Of Low Yielders and Carry Trading – the JPY and CHF as Market Risk Sentiment Gauges

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Of Low Yielders and Carry Trading – the JPY and CHF as Market Risk Sentiment Gauges

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Abstract

Ever since the credit turmoil took hold in the summer 2007 financial markets have been on the brink. Volatility in asset returns and correlations have been high and investors' view on the underlying market fundamentals equally as fickle. Within that market context, this paper provides strong evidence for the idea of carry trading currencies as risk sentiment gauges in the market. Using daily returns from 2006 to May 2008 it is shown how traditional carry trading currency crosses (mainly JPY and CHF crosses) exhibit strong negative correlation and beta values with three key equity indices. This paper furthermore shows how this relationship, in relation to specific currency pairs, has been particularly strong since the advent of the credit crisis. Finally, this paper also homes in on the idea of carry trading currencies as means of hedging equity returns and fluctuations on a daily basis. At an initial glance such relationships are however bound to be highly spurious. As such, this paper also attempts to qualify its findings in a more general and solid empirical context.

1.0 Introduction

One of the most vexing features of today's international financial markets is the carry trade phenomenon which exploits wide global interest rate differentials to earn the spread between low yielding and high yielding currencies. Carry trading consequently violates one of the parity conditions of international currency markets; the uncovered interest rate parity (UIP). The UIP states that the expected change in the spot rate must reflect the interest differential between the two currencies. The theory predicts that the country with the high interest rate will see its currency depreciate (i.e. as it is assumed ex ante that the higher interest rate is a compensation for this depreciation). In formal terms:

$$(E)\Delta S = (1+i_h)/(1+i_f)$$

Where $i_{h,}i_f$ are interest rates in home and foreign respectively. Under the conditions of the UIP, the interest rate differential should thus be exactly offset by a change in the spot rate over the investment period in question. In this regard, the mechanics of the trade are fairly simply and in fact also self-fulfilling, if investors expect the UIP to be consistently violated. Consequently, the pursuit of carry trade will tend to keep low yielding currencies from appreciating against high yielding currencies since the aforementioned are being sold in the carry trade transaction itself. Moreover, many investors don't actually perform carry trades per se but simply latch on to the trade in the sense that they, in the spot market, sell the most common funding carry trade currencies (CHF and JPY) against the most common (and liquid) high yielders.

It is clear that such activity cannot be expected to create positive returns on a consistent basis and periods of volatility and sudden reversals of asset prices can prove devastating for carry trade investors since positions are often highly leveraged. Nevertheless, and given the lingering persistence of wide global interest rate differentials some scholars have attempted to account for the ability to make consistent profits from carry trading. In Olmo & Pilbeam (2008) carry trading is however not found to yield excess returns for the most common carry trading crosses. Curiously, the

authors do find excess returns in the context of the GBP/USD cross which is somewhat odd given that interest rate differentials between the US and UK tend to be significantly narrower than other potentially more 'juicy' trades.' Regarding the UIP in general, Bilson (1981) is often referred to as the initial study to reject the hypothesis, but Also Meese and Rogoff (1983) and Longworth (1981) provide evidence to reject it. However, the evidence against the UIP is not entirely uniform. Chinn and Meredith (2004) manage to differentiate the conclusions from the main bulk of the literature. In their 2004 IMF staff paper, they consequently find that the UIP holds over longer sample horizons. Furthermore, they show how failure of UIP to hold in the short run can be attributed to the interaction between shocks on the exchange rate market and endogenous monetary policy reactions.

This paper does not embark on an attempt to qualify these studies but rather assume, ex ante, that carry trading exists as an integral part of market practice and discourse.[1]

