $p < 0.05$ *** $p < 0.01$. Robust standard errors. The UIP deviation is $\lambda_t \equiv i_t - i_t^* + s_t - s_{t+1}^e$. 12-months horizon. Source: IFS, IMF, Consensus Forecast, Avdjiev, Hardy, Kalemli-Özcan, and Servén (2018), ICRG Risk Guide.

6 Conclusion

We uncover new facts about the nature of the UIP deviations and show that these deviations and their sources differ between advanced and emerging economies. We started by documenting that advanced economies do not have on average expected excess return, as the UIP deviations are nil. Instead, emerging markets have on average positive excess returns of 3 percentage points. These deviations are systemic and persistent across time.

Yet there are significant UIP deviations in the time series dimension both in advanced economies and emerging markets. We showed that global risk, fundamentals and political risk are key drivers in these deviations. Global risk pushes capital flows in an out of both emerging markets and advanced countries so fluctuations in global risk creates UIP deviations. However, the source of deviations varies significantly between advanced and emerging economies. In emerging markets, low global risk translates into a decrease in the interest rate differential, lowering excess returns. Since the spot and expected exchange rate move in similar magnitudes, global risk does not create valuation effects in these economies. In contrast, in advanced economies, low global risk appreciates the spot rate more than the expected rate, leading to a decrease in the exchange rate adjustment term and lower excess returns. This finding is similar to the findings in the finance literature that show different currencies load differently on global risk. We show that this is because changes in global risk act as push factors of capital flows. Fundamentals and political risk act as pull factors for flows in emerging markets. Low GDP growth and high political risk lead to expected depreciations and increase the interest rate differentials. This create excess returns in emerging markets. Instead, in advanced economies, low GDP growth does not affect interest differentials, and creates UIP deviations through larger movements in the spot than expected exchange rate, which creates valuation effects. As expected, there is no affect of country-political risk on the UIP deviations in advanced economies.

Overall our results indicate that county-political risk is critical to explain UIP deviations in emerging markets, while currency risk linked to global risk is essential to account for the deviations observed in advanced economies. These results inform theory papers about the sources of UIP deviations and the necessary ingredients that models should incorporate to account for the persistence and time series dimensions of these deviations. In this way, our paper shows that models trying to account for UIP deviations should consider how agents price the currency risk, how much risk financial intermediators take, and in the case of emerging markets, how sensitive foreign investors to political risk. In terms of policy implications, understanding drivers of UIP deviations and excess returns, can shed light on the channels through which sterilized foreign exchange interventions can be effective.

