

DISCUSSION PAPER SERIES

IZA DP No. 15216

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ABSTRACT

Are Entrepreneurs Aware of Covered Interest Parity and Dollar Shortage?

The purpose of this study is demonstrating why entrepreneurs should monitor the broad dollar index. This paper explains the reason why the broad dollar index has become a risk (leverage) gauge since 2008 using the Covered Interest Parity (CIP). CIP can be viewed as a reflection of the shadow price of a bank's balance sheet, which reflects how risky the situation is for a certain entrepreneur attempting to start a new venture. The importance of the link between banks and entrepreneurs has long been recognized. When the banking system is constrained, an entrepreneur should be informed. Entrepreneurs will be able to understand the circumstances in which they want to succeed more correctly if they are aware of the state of the banking system. Overall, the risk appetite of the banking system is critical for both traditional and export-oriented businesses. The VIX index (Chicago Board Options Exchange market volatility index) was once employed as a barometer of the banking system's risk appetite, but things have changed since the great financial crisis and the index has been supplanted by the broad dollar index. Since 2008, the broad dollar index has been used as an indicator of a bank's risk appetite. This paper provides entrepreneurs a handy index for assessing the economic conditions in which they choose to be entrepreneurs more accurately.

JEL Classification: F31, F34, F41, G02, G21

Keywords: dollar shortage, entrepreneurship, balance sheet capacity, dollar index, covered interest parity

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1. Introduction

The relation between the banking system and entrepreneurs is of great importance in achieving economic growth Schumpeter (1934/39). Some economists believe that less risk averse people are more likely to become entrepreneurs (Kihlstrom and Laffont, 1979), emphasizing that risk aversion is important for appreciating entrepreneurial activity Caliendo et al. (2009). However, one of the key elements that shape the level of risk aversion among entrepreneurs indirectly, is the banking system and how well it operates in favor of economic growth and not asset price growth. The risks of a new business should be taken both by the entrepreneur and the banking system with their credit creation powers otherwise an entrepreneur will have to take a lot more risks. Others argue that liquidity constraints are a substantial impediment to entrepreneurship (Evans and Jovanovic, 1989). According to Kihlstrom and Laffont (1979) these two assumptions are related because those with more wealth are also less risk averse. However, if various liquidity limitations are assumed it leads to the question of why certain decision makers have more wealth than others if their abilities are equal.

The economic environment will be better for entrepreneurs to take risks once there is a solid and healthy banking system that attempts to fund them. Instead of going to individuals to fund their ideas, entrepreneurs can visit their local banks and convince them that their ideas are worth considering. In case the banks agree, they can fund the ideas with their special power of money creation, more specifically credit creation. This will be new credit creation for entrepreneurs who will then try and establish their ideas which in turn will lead to job creation; this will be considered as credit creation for good purposes, as opposed to credit creation for speculation that does not lead to GDP growth Werner (2014a). On the other hand, when the banking system does not give out loans for whatsoever reasons, it is not taking risks and these risks have to be borne by the entrepreneurs.

When entrepreneurs do not have access to credit creation, there is great constraint on them in realizing their new ideas. In Schumpeter's (1912, p. 197) view, "Credit is essentially the creation of purchasing power for the purpose of transferring it to the entrepreneur, but not simply the transfer of existing purchasing power. ... By credit, entrepreneurs are given access to the social stream of goods before they have acquired the normal claim to it. And this function constitutes the keystone of the modern credit structure." Entrepreneurs should be able to borrow from their future cash flows, otherwise they will not be able to combine different means of production to start a new venture. Entrepreneurs should be aware of the banking system's condition and have a handy tool to realize how risky the overall economic environment is Alvarez et al., (2005).

Since 2008, a new tool, the broad dollar index, has served as a good gauge for the banking system's risk appetite and the shadow price of banks' balance sheets to extend different lines of credit. As Shin (2016) points out, there is a triangular relation between the broad dollar index, the shadow price of a bank's balance sheet, and cross-border bank lending. The failure of covered interest parity may be mirrored in the real economy by poor trade growth (and thus productivity development). In this regard, the three big economic problems of our day — poor productivity growth, covered interest parity (CIP) failure, and trade slowdown —

could all be linked. There may be no winners in a stronger dollar scenario, given the dollar's function as a barometer of global appetite for borrowing.

