Working Paper Series

Carry Trade with Maintained Currencies

A Risk and Return Analysis for the Egyptian Pound

by
Christian Kalhoefer
Sara Shenouda
Ahmed Badawi

Carry Trade with Maintained Currencies: A Risk and Return Analysis for the Egyptian Pound

by
Christian Kalhoefer
Sara Shenouda
Ahmed Badawi

Abstract

The forward premium puzzle in the exchange rate market, resulting from the deviation and failure of interest rate parity, has awakened the interest of speculators to perform carry trade activities. Across literature the main risk associated and measured for carry trade has been the exchange rate risk and crash risk related to the relevant currencies used. But within the literature, the influence of maintained currencies on the carry trade results has not yet been covered. This paper analyzes the potential performance and the risk of carry trade strategies within a maintained exchange rate regime. For this analysis an empirical study of carry trade strategies applied between the EGP and other currencies has been used and compared to those with the USD as an example for a maintained exchange rate. Our risk and return analysis clearly shows a combination of high return and low risk for the maintained currency carry trade.

JEL classification

Keywords

Christian Kalhoefer
German University
in Cairo
Department of Finance
Al Tagamoa Al Khames
11835 New Cairo – Egypt
christian.kalhoefer@guc.edu.eg

Sara Shenouda
German University
in Cairo
Department of Finance

Ahmed Badawi
German University
in Cairo
Department of Finance

(corresponding author)

1 Introduction

The global interest in the exchange market and the growth of the transactions performed within raises the question of benefits that can be won from the different currencies. Exchange rates between currencies are defined as the price of a currency in another currency. These are determined on a daily basis reflecting various variables in the economy (Murphy 1985, 71). Several theories have been developed to explain and calculate the expectations of exchange rate movements, but despite these theories exchange rates move haphazardly with no defined explanation (Brunnermeier et al. 2008, 2). One of the variables that are economy related and are said to be reflected in the exchange rates are interest rates (Flood and Rose 2002, 252).

Two different theories explain the movement of exchange rates based on interest rates differentials, those were given the names "Chicago" theory and the "Keynesian" theory by Frankel (1979). The first theory argues from the basis that the interest rate differential is a reflection of inflation and depreciation. The high interest rates on a currency reflect accordingly the expectation of decreasing value, this leads to the demand for this currency to fall and the depreciation falls even more. There exists a positive relationship between exchange rates and interest rates. The second theory argues that that interest rate differential has to do with the monetary policies on the country. The rising interest rates under this theory are a reflection of a shortage in the money supply compared to the money demand; an increase in interest rates will then attract investors and the currency accordingly appreciates. There exists a negative relationship between exchange rates and interest rates (Frankel 1979, 610).

The relationship between the exchange rates is explained through the uncovered interest parity (UIP) and matches the Chicago theory. UIP argues that currencies that yield high interest rates are expected to depreciate in value while currencies that yield a low interest rate are expected to appreciate. The interest rate differential between the two currencies is said to equal the ex post change in exchange rate (Flood and Rose 2002, 252). Under the UIP an investment in a domestic currency or a foreign currency should be equal in terms of their return since the low yielding asset should appreciate with an amount equivalent to the difference in the yield (Christiansen et al. 2009, 3 and Olmo and Pilbeam 2009, 234). This happens as countries attract foreign investment through proposing high interest rate and the capital inflow to the country causes an appreciation of the currency. This appreciation of the currency however does not happen immediately but over a certain time horizon. In that meantime speculators who anticipate this appreciation reflected in decreasing exchange rates will withdraw their capital, which is disturbing the appreciation of the currency and can even cause it to start depreciating and by that fulfill the theoretical concept of UIP (Brunnermeier et al. 2008, 3). The end position between the depreciation of the one currency versus the appreciation of the other eliminates the profit from interest differential (Giddy 1977, 25 and Gyntelberg and Remolona 2007, 73).

