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Insured Uncovered Interest Parity

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The current literature suggests that uncovered interest parity (UIP) does not hold because of differences in risk in holding different currency denominated debt. We test whether this risk is related to sovereign credit risk in government bonds. We consider an insured uncovered interest parity relationship – that is, one where debt is insured with credit default swap (CDS) contracts. CDS rates help explain the UIP puzzle, but have no predictive power for currency movements.

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Insured Uncovered Interest Parity

1. Introduction

Existing evidence finds that the uncovered interest parity (UIP) relationship does not hold (Fama, 1984), and thus forward rates are not unbiased predictors of future spot exchange rates. However, tests of uncovered interest parity assume that the sovereign rates considered are risk-free instruments. We consider whether part of the reason that uncovered interest parity fails is due to the small, but non-zero, risk involved in these bonds.

Typically, failures of UIP are associated with differences in risk among different currencies (see, for instance, Cumby, 1988; Kaminsky and Peruga, 1990). Closely related to the failure of UIP are the excess returns in the carry trade, wherein investors borrow in low yielding currencies and invest in high yielding currencies. Burnside et al. (2010) find that excess returns in the carry trade are related to a peso problem, where infrequent large depreciations or, as they find, large increases in the stochastic discount factor, account for excess returns typically observed in carry trades. Brunnermeier, Nagel, and Pedersen (2009) show that carry trade returns are subject to crash risk. These findings are consistent with their model of liquidity risk, and they show that the VIX equity-option implied volatility index is able to explain part of the foreign exchange returns. The carry trade risk premium has also been explained by foreign exchange volatility (Menkhoff et al., 2012; Sarantis, 2006).

We test the hypothesis that deviations from UIP are associated with sovereign credit risk by examining the excess returns of the carry trade against the US dollar for 18 currencies. Overall, we find that the sovereign credit swap (CDS) rates are able to significantly explain part of the deviations from UIP (beyond that captured by VIX); a higher CDS cost is associated with a greater carry trade excess return. Thus deviations from UIP appear to be partly explained by differences in the risk and creditworthiness of different country's interest bearing instruments. We also examine whether CDS rates are able to improve forecasts of future spot exchange rates. We find that CDS rates provide no forecasting improvement in currencies. Adding CDS rates does not decrease the root mean squared error (RMSE) for most currencies, and the few decreases we find are small (less than 0.2%). Our findings are also related to Zhang, Yau, and Fung (2009), who examine the effect of CDS spreads on four major currencies and find a significant causal effect on only one of them.

2. Motivation

In the most typical formulation of UIP, a difference in interest rates is expected to be offset by changes in exchange rates. Thus,

$$\frac{E(S_t)}{S_0} = \frac{1+r}{1+r*} \tag{1}$$

where S_0 is the current spot rate (units of domestic currency per foreign currency), $E(S_t)$ is the expected spot rate at time t, r is the domestic risk-free rate, and r^* is the foreign risk-free rate. Taking logarithms of both sides of Eq. (1), as shown in Brunnermeier et al. (2009) and many others, the excess return of an investment in the foreign currency financed by borrowing the domestic currency is given by

$$z_t = \Delta s_t - (r - r*) \tag{2}$$

where $\Delta s_t = \log(S_t/S_o)$ is the appreciation of the foreign currency. z_t is a measure of currency returns in excess of that predicted by UIP. More specifically, z_t is the excess return to a carry trade strategy (or carry trade return) with the foreign currency being the investment currency and the US dollar being the funding currency. Like prior research, we consider the US dollar the domestic currency, although carry traders do not necessarily use the US dollar as the funding currency.

If UIP holds, E(z_t) = 0. That is, carry trades exploit the violation of UIP, speculating that high interest rate currencies will appreciate in value relative to low interest rate currencies. If UIP does not hold, z_t will be positive for high-yielding investment currencies and negative for low-yielding funding currencies.

However, if the interest bearing instruments are not perfectly risk-free, differences in interest rates may reflect differences in expected payoffs due to default risk, not just due to differences in exchange rate consumption risk or other risk factors. Thus, we wish to consider UIP after insuring the interest bearing instruments. Let *p* and p^* be the cost of the CDS premium (see, e.g., Chen et al., 2008). An insured version of UIP is

$$\frac{E(S_t)}{S_0} = \frac{1+r-p}{1+r*-p*} \tag{3}$$

Substituting Eq. (2) into the logarithmic form of Eq. (3),

$$z_t = p* - p \tag{4}$$

Eq. (4) indicates that carry trade returns can be explained by the CDS premium differential. We test (4) empirically to see whether excess returns can be explained by CDS premiums. We also investigate whether the CDS premium can forecast future currency rates.

