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Predictability of currency carry trades and asset pricing implications ☆

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ABSTRACT

This paper studies the time series predictability of currency carry trades, constructed by selecting currencies to be bought or sold against the US dollar, based on forward discounts. Changes in a commodity index, currency volatility and, to a lesser extent, a measure of liquidity predict in-sample the payoffs of dynamically re-balanced carry trades, as evidenced by individual and joint *p*-values in monthly predictive regressions at horizons up to six months. Predictability is further supported through out-of-sample metrics, and a predictability-based decision rule produces sizable improvements in the Sharpe ratios and skewness profile of carry trade payoffs. Our evidence also indicates that predictability can be traced to the long legs of the carry trades and their currency components. We test the theoretical restrictions that an asset pricing model, with average currency returns and the mimicking portfolio for the innovations in currency volatility as risk factors, imposes on the coefficients in predictive regressions.

1. Introduction

Currency carry trade strategies involve borrowing in countries with low interest rates and investing in the currencies of countries that offer high interest rates. Such trading strategies have been pursued by practitioners, and their existence could be traced to exploitable disparities in global macroeconomic conditions.

> The economic malaise of the EU and Japan has central bankers and bondholders worried. But it has currency speculators and arbitragers licking their lips at the prospect of riding the euro and yen on their downward slide, while at the same time making fat profits on

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> high-yield investments and rising currencies in emerging markets…. This sophisticated bit of financial wizardry is known as a carry trade, and it's a popular way to offset moves in equity and bond markets while also producing a handsome return. (*Time*, January 26, 2011)

Even if potentially lucrative, carry trades also present substantial downside risks, as witnessed, for example, by the strong appreciation of the yen in the wake of the Japanese earthquake in March 2011.

While advances have been made in understanding the role of peso effects in carry trade payoffs (e.g., Burnside, Eichenbaum, Kleshchelski, and Rebelo, 2011), and in identifying risk factors that determine average currency returns (e.g., Lustig, Roussanov, and Verdelhan, 2011; Ang and Chen, 2010; Menkhoff, Sarno, Schmeling, and Schrimpf, 2012), questions that still warrant reconciliation are: Do carry trade payoffs exhibit time series predictability? Is such predictability statistically and economically significant? If so, can one link the identified predictors to some asset pricing model? Our innovation is the focus on time series predictability, as opposed to the cross section of currency portfolio returns, and we adopt as criteria the parameter significance in predictive regressions, out-of-sample predictability, and increase in Sharpe ratios and skewness of carry trade payoffs, achieved by exploiting a predictability-based decision rule.

We build time series of monthly carry trade payoffs, using spot and forward exchange rates of G-10 currencies and accounting for bid–ask spreads, and examine the profitability of carry trade strategies from two perspectives. First, we consider carry trades with fixed currency pairs, which borrow in a currency with traditionally low interest rate (e.g., Japanese yen), and then invest in a currency with high interest rate (e.g., New Zealand dollar) and, hence, are not necessarily anchored to funding in US dollars. Second, we follow the construction of investable carry trade indexes and dynamically rank-order currencies according to their interest rate differentials, as embedded in the forward discount, whereby the lowest- (highest-) yielding currencies are selected to be sold (bought).

Our approach elicits several findings about the payoffs of carry trade strategies. First, only the dynamically rebalanced carry trade strategies show evidence of profitability. In contrast to the fixed-pair strategies, with annualized Sharpe ratios not exceeding 0.10, certain dynamic carry trade strategies can generate Sharpe ratios as high as 0.50 in our sample and exhibit statistically significant average payoffs.

Next, we show that monthly payoffs of dynamic carry trades can be predicted in-sample, using as predictors changes in a commodity price index, changes in average currency volatility, and a variable that captures global liquidity. We establish both marginal and joint predictive power, and we show robustness using p-values obtained with the covariance estimators of Newey and West (1987) and Hodrick (1992), and via parametric bootstrap (e.g., Mark, 1995; Kilian, 1999; Amihud, Hurvich, and Wang, 2009). The coefficients in the predictive regressions are positive for commodity returns and negative for currency volatility. Moreover, decreasing liquidity is associated with lower future carry trade payoffs. A notable feature of our predictors is that they are not highly correlated among each other, which highlights the differences in their economic nature.

Our interest in a commodity-based predictor is motivated by the analysis in Chen and Rogoff (2003) and Chen, Rogoff, and Rossi (2010) and also by anecdotal evidence that commodity investing often coincides with an appetite for risk-taking. In considering average currency volatility as a predictor, we are guided by the perception, as in Bhansali (2008), that the profitability of carry trades appears to decline in volatile currency markets. In turn, the potential relevance of global liquidity is implied, among others, by the studies of Brunnermeier and Pedersen (2009) and Asness, Moskowitz, and Pedersen (2009).

The predictive ability is preserved in out-of-sample tests, as evidenced by the consistently positive values of the out-of-sample R^2 statistic of Campbell and Thompson (2008) and the low p-values associated with the MSPE-adjusted statistic of Clark and West (2007). In addition, combination forecasts, as in Stock and Watson (2004), yield p-values below 0.05 for the MSPE-adjusted statistic, strengthening the evidence for predictability. Furthermore, conditional carry trade strategies that exploit trading signals, generated using our predictors, enhance Sharpe ratios and mitigate negative skewness, relative to the unconditional carry trades. Complementing these results, the non-parametric market timing test of Henriksson and Merton (1981) indicates statistically significant timing ability based on our predictors.

Moreover, we investigate the robustness of our results using other predictors, in particular, the term structure variables found to be important in the context of Ang and Chen (2010), as well as the change in VIX, as in Brunnermeier, Nagel, and Pedersen (2009). The presence of these additional variables does not appear to diminish the predictive ability of our predictors.

We also find that focusing on distinct components of carry trade payoffs is informative about the nature of carry trades. In particular, we find that carry trade payoffs inherit their predictability from the long, and not the short, legs of the trades, but it is also seen that combining the short and long legs strengthens the evidence for predictability. Further, we observe that it is the currency component of payoffs that is captured by our predictors. We verify that these features appear to be specific to carry trade payoffs and do not pass on to the payoffs of the fixed currency pairs in our sample.

Building on the evidence, we perform GMM tests that suggest that the forecasting ability of our predictors is not inconsistent with a latent-variable model, as developed by Hansen and Hodrick (1983). We further examine whether the predictability of carry trade payoffs can be reconciled with an explicit asset pricing model and observable risk factors. Here we follow the approach developed in Kirby (1998) and assess the restrictions imposed by a stochastic discount factor model on the coefficients, obtained in predictive regressions. As prescribed in this approach,