The purpose of this paper is encouraging entrepreneurs to track and keep an eye on CIP (covered interest rate parity) as the price of the bank's balance sheet and hence its willingness to take risks. The more negative the CIP, the more price the banking system is putting on its balance sheet for using. Thus, the economic environment will become more liquidity constrained which is a good sign for entrepreneurs as they will have to take less risks. This paper contributes to literature as it discusses a new framework which divides risk taking between the banking system and entrepreneurs; the more risks the banking system takes, the less risk averse entrepreneurs can be.

A policy recommendation of this paper is getting the banking system to use its balance sheet space which is the main source of credit creation for the real economy Werner (2014b) to translate into demand for different businesses and entrepreneurs. For this there is a need to reduce the cost of using its balance sheet Duffie (2016). To reduce the cost of banks' intermediation, we believe that it is important to consider their repo/reverse repo activities on a net basis as it has been done for FX swaps and forwards Borio et al., (2017).

The rest of the paper is organized as follows. Section 2 discusses the risk appetite or the inverse relationship between financial intermediaries and entrepreneurs risk taking. Section 3 presents the covered interest parity which is the most famous non-arbitrage condition in international finance serving as a good guide to see through the shadow price of a bank's balance sheet. The broad dollar index as a barometer of the leverage appetite of the banking system is discussed in Section 4. The impact of a strong dollar on export-oriented entrepreneurs is analyzed in Section 5. Here the broad dollar index, as a measure of the banking system's balance sheet costs, is an index that should be considered by entrepreneurs. The final section provides a conclusion and policy recommendations.

2. Risk Appetite: Banks versus Entrepreneurs

There is an inverse relation between the financial intermediaries and entrepreneurs' risk taking in an economy. As financial intermediaries have changed over the last few decades Adrian et al. (2010a, 2010c), we need to focus our attention specifically on broker-dealers and their risk aversion conditions, whether they are more or less risk averse, to get a good grasp of the situation. When the dealer-banks do not take risks, the condition is much riskier for an entrepreneur to establish a new business. In this situation the price of the dealers' balance sheets is expensive because they do not want to take risks leaving entrepreneurs to take those risks instead. Thus, the more risk-averse the dealers get the less risk-averse entrepreneurs need to be. Put another way, when dealers get risk-averse they sit on their hands and do not engage in any risky activities, so these risks have to be taken by the entrepreneurs.

The banking system's risk (leverage) appetite can be explained using various means of credit creation, be it internationally (like the example below) or domestically. When the banking system is risk averse, it can influence entrepreneurs from two angles -- aggregate demand and transferring of new purchasing power to entrepreneurs. Once the cost of banks' balance

sheets is high, the bankers will not take that many risks, meaning they will not expand their balance sheets. This means not having enough credit creation. Less credit creation leads to less aggregate demand which in turn influences new entrepreneurs' business and profitability Schumpeter (1939). From the other angle, the risk aversion of the banking system puts a lot of pressure on entrepreneurs' credit for establishing their new businesses. In an environment in which dealer-banks take risks many people want to be entrepreneurs because the more the dealer banks take risks and engage in risky activities the more people can come up with new ideas and establish new businesses because the environment is less risky as the dealers have bought the risks in the economy.

On the other hand, when the dealer-banks get risk-averse, and they do not take risks which in banking is referred to as the cost of their balance sheets getting expensive. When the costs of the balance sheets get expensive, there will be a dollar shortage. A dollar shortage indicates that the dealers are risk-averse again McGuire et al. (2009). Thus, the question becomes: who should take the risks in an economy? Should entrepreneurs take the risks that have not been taken by the financial intermediaries, specifically the dealers? There is an inverse relationship between risk aversion of financial intermediaries and risk aversion of entrepreneurs in the economy, meaning the more risk-averse the dealers are, the less risk-averse an entrepreneur has to be.

