THE PROFITABILITY OF CARRY TRADE:

EVIDENCE FOR FIVE CIS COUNTRIES

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ABSTRACT

This paper explores whether carry trade operations in the five CIS currencies – Armenian drams, Azerbaijani manat, Kazak tenge, Kyrgyz soms and Moldovan lei – were profitable over the period 1996:01-2010:02. The results show that carry trades in the five CIS currencies funded by short positions in the Japanese yen and Swiss franc outperform the two major stock markets–the Japanese Nikkei 225 and Swiss market indices. The annualized quarterly returns in carry trades range between 1.5% and 14.01%, whereas those on the Swiss market and Japanese Nikkei 225 market indices are 5.79% and -3.4%. The results show that the average annualized interest differential are the highest for the Kyrgyz soms and Armenian drams and the lowest for the Kazakh tenge and Azerbaijani manat when carry trades in these currencies are funded with short positions in both the Japanese yen and Swiss franc. However, the quarterly annualized mean return in carry trades is the highest in the case of Armenian drams and the lowest in the case of the Kazakh tenge. These findings are also strongly supported by the Sharpe ratios, which are 0.44 and 0.48 for the former currency pairs and only 0.04 and 0.05 for the latter pairs, implying that the risk-adjusted return in carry trade is the highest for the Armenian drams.

Key words: Uncovered interest parity, exchange rate and open economy
JEL Classification: F30, F31, F41.

INTRODUCTION

This paper explores the profitability of carry trade in five CIS countries–Armenia, Azerbaijan, Kazakhstan, Kyrgyzstan and Moldova. Carry trade is described as a highly speculative investment strategy whereby a currency manager borrows funds in a currency yielding low interest rates (funding currency) to finance investment in a currency yielding high interest rates (target currencies) in order to capitalize on the interest differential and possibly on the expected movement in the exchange rate of the target against the funding currency. The carry trade operation remains profitable as long as the gain from the interest rate differential is not overwhelmed by short-to-medium term movements in exchange rates (Galati *et al*, 2007). While one can be certain about the interest differential, he is not what the exchange rate will be of the target against the funding currency at the time the loan will be repaid in the funding currency. The movement in the exchange rates between the time the funds are borrowed and paid back in low-interest currencies can add to the gains emanating from the interest differentials, result in a smaller gain, or give rise to even a huge loss[1]. This implies that the return in carry trades depends not only on the interest differential between funding and target currencies but also on the expected rate of change of the exchange rate of the latter against the former currencies. The carry trade operation becomes highly profitable as long as the high-interest currencies appreciate against the low-interest currencies. On the contrary, depreciation of the high-interest currencies may wipe out much of the gains from the interest differential, and can even put a carry trader out of business if the depreciation of the high-interest currencies is much higher than the interest differential[2]. Consequently, the carry trade operation may entail a high degree of risk if the target currencies depreciate possibly by more than the interest differentials over the holding period.

Carry trades have important implications for the exchange rates of funding against target currencies as well as for monetary policies pursued in countries with low- and high-interest currencies. Galati *et al* (2007) argue that carry trades typically tend to have asymmetric impact on exchange rates. In general, the build-up of these positions is viewed to result in a persistent strengthening of target currencies and weakening of funding currencies[3]. La Marca (2007) holds the same view by arguing that the relative funds involved in carry trade activities may trigger a cumulative effect on exchange rates, inducing an appreciation of target currencies and a depreciation of funding currencies. According to him, Japanese-yen- and Swiss franc-funded carry trade operations appear to have been responsible for a persistent trend to towards appreciation of high-yielding currencies, such as the Australian dollar, New Zealand dollar, Brazilian real, Turkish lira, South African rand, Korean won and the currencies of some transition economies such as Hungry, Romania, Bulgaria and the Baltic states. Funding currencies, such as the Japanese yen and Swiss franc, have demonstrated an opposite trend. It is also argued that national monetary policies in these countries have become increasingly affected by the pressures on exchange rates and inflows of short term capital. The fear of a sudden stop of inflows of short term capital, currency depreciation and a consequent inflationary pressure may induce central banks in these countries to maintain high interest differentials and accommodate the increasing appetite of carry traders.

