Trading the Forward Rate Puzzle

MOMTCHIL POJARLIEV

MOMTCHIL POJARLIEV
is head of currencies
at Hermes Investment
Management Limited in
London, U.K.
m.pojarliev@hermes.co.uk

The recent interest from the asset management industry in "portable alpha" has made currencies more attractive than ever as an asset class. One of the most attractive features of managing currencies within an investment portfolio is that currency returns come on top of, and not instead of, those from other assets. This means that if the currency manager makes 1% per annum on a portfolio, that is 1% on top of x% made by the portfolio's other assets. Furthermore, the returns from currencies are not correlated with the returns already in the portfolio. They have little correlation with underlying asset returns. This means that the portfolio not only is going to benefit from the added alpha on top but is also subject to a significant diversification benefit.

There is substantial evidence that currency managers generate positive returns. Studies by such consultants as Strange [1998]; Mercer [2001], and more recently, Harris [2004], have demonstrated that currency managers have on average added value over their benchmarks. While past performance is no guarantee for future performance, there is no surprise that the consultants advocate the use of currency as an alpha source.[1]

A good benchmark for the performance of currency managers is given by the Barclay Currency Traders Index. It is an equal-weighted composite of managed programs that trade currency futures and forwards. In 2007 there were 113 currency programs included in the index. Exhibit 1 shows the yearly performance of the Barclay Currency Traders Index since 1987. The information ratio since 1987 has been 0.41, and the correlation with the S&P 500 Index has been –0.04, with U.S. bonds 0.08, and with world bonds 0.13. Note that traditionally the information ratio in currencies is measured against a zero benchmark, as currency programs do not need to be funded. Exhibit 1 illustrates that although the performance of the currency managers has been impressive over the last 20 years, the years 2005 and 2006 were challenging.

As often in finance, there is a large discrepancy between what is consensus within academic literature and what is applied by investment professionals. There are many different styles in currency management. However, regardless of style, three traditional trading strategies remain very popular: valuation, trend-following, and carry. Trend-following traders use technical analyses to identify "trends" in the currency market. Valuation traders use macroeconomic variables to identify "overvalued" and "undervalued" currencies. An example of a simple valuation trade is to go long the undervalued currencies against the overvalued currencies in the Big Mac Index.[2] Carry traders buy high-yielding currencies against low-yielding currencies.

Academic literature offers little justification for valuation traders. There is

EXHIBIT 1

Performance of the Barclay Currency Traders Index (as of November 20, 2006)

1987	29.56%	**1997**	11.35%
1988	4.28%	**1998**	5.71%
1989	18.89%	**1999**	3.12%
1990	57.74%	**2000**	4.45%
1991	10.94%	**2001**	2.71%
1992	10.27%	**2002**	6.29%
1993	−3.33%	**2003**	11.08%
1994	−5.96%	**2004**	2.36%
1995	11.49%	**2005**	−1.21%
1996	6.69%	**2006**	−2.11%

Source: The Barclay Group, www.barclaygrp.com.

EXHIBIT 2

Performance of the AFX Currency Management Index

1987	14.33%	**1997**	7.19%
1988	−0.22%	**1998**	0.10%
1989	6.36%	**1999**	1.97%
1990	5.72%	**2000**	7.26%
1991	6.96%	**2001**	−1.96%
1992	3.57%	**2002**	2.80%
1993	−3.33%	**2003**	5.72%
1994	−1.54%	**2004**	−5.68%
1995	4.71%	**2005**	1.14%
1996	7.93%	**2006**	−2.81%

Source: Liverpool John Moores University, http://www.ljmu.ac.uk/AFE/CIBEF/67762.htm.

a widespread consensus in academic literature that macroeconomic variables offer little help in exchange rate forecasting. Meese and Rogoff [1983] show that random walk forecasts outperform economic models on exchange rates. A survey by Frankel and Rose [1995] on empirical literature focusing on floating exchange rates found that driftless random walk characterizes exchange rates better than standard models based on observable macroeconomic fundamentals.

The existence of trends is questioned in academic literature. The empirical results are mixed. Simple trend-following strategies have been shown to be profitable (see Levich and Thomas [1993]; LeBaron [1999]; Acar and Lequeux [2001], and Okunev and White [2003]). However, recent studies have suggested a declining profitability of trend-following rules (see Olson [2004] and Schulmeister [2005]).

