Once the ‘law of gravity’ in international currency markets, Covered Interest Rate Parity (CIP) is becoming an increasingly imperfect description of FX forward pricing dynamics. CIP, or the principle that forward prices must reflect interest rate differentials between traded currencies, can be distorted by a range of factors that vary both over time and across markets. Asset managers dealing in FX forwards should be aware of these frictions to ensure that their execution styles align with their and their clients’ interests. In this piece, we present a framework for examining this new pattern in FX forward markets.

Covered Interest Rate Parity
By Hendrik Klaus
CIP is a cornerstone principle in international finance. First described by John Maynard Keynes in 1923, the idea that FX forward rates must reflect interest rate differentials between currencies has long been considered one of the best tested theories in financial economics. If a market participant is willing to swap a higher yielding currency for a lower yielding currency over some time horizon, he must be compensated for the difference in yield via an adjusted forward price. Otherwise an arbitrage opportunity arises until prices and interest rates align again.

The financial crisis and direct aftermath revealed cracks in the armour of CIP. In a market environment with scarce liquidity and high credit risks in forward markets, dealers were constrained in their ability to profit from what was previously regarded as an almost risk-free arbitrage trade. But as conditions in financial markets slowly normalized after the crisis, CIP deviations remained and cross-currency basis never returned to its pre-crisis levels. After narrowing for some time, it started to widen again across most G10 pairs since approximately 2015. Increasingly, FX forward markets seemingly do not reflect what would be expected given the observed interest rate differentials. Figure 1 illustrates these dynamics by depicting the magnitude of G10 cross-currency basis over time for an exemplary three-month tenor.

By now, the existence of persistent, predictable cross-currency basis has been widely documented in the academic literature for a variety of currency pairs and across a spectrum of benchmark interest rates.\textsuperscript{1,2,3,4} Given the importance of CIP as an organising principle in international finance, instances where it appears to fail are now an active and ongoing area of research. Two key questions are crucial when trying to make sense of the observed facts: What are the demand forces in FX forward markets that seem to drive price deviations and create cross-currency basis? And how can these deviations from CIP persist over time within a large and liquid market such as G10 FX?

\textbf{Figure 1}: 1m moving average of LIBOR-based CIP deviations vs. USD for G10 currencies over time at a 3-month horizon (Source: Bloomberg, BBH calculations)
To illustrate **Covered Interest Rate Parity (CIP)**, think of a European investor aiming to earn interest over a one-year horizon. Instead of putting her money in a European bank where interest rates are close to zero, an alternative strategy would be to change her euros to dollars and invest at the higher dollar rate. Simultaneously, she sets up a one-year forward to exchange the dollar proceeds back to euros at the end of the year.

### Covered Interest Rate Parity & Cross Currency Basis

The principle of CIP now states that our investor’s choice of strategy should not matter. FX forward rates will adjust to precisely reflect the interest rate differential. If that was not the case, an arbitrageur would borrow money at the cheaper interest rate, swap the proceeds out to the higher yielding currency, and make a risk-free profit. The arbitrageur would benefit from the trade until forward prices adapt and CIP holds again. In this framework, the term cross currency basis is used to refer to the difference between actual and CIP-implied interest rates.

CIP holds when the cross-currency basis is zero.

### What causes CIP deviations?

The data limitations of an OTC market make a wholistic analysis of demand dynamics in FX forwards challenging. Nevertheless, a growing literature on CIP deviations suggests multiple factors which together seem to drive demand and ultimately cross-currency basis in G10 currencies. The picture of a segmented market emerges, where a significant portion of cross-currency forward demand is driven by dollar funding needs and hedging requirements of globally invested banks, institutional investors, and corporates.

The need for dollar funding in forward markets arises when a firm holds dollar-denominated assets from its business activities, but funds at least part of these activities via liabilities in a non-dollar currency. An example for a positive dollar funding gap might be a Japanese bank that engages in dollar-denominated intermediation in global markets but is funded through yen-denominated equity and debt. Such balance sheet mismatches not only result in currency risk for the firm but can also entail significant capital charges and invite regulatory scrutiny. There is thus a strong incentive for firms to limit the size of such a funding gap and assume a liability that can be used to offset dollar assets on their balance sheets. This can be achieved by selling a dollar forward, i.e. enter into an obligation to pay dollars and receive some other currency in the future. In our example, the Japanese bank would sell a USDJPY forward and offset the resulting liability with its dollar assets.

