

# Currency benchmarks for investors

by Jason Batt and Bilal Hafeez, Deutsche Bank

**END USERS HAVE EMBRACED THE DEUTSCHE BANK CURRENCY INDICES BECAUSE THEY PROVIDE A CHEAP AND EFFICIENT MEANS OF GAINING EXPOSURE TO THE RETURNS INHERENT IN THE FX MARKET, THEY ARE VERY LIQUID AND TRANSPARENT, THEY ALLOW NON-SPECIALIST FX MARKET PARTICIPANTS TO BENEFIT FROM DEUTSCHE BANK'S (DB) INTELLECTUAL CAPITAL AND LEADING MARKET POSITION, AND EXPOSURE TO THEM IS OFFERED IN A NUMBER OF SIMPLE AND EASY-TO-TRADE FORMATS.**

Whether it is competitive pressures from other fund managers, or stakeholder pressure to meet increasing pension fund liabilities, investors are continually being pushed to generate higher returns with less volatility. One of the best ways to achieve this is to include more assets that simultaneously offer higher returns and increased diversification. It therefore comes as no surprise that investments other than bonds and equities have proven to be an area of great focus in recent years. The biggest pitfall of many investments outside of bonds and equities, however, is their relative lack of liquidity, which makes larger allocations prohibitive. In this context, foreign exchange stands out. It has the highest daily turnover of any market, a track record of positive excess returns and it offers true diversification to bonds and equities.

In a March 2007 DB Research piece: "Currency Markets: Is money left on the table?" we showed that currency markets have inherent positive returns over time. The existence of a sizeable proportion of market participants who do not maximise profits, the fact that market participants have different objectives and beliefs, and the historically positive returns of following three investment approaches: carry, momentum and valuation all provide evidence for this.

The real paradigm shift has been to recognise these returns as 'beta' rather than 'alpha' alone; in other words, to acknowledge that there is an inherent return available in currency markets. Importantly, we can show that



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benchmarks in other asset classes that are viewed as representing the market return, or beta, are in fact trading rules that capture the bulk of returns of the given market.

## Currencies: last one to join the benchmark club?

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The absence of a benchmark for the currency market is quite conspicuous, given that the daily turnover now exceeds US\$2 trillion and the market has been trading for more than 20 years since the end of Bretton Woods in 1973 and the more widespread adoption of capital account convertibility through the late 1970s and early 1980s.

When viewed as a set of trading rules, the accepted benchmarks of other asset classes indicate a level of subjectivity that would not otherwise be apparent. In fact, they really reflect a set of transparent rules that capture a substantial portion of the returns of a given market. By being widely followed, they become benchmarks.

## Currency beta: the Deutsche Bank Currency Returns (DBCR) Index

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DB has identified four broad rules by which to take positions in currencies, such that the characteristics of these rules are consistent with those of other established benchmarks.

- **Select from the currencies of the Developed World – to meet liquidity requirements.**

The DBCR Index is constructed from the currencies of the G10 economies: the US dollar (US\$), euro (€), Japanese yen (¥), British pound (£), Swiss franc (SFr), Norwegian krone (Nkr), Swedish krona (SKr), Australian dollar (A\$), New Zealand dollar (NZ\$) and Canadian dollar (C\$).

- **Positive net yield (or carry) – similar to bond indices.**

The 10 currencies in the DBCR Index universe are ranked each quarter according to their three-month LIBOR yield. The DBCR carry index goes long the three currencies with the highest yields and short the three currencies with the lowest yields.

- **Positive momentum – similar to market cap weighting and minimum capitalisation rules.**

The 10 currencies in the DBCR Index universe are ranked each month by their annual return against the US\$. The DBCR Momentum Index goes long the three currencies with the highest return against the US\$ and short the three currencies with the lowest return against the US\$.

- **Undervalued – similar to incorporating a ‘fundamental’ metric such as earnings or revenue as often used in equity indices.**

For valuation we rank the 10 currencies according to their purchasing power parity (PPP) exchange rates and go short the three with the highest spot-exchange rate relative to the fair value level of PPP, and go long the three with the lowest spot-exchange rate relative to the fair value level of PPP. In this way, though we may arrive at lower returns, we get around the issue of picking arbitrary over- and undervaluation extremes such as +/-20%, which could lead to a risk of ex-post optimisation

- **Finally, we create our benchmark DBCR Index by simply taking the average of the three strategies (rules).**

## Brief summary of the rationale for these rules

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### Carry

Exploits the widely observed ‘forward premium puzzle’ or ‘forward rate bias’, which suggests that systematically buying high interest rate currencies and selling low interest rate currencies may be profitable. This is because of the existence of a risk premia, the use of different models to forecast currencies by rational market participants and the differing constraints and objectives faced by market participants.