A good proxy for the performance of trend-following rules is given by the AFX Index. It is based on previous work by Lequeux and Acar [1998], which shows that a triple moving average rule of 32, 61, and 117 days is a good proxy for a trend-following style. The AFX invests using weights of global turnover distribution as reported by the Bank of International Settlement (BIS). Therefore, it is mainly exposed to the G3 currencies, i.e., USD, EUR, and JPY. The underperformance of the AFX between 2004 and 2006 (see Exhibit 2) suggests that trend followers might be struggling recently when investing in the major currencies. However, there is no evidence that trend-following strategies have been underperforming across the board, i.e., in cross rates and emerging market currencies. A recent article by Pukthuanthong, Levich and Thomas [2007] shows that while trend-following rules in the major currencies have been underperforming post-1995, they still remain profitable in less liquid currencies (the "exotics").

The carry strategy is the only one fully supported by academic literature. The carry strategy is based on the belief that uncovered interest rate parity (UIP) does not hold, i.e., that the forward rate is a biased prediction of the future change in spot exchange rate and that it usually points in the wrong direction. The general conclusion from academic literature is that, while covered interest rate parity (CIP) holds, UIP does not. This conclusion is the so-called forward premium puzzle. This finding has been confirmed in many studies (e.g., Bilson [1981]; Froot and Thaler [1990]; Alexius [2001]).

There are several reasons why the forward premium puzzle might exist. Previous research has focused on a) the invalidity of the rational expectations hypothesis (Froot and Frankel [1989]), b) issues of econometric implementaion of testing if UIP holds (Baillie and Bollerslev [2000]), and c) existence of an exchange risk premium (see Engel [1996] for a survey).

This article focuses on the following questions: If the trend-following rules had been performing well in 1975–1995, but not so well post-1995, are we going to find a similar effect for the carry based strategy? And if the simple carry rule does not perform well, would

more sophisticated versions perform better? The study evaluates the performance of three carry rules for the most-traded developed currency pairs (six currencies) between 1996 and 2006. It compares the performance of the carry strategies with the performance of currency managers. This article shows that the carry strategy continued to perform exceptionally well between 1996 and 2006 and has posted very good results, especially in the post-2000 period. A new volatility carry rule performs slightly better than the simple carry rule. Surprisingly, currency managers seem to have little exposure to carry styles. The result could have important implications for currency management since it would suggest that currency managers should increase the use of carry strategies and might take advantage of information from the options market.

CARRY TRADING STRATEGIES

There has been a lot of talk in the financial media about carry trades, especially about the yen carry trade and the Swiss franc carry trade. The recent focus on the carry strategy has lead to a surge in products, designed to evaluate the performance of carry trades more easily. For example, Deutsche Bank introduced a G10 Carry Basket Spot index, which represents a long carry portfolio within the G10 sphere. It shows the performance of being long the three highest-yielding currencies against the three lowest-yielding currencies within the G10 currencies. In 2006 Bloomberg introduced a number of carry indices, which track the performance of different carry trades.

Simple Carry Rule

In a carry trade, investors borrow in a low interest rate currency, such as the yen, and then invest in a higher interest rate currency such as the New Zealand dollar. Let's define the currency returns R at period t as follow:

$$R_t = \ln(S_t) - \ln(F_{t-1}) \tag{1}$$

with *S* the spot rate and F the forward rate.

The carry rule is to sell the forward rate if $F_t > S_t$ and to buy the forward if $F_t < S_t$. The achieved return with this strategy at period t is:

$$R_t \quad \text{if } F_{t-1} - S_{t-1} > 0 \quad \text{and} \quad -R_t \quad \text{if } F_{t-1} - S_{t-1} < 0 \tag{2}$$

For example, under the carry strategy, an investor would have been long the U.S. dollar against the euro from January 1999 until March 2001 and then reversed his position, by going short the U.S. dollar against the euro, in April 2001 until November 2004. In December 2004, the Fed funds rate once again moved above the ECB refinancing rate. Therefore, a carry trader would have again switched his position by going long the U.S. dollar against the euro. The carry strategy causes minimal transaction costs since it seldom requires rebalancing.