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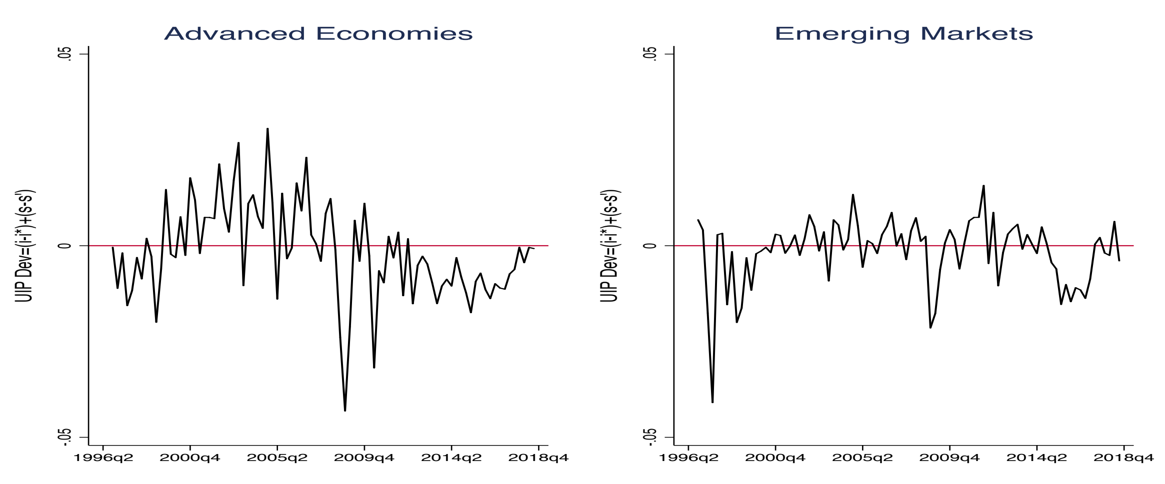
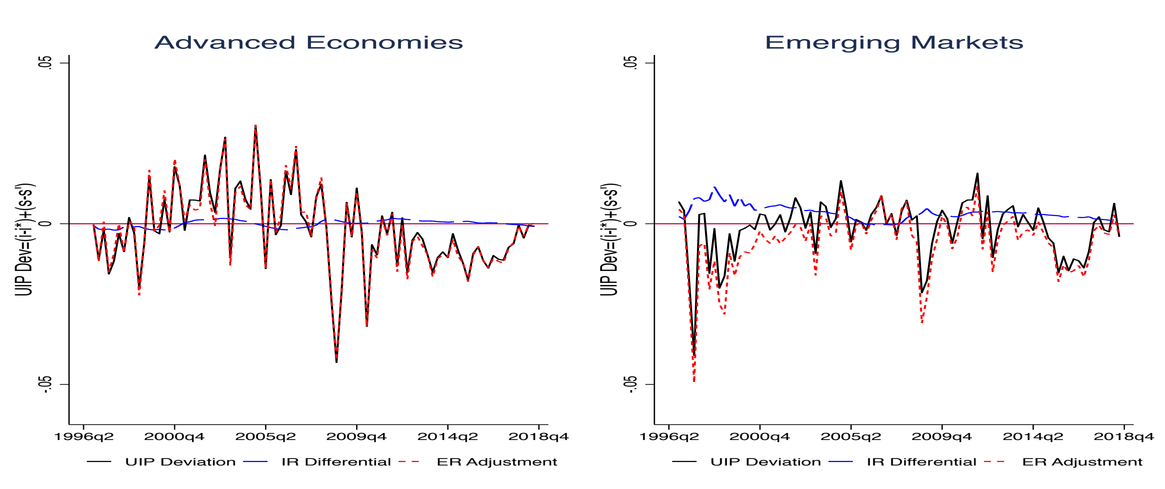
Appendix A Additional Figures and Tables



A) UIP Deviation



B) Interest Rate Differential and Exchange Rate Adjustment Terms

Figure A.1: UIP Deviation in Advanced and Emerging Markets

Note: This figure shows the UIP deviation and its decomposition between interest rate differential and exchange rate adjustment. At 1 month horizon.

Table A.1: List of Countries

Advanced Economies (1)	Emerging Markets (2)
Australia	Argentina
Canada	Brazil
Denmark	Chile
Euro Area	China, P.R.: Mainland
Israel	Colombia
Japan	Czech Republic
New Zealand	Hungary
Norway	India
Sweden	Indonesia
Switzerland	Republic of Korea
United Kingdom	Malaysia
	Mexico
	Peru
	Philippines
	Poland
	Romania
	Russian Federation
	Slovak Republic
	South Africa
	Thailand
	Turkey
	Ukraine

Notes: 33 countries, 11 Advanced Economies and 22 Emerging Markets. Period 1996q2-2018q4.

Table A.2: UIP Deviation Decomposition- 1 Month Horizon

	Emerging Markets			**Advanced Economies**		
	Log UIP Deviation (1)	Log IR Differential (2)	Log ER Adjustment (3)	Log UIP Deviation (4)	Log IR Differential (5)	Log ER Adjustment (6)
	1 Month Horizon					
Mean	-0.002	0.004	-0.006	-0.001	0.000	-0.002
Median	0.000	0.003	-0.003	-0.002	0.000	-0.002
Std Dev	0.019	0.004	0.020	0.015	0.002	0.016
p25	-0.009	0.001	-0.013	-0.010	-0.001	-0.010
p75	0.007	0.005	0.004	0.008	0.001	0.008
N of Observations	1240	1240	1240	732	732	732

Notes: 33 countries, 22 emerging Markets, 11 advanced economies. Period 1996q2: 2018q4.