This paper aims to explore the profitability of the Japanese yen and Swiss franc–funded carry trades in five currencies of the countries of independent states (CIS) – Armenia, Azerbaijan, Kazakhstan, Kyrgyzstan and Moldova – using historical quarterly data on three-month Treasury bills interest and spot exchange rates over the period 1996:01-2010:02. Since the independence of these countries from the Soviet Union and their transition to a market economic system, nominal interest rates in these CIS countries have been, and are still consistently much higher than those of the two major currencies. Over the period under consideration, the annualized average quarterly interest rates on T-bills in Japan and Switzerland are in the range of 0.21% and 1.26% respectively, whereas the average annualized quarterly interest rates are in the range of 19.31% (Kyrgyzstan) and 10.31% (Kazakhstan) in the five CIS countries. This provides incentive to currency managers around the world to borrow funds in the Japanese yen and Swiss franc[4] and invest the funds borrowed in each of the five currencies of the CIS countries to capitalize on differences in interest rates and possibly on exchange rate movements. The objective of the paper is to explore whether such carry trade opportunities in 10 currency pairs of the CIS countries with the Japanese yen and Swiss franc have been profitable over the period under consideration. Besides, the paper aims to assess whether there is any degree of risk involved in carry trades in the five CIS currencies funded by the two major currencies. Several measures of return and risk are employed in this study[5]. The measures of return used in this paper include mean annualized and cumulative returns, whereas those of risk include standard deviation, downside semi-standard deviation and value at risk. The Sharpe ratio is also used which measures a risk-adjusted return on carry trades.

CARRY TRADE THEORY

Carry trade strategies are closely linked to the uncovered interest parity (UIP) hypothesis postulating that high-interest currencies should depreciate whereas low-interest currencies should appreciate by exactly the extent of the interest differential. Let i_t^F and i_t^T be the interest rates on the funding and target currencies respectively set at time *t*, where $i_t^F < i_t^T$. Also let S_t and S_{t+1} be the current and future spot exchange rates between the funding and target currencies (defined as the target currency price of a unit of the funding currency, implying that if the exchange rate increases, then the target currency will depreciate whereas the funding currency will appreciate) prevailing at time *t* and *t+1* respectively. The UIP conditions is given by

$$\frac{S_{t+1}}{S_t} = \frac{1+i^F}{1+i^T} \tag{1}$$

Equation (1) can be approximated by

$$\dot{S}_{t+1} = i_t^T - i_t^F \tag{2}$$

If equation (2) does not hold, then profit can be made by engaging in carry trades by taking a short position in low interest currencies and a long position in high interest currencies, and as such the return made on carry trade is given by

$$\pi = (i^T - i^F) - \dot{S}_{t+1} \tag{3}$$

Equation (3) implies that the carry trade operation will not be profitable at all unless the UIP condition (as represented by equation (1) or (2)) is violated consistently over time, implying that the target currency depreciates against the funding currency by exactly the extent of the interest differential and that the interest differential is eventually completely wiped out forcing π in equation (3) to be equal to zero over time[6]. This also implies that carry trade will be highly profitable if the target currency appreciates at the time when the loan will be paid back in the funding currency, that is $\dot{S}_{t+1} > 0$ in equation (3) and as such in this case return on carry trade comes not only from the interest differential but also from the gain on currency holding. Thus carry trade can still be profitable as long as the target currency does not depreciate by more than the interest differential as indicated by equation (3); however, if the target currency depreciates by more than the interest differential then carry trade may result in huge losses.

It must, however, be noted that the failure of UIP is not the only cause for carry trade. The other cause for carry trade is the failure of CIP, resulting in opportunities for profit that can be made by financing long positions in the currencies selling at a discount via short positions in the ones selling at a premium. Because covered interest parity must hold as an arbitrage or a hedging condition, the two forms of carry trades are equivalent (Moosa, 2010; p.362).

