International Business Research; Vol. 9, No. 9; 2016
ISSN 1913-9004 E-ISSN 1913-9012
Published by Canadian Center of Science and Education

The Currency Carry Trade: Selection Skill or Behavioral Bias

Ian Hudson

Correspondence: Ian Hudson, College of Professional Studies, Northeastern University, Boston, Massachusetts 02115, USA. E-mail: i.hudson@neu.edu

Received: June 28, 2016 Accepted: July 12, 2016 Online Published: August 29, 2016

doi:10.5539/ibr.v9n9p176 URL: http://dx.doi.org/10.5539/ibr.v9n9p176

Abstract

Many attempts have been undertaken to solve the forward premium puzzle with little to no success. The global currency market is considered the most information efficient and transparent of all financial markets since it demonstrates a balance between over and under-reaction to information with remarkable consistency. The Efficient Market Hypothesis espouses investors cannot systematically outperform a benchmark since all investors have access to the same information. Therefore, the expected long-term rate of return for currencies is essentially zero. The Arbitrage Pricing Theory asserts investment returns are random. As such, traders cannot avail themselves of mispriced currencies. The assertion of Uncovered Interest Rate Parity is that bi-national interest rate variance is equal to the expected differential in exchange rates. This paper asks the following questions: does alpha persistence exist in currency carry trade funds or are its excess returns merely a collection of behavioral biases?

Keywords: carry trade, alpha, forward rate bias, behavioral bias, arbitrage pricing theory, uncovered interest rate parity, efficient market hypothesis, forward premium puzzle, behavioral finance

JEL Classification: G150

1. Introduction

For investors, risk is unequivocally linked to the behavioral trait of loss aversion; that is, investors are more conscious of losses than gains (Berkelaar, Kouwenberg, & Post, 2004). It is also associated with downside risk; that is, the loss of any portion of the initial investment (Ang, 2006). Despite extreme price volatility and a noisy trading environment, proponents of the currency carry trade believe the high level of risk is justified by its return. Fund managers seek to minimize downside risk and earn returns which are the result of either beta or alpha. Beta is merely the return granted from exposure to the market (Kung & Pohlman, 2004). Alpha is selection skill—the result of successful exploitation of market inefficiencies and behavioral biases. Currency carry fund managers actively trade long and short futures and forward contracts on various currencies to capitalise on currency price and interest rate volatility (Hudson, 2008). Therefore, the following must be considered: Do currency carry trade funds manifest evidence of alpha or as Holmes (2009) posits, are these funds merely a collection of risky biases with associated downside risk?

This overview contributes to the existing literature as it places the evidence in context and provides a survey of current literature and discussion of important theories. Additionally, it conducts, presents and reviews the results of an investigative study of two currency carry trade funds, the PowerShares G-10 Currency Harvest Fund Exchange Traded Fund and the iPath Optimized Currency Carry Exchange Traded Note, in an attempt to determine the existence of performance persistence present in either fund.

The remainder of this paper is structured as follows: Section Two surveys the relevant literature; Section Three describes the data and provides descriptive statistics; Section Four presents a comparative analysis of the empirical results; and Section Five offers a summary and concluding remarks.

2. Literature Survey

The currency market is the largest and most liquid financial market in the world (Harvey & Huang, 1991; Lequeux & Acar, 1998) with average daily turnover of USD 5.3 trillion. No other financial market better meets Fama's (1970, 1998) isomorphic requirements of market efficiency: at any given time, prices reflect information available to all market participants with no natural short-selling constraints. Currency trading is the quintessential example of a zero-sum game; for every long position, there is a short one. Yet if true, how can traders earn systematic profits?

Copeland (2014) describes the currency carry trade as the ability to lend in a high interest rate currency such as the New Zealand Dollar (NZD) financed by borrowing in a low interest rate currency such as the Japanese Yen (JPY) at rates approaching zero; that is, borrow low, lend high. 'Carry' is a result of a positive interest rate differential between the two currencies; that is, the decline in the value of the low yield currency relative to the high yield currency. Currency traders are not rational investors but instead rational economic actors (Hardie & MacKenzie, 2007) desiring wealth but not the work necessary to attain it. They are essentially arbitrageurs seeking riskless profits at no cost. Their actions result in a forced endurance of very high downside risk and interest rate fluctuations, both of which threaten profits and significantly increase the chance of forced position unwinding.

Lustig, Roussanov, and Verdelhan (2011) insist investors are not exposed to any country or currency-specific risk as a result of carry trades. Instead, the investor bears foreign exchange risk, not sovereign risk (Daniel, et al., 2014). The risk/return profile of currency trading is determined by the prime interest rate listed by various central banks, the result of which is forward rate bias. In November 2014, the Bank of Japan announced a significant increase in its aggressive quantitative easing program with the aim of maintaining near-term interest rates at zero percent. Coupled with the current monetary policies of the Reserve Bank of New Zealand, the NZD/JPY currency pair exists as a synthetic, risk-free asset. Profit occurs when the New Zealand Dollar rises against the Japanese Yen. Trade in the NZD/JPY pair is now consistent with Siegel's Paradox (1972) as risk management is no longer the prime motivator.