International, non-US financial institutions are naturally exposed to positive dollar funding gaps as a result of their activities in global financial markets and balance sheets that are to a significant extent funded by non-USD liabilities. According to statistics from the Bank for International Settlements (BIS), consolidated funding gaps ranged between 10 to 30% of total dollar assets for European banks and exceeded 45% of total dollar assets among Japanese banks in 2016. Since the financial crisis, regional differences in dollar funding needs have increased. While European banks have reduced their dollar asset sizes, Japanese banks have seen growth in the size of their dollar denominated assets and with it the potential for larger dollar funding gaps (see Figure 2). Although demand for short dollar forwards is prevalent across most major currencies, these figures suggest that USDJPY forwards play a particularly important role as tools to manage banks’ funding gaps.

### Figure 2: Non-US Banks’ Global Dollar Assets

Dollar assets held by global banks can serve as a proxy for their dollar funding needs. Graph from BIS.

Note: Excludes interoffice positions.
Source: BIS locational banking statistics; BIS consolidated banking statistics.
Dollar funding pressures also arise from corporate issuance in international debt markets. For instance, US firms have increasingly taken advantage of cheaper funding opportunities abroad by issuing non-dollar denominated debt (Reverse Yankee bonds). Such activity appears to be a significant driver behind dollar funding pressures and ultimately cross-currency basis in the EURUSD pair. As Figure 3 illustrates, the difference in corporate financing costs in the US vs. the eurozone seems to be related to the magnitude of cross-currency basis. And the significant increase in US-firms’ EUR debt issuance thus appears to be a direct driver of increasing CIP deviations that have been observed in recent years.

Large scale hedging programs from institutional investors add another significant source of demand for currency forwards. The search for yield has for some time now motivated large capital flows from lower yield currencies (e.g., yen, Swiss franc) to higher yield currencies (e.g., US dollar). At the same time, investors may seek to hedge their foreign currency exposure, which again generates demand for short dollar forwards to eliminate the long dollar exposure from any investments. On a net basis, hedging demand is largely one-directional and significant in size, but varies across currency pairs. Although aggregate data is generally hard to collect, figures for Japanese insurance companies are available and provide an indication of the magnitude of hedged flows with investments in USD denominated bonds exceeding USD $600 billion in 2018 and typical hedge ratios of approximately 60-70%.

Although the underlying sources of demand are different, dollar funding pressures and hedging demand are ultimately two birds of a feather. In both cases, FX forward markets are accessed to protect against a currency mismatch that results from global business and investment activities. While the examples in this white paper have focused on relevant, real-world cases of positive US dollar funding gaps (or hedging demand that looks to short USD forwards), a more rigorous examination indicates that the net demand flow and ultimately the sign of cross-currency basis appears to be strongly correlated with yield levels across G10 countries (see Figure 4). In relation to the US dollar this suggests: the larger the discrepancy of a currency’s interest rate relative to the USD yield, the more significant the cross-currency basis relative to USD. It appears plausible that this correlation is the manifestation of a causal relationship. Differences in yield across regions move capital across borders (e.g., through search for yield, Reverse Yankee issuance). This movement in turn creates a demand for hedging and balance sheet funding, which ultimately drives forward demand and cross-currency basis.
Source: Bloomberg, BBH calculations

**Figure 4: Cross-Sectional Variation of Cross Currency Basis:** Interest rate levels relative to the US dollar correlate strongly with historically observed cross-currency-basis. The chart shows average interbank rates/ cross currency basis for 2016-2017. The above gives possible reasons as to why one-directional demand pressure is prevalent in FX forward markets and why prices do not align with what interest rate differentials would suggest. It is also noteworthy that funding needs and hedging demand tend to be relatively inelastic in the short term. (Inelastic means that the quantity of demand does not react much to price changes.) Firms often have no choice but to address funding gaps on their balance sheets and shorter-term changes in the cost of hedging rarely have an immediate impact on institutional investors’ hedging decision per se. Nevertheless, one-directional, rigid demand dynamics on their own are insufficient to explain the persistent violation of covered interest rate parity. If CIP truly is a no-arbitrage condition, what prevents market participants from engaging in the arbitrage trade, earning a ‘free lunch,’ and providing enough supply to meet the increasing demand?