3. Covered Interest Parity

The deviation from Covered Interest Parity (CIP) which is the most famous non-arbitrage textbook condition in international finance, could serve as a good guide to see through the shadow price of banks' balance sheets. The textbook definition of CIP is that the money market rate of interest should be equal to the implicit rate of interest in the FX (foreign exchange) market Borio et al., (2016). CIP is: $1 + r_x = \frac{F}{S} (1 + r_v)$, where r_x is the dollar interest rate in the cash market, r_v is the other currency's interest rate in the cash market, and S and F are the spot and forward exchange rates of x (dollar) in terms of v (other currencies). This formula should hold, otherwise there will be an arbitrage opportunity, meaning one could borrow in the US cash market and lend those dollars in the other currency's market to seize the opportunity in the differences in the rates.

For instance, if an institution in Korea wants to hedge its dollar assets, it will normally go to the market to borrow dollars on a secured basis, that is, borrow dollars and pledge its own currency Korean won as collateral. However, there should be an incentive for the dollar-lender, otherwise why bother taking liquidity and credit risk by lending dollars? The dollar lender's incentive is in the implicit interest rate on this secured lending, that is, at maturity the borrower should repurchase his Korean won from the lender, which had been pledged as collateral at a higher rate. This difference between the beginning (spot rate) and maturity (forward rate), $F-S$, is the 'implicit interest rate.' This implicit interest rate should be equal to the dollar interest rate in the US money market. Otherwise, a given dealer bank will borrow dollars from the US money market and lend these dollars in the other country's cash market to make use of an arbitrage opportunity.

There was no CIP deviation before 2008, that is, the dealer banks took the arbitrage opportunities and closed the gap.

However, since 2008 we have been witnessing fluctuations in a deviation from CIP. A bigger deviation indicates more strains on banks' balance sheets for these arbitrages Pinnington et al. (2016). The deviation from the CIP condition is measured using the cross-currency basis. When the cross-currency basis is zero, CIP holds. However, when it is negative, it indicates that synthetic dollar funding in the FX swap market is higher than direct funding dollars in the US money market. On the other hand, a positive cross-currency basis implies that funding dollars through the FX swap market is more expensive than it is in the US money market. In the repurchase agreements (repo), the borrower receives cash and pledges securities like treasuries as collateral. This determine the maturity date and the prices at which cash borrowers should repurchase their securities at a slightly higher price (the difference between the purchase and repurchase price is the interest rate for the lender).

This also occurs in a FX swap, like what we have in repurchase agreements (repo). For instance, the dollar borrower receives dollars and pledges his own currency like Korean won as collateral. The difference between spot price S and forward price F of this FX swap is the implicit interest rate, which according to CIP should be consistent with the interest rate of the cash market. Put another way, the rate of borrowing in the cash market should be consistent with the rate of the synthetic dollar borrowing. Otherwise, there will be an arbitrage opportunity where one can borrow from the lower rate and lend to the higher one. The demand for hedging and tighter limits for banks to take this arbitrage opportunity have led to CIP violations and the deviation from CIP has been widening especially after 2014.

The cross-currency basis point is used for measuring the difference between direct dollar funding and indirect dollar funding. The basis point indicates the strain on dollar funding in some areas. The more the cross-currency basis goes negative, the more there is a dollar shortage in that area Lee et al. (2022). The questions why the cross-currency basis goes negative and then why it does not close are of importance. The demand for a currency risk hedge requires more dollar funding in those specific areas which have a negative cross-currency basis. And the reason why they cannot be closed as easily as they could before 2008 is the constraint on doing arbitrage, that is, the price of banks' balance sheets has become more expensive so that engaging in existing arbitrages is not attractive anymore.

Figure 1 shows the long-term Libor-based deviations from covered interest rate parity. It plots the 10-day moving averages of the five-year Libor cross-currency basis, measured in basis points for G10 currencies. Covered interest rate parity implies that the basis should be zero, corresponding to the period 2001-08.