Pojarliev and Levich (2008) define alpha in the context of currency trading as returns in excess of "transparent and readily implemented currency trading strategies". Alpha measures selection risk assumed by a currency carry trade fund manager—it measures risk-adjusted performance. Risk factoring is due to the specific currency pair traded, rather than the overall market. Positive alpha is the additional return awarded for the assumption of additional risk rather than accepting market returns. Currencies are considered to be a zero beta asset (Burnside, et al., 2007) with erratic returns minimally correlated with stocks and bonds. Unlike debt and equity securities where profits depend solely on price appreciation, opportunities for excess returns in currency trading exist in both rising and falling markets (Liang, 2004).

The Efficient Market Hypothesis (EMH) postulates, absent inside information, alpha generation is impossible (Fama, 1970). In essence, forward rate bias is a clear rejection of the EMH. The very existence of successful currency carry trades is a violation of Ross's (1976a, 1976b) Arbitrage Pricing Theory (APT) which is based on the law of one price and contends that no security exists which has a zero price and a non-negative payoff. According to the implication of no-arbitrage, profitable trades on the NZD/JPY currency pair are a monetary illusion; the carry premiums should disappear. Yet arbitrage opportunities do exist and are exploited by irrational traders leading to what is termed by DeLong, et al. (1990) as noise trader risk; that is, the risk that arbitrage opportunities exploited by irrational traders disappear leading to large losses.

In keeping with interest rate parity, significant abnormal returns do not occur from lending or borrowing a currency at a foreign or domestic interest rate (Egbers, 2013). Therefore, a rational investor would be indifferent to the inevitable convergence of available interest rates. Should the foreign interest rate be higher than the domestic interest rate, the interest rate differential is compensated by a lower forward exchange rate. The mathematical calculation of Covered Interest Parity is as follows:

$$\left(1 + ir_{i,t}\right) = \frac{F_{ij,t}}{S_{ij,t}}\ (1 + ir_{j,t}) \tag{1}$$

Where

$ir_{i,t}$ = interest rate of the domestic currency

$ir_{j,t}$ = interest rate of the foreign currency

$S_{ij,t}$ = spot interest rate

$F_{ij,t}$ = forward exchange rate at time t

If uncovered interest rate parity holds, the arbitrage opportunity in the NZD/JPY trading pair would be eliminated since the New Zealand Dollar return on NZD deposits will equal the NZD return on Japanese Yen. Uncovered Interest Rate Parity (UIP) is represented mathematically as follows:

$$1 + i_t = \frac{S_{t+1}}{S_t}\ (1 + i^*) \tag{2}$$

Where

i = JPY interest rate

i^* = NZD interest rate

S = NZD interest rate vs. JPY

There is general agreement amongst academic finance researchers that uncovered interest rate parity does not hold (Alexius, 2001; Anker, 1999; Chinn, & Meredith, 2004; Chortareas & Driver, 2001; Frachot, 1996). The failure of Uncovered Interest Rate Parity is one of the primary inducements for the currency carry trade and has come to be known as the forward premium puzzle: the notion that currencies of high interest rate countries' appreciate relative to currencies of low interest rate countries (Jylha & Suominen, 2009). Furthermore, academic finance research has shown UIP tends to fail at time horizons less than five years (Gyntelberg & Remolona, 2007).

Leading economic models fail to explain the forward premium puzzle (Bansal, 1997). In practice, currency markets contain pockets of inefficiency, arbitrage opportunities exist (Sarno & Taylor, 2002), and uncovered interest parity does not hold. Therefore, an important question is whether or not alpha persistence exists in the currency carry trade.

3. Data

A backtest was performed using time series data collected from 2 October 2006 to 28 November 2014—the greatest time period in which data were readily available. The study appropriated daily time series returns for the following: Australian Dollar (AUD), British Pound Sterling (GBP), Canadian Dollar (CAD), New Zealand Dollar (NZD), and United States Dollar (USD) relative to the Japanese Yen (JPY). The interest rate of each currency was the 3-month London Interbank Offered Rate (LIBOR) from the British Bankers Association. Returns for these currencies were retrieved from Oanda.

The alternative investment industry often argues performance should not be compared to an absolute return target (Anson, 2001). Nonetheless, for valuation purposes it is reasonable to compare the returns of currency carry trade funds versus a performance index. The currency carry trade index reviewed here (AFX Currency Management Index) represents the average performance of active, trend-following currency managers. The index replicates the trading actions of an active manager and provides a more realistic benchmark for active currency traders. (Laws, n.d.). The AFX Currency Management Index uses moving averages of 32, 61, and 117 days. It serves as proxy for a currency carry trade benchmark.