EXISTING EVIDENCE ON CARRY TRADE

A number of studies have been conducted exploring the return and risk characteristics of carry trades in the currencies yielding higher interest rates funded by short positions in the currencies yielding lower interest rates and produced results showing that carry trades yield profits if maintained over long periods. Testing carry trade strategies for 10 currency pairs – involving the Japanese yen and Swiss franc as two funding currencies and the Australian dollar, Indian rupee, Indonesian rupiah, New Zealand dollar and Philippine peso as target currencies – Gyntelberg and Remolona (2007) produced evidence showing that carry trades outperformed the major stock markets over the period December 2000-September 2007. The results they obtained show that the annualized average daily returns on these currency pairs were in the range of 12.9 to 2.40% compared to 2.18 to 5.47% on stock market indices including the S&P 500, Nikkei 225 and FTSE 100. The annualized daily returns on carry trades were much higher when the Japanese yen was used as the funding currency than when the Swiss franc was used. For example, the returns on the New Zealand dollar, Australian dollar, and Indonesian rupiah were 14.94%, 12.50% and 10.40% respectively when the

Japanese yen was used as the funding currency, whereas of those involving the Swiss franc were 8.38%, 6.08% and 4.13% respectively. They also found evidence strengthening the results of earlier studies conducted by Galati *et al* (2007) and Hattori and Shin (2007) showing that volumes of carry trade involving the yen are high when interest differential against the yen are high. Based on the carry-to-risk ratio (the interest differential adjusted by the risk of future exchange rate movements), Galati *et al* (2007) found that carry trade positions that were short the Japanese yen, Swiss franc and US dollar and long the Australian dollar, New Zealand dollar and British pound were increasingly promising between the period 2002-2005. Results obtained by studies conducted, *inter alia*, by Burnside *et al* (2007), Dunis and Miao (2007), Jurek (2008), Moosa (2008), Dravas (2009) and Fong (2010) were also supportive of the profitability of carry trade over long periods.

Burnside *et al* (2007) find that carry trades applied to two different portfolios – one consisting of the currencies of developed countries and the other currencies of both developed and emerging markets[7] – yield high average payoffs as well as Sharpe ratios that are substantially higher than those associated with the US stock market. They attribute the high Sharpe ratio associated with the carry trade strategy to the diversification effect that results from combining individual currencies into portfolios. Examining yen-based carry trade over the period 2001-2009, Fong (2010) produced results generating high mean returns and Sharpe ratios prior to the global financial crisis. Moosa (2008) argue that although carry trades could be profitable over a long period of time, significant losses could arise on a single occasion that may put a carry trader out of business. He used different measures to examine the risk and return profile of six currency combinations involving two funding currencies (the Japanese yen and Swiss franc) and three target currencies (the US dollar, UK pound and Canadian dollar) and quarterly historical data covering the period 1995:4-2006:4. Results show that the yen carry trade with the British pound as a target currency, yielding the highest interest differential, is the most profitable. This combination produces an average annualized return of 9.04% and an average annual compound return of 8.87%. The combination that produces the lowest return is the US dollar with the Swiss franc as the funding currency. Moosa (2008) also uses the performance of the Monte Carlo simulations on the rate of return on carry trade in order to determine whether or not the results obtained are just due to a chance resulting from small sample bias. Based on the fitted distributions of Kolmogorov Smirnov test to pick the most appropriate distribution out of a list of 15 possible continuous contributions, it was found that in no case is the return normally distributed, and in most cases the rate of return follows a distribution that is similar to the distributions followed by the percentage change in the exchange rate, which is the source of risk in carry trade. The probability or the certainty level that a positive return will be produced by any single carry trade operation for the underlying currency pair was shown to be too low for comfort. All measures of distribution (downside risk, value at a risk and Sharpe ratio) used in the study showed that significant risk was associated with carry trade.