Within the theory of UIP an investor should be indifferent between the two currencies in terms of his choice of investment. Should the UIP not hold so would the high interest rate currencies be an attractive choice for investment. The debate over the usability and accuracy of the uncovered interest rate parity has been argued in literature for a long time; James et al. 2009 quote a statement by Shafer et al. back in 1983, indicating that there is evidence of the possible failure of uncovered interest parity due to the irrational expectations it holds. Fama in 1984 and Bilson 1981 also quoted by James et al. 2009 have similar arguments in regard to the uncovered interest parity and argue that the forward exchange rates are a weak prediction of future spot rates (James et al. 2009, 124). Reasons for the deviation from the theory of uncovered interest parity are often attributed to one or a mix of factors like risk premium, irrational speculation, peso problem and the non linearity of exchange rates, illiquidity spirals, and crash risks, but are also put in many situations on the carry trade investment strategies (Christiansen et al. 2009, 3; Olmo and Pilbeam 2009, 232 and James et al. 2009, 124).

2   Idea and Risks of Carry Trades

The fact that the UIP does not always hold can be used for speculative investments. A carry trade is such a speculative strategy and is usually seen practiced by investors on the international financial markets once they explore there is a difference in the interest rates offered on different currencies (Cavallo 2006, 1; La Marca, 1 and James et al. 2009, 124). In return to this observation investors follow the basic strategy of low cost versus high return strategy by borrowing funds in the low interest currency, convert them into a currency with a higher interest and invest the amount to generate that yield difference creating leveraged cross currency speculative positions. The behavior of borrowing funds is not necessary the starting position; the investor might also own the low interest currency and sell it in exchange for the investment currency (Christiansen et al. 2009, 3; Brunnermeier et al. 2008, 2; Bhansali 2007, 72 and La Marca, 1). As long as the currency they invest in keeps appreciating they generate profit, and if the currency depreciates they only start making loss when the depreciation exceeds the interest rate differentials (Olmo and Pilbeam 2009, 237). The low interest rate currencies are also given the term funding currencies and the high interest rate currencies the term target currencies or investment currencies (Cavallo 2006, 1 and Brunnermeier et al. 2008, 2). The strategy is regarded as a practical bet against the theoretical concept of the UIP (Moosa 2008, 10).

A carry trade based on interest rates differential is explained through the forward premium puzzle. It follows the above mentioned Keynesian expectations of exchange rate movements and argues that in practice the currencies with low interest rates that were expected to appreciate tend to depreciate and currencies with high interest rates that were expected to depreciate tend to appreciate. This contradiction between theory and practical is often referred to as the forward premium puzzle and is considered the basis why carry trade is applied and generates profit. This deviation can be explained by the economic principle of supply and demand. Under the carry trade investors buy the investment currency

with high interest rates and sell the funding currency with low interest rates. While more investors practicing the strategy the demand of the target currency leads to its appreciation and the supply of the funding currency leads to its depreciation. (Galati et al. 2007, 27; Brunnermeier et al. 2008, 2 and La Marca, 2). These when happen increase the profit of the strategy even more and under these expectations it is no longer questionable why carry trade is attractive (Cavallo 2006, 3).

The benefit of a carry trade investment strategy can be seen on multiple dimensions. For the carry trade investor a return from borrowing in low interest rate economies and investing in high interest rate economies can be traced; and for the developing country that offers high interest rates they now have access funds deposited available for domestic investors to take out as credits. This availability of credits helps the economy to boom and affects both consumption and investments. However, this change and boom is then reflected on the prices of goods and services affecting trading activities which then affect exchange rates as the domestic currency appreciates (La Marca, 1).

As explained before, based on the expectations of the UIP the carry trade should not generate any excess profit (Olmo and Pilbeam 2009, 231 and Galati et al. 2007, 28). Therefore, the risk embedded in the carry trade is that the UIP holds and an excess profit cannot be achieved. The worst case would be the change in exchange rate where the target currency depreciates against the funding currency even more than described by the UIP. This indicates that the open position in the currency is the main risk the investor faces (Bhansali 2007, 72 and Cavallo 2006, 2). A specific form of the risk associated with exchange rates is the crash risk. When carry trade investors hold on to their investment this causes the currency to keep appreciating creating an exchange rate bubble. The bursting of the bubble and the sudden drop in values takes place once the carry trade investors decide to start closing their position. This risk tends to increase with more carry trade investors approaching the market. And with the ongoing growth in the carry trade activities, exchange rate developments continue to be influenced by these activities. Therefore exchange rates are regarded like assets that move just like asset prices largely influenced by the investors and speculators and their trading activities (Galati et al. 2007, 27; La Marca, 2 and Brunnermeier et al. 2008, 3).