The Deutsche Bank DB G10 Currency Future Harvest Index – Excess Return (ticker symbol: DBCFHX) employs a strategy which is long three currency futures contracts with the highest interest rates and short three currency futures contracts with the lowest interest rates. The currencies considered are: British Pound Sterling (GBP), New Zealand Dollar (NZD), Canadian Dollar (CAD), Australian Dollar (AUD), United States Dollar (USD), Japanese Yen (JPY), the Euro (EUR), Norwegian Krone (NOK), Swedish Krona (SEK), and Swiss Franc (CHF). The PowerShares G10 Currency Harvest Fund Exchange Traded Fund (ticker symbol: DBV) directly tracks DBCFHX and serves as proxy for the first carry factor. Nominal results were collected from Macroaxis.

The iPath Optimized Currency Carry Exchange Traded Note (ticker symbol: ICI) directly tracks the Barclays Optimized Currency Carry Index and serves as a second proxy for the currency carry factor. Nominal results were collected from Macroaxis.

3.1 Empirical Strategy

The time series data were analysed using the following statistical tests:

- Skewness
- Kurtosis
- Tracking Error
- Sharpe Ratio
- Sortino Ratio
- Jensen's Alpha
- Information Ratio

3.1.1 Skewness

A test for skewness was performed to determine return distribution characteristics. Skewness is a measure of the degree of asymmetry of a distribution around the mean. A normal (that is, Gaussian) distribution is symmetric with a skewness value of zero.

3.1.2 Kurtosis

A test for kurtosis was performed to determine the normality of the data. Kurtosis measures the concentration of data at the tails of the distribution. It compares the relative flatness or peakedness of a particular distribution with that of a normal distribution. Positive kurtosis is characterized by a peaked, or leptokurtic distribution; negative kurtosis indicates a relatively flat distribution. Distributions with high levels of kurtosis are known as fat-tailed and are non-Gaussian (Fung & Hsieh, 1997).

3.1.3 Tracking Error

As defined by Tobe (1999), tracking error is used in evaluating active manager risk. It is most commonly calculated using the standard deviation of the difference between index and portfolio returns—i.e. the standard deviation of excess returns. Low tracking error suggests the fund manager is closely following the index. One could surmise high tracking error is not an indicator of a fund manager's ability to consistently generate a positive alpha. Instead, it is indicative of his attempts to maximize alpha. The reverse is true of a passively managed portfolio; high tracking error is neither desired nor acceptable. Tracking Error is represented mathematically as follows:

$$TE = \sqrt{\frac{\Sigma(R_d - \overline{R_d})^2}{n-1}} \tag{3}$$

Where

$\Sigma =$ the sum of

$R_d =$ Return Difference

$\overline{R_d} =$ Mean of Return Difference

$n =$ Number of Periods

Tobe's formula can be further simplified as follows:

$$TE = \sqrt{var\ (R_i - R_b)} \tag{4}$$

3.1.4 Sharpe Ratio

Sharpe (1994) considers mean and variance statistics appropriate for a Gaussian distribution. The Sharpe Ratio is a univariate measure commonly applied to analyse returns in conjunction with the risks taken to achieve those returns; it quantifies excess return per unit of risk and is represented mathematically as follows:

$$\frac{R_p - R_{rf}}{\sigma_p} \tag{5}$$

Where

R_p = Expected portfolio (asset) return

R_{rf} = Risk free rate of return

σ_p = Portfolio (or asset) standard deviation

3.1.5 Sortino Ratio

Standard deviation is the most common measure of risk. It measures the variability of returns from the average return—that is, the volatility of the return stream. The assumption is that the higher the volatility, the higher the risk. Its usefulness as a comparative measure of risk is predicated on the assumption the investments being compared share similar return distributions. It assumes a Gaussian distribution, interpreting any difference from the mean, above or below, as risk. As a result, upside volatility, which is used to accomplish investment objectives, is penalized because it is equated with value-destroying downside volatility.

Sharpe's measure is widely seen as an oversimplification of risk. Unlike the Sharpe Ratio which utilizes standard deviation, the Sortino Ratio quantifies the risk-adjusted return of a portfolio through the use of downside risk. Downside risk is considered to be the standard deviation of the returns below a minimum acceptable return. When return distributions are near symmetrical and the target return is close to the distribution median, the two measures will yield similar results. However, as skewness increases and target returns vary from the median, the results are very different. The mathematical representation of the Sortino Ratio is as follows:

$$\frac{R_p - R_t}{\sigma_{np}} \tag{6}$$

Where

R_p = Expected portfolio (asset) return

R_t = Required rate of return

σ_{np}= Downside Deviation (that is, square root of the semi-variance)

Jensen's Alpha

According to Michael Jensen (1968), portfolio managers who accurately predict major changes in the market or identify undervalued assets earn higher returns. Jensen's alpha quantifies the extent to which an investment contributes a value-added relative to a benchmark. The positive α implies a manager has the ability to earn excess returns as opposed to purely to random selection (Jensen, 1969). Jensen's measure is calculated as:

$$\tilde{R}_{jt} - R_{Ft} = \beta_j[\tilde{R}_{Mt} - R_{Ft}] + \tilde{e}_{jt} \quad (7)$$