### Momentum

Currencies appear to trend over time, which suggests that using past prices may be informative to investing in currencies. This is due to the existence of irrational traders,

the possibility that prices provide information about non-fundamental currency determinants or that prices may adjust slowly to new information.

### Valuation

In the long run, currencies tend to move back to their fair value based on (PPP). However, in the short- to medium-run, currencies can deviate considerably from their PPP values due to trading, information and other costs. This allows for the possibility of profiting from currencies as they revert back to their fair values over the long-run.

### Easy to pick the rules, but it needs to be investable

DB's investable indices are designed with regard to some quite obvious considerations such as liquidity, availability of reliable market data, the frequency of rebalancing and the sources of fixing references; these are particularly relevant for the FX market, which trades on an OTC basis rather than on an exchange where closing levels could reliably be used. There are also some more esoteric factors that are a critical part of the intellectual property that the non-specialist investor is leveraging when they invest in a DB Currency Index.

### It needs to be reliable

Another very important factor is ensuring the robustness of index performance over time. DB indices are built in a logical order which ensures their robustness. We start with trading logic which is corroborated by research and economic rationale. A set of trading rules are built from this which forms the rules governing the index construction and calculation. These rules are then tested over a lengthy data set. This order of construction ensures that results will be robust over time across multiple data sets, avoiding the out of sample bias that many 'optimised' indices have because they were constructed from data mining rather than logical trading rules. This last point is often overlooked but investors should be particularly aware that an over-complicated set of index rules can have parameters optimised in such a way that it is unrealistic to assume historic performance will be repeated after the index launch date.

## A note on optimisation in indices

### Modern finance theory was one cause of last summer's turmoil

Although August 2007 may seem a long time ago, the issues of how central banks should respond to such events, the complexity of financial products and the disintermediation of banks from the credit process have been noted. Yet the biggest lesson has not been fully appreciated. That is, our commonly used notions of risk must be wrong if hedge funds are suffering 'one-in-100,000 year losses', the market from which the 'risk-free' rate is taken (money markets) suddenly becomes the riskiest market, and 'once-in-a-lifetime' events recur (remember LTCM in 1998, and the stock market crash of 1987). The culprit is a dogmatic belief in modern finance theory that results in the under-appreciation of true 'risk' and over-investment in certain markets or strategies. We can see this clearly in currency markets in general, and the carry trade in particular.

### The paradox of optimisation and carry

An FX carry trade takes place when an investor borrows in a low-interest rate currency, such as the Japanese yen, and invests in a high-interest rate currency, such as the New Zealand dollar. It is common to construct a portfolio of carry trades to diversify the risk. Such portfolios have delivered strong returns over the decades, comparable to those in equity markets. To further enhance these returns, one of the central tools of modern finance theory is used; mean-variance optimisation (MVO). This technique adjusts the weights of each currency pair in the portfolio to deliver the highest returns for a given level of volatility. The process by which this is done is surprisingly simple. All we need are the expected returns, volatilities and correlations of the currency pairs in the portfolio. We can then 'optimise' the portfolio for the ideal degree of diversification.

This is all well and good, however we must realise that MVO is built on the idea that markets are efficient; that is, investors are just as likely to experience losses as gains. It may seem like a technical point, but critical in this context because FX carry trades seem to be profitable precisely because markets are not efficient. If they were, even in the

presence of acceptable levels of risk premia, then FX carry trades would not be profitable. The paradox then is that investors are employing an investment strategy premised on markets not being efficient, while at the same time employing an optimisation technique that is premised on markets being efficient. But you cannot have it both ways.

### The nuisance of extreme returns

The flaws are more apparent if we look at the assumptions behind MVO, namely, that returns are normally distributed, and volatilities and correlations are stable. If FX carry returns were normally distributed then extreme gains or losses would not have much impact on overall returns. Yet, if we exclude the 25 largest one-day losses since 1980, we find that FX carry returns would be dramatically higher; US\$100 invested in 1980 would have grown to US\$6000, rather than US\$3000, if all returns are included. From another angle, in a 'normal' world, a one-day loss of more than 3% would only be seen once every 4,000,000 years. Since 1980, we've already seen four such extreme trading days! The fundamental flaw in MVO is that it optimises to 'average risk', when in fact we should care more about 'extreme downside risk'.