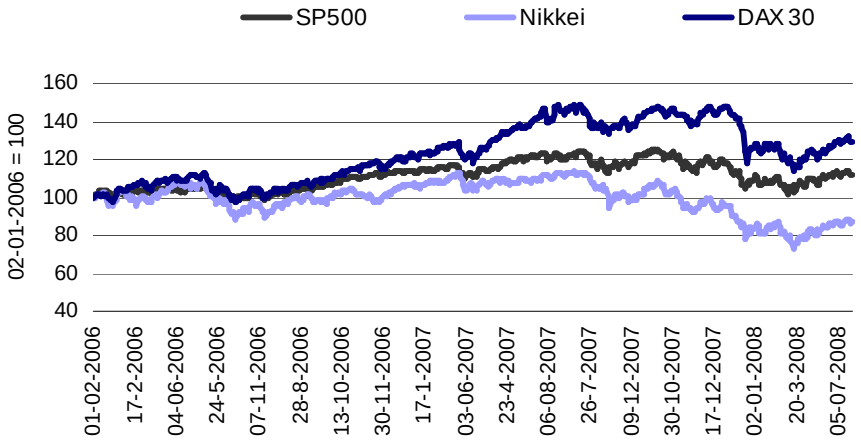
The remarks above opens up the door for an investigation of one of the interesting derivative effects from carry trading activity. One question which thus seems interesting is the extent to which carry trading activity as measured by movements in the most common funding currencies can say something about general market conditions. Clearly and assuming that carry trading does not create positive returns on an universally consistent basis it would be interesting to gauge the extent to which shifts in *'carry trading behavior'* coincides with other changes in the market. This is exactly what this paper sets out to examine in the context of the credit turmoil which, since August 2007, have crippled liquidity and sent shivers through financial markets.

Section one presents the theoretical and conceptual framework, section two presents the theoretical operationalization, estimation and presentation of results, section three discusses the results and section four concludes.

[1] As such, it is of less importance to the conclusions of this paper that carry trading works than it is important to assume that investors act according to the tenets of carry trading.

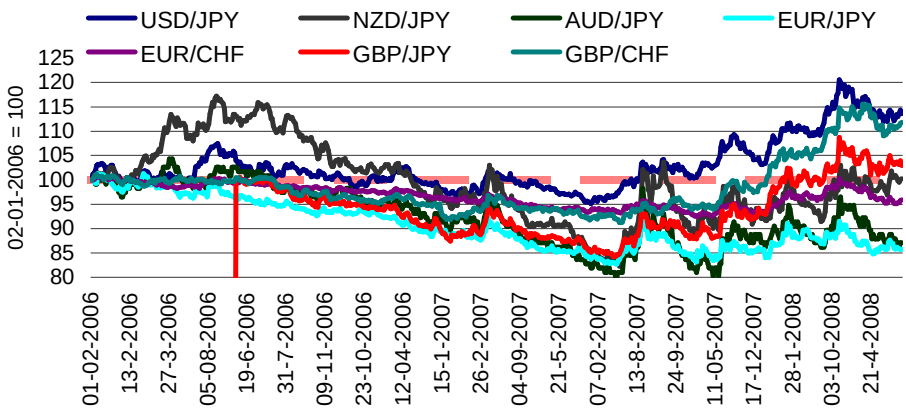
1.0 Theory and Conceptual Framework

Since the end of July 2007 equity markets across the global have weakened significantly and most investors and market sages do not believe that the bottom has been reached yet.



In the context of the credit turmoil, this has lead to a market discourse surrounding *unwinding* of risky carry trade positions. The key element in this discourse is how the CHF and JPY, as primary funding currencies, are being coined as risk sentiment gauges, and thus measures of risk in the market place. The *unwinding* effect in this regard would then be conjured by investors' and traders' abandonment of highly leveraged spot market positions against the CHF and JPY. One way to operationalize this would be to narrate the CHF and JPY as the famous canaries whose demise were used by coal miners in the 19th century Britain to gauge when it was time to get out of the mine due to the presence of toxic gasses. In this way, CHF and JPY crosses can equally be seen as canaries in the context of financial markets whereby a sudden spike of volatility or a downward correction in risky assets is followed by an appreciation of the

funding carry trade currencies as positions are unwound. Formally, the mechanics of such movements would suggest a negative correlation between the CHF and JPY and risky assets. Moreover, this would also suggest that we should have observed a strengthening across the board of the low yielding currencies since August 2007. This however is not uniformly so, as can be seen below.



An increase means an appreciation of the low yielders (CHF and JPY)

As can readily be observed, the beginning of the credit turmoil has seen significant divergence between the JPY and CHF crosses. Yet, this is merely if we look at the levels of the time series. If we look at the daily trend there thus seems to be considerable co movement. In fact, if we home in on the two graphs above even a scant glance suggest a negative correlation between equities and low yielding currencies. It is exactly this tendency which is of interest in the present context.

Notional evidence of such market dynamics is easy to find. Daily readership of Bloomberg's financial news stream will thus often present investors and other market participants with headlines such as *Yen Falls as Asian Stock Gains Boost Confidence in Carry Trades*[2]*,* which is indicative of the relationship described above. Moreover and apart from an account of the theatricals of financial markets such reports also highlight two other points. First of all, it indicates that the argument upon which this paper builds its case is already formalized in the daily market discourse. Secondly, it suggests that

[2] Stanley White and Kim-Mai Cutler (2008) – *Yen Falls as Asian Stock Gains Boost Confidence in Carry Trades,* 16th June 2008 Bloomberg News Article.

the relationship is one which, at the very least, can be tracked on a daily or short term frequency basis.