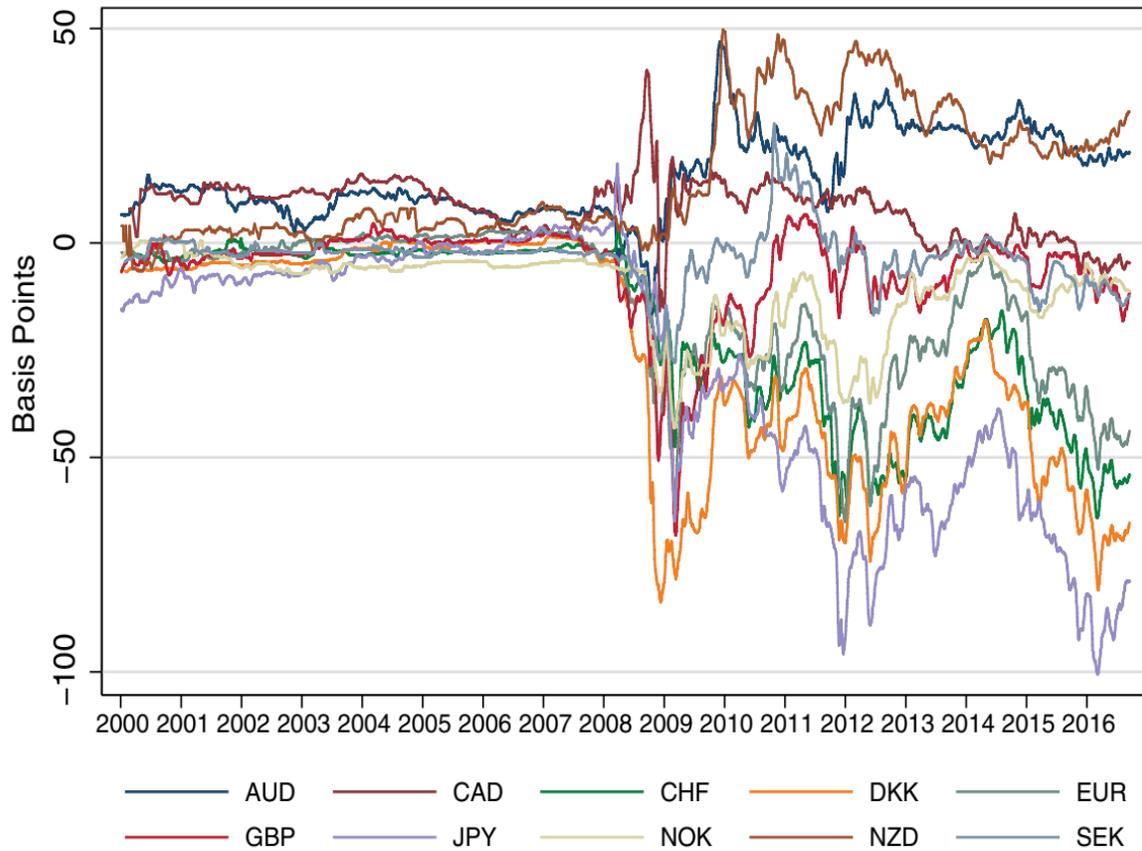


Figure1: Long-term Libor-based deviations from covered interest rate parity (Source: Du et al. 2018/2021).

4. Broad Dollar Index as a Risk Barometer

The VIX index (Chicago Board Options Exchange market volatility index) used to be a good barometer of the leverage appetite of the banking system as shown in Figure 2. The situation was called the ‘fear gauge of the market’ by market participants. Before 2008, when the VIX was low, the dealer banks’ leverage was high, and when VIX was high, banks’ leverage was low. However, since the global financial crisis, this index has not been correlated to the risk (leverage) appetite of dealer-banks, that is, even though it has been low, the dealer-banks’ leverage has not gone back to where it was before 2008 Adrian et al. (2010b).

