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The Effect of Considering Drift Factor on Carry Trade Profitability: A Case Study on GCC Currencies

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Abstract

It has been well documented that carry trade is a profitable strategy specially when held for long periods. Literature have shown that such strategy can be very rewarding, matching the return of the S&P 500 and exceeding it in terms of the Sharpe ratio. Carry traders take advantage of interest rate differential between currencies by funding their investments in high yield currencies through borrowing low interest rate currencies. Since carry traders assume that exchange rates behave in a driftless manner, they enter such strategy based on interest rate differential as a sole selection criterion without considering the effect of changes in foreign exchange on their profitability. This paper examines the effect of considering statically significant drift in exchange rate on carry trade profitability if such criteria is embedded into the decision making process. Results from this paper show that taking statistically significant drift in exchange rate into the decision making process led to an improvement in both profitability and standers deviation resulting in an improvement in Sharpe ratio.

Keywords: Carry trade, uncovered interest rate parity (UIP), Gulf Co-operation Council (GCC).

Introduction

The topic of carry trade has attracted much attention and popularity from both the academic and practical sides in recent years. Such popularity is fueled by the simplicity and attractive returns of such strategy. Carry trade is a rewarding strategy where traders take advantage of interest rate differential between two currencies. Basically, in its simplest form, carry trade is done by funding investments in a high interest currencies through borrowing low interest currencies. Sy and Tabarraei (2009) define carry trade as a

"*leveraged cross-currency position to take advantage from interest rate differentials and high Sharpe ratio of this market*". It is well documented by Burnside et al. (2006), Lustig and Verdelhan (2007), Lusting et al. (2011), Menkhoff et al. (2012), Rafferty (2012), Bhatti (2012) and many others that such a strategy is very profitable, most of the time. Literature show that such strategy yields a return that is similar to the S&P 500 but with better Sharpe ratio. Neely and Weller (2013) showed that there is a growing body of literature indicating that carry trade has statistically and economically significant positive excess returns and a Sharpe ratio about double that of equity markets. Gyntelberg and Remolona (2007) show that the annualized average daily return on the Australian dollar/yen carry trade was 12.5% per year during the period 2001-2007, compared to 3.6% for the S&P 500 index. Jylha and Suominen (2011) conducted a study of 11 major currencies for the period from 1:1979 to 12:2008 and found that the simplest form of carry trade produced a mean monthly return of 0.47% and a standard deviation of 2.06%, implying a monthly Sharpe ratio of 0.228. Hochradl and Wagner (2010) studies the currencies of seven developed countries for the period 1:1990 to 12:2015 and found that carry trade produced a Sharpe ratio of 0.97 compared to 0.32 for the S&P 500. Not only does carry trade produce returns that exceed the return on the S&P 500—as confirmed by Burnside et al. (2006), Moosa (2008), and Menkhoff et al. (2012)—but it is also less risky than the stock market. Barroso and Santa-Clara (2013) argue that conventional stock market risk factors do not explain carry trade returns at all—the same conclusion is reached by Burnside et al. (2011) as they contend that the high payoffs on carry trade represent a compensation for bearing a risk. They argue that it is difficult to explain the profitability of carry trade with conventional risk factors. Moosa (2008) points out that, unlike stock market investment, high Sharpe ratios do not necessarily represent compensation for risk because the payoff is not associated with standard risk factors.

Carry trade owes its success to the failure of uncovered interest rare parity (UIP). UIP is an arbitrage condition indicating that there should be no profit opportunity from interest rate differential between two currencies since currency movement should offset the difference. But, literature has shown that UIP does not stand as concluded by Engle (1996), Floor and Rose (2002), Szilagyi and Batten (2006). Frankel (2007) states that the statistical evidence against UIP is probably stronger than the statistical evidence in favor of most other theories in economics. Sy and Tabarraei (2009) argues that although carry trade is performed in short-term periods most of the times, UIP holds (if it does hold) for periods longer than five years as concluded by Chinn and Meredith (2004). Not only that UIP does not hold, but it has been documented by Brunnermeier et al. (2008), Clarida et al. (2009) and others that currencies with high-interest rates tend to appreciate against low-interest rate currencies contradicting UIP. Burnside et al. (2008) suggest that "*market participants take advantage of the failure of uncovered interest rate parity to speculate in currency markets*". Baillie and Chang (2011) look at carry trade as nothing more than a speculation against UIP.