If notional evidence suggests that funding currencies in the carry trade are risk gauges in the market place how could this be operationalized? One way would simply be to treat it as an interesting curiosity. However, in light of the fact that the dynamics seem more than notional, and in light of the suggested negative correlation between currency crosses and risky assets another theoretical approach could also be interesting.

Within the context of international portfolio allocation one of the main tenets is to go international. Countless studies have shown that even taking into account the higher degree of risk as per reference to variance of exchange rates adjusted return it still pays off to diversify internationally; for an extensive literature review see Edwin J. Elton et al. (2007; 7th edition, chapter 12). The argument for international diversification is traditionally formalized through studies of correlations between international equity indices. The point is that considerable gains from diversification can be obtained by exploiting the relatively low correlation coefficients across stock indices from other countries. In Edwin J. Elton et al. (2007) the reported correlation coefficients between international equity indices vary between 0.35 and 0.40 depending on the study, and thus time period, surveyed. This sounds awfully good then; but there is a rub.

While it is doubtlessly true that international diversification is commendable, evidence also suggests that in times of trouble where investors would strongly demand the benefits from international diversification those very same benefits tend to evaporate. Consequently, Zimmerman et al. (2003) manage to pour cold water on the benefits of international diversification. Not only do the authors detail how stock market volatility is higher in down periods (bad spawn more volatility than comparable good news). But more importantly, they show that down periods when volatility is high and when economic activity is shrinking also is associated with a significant increase in correlation amongst international securities. It is exactly this effect which decreases the benefits from international diversification in periods where international investors crave it the

most. Investors and pundits following the credit turmoil as it has ravaged across markets since the summer 2007 will know these facts first hand; or as the adage goes; *sometimes, everything is correlated*.

From a general perspective one could also argue that as the capital markets of the world become ever more integrated the benefits derived from international diversification will tend to be suppressed. In a recent contribution though, Sarno and De Santis (2008) provide valuable differentiation to this claim. Two conclusions stand out. One is derived from the authors' construction of a portfolio framework to show that while diversification matters, the way it is done even more so. From the point of view of a US equity investor, it is shown how a careful choice of a few foreign stock indices is better than choosing a global portfolio. The second conclusion is of distinct interest to the query of this paper. The authors thus opens up the door for a rigorous study of what co-movements across asset classes might mean for international diversification. Specifically, in the context of equities and exchange rates Sarno and De Santis (2008) latch on to the principle of uncovered equity return parity which was explored in Hau and Rey (2004 and 2006) as well as Cappiello and De Santis (2007). The formal conceptualization of this is that higher returns on domestic equity market are associated with a depreciation of the home currency. This is has a whiff of the argument presented above about it although the distinction between domestic and foreign is not the same.

This paper studies daily returns within a, for traditional empirical purposes, relatively short period. This paper attempts nonetheless to insert itself within the conceptual framework noted above by asking the following question. To what extent can the idea of carry trading currencies as risk sentiment gauges be formalized and does this indicate a way to hedge daily equity returns?

Coupled with the objective to show how carry trade currencies act as risk sentiment gauges in the markets it is towards this question the investigation now turns.

2.0 Theory and Empirical Results

Thomson Datastream was used to pull data on 7 currency pairs considered to be traditional carry trade crosses. Of the seven, two CHF crosses and five JPY crosses have been used.[3] Furthermore three major stock indices from three main regions in the form of the SP500, the Nikkei 225 and the DAX 30 were chosen as the market(s).The sample period and anatomy is interesting in this regard. A relatively short term perspective was consequently chosen. The data series consists of daily values (returns) of the seven currency crosses and the three stock market indices from 01-02-2006 to 05-22-2008 of a total of 623 observations. These data sets form the basis of the estimation below.