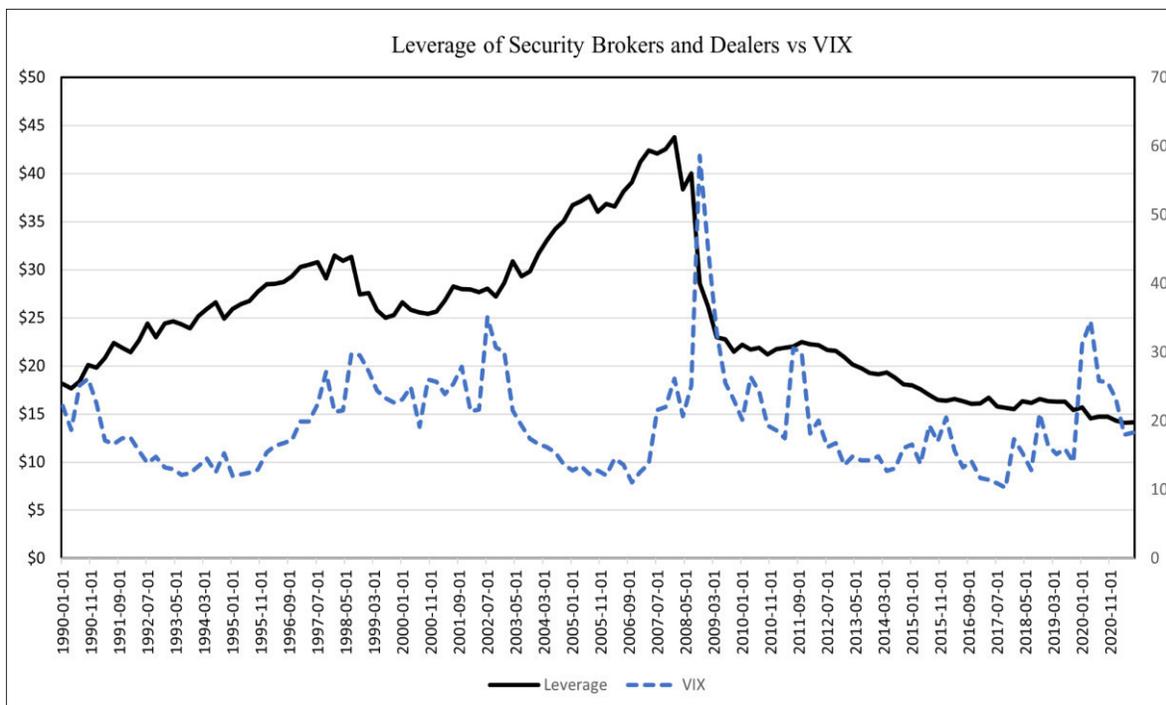


Figure 2: Development of the leverage of security brokers and dealers compared with the VIX index

(Source: Authors' interpretation based on US Flow of Funds, Federal Reserve, 1990-2020, FRED).

5. The impact of a strong dollar on export-oriented entrepreneurs

According to our framework theory, the broad dollar index, as a measure of the banking system's balance sheet costs, is one of the indices that should be considered by entrepreneurs. According to Shin (2016), there is a triangular relationship between the dollar's strength, deviation from CIP, and cross-border bank lending. A CIP deviation should be viewed as a reflection of the shadow pricing of a bank's balance sheet, resulting in the current situation of dollar scarcity Du et al. (2019). Figure 3 shows a clear relationship between the dollar's strength and the total amount of global goods exports, which are inversely correlated. As a result, dollar scarcity will have an impact on entrepreneurs, particularly those who are export oriented. Now that we have covered the transition from VIX to the broad dollar index, we need to concentrate on the broad dollar index as a global risk factor.

According to Shin (2019) when the dollar appreciates in value, it signals limits on credit supply channels. This manifests itself, for example, in the export of goods. When the value of the US dollar rises, the price of banks' balance sheets rises as well, and as a result they reduce loan distribution, which has an impact on exports through global value chains (GVCs) Bruno et al. (2021). Every country has its own specific know-how in the global playground (Figure 3) and the US dollar index has an inverse correlation with the export of global goods (Shin, 2016). At times, participating in GVCs requires much more working capital due to the

long value chains globally. The businesses and companies need credit for their operations. However, when the broad dollar index appreciates it affects all the companies, especially those entrepreneurs who are trying to get competitive in the GVC game or establish a new export business Erik et al. (2020).



Figure 3: The negative correlation between dollar strength and world goods exports (Source: Authors’ interpretation based on FRED, BIS, and WTO).

As has been seen recently some countries have gone into negative interest rate territory. This situation encourages reserve managers to invest in places where interest rates are positive. This has led reserve managers to invest in the US treasury market. By investing in the US treasury market, all the reserve managers need hedging. That is why the demand for hedging has skyrocketed recently. As shown in Figure 4, after the global financial crisis, the more the demand for hedging (synthetic dollar funding) goes up, the more the basis goes negative. And because most hedges are conducted in US dollars, in the FX swap market the dollar has a premium. According to the CIP equation, the interest rate of borrowing dollars directly from the US cash market should be consistent with the implicit interest rate in the FX swap market. However, this is not necessarily the case for the US dollar.