Where

R_{Ft} = risk free rate in a corresponding period t

$\tilde{R}_{Mt}$ = market return in period t

$\tilde{R}_{jt}$= portfolio return in the period t

3.1.6 Information Ratio

A large, positive information ratio is evidence that a fund manager consistently achieves excess returns. The information ratio is essentially a measure of risk-adjusted alpha. The Information Ratio establishes whether or not a reported positive alpha is statistically significant from zero or merely a random occurrence. It offers a summary of the mean-variance qualities of a portfolio (Markowitz, 1952; 1959). Gupta, Prajogi, and Stubbs (1999) consider it the strongest predictor of performance persistence. The mathematical representation of the Information Ratio is as follows:

$$\frac{R_P - R_B}{\sigma_A} \quad (8)$$

Where:

R_P = Portfolio Return

R_B = Benchmark Return

$\sigma_A =$ Standard Deviation of excess returns (i.e. tracking error)

4. Empirical Results and Analysis

A nominal listing of all empirical results is located in Tables 1 and 2. The risk-adjusted return for the DB G10 Currency Future Harvest Index was 0.05% compared to the PowerShares G10 Currency Harvest Fund Exchange Traded Fund (DBV), which was 2.95882%. The tracking error was 2.7322%, indicative of the fund manager's successful attempt to outperform the DB G10 benchmark. The risk-adjusted return of the iPath Optimized Currency Carry Exchange Traded Note (ICI) is -0.12 with a tracking error of 2.9%, indicative of the fund manager's successful attempt to outperform the Barclays Optimized Currency Carry Index benchmark.

Table 1. Comparative Empirical Results: Indicies

	AFX Currency Index	Powershares ETF	iPath ETN
Skewness	-0.3755	-0.5728	-0.2900
Kurtosis	-0.8093	0.28968	4.7600
Sortino Ratio	-0.6750	-0.4723	0.0670
Sharpe Ratio	-0.8263	-0.5309	-0.4255
Jensen's Alpha	0.1609	-0.2600	-0.1800
Beta	-0.1048	-0.5287	-0.0919
Information Ratio	12.4859	-0.4500	-0.1200
Investor Sentiment	N/A	0.0000	0.0300
Tracking Error	N/A	0.02732	0.0290

Table 2. Comparative Empirical Results: Currency Pairs

	JPY/NZD	JPY/AUD	JPY/GBP	JPY/CAD	JPY/USD
Skewness	0.0315	-0.5110	0.8483	0.4918	0.2758
Kurtosis	-1.1749	0.0441	-0.6382	-0.6104	-0.9505
Standard Deviation	7.8200	6.2950	17.8950	0.6850	0.2800
Sortino Ratio	-0.4862	-0.4561	-0.2464	-0.3568	-0.4768
Sharpe Ratio	-0.5402	-0.4949	-0.2422	-0.3611	-0.5076
Information Ratio	4.7015	-1.9977	-45.4400	-23.0239	-29.3221

The graphical representation of the skewness and kurtosis values are contained in Figures 1, 2, and 3 in the Appendix. A negatively skewed distribution exhibits scores are concentrated on the high end of the scale. The currency carry trade exhibits negative skewness (the returns to the left of the mean are fewer yet lie a greater distance from the mean). For the study period, the returns of the currency pairs were negative or close to zero; a finding is consistent with Brunnermeier, Nagel, and Pedersen (2008) as well as Burnside, et al., (2011). The skewness result for DBV is –0.57284 and -0.29 for ICI. These skewness values are acceptable, denoting a Gaussian return distribution. The kurtosis statistic is 0.28968 for DBV which is close to zero and implicit of a normal distribution with a platykurtic shape. Kurtosis for ICI is 4.76 suggesting a leptokurtic, Gaussian distribution.

Currency Carry trades are generally known to exhibit high Sharpe Ratios (Burnside, et al., 2011). Yet the Sharpe Ratio results of -0.5309 for the PowerShares G10 Currency Harvest Fund Exchange Traded Fund (DBV) and -0.4255 for the iPath Optimized Currency Carry Exchange Traded Note (ICI) differ with that notion. According to the Sharpe Ratio, both currency carry trade funds performed worse than the risk free security; that is, the 3 month U.S. Treasury Bill. The Sortino Ratio results are -0.4723 for DBV and 0.067 for ICI. The cumulative results of negative Sharpe and Sortino ratios, negative skewness, and positive, near-zero kurtosis imply both funds have significant downside risk with minimal upside gain. Jensen's Alpha is measured at -0.26 for DBV and -0.18 for ICI. Adjusting these results for negative market beta confirms that the risk assumed by both fund managers is unjustified.

