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Covered interest rate parity in emerging markets

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ABSTRACT

This paper finds that while covered interest rate parity holds for large and small triple A rated economies, it holds for emerging markets only for a three-month maturity. For a five-year horizon the size and frequency of violations lead to the conclusion that covered interest rate parity does not hold for longer maturities for Brazil, Chile, Russia and South Korea. Overall this paper finds that aspects of credit risk are the source of violations in CIRP in the long-term capital markets rather than transactions costs or the size of the economy.

1. Introduction

One of the fundamental tenets of international finance is covered interest rate parity CIRP. This relation says that exchange rate forward premiums (discounts) offset interest rate differentials between two sovereigns. This paper examines the role of the size of the underlying economy, transaction costs and aspects of credit risk such as volatility, market and default risk in apparent deviations in CIRP for Brazil, Chile, Russia, South Korea, Norway and the United Kingdom. Table 1 shows that Brazil and Russia were rated below investment grade on January 1, 2003, the date that this study commences, and all emerging economies were upgraded to some extent by October 31, 2006, the date that this study ends.[2] Thus this dataset encompasses a time of fairly stable market conditions and remain untainted by the peculiarities of the recent credit crunch. Meanwhile Norway and the United Kingdom remain triple A rated throughout the sample period.

CIRP is well established in recent decades amongst the OECD economies for short-term instruments. Any apparent deviations are due to transactions costs (Al-Loughani & Moosa, 2000; Bhar, Kim, & Pham, 2004; Taylor, 1987, 1989) and during the extreme market conditions of 2007–08, spill over effects from counter party credit risk in the money market (Baba & Packer, 2009). Otherwise large deviations after transactions costs are rare and fleeting (Louis, Blenman, & Thatcher, 1999) and in recent years have virtually disappeared (Batten & Szillagyi, 2010). Batten, Chan, Chung, and Szilagyi (2011) find that market frictions due primarily to interest rate volatility cause the parity price to vary within a trading ban. Aliber (1973) finds that credit risk can explain violations in CIRP in the pre floating exchange rate regime in the late 1960s. Another possible reason why covered interest rate parity may not hold is tax (Levi, 1977) but Stroble's (2001) model finds that CIRP remains unaffected by capital gains tax.

However Fong, Valente, and Fung (2010) find large numbers of deviations in covered interest rate parity for the Hong Kong Dollar for the short term capital market. They find evidence that most of these deviations are caused by liquidity and credit risk premia yet some violations persist and can be exploited by traders able to negotiate small transaction fees. Moreover Fletcher and Taylor (1996) also find that deviations from CIRP are neither rare nor short lived in the long dated capital market. They do not provide an economic reason why this is the case however. Moreover, except for Fong et al. (2010) CIRP has not been examined for capital markets outside the OECD club. This paper seeks to address these gaps by examining CIRP for Brazil, Chile, Russia and South Korea for the short and long-term horizons.

We are also curious to see whether the size of the economy plays any role in evident violations in covered interest rate parity. For instance, the volume of foreign exchange transactions can be much smaller for modest sized economies so a lack of liquidity can lead to violations in

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[2] Deviations in covered interest rate parity around the dates that Standard & Poor and Moodys upgraded the sovereigns are examined. There was no evidence that deviations in covered interest rate parity are affected by these rating upgrades. Moodys rating changes are very similar to Standard & Poor's so for the sake of brevity Moods ratings history of the sovereigns are not reported.

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Table 1
This table reports the credit rating history of Brazil, Chile, Russia, South Korea, Norway and the United Kingdom UK from January 1, 2003 to October 31, 2006 according to Standard & Poor. Standard & Poor's credit system ranks AAA as the highest possible credit rating and AA, A and BBB are investment grade whereas BB and B are below investment grade. Modifiers of + and − indicate that the sovereign are at the upper and lower end respectively of the broad rating class.

Rating date	Brazil	Chile	Russia	South Korea	Norway	UK
January 1, 2003	B+	A-	BB	A−	AAA	AAA
January 14, 2004	B+	A	BB	A−	AAA	AAA
January 27, 2004	B+	A	BB+	A−	AAA	AAA
September 17, 2004	BB−	A	BB+	A−	AAA	AAA
January 31,2005	BB−	A	BBB−	A−	AAA	AAA
July 27, 2005	BB−	A	BBB−	A	AAA	AAA
December 15, 2005	BB−	A	BBB	A	AAA	AAA
February 28, 2006	BB	A	BBB	A	AAA	AAA
September 4, 2006	BB	A	BBB+	A	AAA	AAA

covered interest rate parity. For this reason we also examine the United Kingdom, a large triple A rated economy and Norway, a small triple A rated economy and compare their results with the emerging market economies.

A salient feature of this study is the quality of the data. This study uses time synchronised closing daily mid, bid and ask prices for the spot currency, three month and five year forward currency exchange rates, three month interest rate, five year swap interest rate and five year credit default swap rates as reported by Bloomberg™ as of 16:30 British Standard Time BST. Only data for instruments that were flagged by Bloomberg™ as actively traded were used. The credit default swap data allows for an examination of the role of credit risk and the bid and ask data allows for an examination of the role of transaction cost in explaining apparent deviations in CIRP.