To assess the risk of carry trade strategies, different approaches have been applied. Most commonly used techniques include the Standard deviation (STD) and Value at Risk (VaR) of the results. (Moosa 2008, 10 and Gyntelberg and Remolona 2007, 73). The profitability/risk profile of carry trades has also been determined by the Sharpe Ratio as it is considered is a tool to calculate the risk adjusted return. For a long period the calculated Sharpe Ratio for carry trades was high, even outperforming the S&P 500 Sharpe Ratio (La Marca, 2 and Moosa 2008, 10). These measures, in addition to others, will be applied in the analytical part of this paper.

For the mentioned reasons, carry trade in general is said to be found in application when significant interest rate differentials are observed and volatility in the exchange rate is low (Gyntelberg and Remolona 2007, 73; Bhansali 2007, 72 and Galati et al. 2007, 28). The described preconditions can often

be seen in the market when comparing interest rates of developed and developing countries; where additionally several developing countries have their currencies maintained against the United States Dollar (USD). A prominent example for this behavior, although not a typical developing country, would be China. Another example can be found in the Egyptian Pound (EGP). The next section analyzes the riskiness of carry trade with the Egyptian pound as investment currency, using USD, Euro (EUR) and British Pound (GBP) as funding currencies.

3   Carry Trade with the Egyptian Pound

3.1   Methodology

The data series chosen for this analysis starts January 2006 and ends May 2008, representing 623 trading days. For this period, the interest rates on EGP, EUR, USD and GBP were gathered as well as the exchange rates between all of them. To be able to test the general idea of the carry trade under maintained exchange rates, it was checked whether the suggested currencies match the requirements.

Within the 2.5 years, Egyptian interest rates have been on average more than 4% higher than the US rates, almost 4% higher than EUR rates, and more than 2% higher than the GBP rates. From this information alone the USD versus EGP would indicate the highest interest rate differential which is the first criteria for carry trade, followed by the EUR and lastly the GBP. As this paper mainly seeks to test the carry trade strategy under maintained exchange rates, the fluctuation of exchange rates is the next criteria examined. Considering the Standard Deviations, USD and EUR appear to have the lowest, so together with the interest rate differential, they seem to be similarly suited to perform the carry trade. The GBP has a lower interest rate differential and a higher fluctuation of exchange rates.

Currency	USD/EGP	EUR/EGP	GBP/EGP
Average Interest Rate Differential	4.20%	3.99%	2.09%
Average Yearly Change	-2.72%	7.49%	3.35%
Standard Deviation of Yearly Changes	2.58%	2.62%	6.30%
Range of Yearly Changes	13.84%	13.47%	26.26%

Table 1: Analysis of the sample data

But although the Standard Deviation of the yearly changes in the exchange rates does not differ significantly between the EGP/USD and the EGP/EUR exchange rate, as well as the range, the latter shows higher fluctuations as the average yearly change is 2.75 times higher than the average yearly change of the EGP/USD rate. The fluctuation between USD and EGP is low, because the exchange rate is not free floating but maintained. Evidence for this can be found through a regression between

