Deciphering CIP Deviation: Who Moves It and Why It Matters?*

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April 23, 2025

Abstract

This paper studies covered interest parity deviations (CIPD) using participant-position level monthly data for the Korean FX derivative market from 2015 to 2024. Applying the granular instrumental variables (GIV) method, we decompose CIPD into contributions from 12 groups of domestic and foreign market participants. This decomposition allows us to examine both supply and demand forces of US dollar funding for CIPD to emerge. We find that foreign investors' supply forces account for 61% of CIPD throughout the sample period, while the domestic agents' demand forces is responsible for the rest. During stress periods, foreign investors' reduced supply is intensified as all domestic agents dash for dollar. We use the CIPD components as instruments in local projections (LP-IV) to assess their macro-financial impact. A 10bp increase in CIPD raises foreign bond inflows by up to 0.7% and reduces domestic bond outflows by up to 1.48%. Furthermore, CIPD instrumented with non-deliverable forwards decreases exchange rates by 0.74%. Our findings highlight the role of local banks' FX hedging behavior in transmitting the underlying forces of CIPD.

Keywords: Covered Interest Parity Deviation; Foreign Exchange; FX Hedging; Bank; Non-bank Financial Institution; Exchange Rate; Non-derliverable forward; Capital Flow; Micro to Macro
JEL codes: E58, E44, F31, F32, F41, G11, G21, G23

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*This paper is based on a related internal project at International Department of the Bank of Korea. We thank colleagues at the Bank of Korea who provided valuable comments on this project, especially Kyoungsoo Yoon, Ki-Dok Park, Seunghwa Son, Jaeyoung Lee for their helpful comments. The views expressed herein are those of the authors and do not necessarily reflect the official views of the Bank of Korea.

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1. Introduction

Covered Interest Parity (CIP) is a foundational no-arbitrage condition in international finance. Yet, persistent deviations from CIP (referred to as CIPD) have been observed, particularly following the 2008 Global Financial Crisis. Most of previous literature has focused on CIPD for advanced economies, explaining it from the supply side perspective (e.g., risk-bearing capacity of global banks).[1] The heterogeneity across foreign exchange (FX) derivative market participants in driving CIPD remains underexplored.

In this paper, we provide a novel decomposition of CIPD taking into account both supply and demand forces. We further leverage the decomposed CIPD components as instrumental variables to explore the causal implications on spot exchange rates and capital flows. To decompose CIPD into the market participant level, we exploit participant-position level data (January 2015 – December 2024) from the Bank of Korea. The data is constructed from the unique regulatory dataset based on local banks' FX derivative trading reports. Using the granular instrumental variables (GIV) methodology (Gabaix and Koijen, 2024; Chaudhary, Fu, and Zhou, 2024), we attribute observed CIPD to 12 distinct groups of participants – local banks, domestic non-bank financial Institutions (NBFIs), and foreign investors, among others.

Our decomposition reveals that most CIPDs are driven by foreign investors (61%), while the rest are driven by domestic agents (39%). In particular, during market stress periods such as COVID-19 and the late 2024, the dollar funding supply by foreign investors accounts for more than 80% of the up-and-down of CIPD dynamics. The time-varying contribution of each group highlights the importance of participant-specific drivers in shaping apparent deviations from no-arbitrage conditions.

CIPD is more than an indicator of the US dollar funding shortage. Depending on

[1] See a comprehensive survey in Du and Schreger (2022).

the shocks at play, CIPD has different consequences that go beyond the FX derivative market. The participant-level decomposition of CIPD allows us to identify exogenous sources of shocks and establish causal links to captial flows and spot exchange rates. Using Jordà (2005)'s local projections with IV (LP-IV), we show that increases in CIPD lead to net debt inflows. In particular, the 10bp increase in CIPD driven by domestic demand leads to 0.7% increase in foreign debt inflows. When driven by foreign supply, 10bp CIPD decreases domestic debt outflows by 1.48%. This result implies that CIPD stands for an arbitrage investment opportunity for foreign investors, while it represents dollar funding costs for domestic agents. Furthermore, when instrumented with non-deliverable forwards, 10bp increase in CIPD leads to 0.79% decrease in exchange rates.

Related literature. Our paper contributes to the literature on CIP deviations (Avdjiev et al., 2019, Du, Tepper, and Verdelhan, 2018, Du and Schreger, 2022 among others), in particular, those studies focusing on emerging markets (Hong et al., 2021; Cerutti and Zhou, 2024; Dao and Gourinchas, 2025) and emphasizing the hedging demand (Borio et al., 2018; Alfaro, Calani, and Varela, 2021; Keller, 2024; Jung, 2025; Chen and Zhou, 2025 among others).

