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Getting Carried Away: How the Carry Trade and Its Potential Unwinding Can Explain Movements in International Financial Markets.

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Some ten years ago, the phrase "carry trade" completed the leap from the esoterica of screens in trading rooms to reporting on the financial news pages. More recently, readers have been treated to assertions that the carry trade is "unwinding." What is this about? Who is carrying what? Do implications extend beyond one narrow trading strategy? Are there wider implications for the economy? For strategies under which you, the reader, can expect to profit?

Here are the short answers:

- Carry trade is the name of the strategy of going short in a low-interest rate currency such as the Japanese yen, and simultaneously long in a high-interest rate currency such as the New Zealand dollar. [1]
- In the narrowest form, the speculator borrows in yen, converts the proceeds to dollars, and invests in dollar assets. The dollar assets are the ones being "carried," much as an auto dealer might carry an inventory of cars, which he or she finances by borrowing from the bank.
- The low-interest-rate currency need not be the yen. The Swiss franc is another currency that has long had low interest rates, thereby engendering a carry trade. Even the US dollar and the euro have had low enough interest rates in recent years to finance a carry trade into such high-return countries as Australia, Brazil, Hungary, Iceland, India, Indonesia, Mexico, New Zealand, Russia, South Africa, and Turkey.
- Yes, the carry trade is also of more general interest. To begin with, the speculator need not literally borrow. It still qualifies as the carry trade if he or she simply shifts his or her portfolio out of the low-interest-rate currency into the high-interest-rate currency. In Japan it is said that Mrs. Watanabe – by which is meant the typical woman in the street – has in recent years learned to play the foreign exchange market as a way of escaping the limited low-interest alternatives traditionally available to her domestically. A broader definition of the carry trade would cover any investment strategy that involved shifting out of low-interest-rate assets and into everything else: emerging market debt, equities, real estate, commodities, etc.
- Yes, there are implications for monetary policy. One of the reasons that, since 2001, so much money has flowed into these emerging markets, not to mention

[1] For a good review of the carry trade, including attempts to quantify it and further references, see Galati, Heath and McGuire (2007).

equities, commodities, and – until the last year or two – real estate, is that money has been relatively loose and interest rates relatively low among the big four central banks: the Fed, ECB, Bank of Japan, and People's Bank of China.

- Yes, there are also implications for individual investment strategies. The carry trade pays off on average. But "on average" is a key qualifier. The volatility is high. At times the strategy produces big losses. Often these times can be described as the "unwinding of the carry trade." On the broadest level, we already know that those who a few years ago "went long" in US real estate, financed by borrowing at low interest rates, did badly once interest rates rose and housing appreciation ceased (2004-07). The same is potentially true of other assets. As of the time of writing, November 2007, anyone who is currently short yen and long euros could be in for a big disappointment, despite the 400 basis point interest differential favoring euros.

Earlier incarnations of the currency carry trade

The current decade is not the first time when the carry trade has driven international currency markets. In the markets boom that preceded this decade's, which ran from 1990 to mid-1996, low US interest rates sent investors scurrying into Latin America, Asia, and elsewhere. The impetus was all the stronger in that market participants had become addicted to high nominal interest rates in the 1970s and 1980s; their withdrawal symptoms accelerated when the recession of 1990-91 brought lower US interest rates. Investors looked around for the high yields, and found them in emerging markets. They told themselves that these countries were now good investments because of the triumph of free-market capitalism over socialist economics.[2] By the mid-1990s, US interest rates were higher, but Japanese interest rates had fallen almost to zero. Now the carry trade generally meant going short in yen and long in anything with the word "dollar" in it -- not just US dollars, but Australian dollars, New Taiwan dollars, Hong Kong dollars, and so forth – also investments in Korea, Thailand, and other Southeast Asian countries that were denominated in dollars. When the world's major central banks lowered interest rates again in the fall of 1998 -- in reaction to contagious crises associated with Russia and LTCM – they arguably injected new life into the carry trade.

Another earlier incarnation of the carry trade, under another name, were the "convergence plays" of the formative stages of European Monetary Integration. At the time of the Maastricht Treaty of December 1991, it seemed that the permanent fixing of exchange rates among member countries was at hand.[3] Yet such currencies as the Swedish kronor, Italian lira, pound sterling, Finnish markka and Portuguese escudo were still paying substantially higher interest rates than German marks, suggesting that perhaps financial markets had not yet fully internalized the obsolescence of exchange risk within

[2] Insufficiently noted at the time were several prescient articles -- Calvo, Leiderman and Reinhart (1996) and its predecessors -- suggesting that low rates of return in the rich countries were at least as important in explaining the capital flows to emerging markets as were the reforms in the latter, that these flows could reverse if and when US interest rates went back up, and that this pattern was a replay of the bank loans to developing countries when US real interest rates were low in the late 1970s, which ended in the international debt crisis of 1982. Calvo, Leiderman and Reinhart were proven correct in 1994 when the US raised interest rates and the Mexican peso crashed – an earlier instance of a reversal in the carry trade.