Moosa (2008) demonstrates that carry trade can be profitable if conducted over a long period of time, but the risk involved can be high. Assessing the profitability of carry trade for six currency combination – CAD/USD, JPY/USD, GPB/USD, JPY/CAD, JPY/GBP and CAD/GBP – using monthly data on over the period December 1999-June 2006, Moosa (2010) produced results which cast doubt on the profitability of carry trade. These results were interpreted as indicating that there is mostly a fifty-fifty chance that profit can be made from a single carry trade operation. Baillie *et al* (2011) also demonstrate that carry trade involves significant foreign exchange risk to the extent that it may not be worthwhile in terms of risk and return. They warn that carry trade may involve excessive risk over a long period of time if the fundamental of a currency is ignored, and as such they may be also vulnerable to any sudden unanticipated changes in exchange rates. Testing carry trade strategies for the Pak rupee using the Japanese yen, Swiss franc and US dollar as funding currencies over the period 1995:01-2010:06, Bhatti (2012) also found results indicating that carry trade operation which appears to be highly profitable because of significant interest differential on Pak rupee eventually turns out to be highly unprofitable and risky at the end of day because of enormous depreciation of the Pak rupee over the sample period. Results based on all the measures of return and risk employed in this study show that major equity markets, except for Nikkei 225, outperform carry trades in the Pak rupee funded in three major currencies. The results produce relatively higher average annualized returns and lower standard deviations for S&P 500 and Swiss equity markets rather than for carry trades, giving rise to higher Sharp ratios for the former than for the latter. This implies that risk-adjusted returns of equity markets are much higher than those of carry trades. The results also show that the mean of the interest differential is the highest when the Pak rupee is paired with the Japanese yen (PKR/JPY) than when it is paired with the Swiss franc and US dollar (PKR/CHF and PKR/USD). Although high interest differentials apparently make carry trades appear very profitable, enormous depreciation of the Pak rupee over the sample period has resulted in huge losses in carry trades. An important conclusion that emerges from these results is that carry trade operations may become highly unprofitable and risky if a target currency depreciates by more than the interest differential.

EMPIRICAL RESULTS

The results of the annualized quarterly returns in carry trades, as presented in Table 1, show that the Japanese-yen and Swiss-franc-funded carry trades in the five CIS currencies were highly profitable over the last 15 years and six month. As evident from Table 1, carry trades in all the CIS-currency pairs with the Japanese yen and Swiss franc outperform the two major stock markets–the Japanese Nikkei 225 and Swiss market indices. The annualized quarterly returns in carry trades range between 1.50% (in the case of the KZT/CHF pair) and 14.01% (in the case of the ARD/JPY pair), whereas the Swiss market index produces an annualized quarterly return of 5.79% and Nikkei 225 market index produces a negative return of 3.4%. Moreover, the risk in carry trades (as measured by standard deviation) in eight currency pairs is lower than that of the stock markets, whereas the downside risk (measured by VaR) of carry trades in all cases is the lowest. It must also be noted that carry trades in all cases produces Sharpe ratios which are higher than those of the stock markets, implying that risk-adjusted returns on carry trades are higher than those of the stock markets.

TABLE 1: RETURN AND RISK ON CARRY TRADES

Currency Pairs	Mean Interest Differential	Positive change in exchange rate (%)	Positive return (%)	Mean annualized return	Cumulative return	Standard deviation	Downside semi standard deviation	99% value at risk	Shar ratio
ARD/JPY	15.47	50.88	73.68	14.01	530.62	31.22	27.99	58.72	0.4
AZM/JPY	10.66	48.07	69.23	8.06	153.07	26.08	20.53	64.06	0.3
KRS/JPY	19.09	52.63	72.93	6.16	77.31	38.58	24.31	118.61	0.1
KZT/JPY	10.1	49.12	70.18	1.61	-3.92	35.88	17.58	113.89	0.0
MDL/JPY	16.88	49.12	61.4	5.61	-43.1	54.96	24.59	10.2	0
ARD/CHF	14.43	42.11	70.18	13.78	501.85	28.43	27.19	47.38	0.4
AZD/CHF	9.64	44.23	69.23	6.9	64.48	22.22	18.97	41.86	0.3
KRS/CHF	18.05	57.89	66.67	6.41	78.17	31.56	24.5	81.98	0
KZT/CHF	9.04	49.12	63.16	1.5	17.67	32.38	18.67	100.92	0.0
MDL/CHF	15.83	51.88	66.67	6.08	23.31	43.32	24.62	143.32	0.1
Swiss Market Index				5.79		41.30	30.78	92.20	0.14
Nikkei 225				-3.40		43.18	28.20	91.10	-0.08