The Information Ratio result is -0.45 for DBV and -0.12 for ICI revealing that there is, at best, below average skill demonstrated by the managers of both currency carry trade funds. Investor sentiment was 0% for ICI; when compared to other exchange traded funds, 100% of investors do not wish to have iPath Optimized Currency Carry Exchange Traded Note (ICI) in their portfolios. The PowerShares G10 Currency Harvest Fund Exchange Traded Fund (DBV) did not fare much better. At an investor sentiment rating of 0.030, 97% of investors would rather purchase another exchange traded fund. These results are indicative of a significant agency problem. Investors in both funds are reliant on the respective fund managers for financial expertise, yet the results achieved do not demonstrate positive performance persistence.

5. Summary and Conclusions

5.1 Biases

The information retrieved from the database vendors is assumed accurate. However, survivorship and instant history biases (that is, backfilling or backtesting) are present in the dataset. Since currency carry trade funds report results to database vendors on a voluntary basis primarily for their own marketing purposes, these biases are inevitable.

Retrodiction is a form of hindsight bias prevalent in backtesting and has an influence on the analysis of results. The researcher essentially sees what he believes he knew all along. He then makes predictions based on the past and then uses those results to predict future investment returns. Since the outcome has not yet occurred, retrodictions cannot be measured; it is not possible to determine distinct chances of initial occurrences from knowledge of the final state.

The spread in the returns of the five currency pairs is not consistent with traditional risk factors. It is consistent with the noisy signal of over and under-reaction to new information, a behavioral trait rampant in trend-following/momentum trading strategies.

5.2 Limitations of the Study

No consensus exists within the literature as to which economic variables are most highly correlated with changes in currency exchange markets. Meese and Rogoff (1983) reason currency forecasting models cannot outperform a coin toss. As such, it is difficult to identify appropriate quantitative variables to measure. Unlike the stock market, there is no consensus amongst currency traders as to a proper benchmark for the currency market—essentially, no market portfolio exists, just a collection of long and short positions. This study utilized the AFX Currency Management Index as a proxy benchmark for currency carry trades which is, unfortunately, incorporated in only a few empirical studies. The Index makes subjective decisions regarding its currency composition, weighting schemes, and rebalancing criteria. As such, the robustness of this study will be difficult to measure against other relevant academic finance research.

5.3 Concluding Remarks

Currency carry trades create new pricing opportunities and further ensure market transparency. Whether an investor purchases available currency carry funds or buys currency pairs directly, the amount of profit generated will be limited due to high transaction costs further exacerbated by the constant rebalancing required to implement and maintain a momentum strategy. Standard risk measures cannot account for the excess returns seen in currency carry trading.

The currency carry trade is seen as a skill-based strategy. As such, traders choose not to compare their performance to an index, which is understandable due to the lack of a generally accepted index similar to the FTSE 100 or S&P 500. The general notion of portable alpha and its overlay potential relative to the currency carry trade is flawed. This study finds what appears to be occurrences of 'incidental' alpha perhaps the result of the peso problem (Burnside, et al., 2011); that is, a small probability of a large change in interest rates and vice versa. The result of backtesting the five currency pairs discovered either negative alpha or positive alpha of no significance. An investor would have fared no better using the PowerShares G10 Currency Harvest Fund Exchange Traded Fund or the iPath Optimized Currency Carry Exchange Traded Note than choosing either fund's constituent currency pairs on his own.

An investor in either fund submits himself to significant noise trader risk. Fund managers invest on behalf of their clients; their own capital is not at risk resulting in what Shleifer and Vishny (1997) deem a "separation of brains and capital". Instead of alpha persistence, this paper concludes there is instead evidence of wishful thinking (Weinstein, 1980) from the managers of both currency carry trade funds. Consistent with the aforementioned behavioral bias, both funds extrapolate past results as a guide to future performance—a clear portrayal of hindsight bias. These biases lead fund managers to believe they possess extraordinary skills, which in reality do not exist.

This investigation yielded no evidence of either performance persistence or portable alpha. The PowerShares G10 Currency Harvest Fund Exchange Traded Fund and the iPath Optimized Currency Carry Exchange Traded Note both yielded overall negative alpha, indicating neither manager manifested skill. These findings could be due to data selection. Nevertheless, the results of this study are consistent with the generalized notion that currencies are a zero sum game; excess returns are incidental and attributable to market beta. The return characteristics of currency carry trades are such that excess systematic returns are earned in exchange for enduring significant downside risk and high volatility.

The forward premium puzzle remains unresolved.

Acknowledgements

My profound thanks to Mark Matthews of Bentley University, Waltham, Massachusetts (matthew_mark@bentley.edu) for his research assistance, and to Will Thomas of Nova Southeastern University, Fort Lauderdale, Florida (wt184@nova.edu) for his edit review assistance. My sincere appreciation goes to the anonymous referees and editors of this publication for their acceptance of this work.

Bibliography

AFX Currency Management Index: Historical Prices. *New York University Stern School of Business*. Retrieved 9January 2015 from http://people.stern.nyu.edu/rlevich/afx_index.html

Board of Governors of the Federal Reserve System (US), *3-Month Treasury Bill: Secondary Market Rate* [DTB3]. Retrieved 16 April 2015 from FRED, Federal Reserve Bank of St. Louis at https://research.stlouisfed.org/fred2/series/DTB3/.

