Carry trade, covered interest parity, and uncovered interest parity before and after the global financial crisis

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1 Introduction

Uncovered interest parity (UIP), covered interest parity (CIP), and carry trade portfolio analyses are key aspects studied within international finance. If no deviations are present, the conventional UIP regression, Equation (1), should yield $\beta = 1$ and $a = 0$. Deviations from UIP have been researched for quite some time, back to the seminal paper by Eugene Fama (1984)[3] which coined the term "Fama puzzle," documenting long-standing excess returns in high interest rate currencies.[1]

$$s_{t+1} - s_t = a + \beta(i_t - i_t^*) + u_{s,t+1} \tag{1}$$

CIP, which until recently, has been assumed to hold and is taught as such in most international finance programs.[2] The CIP relationship is expressed mathematically in Equation (2).[3] Du, Tepper, and Verdelhan (2017)[1] go to great lengths to demonstrate that deviations from CIP can be found following the global financial crisis (GFC). They show existence of persistent arbitrage opportunities in the forward market and suggest that increased financial intermediation costs, likely in response to the GFC, and imbalances between investment demand and supply are likely playing a role.

$$\rho_t \equiv f_t - s_t = y_t - y_t^{\$} \tag{2}$$

Econometricians have raised concerns regarding the conduct of Fama regressions. An analytical technique that side-steps this issue is the carry trade portfolio analysis technique, utilized by Lustig and Verdelhan (2007)[5] and Husted, Rogers, and Sun (2017).[4] This methodology involves the sorting of currencies with respect to the foreign-home interest rate differential and assembling currency portfolios based on this sort. Portfolio average excess returns can be calculated over a specified time period when using this technique. Carry trade portfolio method offers two advantages; (i) it avoids the endogeneity issue present in the standard UIP regression equation and (2) random exchange rate fluctuations appear to wash out, on average, when considering a portfolio of currencies rather than a single bilateral exchange rate.

In this paper, I consider three groupings of countries to assess deviations from UIP using the regression developed by Engel (2016),[2] deviations from CIP, and deviations from UIP using the

[1] UIP suggests that high interest rate currencies should depreciate resulting in no excess returns.

[2] John Rogers takes care by introducing literature documenting CIP deviations in his graduate level international finance course.

[3] I maintain the notation from Du, Tepper, and (2017).

carry trade portfolio method. There are large overlaps in the countries contained in each analysis, but variations are introduced to obtain larger data sets which include emerging market economies (EMEs). Standard UIP regressions are run for a grouping of 25 countries that include a high percentage of EMEs (60 percent) from 1998M1 through 2017M3. In alignment with existing literature, there appears to be strong evidence of positive excess returns prior to 2008M6. This finding does not hold as well over 2008M7 through 2017M3. I swap out EMEs for advanced economies, primarily due to the fact that forward contracts for a large portion of the EMEs previously chosen either do not have forward contracts or I could not find the data on them, when investigating deviations from CIP in 17 currencies. I find CIP to be relatively robust from 2000M2 through 2008M6. Deviations are found in the regressions from 2008M7 through 2017M3. For the carry trade portfolio analysis I maintain a high level of advanced economies in my data set of 25 countries. Similar to existing literature, I find a monotonic increase in excess returns over the five constructed portfolios from 2000M2 through 2008M6 and 2008M7 through 2017M3. There appears to be a reduction in the excess returns from 2008M7 through 2017M3 relative to the previous period. This finding appears to differ from results found in Husted, Rogers, and Sun (2017).

The remainder of this paper is organized as follows: section two summarizes the data used in this analysis; section three introduces and discusses the UIP regressions, CIP deviations, and carry trade portfolio results; finally, section four provides concluding remarks.

2 Data Summary

I use monthly data for each portion of this analysis. UIP regressions consider 1998M1 through 2017M3 and include 3-month treasury bill (t-bill) interest rates and bilateral exchange rates relative to the U.S. dollar for the United Kingdom, Trinidad and Tobago, Sweden, South Africa, Sierra Leone, New Zealand, Canada, France, Belgium, Hong Kong, Spain, Hungary, Mexico, Guyana, Eswatini, Barbados, Kenya, Lebanon, Malawi, Japan, Nepal, Israel, Namibia, Sri Lanka, and Cabo Verde. T-bill data is taken from Thomson One database and the International Monetary Fund (IMF) International Financial Statistics (IFS) data set.[4] I cross reference the listed data with the IFS Country Notes publication to ensure data reflects consistent t-bill maturities. Monthly spot exchange rate data is from Thomson One and the Federal Reserve (2020) historical database with exchange rate values taken from the varying days within the month.[5] I investigate deviations from UIP prior to and post 2008M6.