Table A.3: Robustness: Inflation Differential

	Emerging Markets			**Advanced Economies**		
	(1)	(2)	(3)	(4)	(5)	(6)
	Panel A. UIP Deviation Decomposition					
	λ_t	IR Diff	ER Adj	λ_t	IR Diff	ER Adj
Log(VIX) (t-1)	0.0414***	0.0259***	0.0155***	0.0406***	0.0102***	0.0304***
	(0.0036)	(0.0028)	(0.0041)	(0.0041)	(0.0015)	(0.0046)
GDP Growth Differential (t-1)	-0.5202**	-0.5765***	0.0564	-0.4835**	0.0094	-0.4929**
	(0.2190)	(0.1312)	(0.2932)	(0.2079)	(0.0848)	(0.2154)
Inflation Differential (t-1)	-0.2548	0.7645***	-1.0192***	-0.2028	0.1038	-0.3067
	(0.2026)	(0.0738)	(0.2343)	(0.2310)	(0.0848)	(0.2677)
R^2	0.3018	0.7111	0.4666	0.2674	0.4937	0.1734
	Panel B. Exchange Rate Adjustment					
	s_t	s^e_{t+k}		s_t	s^e_{t+k}	
Log(VIX) (t-1)	-0.0345*	-0.0505***		0.1084***	0.0778***	
	(0.0181)	(0.0174)		(0.0162)	(0.0137)	
GDP Growth Differential (t-1)	-3.6600***	-3.6424***		-4.0294***	-3.5306***	
	(1.1957)	(0.9497)		(0.8258)	(0.6737)	
Inflation Differential (t-1)	-2.5201***	-1.4444*		0.9940	1.2804*	
	(0.9351)	(0.7935)		(0.9491)	(0.7672)	
R^2	0.9918	0.9921		0.9884	0.9920	
Observations	1133	1133		709	709	
Number of Countries	22	22		11	11	
Country FE	yes	yes		yes	yes	

Notes:* $p < 0.10$ ** $p < 0.05$ *** $p < 0.01$. Robust standard errors. The UIP deviation is $\lambda_t \equiv i_t - i^*_t + s_t - s^e_{t+1}$. 12-months horizon. The data from net flows comes from IMF. Source: IFS, IMF, Consensus Forecast.

Table A.4: Robustness: Inflows and Outflows

	Emerging Markets			Advanced Economies		
	(1)	(2)	(3)	(4)	(5)	(6)
	Panel A. UIP Deviation Decomposition					
	λ_t	$i_t - i_t^*$	$s_t - s_{t+k}^e$	λ_t	$i_t - i_t^*$	$s_t - s_{t+k}^e$
log(VIX) (t-1)	0.0367***	0.0323***	0.0044	0.0398***	0.0076***	0.0322***
	(0.0048)	(0.0038)	(0.0057)	(0.0051)	(0.0018)	(0.0055)
Growth Differential (t-1)	-0.2233	-0.5981**	0.3748	-0.7068***	-0.0013	-0.7054**
	(0.3924)	(0.2638)	(0.6205)	(0.2594)	(0.1043)	(0.2767)
Total Debt Inflows/GDP(t-1)	0.0961***	-0.0313	0.1274***	-0.0625**	0.0171	-0.0796**
	(0.0316)	(0.0205)	(0.0366)	(0.0310)	(0.0120)	(0.0346)
Total Debt Outflows/GDP(t-1)	-0.1613**	0.1501***	-0.3114***	0.0837**	-0.0224*	0.1061***
	(0.0713)	(0.0468)	(0.0813)	(0.0363)	(0.0132)	(0.0403)
R^2	0.2409	0.6841	0.3553	0.3490	0.4903	0.2548
	Panel B. Exchange Rate Adjustment					
	s_t	s_{t+k}^e		s_t	s_{t+k}^e	
Log(VIX) (t-1)	-0.0181	-0.0221		0.1483***	0.1158***	
	(0.0225)	(0.0201)		(0.0190)	(0.0160)	
Growth Differential (t-1)	-2.9382	-3.2315**		-4.6225***	-3.8943***	
	(2.2457)	(1.6060)		(1.0821)	(0.8947)	
Total Debt Inflows/GDP(t-1)	-0.5455***	-0.6771***		-0.3027**	-0.2236*	
	(0.1425)	(0.1226)		(0.1391)	(0.1164)	
Total Debt Outflows/GDP(t-1)	-0.5570	-0.2381		0.4195***	0.3132**	
	(0.4199)	(0.3631)		(0.1566)	(0.1307)	
R^2	0.9912	0.9930		0.9912	0.9938	
Observations	727	727	727	480	480	480
Number of Countries	16	16	16	8	8	8
Country FE	yes	yes	yes	yes	yes	yes

Notes:* $p < 0.10$ ** $p < 0.05$ *** $p < 0.01$. Robust standard errors. The UIP deviation is $\lambda_t \equiv i_t - i_t^* + s_t - s_{t+1}^e$. 12-months horizon. Source: IFS, IMF, Consensus Forecast, Avdjiev, Hardy, Kalemli-Özcan, and Servén (2018).