The results also show that annualized averages of the interest differential and carry trade returns are the highest for the Kyrgyz soms when it is paired with both the Japanese yen and Swiss franc and the lowest for the Azerbaijani manta and Kazakh tenge when they are paired with both the Japanese yen and Swiss franc. These findings are strongly supported by the Sharpe ratios, which are 0.62 and 0.72 for the former currency pairs and only in the range between 0.45 and 0.50 for the latter pairs. This implies that the risk-adjusted return in carry trade is the highest for the former than the latter. However, the frequency of positive return for the KRS/CHF pair is much higher than the positive changes in the underlying exchange rate when compared with that of the KRS pair with Japanese yen. Similarly, the frequency of positive return for the MDL/JPY, ARD/CHF, AZD/CHF and MDL/CHF currency pairs is also much higher than the positive changes in the underlying exchange rates. This leaves the biggest percentage of negative rates of return for the ARD, AZM, and KRS when they are paired with the Japanese yen and the KZT when it is paired with both the Japanese yen and Swiss franc, implying that the highest risk is involved in these currency pairs. These results are supported by the findings based on the Sharpe ratio, showing that the risk-adjusted return in carry trade is the highest for the Kyrgyz soms and lowest for Kazak tenge. These results clearly imply that carry trades in the Kyrgyz soms initiated by short positions in both the major currencies are relatively more profitable than those of other currency pairs. This finding becomes more pronounced in Figure 1, showing that the annualized quarterly returns in the Kyrgyz soms tend to have been positive and have often been quite high on more occasions and that only on a smaller number of occasions have returns in carry trades been negative. This also implies that the probability of huge occasional losses is much smaller in the Kyrgyz soms than in other currency pairs.

FIGURE 1: CARRY TRADE RETURN

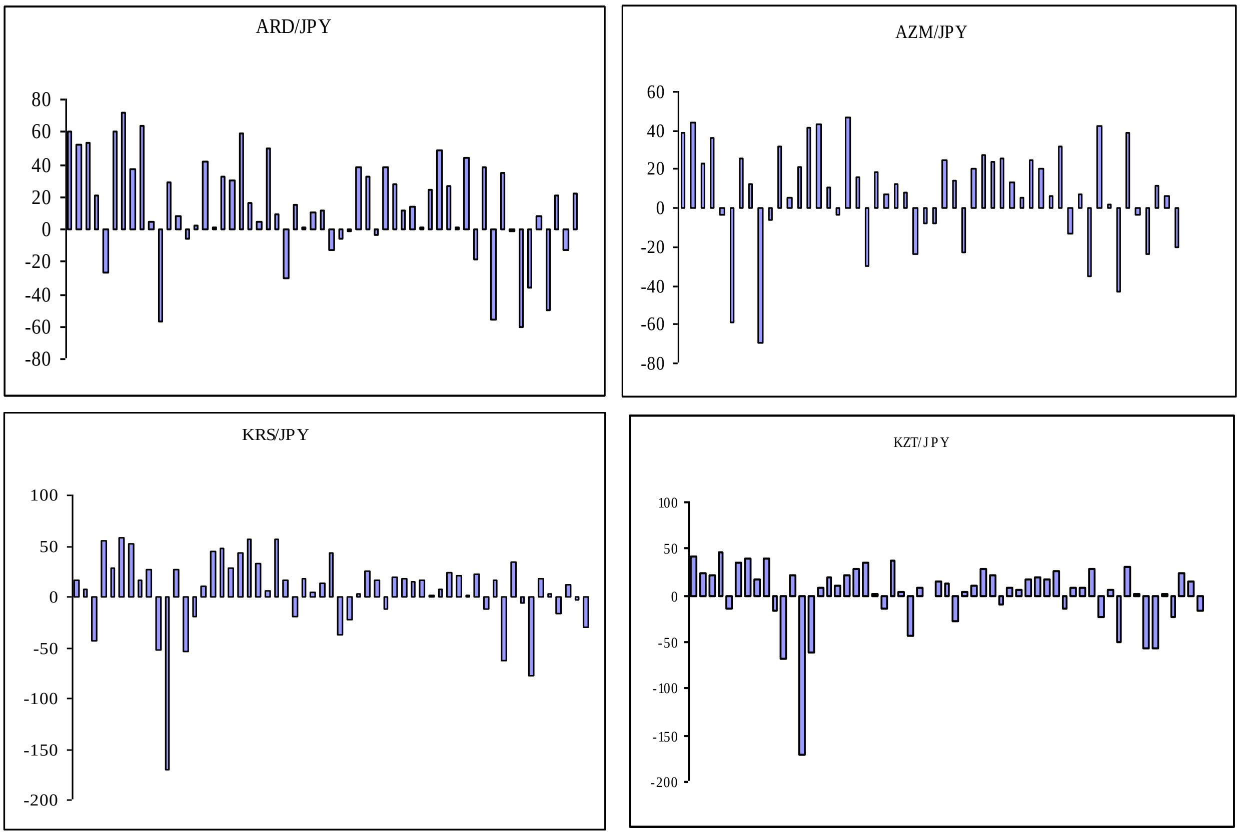


FIGURE 1: CONT.