The second assumption is as shaky; both volatilities and correlations are unstable in the real world. Focusing on NZ\$/¥ volatilities, we find that one-year (historic) volatility has ranged from 5% to 29% with even wider swings for one-month volatility. Worryingly, periods of low volatility tend to get interrupted by sharp spikes in volatility triggered by carry trade losses. Using MVO, this has the unfortunate implication of giving signals to increase one's exposure to carry trades just before sharp losses, and then reducing ones' exposure after them, which prevents capturing the typical recovery in profits. Correlation is no different. During periods of carry losses, correlations between currency pairs pick up and so the diversification one thought one had fails to hold when most needed.

### How does the Deutsche Bank Currency Returns (DBCR) Index perform?

Since 1980, the DBCR has delivered excess returns of close to 4% with a Sharpe ratio of 0.80 and a maximum peak-to-trough drawdown of 11%. Between 2002 and 2007, it had

an annualised excess return of 4.6% with a Sharpe ratio of 0.78. It appears that returns broadly follow a cycle so, as in equities, currencies appear to have bull-and-bear markets, with bull markets tending to last much longer than bear markets (see Exhibit 1).

In comparison to the DBCR, the investment return statistics for the component strategies are lower for momentum and valuation, but in some cases are higher for carry (Exhibit 1). However, the DBCR draw-downs are unambiguously lower than any of the individual strategies and the Sharpe ratio is higher over the long-run. This is due to the fact that strategies tend to perform well at different times, and so the correlations are low and often negative between the strategies (Exhibit 1). It appears that valuation and carry have positive correlations, while momentum has a negative correlation with both.

The low correlations between the individual strategies manifest themselves in a lowered overall DBCR volatility. This reduces mark-to-market volatility for investors who are reporting earnings more frequently and importantly it reduces the volatility and hence the cost of hard options bought on the DBCR Index, allowing for increased leverage when investing via options.

### What about alternative benchmarks?

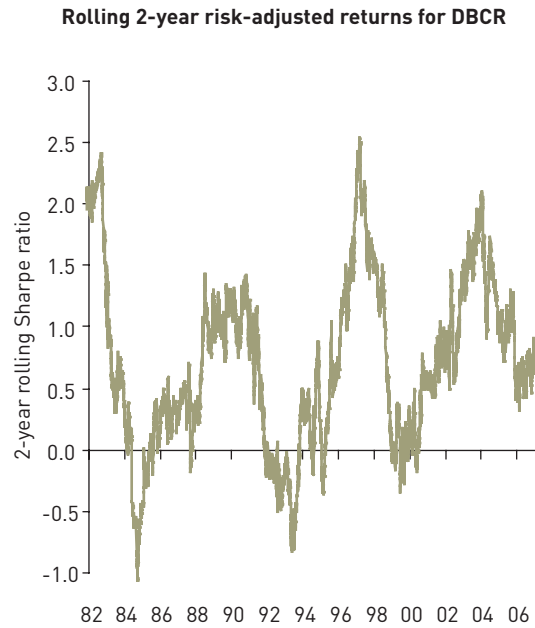
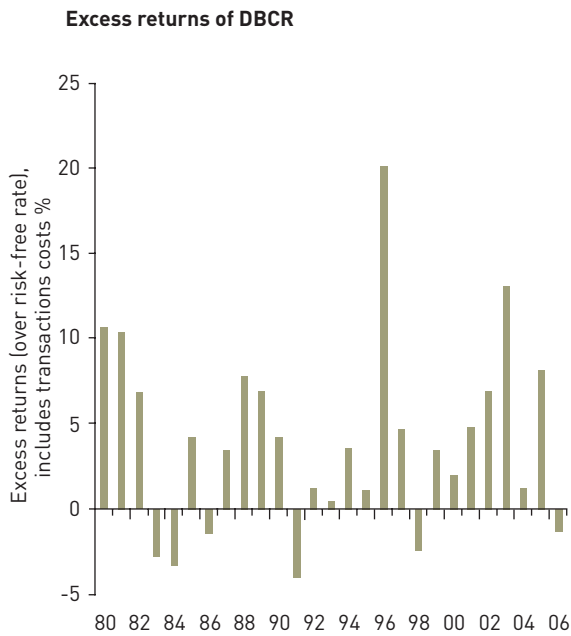
Just as multiple benchmarks exist in equity and fixed income markets, DB believes that multiple benchmarks are also appropriate for FX markets.