Data used used to investigate CIP deviations includes monthly spot exchange rates, 3-month forward exchange rates, and t-bill interest rates from 2000M2 through 2017M3. Forward exchange rate data is sourced exclusively from the Thomson One database. Countries included in this portion of the analysis are United Kingdom, Netherlands, Sweden, South Africa, Norway, New Zealand, Canada, France, Belgium, Hong Kong, Spain, Switzerland, Italy, Denmark, Germany, Australia, and Japan. Again, I investigate deviations prior to and following 2008M6 as well as over the entire sample.

The carry trade portfolio investigation of UIP considers 25 countries with data from 2000M2 through 2017M3, including United Kingdom, Sweden, South Africa, New Zealand, Canada, France, Belgium, Hong Kong, Spain, Hungary, Mexico, Kenya, Japan, Israel, Sri Lanka, Australia, Germany, Denmark, Italy, Switzerland, Columbia, Norway, South Korea, Netherlands, and Russia.

[4] See https://data.imf.org/regular.aspx?key=61545867

[5] See https://www.federalreserve.gov/releases/h10/Hist/ for a listing of daily rates.

T-bill data could not be found on a subset of countries included in this portion of the analysis so 90-day interbank interest rates are utilized in their stead.[6] Newly included country spot exchange rates are sourced from Thomson One. Annualized log exchange rate changes for each of the countries, calculated using Equation (3), can be seen in Figure 1. Expected exchange rate volatility over time is seen with a sharp decline in 2008 (U.S. dollar appreciation). Also, of note is the large appreciation of the U.S. dollar relative to the Russian ruble in 2014 followed by what appears to be a correction with a trend back towards the mean.

$$\Delta s_{annualized} = [1 + (\frac{s_{t+65}}{100} - \frac{s_t}{100})]^{12} - 1 \tag{3}$$

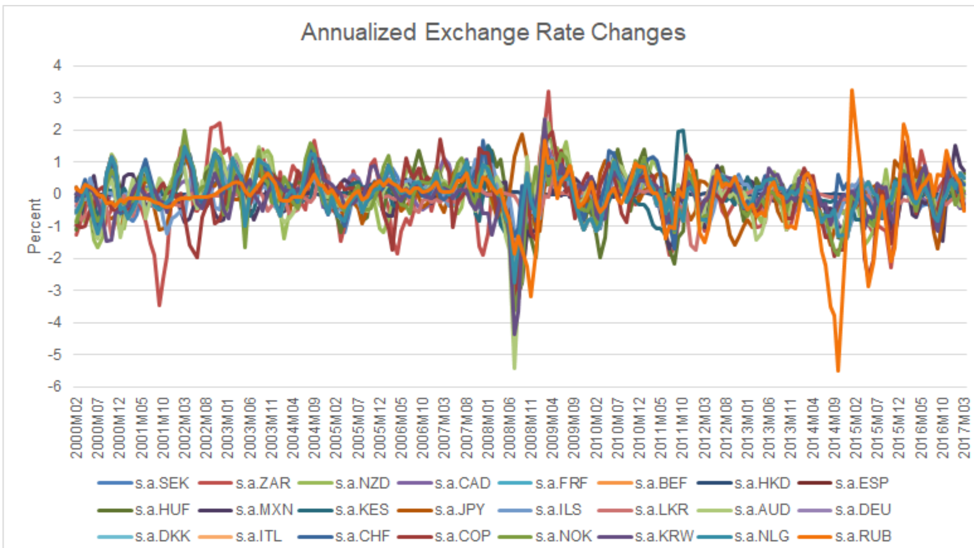

Figure 1: Annualized log exchange rate changes for 25 countries used in carry trade analysis.

3 Results and Discussion

I chose to track France throughout the results below for comparison to the constructed panels of countries. Commentary on similarities and differences are provided in each subsection.