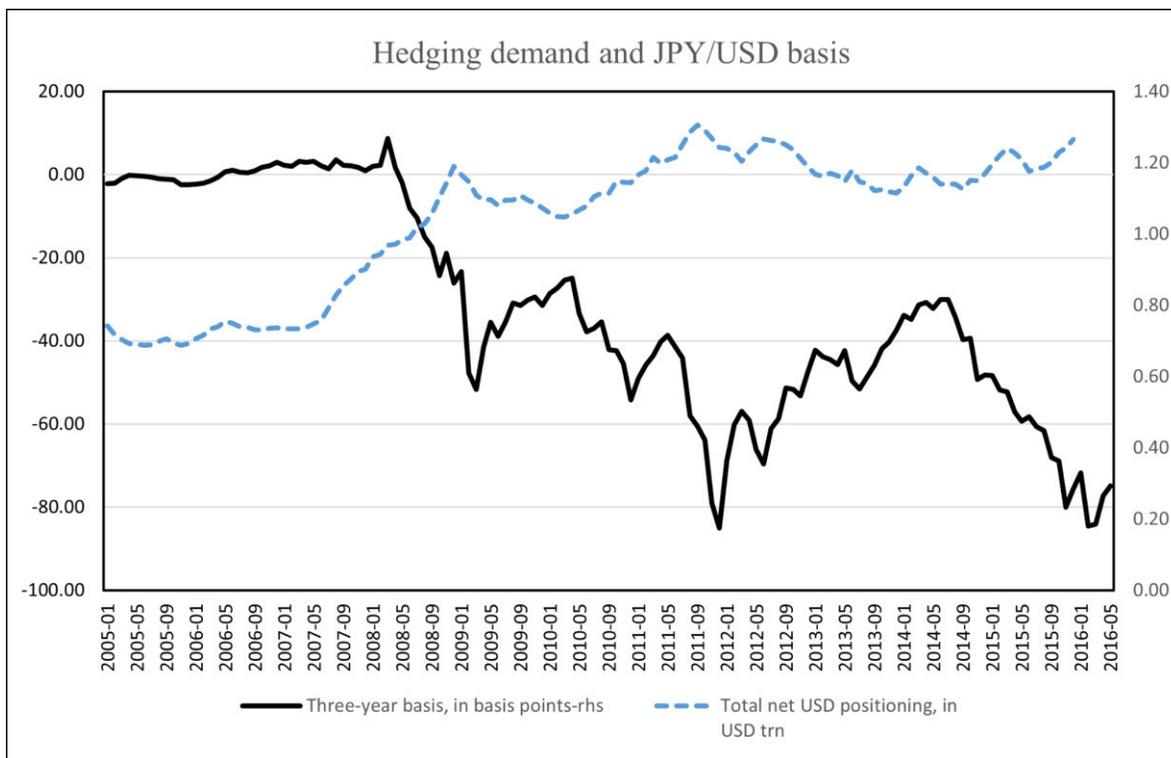


Figure 4: Currency hedging demand before and after GFC in Japan

Sources: Bank of Japan; Japanese Ministry of Finance; The Life Insurance Association of Japan; Barclays FICC Research; Bloomberg; BIS international banking statistics and debt securities statistics; authors' calculations.

Our main argument here is simple, after 2008 when the dollar index appreciated, it affected all companies globally, specifically export-oriented entrepreneurs. Export-oriented entrepreneurs Hessels et al. (2009) should know that the broad dollar index is being used as a global risk (leverage) factor. Once the broad dollar index goes up in value, entrepreneurs should be more risk averse, otherwise they will lose and absorb the global contractions in banking credit channels. We hope to demonstrate how the FX swap market, covered interest parity, and dollar appreciation function in the real world using the scenario: Assume that Sweden wants to purchase some given products from South Korea produced by export-oriented entrepreneurs. If Sweden does not have a dollar shortage, it will pay in dollars for the goods. However, this is not the case most of the time, that is, Sweden does not always have dollars in hand. So how is it going to purchase without dollars?