The Gulf co-operation council (GCC) is a union that was found in 1981. The union is made of 6 countries, Kuwait, Saudi Arabia, United Arab Emirates, Oman, Qatar, and Bahrain. All of these countries have their currencies pegged to the U.S. dollar since the 1970's, except for the Kuwaiti dinar it is pegged to an undisclosed basket of currencies. According to OPEC 2014 annual report, the GCC countries account for 53% of OPEC oil production and control 34.5% of world oil reserve. These nations are

categorized as emerging economies by the international monetary fund (IMF). Literature shows that using emerging markets currencies in carry trade is very rewarding as concluded by Darvas (2009), Bhatti (2012) and Hamlin (2013). AlAli and AlKulaib (2015) conducting carry trade using Qatari riyal (QAR) against currencies of developed economies for the period from 1:2001 to 12:2012. They found that using emerging currency in carry trade was profitable, producing a mean return of 0.51% with a Sharpe ratio of 0.35. Bhatti (2012) conducted a study using the Pakistani rupee (PAK) against U.S. dollar, Swiss franc, and Japanese yen for the period 1:1995 to 6:2010. His samples produced average annualized return of 12.03% to 16.70% compared to -3.4% to 7.19% for the Swiss and Nikkei 225 stock market indices. AlAli et al. (2016) used Saudi riyal (SAR) in carry trader against the currencies of six developed countries for the period 1:2001 to 12:2012 and found that it produced a mean return of 1.065%. Hoffmann (2012) using the currencies of eastern and central European for the period 1999-2009 argued that fixed exchange currencies allowed for safe returns during financial crisis periods. He concluded that carry trade Sharpe ratio of managed floaters and countries with fixed exchange rates are higher than for countries with flexible exchange rates. On the other hand, AlAli (2016) examined carry trade using United Arab Emirates dirham (AED), which is a fixed exchange rate currency, against the currencies of six developed counties currencies during financial crises periods. He showed that simple carry trade produced negative returns during the East Asia financial crises in 1997, global stock market crash in 1998, and the global financial crisis 2008. These findings were inline with Jorda and Taylor (2009) and Darvas (2009) findings that carry trade works poorly during financial crises.

It is interesting to find out if carry trade can be more profitable when the drift factor, if it is statistically significant, is taken into consideration. When carry traders look at the interest rate differential as the source of return, they assume that the exchange rate behaves like a random walk without drift which means that the expected change in exchange rate is zero. For that, the assumption that the change in exchange rate is zero, carry traders look for currency pair with the highest interest rate differential since they consider the interest rate differential as the return on carry trade. While the evidence indicates that exchange rates move like a random walk without drift over a short horizon (week-to-week, for example), the drift factor tends to be significant over long horizons. Ignoring statistically significant drift factor would mean that carry traders are not utilizing all the information available which may lead to inferior trading decisions. Some evidence actually indicates that calculating the drift factor and embedding it into the decision-making process enhances the profitability of carry trades (Moosa and Burns, 2013). Engel and Hamilton (1990) argue that (in theory) the random walk with drift is a more reasonable standard of comparison when the drift factor is significantly different from zero.

Research Methodology

This paper examines two strategies. While the first strategy, simple carry trade, only takes interest rate differential into consideration and nothing else. The second strategy, modified carry trade, takes into account both interest rate differential and the expected percentage change in the exchange rate if the drift is statistically significant.

Assuming i_x and i_y are the interest rates for both currencies *x* and *y*, respectively. In addition, *S* is the spot rate between the two currencies measured as one unit of *y* against *x*, so appreciation of *y* against *x*

would result in a higher *S*, and vice versa. Under simple carry trade, carry traders would go long currency *y* and short currency *x* if $i_y > i_x$ and vice versa. In this case the return on carry trade is given by;

$$(i \qquad) \quad \dot{S} \tag{1}$$

Where $\dot{S}_{t+1}$ is the percentage change in the exchange rate between *t* and *t*+1. The carry trade operation is implicitly based on the assumption of random walk without drift (Moosa, 2004), which means that $\dot{S}_{t+1}$= 0. Thus, carry trade is profitable as long as $(\qquad) \quad \dot{} \; {}_1$. (That is, as long as the interest rate differential is larger than the depreciation of currency *y* against currency *x*.)