3. Data

We collect daily carry trade data from the following 18 countries: Japan, Australia, New Zealand, UK, Sweden, Norway, Portugal, Italy, Greece, Spain, Germany, Ireland, France, Iceland, Mexico, Brazil, Argentina, and Russia. As noted by Gyntelberg and Remolona (2007), carry trades have been so popular that Bloomberg makes daily returns for them available through the FXFB command.

We obtain the CDS data from Bloomberg and DataStream, and the VIX index of market volatility and carry trade excess returns from Bloomberg. Spot and forward exchange rates are collected from WM/Reuters and DataStream. Our sample period is from 12/07/2009 through 04/10/2012 as CDS data are not actively traded in earlier years. We end the analysis for Greece on 02/23/2011 because the Greek CDS price does not vary in our data after that day.

We do not include Switzerland because the Swiss CDS data are inactive, and Canadian data are not available through Bloomberg or DataStream. We use the euro for the eurozone countries of France, Germany, Greece, Italy, Ireland, Portugal, and Spain.

4. Results

The excess returns z_t in Eq. (2) are calculated using three-month eurodeposit rates and all data are collected at the New York closing. As shown by Gyntelberg and Remolona (2007), Brunnermeier et al. (2008), and others, the average excess returns are positive for investment currencies with high interest rates (such as the Australian dollar) and negative for funding currencies with low interest rates (such as the Japanese yen). We use the following regression to investigate the impact of changes in VIX and CDS on each currency's excess returns (i.e., on the carry trade return, z_t).

$$z_t = \alpha + \beta \text{VIX}_t + \gamma \text{CDS}_t \tag{5}$$

where VIX and CDS are the log returns.

We include VIX in Eq. (5) because Brunnermeier et al. (2008) show that when global risk or risk aversion (as measured by the VIX index) increases, speculators reduce and unwind their carry positions, resulting in carry trade losses. Pan and Singleton (2008) also report that the VIX index is directly related to the variation in risk premiums in sovereign CDS. Both the VIX index and CDS rate are proxies for global risk. Therefore, the coefficients for VIX and CDS, β and γ, respectively, in Eq. (5) should have the same sign; negative for investment currencies (e.g., Australian dollar) and positive for funding currencies (e.g., Japanese yen).

Eq. (5) is estimated using OLS with a Newey–West heteroskedasticity and autocorrelation consistent covariance matrix. We report the results using both daily and weekly returns in Table 1. Our results for the daily returns show that the coefficient on CDS is significant at the 1% level for 13 out of the 18 countries, significant at the 5% level for two countries (Japan and Portugal), significant at the 10% level for Greece, and not significant for two countries (Argentina and New Zealand). We also note that the signs of the coefficients on CDS and VIX are the same in all cases. In particular, the signs for both coefficients are negative for funding currencies such as the Japanese yen and positive for investment currencies such as the Australian dollar. The weekly currency return results are similar, although the CDS coefficient results for New Zealand are significant at the 5% level, whereas the coefficients for Portugal, Greece, and Ireland are no longer significant.

To test whether adding the CDS rates helps forecast the spot currency rate three months later, S_T, we consider the following equations:

$$\Delta s_T = a + b\,\Delta f_t \tag{6}$$

$$\Delta s_T = a + b\,\Delta f_t + c\,VIX_t + d\,CDS_t \tag{7}$$

$$\Delta s_T = a + b\,\Delta f_t + c\,VIX_t \tag{8}$$

$$\Delta s_T = a + b\,\Delta f_t + d\,CDS_t \tag{9}$$

where Δs_T is the spot return and Δf_t is the forward return. Equation (6) is the original forecasting model; (7), (8) and (9) are augmented models with either VIX or CDS or both added. These equations are estimated with a one-step ahead rolling forecast method.

The improvement in forecasting power from (6) to (7) is measured by the percentage changes in the root mean square error, RMSE, a common measure for forecast accuracy (see, e.g., Chan, Tse, and Williams, 2011).

$$[RMSE_{(7)} - RMSE_{(6)}]/\, RMSE_{(6)} \tag{10}$$

If this number is negative, there is an improvement in forecasting power with the additional explanatory variables. Table 2 reports the percent changes in RMSE including CDS and/or VIX returns. The estimated percentage changes in RMSE are mostly positive, implying no forecasting improvement. The four cases with negative changes in RMSE have a magnitude less than 0.2%, indicating that neither the CDS rates nor the VIX index provides economically meaningful forecasting improvement. In unreported regressions, we also find that using CDS levels does not improve forecasting power.

5. Conclusions

We test the hypothesis that deviations from uncovered interest parity (UIP) are associated with sovereign credit risk. We examine daily excess returns of the carry trade against the US dollar for 18 currencies for the period of 12/07/2009 through 04/10/2012. The overall results show that sovereign CDS rates (incremental to the VIX index) are significantly related to the carry trade returns. Although CDS rates help explain currency movements and resolve the UIP puzzle, CDS rates cannot improve forecasts of future exchange rates.