the daily changes of the USD/EUR exchange rates and the EGP/EUR rates as shown in Figure 1. The cross rate between the two chosen currencies reflects the (maintained) EGP/USD rate. As the equation as well as R^2 indicate, changes in the USD/EUR exchange rate can be almost exactly explained by the changes of the EGP/EUR exchange rates. If, as a comparison, this analysis is done for unmaintained currencies like EGP and EUR, the result will be much more scattered, as shown in the right graph of Figure 1 for a regression done for the USD/EUR and EGP/USD exchange rates. Within the sample currencies, EGP/USD clearly represents the maintained currency; the other two combinations are free floating rates.
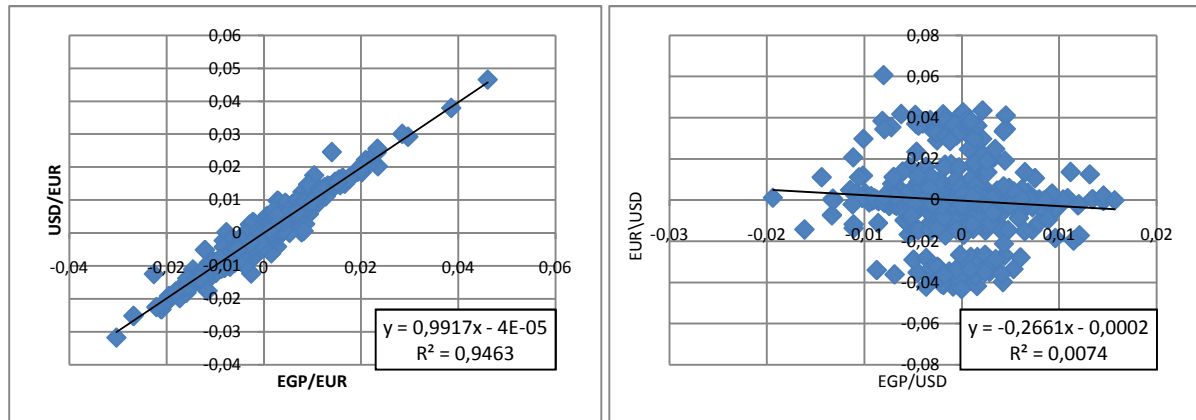

Figure 1: Regressions between USD/EUR, EGP/EUR and EGP/USD exchange rates

As described above, the carry trade strategy works as follows: an investor owning funds in any of the funding currencies, EUR, USD or GBP converts these funds into the investment currency EGP for a certain period and re-exchanges the funds at the end, hoping that the return of this speculative strategy would be higher than a direct investment in the funding currency. In such a case the investor would be considered to have obtained excess return and has outperformed an alternative direct investment in the funding currency. The first required step is to calculate the outcome of the carry trade, using:

$$I_{f,t+1} = I_{f,t} \cdot x_t \cdot (1 + i_i) \cdot \frac{1}{x_{t+1}} \qquad\qquad [1]$$

where $I_{f,t}$ = *invested amount in t, nominated in funding currency*
$\quad\qquad I_{f,t+1}$ = *value of the investment in t+1, nominated in funding currency*
$\quad\qquad x_t$ = *exchange rate at the beginning of the investment (direct quote)*
$\quad\qquad x_{t+1}$ = *exchange rate at the end of the investment (direct quote)*
$\quad\qquad i_i$ = *investment interest rate*

This step alone does not show if the strategy has outperformed the direct investment in the funding currency and therefore the performance of the carry trade is calculated. The performance in percentage is represented by the relative output minus the funding currency interest rate.

$$p = \frac{I_{f,t} \cdot x_t \cdot (1 + i_i) \cdot \frac{1}{x_{t+1}}}{I_{f,t}} - 1 - i_f \qquad\qquad [2]$$

where p = *percentage performance of the carry trade*
$\quad\qquad i_f$ = *funding interest rate*

This equation can be rewritten as:

$$p = \frac{x_t}{x_{t+1}} \cdot (1 + i_i) - (1 + i_f) \qquad\qquad [3]$$

The only uncertain element within this equation is the future exchange rate x_{t+1}. That affirms the literature review about carry trade where the exchange rate is considered the main risk faced by the strategy which therefore will determine the potential success.