Threshold Carry Rule

In a recent article, Bilson [2003] proposes a modification of the simple carry rule. He makes the case that one should try to capture the carry only if the higher interest rate compensates for the expected inflation differential. Bilson [2003] uses the difference in the 10-years government bond yields as a proxy for the expected inflation differential. Let's call this modification a threshold carry rule, since the interest rate differential is compared with the difference in expected inflation (the threshold), that is,

$$T_{t+1} = y10^d_t - y10^f_t, \tag{3}$$

where "y10" stands for the 10-year government bond yield.

Under the threshold carry (TC) rule, an investor should go long a high-yield currency only if the carry is larger than the "threshold," or otherwise go short. The modified carry rule would lead to the following return:

$$\begin{array}{ll} R_t & \text{if } (F_{t-1,} - S_{t-1}) > T_{t-1} \quad \text{and} \\ -R_t & \text{if } (F_{t-1,} - S_{t-1}) < T_{t-1}, \end{array} \tag{4}$$

with T computed from Equation (3).

Volatility Carry Rule

One of the criticisms aimed at carry investors is that the volatility of the exchange rates is too high to justify holding a carry position. When holding a carry position (being long a high-yielding currency against a low-yielding currency) an investor is collecting the interest rate differential and is exposed to movements in the exchange rate. The tracking error of this position would be equal to the exchange rate volatility. Thus, looking only at the interest rate differential to assess the

attractiveness of a carry trade would make little sense. Instead, the level of underlying volatility should also be taken into account, by looking at the carry-to-volatility ratio, i.e., one should divide the interest rate differential by the expected volatility.

For example, the interest rate differential between the U.S. and the EMU as per September 15, 2006, was 2.25% = 5.25% (U.S. rates) – 3% (EMU rates) in favor of the U.S. According to the simple carry rule, carry traders should be short the euro against the U.S. dollar. At the same time, the interest rate differential between EMU and Switzerland was 1.25% = 3%(EMU rates) – 1.75% (Switzerland rates). At the first glance, carry traders would be better off by shorting the euro vs. the U.S. dollar, instead of shorting the Swiss franc vs. the euro. However, the volatility of the EUR/USD exchange rate at the same time was 7.2% while the volatility of the EUR/CHF exchange rate was only 3%. The carry-to-volatility ratio for a short EUR/USD position was only 0.31 = (5.25% – 3%)/7.2%, while the carry-to-volatility ratio for a long EUR/CHF position was 0.42 = (3% – 1.75%)/3%. Thus, the long EURCHF trade seems to be more attractive than the short EURUSD trade when adjusting for volatility.

It makes sense to modify the simple carry rule using volatility as an additional input. Let's define the carry-to-volatility ratio as follows.

$$CV_t = \text{abs}(i_t^d - i_t^f)/V_t \qquad (5)$$

where "V_t" stands for the 1-month implied volatility of the exchange rate, i_t^d is the domestic short-term interest rate and i_t^f is the foreign interest rate at time t.

Under the volatility carry (VC) rule, an investor should go long a high yield currency only if the carry-to-volatility ratio is larger than θ, or otherwise stay at neutral. The parameter θ might be interpreted as the minimum required information ratio (IR). Using the Barclay Currency Traders Index the information ratio of the currency managers has been 0.41 on average since 1987. This could be interpreted as an expected long-term information ratio in currencies. Thus, I propose to set θ to 0.2, i.e., ½ of the long-term expected information ratio. In other words, it would make sense to establish a carry trade only if the expected information ratio of this trade is going to be at least ½ of the potential long-term information ratio.

The modified carry rule would lead to the following return:

$$\begin{array}{rlll} R_t & \text{if} & F_{t-1} - S_{t-1} > 0 & \text{and} \quad CV_t > 0.2 \\ -R_t & \text{if} & F_{t-1} - S_{t-1} < 0 & \text{and} \quad CV_t > 0.2 \\ 0 & \text{if} & CV_t < 0.2 & \end{array} \qquad (6)$$

with CV_t computed from Equation (5).

The volatility carry rule would lead to the same results as the simple carry rule, if the carry-to-volatility ratio is greater than 0.2.

PERFORMANCE OF CURRENCY MANAGERS

As of the beginning of 2007, 113 currency managers were included in the Barclay index. However, from these 113 managers only 17 had a track record of at least 10 years, with 36 managers having a track record of less than 3 years. Therefore, this article uses the data of only 17 currency managers.[3] Barclay classifies the managers as systematic or discretionary with about 20%–25% of the universe without any category. Unfortunately, it was not possible to obtain the individual classification of the managers.