Within the realms of finance there are essentially two ways to operationalize the benefits and anatomy of diversification. One is through simple cross-correlation analysis where a correlation coefficient of 1 signifies zero diversification benefit over to a coefficient of -1 signifying the perfect 'hedge' or diversification asset. Following the themes outlined above, the key for investors is to construct a portfolio of assets with as low correlations as possible to obtain the maximum amount of diversification. The specific point to note in this regard is that in periods of significant volatility, correlations between equities tend to shoot up. This negates the benefits from volatility in a market context where it is craved the most by investors. In order to conceptualize the results and the idea of carry trade currency crosses as negative beta assets or risk gauges, the correlation matrix of the three stock markets can be compared to the corresponding matrix including the currency crosses (see appendix)

As can be observed, an equity portfolio consisting solely of three stock market indices in question have not provided much diversification; save perhaps for the Nikkei 225 and SP500/DAX 30 which appear to offer a fair degree of diversification benefits to each other. However, if we peer towards the correlation matrix between the currency crosses and the three stock market indices the tableau seems to constitute a fund manager's wet dream, almost exclusively with negative coefficients. The mechanics here are quite

[3] USD/JPY, NZD/JPY, AUD/JPY, EUR/JPY, EUR/CHF, GBP/JPY and GBP/CHF.

simple. Given the fact that the currencies are quoted directly (i.e. amount of high yielding currency to buy one low yielding currency) the negative coefficients strongly underpin the notion of carry trade currencies as canaries in the coalmine relative to risk sentiment in the market place. The formal rationale is that during times of heightening risk aversion the JPY and CHF strengthens while equities fall[4].

Another and somewhat more rigorous approach is to assume the tenets of the capital asset pricing model (CAPM) developed by William Sharpe Sharpe (1964). In this framework, the degree of co-movement between two assets (the market and a single asset is operationalized through simple linear regression analysis (OLS) where the market is dependent variable with the single asset as independent variable. Formally, the CAPM takes the following form in the simplified version:

$$\overline{R}_i = R_f + \left(\frac{\overline{R}_m - R_f}{\sigma_m^2} \right) \sigma_{im}$$

And in an even simpler form where the beta value is visible; the beta is defined accordingly here as $\frac{\sigma_{im}}{\sigma_m^2}$.

$$\overline{R}_i = R_f + \beta_i (\overline{R}_m - R_f)$$

The CAPM famously states that the return on asset i equals the risk free rate plus the market premium. The CAPM has consequently fathered one of the most fundamental measures of risk in modern financial analysis; the beta (β) which measures the covariance between any risky asset and its market (its unique and non diversifiable risk). In this paper, the CAPM framework cannot be directly applied for the obvious reason that currency crosses do not, as such, exist within the markets used (i.e. the SP500, Nikkei 225, and DAX 30). However, the rationale of the CAPM can still be applied in the

[4] The only exceptions here would be the NZD/JPY and AUD/JPY to the SP500 according to the correlation matrix.

sense that a beta-coefficient can still be estimated. Thus, the estimation of the currency crosses' beta shall be approximated by the following equation for a total of 21 regressions (3 stock market indices and 7 currency crosses).

$$\Delta equity = \alpha_t + \beta_t \Delta currency + u_t$$

Where equity is a stock market index and currency one of the 7 currency crosses used to formalize the argument. All variables and parameters are in % changes (daily returns) to correct ex ante for stationarity problems. In this expression, the estimated parameter β_t will be the main result to gauge. Given the theme of the present study and the fact that all currencies are quoted directly one would expect negative signs. The added benefit from this approach is also that, contrary to the correlation analysis, the strength of the relationship can be measured as per reference to the regression's coefficient of determination (R^2) and its corresponding F value to measure statistical significance. In the following table, the figure outside the brackets will be the estimated beta-coefficient while the figure inside the brackets its associated coefficient of determination. The asterisks denote level of significance in all the subsequent tables.[5] As such, for the USD/JPY to the SP500 the estimated beta is -0.34, its (R^2) equal to 0.05 and the * denotes significance at 1%.

	SP500	Nikkei 225	DAX 30
USD/JPY	-0.34(0.05)*	-0.49(0.048)*	-0.63(0.116)*
NZD/JPY	0.1(0.016)*	-0.43(0.126)*	-0.098(0.01)**
AUD/JPY	0.1(0.012)*	-0.61(0.226)*	-0.14(0.017)*
EUR/JPY	-0.17(0.013)*	-0.88(0.164)*	-0.58(0.106)*
EUR/CHF	-0.5(0.02)*	-2.35(0.214)*	-1.76(0.182)*
GPB/JPY[6]	-0.34(0.067)*	-0.55(0.088)*	-0.73(0.23)*

[5] * for 1%, ** for 5 %, and *** for 10%

[6] The sample period for the GBP/JPY begins at 06-08-2006 and thus must be taken with a pinch of salt relative to the other currencies.