As a side not, it should be mentioned again that, according to the UIP, the interest rate differentials between two currencies should be balanced by the change of exchange rates over the time. Therefore, a market matching these conditions should be arbitrage free; an investment strategy that tries to exploit interest rate differentials between currencies would not create a positive performance if the re-exchange of the currency is done at a (fairly priced) forward rate or as long as the market rates change accordingly to the UIP. In this case, the performance should not exceed zero.

$$p = \frac{x_t}{x_{t+1}} \cdot (1 + i_i) - (1 + i_f) = 0 \qquad\qquad [4]$$

If this holds, the equation can be rewritten as the well known interest rate parity equation.

$$\frac{x_t}{x_{t+1}} = \frac{1 + i_f}{1 + i_i} \qquad\qquad [5]$$

It has already been mentioned that the potential success of a carry trade is dependent on two aspects:

- the interest rate differential between the two currencies at the beginning and
- the exchange rate at the end of the investment.

To identify the potential success of a carry trade as described in equation [3], sample data has been analyzed. The above mentioned data set consists of 623 trading days and therefore 623 daily interest rates and exchange rates for USD, EUR, GBP, and EGP. With an investment duration of one year, this data set can be used to derive 364 carry trades of one year duration each. The carry trade is applied as follows:

- Exchange the low interest funding currency (USD, EUR, and GBP) into the investment currency EGP.
- Invest the EGP in Government Bonds for one year.
- Re-Exchange the EGP into the original funding currency at the end of the year.

It is assumed that applying the strategy using USD and EGP would provide the highest outcome, as these two currencies combine high interest rate differential and based on a maintained exchange rate system have low fluctuation, therefore matching the preconditions for a successful carry trade mentioned above. To analyze return and risk, first of all some basic descriptive statistics are applied on the historical data (ex-post analysis). Secondly, an analysis based on risk the adjusted performance is conducted, representing an ex-ante analysis.

3.2 Data Analysis

The results of the first analysis clearly support the assumption (Table 2). On average, applying the described carry trade with the USD as funding currency has lead to a performance of 7.12%, indicating that exchanging USD into EGP, investing them at the EGP rate for one year and then re-exchange the proceeds to USD is outperforming the direct investment in USD by 7.12%. The Standard Deviation of the results is 3.05%. Even in the worst case, the USD investor would have earned almost the interest of USD.

Currency	USD/EGP	EUR/EGP	GBP/EGP
Average Performance	7.12%	-2.31%	0.41%
Standard Deviation	3.05%	2.38%	6.41%
Minimum Performance	-0.29%	-8.69%	-11.54%
Maximum Performance	14.86%	5.89%	14.39%
Average Sharpe Ratio	2.34	-0.82	0.06

Table 2: Ex post analysis of the carry trade

Performing the same carry trade strategy on the other currencies would on average have resulted in almost zero or negative performance. Although in this analysis the standard deviation of the EUR/EGP is even lower than that of the USD/EGP, it is not a good indicator of the risk situation as the average performance of the EUR/EGP is negative.

As the Sharpe ratio has been suggested in the literature as a reference for the relation between risk and return, it has also been derived for this analysis.

$$S = \frac{E(r - r_f)}{\delta_{r - r_f}} \qquad\qquad [6]$$

where S $\quad\quad$ = *Sharpe ratio*
$\quad\quad\quad$ $E(r - r_f)$ = *expected performance*
$\quad\quad\quad$ $\sigma_{r - rf}$ $\quad$ = *standard deviation of the performance*

The analysis again shows the same picture: the USD based strategy shows by far the highest Sharpe ratio, for the other two, the ratio is close to zero or even negative for the first appeared interesting alternative of the EUR/EGP.

For a deeper and more advanced analysis, the relation between risk and return is considered with reference to the economic value of the investment. Therefore, risk adjusted performance measurement (RAPM) is applied. The most commonly used indicator is the return on risk adjusted capital (RORAC). Although various definitions of RORAC exist, a common understanding is that RORAC relates the performance to the risk.

$$RORAC = \frac{P}{R} \qquad\qquad [7]$$

where $RORAC$ = *return on risk adjusted capital*
$\quad\quad\quad$ P $\quad\quad\quad$ = *monetary performance*
$\quad\quad\quad$ R $\quad\quad\quad$ = *risk*

As currency risk is a market risk, the Value at Risk can be applied as risk measure. The Value at Risk is the (1-α)-Quantile of the probability distribution of market value changes, while this is represented by the performance in this sample, and can be mathematically derived from the inverse of this probability function.

$$VaR_{t,\alpha} = F^{-1}(x_{1-\alpha}) \hspace{4cm} [8]$$

where   *t*   *= holding period*
           a   *= confidence level*
           F⁻¹   *= inverse of the probability distribution*
           x   *= variable*

The VaR is indicating the risk for a certain holding period; it is therefore looking into the future.

