Evaluating the Carry Trade as a Trading and Investment Strategy

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Introduction

Low-yield currencies consistently produce low returns and high yield currencies consistently produce high returns for US investors. This is true for a wide range of currencies in both developed and emerging markets, and it holds true over long periods of time.¹ As a result, the carry trade in currency markets, borrowing in low-yield currencies to go long in high-yield currencies, has been a profitable investment strategy over the last three and a half decades. In fact, a levered position in currency markets has consistently outperformed the US stock market. However, carry trade investors load up on systematic risk. Cross-country differences in interest rates convey information about differences in the risk characteristics of these currencies, much in the same way that differences in book-to-market ratios convey information about stocks.

Returns on the Carry Trade

We use \( s_t \) to denote the exchange rate in units of foreign currency per dollar². The monthly excess return in dollars on a long position in foreign currency \( (r_{x_{t+1}}) \) is the one-month forward discount \( (f_{t+1} - s_t) \) less the rate of depreciation \( \Delta s_{t+1} \) of the foreign currency (also in logs):

\[
rx_{t+1} = (f_{t+1} - s_t) - \Delta s_{t+1} \tag{0.1}
\]

¹ There is one exception: currencies with very high yields in countries that experience high rates of inflation

² The following variables are denoted in logs: \( s_t, f_{t+1}, \Delta s_{t+1}, r' \), and \( r \).
The forward discount is simply the spread between the foreign and domestic spot interest rate: $f_{t,t+1} = r^*_{t} - r_t$. Hence, a US investor who is long in foreign currency and short in dollars simply earns the interest rate spread minus the rate of depreciation.

It is common practice to sort stocks into portfolios based on characteristics like size and book-to-market as these portfolios deliver a sharper picture of the risk-return trade-off in stock markets. We apply the same approach in currency markets. We evaluate the historical performance of a carry-trade investment strategy in currency markets. To do so, we construct a sample of 22 developed country currencies between 1971 and 2005.

At the start of each month, we sort these foreign currencies into six portfolios based on the forward discount or the interest rate difference with the US. The first portfolio has the lowest interest rate currencies. Current examples include the Japanese Yen and Swiss Franc. The last portfolio has the highest interest rate currencies, such as the Australian and New Zealand dollar. This sorting averages out currency-specific variation in foreign currency returns, and it allows us to focus on the variation in average returns across different currencies that is driven by the interest rate gap, not by other factors.

Low interest rate currencies -----------------------------→ High interest rate currencies

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3 For now, we abstract from sovereign default risk, but we will check our results on a shorter sample of returns computed from forward rates that are not subject to this deficiency.
We compute the monthly returns for each portfolio by taking an equally weighted average of the log returns for all of the currencies in each portfolio, and we use 3-month T-Bill rates for all these currencies to compute the forward discount. The first panel in Table 1 reports the average excess returns that a US investor would have earned between 1971 and 2005 by taking long positions in these foreign currency portfolios. The average return on the first portfolio is -1%, while the average excess return on the last portfolio is 3.29%. The average excess returns increase almost monotonically from portfolio 1 to portfolio 6. The annualized return on a carry-trade strategy that goes long in the last portfolio and short in the first portfolio is 4.35%, and the standard deviation of the return on this currency high-minus-low (HML) strategy is only 6.77%, because the long-short strategy eliminates dollar risk.

To create a good benchmark, we lever up the currency HML strategy to match the volatility of the returns on the S&P 500 over the same sample (15.4%). A US investor who invested $1 in the levered currency HML strategy in 1971 would have ended up...
with $135 in 2005, but only $40 in the stock market. Over this sample, the carry trade consistently outperforms the market.

![Currency HML Cumulative Returns Graph](image)

**Figure 1: Cumulative Returns on the levered currency HML strategy and the S&P 500.**

**Interest rates, Inflation and Risk**

Why do high interest rate currencies earn higher returns for US investors? On average, the low interest rate currencies do not appreciate enough to offset the lower interest rate, while high interest rate currencies do not depreciate enough to offset the higher interest rates. The second panel in Table 1 reports average portfolio-by-portfolio forward discounts, while the third panel reports rates of depreciation. The log excess return is the difference between the log forward discount and the rate of depreciation of the foreign currency. The currencies in the first portfolio appreciate by 1.29%, while the interest rate gap is larger: -2.35% on average. On the other hand, the highest interest rate currencies depreciate by less than 14%, while the average interest rate gap is 17.3%

**It’s a risk premium!**

Why then, are low interest rate currencies less risky than high interest rate currencies? It turns out that currencies behave very differently in bad times when (i) the volatility in
currency markets rises, (ii) when the volatility in stock markets rises and (iii) when the US economy takes a turn for the worse. In all three cases, the returns on the currency HML strategy tend to be low. The beta of the unlevered HML return with respect to the volatility of currency markets (measured as the realized average standard deviation of monthly changes in the log spot rates over the last 12 months) is 1.95. This means that a 100 basis points increase in the monthly standard deviation lowers the annualized return by 195 basis points on average. The first portfolio’s return increases on average by 50 basis points, while the last portfolio’s return declines on average by 145 basis points. In addition, during these episodes of high volatility, the HML return becomes highly correlated with the US stock market return.

![Rolling correlations of daily exchange rate changes with return on S&P 500](image)

**Figure 2: One-Month Rolling Correlation of Daily Exchange Rate changes with S&P 500 Returns**

To illustrate this point, we take a closer look at the last 12 months in currency markets. In February and in July of 2007, US stock markets were subject to large and sudden increases in volatility because of developments in US mortgage markets.

Figure 2 plots the one-month correlation of daily changes in the exchange rate for two low interest rate currencies, the Japanese Yen and the Swiss franc, and two high interest rate currencies, the NZD and the AUSD, with the returns on the S&P 500. None of these currencies were highly correlated with stock market returns until
February 2007, the start of the sub-prime crisis. The sharp increase in the VIX index coincided with a sharp decrease in the correlation for the low interest rate currencies and a sharp increase in the correlation for the high interest rate currencies. The same scenario unfolds at the start of the summer in 2007. Figure 3 shows exactly how much market risk carry trade investors have exposed themselves to. It plots the VIX index against the market beta of a levered currency HML strategy in these four currencies (long in AUD and NZD, short in Yen and Swiss Franc). The leverage is 2.2. In the first instance, the market beta of levered HML dramatically increases from 0 to 2.25 in a matter of days. At the start of the summer, the increase is from .5 to 2.

Conclusion

A carry trade investment strategy with the same volatility as the US stock market consistently outperforms a buy-and-hold in the US stock market over the last three and a half decades. However, a currency’s interest rate conveys information about its riskiness, just like a book-to-market ratio does for stocks. This becomes most apparent in bad times for US investors.

Figure 3: Rolling market beta of currency HML with the VIX index