[3] E.g., Frankel and Phillips (1992).

the member countries. A lively convergence play called for going short in marks and long in one of the other currencies. This strategy paid good profits for some years, as the speculators collected the high interest rates, without adverse exchange rate movements.

Yet another, still earlier, example of the phenomenon arose in the US in the early 1980s. The high US real interest rates produced by "Reaganomics" attracted capital from Japan and other foreign countries. For four years, 1981-1984, anyone long in the dollar made out like a bandit. Not only did they earn a substantial interest differential, but on top of that the dollar appreciated strongly each year.

Carry-out is no free lunch

At one level, the strategy of investing where interest rates are high, to the exclusion of where they are low, might seem like a "no brainer." Certainly "chasing yield" has been a prime motivation of investors since the time of the earliest cross-border flows. But it is not as obvious as it might sound. As so often in finance, if it were that easy to make money, others would have already done so on a massive scale, and in the process would have "arbitraged away" the profit opportunity.

In theory, if the yen pays an interest rate of only 1% per annum and the Australian dollar 7%, the interest rate differential should represent the compensation that investors require to off-set currency risk. The phrase currency risk, as used here, could be defined to include only the expected rate of depreciation of the Australian dollar against the yen, that is, speculators' best guess as to where the exchange rate is likely to go in the future.[4] In other words, if the Australian dollar pays an interest rate of 7%, this is probably because speculators are fearful that it will depreciate against the yen in the near future. If the A$ turns out to depreciate at a rate of 6%, nothing will have been gained (7% interest – 6 % depreciation = 1 %, the same rate of return as is paid on yen). Of course it may depreciate faster or slower than this, but that uncertainty is not a positive incentive. The technical term for the condition under which the interest differential precisely offsets expected currency depreciation, because speculators equalize expected returns across countries is "Uncovered Interest Parity." Another name for what we are talking about comes from the market in forward exchange: "Unbiasedness of the Forward Discount." The two are virtually equivalent, because the forward discount is equal to the interest differential (except in those cases – far more common among developing countries than rich countries -- where cross-border barriers such as capital controls or default risk are interposed between the two interest rates).

The only problem with the theory is massive evidence that it does not hold in practice. Indeed the statistical evidence *against* the theory is probably stronger than statistical evidence *in favor* of most other theories in economics ! When one currency pays a higher three-month interest rate than another, the low-interest rate currency does not tend on average to appreciate correspondingly during the ensuing three months. If

[4] Or it could be defined, in academic parlance, to include the extra premium that investors demand to compensate them for holding a currency that is perceived as being risky in the sense of uncertain (with unforecastable movements both up and down).

anything it tends on average to move the opposite direction. Not only do those who hold a currency like the Australian dollar gain on interest, but more often than not they also gain through appreciation of the currency.

We know this because there is a huge collection of academic studies testing whether the interest differential or – more often, but equivalently, the forward discount – on average predicts correctly the movements in the future spot exchange rate. The studies go back thirty years, to studies in 1977 of the first four years of data on floating exchange rates. Virtually all of them reject the hypothesis that the markets get exchange rate movements right on average. Most of them in fact find that the forward discount or interest differential on average points the wrong direction. In other words, one can expect to make money on average by going short in the low interest rate currency (the one selling at a forward premium) and going long in the high interest rate currency (the one selling at a forward discount). This is called the finding of Forward Discount Bias. The forward rate is not just a poor predictor of the future spot rate, but a biased predictor.[5] This finding has held up over and over, on many currencies, and many sample periods.[6] Only in developing countries with high inflation rates do currencies with high interest rates or high forward discounts tend to depreciate, and even then the bias does not disappear entirely.[7]

It is a sad commentary on the isolation of the ivory tower that almost none of the academic writings on the forward discount bias refer to the phrase "carry trade" (or "convergence plays"), and almost none of the financial newsletter reports on the carry trade refer to the "forward discount bias." Still, it is clear that they are talking about the same thing.[8]

When the Carry Trade Gets Carried Away

Each of the historical examples offered above -- periods when speculators earned high returns from the carry trade -- ended with rather rapid reversals. In 1992, the upward pressure on the mark vis-à-vis the lira, pound, and other EMS currencies proved