3.1 Standard UIP regression

I begin by looking at UIP regressions (interchangeably called Fama regressions throughout) to understand the ex post excess returns on a foreign currency, conserving the notation developed in Engel (2016). The intent is to investigate whether the foreign minus home interest difference coefficient is $\beta < 0$, $\beta > 0$, or if it is near zero.[7] The regression equation used can be seen in

[6]Interbank rates are sourced from the Federal Reserve Economic Database (FRED) for Australia, Germany, Denmark, Italy, Switzerland, Columbia, Norway, South Korea, Netherlands, and Russia.

[7]A β equivalent to zero is the null hypothesis as defined by Engle (2016). This is a slight variation from the standard UIP regression which tests the null hypothesis of β equal to one, but is, by definition, equivalent.

Equation (4), where ρ is excess returns, The first set of regressions consider data from 1998M2 through 2008M6, while the second considers 2008M7 through 2017M3.

$$\rho_{t+1} = \zeta_s + \beta_s(i_t^* - i_t) + u_{s,t+1} \tag{4}$$

Regression coefficients and 90% confidence intervals[8] for the 1998M1 through 2008M6 are reported in Table 1. For each currency the estimate of β is positive, indicative of a positive covariance between the interest rate differential and risk premium. The United Kingdom and Canada nearly exclude zero in their slope estimate 90% confidence interval. Additionally, the slope coefficient estimate confidence intervals for Sierra Leone, Hungary, Guyana, Nepal, Israel, and Cabo Verde all include zero. It is interesting to note that other than United Kingdom, Canada, and Israel all countries whose coefficient estimates include zero are characterized as emerging market and developing economies by the IMF.

Intercept estimates, which per the null hypothesis should be zero, are outside the 90% confidence interval for a mixture of advanced and developing economies; including South Africa, France, Belgium, Spain, Eswatini, and Namibia. The remainder of countries included are sufficiently close to zero. Barbados, which has a fixed exchange rate with respect to the U.S. dollar, yields the expected results in terms of slope and intercept estimates. This makes sense based on the structure of the regression equation.

Fama regressions are run for 2008M7 through 2017M3, with results reported in Table 2. Slope coefficient estimates, β, are heterogeneous across countries. Trinidad and Tobago, Sierra Leone, Guyana, Barbados, Kenya, Lebanon, Malawi, Cabo Verde, and Japan all retain positive excess returns over this period with the remainder of currency slope coefficient estimates either completely below zero or including zero in their 90% confidence interval. Of those countries who's estimates reflected a positive excess return, Japan is the only developed economy with an estimate of 1.428.

Estimates of the intercept for Sierra Leone, New Zealand, Canada, Hungary, Kenya, Nepal, and Cabo Verde are all significantly different that zero according to the 90% confidence intervals. With the exception of New Zealand and Canada, the remainder of these countries are considered emerging market and developing economies. Barbados yields similar estimates as the prior period due to its maintained fixed exchange rate. Interestingly, Lebanon appears to have adopted a fixed exchange rate over this time period. This is evident in the exchange rate data.

France appears to adhere to expectations with respect to the Fama puzzle for the earlier period investigated, with a positive statistically significant slope estimate greater than zero. In the later time period the slope estimate is less than zero, but zero lies within the 90% confidence interval. This is similar to the majority of other advanced economies within the panel of countries. Its intercept estimate is below zero, but zero lies within the 90% confidence interval. France appears to yield estimates consistent with the "new new" Fama puzzle over the later time period.

3.2 Deviations from CIP

I investigate deviations from CIP by running regressions for each country over three different time periods; 2000M2 through 2008M6, 2008M7 through 2017M3, and 2000M2 through 2017M3 with results in Tables 3, 4, and 5, respectively. The composition of the country panel for this exercise diverges from the standard UIP regressions due to availability of three-month forward exchange

[8]Confidence intervals throughout are based on Newey-West standard errors.

rate data[9].