The performance of the chosen carry trade has already been described in formula 3: it is the excess profit generated in comparison with the direct investment in the funding currency. For the RORAC calculation, the performance has to be stated as a monetary figure; therefore the percentage must be multiplied with the originally invested amount.

$$P = I_{f,t} \cdot \left[\frac{x_t}{x_{t+1}} \cdot (1 + i_d) - (1 + i_f) \right] \hspace{3cm} [9]$$

To calculate the performance for the sample, the above mentioned formula is applied on an investment of 100,000 USD, EUR, and GBP, respectively.

According to the theoretical concept of VaR to assess market risk it is usually suggested to use an analytical (variance/covariance) approach or a historical simulation. Two arguments caused the choice of the historical simulation over the analytical approach;

- first the exchange rate fluctuations do not follow a normal distribution; and
- second the usage of EGP Interest Rate fluctuation as a one of the Risk Parameters for all carry trade strategies will lead to a constant variable among all currencies and therefore limit the evidence.

For the adoption of the historical simulation, from the given data set a total of 623 trading days was available, representing 2.5 calendar years. Since an observation period of at least one year should be used for the VaR, first year data set of 259 trading days had to be used to derive the returns for the second year; leaving a set of 364 days data to be used for the VaR calculation. As the first 258 days of the data represent the second year with its returns, a series of historical scenarios could be made for the remaining 106 days, using 258 daily scenarios each, and therefore resulting in a total of 27,348 different potential performances for each currency combination. Sorting the list of the 258 simulated daily performances for each of the 106 days results in the daily probability distributions of the performance. Applying the formula $((1 - \alpha) \cdot n + 1)$ results in the xth element of the list to reflect the corresponding VaR. This under a confidence level of 99.9% and with n=258 leads to the 1st element of the list being the VaR. The expected return is represented by the average return of the calculated scenarios. Some results are summarized in Table 3.

Currency	USD/EGP	EUR/EGP	GBP/EGP
Total number of Scenarios created	27,348	27,348	27,348
Number of Probability Distributions created	106	106	106
Average Performance	8,294 USD	-3,638 EUR	-5,437 GBP
Average Value at Risk	38 USD	9,407 EUR	15,271 GBP
Average RORAC	2,055.41%	-35.33%	-34.05%
Scenarios with negative Performance	10 (0.04%)	24,835 (91.68%)	22,139 (81.72%)
Probability Distributions with determinable Value at Risk at 99.9%	10 (9.43%)	106 (100%)	106 (100%)
Probability Distributions with determinable Value at Risk at 99%	0 (0%)	106 (100%)	106 (100%)

Table 3: Analysis of risk adjusted performance measurement

Applying the carry trade for EUR and GBP as funding currency, the average RORAC is negative, because the average performance is negative. For these two currencies, more than 91% and 81%, respectively, of the simulated results show a negative performance. For the USD investment the average RORAC is 2,055.41%. The high ratio can be explained when recognizing that, within the analyzed time series, the historical simulation shows only ten negative performance result for the USD investment while the remaining 27,338 scenarios show a positive performance. As these ten negative results have occurred on ten different days, the average RORAC consists of ten results; for the other 96 days, a RORAC cannot be calculated as the VaR is Zero. However, the mentioned average Value at Risk of 38 USD includes all the days with a zero VaR; the average for the 10 days is app. 400 USD, therefore still much lower than the average calculated for the other two currencies. If the confidence level is lowered to 99%, the USD based carry trade results would not leave one day with a determinable Value at Risk, as no negative performances exist at this confidence level, so at 99% the average VaR would be zero. To sum up, the risk adjusted performance measurement is again indicating the low risk of the carry trade if applied based on the maintained EGP/USD exchange rate.