[5] Now is the time for me to indulge two Inside-the-Ivory-Tower pet peeves. The first one is that the name Forward Discount Bias is to be preferred over the more common "Rejection of Uncovered Interest Parity." Uncovered Interest Parity (or its rejection) refers to expectations of future exchange rates that are inside speculators' heads. Forward Discount Unbiasedness (or bias) refers to the mathematical expectation within any given sample period. The two are equivalent under Rational Expectations methodology. But that methodology does not necessarily give us the right answer. (Frankel and Froot, 1989.) There is no need to prejudge this issue of interpretation by giving the empirical finding a tendentious name. The second pet peeve is that the paper most widely cited as the breakthrough contribution to the literature on forward discount bias is Fama (1984). While Gene Fama is one of the great finance economists of our time, his paper was very far from the first to find statistical bias in the forward rate. The first paper to specify the test in terms of bias in the forward discount was Tryon (1979): It was never published; perhaps it was ahead of its time.

[6] Three surveys are Engel (1996), Froot and Thaler (1990) and Lewis (1995). Farhi and Gabaix (2007) have recently offered a rare persuasive argument, based on occasional disasters, of why the forward discount could 100% (or more) reflect a risk premium.

[7] Chinn (2006), Frankel and Poonawala (2006), and Burnside, Eichenbaum, and Rebelo (2007) look at developing countries.

[8] One good example of financial news reports on the carry trade is Nordvig (2007).

too strong, and the latter were forced to devalue: the convergence play turned abruptly into a big money-loser. In 1997-98, Thailand, Korea, Indonesia, Russia, and Brazil all underwent large devaluations against the dollar, bringing disaster to what had long been a successful carry trade in such countries. In one week of 1998 (October 4-10), the yen rose 16% against the dollar, thereby suddenly reversing years of profitable carry trade from the low-interest-rate yen into the higher-paying dollar.[9]

The carry trade has been likened to picking up pennies in front of a steam roller. In most months, it pays off. But every once in awhile, things reverse, the low-interest-rate country undergoes a sudden revaluation upward, and anyone caught in the carry trade is squashed. The profitable months more than make up for the reversals. The many statistical findings of carry trade profitability, forward discount bias, and rejections of uncovered interest parity tell us so. But the risk is large.

What causes these reversals of the carry trade? Sometimes unforeseen events or new information regarding economic fundamentals causes investors suddenly to pull out of the high-interest-rate currency or carried asset. Possible examples include the Plaza Accord of 1985 (dollar), the early stages of the 1992 crisis in the European Exchange Rate System (Finnish markka), political instability in Mexico in early 1994 (peso), and the US sub-prime housing crisis of 2007 (non-government bonds). But often the reaction seems excessive, or at best an overdue correction to preceding excessive enthusiasm in favor of the carried asset. Whatever one thinks of the economic fundamentals of East Asian economies in the 1990s, there was nothing in the way of new information in mid-1997 that can explain the timing of the collapse of the Thai baht. The carry traders are often among those leading the turnaround; this is the phenomenon of "unwinding the carry trade."

Sometimes the reversal is triggered by a tightening of monetary policy in the low-interest-rate country, however necessary or well-intentioned the authorities' steps against inflation. Possible examples include the role of Paul Volcker's 1980-82 tightening in precipitating the international debt crisis of 1982, the role of the Bank of Japan's 1990 tightening in setting off a five-year yen appreciation, and the role of Alan Greenspan's 1994 tightening in helping precipitate the Mexican peso crisis.

The questions of most topical interest concern the sources of the recent carry trade – whether in its narrow or broad definitions – and the prospects of its reversal. There can be little doubt that easy monetary policy by the Fed and the other major central banks beginning in 2001 motivated a strong subsequent carry trade into smaller currencies (narrow definition) and a diverse range of other assets that share only the characteristic of being riskier than treasury bills (broad definition). Many of us have thought for the past three years that market perceptions of risk had fallen to irrational lows, as reflected in low sovereign spreads for emerging markets, low spreads on mortgages and corporate bonds,

[9] The same for the earlier episodes. Going long in the high-interest-rate dollar and short the yen or mark, a very profitable strategy from 1980 to 1984, suddenly turned unprofitable during 1985-87 (a period of dollar decline generally associated with the Plaza Agreement of 1985). Going long in developing country debt suddenly turned unprofitable in 1982.

and low implied volatilities in options prices such as the VIX. Investors in these assets, including carry traders, got carried away. This underpricing of risk may have been in part a further consequence of easy monetary policy. Another, complementary, possibility is that traders who price options and other securities mindlessly plug into the formulas statistical measures of volatility in the recent past, rather than taking a longer term perspective to think about possible future risks. Regardless, the market underpricing of risk partially reversed in the "sub-prime" crisis of August 2007. The question is whether there is more to come.