Similar to Engel (2016), I construct my regression, Equation (5), to test for CIP deviations such that $\beta > 0$ is indicative of a CIP deviation. Interest rates are converted to monthly returns to accurately compare them to exchange rate differentials. Similar to Du, Tepper, and Verdelhan (2017), I include the term $\frac{1}{n}$[10] to account for the holding period of the forward contract and the securities that interest rates are derived from.

$$\frac{1}{n}(f_{t,t+n} - s_t) + i_t^* - i_t = a + \beta(i_{t,t+n}^* - i_{t,t+n}) + u_{s,t+n} \tag{5}$$

CIP regressions for the 17 country panel covering 2000M2 through 2008M6 is documented in Table 3. I find that with the exception of New Zealand, Hong Kong, and Japan, all currencies do not appear to exhibit deviations from CIP based on their slope estimates. The 90% confidence interval for Hong Kong is only slightly above zero. Japan and New Zealand both have slope estimates of approximately 1.0. A large portion of the European countries have intercept estimates that are significantly different than zero, with the exception of the United Kingdom and Sweden. Australia is the only non-European country in the panel with an intercept estimate that is significantly different than zero.

Table 4 provides the slope and intercept estimates for the panel based on data from 2008M7 through 2017M3. I find that the Netherlands, Norway, New Zealand, Canada, Spain, Italy, Denmark, Germany, and Japan all indicate deviations from CIP based on their slope estimates for this period (three times more countries than the previous period). Only Canada appears to have a negative slope coefficient estimate (-3.743). Intercept estimates for ten of the 17 countries in the panel significantly differ from zero based on the 90% confidence intervals.

I estimate regression coefficients using data from the entire time frame, 2000M2 through 2017M3, in Table 5. Slope coefficient estimates for Netherlands, New Zealand, Canada, Hong Kong, Spain, Italy, Denmark, Germany, and Japan all different from zero at a statistically significant level. These results are similar to those found when only considering data from 2008M7 through 2017M3. Additionally, intercept estimates for 12 of the 17 currencies considered are significantly different from zero.

Monthly CIP deviations are calculated and plotted for all 17 countries in Figure 2. Unlike the CIP regressions, all rates are annualized to compare the differences. I find there is a clear difference in behavior across two periods, with the GFC being the dividing event between the two. Prior to late 2008, deviations appear to oscillate around zero or some slight offset near zero. This seems to indicate that prior to late 2008, on average, investors would not expect to see a return if seeking an arbitrage opportunity in the forwards market. However, this pattern alters drastically with a sharp correction followed by what appears to be a persistent plateau below zero with country-to-country variation. As suggested to Wu, Tepper, and Verdelhan (2017), differences between periods may be a result of increased financial regulation following the GFC or due to investors "reaching for yield", causing a supply and demand imbalance in the forwards markets.

The estimates for France over the two periods are interesting when compared to other EU and European countries. In the earlier time period, the slope estimate in the CIP regression is similar to the majority of other co-located EU countries, such as Germany, Spain, and Belgium. However, when focusing on the later time period, there is a divergence of slope estimates for France when

[9]Countries include United Kingdom, Netherlands, Sweden, South Africa, Norway, New Zealand, Canada, France, Belgium, Hong Kong, Spain, Switzerland, Italy, Denmark, Germany, Australia, and Japan.

[10]I use $n = 3$ given that the interest rate data is expressed in monthly returns.

compared to its neighboring European countries. While I do find a positive slope estimate, I cannot reject the null outright based on the 90% confidence interval. Additionally, when comparing France to other countries with respect to monthly CIP deviations, we can see that prior to 2008 the trend is similar to the remainder of the countries. Following 2008, France appears to exhibit CIP deviations that are near zero over the later period.