Our contribution to this literature is twofold. Firstly, we provide a comprehensive analysis on CIPD determination taking into account both supply and demand channels. The unique regulatory data set allows us to collect FX derivative transactions reported by local banks where Korean Won (KRW) and US dollar (USD) are involved. [2] We treat CIPD as an equilibrium object and provide a complete decomposition along the market participant level. Compared to the common approach in the literature, our approach is novel in the sense that it takes into account heterogeneous price elasticities and idiosyncratic trading motives among the market participants. Secondly, we shed light

[2]KRW is not a fully internationalized currency. Any KRW involved spot and derivative transactions must have residents as counterparties, often the local banks. Thus, the local FX market is the "clearing house" that determines the market equilibrium prices.

on the mechanism through which shocks to CIPD propagate to capital flows and spot exchange rate. With local banks at the core of the mechanism, our participant-level CIPD decomposition allows us to identify exogenous sources of shocks to derive causal implications.

The closest work to ours is Kubitza, Sigaux, and Vandeweyer (2025) who exploit Euro area investor level data to find that a wider CIPD induces portfolio rebalancing from USD to EUR bonds. Despite similarities, the distinctive feature of our paper is that we provide a complete decomposition of CIPD and put local banks hedging behavior at the core of the mechanism. In addition, we examine the impact of CIPD not only on capital flows but also on exchange rates. Our paper shares the same spirit as De Leo, Keller, and Zou (2024) in emphasizing the role of local banks in connecting FX derivative and spot markets using Peruvian data. In contrast to their finding, we show that foreign investors' forward demand can actually reduce CIPD when banks engage in FX swap trading in addition to spot trading. This discrepancy comes from the fact that Korea has a well-established FX swap market compared to Peru.

Outline. The remainder of the paper is organized as follows. Section 2 describes data and institutional background on the FX derivative market in Korea. Section 3 describes the empirical model for CIPD decomposition whose results are illustrated in Section 4. Section 5 examines the impact of CIPD on capital flows and spot exchange rates. Finally, Section 6 concludes.

2. Data and Institutional Details

2.1. Data

We construct participant-position level data based on FX derivative trade records reported by local banks in Korea (January 2015 – December 2024). The data is obtained from the Bank of Korea that contains detailed information about every trade record: trading date, types of derivatives and currencies, notional amounts, maturity date, and the counterparty. We rearrange these trade records along the counterparty dimension classified into 12 groups: local banks, non-bank financial institutions (security firm, insurance fund, pension fund, etc.), local firms, government authorities, and foreign investors. In addition, we further divide foreign investors into two groups based on whether the contract is deliverable. Since notionals are not exchanged between the parties at maturity date, non-deliverable (ND) trades are more frequently used for speculation rather than curreny hedge purposes.

[Insert table for participant classifications (%)]

[Insert table for key variable statistics]

2.2. Korea's FX derivative market

Korea has a well-established FX derivative market. The average daily turnover is $43.3 billion in 2024, which is almost twice as large as spot market ($25.7 billion). Specifically, FX swap is the most actively traded derivative ($28.4 billion, 65.6%) followed by FX forward ($13.4 billion, 30.9%) and cross-currency swap and option ($1.4 billion, 3.2%). Most of the derivative transactions are KRW-USD involved (78.4%). Non-residents (e.g., foreign investors) are the most active market participants accounting for 45.2% of the overall FX derivative turnover. Their frequent counterparties are the local banks whose within-group turnover is 33.9% of the total. The rest (20.9%) represents domestic agents' trades with the local banks.

NDF market. ND forward (NDF) accounts for 81.3% of forwards turnover, whereas onshore deliverable forward (DF) accounts for the rest (only 18.7%). Note that this is the amount not including NDF contracts without local banks involved. Offshore NDF market for KRW is so liquid and deep that it accounts for 20% ($50 billion) of the total global NDF turnover, according to the BIS 2019 Triennial survey.[3] One distinctive feature of KRW NDF market is that onshore residents (often the local banks) are allowed to freely trade with non-residents in the offshore market as part of deregulation implemented after the 1997 Asian Financial Crisis.

Local banks' FX hedging. Both NDF and DF trading result in local banks being exposed to open FX positions. Local banks hedge FX risks (i.e., square the positions) by engaging in FX swap and spot tradings.[4] Consider the case where foreign investors enter into a NDF contract with local banks. When a strong dollar is anticipated, foreign investors purchase NDF, leaving the counterparties (local banks) exposed to short FX position at far date. To cover this position exposure, banks buy dollar in the spot market, and at the same time, engage in Sell&Buy FX swap. This series of tradings allows banks not only to hedge against FX risks, but also to enjoy arbitrage (i.e., CIPD) by supplying dollar funding when it is in shortage. Hence, foreign investors' NDF purchase is one of the important sources to provide dollar funding supply in the FX derivative market. Likewise, forward sales of domestic agents (e.g., exporters) are the source of dollar funding demand.

Supply and demand for dollar funding. CIPD is an equilibrium object determined in the dollar funding market (Du and Schreger, 2022). We classify the supply and demand for dollar funding in the following way:

[3]NDF market is the largest for Asian currencies among which KRW accounts for the biggest share followed by Indian rupee (INR), and New Taiwan dollar (TWD). See for details Schmittmann and Teng (2020).