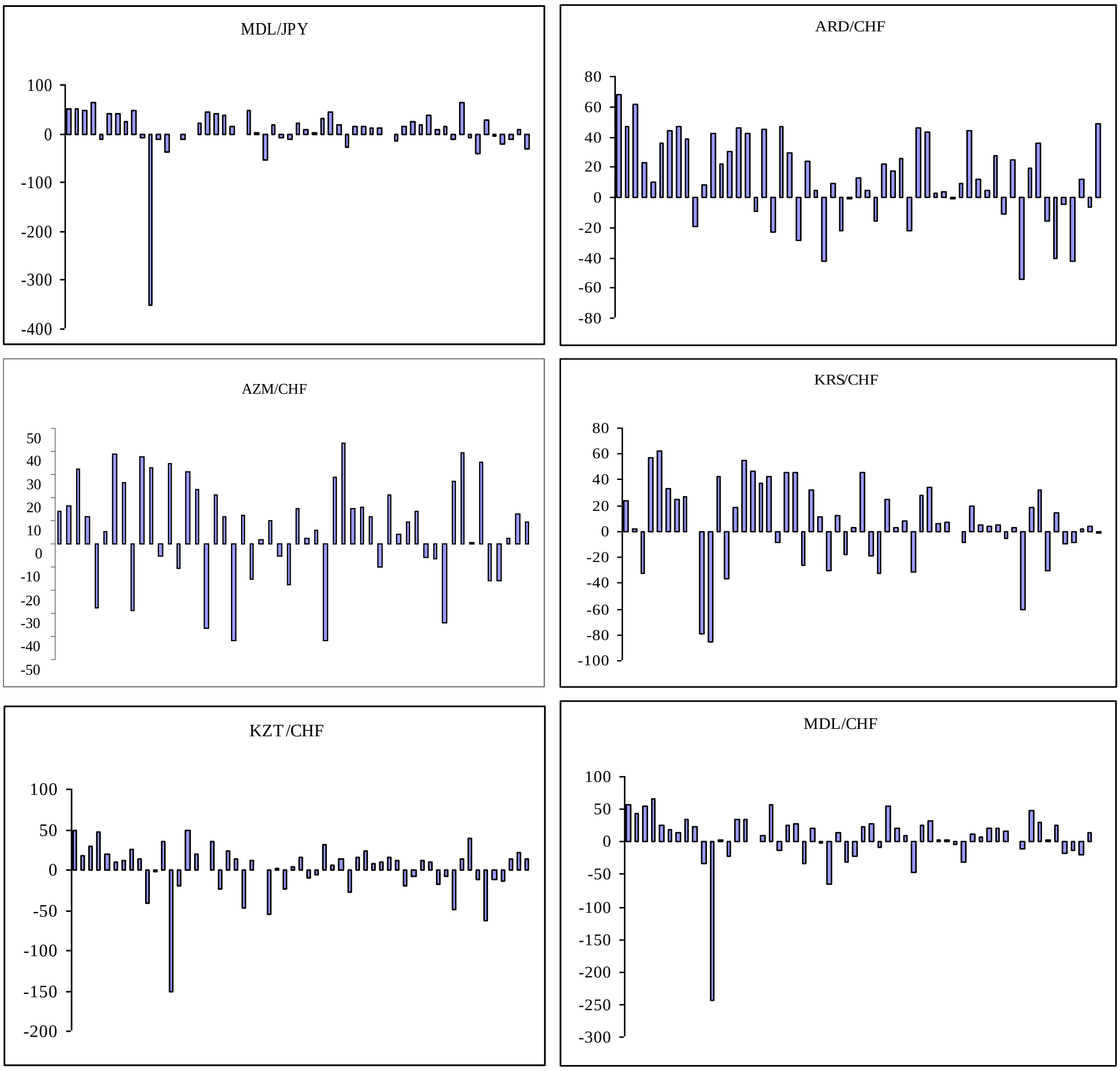