Federal Reserve Bank of St. Louis, TED Spread [TEDRATE], Retrieved 20 May 2015 from FRED, Federal Reserve Bank of St. Louis, at https://research.stlouisfed.org/fred2/series/TEDRATE/.

Historical Exchange Rates. *Oanda*. Accessed 16 April 2015 at http://www.oanda.com/currency/historical-rates/

iPath Optimized Currency Carry ETN: Historical Prices. *Yahoo! Finance*. Accessed 20 May 2015 at http://finance.yahoo.com/q/hp?s=ICI&a=03&b=17&c=2008&d=00&e=10&f=2015&g=m

PowerShares G10 Currency Harvest Fund ETF: Historical Prices. *Yahoo! Finance*. Accessed 20 May 2015 at http://finance.yahoo.com/q/hp?s=DBV&a=08&b=18&c=2006&d=10&e=28&f=2014&g=d

Research Center. *Macroaxis*. Accessed 21 June 2015 at https://www.macroaxis.com/invest/market/DBV--PowerShares-DB-G10-Currency-Harvest-ETF

Research Center. *Macroaxis.* Accessed 21 June 2015 at https://www.macroaxis.com/invest/market/ICI--iPath-Optimized-Currency-Carry-ETN

References

Alexius, A. (2001). Uncovered interest parity revisited. *Review of International Economics, 9*(3), 505-517. http://dx.doi.org/10.1111/1467-9396.00296

Ang, A., Chen, J., & Xing, Y. (2006). Downside risk. *The Review of Financial Studies*, *19*, 1191-1239. http://dx.doi.org/10.1093/rfs/hhj035

Anker, P. (1999). Uncovered interest parity, monetary policy and time-varying risk premia. *Journal of International Money and Finance*, *18*(6), 835-851. http://dx.doi.org/10.1016/S0261-5606(99)00036-4

Anson, M. (2001). Performance presentation standards: Which rules apply when? *Financial Analysts Journal, 57*(2), 53-60. http://dx.doi.org/10.2469/faj.v57.n2.2433

Bansal, R. (1997). An exploration of the forward premium puzzle in currency markets. *Review of Financial Studies, 10*(2), 369-403. http://dx.doi.org/10.1093/rfs/10.2.369

Berkelaar, R., Kouwenberg, R., & Post, T. (2004). Optimal portfolio choice under loss aversion. *Review of Economics and Statistics, 86*(4), 973-987. http://dx.doi.org/10.1162/0034653043125167

Brunnermeier, M. K., Nagel, S., & Pedersen, L. H. (2008). Carry trades and currency crashes. (No. w14473), *National Bureau of Economic Research*, Cambridge, Massachusetts. http://dx.doi.org/10.1086/593088

Burnside, A., Eichenbaum, M., Kleshchelski, I., & Rebelo, S. (2011). Do Peso Problems Explain the Returns to the Carry Trade? *Review of Financial Studies*, *24*(3), 853-891. http://dx.doi.org/10.1093/rfs/hhq138

Burnside, C., Eichenbaum, M. S., & Rebelo, S. (2011). Carry trade and momentum in currency markets. *Annual Review of Financial Economics, 3*(1), 511-535. http://dx.doi.org/10.1146/annurev-financial-102710-144913

Burnside, C., Eichenbaum, M., Kleshchelski, I., & Rebelo, S. (2007). The returns to currency speculation. *The American Economic Review, 97*(2), 333-338. http://dx.doi.org/10.1257/aer.97.2.333

Chinn, M. D., & Meredith, G. (2004). Monetary policy and long-horizon uncovered interest parity. *International Monetary Fund Staff Papers*, 409-430.

Chortareas, G. E., & Driver, R. L. (2001). PPP and the real exchange rate-real interest rate differential puzzle revisited: Evidence from non-stationary panel data. *Bank of England.* Discussion paper no. 138. http://dx.doi.org/10.2139/ssrn.274992

Copeland, L. (2014). The currency carry trade anomaly. *Journal of Business and Financial Affairs, 3*(1). http://dx.doi.org/10.4172/2167-0234.1000e141

Daniel, K., Hodrick, R., & Lu, Z. (2014). The carry trade: risks and drawdowns. (No. w20433). *National Bureau of Economic Research*. Cambridge, Massachusetts. http://dx.doi.org/10.2139/ssrn.2486275

DeLong, J., Shleifer, A., Summers, L., & Waldmann, R. (1990). Noise trader risk in financial markets. *Journal of Political Economy, 98*, 703-708. http://dx.doi.org/10.1086/261703

Egbers, T. (2013). A crisis-robust carry trade strategy developed using the VIX. Economics. *Erasmus University*.