The time horizon is from July 1996 until June 2006 (10 years), and it is divided into two subperiods, from 1996 until 2000 and from 2001 until 2006. The performance of the managers is presented for the whole 1996–2006 period (Exhibit 3) and for two subperiods, i.e., 1996–2000 and 2001–2006 (Exhibit 4).

The return (R) is the annualized excess return, defined as the mean return multiplied by 12. A risk-free rate is not subtracted from the currency return. This is typical for performance measurement on currencies, since a currency program could be initiated without any investment. The tracking error (TE) is the annualized tracking error defined as the monthly standard deviation multiplied by the square root of 12. The annualized information ratio (IR) is computed as R/TE. M1 stands for the first currency manager, M2 for the second, etc.

The performance data show that currency managers have been performing very well over this 10-year period. The IRs are in the 0.33–1.90 range, with an average IR equal to 0.87. However, these performance data probably overstate the potential IR of an average currency manager due to the survivorship bias. The tracking errors are in a relatively broad range of 1.78%–33.95%, which suggests that some of the managers are probably using

EXHIBIT 3

Performance of Currency Managers, the AFX Index, and Carry Strategies, July 1996–June 2006

Manager	Return	Tracking Error	Information Ratio
M1	4.54	2.77	1.64
M2	5.76	8.94	0.64
M3	10.65	21.40	0.50
M4	3.39	1.78	1.90
M5	6.01	12.14	0.50
M6	11.37	33.95	0.33
M7	8.16	13.30	0.61
M8	11.17	14.26	0.78
M9	11.09	9.91	1.12
M10	12.35	11.84	1.04
M11	10.22	30.68	0.33
M12	11.39	22.39	0.51
M13	12.14	10.15	1.20
M14	12.05	13.36	0.90
M15	12.26	21.13	0.58
M16	6.92	12.48	0.55
M17	6.44	3.88	1.66
Average			**0.87**
AFX	2.20	5.56	0.40
SC	5.67	4.46	1.27
TC	6.89	5.76	1.20
VC	4.28	3.34	1.29

leverage and some of them have very tight benchmark constrains. This is as expected and illustrates that in the currency management industry there is not a standardized mandate and that objectives and currency benchmarks might be completely different from one mandate to another.

The results for the subperiods show a similar picture. This implies that the manager's skills are not too sensitive to the time horizon. The biggest difference is for the manager M16 who has relatively high IR (1.27) between 1996 and 2000, but achieves the lowest IR (0.15) between 2001 and 2006. It is interesting that the average IR in the second subperiod is much lower (0.57) than the average IR in the first subperiod (1.27). This suggests that most of the managers might be trend-followers. Nevertheless, the average IR between 2001 and 2006 is much higher than the IR of the AFX, which is only 0.08. The IR of the AFX has dropped from 0.80 between 1996 and 2000 to only 0.08 between 2001 and 2006. This implies that although most of the managers might be trend-followers, they are exploring trends not only within the major currencies, but also within exotic currencies.

Style Analysis

Following a similar approach as Middleton [2005], a multi-factor regression is used to assess the style of the 17 currency managers. The returns of the managers are regressed on the returns of the AFX and on the returns of a simple carry (SC) portfolio constructed by applying the simple carry rule across the major currencies (see the next section). The threshold carry rule and the volatility carry rule are not included in the regressions because they are highly correlated with the simple carry rule. The results are summarized in Exhibit 5. It shows the T-statistics of the beta coefficients, R^2, and the p-value of the F-statistic. The T-statistics which are significant at a 95% confidence level are shown in bold font.

The AFX was a significant factor for 11 of the 17 managers, which highlights that most of the currency managers can be classified as trend-following. Interestingly, the SC portfolio is a significant factor for only one manager (M4). This is consistent with previous research (see Middleton [2005]) which has shown that trend-following is the dominant trading style among currency managers. This is a very interesting result as it suggests that currency managers have little exposure to carry trades. This is also consistent with the recent performance of currency managers' indices, such as the Barclay, CISDM, and Parker indices. The performance of these indices over the last three years of the investigated time period has been poor despite the excellent performance of carry strategies (see the next section). It seems that the retail investors and not the investment community are mostly the ones exposed to carry trades. For example, the Austrian National bank has pointed out the rising importance of foreign currency loans since the middle of the 1990s and estimates the percentage of foreign currency loans to households in