GBP/CHF	-0.057(0.000)	-0.97(0.119)*	-0.54(0.055)*

The first rather interesting result is that although the R^2 values differ significantly most of the returned values are highly significant save GBP/CHF for the SP500. For the SP500 most R^2 values are not particularly strong indicating that, over the sample period in question, carry trade crosses have not been very strong indicatiors of the movements in SP500. This picture changes decisively with regards to the Nikkei 225. Not only are the estimated R^2 values larger but also the beta parameters are more extreme. One interesting result here must clearly be the coefficient estimated for EUR/CHF at -2.35 with a corresponding R^2 of 0.214. Moving over to the DAX 30 EUR/CHF and GBP/JPY in particular have strong explanatory power. In general, Euro crosses as well as the GBP/JPY seem to provide the strongest foundation for the argument that carry trade crosses act as risk sentiment gauges in the market place.

Yet, the results are from the whole sample period.

Given the conceptual foundation noted, one should expect the correlations to have grown stronger in the context of the turmoil which settled on financial markets during the summer of 2007. It would be interesting then, to see whether a change has occurred in the context of recent events in financial markets. In order to pinpoint a break in the series August the 1st 2007 is defined as the 'beginning' of the financial market turmoil. Period one will then be defined as 01-02-2006 to 07-31-2007 and period two as 08-01-2007 to 05-22-2008.

First we look at correlations (appendix). Interestingly, the conclusions reached by Zimmerman et al. (2003) for equity returns do not seem to come off as strong as one would have expected. For example, the cross correlation between DAX 30 and SP500 is lower after the credit turmoil grabbed hold. In general however, the correlations between

the three indices are quite high both in terms of the full sample period as well as the two sub periods.

More interesting in the present context are the values for the currency crosses relative to the three equity indices. Except for one currency pair (GBP/CHF to the SP500) the signs remain the same over the two periods. It can also be observed with clarity how the negative correlations are much stronger in period 2. This lends evidence to the idea of carry trading currencies as ‘canaries in the coal mine’ for global risk sentiment as well as, by consequence, their profile as negative beta assets. Especially, the USD/JPY pair has seen its negative correlation coefficient spike significantly.

Moving on to the estimated beta values, the same approach is deployed by splitting up the data set in two periods.

Betas (Period 1, 01-02-2006 to 07-31-2007)

	SP500	Nikkei 225	DAX 30
USD/JPY	-0.089(0.00)	-0.11(0.00)	-0.2(0.01)*
NZD/JPY	0.014(0.00)	-0.183(0.02)***	-0.15(0.02)*
AUD/JPY	0.025(0.00)	-0.43(0.074)*	-0.15(0.01)**
EUR/JPY	-0.15(0.01)**	-0,5(0.04)*	-0,41(0.04)*
EUR/CHF	-0,6(0.03)*	-1,65(0.09)*	-1,59(0.11)*
GBP/JPY	-0,21(0.02)***	-0,3(0.02)*	-0,56(0.08)*
GBP/CHF	-0,18(0.00)***	-0,7(0.05)*	-0,47(0.03)*

Betas (Period 2, 08-01-2007 to 05-22-2008)

	SP500	Nikkei 225	DAX 30
USD/JPY	-0.56(0.11)*	-0.79(0.12)*	-0.96(0.31)*
NZD/JPY	0.15(0.04)*	-0.56(0.25)*	-0.06(0.00)

AUD/JPY	0.13(0.02)**	-0,69(0.36)*	-0,13(0.02)**
EUR/JPY	-0.19(0.02)***	-1.11(0.30)*	-0.68(0.19)*
EUR/CHF	-0,42(0.01)***	-2,76(0.34)*	-1,86(0.25)*
GBP/JPY	-0,38(0.09)*	-0,62(0.13)*	-0,79(0.34)*
GBP/CHF	0,018(0.00)	-1,11(0.19)*	-0,57(0.08)*

As with the correlations, even a scant initial glance suggests that a break is present around the dawn of the credit crisis. Not all currency pairs reflect this, but the degree of change and the range of currencies displaying an increase in negative coefficients and R^2 values merit this initial conclusion. However, in order to test the robustness of this initial conclusion a statistical test for structural break is performed below. This will show more rigorously which relationships that have decisively or more aptly statistically changed.

There are two ways in which structural break can be identified. One is to let the data speak for itself. This means that you identify the break by looking at the trend and fluctuations in series itself (themselves) independent of a theoretical or rational impetus for identifying the break. Another way would be to impose assumptions given an event or change of exogenous circumstance which could provoke a structural change in the series. By identifying the credit turmoil as the point of reference for the structural break, this paper opts for the latter approach. As noted, the structural break is identified ex ante as the beginning of the credit turmoil in August 2007 (concretely 01-08-2007).