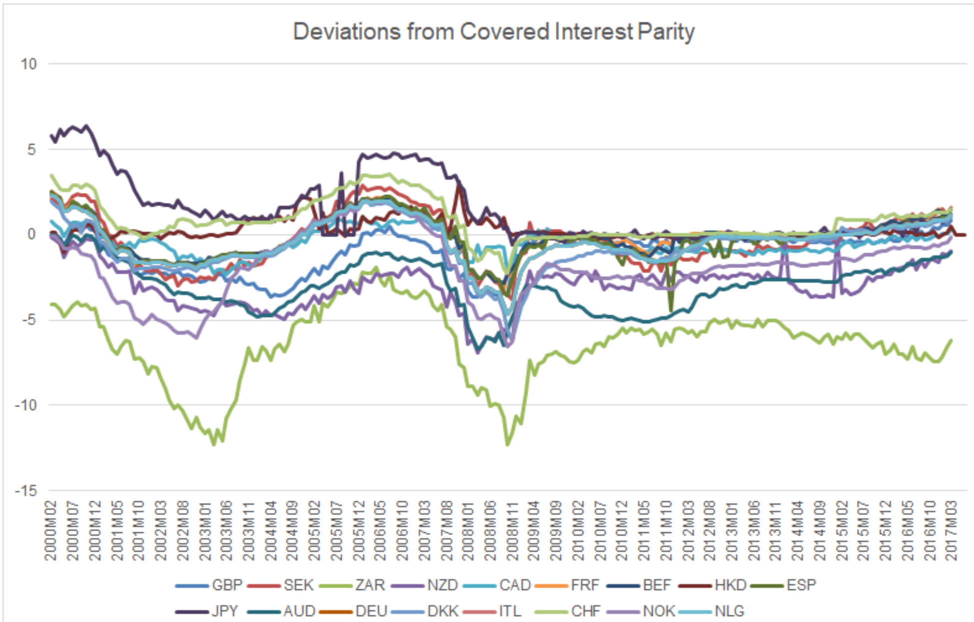

Figure 2: Monthly deviations from CIP for 17 countries with available 3-month forward exchange rates based on annualized returns. This is a subset of countries used for carry trade portfolio analysis.

3.3 Carry trade portfolio analysis

Following the procedure utilized by Lustig and Verdelhan (2007) and Husted, Rogers, Sun (2017), I construct five carry trade portfolios with each containing five countries (25 countries total). For each month from 2000M2 through 2017M3 I sort the countries into portfolios by foreign-home interest rate differentials with the lowest differentials assigned to portfolio one and the remainder assigned in an ascending fashion. Similar to other portions of analyses conducted thus far, I look at two time periods, one before and one after 2008M6. In both time periods I find a monotonic increase in excess returns with respect to portfolio number. Excess returns are lower over 2008M7 through 2017M3 when compared to the earlier time period. This differs from prior findings in the literature but may be due to differences in countries included in the panel.

I find that France falls in the low risk portfolios, one and two, for the vast majority of the entire time period. It spends 53.9% of the time in portfolio one, 43.2% in portfolio two, 2.9% in portfolio three, and 0% in portfolios four or five. Given that sorting is done based on interest rate differences relative to the U.S., it makes sense that a country like France would maintain interest rates close to the U.S. over the entire period. In fact, due to prevailing negative interest rates seen in Europe since 2014, the placement of France in any portfolios other than the top two would not make sense based on the sorting algorithm.

4 Conclusion

In this paper I investigate three key areas of study in international finance: standard UIP regressions looking at the Fama puzzle, deviations from CIP, and the carry trade portfolio methodology for examining UIP. This is done by looking at three panels of countries over roughly the same time period. Three-month treasury bills, three-month forward exchange rates, 3-month interbank rates, and spot exchange rates are utilized throughout. Interest rates used differ due to limitations in available data. Time frames considered differ due to availability of forward exchange rate data. These factors drive the makeup of countries composing each panel. I notice that there are trade-offs to be considered when conducting economic research with respect to time frame and countries to include.

The results I find match well with existing UIP and CIP deviation literature when using a standard regression methodology. There is evidence of a structural change following the GFC in both of these areas. The Fama puzzle seems to hold strongly prior to 2008M6 and has waned following the GFC. Deviations from CIP seem to be near zero prior to the end of 2008 but their is now evidence of persistent deviations following the GFC. I do find a subtle difference in carry trade portfolio results when compared to existing literature, specifically that there continues to be a monotonic increase in excess returns with respect to portfolio number. This may be due to differences in countries included in the analysis.

References

[1] W. Du, A. Tepper, and A. Verdelhan. Deviations from covered interest rate parity. Working Paper 23170, National Bureau of Economic Research, February 2017.

[2] C. Engel. Exchange rates, interest rates, and the risk premium. *American Economic Review*, 106(2):436–474, 2016.

[3] E. F. Fama. Forward and spot exchange rates. *Journal of Monetary Economics*, 14(3):319–338, 1984.

[4] L. Husted, J. Rogers, and B. Sun. Uncertainty, currency excess returns, and risk reversals. International Finance Discussion Paper 1196, Board of Governors of the Federal Reserve System, February 2017.

[5] H. Lustig and A. Verdelhan. The cross-section of foreign currency risk premia and u.s. consumption growth risk. *Journal of Political Economy*, 97(1):89–117, March 2007.