Because of the changes in interest rates differential, it is necessary to switch the role of the currencies, so the general formula for calculating the rate of return on the carry trade will be as follow:

$$\begin{cases} & \dot{S} \\ & \dot{S} \end{cases} \tag{2}$$

For a horizon of one period, the random walk without drift is specified as

(3)

where, is the error term. For a horizon of n, the random walk without drift is written as

(4)

Under the random walk without drift, the expected percentage change in exchange rate is zero, but because of the high volatility in the foreign exchange market, this is unlikely to be the case. Following Meese and Rogoff (1983), the drift factor for the random walk is measured as the average value of the percentage change in the exchange rate. The random walk with drift corresponding to equations (3) and (4) are the following

(5)

and

(6)

Where α is the drift factor, which can be estimated by running a regression of the percentage change in the exchange rate on a constant, in which case the drift factor is the intercept term in the regression. Hence we have

$\dot{S}$ (7)

Where $\dot{S}_t$ is the percentage change in the exchange rate. In general $\dot{} = \hat{\alpha}$, where *n* is the horizon. The estimated value of the drift factor ($\hat{\alpha}$) is basically the percentage change in the exchange rate. If the drift factor is taken into consideration, the return on modified carry trade is

$$\begin{cases} (i \quad) \quad \hat{\alpha} \\ (i \quad) \quad \hat{\alpha} \end{cases} \tag{8}$$

Following the estimation of the period-to-period return for both strategies, the mean and standard deviation for the return are calculated as follow

$$\bar{\pi} \quad \sum \tag{9}$$

$$\sqrt{(\quad 1) \sum \quad \bar{\pi})} \tag{10}$$

The Sharpe ratio is used to measure risk-adjusted return. According to Eling and Schuhmacher (2007), the Sharpe ratio is an efficient measure to evaluate investment strategies. Following Burnside et al. (2011), the Sharpe ratio is calculated as

$$\bar{\pi}/ \tag{11}$$

Data and Empirical Results

The empirical results presented in this paper are based on thirty six currency combinations involving the currencies of the six Gulf Co-operation Council (GCC) countries that include United Arab Emirates dirham (AED), Saudi riyal (SAR), Bahraini dinar (BHD), Qatari riyal (QAR), Omani rial (OMR) and Kuwaiti dinar (KWD) against the Japanese yen (JPY), British pound (GBP), Korean won (KRW), Singaporean dollar (SGD), Canadian dollar (CAD), and Swiss franc (CHF). Monthly data were used for the period of January 2001 to December 2011. Data were obtained from the International Financial Statistics (CD-ROM) and DataStream terminal.

Starting by estimating the drift factor for horizons ranging between one to twelve months, using all possible currency pairs. The results reported in Table 1 show the statistical significance of the drift factor over the number of lags and the expected change in exchange rate. Out of the 36 currency combinations, 24 pairs produce statistically significant drift factors and there was no statistically significant drift over the one month period. For example, the five month CAD/AED drift is -0.38%, implying that this exchange rate is expected to decline by 0.38% after five months. So if a carry trader conducts a position where he goes long AED and short CAD, he should expect that the CAD/AED exchange rate to depreciate by 0.38% over the next five months. The drift factor is then annualized meaning that if the carry trader is planning to hold this position for one year, he should expect the AED to depreciate against

the CAD by 0.912%. The reason behind such differences in the drift factor between the pairs despite being all pegged to the UD dollar, except for the Kuwaiti dinar, is due the fluctuation range set by each central bank individually.