This leaves 411 observations in the first period regression and 212 observations in the second. The test for structural breaks in the 21 regressions will be carried out in line with the method presented in Gujarati (2003)[7] and first deployed by Chow (1960); i.e. the so-called *Chow Test*. Assume then the generic regression for the whole period as stated above

[7] PP. 273-279.

$$\Delta equity = \alpha_t + \beta_t \Delta currency + u_t$$

As well as the following regressions for period one and two respectively;

$$\Delta equity_1 = \alpha_t + \lambda_t \Delta currency_1 + u_t \text{ and } \Delta equity_2 = \alpha_t + \gamma_t \Delta currency_2 + u_t$$

The mechanics of the Chow Test assumes that $\alpha_t = \alpha_t = \alpha_t$ in all three estimations[8] but also more importantly that $\beta_t = \lambda_t = \gamma_t$. This last assumption is what we are particularly interested in although formally the test cannot explain whether it is the intercept of the slope that changes[9]. The key to perform the Chow Test is to test whether the residual sum of squares (RSS) from the original regression is statistically different from the sum of the RSS from the two period regressions. Formally, the test is conducted by calculating the following F-value:

$$F = \frac{(RSS_R - RSS_{UR})/k}{(RSS_{UR})/(n_1 + n_2 - 2k)} \sim F_{[k,(n_1+n_2-2k)]}$$

Where RSS_R is the residual sum of squares from the original full sample size regression and RSS_{UR} is the sum of residual sum of squares from the two separate period regressions. $(n_1 + n_2 - 2k)$ is equal to (411+212)-(2*2) = 619 and the critical values of the F is 2.30, 3.00 and 4.61 for 10%, 5% and 1% level of significance respectively. The null is that there is no structural break which means that a significant F-value would indicate that a structural break is present as per reference to rejection of the null. In the table below the computed F value is shown for all the 21 original regressions.

[8] Although the intercept is of little importance in this present context.
[9] Dummy variables would be an alternative here.

F-Values for Structural Breaks

	SP500	Nikkei 225	DAX 30
USD/JPY	8.75*	10.35*	15.00*
NZD/JPY	3.52**	9.96*	2.05
AUD/JPY	2.32***	4,25**	1.12
EUR/JPY	1.16	7.79*	2.30***[10]
EUR/CHF	0.58	4.89*	0.00
GPB/JPY	1,10	1,78	1,54
GBP/CHF	2,08	3,34**	0,63

As could have been expected, this somewhat more rigorous method differentiates the initial conclusion[11]. The USD/JPY in particular seems to exhibit a strong structural break and so do the currency pairs, in general, when regressed on the Nikkei 225. It is interesting in this regard to consider that many currency pairs were significant for the DAX 30 in both periods. Given the lack of significant structural breaks it suggests that the relationship transcends beyond the credit turmoil. In fact, the same conclusion can be made in the context of the Nikkei 225 save the fact that the negative relationship has clearly strengthened since August 2007. In the SP500's case only the USD/JPY seems to have displayed a structural break whereas the other currency pairs *in general* (save the GBP/JPY) offer little explanatory power relative to the movements of this stock index.

3.0 Discussion

The estimation above presents several interesting results. The results which show carry trade currency pairs as negative beta assets seem particularly strong in the context of the Nikkei 225 index. This may not in itself vindicate the theory since it may simply be

[10] Barely significant at 10%.
[11] Although the Chow Test assumes equal variance in the two sub-periods which seems to be somewhat violated here. (G)ARCH models could be considered here in order to be more rigorous.

replicating the idea that higher equity returns in the domestic market is associated with a depreciation of the home currency as showed by other studies. This need not be the case though. It is important to note that the present study studies daily returns which are quite different than the norm of studying monthly returns. Moreover, it is also clear that if we look at the full sample period, not only the JPY crosses show negatively significant beta values to the Nikkei 225 but so do the EUR/CHF and GBP/CHF. This strong result is echoed with the DAX 30 where strong results are presented over the entire sample period with the AUD/JPY and NZD/JPY as the only exceptions. In relation to the SP500 the results were somewhat more meager with the notable exception of the USD/JPY which has exhibited a strong structural break around the summer 2007. In overall terms, one could distinguish between the currency pairs by looking at their respective coefficients of determination. In this way, some of the currency pairs clearly offer a higher degree of explanatory power and thus, by derivative, a more believable act as negative beta assets. Examples here would be (GBP/JPY and GBP/CHF to the DAX 30 and EUR/CHF and AUD/JPY to the Nikkei 225).