Fama, E. (1970). Efficient capital markets: A review of theory and empirical work. *The Journal of Finance, 25*(2), 383-417. http://dx.doi.org/10.2307/2325486

Fama, E. (1998). Market efficiency, long-term returns, and behavioral finance. *Journal of Financial Economics, 49*(3), 283-306. http://dx.doi.org/10.1016/S0304-405X(98)00026-9

Frachot, A. (1996). A reexamination of the uncovered interest rate parity hypothesis. *Journal of International Money and Finance, 15*(3), 419-437. http://dx.doi.org/10.1016/0261-5606(96)00008-3

Fung, W., & Hsieh, D. (1997). Empirical characteristics of dynamic trading strategies: The case of hedge funds. *The Review of Financial Studies, 10*(2), 275-302. http://dx.doi.org/10.1093/rfs/10.2.275

Grinold, R., & Khan, R. (1992). Information analysis. *Journal of Portfolio Management, 18*(3), 14-21. http://dx.doi.org/10.3905/jpm.1992.409408

Gupta, F., Prajogi, R., & Stubbs, E. (1999). The information ratio and performance. *Journal of Portfolio Management*, *26*(1), 33-39. http://dx.doi.org/10.3905/jpm.1999.319779

Gyntelberg, J., & Remolona, E. M. (2007). Risk in carry trades: A look at target currencies in Asia and the Pacific. *BIS Quarterly Review, 4,* 73-82.

Hardie, I., & MacKenzie, D. (2007). Assembling an economic actor: The *agencement* of a hedge fund. *The Sociological Review, 55*(1), 57-80. http://dx.doi.org/10.1111/j.1467-954X.2007.00682.x

Harvey, C., & Huang, R. (1991). Volatility in the foreign currency futures market. *Review of Financial Studies*, *4*(3), 543-569. http://dx.doi.org/10.1093/rfs/4.3.543

Holmes, C. (2009). Seeking alpha or creating beta? Charting the rise of hedge fund-based financial ecosystems. *New Political Economy*, *14*(4), 431-450. http://dx.doi.org/10.1080/13563460903287231

Hudson, I. (2008). Managing downside risk with upside volatility: Enhancing the performance of an investment portfolio with managed futures. *Journal of Business & Economics Research*, *6*(4), 25-30.

Jensen, M. (1968). The performance of mutual funds in the period 1945-1964. *The Journal of Finance*, *23*(2), 389-416. http://dx.doi.org/10.1111/j.1540-6261.1968.tb00815.x

Jensen, M. (1969). Risk, The pricing of capital assets, and the evaluation of investment portfolios. *The Journal of Business, 42*(2), 167-247. http://dx.doi.org/10.1086/295182

Jylhä, P., Lyytinen, J., & Suominen, M. (2008). Arbitrage Capital and Currency Carry Trade Returns. Working paper, Helsinki School of Economics. http://dx.doi.org/10.2139/ssrn.1107797

Kouwenberg, R. (2002). Do hedge funds add value to a passive portfolio? Correcting for non-normal returns and disappearing funds. *Journal of Asset Management, 3*(4), 361-382. http://dx.doi.org/10.1057/palgrave.jam.2240089

Kung, E., & Pohlman, L. (2004). Portable alpha: Philosophy, process and performance. *Journal of Portfolio Management, 30*(3), 78-87. http://dx.doi.org/10.3905/jpm.2004.412322

Laws, J. (n.d). AFX currency management index. Retrieved 13 March 2015 from http://people.stern.nyu.edu/rlevich/afx_index.html.

Lequeux, P., & Acar, E. (1998). A dynamic index for managed currencies funds using CME currency contracts. *The European Journal of Finance*, *4*(4), 311-330. http://dx.doi.org/10.1080/135184798337209

Liang, B. (2004). Alternative investments: CTAs, hedge funds, and fund-of-funds. *Journal of Investment Management*, *2*(4), 1-18. http://dx.doi.org/10.2469/dig.v34.n4.1556

Lustig, H., Roussanov, N., & Verdelhan, A. (2011). Common risk factors in currency markets. *Review of Financial Studies, 24*(11), 3731-3777. http://dx.doi.org/10.1093/rfs/hhr068

Markowitz, H. (1952). Portfolio selection. *The Journal of Finance, 7*(1), 77-91. http://dx.doi.org/10.1111/j.1540-6261.1952.tb01525.x

Markowitz, H. (1959). *Portfolio Selection: Efficient Diversification of Investments.* New York: John Wiley & Sons.(reprinted by Yale University Press, 1970).

Meese, R., & Rogoff, K. (1983). Empirical exchange rate models of the seventies: Do they fit out of sample? *Journal of International Economics*, *14*(1), 3-24. http://dx.doi.org/10.1016/0022-1996(83)90017-X

Pojarliev, M., & Levich, R. (2008). Do professional currency managers beat the benchmark? *Financial Analysts Journal*, *64*(5), 18-30. http://dx.doi.org/10.2469/faj.v64.n5.4

Ross, S. (1976a). The arbitrage theory of capital asset pricing. *Journal of Economic Theory, 13*(3), 341-360. http://dx.doi.org/10.1016/0022-0531(76)90046-6

Ross, S. (1976b). Risk, return, and arbitrage. *Risk Return in Finance*. Cambridge, Massachusetts: Ballinger.