In Balance Sheet 1, the first row shows that Sweden has a liability of \$100 to Korea. Hence, Korea has \$100 due from Sweden. In the second row, the FX dealer facilitates this settlement by creating credit, namely by expanding its balance sheet, creating a \$100 dollar spot liability. Then Sweden buys that \$100 liability with its own currency, the Swedish krona, at the current spot rate. It later transfers the purchased dollar liability to Korea. At this stage, the FX dealer has expanded its balance sheet, which is real money creation that will eliminate the dollar

shortage problem that we have been dealing with since 2008. However, now the FX dealer has exposed itself to an exchange risk, namely, there is the risk that the dollar value of its asset might go down. In the third row, to hedge the exchange risk, the FX dealer decides to enter into a FX swap or term forward contract. By lending \$100 term dollars and borrowing term FX (kronor). In this situation if the dollar value of its asset goes down, the dollar value of its term FX liability falls as well. This FX dealer has a matched book position, that is, it is not exposed to exchange risks. The fourth row shows the position of another dealer, a speculative dealer, who enters into forward contracts with the first dealer to speculate and make profits.

Surplus Country (Korea)		FX Dealer		Deficit Country (Sweden)	
Asset	Liability	Asset	Liability	Asset	Liability
\$100 due from Sweden					\$100 due to Korea
-\$100 due from Sweden +\$100 spot		+\$100S FX Spot	+\$100 spot	- \$100S FX Spot	-\$100 due to Korea
		+\$100 term	+\$100S FX term		
		+\$100S FX term	+\$100 term		

Balance Sheet 1: A stylized example of the relationship between CIP, currency hedging, global FX dealer and export (Source: this example has been taken from Perry Mehrling lectures, <https://sites.bu.edu/perry/mb-lectures/>).

The dealers are usually private dealers. However, sometimes they are central banks. For major currencies these dealers are mostly private dealers, but for minor currencies, central banks act as FX dealers. The second dealer might not be a speculative dealer per se, for instance, it could be a Swedish pension fund or a Swedish bank who will pass it on to the Swedish pension fund. If we break down the second dealer's situation, we get to Balance Sheet 2: in the first row, the pension fund has krona liabilities of its own people, and probably because the rates are so low (especially the rates in Europe are negative), these pension funds tend to seek yields in other countries' markets, mainly in the US treasury McGuire et al. (2021). For example, they purchase T-bills with those liabilities. The problem for the Swedish pension fund here is that it is exposed to exchange risk, that is, it has a krona liability to its own people but has dollar assets. To hedge those risks, the pension fund enters the same FX swap and forward markets. In the second row, it borrows \$100 term dollars and lends

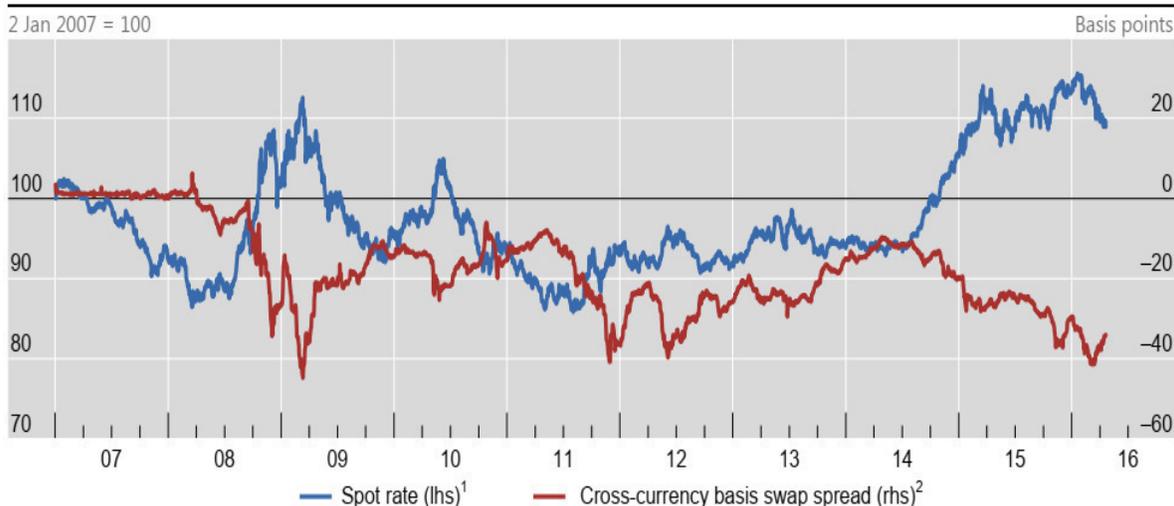
\$100S FX term (kronor). The demand for hedging has now risen and this Swedish pension fund needs dollars to hedge its positions. Putting these two figures together, we realize the relation between a hedge demander and a hedge supplier. If the first, the FX dealer does not supply dollar hedging for the pension fund, the FX dealer faces a challenging situation. If it does not hedge, it cannot facilitate payments between Sweden and South Korea from the beginning. Not facilitating these payments will lead to a shrinkage in trade and export growth which as a consequence will affect export-oriented entrepreneurs as well.