Table 1: Fama Regressions (1998M1 - 2008M6): $s_{t+1} - s_t + i_t^* - i_t = \zeta_s - \beta_s(i_t^* - i_t) + u_{s,t+1}$

Country	$\hat{\zeta}_s$	90% interval	$\hat{\beta}_s$	90% interval
United Kingdom	-0.086	(-0.563, 0.391)	2.907	(-0.133, 5.947)
Trinidad and Tobago	-0.097	(-0.263, 0.069)	1.342	(0.715, 1.970)
Sweden	0.292	(-0.049, 0.633)	4.863	(2.546, 7.180)
South Africa	-1.798	(-3.143, -0.453)	3.696	(1.082, 6.310)
Sierra Leone	-0.107	(-1.651, 1.437)	0.713	(-0.546, 1.972)
New Zealand	1.812	(-0.739, 4.362)	0.759	(0.371, 1.147)
Canada	0.228	(-0.068, 0.524)	3.905	(-0.261, 8.071)
France	0.418	(0.071, 0.765)	5.352	(2.549, 8.155)
Belgium	0.429	(0.085, 0.773)	5.663	(2.729, 8.598)
Hong Kong	-0.005	(-0.021, 0.011)	1.153	(0.982, 1.324)
Spain	0.420	(0.078, 0.763)	5.913	(2.992, 8.833)
Hungary	0.207	(-0.742, 1.156)	1.028	(-0.447, 2.503)
Mexico	-0.260	(-0.675, 0.154)	1.120	(0.394, 1.845)
Guyana	-0.138	(-0.304, 0.028)	0.300	(-1.177, 1.776)
Eswatini	-2.546	(-3.945, -1.147)	5.910	(2.954, 8.867)
Barbados	0.000	(0.000, 0.000)	1.000	(1.000, 1.000)
Kenya	-0.092	(-0.541, 0.357)	1.066	(0.557, 1.575)
Lebanon	0.014	(-0.003, 0.031)	0.995	(0.990, 1.001)
Malawi	-1.941	(-4.221, 0.339)	1.070	(0.773, 1.367)
Japan	0.282	(-0.668, 1.232)	0.923	(0.425, 1.421)
Nepal	-0.095	(-0.340, 0.150)	0.509	(-1.015, 2.034)
Israel	0.194	(-0.391, 0.779)	0.475	(-1.014, 1.963)
Namibia	-1.607	(-2.971, -0.244)	3.313	(0.665, 5.961)
Sri Lanka	-0.556	(-1.133, 0.020)	1.169	(0.337, 2.001)
Cabo Verde	0.200	(-0.270, 0.671)	1.168	(-0.136, 2.472)

Table 1 Notes: The Engel (2016) UIP regression is used to estimate the Fama regressions for all 25 countries. 90 percent confidence intervals are based on Newey-West standard errors. Data sources are Thomson One and IMF.

Table 2: Fama Regressions (2008M7 - 2017M3): $s_{t+1} - s_t + i_t^* - i_t = \zeta_s - \beta_s(i_t^* - i_t) + u_{s,t+1}$

Country	$\hat{\zeta}_s$	90% interval	$\hat{\beta}_s$	90% interval
United Kingdom	0.295	(-0.259, 0.849)	-20.519	(-27.344, -13.694)
Trinidad and Tobago	-0.062	(-0.139, 0.016)	0.820	(0.557, 1.084)
Sweden	-0.016	(-0.694, 0.661)	-7.508	(-17.747, 2.730)
South Africa	-0.914	(-6.546, 4.719)	1.796	(-10.208, 12.801)
Sierra Leone	-1.389	(-2.111, -0.667)	1.604	(1.093, 2.114)
New Zealand	1.712	(0.513, 2.910)	0.336	(-0.146, 0.818)
Canada	0.840	(0.085, 1.596)	-20.907	(-34.121, -7.694)
France	-0.257	(-0.740, 0.226)	-8.084	(-18.062, 1.893)
Belgium	-0.241	(-0.730, 0.246)	-7.840	(-17.499, 1.819)
Hong Kong	0.003	(-0.011, 0.018)	-0.313	(-2.977, 2.351)
Spain	-0.154	(-0.646, 0.339)	-4.066	(-11.533, 3.401)
Hungary	-0.845	(-1.679, -0.011)	1.536	(-1.834, 4.907)
Mexico	0.321	(-3.493, 4.134)	-1.671	(-13.552, 10.210)
Guyana	-0.027	(-0.080, 0.025)	1.083	(0.788, 1.377)
Eswatini	0.128	(-7.831, 8.087)	-0.264	(-15.458, 14.930)
Barbados	0.000	(0.000, 0.000)	1.000	(1.000, 1.000)
Kenya	-1.684	(-2.885, -0.483)	2.885	(1.208, 4.561)
Lebanon	0.000	(0.000, 0.000)	1.000	(1.000, 1.000)
Malawi	-1.431	(-3.202, 0.339)	0.972	(0.600, 1.344)
Japan	-0.799	(-2.441, 0.849)	1.438	(0.590, 2.285)
Nepal	-0.447	(-0.879, -0.016)	1.089	(-0.049, 2.226)
Israel	0.361	(-0.255, 0.976)	-3.041	(-9.113, 3.031)
Namibia	-3.541	(-9.090, 2.008)	6.508	(-4.508, 17.525)
Sri Lanka	0.041	(-0.639, 0.722)	0.450	(-0.562, 1.462)
Cabo Verde	-0.918	(-1.800, -0.036)	3.611	(0.103, 7.120)