EXHIBIT 4

Performance of Currency Managers, the AFX Index, and Carry Strategies

Manager	Period 7/96–12/00			Period 1/01–6/06		
	Return	Tracking Error	Information Ratio	Return	Tracking Error	Information Ratio
M1	6.40	2.48	2.58	3.01	2.93	1.03
M2	8.17	9.04	0.90	3.78	8.89	0.43
M3	16.05	20.64	0.78	6.32	22.09	0.29
M4	6.32	2.14	2.95	0.93	0.96	0.97
M5	9.02	12.12	0.74	3.55	12.20	0.29
M6	12.45	38.45	0.32	10.49	30.08	0.35
M7	12.03	14.84	0.81	4.99	11.92	0.42
M8	16.68	14.56	1.15	6.67	13.99	0.48
M9	21.43	13.73	1.56	2.94	4.00	0.74
M10	22.00	14.82	1.48	4.46	8.13	0.55
M11	9.91	12.49	0.79	10.47	39.94	0.26
M12	18.88	19.61	0.96	5.26	24.43	0.22
M13	19.01	11.23	1.69	6.53	8.94	0.73
M14	18.30	15.20	1.20	6.95	11.55	0.60
M15	13.70	18.97	0.72	11.08	22.89	0.48
M16	12.86	10.09	1.27	2.06	14.07	0.15
M17	7.36	4.32	1.70	5.69	3.50	1.63
Average			**1.27**			**0.57**
AFX	4.38	5.48	0.80	0.43	5.61	0.08
SC	7.20	5.60	1.28	4.50	3.20	1.41
TC	6.60	5.50	1.21	7.10	5.90	1.20
VC	4.80	4.00	1.18	3.90	2.60	1.50

Austria at approximately 25% of total loans to households, with loans in Swiss francs and yen dominating. Low Swiss interest rates have attracted mass Swiss franc borrowing by individuals in Eastern Europe and Turkey. The exposure of the retail Japanese investors to foreign currencies has also been a major focus of the investment community over the last years. The most recent experience confirms the results: Despite the liquidation of carry trades in 2008 due to the credit crunch (NZD/JPY declined more than 35% between July 2008 and October 2008), currency managers are enjoying a relatively good year. The Barclay currency index is up for the year as of November 2008.

One explanation of why currency managers are not involved heavily in carry trades might lie in the nature of a typical currency mandate. Currency managers typically have to report their profit/loss on a monthly or quarterly basis, and while the forward puzzle has been found to persist over the longer-term time horizon, there is little justification to go long a currency because of high interest rates when the time horizon is only one month. On the contrary, retail investors have a much longer time horizon, especially when using foreign currency denominated mortgages.

Given the strong performance of carry strategies over the last years (see next section) it is not a surprise that the manager M4 has the highest IR (1.90). Manager M16 seems to have the highest exposure to the trend style, with the T-statistic at 12.42 and the R^2 at 0.573. This is consistent with the drop of his IR from 1.27 in the first subperiod to 0.15 in the second. Only manager M6 seems to be diversifying across trend and carry styles, but the T-statistics are only significant at a confidence level of 90%.

EXHIBIT 5

Regression Results on Individual Currency Managers, July 1996–June 2006

	T-Stats			
Manager	**AFX**	**SC**	**R^2**	**p-value**
M1	0.08	1.30	0.014	0.422
M2	**6.67**	0.36	0.276	0.000
M3	**6.96**	0.09	0.293	0.000
M4	1.43	**1.98**	0.053	0.045
M5	**2.06**	0.20	0.035	0.117
M6	1.89	1.65	0.053	0.038
M7	**8.84**	1.24	0.407	0.000
M8	0.98	–0.09	0.008	0.614
M9	1.41	–0.38	0.017	0.350
M10	0.66	1.38	0.020	0.298
M11	**11.21**	–1.34	0.517	0.000
M12	**8.72**	0.76	0.396	0.000
M13	**3.20**	1.26	0.094	0.002
M14	**2.03**	0.35	0.035	0.117
M15	**10.21**	–0.89	0.469	0.000
M16	**12.42**	1.37	0.573	0.000
M17	**3.26**	1.62	0.105	0.001