Here, at the brink of the paper, (at least) two overall questions impose. The first is the question of structural stability of beta values or more specifically the sign of the estimated parameters. The second is the dodgier question of causality between currency pair and equity index.

On the first question this paper clearly falls outside the norm in its study of daily returns over a relatively short time span. Considerable ink has been devoted by finance scholars in determining the estimation period which best approximates a stabile beta value. At a first glance such studies are not directly replicable in the present context. As such, the CAPM was not explicitly used but more so its theoretical foundation to derive a simple regression analysis framework to operationalize the argument. Traditionally however, studies have shown that 4-6 years (about 300 observations with monthly returns) provide the strongest result Alexander and Chervany (1980). It has also been shown how extreme betas are shown to be less stable over time than betas drifting closer to the mean Alexander and Chervany (1980). These methodological glitches

notwithstanding, it is interesting in the context of the present study. As such, one should be careful making general extrapolations on the basis of the findings above. On the other hand though, and given the strength of the results, effort should be put into pinning down which of these relationships hold up for scrutiny over time.

Turning to the issue of causality, I really rather would like to leave it alone all together. One can consequently always quibble about causality in the context of statistical analysis even to such an extent to make the actual results secondary to the inquiry. This mistake will not be made here. Still, the approach chosen above does seem to run counter to what could be described as the intuitive causal relationship. In the regressions conducted above the causal relationship was estimated in the form of how the change in the currency pairs explain the change in equity indices. This runs counter to the market discourse on the subject but it was a necessary approach in order to express the hypothetical beta values of the currency pairs. Granger causality tests (Granger 1969) could be performed to formally ascertain the arrows of causality but in essence, the Granger test itself says very little about what really constitutes causality more than it merely provides a binary analysis of what affects what.

4.0 Conclusion

The principles of carry trading and how to bet against the patchy theory of uncovered interest rate parity are well known. Moreover, carry trading and the effect of investors pursuing it, have almost turned in to an urban legend on financial markets where many derivative effects of *'carry trading behavior'* are cited. This paper has attempted to scrutinize one of the most widespread of these. It has consequently been shown how the JPY and CHF, often cited as the traditional funding currencies in carry trades, exhibit strong negative correlations and beta values to equities (SP500, Nikkei 225 and DAX 30). This lends evidence to the idea of the CHF and JPY as risk sentiment gauges. A conclusion important to this argument was also that many negative beta values and their explanatory power increase in the context of an exogenous event which brings volatility and uncertainty to the market.

Regarding the potential for investors to use carry trade crosses to hedge equity positions the evidence appears strong. An initial glance will thus reveal that most currency pairs not only exhibit negative correlations with equities but also how they posses significant, in statistical terms, negative beta values. This suggests that investors can indeed cover equity positions by buying low yielding currencies in times of volatlity. Yet, these conclusions need to be taken with a pinch of salt. First of all, the study is based on daily returns which means that only investors of a certain pedigree would be able to benefit from these correlations (i.e. investors trading on a daily basis). Moreover, it is not certain that such correlations can be assumed to persist. In this regard it is important to watch the currency pairs with significant negative beta values and relatively high coefficients of determinations across the two periods (GBP/JPY and GBP/CHF to the DAX 30 and EUR/CHF and AUD/JPY to the Nikkei 225).

Further studies on this topic should attempt to widen the time span of the sample to gauge the general validity of the results as well as attempt to make forecasts of daily exchange rate and/or stock returns based on the relationships cited above.

5.0 List of References

Alexander, J. Gordon & Chervany, L. Norman (1980) – *On the Estimation and Stability of Beta*, The Journal of Financial and Quantitative Analysis vol. 15 no. 1 (march 1980) pp. 123-137

Bilson, John (1980) – *The Speculative Efficiency Hypothesis*, Journal of Business vol. 54 (June) pp. 433-451

Capiello, L. & R. A. De Santis (2007) – *The Uncovered Equity Return Parity Condition*, ECB Working Paper No. 812.