The findings of the analysis clearly show the potential high return – low risk situation if a carry trade is applied between maintained currencies. Although this result itself might not be surprising, the level of return and risk that has been derived in this analysis certainly is unexpected as it violates the general idea of risk and return relationship. While the strategy appears to be an attractive choice for currency investors, the question of a currency shock remains unaddressed so far. Therefore, a worst case analysis is performed using sensitivity analysis for the currency shock. Should the shock results be

significantly higher under the maintained carry trade strategy than in the other two, the results of the previous analysis can be viewed as misleading, because a potential high loss in a shock scenario might override any other promising results. This can prevent investors from engaging in such a strategy.

The magnitude of the shock effect is calculated by taking the first derivative of the strategy proceeds with respect to x_{t+1}. Using equation 3 this will be

$$\frac{\Delta p}{\Delta x_{t+1}} = -\frac{x_t}{x_{t+1} \cdot x_{t+1}^*} \cdot (1 + i_i) \qquad [10]$$

where   *Δp*   *= performance change*
          Δx_{t+1}   *= exchange rate change*
          x_{t+1}^*   *= exchange rate in t + 1 after the shock*

if the effect of the shock is indicated separately using the x_{t+1}^*. This equation might be rewritten as

$$\Delta p = -\frac{x_t}{x_{t+1} \cdot x_{t+1}^*} \cdot (1 + i_i) \cdot \Delta x_{t+1} \qquad [11]$$

to calculate the effect of the shock on the performance. If the shock is expressed as a percentage change of the future exchange rate, the performance change can also be written as:

$$\Delta p = -\frac{x_t}{x_{t+1} \cdot x_{t+1} \cdot (1+s)} \cdot (1 + i_i) \cdot x_{t+1} \cdot s = -\frac{x_t}{x_{t+1}} \cdot \frac{s}{1+s} \cdot (1 + i_i) \qquad [12]$$

where   *s*   *= shock in percentage*

It is clear from equation 12 that besides from the future exchange rate itself, Δp will be mainly affected by the assumed shock. As $s/(1 + s)$ is lower than s, the expected change in performance will be less than the assumed shock. This result can clearly be seen in the analysis of the data sample. Two different approaches have been used; the results are summarized in Table 4.

- First, a depreciation of the investment currency of 20% was assumed. This has been the worst case that could be observed in the last ten years; at the beginning of 2003 the Egyptian pound depreciated by approximately this amount against the USD within a couple of days. Although in this example it was not a real shock as the black market exchange rate was already matching this effect beforehand, investors should be aware that this kind of event might happen in the future.
- Second, the worst case from the chosen data sample was applied per currency. Here the worst case yearly depreciations of the EGP have been approximately 4%, 14%, and 16% for the USD, EUR, and GBP exchange rates respectively.

For both approaches the effect of the shock was calculated for the available 259 historical scenarios. The standardized 20% shock shows similar results for all three currencies, with an average effect on the performance between -16.9% and -18.9%. However, it is remarkable that the highest effect can be seen for the USD/EGP strategy. Keeping in mind that the average performance of the USD carry trade in the mentioned scenarios was exceptionally higher than in the other two currencies (see Table 2), the amount of shock induced risk is not significantly different from the other two currencies. The same analysis for the worst case from the data sample shows the lowest risk for the USD/EGP, as the max-

imum depreciation of the EGP was by far the lowest. Finally, as a benchmark scenario, the hypothetical case of a perfectly maintained currency ($x_{t+1} = x_t$) shows that the average performance change of a 20% shock is around -18%; therefore pretty similar to the results from the data sample.