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Table 1. Carry trade return determination

$z_t = \alpha + \beta VIX_t + \gamma CDS_t$

Country		Daily return, z_t	Weekly return, z_t
Japan (Yen)	constant	0.00020	0.00072
	VIX	0.011	0.013
	CDS	0.021**	0.011
Australia (Dollar)	constant	0.00027	0.0012
	VIX	-0.075***	-0.051***
	CDS	-0.031***	-0.096***
New Zealand (Dollar)	constant	0.00021	0.00074
	VIX	-0.071***	-0.056***
	CDS	-0.012	-0.055**
Great Britain (Pound)	constant	-9.03e-5	-3.12e-6
	VIX	-0.027***	-0.0074
	CDS	-0.028***	-0.058***
Sweden (Krona)	constant	-6.44e-5	8.30e-6
	VIX	-0.064***	-0.048***
	CDS	-0.042***	-0.048**
Norway (Krone)	constant	-7.87e-5	-0.00025
	VIX	-0.064***	-0.056***
	CDS	-0.026***	-0.040***
Portugal (Euro)	constant	-0.00015	-0.00063
	VIX	-0.042***	-0.032***
	CDS	-0.021**	-0.0098
Italy (Euro)	constant	-0.00014	-0.00023
	VIX	-0.036***	-0.014
	CDS	-0.042***	-0.049***
Greece (Euro)	constant	-0.00013	0.00019
	VIX	-0.045***	-0.026**
	CDS	-0.0098*	-0.012
Spain (Euro)	constant	-0.00016	-0.00014
	VIX	-0.039***	-0.019*
	CDS	-0.033***	-0.045***
Germany (Euro)	constant	-0.00015	-0.00037
	VIX	-0.038***	-0.020*
	CDS	-0.047***	-0.053***
Ireland (Euro)	constant	-0.00018	-0.00066
	VIX	-0.041***	-0.032***
	CDS	-0.030***	-0.016
France (Euro)	constant	-0.00013	-0.00014
	VIX	-0.039***	-0.022*
	CDS	-0.038***	-0.047***
Iceland (Krona)	constant	9.96e-05	0.00058
	VIX	-0.036***	-0.020*
	CDS	-0.042***	-0.074***
Mexico (Peso)	constant	-3.29e-5	-0.00019
	VIX	-0.048***	-0.031***
	CDS	-0.091***	-0.10***
Brazil (Real)	constant	0.00013	0.00063
	VIX	-0.040***	-0.016
	CDS	-0.11***	-0.15***
Argentina (Peso)	constant	0.00025***	0.0010***
	VIX	-0.0020**	-0.0080
	CDS	-1.03e-5	-0.0022
Russia (Ruble)	constant	0.00015	0.00093
	VIX	-0.013***	-0.0097
	CDS	-0.10***	-0.098***

*10% significance **5% significance ***1% significance

Table 2. Forecasting of spot currency rates with CDS returns

$$\Delta s_T = a + b\,\Delta f_t \qquad (6)$$
$$\Delta s_T = a + b\,\Delta f_t + c\,\text{VIX}_t + d\,\text{CDS}_t \qquad (7)$$
$$\Delta s_T = a + b\,\Delta f_t + c\,\text{VIX}_t \qquad (8)$$
$$\Delta s_T = a + b\,\Delta f_t + d\,\text{CDS}_t \qquad (9)$$

Country	$\frac{RMSE_{(7)} - RMSE_{(6)}}{RMSE_{(6)}}$	$\frac{RMSE_{(8)} - RMSE_{(6)}}{RMSE_{(6)}}$	$\frac{RMSE_{(9)} - RMSE_{(6)}}{RMSE_{(6)}}$
Japan	0.28%	0.37%	-0.17%
Australia	0.53%	0.37%	0.16%
New Zealand	0.57%	0.33%	0.23%
Great Britain	0.74%	0.50%	0.22%
Sweden	0.19%	0.32%	-0.14%
Norway	0.82%	0.43%	0.37%
Portugal	0.61%	0.45%	0.37%
Italy	0.06%	0.45%	-0.15%
Greece	0.75%	0.29%	0.46%
Spain	0.21%	0.45%	-0.06%
Germany	1.24%	0.45%	0.96%
Ireland	0.66%	0.45%	0.29%
France	0.97%	0.45%	0.68%
Iceland	0.91%	0.40%	0.50%
Mexico	0.37%	0.28%	0.28%
Brazil	0.52%	0.27%	0.08%
Argentina	0.14%	0.01%	0.22%
Russia	0.85%	0.19%	0.49%