The Fed, ECB, and Bank of Japan still are setting interest rates at levels that are low compared to those in such countries Australia, Brazil, Hungary, India, Mexico, New Zealand, Russia, South Africa, and Turkey. As a result, the carry trade continues. The true reversal has yet to come. One possibility is a new failure of the convergence play in Central and Eastern Europe: Hungary or other high-interest rate countries that are in line to join the euro could be the source of the next currency crisis.

Most closely watched is the possibility of a reversal of the carry trade from the yen, which still pays near-zero interest rates, to the dollar itself. The traditional pattern is most clear with the carry trade from the yen to the euro: it has been predictably profitable for the last five years, and this will predictably end soon, as the yen reverses its depreciation against the euro. ("Predictably" in short-term exchange rate forecasting never means 99% probability. It means some probability substantially in excess of 50 %.) But the big question globally is whether the dollar will now depreciate at an accelerated rate, against the yen in particular. It seems likely, with a reversal in the yen carry trade playing an important role.

Harder to predict is whether the decline of the dollar will turn into a hard landing, definable as a simultaneous fall in US securities markets. The Fed and the financial markets have long been accustomed to viewing the dollar and US bonds as the ultimate safe haven, where money flees when risk perceptions shoot up. But the United States by now has a 40-year legacy of a declining dollar, which may be attributable to high spending accommodated by monetary policy (with a few major exceptions such as the Volcker tightening period). If Asians and oil-exporters accelerate the switching of their reserve shares from the dollar to the euro, the US may finally lose its privileged safe haven status, as did the United Kingdom in over the first half of the last century. If so, we may indeed experience a hard landing of the dollar, abetted by a reversal in the carry trade from Japan.

References

Burnside, Craig, Martin Eichenbaum, and Sergio Rebelo, 2007, "The Returns to Currency Speculation in Emerging Markets," NBER Working Paper No. 12916, Feb.

Calvo, Guillermo, Leo Leiderman and Carmen Reinhart, 1996, "Inflows of Capital to Developing Countries in the 1990s," *Journal of Economic Perspectives*, 10, no. 2, Spring, 123-139.

Chinn, Menzie, "The (Partial) Rehabilitation of Interest Rate Parity in the Floating Rate Era: Longer Horizons, Alternative Expectations, and Emerging Markets," *J. International Money and Finance* 25, 2006, 7-21.

Engel, Charles, 1996, "The Forward Discount Anomaly and the Risk Premium: A Survey of Recent Evidence," *Journal of Empirical Finance*, June, pp. 123-191.

Fama, Eugene, 1984, "Forward and Spot Exchange Rates," *Journal of Monetary Economics* 14: 319-38.

Farhi, Emmanuel, and Xavier Gabaix , 2007, "Rare Disasters and Exchange Rates: A Theory of the Forward Premium Puzzle," International Finance and Macroeconomics Program Meeting, National Bureau of Economic Research, October.

Frankel, Jeffrey, and Kenneth Froot, 1989, "Forward Discount Bias: Is it An Exchange Risk Premium?" *Quarterly Journal of Economics*, 104, no.1, Feb..

Frankel, Jeffrey, and Steve Phillips, "The European Monetary System: Credible at Last?" *Oxford Economic Papers*, vol. 44 (1992), 791-816.

Frankel, Jeffrey, and Jumana Poonawala, 2006, "The Forward Market in Emerging Currencies: Less Biased than in Major Currencies" NBER WP No. 12496, August.

Froot, Kenneth, and Richard Thaler, 1990, Anomalies: Foreign Exchange," *Journal of Economic Perspectives* 4, no. 3, (Summer 1990), pp. 179-92.

Galati, Gabrielle, Alexandra Heath and Patrick McGuire, 2007, "Evidence of Carry Trade Activity," *BIS Quarterly Review*, September, 27-41..

Lewis, Karen, 1995, "Puzzles in International Financial Markets," in *Handbook of International Economics*, vol. 3, G. Grossman and K. Rogoff, eds., North Holland, 1995.

Nordvig, Jens, 2007, "Can the Carry trade Carry On?" *Global Economics Paper 156*, Goldman Sachs, June 7.

Tryon, Ralph. 1979. "Testing for rational expectations in foreign exchange markets," International Finance Discussion Paper no. 139. Federal Reserve Board (May).