**Why can CIP deviations persist?**

If we pick yen as a currency where CIP deviations have been particularly severe and focus on shorter dated forward contracts, a striking pattern emerges as illustrated in Figure 5. At regular intervals, which match reporting dates at the end of each financial quarter, cross-currency basis spikes. The spikes occur precisely on the day when the related forward’s tenor spans two quarters: the 1-week basis widens exactly one week before the quarterly turn, the 1-month basis one month before, and so on. In the case of yen, this means that shorting a USDJPY forward over quarter-end is significantly more expensive than setting up a contract within just one quarter. In other words, carrying a short dollar position over quarter-end comes at a substantial premium.

This distinct pattern at quarter-ends provides strong evidence that regulatory frictions may play a major role in causing CIP to fail. As discussed above, financial institutions have a strong incentive to close funding gaps to limit regulatory capital charges. But for European regulators in particular, not all days of the year are created equal; European banks’ capital requirements are only assessed on the final day of each quarter. At the same time, those European banks play a crucial role in supplying forwards to meet the global demand for hedging and dollar funding – in part due to the limitations US institutions face under the Volcker rule. At quarter-ends, when European banks must now keep their funding gaps in check, supply collapses and cross-currency basis spikes.

**Figure 5: Yen Cross Currency Basis around Quarter Ends:** Cross currency basis spikes predictably around quarter ends for shorter term forward contracts. Spikes appear one month prior to quarter end for 1-month forward contracts and one week prior to quarter end for 1-week contracts.

This extreme form of supply shortage at quarter-ends is a case in point for the more general supply constraints that may ultimately explain the persistence of cross-currency basis. Engaging in the arbitrage trade and supplying FX forwards to meet one-directional demand flows in the market is capital intensive for banks – and unless forward tenors are short enough not to span across two quarters, those capital costs are likely passed on to the demand side.

Other, less tightly regulated entities such as hedge funds have so far not been able to replace banks in their role as arbitrageurs. While significant, the premium to be earned in the CIP trade does not seem large enough relative to the spread a hedge fund pays in order to borrow on an unsecured basis and lever up the trade. As an example, Figure 1 shows that 3M CIP deviations in recent years went as high as approximately 50bps. This means a hedge fund would need access to unsecured borrowing at a rate of less than LIBOR + 50bps over a
In an environment where CIP persistently fails, it is less obvious what a “fair” forward price would look like.”

Outlook

For asset managers dealing in FX forward markets, CIP deviations have concrete implications. Maintaining a hedge has generally become more expensive in recent years, but the extent to which hedging costs have changed varies significantly across currency pairs. Moreover, frictions in the forward market around quarter-ends mean that price discovery becomes more challenging and often less transparent. In an environment where CIP persistently fails, it is less obvious what a “fair” forward price would look like, and classical TCA frameworks must be applied with caution. Furthermore, dealer prices might be significantly distorted by the dealer’s own funding requirements, which can vary heavily across both time and regions. Under such conditions, asset managers should not revert to out-of-the-box forward execution. As FX markets generally trend towards low touch execution models, the failure of CIP may provide an incentive for careful, manual forward execution that leverages a network of trusted dealers and considers the various factors that are at play when supply shortages distort FX forward prices.

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5 Liao (2019): “Credit Migration and Covered Interest Rate Parity”

three-month horizon to make the trade profitable (borrowing needs to be unsecured to lever up the arbitrage trade). This may be an unrealistic rate for most funds. A remaining question is whether and to what extent long cash investors are able to engage in CIP trades to earn an additional premium on their cash holdings. The data suggest that if such activity is occurring, it is not sizeable enough to meet the demand and eliminate CIP deviations.

In addition to regulatory capital costs faced by banks and the borrowing constraints faced by non-bank entities, it is noteworthy that CIP is not a true arbitrage condition unless liquidity and counterparty risks in the forward markets are deemed sufficiently small. It is possible that the experience of the financial crisis has once and for all changed the market’s perception on how to price such risks and a swap trade that prior to Lehman was largely regarded as risk-free now generates a premium.

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