Table A.5: Robustness: Total Net Flows

	Emerging Markets			Advanced Economies		
	(1)	(2)	(3)	(4)	(5)	(6)
	Panel A. UIP Deviation Decomposition					
	λ_t	$i_t - i_t^*$	$s_t - s_{t+k}^e$	λ_t	$i_t - i_t^*$	$s_t - s_{t+k}^e$
log(VIX) (t-1)	0.0389***	0.0336***	0.0053	0.0395***	0.0117***	0.0278***
	(0.0037)	(0.0031)	(0.0043)	(0.0040)	(0.0014)	(0.0043)
Growth Differential (t-1)	-0.4896*	-0.8681***	0.3785	-0.5332**	-0.0319	-0.5013**
	(0.2522)	(0.2022)	(0.3697)	(0.2121)	(0.0845)	(0.2203)
Total Net Flows/GDP(t-1)	0.0043	-0.0001	0.0044	-0.0829***	0.0145	-0.0974***
	(0.0038)	(0.0015)	(0.0035)	(0.0279)	(0.0092)	(0.0312)
R^2	0.3053	0.6686	0.4087	0.2791	0.5040	0.2002
	Panel B. Exchange Rate Adjustment					
	s_t	s_{t+k}^e		s_t	s_{t+k}^e	
log(VIX) (t-1)	-0.0777***	-0.0829***		0.1091***	0.0810***	
	(0.0201)	(0.0187)		(0.0158)	(0.0134)	
Growth Differential (t-1)	-2.9034**	-3.2214***		-3.9114***	-3.4027***	
	(1.4111)	(1.0910)		(0.8552)	(0.7014)	
Total Net Flows/GDP(t-1)	0.0086	0.0041		-0.2456**	-0.1495	
	(0.0223)	(0.0208)		(0.1157)	(0.0959)	
R^2	0.9915	0.9919		0.9887	0.9921	
Observations	1133	1133	1133	709	709	709
Number of Countries	22	22	22	11	11	11
Country FE	yes	yes	11	yes	yes	yes

Notes:* $p < 0.10$ ** $p < 0.05$ *** $p < 0.01$. Robust standard errors. The UIP deviation is $\lambda_t \equiv i_t - i_t^* + s_t - s_{t+1}^e$. 12-months horizon. Net capital flows constructed using IFS, from IMF. Source: IFS, IMF, Consensus Forecast.

Appendix B Exchange Rate Survey Data

Our survey data comes from Consensus Forecast which reports monthly exchange rate forecasts for 1, 3 , 12 and 24 months for overall 62 currencies since 1989. This is an unbalanced panel where some currencies drop from the sample (notably European countries after the creation of Euro), and new currencies are incorporated.

The number of forecasters is 26 per currency, but it varies significantly across currencies going from 8 forecasters for small currencies (as for example Argentina) to more than 100 (as in the Euro). These forecasters are principally global banks and investors as for example JP Morgan, HSBC, Citigroup, BNP Paribas, Merryll Lynch, Royal Bank of Canada, Allianz, Goldman Sachs, Morgan Stanley, Unicredit, Barclays, Societe Generale, Raiffeisen Bank, Royal Bank of Scotland, ABN AMRO, among others.

There are two main concerns when using survey data on exchange rates. The first concern is whether forecasters simply replicate the forward rate when making their exchange rate forecast and, in this sense, whether surveys provide useful information. The second concern is about whether expectations are biased. In this appendix, we conduct preliminary analysis assessing these two concerns.