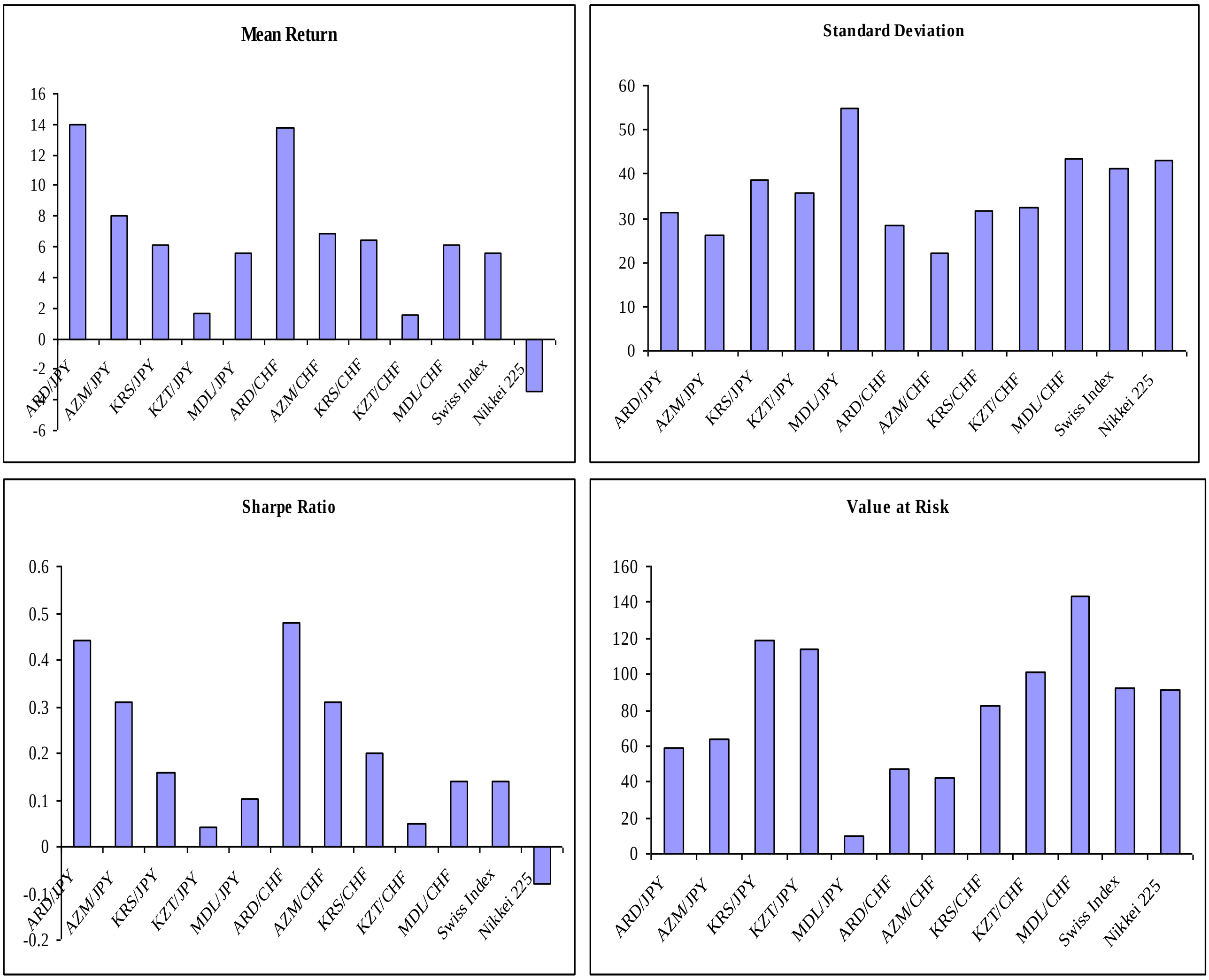