Chinn, D. Menzie & Meredith, Guy (2004) – *Monetary Policy and Long Run Horizon Uncovered Interest Parity*, IMF Staff Paper vol. 51 no 3

Chow, C. Gregory (1960) – *Tests of Equality Between Sets of Coefficients in Two Linear Regressions*, Econometrica vol. 28 no. 3 (1960) pp. 591-605

De Santis, A. Roberto & Sarno, Lucio (2008) – *Assesing the Benefits of International Portfolio Diversification in Bonds and Stocks*, ECB Working Paper no. 883 (March 2008)

Edwin J. Elton et al. (2007) – *Modern Portfolio Theory and Investment Analysis*, John Wiley and Sons Incorporated 7th Edition 2007

Granger, C. W. J. (1969) – *Investigating Causal Relations by Econometric Models and Cross Spectral Methods*, Econometrica (July 1969) pp. 424-438

Gujarati, Damodar N. (2003) – *Basic Econometrics* 4th edition McGraw Hill

Hau, H, & H, Rey (2004) – *Can Portfolio Rebalancing Explain The Dynamics of Equity Returns Flows, and Exchange Rates?* American Economic Review Papers and Proceedings 94: 126-133.

Hau, H, & H, Rey (2006) – *Exchange Rates, Equity Prices, and Capital Flows*, Review of Financial Studies 19; 273-317.

Longworth, David (1981) – *Testing the Efficiency of the Canadian–U.S. Exchange Market Under the Assumption of No Risk Premium*, Journal of Finance, Vol. 36, No. 1, pp. 43–9

Meese, Richard (1989) – *Empirical Assessment of Foreign Currency Risk Premiums," in Financial Risk: Theory, Evidence, and Implications*, ed. by Courtenay Stone (Boston: Kluwer Academic Publications)

Olmo, Jose & Pilbeam, Keith (2008) – *The Profitability of Carry Trades, Annals of Finance* 11 April 2008

Rogoff, Kenneth (1983) – *Empirical Exchange Rate Models of the Seventies,* Journal of International Economics, Vol. 14 (February), pp. 3–24

Sharpe, W. F. (1964) – *Capital Asset Prices: A Theory of Market Equilibrium Under Conditions of Risk*, Journal of Finance (September 1964) pp. 425-442

Zimmermann H. et al. (2003) – *Global Asset Allocation: New Methods and Applications (chapter 3)*, John Wiley and Sons inc

6.0 Appendix – Cross Correlations

Cross Correlations (full period, correlations of level form)

	SP500	Nikkei 225	DAX 30
SP500	1,00	0,44	0,93
Nikkei 225	0,44	1,00	0,21
DAX 30	0,93	0,21	1,00

Cross Correlations (full period, correlations of % daily changes)

	SP500	Nikkei 225	DAX 30
USD/JPY	-0,2245	-0,2198	-0,3409
NZD/JPY	0,1278	-0,3543	-0,1005
AUD/JPY	0,1118	-0,4752	-0,1338
EUR/JPY	-0,1137	-0,4053	-0,3257
EUR/CHF	-0,1419	-0,4630	-0,4264
GBP/JPY	-0,2578	-0,2973	-0,4799
GBP/CHF	-0,0293	-0,3463	-0,2365

And for the separate periods …

Cross Correlations (Period 1, 01-02-2006 to 07-31-2007)

	SP500	Nikkei 225	DAX 30
SP500	1,0000	0,8317	0,9764
Nikkei 225	0,8317	1,0000	0,8494
DAX 30	0,9764	0,8494	1,0000

	SP500	Nikkei 225	DAX 30
USD/JPY	-0,0654	-0,0509	-0,1036

NZD/JPY	0,0172	-0,1368	-0,1310
AUD/JPY	0,0257	-0,2725	-0,1066
EUR/JPY	-0,1015	-0,2052	-0,1930
EUR/CHF	-0,1797	-0,2984	-0,3328
GBP/JPY	-0,1463	-0,1378	-0,2815
GBP/CHF	-0,0943	-0,2143	-0,1651

Cross Correlations (Period 2, 08-01-2007 to 05-22-2008)

	SP500	**Nikkei 225**	**DAX 30**
SP500	1,0000	0,9293	0,8998
Nikkei 225	0,9293	1,0000	0,8672
DAX 30	0,8998	0,8672	1,0000

	SP500	**Nikkei 225**	**DAX 30**
USD/JPY	-0,3282	-0,3533	-0,5536
NZD/JPY	0,1908	-0,5020	-0,0759
AUD/JPY	0,1546	-0,6032	-0,1549
EUR/JPY	-0,1189	-0,5430	-0,4310
EUR/CHF	-0,1186	-0,5793	-0,5042
GBP/JPY	-0,2956	-0,3589	-0,5833
GBP/CHF	0,0093	-0,4311	-0,2879