Table 2 Notes: The Engel (2016) UIP regression is used to estimate the Fama regressions for all 25 countries. 90 percent confidence intervals are based on Newey-West standard errors. Data sources are Thomson One and IMF.

Table 3: Covered Interest Parity Regressions (2000M2 - 2008M6): $\frac{1}{n}(f_{t,t+n} - s_t) + i^*_{t,t+n} - i_{t,t+n} = \zeta_s - \beta_s(i^*_{t,t+n} - i_{t,t+n}) + u_{s,t+n}$

Country	$\hat{\zeta}_s$	90% interval	$\hat{\beta}_s$	90% interval
United Kingdom	0.033	(-0.031, 0.096)	-0.240	(-0.640, 0.159)
Netherlands	0.038	(0.027, 0.049)	0.024	(-0.097, 0.145)
Sweden	0.000	(-0.064, 0.065)	0.252	(-0.113, 0.618)
South Africa	-0.180	(-0.498, 0.139)	0.151	(-0.411, 0.713)
Norway	0.043	(0.035, 0.050)	-0.037	(-0.085, 0.011)
New Zealand	-0.182	(-0.752, 0.387)	0.998	(0.905, 1.092)
Canada	0.012	(-0.040, 0.065)	-0.357	(-0.919, 0.205)
France	0.026	(0.019, 0.321)	-0.019	(-0.069, 0.031)
Belgium	0.023	(0.015, 0.030)	-0.063	(-0.129, 0.004)
Hong Kong	0.005	(-0.002, 0.013)	0.190	(0.055, 0.326)
Spain	0.021	(0.015, 0.028)	-0.029	(-0.085, 0.027)
Switzerland	0.045	(0.017, 0.074)	0.013	(-0.135, 0.162)
Italy	0.038	(0.027, 0.049)	0.024	(-0.097, 0.145)
Denmark	0.040	(0.030, 0.050)	0.051	(-0.079, 0.181)
Germany	0.038	(0.027, 0.049)	0.024	(-0.097, 0.145)
Australia	0.033	(0.017, 0.050)	-0.001	(-0.109, 0.108)
Japan	0.301	(0.135, 0.468)	0.981	(0.905, 1.057)

Table 3 Notes: I adapt the Engel (2016) UIP regression form to estimate the CIP deviations for all 17 countries. 90 percent confidence intervals are based on Newey-West standard errors. Data sources are Thomson One and IMF.

Table 4: Covered Interest Parity Regressions (2008M7 - 2017M3): $\frac{1}{n}(f_{t,t+n} - s_t) + i^*_{t,t+n} - i_{t,t+n} = \zeta_s - \beta_s(i^*_{t,t+n} - i_{t,t+n}) + u_{s,t+n}$