The three sub-indices of the DBCR broad market benchmark lend themselves to becoming benchmarks for their respective strategies. DB currently makes markets in all three DBCR sub-indices in various formats including contracts for difference and options.

Of particular interest to the investor community has been DB's harvest family of indices.

#### DB Currency Harvest

For over two years DB has been marketing variations on dynamic carry indices. Dynamic indices perform much better over time than static carry indices. Although there



Summary statistics of DBCR and components	1980-2006	1990-2006	2000-2006
<b>DBCR</b>			
Excess returns*	4.0%	3.9%	4.9%
Volatility	5.2%	5.1%	5.3%
Sharpe ratio	0.77	0.76	0.94
Maximum drawdown	-11%		
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<b>Carry</b>	4.9%	5.1%	7.0%
	0.59	0.65	0.98
<b>Momentum</b>	3.0%	2.8%	3.5%
	0.35	0.32	0.46
<b>Valuation</b>	4.1%	3.8%	4.3%
	0.46	0.41	0.54

\* Includes transaction costs and carry, and excludes legacy euro currencies, save DEM. Including them, would have kept returns close-to-unchanged for DBCR

Source: DB Global Markets Research

are some core components to the carry trade such as being short ¥ against long NZ\$, many currencies, such as the US\$, Nkr and SKr, have spent time as both a long and short currency in the highest yielding carry basket, while others have been selected as a long or short at various times and been omitted from the component currencies at others.

A diversified carry basket is much more efficient than merely selecting the one highest-yielding currency to be long of and the one lowest yielding currency to be short of. A basket of three to five currencies to be long and short of still captures the bulk of the carry differential in the currencies' yields, but has a much lower volatility than a single currency pair.

In addition to the G10 Harvest Index, which forms the carry component of the DBCR benchmark Index, there are two dynamic carry indices which draw on currencies for an expanded universe of twenty currencies, the DB Balanced Currency Harvest Index and the DB Global Currency Harvest Index.

In addition to the 10 G10 currencies, 10 other currencies may be included in the Balanced and Global Harvest Indices, drawn from the Korean won (W-offshore), Singaporean dollar (S\$-offshore), Taiwanese dollar (NT\$ – offshore), Mexican peso (Mex\$), Brazilian real (R\$ – offshore), South African rand (R), Polish zloty (Zl), Czech koruna (Kc), Hungarian forint (Ft), and the Turkish lira (TL).

The three Harvest Indices are constructed in broadly the same way. They each select which currencies to go long and short of based on three-month LIBORs and they each rebalance on a quarterly basis, utilising the innovative roll window mechanism which helps ensure returns from these indices stay with those who are invested in them.

The major difference between these indices is the rule on composition. The G10 Currency Harvest Index selects the three highest yielding currencies to be long and the three lowest yielding currencies to be short, with the selections limited to the G10 currencies. The Balanced Currency Harvest Index selects the five highest yielding currencies to be long and the five lowest yielding currencies to be short, with the selections coming from the entire universe of 20 currencies, but with the caveat that at least two of the high yielding currencies and two of the low yielding currencies must be G10 currencies. The

## A summary of the three indices' returns and Sharpe ratios for the period 2002 to 2007 **Exhibit 2**

Index	Annualised excess return	Sharpe ratio
DB Balanced Currency Harvest	15.15%	1.67
DB Global Currency Harvest	12.03%	1.35
DB G10 Currency Harvest	6.84%	0.87