Sarno, L., & Taylor, M. (2002). *The economics of exchange rates.* Cambridge University Press.

Sharpe, W. (1994). The Sharpe ratio. *Journal of Portfolio Management, 21*(1), 49-58. http://dx.doi.org/10.3905/jpm.1994.409501

Siegel, J. (1972). Risk, interest rates and the forward exchange. *Quarterly Journal of Economics, 86*, 303-309. http://dx.doi.org/10.2307/1880565

Tobe, C. (1999). Tracking error: An essential tool in evaluating index funds. *The Journal of Investment Consulting, 2,* 8-11.

Weinstein, N. (1980). Unrealistic optimism about future life events. *Journal of Personality and Social Psychology, 39,* 806-820. http://dx.doi.org/10.1037/0022-3514.39.5.806

Appendix

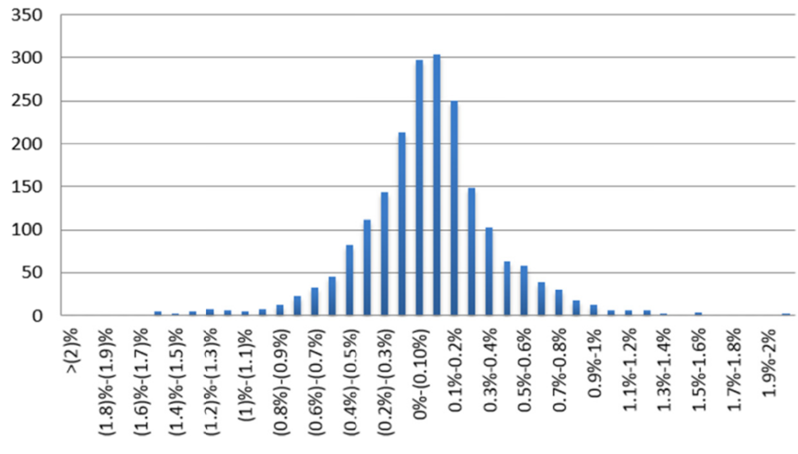

Figure 1. AFX Currency Management Index

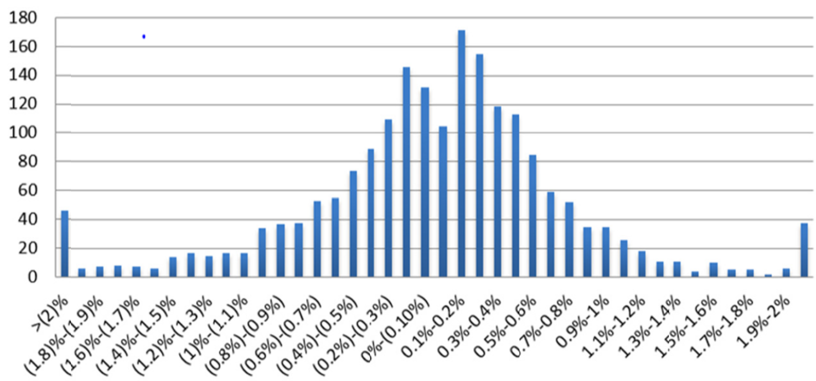

Figure 2. PowerShares G10 Currency Harvest ETF

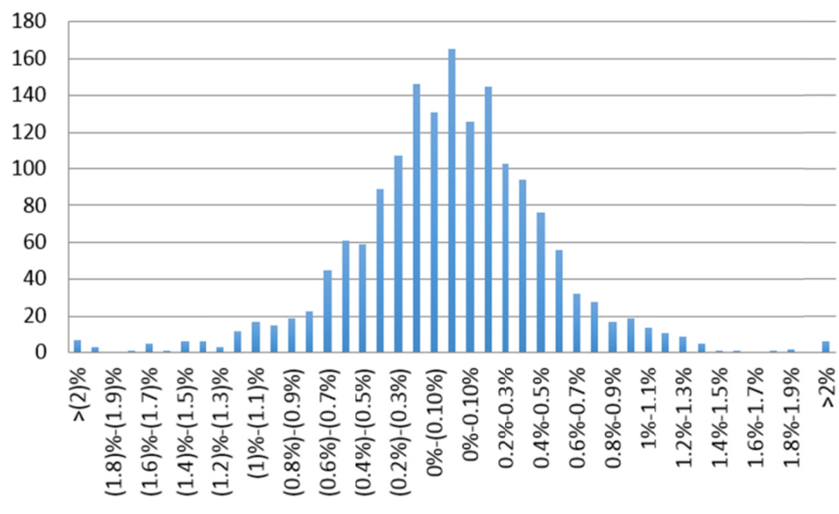

Figure 3. iPath Optimized Currency Carry ETN