EXHIBIT 6

Performance Results of Carry Trading Rules for Individual Currency Pairs, July 1996–June 2006

	EUR	**JPY**	**GBP**	**CHF**	**AUD**	**CAD**
Simple Carry						
Return	9.90	5.00	3.60	3.30	8.90	3.70
Tracking Error	9.20	11.40	7.70	9.90	10.30	6.60
IR	1.07	0.44	0.47	0.33	0.86	0.57
Threshold Carry						
Return	10.40	5.80	1.80	10.00	9.20	4.70
Tracking Error	9.10	11.40	7.80	9.50	10.30	6.50
IR	1.14	0.51	0.23	1.05	0.89	0.73
Volatility Carry						
Return	2.60	5.70	3.30	6.10	5.50	1.90
Tracking Error	4.30	10.60	5.40	7.50	5.80	3.00
IR	0.62	0.53	0.61	0.82	0.94	0.64

PERFORMANCE COMPARISON

The three carry strategies described in the first section have been applied for the most-traded currencies,[4] the so-called major currency pairs, using monthly data and exchange rates against the U.S. dollar. As the carry strategies do not generate trading signals very often (unlike trend-following rules) using monthly data does not compromise the execution of the strategies. The idea was to compare and contrast the performance of the carry rules with the performance of the managers from the previous section.

Results for Individual Currency Pairs

Exhibit 6 presents the results for the individual currency pairs. The results show that the carry strategies would have yielded good results over the last 10 years for the major currency pairs.

The simple carry rule yields positive IRs for all six currency pairs. The IRs are in the 0.33–1.07 range. The simple carry rule works exceptionally well for the euro, with the IR (1.07) and the return (9.9%) being the highest. The lowest IR (0.33) and the lowest return (3.3%) are achieved for the Swiss franc. The "riskiest" currency to invest into has been the Japanese yen. It has the highest tracking error (11.4%) and a big drawdown (–24%). The drawdown was due to the massive liquidation of yen carry trades in the 6/98–12/99 period, with USD/JPY falling from levels above 145 to almost 100 during this time period.

Exhibit 7 shows the performance of the 17 currency managers during the period of the liquidation of the yen carry trades, i.e., from June 1998 until the end of 1999. The performance of the managers is not bad at all, with only 2 managers of the 17 yielding a negative IR during this period. This is as expected, because the regression analyses have shown that these managers have little exposure to a carry style. Surprisingly, the M4 manager performed very well during this period despite having a significant exposure to the SC portfolio. Probably, M4 was exposed to other carry trades and not to the yen carry trade. The negative IR of M6 is more consistent with the expectations, since this manager had some significant exposure to the SC portfolio, although only at a 90% confidence level. The worst performance is that of M15, who

EXHIBIT 7

Performance of Currency Managers during the Liquidation of the Yen Carry Trade, July 1998–December 1999

Manager	Return	Tracking Error	Information Ratio
M1	4.33	1.95	2.22
M2	0.62	7.81	0.08
M3	0.15	18.94	0.01
M4	4.96	2.12	2.34
M5	5.80	12.41	0.47
M6	–1.31	48.48	–0.03
M7	7.93	15.07	0.53
M8	3.84	11.56	0.33
M9	39.34	19.45	2.02
M10	12.43	12.17	1.02
M11	6.96	11.40	0.61
M12	7.37	21.33	0.35
M13	8.31	9.10	0.91
M14	51.64	19.28	2.68
M15	–11.23	18.89	–0.59
M16	6.96	7.13	0.98
M17	3.25	3.71	0.88

is clearly a trend follower (see Exhibit 5). This suggests that sharp liquidation of carry trades and thus a sharp change in the "trend" might also be problematic for the trend-followers. Note that the average performance of the managers during this period is probably biased towards the upside, due to the survivorship bias. If any managers were heavily exposed to the yen carry trade at that time, they probably did not survive to 2007 to remain in the database.

The IRs for threshold carry rule are slightly more volatile, i.e., they are in the 0.23–1.14 range. Here again the best results are achieved for the euro, but the lowest IR was achieved for the British pound (0.23). This might be explained by the fact that the 10-year government bond yields in the U.K. have been a poor indicator for the expected inflation. It is remarkable that the IR for the Swiss franc is much better when applying the threshold carry rule than the simple carry rule. The difference in the performance is due to the 4/2001–12/2004 period, during which the simple carry rule was recommending to be long the U.S. dollar vs. the Swiss franc, but the threshold carry rule was recommending to short the U.S. dollar. The Japanese yen is again the riskiest currency with the highest tracking error (11.4%).