To evaluate the first concern, namely whether the forecasters simply replicate the forward rate, we test empirically whether the expected change in the exchange rate correlates with the forward premium. In particular, we estimate

$$s^e_{c,t+k} - s_{c,t} = \beta(f_{c,t+k} - s_{ct}) + \mu_c + \varepsilon_{c,t}, \tag{7}$$

where $f_{c,t+k}$ is the forward rate at $t+k$ horizon for country c, $s^e_{c,t+k}$ is the expected exchange rate, $s_{c,t}$ is the spot rate and μ_c are country fixed effects. If $\beta = 1$, the forward premium is equal to the expected exchange rate change and forecasters are simply replicating the forward rate. Columns 1 and 2 in Table B.1 report the estimated coefficients of regression (7) for emerging markets and advanced economies, respectively. Both estimated coefficients are positive. In particular, the coefficient for emerging markets only reaches 0.759 and that for advanced economies is 1.11. Interestingly, the coefficient on the emerging markets is statistically different that one, which is consistent with the UIP condition not holding on average in this economies. For advanced economies, the coefficient is non-statistically different that one, which is in line with our findings that the UIP condition tends to hold on average in advanced economies.

The second concern regarding the use of survey data is whether expectations are biased. There are two steps to address this question. First, one can consider whether the unconditional forecast errors are normally distributed. Second, one can test whether agents' expectations vary conditional on fundamentals. We consider them in turn.

To assess whether unconditional agents' expectations are biased, we regress the expected ex-

Table B.1: Exchange Rate Survey vs Forward Premium

	$s^e_{t+1} - s_t$	
	Emerging Markets	Advanced Economies
	(1)	(2)
Forward Premium ($f_{t+k} - s_t$)	0.759***	1.115***
	(0.081)	(0.103)
P-value ($H0 : \beta = 1$)	0.0007	0.103
R^2	0.3148	0.2834
Observations	1359	1144
Number of Countries	21	12
Country FE	yes	yes

Notes: * p < 0.10, ** p < 0.05, *** p < 0.01. Robust standard errors. Source: IFS, IMF, Consensus Forecast.

change rate change on the realized change and plot the residuals. In particular, we regress

$$\Delta s^e_{c,t+k} = \Delta s^r_{c,t+k} + \mu_c + \varepsilon_{c,t}, \tag{8}$$

where $\Delta s^e_{c,t+k}$ is the expected change in the exchange rate, $\Delta s^r_{c,t+k}$ is the realized (ex-post) change. If residuals –$\varepsilon_{c,t}$– are normally distributed, the forecast errors are random. Inversely, if residuals are non-normal, agents could be making systematically forecast errors. For example, if the distribution of the forecast errors followed a fat tail and forecast errors were systematically positive –$\varepsilon > 0$– agents would be continuously expecting depreciation that does not materialized (e.g. $\Delta s^e_{c,t+k} > \Delta s^r_{c,t+k}$) as in the denominated "peso problem".

Figure B.1 plots the forecast errors for 1 and 12 month horizons and shows that forecast errors seems to follow closely to a normal distribution. At 12 month horizons, forecast errors seems to have a longer right tail, which is consistent with agents making more forecast errors at longer horizons.

One of the concerns when using survey data is whether agents are making systematic errors in their expectations. One example of this is the denominated "peso problem", where agents systematically expect a currency depreciation that does not materialize. To assess whether this occurs in this survey, we check whether the forecast errors are normally distributed. More precisely, we regress the expected change in exchange rate on the realized change and plot the residuals. In particular, we regress $\Delta s^e_{t+k} = \Delta s_{t+k} + \mu_i + \varepsilon_t$, where Δs^e_{t+k} is the expected change in the exchange rate, Δs_{t+k} is the realized (ex-post) change and μ_i are country fixed effects. If residuals –ε_t– are normally distributed, the forecast errors are random. Inversely, if residuals are non-normal, agents could be making systematically forecast errors. For example, if the distribution of the forecast errors followed a fat tail and forecast errors were systematically positive –$\varepsilon > 0$– agents would be continuously expecting depreciation that does not materialized (e.g. $\Delta s^e_{t+k} > \Delta s_{t+k}$) as in the peso problem.

Figure B.1 plots the forecast errors at 12 month horizon for advanced and emerging economies.

This figure shows that the unconditional forecast errors have zero mean and follow relatively close to a normal distribution. Remarkably, for advanced economies, the forecast errors tend to have a higher left tail than a normal distribution, suggesting that the forecast error in large events is negative and expected exchange is lower than the realized rate. This is in line with our findings that, in these economies, the spot rate moves more than the expected rate following increases in risk. In contrasts, emerging markets tend to have a larger right tail than a normal distribution, indicating that the expected exchange rate is higher than the realized rate in high events. This is consistent with our previous findings that, in emerging markets, the expected exchange rate moves more than the spot rate following increases in risk.