In contrast to Fong et al. (2010) this paper finds that for a three-month time horizon, deviations in CIRP are rare and are nearly fully explained by transaction costs for all four emerging markets that are examined. Any remaining violations are trivial. It is possible that our results differ from Fong et al. (2010) as they use tick data rather than time synchronised end of trading day data so violations that occur during the day are exploited and arbitraged away by the close of business. However, we do find that deviations in CIRP can be large and frequent for the long-term capital markets. Specifically, after transactions costs Brazil, Chile, Russia and South Korea all show some degree of violation in CIRP at a five-year horizon. In contrast Norway and the UK show no evidence of violation of covered interest rate parity at either the three-month or five year horizons. This suggests that it is credit risk rather than the size of the economy that is related to violations in CIRP. While credit default swaps CDS can help explain some of the emerging market violations, still large and frequent CIRP violations remain. In fact, when insuring deviations from CIRP with CDS the deviation from covered interest rate parity often changes sign from a large negative to a large positive thereby suggesting that CDS contracts overprice credit risk. However, like Fong et al. (2010) regressing proxies for aspects of credit risk on deviations from covered interest rate parity finds that credit risk is as least part of the explanation for these violations as the largest violations of covered interest rate parity are associated with factors related to credit risk. Overall this paper finds that there are indeed violations in covered interest rate parity in the long-term capital markets but only for emerging economies. Moreover, credit risk rather than the size of the economy or transactions costs appear to be the source of these violations.

The plan for this paper is as follows. Section 2 derives CIRP for single and multiple periods and show how CIRP can be obtained even in the presence of credit risk. Section 3 introduces the data and the methodology. Section 4 presents the numerical analysis that examines the size and importance of discrepancies in covered interest rate parity. Section 5 conducts a regression analysis on discrepancies in covered interest rate parity. Section 6 then summarises and concludes.

2. CIRP with and without credit risk

To appreciate how credit risk impacts on CIRP, it is useful to review classic CIRP in detail. The problem faced by an investor wishing to access higher foreign interest rates $r_f > r$ is shown in the diagram below. Note that S represents the number of foreign currency units per USD (i.e. 3 Brazilian reals to $1).

Transaction	T = 0	T = 1
Borrow initial investment S_0 and agree to pay domestic interest rate r and principal with funds received from foreign bonds S_1 to be converted into dollars one period hence.	S_0	$-S_1(1+r)$
Convert to foreign currency $-S_0$ and purchase foreign bonds paying interest r_f.	$-S_0$	$S_0(1+r_f)$
Net	0	$S_0(1+r_f)-S_1(1+r)$

After borrowing at the domestic interest rate r, converting dollars to the foreign currency S_0 and investing in the foreign bonds, the investor cannot be sure if a depreciation in the exchange rate one period hence S_1 will more than offset gains from investing in the higher interest rate r_f foreign bonds. Therefore the investor will seek to hedge by selling the foreign currency one period hence S_1 forward F_1. As exchange rate risk is now eliminated and the above position has no net investment then to avoid costless and riskless arbitrage the following must hold.

$$S_0\left(1+r_f\right)-F_1(1+r)=0$$

and rewriting slightly,

$$\frac{F_1}{S_0}=\frac{\left(1+r_f\right)}{(1+r)}. \tag{1a}$$

Eq. (1a) is the classic interest rate parity condition that must hold in the absence of transactions costs. Converting Eq. (1a) into returns data by subtracting one from both sides of the equation and re-arrange the expression obtains Eq. (1b).

$$\frac{F_1-S_0}{S_0}=\frac{\left(r_f-r\right)}{(1+r)} \tag{1b}$$

Now examine CIRP when the investor is uncertain about the credit quality of the foreign bond.

Transaction	T = 0	T = 1 (no default)	T = 1 (default)
Borrow initial investment S_0. Pay domestic interest rate r and principal with funds received from foreign bonds S_1. Hedge foreign exchange risk today by selling S_1 forward at exchange rate F_1.	S_0	$-F_1(1+r)$	$-F_1(1+r)$
Convert to foreign currency $-S_0$ and purchase foreign bonds paying interest r_f.	$-S_0$	$S_0(1+r_f)$	$S_0(1+r_f)\delta$
Purchase default insurance C on the foreign bond S_o.	$-CS_0$	0	$S_0(1+r_f)(1-\delta)$
Net	$-CS_0$	$S_0(1+r_f)-F_1(1+r)$	$S_0(1+r_f)-F_1(1+r)$

Now the investor cannot be sure if a default of the foreign bond will eliminate promised gains from investing in the higher interest rate r_f foreign bonds. Therefore the investor will purchase credit protection by purchasing a credit default swap C on the foreign bond. If the bond does not default then at maturity the cash flows are precisely the same as in