The volatility carry rule yields much more similar results for the different currency pairs. The IRs are in a tighter range, i.e., between 0.53 (Japanese yen) and 0.94 (Australian dollar). This makes sense, since the volatility carry rule is "targeting" a minimum information ratio (0.2). The highest IR (0.94) is the one of the Australian dollar. The Japanese yen has again the highest tracking error (10.6%). Note that applying the volatility carry rule has decreased tracking errors for all currencies.

It is interesting that the carry rules yield such exceptionally good results for the euro. This could be explained by the fact that the euro is actually a "basket" of different currencies and as such offers a "diversification" benefit.

Results for Carry Portfolios

The results for the individual currency pairs are aggregated by building three equally weighted portfolios of the six currency pairs (SC, TC, and VC portfolios). For better comparison with the performance of the currency managers, the performances of these three portfolios are presented together with the performance of the currency managers in Exhibit 3 and 4.

The aggregate results are very interesting. First, all three portfolios show an excellent performance, i.e., the information ratios are in the 1.20–1.29 range. This implies that the described trading strategies would have been working very well during the 1996–2006 period. These results suggest that the carry strategies continue to work well, despite being well documented a long time ago. Only three managers (M1, M4, and M17) have achieved higher IRs than the carry strategies during this 10-year period. The carry strategies work even better in the most recent period (1/01–6/06) with the simple carry rule and the volatility carry rule yielding an information ratio above 1.40. In this period, only one manager (M17) has outperformed the carry portfolios with an IR of 1.63.

The results point to a clear direction: currency managers should increase their exposure towards the carry style. Furthermore, the results suggest that using volatility to assess the attractiveness of a carry trade might improve the results. The information ratio of the VC portfolio is the highest (1.29) among the carry portfolios.

Performance Evaluation

The Jobson–Korkie test of equal Sharpe ratios is widely used for performance evaluation. Jobson and Korkie [1981] propose the following test statistic:

$$z = \hat{\sigma}_2\hat{\mu}_1 - \hat{\sigma}_1\hat{\mu}_2 \tag{7}$$

The asymptotic variance of this estimator is:

$$v(z) = \frac{1}{T}\left[2\sigma_1^2\sigma_2^2 - 2\sigma_1\sigma_2\sigma_{12} + \frac{1}{2}\mu_1^2\sigma_2^2 + \frac{1}{2}\mu_2^2\sigma_1^2 - \frac{\mu_1\mu_2}{\sigma_1\sigma_2}\sigma_{12}^2\right] \tag{8}$$

where μ_1, μ_2, σ_1^2, and σ_2^2 are the excess returns and the return variances of the two portfolios, σ_{12} is the covariance of the two portfolio returns, and T stands for the number of the return observations.[5]

Let's apply this test to the hypothesis of equal information ratios between the SC portfolio and the currency managers. The idea is to test if the currency managers have been outperforming a simple carry strategy. The TC portfolio and the VC portfolio are also tested against the simple carry portfolio to check if a modification of the simple trading rule would have improved the results. Exhibit 8 shows the Jobson–Korkie (JK) test statistics and the corresponding p-values. The JK statistics that are significant at a 95% confidence level are shown in a bold font.

The results are striking. Not only has no single manager significantly outperformed the simple carry rule over the whole period, but the SC portfolio dominates the performance of 5 of the 17 managers (M3, M5, M6, M11, and M12). Their JK statistics are negative and significant at a 95% confidence level. This is a remarkable result,