Figure 2 depicts returns on carry trades and two market indices, as measured by annualized quarterly returns and Sharpe ratio, as well as risk on carry trades and two market indices, as measured by standard deviation and value at risk. Clearly, annualized quarterly as measured by mean returns and risk-adjusted returns as measured by Sharpe ratio on carry trade are highest on Armenian drams when it is paired with both the Japanese yen and Swiss franc. Likewise, the risk on carry trade as measured by standard deviation and value at risk is the lowest in the case of Armenian drams when compared with all currency pairs except Azerbaijani manta and Moldovan lei respectively.

FIGURE 2: RETURN AND RISK



CONCLUSIONS AND IMPLICATIONS

In this paper the profitability is explored in carry trade operations in the five CIS currencies – Armenian drams (ARD), Azerbaijani manat (ABM), Kazakhstan tenge (KZT), Kyrgyz soms (KRS) and Moldovan lei (MDL) – funded by short positions in the Japanese yen and Swiss franc using quarterly data on spot exchange rates and interest rates in Treasury bill markets over the period 1996:01-2010:02. Two important conclusions emerge from these results.

First, results based on several measures of return and risk show that carry trades in five CIS currencies outperform the two major stock markets–the Swiss market index and Nikkei 225 market index. The annualized quarterly returns realized in carry trade operations in the five CIS currencies funded by short positions in the Japanese yen and Swiss franc are highly profitable in all cases over the last 15 years and six month. The annualized quarterly return in carry trades ranges between 12.7% and 32.5%, whereas the Swiss market index produces an annualized quarterly return of 5.79% and Nikkei 225 market index produces a negative return of 3.4%. Moreover, carry trades in all cases produces Sharpe ratios which are higher than those of the stock markets, implying that risk-adjusted returns on carry trades are higher than those of the stock markets.

Second, results also show carry trades in the Kyrgyz soms outperform those of other CIS currencies when paired with both the Japanese yen and Swiss franc. The annualized averages of the interest differential and carry trade returns are the highest for the Kyrgyz soms and the lowest for the Azerbaijani manta and Kazakh tenge when these currencies are paired with both the Japanese yen and Swiss franc. These findings are strongly supported by the Sharpe ratios, which are 0.62 and 0.72 for the former currency pairs and only in the range between 0.45 and 0.50 for the latter pairs. This implies that the risk-adjusted return in carry trade is the highest for the former than the latter. However, the frequency of positive return for the KRS/CHF pair is much higher than the positive changes in the underlying exchange rate when compared with that of the KRS pair with Japanese yen. Similarly, the frequency of positive return for the MDL/JPY, ARD/CHF, AZD/CHF and MDL/CHF currency pairs is also much higher than the positive changes in the underlying exchange rates. This leaves the biggest percentage of negative rates of return for the ARD, AZM, and KRS when they are paired with the Japanese yen and the KZT when it is paired with both the Japanese yen and Swiss franc, implying that the highest risk is involved in these currency pairs.

END NOTES

1. In fact, while the interest differential is a necessary condition for the profitability in carry trades, it is not a sufficient condition. The sufficient for the profitability in carry trades is the expected change in the exchange rate of the funding currency against the target currency. If the funding currency depreciates by more than the interest differential, then the carry trade operation may be completely wiped out.
2. Zukerman and Pacelle (1999) argue that "much of the time this "yen carry activity" is quite successful, although it can backfire if the yen appreciates sharply as it did in 1998 and 1999.
3. However, a sudden unwinding of these positions may give rise to a tendency for target currencies to depreciate and funding currencies to appreciate sharply (see, for example, Beranger *et al*, 1999; and Cairns *et al*, 2007).
4. As McCauley and McGuire (2009,p86-87) argue, both the Japanese yen and Swiss franc are "safe haven" currencies (that is, currencies with low risk and high liquidity) and are considered to be the funding currencies in carry trades. They hold the view that such structural features of Switzerland as political stability, low inflation, confidence in the central bank, comfortable official foreign reserves, high savings and net foreign asset position, as pointed out by Jordan (2009) to explain as to why the Swiss franc serves as safe heaven, matter less than low yields. According to them, "Japan and

Switzerland may have much in common, but it is primarily low yields that have recommended the yen and franc as funding currencies".

5. For a detailed discussion in these measures of return and risk on carry trades, see Moosa (2008p.10-11)
6. This is why Gyntelberg and Remolona (2007) describe carry as "essentially a bet against UIP".
7. Using data used data on spot and forward rates against the US dollar for 63 currencies, Burnside *et al* (2007) found that the inclusion of emerging market currencies in the portfolio substantially increases the Sharpe ration. Some of the emerging market currencies in the portfolio include the currencies of India, Kazakhstan, Pakistan, Philippines, Qatar, Saudi Arabia, Singapore Turkey and Ukraine etc.

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