Pension fund

Asset	Liability
\$100 T-bills	\$100S FX spot
\$100S FX term	\$100 term

Balance Sheet 2: A stylized T-account of a pension fund

Due to a huge demand for dollars, the dollar has got a premium compared to other currencies, that is, to borrow dollars synthetically through the FX swap market, one has to pay a premium. That premium has been known for the basis that is being used in FX swap or cross-currency basis. As shown in Figure 5, the red line indicates the average basis points (premiums) that borrowers in CAD, EUR, GBP, SEK, CHF, and JPY have to pay to get dollars. When the broad dollar index is plotted in the chart, a striking negative correlation can be seen between the dollar and the FX cross-currency swap basis. Figure 5 implies that when the dollar index appreciates, the basis gets negative. Which takes us back to Shin’s (2016) triangular relation between the dollar value, banks' cross-border lending in dollars, and CIP deviation.



¹ Simple average of bilateral exchange rate of the dollar against CAD, EUR, GBP, SEK, CHF and JPY. Higher values indicate a stronger US dollar. ² Simple average of the five-year cross-currency basis swaps against CAD, EUR, GBP, SEK, CHF and JPY vis-à-vis the US dollar.

Sources: Avdjiev, Du, Koch and Shin (2016); Bloomberg; BIS calculations.

Figure 5: The inverse correlation between the dollar index and cross-currency basis (Source: BIS, Shin, 2016).

6. Conclusion and Policy Recommendations

When it comes to taking risks, we advocate that entrepreneur should consider the broad dollar index as a global risk factor in their risk calculations. Since 2008, the broad dollar index has been a crucial indicator of how tight the banking system's credit supply is, which is a critical component for entrepreneurs. The banking system's credit creation is critical in determining the riskiness of innovative ideas proposed by entrepreneurs. When the value of the dollar rises, so does the shadow price of a bank's balance sheet. As a result, banks will not expand their balance sheets, which is what money printing is all about. The dollar scarcity will continue as long as the banking system refuses to take risks and increase its balance sheet Adrian et al. (2008).

Entrepreneurs who are attempting to start new businesses and hoping to succeed should be aware of this indicator. When the dollar index rises, entrepreneurs should stay away from high-risk ventures. When the dollar falls in value, however, the banking system may grow its balance sheet more easily, making credit more accessible to entrepreneurs, particularly export-oriented entrepreneurs.

This paper's contribution to research is that it shows that entrepreneurs should be aware of the banking system's risk aversion and, as a result, align their risk-taking activities with the banks' risk aversion, which has been a good indication of banks' risk aversion since 2008. When it comes to taking enormous risks, keeping an eye on the dollar index is a good idea.

Our policy recommendation is reducing the cost of banks' balance sheets. The main instrument for banks to expand and adjust their balance sheets is repo. However, since the supplementary leverage ratio (SLR) phased in, the amount of capital that regulators require from banks is calculated based on their balance sheet size. By considering repo on banks' balance sheets on a net basis or through having central counterparties (CCPs) Levich (2012) for repo we could let them expand their balance sheets and provide more credit to the real economy by not computing their repo on a gross basis and instead netting them out.

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