EXHIBIT 8
Jobson–Korkie Statistics against the Simple Carry Portfolio

	Periods					
	7/1996–6/2006		7/1996–12/2000		01/2001–06/2006	
Manager	JK	p-value	JK	p-value	JK	p-value
M1	0.79	0.215	**1.72**	0.043	–0.51	0.305
M2	–1.35	0.089	–0.54	0.295	–1.58	0.057
M3	**–1.67**	0.047	–0.41	0.341	**–1.82**	0.034
M4	1.38	0.084	**2.26**	0.012	–0.58	0.281
M5	**–1.67**	0.047	–0.79	0.215	**–1.69**	0.046
M6	**–2.19**	0.014	–1.58	0.057	–1.64	0.051
M7	–1.47	0.071	–0.72	0.236	–1.56	0.059
M8	–1.01	0.156	–0.19	0.425	–1.47	0.071
M9	–0.29	0.386	0.36	0.359	–0.88	0.189
M10	–0.49	0.312	0.29	0.386	–1.25	0.106
M11	**–1.96**	0.025	–0.67	0.251	**–1.69**	0.046
M12	**–1.69**	0.046	–0.48	0.316	–1.89	0.029
M13	–0.15	0.440	0.58	0.281	–0.99	0.161
M14	–0.77	0.221	–0.13	0.448	–1.13	0.129
M15	–1.44	0.075	–0.78	0.218	–1.38	0.084
M16	–1.61	0.054	–0.02	0.492	**–2.06**	0.020
M17	0.86	0.195	0.59	0.278	0.46	0.323
TC	–0.28	0.390	–0.24	0.405	–0.46	0.323
VC	0.05	0.480	–0.34	0.367	0.33	0.371

since only a large difference in the information ratios would lead to statistically significant outperformance.

The currency managers perform better in the first subperiod, in which two managers (M1 and M4) managed to achieve significantly higher IR than the SC portfolio. The JK statistics for M1 and M4 are positive and significant at 1.72 and 2.26, respectively. However, these managers underperform the SC portfolio in the second sub-sample.

The SC portfolio dominates clearly in the post-2000 period. Only one manager (M17) and the VC portfolio exhibit positive JK statistics in this period, but they are not significant.

SUMMARY AND CONCLUSION

This article compares and contrasts the performance of three carry strategies with the performance of currency managers between 1996 and 2006. It examines if currency managers could still rely on the forward rate puzzle and if modification of the simple carry rule can improve the performance. Several results stand out from the analysis.

First, they show that the dominant style among currency managers has been the trend-following style. Currency managers have been performing well between 1996 and 2006, but the IRs have been decreasing post-2000. Only few managers seem to have significant exposure to the carry style.

Second, the results of this study show that carry trading strategies would have generated positive return in the 1996–2006 period and would have performed well relative to the currency managers. This implies that despite the fact that the forward rate puzzle is well documented, it still could be used for alpha generation. This result might have important implications for the currency management industry as it suggests that currency managers should increase their exposure to carry strategies.

Finally, the results of the article show that more "sophisticated" versions of the carry trade fail to improve the performance significantly. A threshold carry rule performs even worse than the simple carry rule. A volatility carry rule performs best, which suggests that currency managers should also look at underlying volatility when assessing the attractiveness of a carry trade. However, testing for difference in the information ratios shows that the performance differences between a simple carry rule and a volatility carry rule are not significant. Keeping things simple might after all be best.

What do the results mean for the asset management industry? This article shows that currencies could be an attractive alpha source. Currency trading strategies have been profitable in the past. Despite the liquidation of carry trades in 2008 due to the credit crunch, and probably even more because of that, investors and asset managers could benefit from active currency management products.

ENDNOTES

The author acknowledges helpful comments from Mark Anson and an anonymous referee on earlier drafts of this article.

[1]A recent presentation from the pension fund asset allocator RogersCasey during an investment seminar in Singapore on September 15 made this point.

[2]The Big Mac Index was introduced by *The Economist* newspaper in September 1986 and has been published by that paper more or less annually since then. In January 2004, *The Economist* introduced a sister Tall Latte Index. The idea is the same, except that the Big Mac is replaced by a cup of Starbucks coffee, acknowledging the global spread of that chain in recent years.

[3]Many thanks to Sol Waksman from Barclay for providing me the data. Without his help, this work would have not been possible.

[4]According to a survey of the Bank for International Settlement [2004], the most-traded currencies are the U.S. dollar (88.7%), the euro (37.2%), the Japanese yen (20.3%), the British pound (16.9%), the Swiss franc (6.1%), the Australian dollar (5.5%), and the Canadian dollar (4.2%). Note that because two currencies are involved in the transaction, the sum of the percentage of the individual currencies totals 200% instead of 100%. The U.S. dollar is 88.7% of all currency transactions, highlighting the status of the greenback as the world currency.

[5]Note that Equation 8 corrects a typographical error in the original Jobson and Korkie article. For more details see Memmel [2003].

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