



Covered interest parity and arbitrage paradox in emerging markets: Evidence from the Korean market[☆]

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ABSTRACT

While emerging forward exchange markets (EMs) have been rapidly developed, market efficiency has rarely been examined for EMs. To properly test the market efficiency for EMs, we set up a simple model to account for EM-specific realistic features. Based on the new model, we develop a modified covered interest parity (CIP) condition, which features multiple neutral bands associated with both transaction costs and differential borrowing costs. In addition, we apply the notion of 'arbitrage paradox' to test market efficiency. In particular, we focus not only on the violation event of the (modified) CIP condition but also on the persistence of arbitrage opportunities. We then apply this methodology to the Korean forward exchange market and provide empirical results for the Korean market, which can also be useful for analyzing other EMs.

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1. Introduction

Covered interest parity (CIP) has played a central role in testing the hypothesis of the efficiency in a forward exchange market.¹ Until now, the market efficiency has only been examined extensively for several advanced markets, while research on emerging markets (EMs) have rarely been conducted. This may be attributable to the fact that EMs have a relatively short history of free-floating exchange rate system and financial liberalization. In addition, while development in a forward exchange market is closely associated with development in money (or capital) markets of the two counterparty currencies, EMs are typically characterized by illiquidity in money, capital or forward exchange market.

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¹ Relatedly but differently, [Rughoo and You \(2015\)](#) employ the CIP as a measure of financial integration across countries. More broadly, [Shleifer and Vishny \(1997\)](#) provide a theoretical perspective on how arbitrage is limited and a market becomes inefficient.

However, some EMs have become more liquid. As of April 2013, several EMs have had daily turnovers of exceeding 10 billion U.S. dollars for outright forwards plus foreign exchange (FX) swaps, including EMs of China, Chinese Taipei, India, Korea, Mexico, Russia, South Africa, and Turkey.² Among those eight EMs, only the Korean market had a daily turnover exceeding 10 billion U.S. dollars as of April 2004, with similar results in five other markets as of April 2007. Such development implies that it is more likely for EMs to be subject to testing the forward exchange market efficiency hypothesis.

EMs are usually populated by multilayered FX banks: domestic banks (DBs) and global bank subsidiaries (GBSs). Compared to the GBSs, DBs are typically less credit-worthy, due to limited access to international money or capital markets, and are faced with higher costs for funding global currencies. Although this heterogeneity in market participants has profound implications for testing the market efficiency for EMs, the traditional CIP does not appropriately take this point into consideration. In this paper, to properly test the market efficiency for EMs, we aim to modify the CIP condition by taking into account the EM-specific heterogeneities.

The modified CIP condition for EMs is featured by multiple neutral bands. By typically assuming transaction costs, the traditional CIP can also obtain a neutral band that is associated with transaction costs. In contrast, the modified CIP condition has neutral bands that are associated not only with transaction costs, but also with heterogeneous factors, such as differential funding costs. The traditional model for homogeneous agents presents the two states of no-arbitrage or (full) arbitrage, whereas the new model with heterogeneous agents presents three states: no-arbitrage (NA), partial arbitrage (PA), or full arbitrage (FA). Importantly, the traditional CIP condition ignores the EM-specific heterogeneities and thus would impose a too conservative no-arbitrage criterion for EMs.

In addition, we apply the notion of 'arbitrage paradox' to test market efficiency. In particular, we focus not only on the violation of the (modified) CIP condition but also on the persistence of arbitrage opportunities. Moreover, we control the effects of disequilibrium shocks on the realized violations of the (modified) CIP condition and try to observe how strongly a market tends to inherently return to equilibrium by conducting counterfactual simulation exercises.

We apply this methodology to the Korean forward exchange market. We utilize unique data for individual banks' funding costs of foreign currencies. We provide empirical results for the Korean forward exchange market which can also be useful for analyzing other EMs. We find that foreign currency borrowing spreads play an important role in testing foreign exchange market efficiency. Specifically, the occurrence of PA has been significant over time, which the conventional CIP framework ignores. In addition, we find that there exists a great discrepancy between the inherent tendency of the market towards equilibrium and the realized one, which suggests the importance of controlling the effects of shocks for testing market efficiency.

The rest of this paper is organized as follows. Section 2 provides a brief literature review of the CIP condition under various situations. Section 3 introduces a new model to incorporate EM-specific features, and develops a modified CIP condition. Section 4 offers empirical analysis results for the Korean forward exchange market by describing the data to be used, explaining the estimation method, and providing the estimation results. The simulation method and its results for testing market efficiency are also included. Section 5 concludes the paper.

2. Literature Review

CIP specifies an equilibrium relation between the interest rates of two currencies and their spot and forward exchange rates for no-arbitrage opportunities by assuming that agents are rational in a frictionless market. There have been several attempts to account for observable deviations from CIP. A prominent strand of attempts takes into consideration transaction costs, with examples including Branson (1969); Frenkel and Levich (1975, 1977); Deardorff (1979); McCormick (1979); Callier (1981a, 1981b); Bahmani-Oskooee and Das (1985); Clinton (1988), and Woodward (1988), among others. In particular, transaction costs may play a greater role in long-date capital markets. Several studies focus on the long-term CIP, including Popper (1993) and Fletcher and Taylor (1994, 1996).

On the other hand, Levi (1977) and Kupferman and Levi (1978) suggest differential tax rates as a potential factor that may account for deviations from the CIP. Measurement errors may be another source of deviations from CIP. Taylor (1987) utilizes high quality data to minimize the potential effects of measurement errors.

More interest might lie in large deviations from CIP during turbulent periods than small ones during normal periods. Frenkel and Levich (1977) and Taylor (1989) study the deviations during turbulent periods. Recently, several works try to explain deviations from the CIP during the 2007–2008 global financial crisis period. Such examples include Baba et al. (2008); Baba and Packer (2009a, 2009b); Coffey et al. (2009); Genberg et al. (2009); Jones (2009); Fong et al. (2010), and Griffoli and Ronaldo (2011), among others.

Like our study, Skinner and Mason (2011) also examine forward exchange market efficiency in EMs. Although they take into account credit risk by utilizing credit default swap premium to investigate market efficiency for the long-term period, they employ a standard CIP condition (with transaction costs) for the short-term period. Unlike Skinner and Mason (2011), we try to develop a new model to accommodate EM-specific features to investigate market efficiency for a short-term period.

Our model is closely related to that of Blenman (1991), who devises CIP under market segmentation. Agents are differentiated with residency and faced with differential lending and borrowing opportunities. This market segmentation implies a neutral band

² Refer to the triennial central bank survey of foreign exchange and derivatives market activity in 2013 by the Bank for International Settlement.

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