Table 1: Statistical Significance of Drift Factor

Currency Pair	Horizon	Coefficient	t statistics	p-value	Significant	Estimated Drift for the period (â)	Annualized Drift
CHF/KWD	4	-0.004132	2.017*	0.0454	Yes	-0.41%	-1.23%
CHF/BHD	4	-0.004664	2.288*	0.0233	Yes	-0.47%	-1.41%
CHF/SAR	4	-0.004662	2.285*	0.0235	Yes	-0.47%	-1.41%
CHF/OMR	4	-0.004663	2.286*	0.0235	Yes	-0.47%	-1.41%
CHF/QAR	3	-0.003435	1.983*	0.0489	Yes	-0.34%	-1.36%
CHF/AED	4	-0.004663	2.286*	0.0234	Yes	-0.47%	-1.41%
CAD/KWD	4	-0.003504	2.248*	0.0260	Yes	-0.35%	-1.05%
CAD/BHD	5	-0.003789	2.402*	0.0370	Yes	-0.38%	-0.912%
CAD/SAR	5	-0.003787	2.104*	0.0369	Yes	-0.38%	-0.912%
CAD/OMR	5	-0.003788	2.096*	0.0375	Yes	-0.38%	-0.912%
CAR/QAR	5	-0.003792	2.092*	0.0379	Yes	-0.38%	-0.912%
CAD/AED	5	-0.003789	2.098*	0.0373	Yes	-0.38%	-0.912%
KWD/KRW	1-12	-	-	-	No	-	-
BHD/KRW	1-12	-	-	-	No	-	-
SAR/KRW	1-12	-	-	-	No	-	-
OMR/KRW	1-12	-	-	-	No	-	-
QAR/KRW	1-12	-	-	-	No	-	-
AED/KRW	1-12	-	-	-	No	-	-
JPY/KWD	5	-0.004601	2.150*	0.0331	Yes	-0.46%	-1.104%
JPY/BHD	4	-0.004533	2.280*	0.0238	Yes	-0.45%	-1.35%
JPY/SAR	4	-0.004530	2.279*	0.0239	Yes	-0.45%	-1.35%
JPY/OMR	4	-0.004531	2.281*	0.0238	Yes	-0.45%	-1.35%
JPY/QAR	4	-0.004534	2.295*	0.0229	Yes	-0.45%	-1.35%
JPY/AED	4	-0.004531	2.281*	0.0238	Yes	-0.45%	-1.35%
SGD/KWD	3	-0.001479	2.045*	0.0426	Yes	-0.15%	-0.60%
SGD/BHD	10	-0.003894	2.046*	0.0423	Yes	-0.39%	-0.468%
SGD/SAR	10	-0.003890	2.044*	0.0425	Yes	-0.39%	-0.468%
SGD/OMR	10	-0.003892	2.042*	0.0427	Yes	-0.39%	-0.468%
SGD/QAR	10	-0.003898	2.032*	0.0437	Yes	-0.39%	-0.468%
SGD/AED	10	-0.003894	2.045*	0.0424	Yes	-0.39%	-0.468%
GBP/KWD	1-12	-	-	-	No	-	-
BHD/GBP	1-12	-	-	-	No	-	-
SAR/GBP	1-12	-	-	-	No	-	-
GBP/OMR	1-12	-	-	-	No	-	-
GBP/QAR	1-12	-	-	-	No	-	-

AED/GBP	1-12	-	-	-	No	-	-

***** Statistically significant at the 95% confidence level. The critical value of the t statistics is 1.96.

It can be seen, from Table 2, that modified carry trade produced higher returns for 12 currency pairs—for the other 12, the mean return is lower than what is produced by simple carry trade. Looking at average improvement in the mean return over the 24 pairs, it can be seen that the mean return has improved by 0.55% from 0.98% for simple carry trade to 1.53% when the drift factor is considered. The biggest improvement came in the CHF/QAR pair where the mean return increased from 0.47% to 4.31%. On the other hand, considering the drift factor resulted in a -1.808% loss for the SGD/AED position. But, when considering the average of the 12 pairs that had an improvement in their mean returns, it can be seen that the average improvement was 1.65% compared to -0.81% for the 12 pairs that had their mean returns declined. Under simple carry trade, out of the 24 pairs, 19 pairs had a positive mean return while under the modified carry trade that number has increased to 20 pairs. This support Burnside et al. (2006), Lustig and Verdelhan (2007), Lusting et al. (2011), Menkhoff et al. (2012), Rafferty (2012), Bhatti (2012) findings that carry trade is profitable strategy even in its simplest forms since more that 50% of the pairs produced positive returns.

Table 2: Comparative Results between Simple and Modified Carry Trade

Currency Pairs	Mean Return		Standard Deviation		Sharpe Ratio	
	Simple	Modified	Simple	Modified	Simple	Modified
SGD/AED	1.823	-0.076	7.006	5.668	0.260	-0.013
JPY/AED	0.951	2.046	18.189	18.205	0.052	0.112
CAD/AED	0.576	-0.411	13.369	13.523	0.043	-0.030
CHF/AED	-0.742	1.066	18.863	19.018	-0.039	0.056
SGD/QAR	2.036	1.414	7.253	5.679	0.281	0.249
JPY/QAR	1.146	3.367	18.062	17.896	0.063	0.188
CAD/QAR	0.778	0.124	13.432	13.589	0.058	0.009
CHF/QAR	0.473	4.308	21.378	21.045	0.022	0.205
SGD/OMR	2.700	1.867	7.305	5.923	0.370	0.315
JPY/OMR	1.842	4.040	18.136	17.892	0.102	0.226
CAD/OMR	1.465	0.629	13.519	13.723	0.108	0.046
CHF/OMR	1.135	3.720	19.013	18.846	0.060	0.197
SGD/SAR	1.649	0.676	7.276	5.887	0.227	0.115
JPY/SAR	0.749	3.574	18.309	18.083	0.041	0.198
CAD/SAR	0.375	-0.198	13.419	13.569	0.028	-0.015
CHF/SAR	-0.414	1.588	18.985	19.093	-0.022	0.083
SGD/BHD	2.058	0.718	7.192	5.903	0.286	0.122
JPY/BHD	3.813	3.750	18.041	18.169	0.211	0.206
CAD/BHD	-0.288	0.002	13.421	13.570	-0.021	0.000
CHF/BHD	-0.477	0.313	18.941	19.113	-0.025	0.016
SGD/KWD	1.519	0.900	8.458	8.424	0.180	0.107