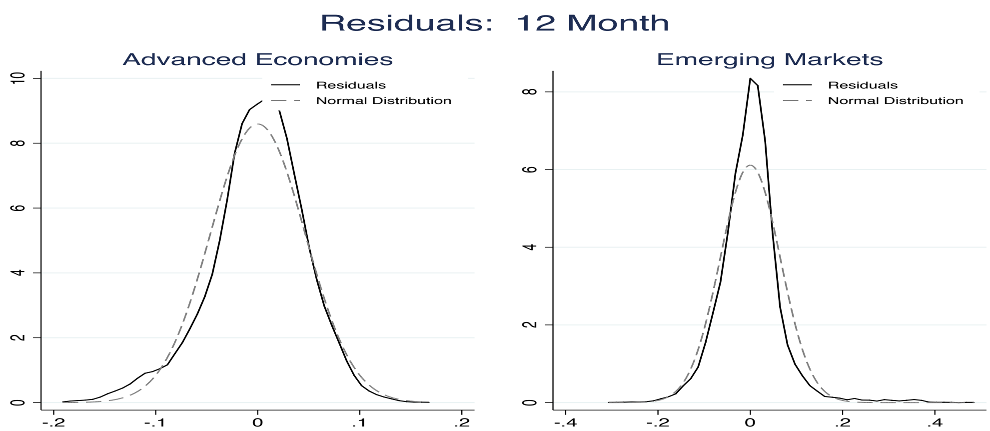


Figure B.1: Forecast Errors

Next, to assess whether agents are making systematic errors conditional on economic conditions, we regress the forecast error –namely, the difference between the expected and the realized rate– on country's spot rate and GDP growth. In particular, we regress

$$s^e_{c,t+k} - s^r_{c,t+k} = \beta_1 s_{c,t} + \beta_2 GDP_{c,t} + \mu_c + \varepsilon_{c,t}. \tag{9}$$

If β_1 and β_2 are statistically different than zero, agents' forecast errors depend on economic conditions and expectations are biased. Table B.2 presents the estimated coefficient. Columns 1-3 report the coefficients for emerging markets. Column 1 shows that the forecast error is positively correlated with the spot rate, suggesting that when the currency is depreciated agents expect a higher depreciation that what it actually materializes. The coefficient on contemporaneous GDP growth –column 2– is statistically significant, showing that the higher growth reduces forecast error. Nevertheless, this coefficient becomes insignificant when including the spot rate in the regression, as in column 3. It worth remarking on columns 4-6 that present the results for advanced economies. Neither the spot rate or the GDP growth is statistically significant, which indicates that in these economies agents' forecast errors do not depend on current fundamentals.

Table B.2: Conditional Forecast Errors

	$s^e_{t+1} - s^r_{t+1}$					
	Emerging Markets			Advanced Economies		
	(1)	(2)	(3)	(4)	(5)	(6)
s_t	0.143***		0.142***	0.011		0.015
	(0.016)		(0.016)	(0.026)		(0.026)
GDP growth		-0.564*	-0.392		0.523	0.576
		(0.332)	(0.322)		(0.629)	(0.636)
R^2	0.110	0.051	0.112	0.037	0.038	0.038
N	1184	1159	1159	708	708	708
Number of Countries	21	21	21	11	11	11
Country FE	yes	yes	yes	yes	yes	yes

Notes: * $p < 0.10$ ** $p < 0.05$ *** $p < 0.01$. Newey-West Standard errors in parentheses.

Appendix C Link between the Fama and the Excess returns regressions

Recall that the UIP condition is $s^e_{t+1} - s_t = i_t - i^*_t$. Using this condition, we can write the Fama regression as

$$s^e_{t+1} - s_t = \alpha^F + \beta^F(i_t - i^*_t). \tag{10}$$

Adding and subtracting $i^*_t - i_t$ from each side of equation (10).

$$s^e_{t+1} - s_t + (i^*_t - i_t) = \alpha^F + \beta^F(i_t - i^*_t) + (i^*_t - i_t).$$

Multiplying both sides for -1 and defining excess returns as $\lambda_t = i_t - i^*_t + s_t - s^e_{t+1}$, we obtain

$$\lambda_t = \beta(i_t - i^*_t) + \varepsilon_t, \tag{11}$$

where $\alpha = -\alpha^F$ and $\beta = 1 - \beta^F$. Then, if $\beta = 0$, increases in the interest rate differential do not correlate with excess return, the Fama regression holds ($\beta^F = 1$) and there is no excess return. Instead, if $\beta > 0$, increases in the interest rate differential raise excess returns. The coefficient of the Fama regression becomes less than one ($\beta^F < 1$) and there are UIP deviations.