Currency		USD/EGP	EUR/EGP	GBP/EGP
Data Sample and 20% shock	Range Δp	2.5067%	2.2928%	3.7266%
	Max. Δp	-19.9866%	-18.1752%	-20.0563%
	Min. Δp	-17.4799%	-15.8824%	-16.3297%
	Average Δp	-18.8963%	-16.9375%	-18.1020%
Data Sample and data sample worst case	Range Δp	0.5785%	1.6894%	3.0841%
	Max. Δp	-4.6123%	-13.3923%	-16.5983%
	Min. Δp	-4.0338%	-11.7028%	-13.5142%
	Average Δp	-4.3607%	-12.4803%	-14.9810%
Perfectly maintained currency and 20% shock	Range Δp	0.4258%		
	Max. Δp	-18.3678%		
	Min. Δp	-17.9420%		
	Average Δp	-18.2048%		

Table 4: Performance Change under different Worst Case Scenarios

The results show that the risk of the USD/EGP carry trade in a worst case scenario is not higher than in the other currencies, therefore supporting the previous findings.

4   Conclusion

The comparison of carry trade strategies with maintained and free floating currencies clearly shows a significant advantage of applying it to a maintained currency over free floating currencies in terms of risk and return. The results of the historical data analysis show an average performance of almost zero for the EGP/GBP strategy (which would be, to be mentioned as a side note, an indicator in favor of the UIP). In the EUR case, the results are clearly negative. On the other hand, using the USD as a funding currency would have outperformed the USD interest rate by more than 7% and with a relatively low standard deviation.

The results of the simulation show a similar picture for the USD, indicating a high potential return and a relatively low risk. For the other two currencies, the average simulated performance was negative and the risk calculated was significantly higher compared to the USD strategy. As a side result from the simulation, the results do not support the UIP. However, the analysis clearly shows the high return – low risk potential of carry trades in maintained currencies. Furthermore, the worst case / shock scenario shows no excess risk for the maintained currency.

Some limitations should be mentioned. All performance results have been calculated without considering transaction costs or bid-ask spread, although setting up the carry trade from the point of view of an investor who already owns the funding currency limits the problem of the bid-ask spread. Including them would lead to lower performance figures. The risk-return structure for the analyzed currencies could also be analyzed for shorter durations, e.g. three months. Furthermore, from a different point of view, it would also be interesting to analyze the exchange rate fluctuation with respect to the UIP theory.

References

Bhansali V. (2007): Volatility and the Carry Trade. The Journal of Fixed Income. Winter 2007, 72- 83

Brunnermeier M. K., Nagel S. and Pedersen L. H. (June 2008): Carry Trades and Currency Crashes. 1-35

Cavallo M. (2006): Interest Rates, Carry Trades and Exchange Rate Movements. FRBSF Economic Letter. November 2006-31, 1-3

Christiansen C., Ranaldo A. and Soederllind P. (2009): The Time-Varying Systemic Risk of Carry Trade Strategies. Swiss National Bank, November 2009, 1-34

Flood R. and Rose A. (2002): Uncovered Interest Parity in Crisis. IMF Staff Papers, Vol. 49 No.2, 252-266

Frankel J. (1979): On the Mark: A Theory of Floating Exchange Rates Based on Real Interest Differentials. The American Economic Review, Vol. 69 No.4, 610-622

Galati G., Heath A. and McGuire P. (2007): Evidence of Carry Trade Activity. BIS Quarterly Review, 27-41

Giddy I. H. (1977): Exchange Risk: Whose View? Financial Management, Vol. 6 No. 2, 23-33

Gyntelberg J. and Remolona E. M. (2007): Risk in Carry Trades: A Look at Target Currencies in Asia and the Pacific. BIS Quarterly Review, 73-82

James J., Kasikov K. and Secmen A. (2009): Uncovered Interest Parity and the FX Carry Trade. Quantitative Finance, Vol. 9 No. 2, 123-127

La Marca M (no year): The Carry Trade and Financial Fragility. Policy Briefs of the Intergovernmental Group of Twenty Four G-24, No. 53

Moosa I. A. (2008): Risk and Return in Carry Trade. Journal of Financial Transformation, Vol. 22 No. 3, 10-15

Murphy J. C. (1985): Reflections on the Exchange Rate System. The American Economic Review, Vol. 75 No. 2, 68-73

Olmo J. and Pilbeam K. (2009): The profitability of carry trades. Ann Finance 5: 231-241. Springer-Verlag