JPY/KWD	1.602	1.808	14.637	14.635	0.109	0.124
CAD/KWD	0.020	-0.311	13.314	13.422	0.001	-0.023
CHF/KWD	-1.346	1.779	17.577	17.321	-0.077	0.103
Average	**0.98**	**1.53**	**14.38**	**14.09**	**0.068**	**0.109**

The standard deviation for the sample improved slightly after taking the drift factor into consideration, where the average standard deviation for the sample improved from 14.38 to 14.09. Out of the 24 pairs, the standard deviation declines in 13 pairs with an average improvement of 0.646, with most of the improvement seen in the SGD/QAR pair where the standard deviation went down from 7.25 to 5.68. The Sharpe ratio, which is the ratio of mean return to standard deviation, showed improvement after taking the drift factor into consideration. Most of the improvement is seen in the SGD/OMR where it was reduced from 7.305 to 5.923. The average Sharpe ratio for the 24 pairs improves from 0.068 to 0.109. Out of the 24 pairs under study 12 pairs had their Sharpe ratio improved by 0.104 on average compared to -0.08 for the other 12 pairs that had their Sharpe ration declined.

Table 3: The Percentage of Positive Returns

Currency Pairs	Simple CT	Modified CT	Difference
SGD/AED	51.18%	56.25%	5.07%
JPY/AED	53.98%	55.81%	1.84%
CAD/AED	51.43%	50.00%	-1.43%
CHF/AED	50.57%	50.58%	0.01%
SGD/QAR	51.18%	68.75%	17.57%
JPY/QAR	53.41%	60.47%	7.06%
CAD/QAR	52.00%	51.18%	-0.82%
CHF/QAR	54.24%	59.20%	4.96%
SGD/OMR	55.29%	67.50%	12.21%
JPY/OMR	55.68%	61.63%	5.95%
CAD/OMR	56.00%	57.65%	1.65%
CHF/OMR	52.84%	60.47%	7.62%
SGD/SAR	51.18%	60.00%	8.82%
JPY/SAR	52.84%	59.30%	6.46%
CAD/SAR	50.86%	50.59%	-0.27%
CHF/SAR	51.70%	51.16%	-0.54%
SGD/BHD	55.88%	58.75%	2.87%
JPY/BHD	61.36%	58.72%	-2.64%
CAD/BHD	49.71%	51.18%	1.46%
CHF/BHD	51.14%	48.84%	-2.30%
SGD/KWD	53.90%	55.63%	1.73%
JPY/KWD	57.89%	53.06%	-4.83%
CAD/KWD	49.02%	48.99%	-0.03%

CHF/KWD	48.37%	54.36%	6.00%
Average	**52.99%**	**56.25%**	**3.26%**

Modified carry trade also produced a larger number of positive returns as seen in Table 3. The percentage of positive returns was higher for 16 out of the 24 pairs. The average improvement for the 16 pairs was 7.61% and the overall average improvement for the whole 24 pairs was 3.26% (from 52.99% to 56.25%). SGD/QAR had the biggest improvement where the percentage of positive returns goes up from 51.18% to 68.75% (that, is an increase of 17.57%). To examine the correlation between mean return and number of positive returns, regression was made between them and a statistically significant relation was found.

Conclusion

In this paper the outcome of considering the effect of embedding statistically significant drift factor on carry trade profitability was examined. The results showed that carry trade, despite ignoring the information embodied in the statistically significant drift factor of the exchange rate movements, produced positive returns which is consistent with previous studies. But, such returns could have been enhanced if the drift factor was taken into consideration. This paper exhibited that embedding the drift factor into the selection process led to an improvement in terms of both return and risk. Since both strategies that were compared are based on the random walk, the results support Engel and Hamilton (1990) findings that the random walk with drift is a more reasonable standard of comparison when the drift factor is significantly different from zero.

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