Appendix D A simple variance decomposition for an identity

Define the UIP deviation in levels as

$$\text{UIP Dev}_t \equiv \frac{S_t}{E_t(S_{t+k})}\frac{(1+i_t)}{(1+i_t^*)}.$$

Defining the interest rate differential term as $IR_t \equiv (1+i)/(1+i^*)$, and the exchange rate adjustment term as $ER_t \equiv S_t/E_t(S_{t+k})$, we re-write the UIP deviation as

$$\text{UIP Dev}_t \equiv IR_t\, ER_t.$$

Re-arranging terms and multiplying the left hand side by $(IR_t/ER_t)\text{UIP Dev}_t$, we obtain

$$IR_t = \text{UIP Dev}_t \frac{IR_t}{ER_t}\frac{ER_t}{\text{UIP Dev}_t}.$$

Taking logs, first differences, multiplying both sides by $\Delta\log(IR_t)$ and taking expectations, we obtain the following decomposition for the cross-section variance of the interest rate differential:

$$\begin{aligned} var(\Delta\log IR_t) &= cov(\Delta\log IR_t, \Delta\log \text{UIP Dev}_t) \\ &+ cov(\Delta\log IR_t, \Delta\log ER_t - \Delta\log\text{UIP Dev}_t) + cov(\Delta\log IR_t, \Delta\log IR_t - \Delta\log ER_t) \end{aligned}$$

We can divide both sides by $\Delta\log(IR_t)$ to get:

$$1 = \beta_{IR} + \beta_{ER} + \beta_{COV}, \tag{12}$$

where $\beta_{IR} \equiv \frac{cov(\Delta\log\text{UIP Dev}_t, \Delta\log IR_t)}{var(\Delta\log IR_t)}$, $\beta_{ER} \equiv \frac{cov(\Delta\log ER_t - \Delta\log\text{UIP Dev}_t, \Delta\log IR_t)}{var(\Delta\log IR_t)}$, and $\beta_{COV} \equiv \frac{cov(\Delta\log IR_t - \Delta\log ER_t, \Delta\log IR_t)}{var(\Delta\log IR_t)}$. We can then run these regressions separately as

$$\Delta\log\text{UIP Dev}_t = \alpha + \beta_{IR}\,\Delta\log IR_t + \varepsilon_t \tag{13}$$

$$\Delta\log ER_t - \Delta\log\text{UIP Dev}_t = \alpha + \beta_{ER}\,\Delta\log IR_t + \varepsilon_t \tag{14}$$

$$\Delta\log IR_t - \Delta\log ER_t = \alpha + \beta_{COV}\,\Delta\log IR_t + \varepsilon_t \tag{15}$$

β_{IR} captures how much of the variation in the UIP deviations is explained by the interest rate differential term, once the role of the exchange rate adjustment term is taken into account. We estimate these three equations and present the estimated coefficients in Table B.3.

Table B.3: UIP Deviation Decomposition

	Emerging Markets			Advanced Economies		
	Δ log UIP	Δ log ER -Δ log UIP	Δ log IR -Δ log ER	Δ log UIP	Δ log ER -Δ log UIP	Δ log IR -Δ log ER
	β_{IR}	β_{ER}	β_{cov}	β_{IR}	β_{ER}	β_{cov}
	(1)	(2)	(3)	(4)	(5)	(6)
Δ log IR Diff	0.7868***	-1.0000***	1.2132***	0.0941	-1.0000***	1.9059***
	(0.1341)	(0.0000)	(0.1341)	(0.3154)	(0.0000)	(0.3154)
Country FE	yes	yes	yes	yes	yes	yes
Time FE	yes	yes	yes	yes	yes	yes
Observations	1199	1199	1199	719	719	719

Notes: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Robust standard errors.