

How do we structure an inverse DCI?

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One of the questions I am asked a lot is how to structure an inverse DCI? A **DCD** or **DCI** is a **Dual Currency Deposit** or **Dual Currency Investment**. The key idea is easy: an investor deposits 10 M USD for 6 months and receives an enhanced coupon above market, e.g. 3.5% p.a. in USD, but accepts that his notional may be converted to 10 M EUR. The issuer would then always return the currency that worth less, i.e. 10 M USD if the EUR-USD exchange rate in 6 months is above 1.0000 or 10 M EUR if the EUR-USD exchange rate in 6 months is below 1.0000. Effectively, the investor sells a USD call EUR put to the issuer, and the premium for this option is used to pay an additional interest amount above market (and a sales margin, of course).¹

DCIs have been popular for many decades. In other asset classes, say in equity/bond markets, the product is referred to as a **reverse convertible bond**. The same principle applies: the investor sells a USD call STOCK put to the issuer with the effect to receive a coupon above market and taking the risk of his cash investment to be returned as shares of stock if the stock price falls. In currency markets, EUR takes the role of the stock.

Why do people trade this? The **buy-side** is looking for a higher coupon, so is essentially greed-driven, while accepting the risk of losing the entire notional in case of the hypothetical case that the EUR isn't worth anything when measured in USD. Institutional investors sometimes have to invest in higher-yield products because they have themselves promised their investors higher yields (pension funds). The **sell-side** is very happy they can buy options from clients without credit risk. DCIs have become in fact a flow product.

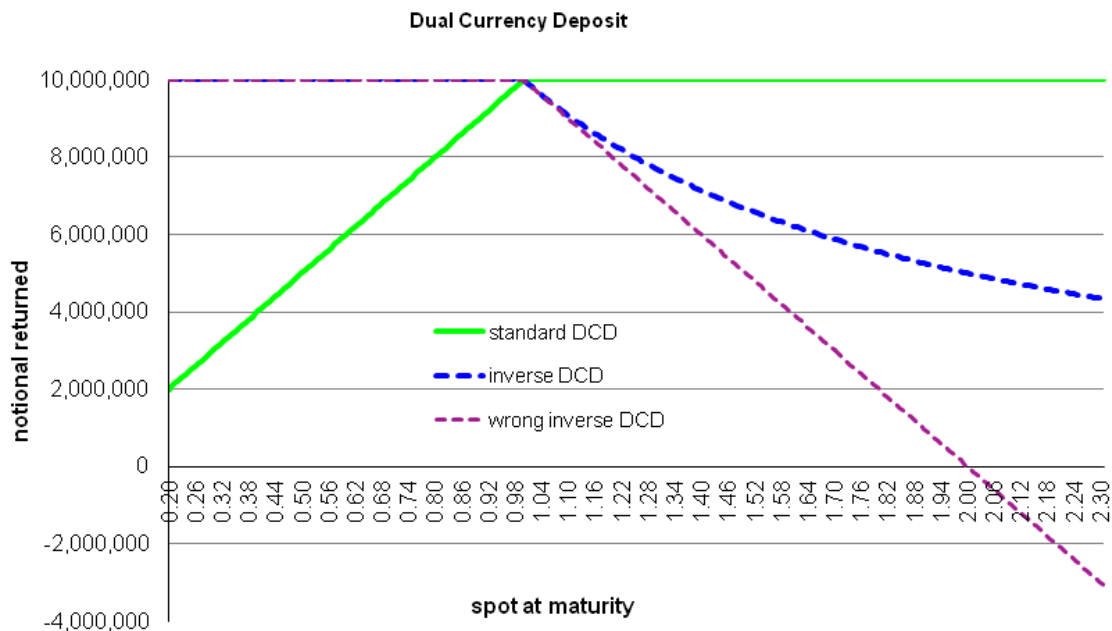
What is needed to offer this product to a larger client base? A trading desk that can do deposits and vanilla FX options, a system that can price, risk manage and administer the transactions. On the quant side, we need a really **solid FX volatility surface**, particular, since DCIs tend to be short dated products, a careful

¹ Market data used on 29 Nov 2016: EUR-USD spot 1.0500, 6M USD MM 0.992%p.a., 6M EUR MM -0.831%p.a., ATM 10.472%, 25RR 2.617% in favor of EUR puts, 25BF 0.355%, volatility for strike 1.0000 12.09% offer, sales margin of 10 bps.

management of trade events, varying geographic trade activity, handling of different cuts. Essentially, a professional issuer requires a technology of interpolation and extrapolation on the FX volatility surface with all bells and whistles, ideally with a proper financial market data platform.

What can an investor do who wants to bet on EUR-USD staying below a pre-specified level K instead of betting on EUR-USD staying above a pre-specified level K ? Well, he could simply invest in 10 M EUR instead of $N=10$ M USD. But this is a non-satisfactory answer for an investor who wants to still invest in USD. Essentially she needs an *inverse DCI*. How to make it work? If we let S_T denote the final spot price in USD-EUR, then for the standard DCI, we could say that the investor receives N if $S_T < K$, and NK/S_T USD otherwise. *In the case of an inverse DCI*, we could then say analogously that the investor receives N if $S_T > K$, and NS_T/K USD otherwise.

Why can't we structure the inverse DCI by the bank buying a **vanilla USD put**, if the regular DCI can be structured by the bank buying the **vanilla USD call**? It is a common sense thing: the USD call is worth at most the USD notional, which is the same notional as the investment notional N ; consequently, the final amount to return to the investor can't go negative. However, the value and payoff of a USD put is unbounded (when measured in USD); consequently the inverse DCI structured with a *vanilla USD put* would potentially have an overall negative value. This is indicated by the dotted lilac line in the following chart.



To make the inverse DCI work, the bank would have to buy N/K **self-quanto USD put** EUR call options, indicated by the dashed blue notional in the chart above. I am sure you won't need more than one night in the pub to check this out. However, the self-quanto needs more work on the quant side and more flexibility of the system. In fact, it needs a fool-proof extrapolation of the volatility surface on the low-deltas. The self-quanto effect comes in because we pretend the investor invests EUR in a standard DCI, in which she would be short a vanilla EUR call USD put; but in fact, she invests USD in an inverse DCI, in which she would then have to be short a self-quanto EUR call USD put.

This is why many banks don't offer the inverse DCD.

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