**Source: DB Global Markets Research**

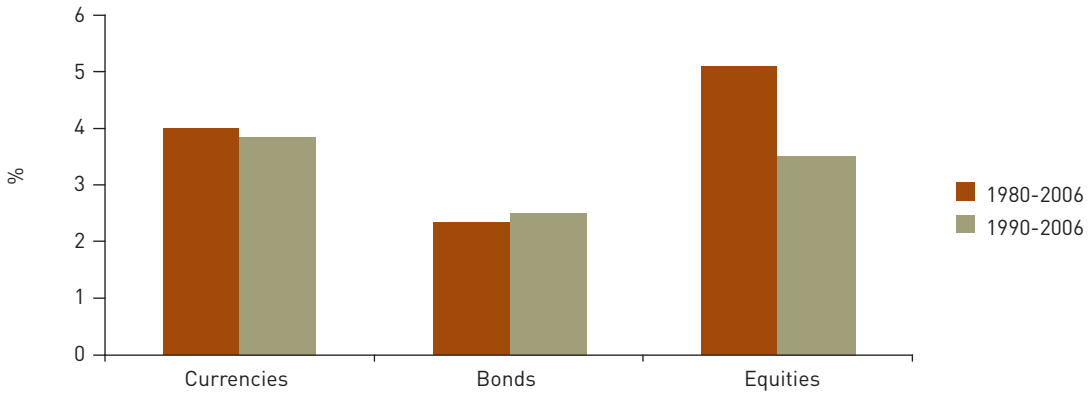
Global Currency Harvest also selects the five highest yielding currencies to be long of and the five lowest yielding currencies to be short of, with selections coming from the entire universe of twenty currencies, but there are no restrictions on which currencies may be selected as high or low yielders.

Typically, the non-G10 currencies have the extremes of interest rates and hence would be selected as the long or short components of each index on each rebalancing date. The main risk in these types of strategy is the exchange rate, and in the event that there are shocks to one non-G10 currency, contagion can become an issue as many non-G10 currencies move in the same way. For this reason, the DB Balanced Currency Harvest Index has been the most popular of the dynamic carry indices because it forces a generally more diversified selection of currencies, with a balance of G10 and non-G10 exposures. It has also historically exhibited the best Sharpe ratio.

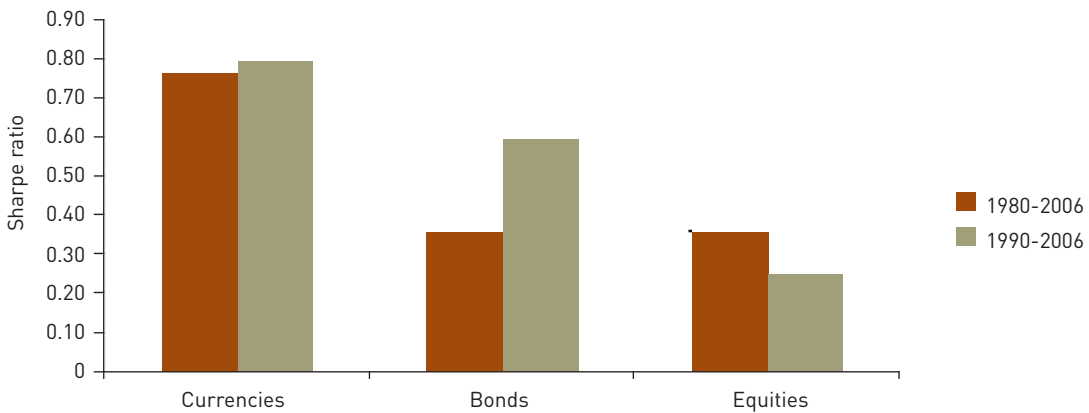
## In summary

DB has created the Deutsche Bank Currency Returns (DBCR) Index to act as a practical broad benchmark for returns inherent in the currency market, in addition to creating other more narrow benchmarks for specific strategies.

Excess returns across asset classes



Risk-adjusted returns across asset classes



Correlation between asset classes

	Bond	Equity	DBCR	FX carry	FX Mom.	FX value
Bond	100%					
Equity	26%	100%				
DBCR	-21%	5%	100%			
FX carry	-16%	4%	74%	100%		
FX mom.	3%	-2%	38%	-6%	100%	
FX value	-25%	7%	66%	40%	-25%	100%

Source: DB Global Markets Research, Lehman's Global Aggregate Index for bonds, and MSCI World for equities

These indices are created from simple, logical and transparent trading rules, ensuring robustness and reliability over time, and are investable in several formats.

In their own right, these indices have admirable return and risk characteristics, but their most attractive feature is the relatively low correlation to the returns from more traditional asset classes such as equity and fixed income. This low correlation combined with a solid history of average annual

excess returns makes these benchmark currency indices an attractive addition to existing investment portfolios and should make them more efficient. The conclusions of DB's August 2006 research piece 'Currencies: pension's saviour?', which advocated a 20%-30% allocation to currencies in a global asset allocation context are validated by the historical return, risk and correlation profile of the benchmark indices that DB has created.

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