Country	$\hat{\zeta}_s$	90% interval	$\hat{\beta}_s$	90% interval
United Kingdom	0.028	(-0.043, 0.010)	-0.571	(-1.831, 0.689)
Netherlands	0.042	(0.024, 0.118)	0.504	(0.240, 0.767)
Sweden	0.024	(-0.070, 0.118)	-0.834	(-1.696, 0.028)
South Africa	0.056	(-1.042, 1.153)	-0.294	(-2.583, 1.995)
Norway	-0.013	(-0.053, 0.026)	0.434	(0.202, 0.665)
New Zealand	-0.157	(-0.301, -0.014)	0.963	(0.904, 1.022)
Canada	0.128	(-0.048, 0.304)	-3.743	(-6.864, -0.623)
France	0.027	(0.017, 0.037)	0.249	(-0.086, 0.583)
Belgium	0.029	(0.019, 0.038)	0.221	(-0.058, 0.500)
Hong Kong	0.013	(0.007, 0.018)	0.204	(-0.231, 0.638)
Spain	0.039	(0.021, 0.057)	0.501	(0.234, 0.767)
Switzerland	0.062	(0.043, 0.081)	0.381	(-0.195, 0.958)
Italy	0.042	(0.024, 0.060)	0.504	(0.240, 0.767)
Denmark	0.062	(0.046, 0.077)	0.431	(0.267, 0.594)
Germany	0.042	(0.024, 0.060)	0.504	(0.240, 0.767)
Australia	-0.005	(-0.056, 0.046)	0.126	(-0.100, 0.352)
Japan	0.063	(-0.135, 0.261)	0.991	(0.867, 1.116)

Table 4 Notes: I adapt the Engel (2016) UIP regression form to estimate the CIP deviations for all 17 countries. 90 percent confidence intervals are based on Newey-West standard errors. Data sources are Thomson One and IMF.

Table 5: Covered Interest Parity Regressions (2000M2 - 2017M3): $\frac{1}{n}(f_{t,t+n} - s_t) + i^*_{t,t+n} - i_{t,t+n} = \zeta_s - \beta_s(i^*_{t,t+n} - i_{t,t+n}) + u_{s,t+n}$

Country	$\hat{\zeta}_s$	90% interval	$\hat{\beta}_s$	90% interval
United Kingdom	0.026	(-0.025, 0.076)	-0.251	(-0.632, 0.129)
Netherlands	0.045	(0.037, 0.054)	0.203	(0.010, 0.397)
Sweden	-0.004	(-0.058, 0.050)	-0.015	(-0.408, 0.378)
South Africa	-0.132	(-0.469, 0.204)	0.065	(-0.640, 0.769)
Norway	0.041	(0.030, 0.051)	0.055	(-0.062, 0.172)
New Zealand	-0.233	(-0.342, -0.124)	1.002	(0.976, 1.029)
Canada	0.008	(-0.039, 0.056)	-0.959	(-1.751, -0.168)
France	0.027	(0.021, 0.033)	0.046	(-0.073, 0.165)
Belgium	0.030	(0.021, 0.033)	0.012	(-0.103, 0.127)
Hong Kong	0.010	(0.005, 0.015)	0.234	(0.122, 0.345)
Spain	0.037	(0.029, 0.045)	0.169	(0.011, 0.326)
Switzerland	0.057	(0.039, 0.075)	0.103	(-0.054, 0.260)
Italy	0.045	(0.037, 0.054)	0.203	(0.010, 0.397)
Denmark	0.053	(0.043, 0.063)	0.256	(0.076, 0.434)
Germany	0.045	(0.037, 0.054)	0.203	(0.010, 0.397)
Australia	0.021	(-0.001, 0.043)	0.040	(-0.076, 0.156)
Japan	0.184	(0.052, 0.316)	0.984	(0.913, 1.059)

Table 5 Notes: I adapt the Engel (2016) UIP regression form to estimate the CIP deviations for all 17 countries. 90 percent confidence intervals are based on Newey-West standard errors. Data sources are Thomson One and IMF.

Table 6: Summary statistics by portfolio, quarterly holding one period

		(1)	(2)	(3)	(4)	(5)	(Avg.)
2000M2 - 2008M6	$i^* - i$	-1.12	0.17	1.08	3.52	6.99	2.13
	Excess Returns	-0.81	0.75	1.48	3.61	7.21	2.45
2008M7 - 2017M3	$i^* - i$	-.08	0.40	1.19	3.22	7.84	2.51
	Excess Returns	-0.23	0.20	0.79	2.81	7.13	2.14

Table 6 Notes: Portfolios are constructed using the procedure detailed in Lustig and Verdelhan (2007) and Husted, Rogers, and Sun (2017). Data sources are Thomson One and IMF.