[4]The regulation requires the net long and short position on both on- and off-balance sheets to be below 50 percent of the capital.

3. Methodology

In this section, we propose a framework to decompose the factors driving movements in CIP deviations in the Korean FX derivatives market, along with an identification strategy in the spirit of granular instrumental variables (Gabaix and Koijen, 2024). Before presenting the framework, we clarify that the term *net position*, denoted as f_{it}, refers to the net dollar purchase position, which indicates near-leg dollar buying and far-leg dollar selling. The change in this position captures the excess demand for dollar funding through FX derivatives markets in each period.

3.1. Framework

Demand for dollar synthetic funding is specified as follows:

$$q_{it} = -\zeta_i p_t + \lambda_i \eta_t + u_{it} \tag{1}$$

The market clears in each period, meaning that the increase in net positions across all entities sums to zero. Let q_{it} denote denote the increase in entity-i net position, scaled by its market size, which is defined as the total market size multiplied by its market share S_i.

$$q_{it} \equiv \frac{\Delta f_{it}}{S_i Size_t} \tag{2}$$

Then market clearing condition is expressed as follows,

$$\sum_{i=1}^{N} S_i q_{it} = 0 \tag{3}$$

3.2. Identification

$$\hat{\mathbb{E}}[\hat{u}_{i,t}\left(\hat{\zeta}_i\right)\underbrace{\sum_{j\neq i} S_j\, u_{j,t}\left(\hat{\zeta}_j\right)}_{\hat{u}_{S(-i),t}(\hat{\zeta})}] \equiv \hat{\mathbb{E}}\left[\left(q_{i,t}+\hat{\zeta}_i\, p_t\right)\sum_{j\neq i} S_j\,\left(q_{j,t}+\hat{\zeta}_j\; p_t\right)\right] = 0. \tag{4}$$

Given that the market clearing condition holds in the sample for each period, and using the sample moment conditions, the estimators for price elasticities are obtained as the solution to the resulting system of equations. Bias correcd ols esimators

$$\hat{\zeta}_i = -\frac{\hat{\mathbb{E}}\left[q_i\, p_t\right] - \frac{1}{\zeta_s} S_i \hat{\sigma}_i^2}{\hat{\mathbb{E}}\left[p_t^2\right]} \tag{5}$$

$$p_t = \frac{1}{\zeta_s}\left(\lambda_s \eta_t + \mu_{st}\right) \tag{6}$$

N system of equation

Estimate $\hat{\lambda}_{ik}$ in a following three steps

(a) Regress q_{it} and p_t on η_k using OLS, and get $\hat{\lambda}_{ik}^q$ and $\hat{\lambda}_k^p$

(b) Estimate market elasiticity ζ_i

(c) Recover $\lambda_{ik} = \hat{\lambda}_{ik}^q + \zeta_i \hat{\lambda}_k^p$

Then variance of λ_{ik} can be derivedd as follows

$$var(\hat{\lambda}_{ik}) = var(\hat{\lambda}_{ik}^q + \zeta_i \hat{\lambda}_k^p) + var(\zeta_i)\hat{\lambda}_k^{p2} \tag{7}$$

where, the first part is equivalent to asymptotic variance of the OLS estimator of regressing $q_{it} + \zeta_i\, p_t$ on η_{ik} and variance of ζ_i is presented in .

TABLE 1. Price Elasticities by Sector

Sector	Share (S_i, %)	Elasticity ζ	ζ Share (%)
Domestic banks	20.74	1.09	3.77
		(-0.15, 2.33)	
Corporates	4.52	4.29	3.24
		(0.07, 8.51)	
Insurance companies	3.11	3.01	1.56
		(-1.19, 7.21)	
Securities companies	3.10	4.62	2.40
		(0.42, 8.82)	
Asset managements	2.47	4.74	1.96
		(-0.02, 9.50)	
Foreign bank branches	29.26	1.62	7.90
		(0.81, 2.43)	
Foreign Non-delivery	19.01	22.92	72.80
		(11.78, 34.06)	
Foreign Delivery	15.17	0.77	1.96
		(-0.06, 1.61)	
Aggregate	100.00	5.99	100.00
		(3.81, 8.16)	

4. Drivers of CIP Deviation in Korean FX Derivatives Markets

foreign bank branches vs foreign non delivery,

Foreign Non-delivery(denoted as foreign ND) capture the demand and supply for derivative-based dollar funding by foreign bank branches. This derivative-based funding need arises as foreign bank branches must unwind the positions they acquire when acting as counterparties to foreign NDF transactions.

During global risk-off periods, heightened global risk factors—reflected in rising excess returns—worsen dollar funding conditions, leading to an increase in CIP deviations. Our estimates suggest that a one standard deviation increase in global risk factors raises the CIP deviation by 17.7($\approx 1.06/0.059 \times 100$) basis points during risk-off

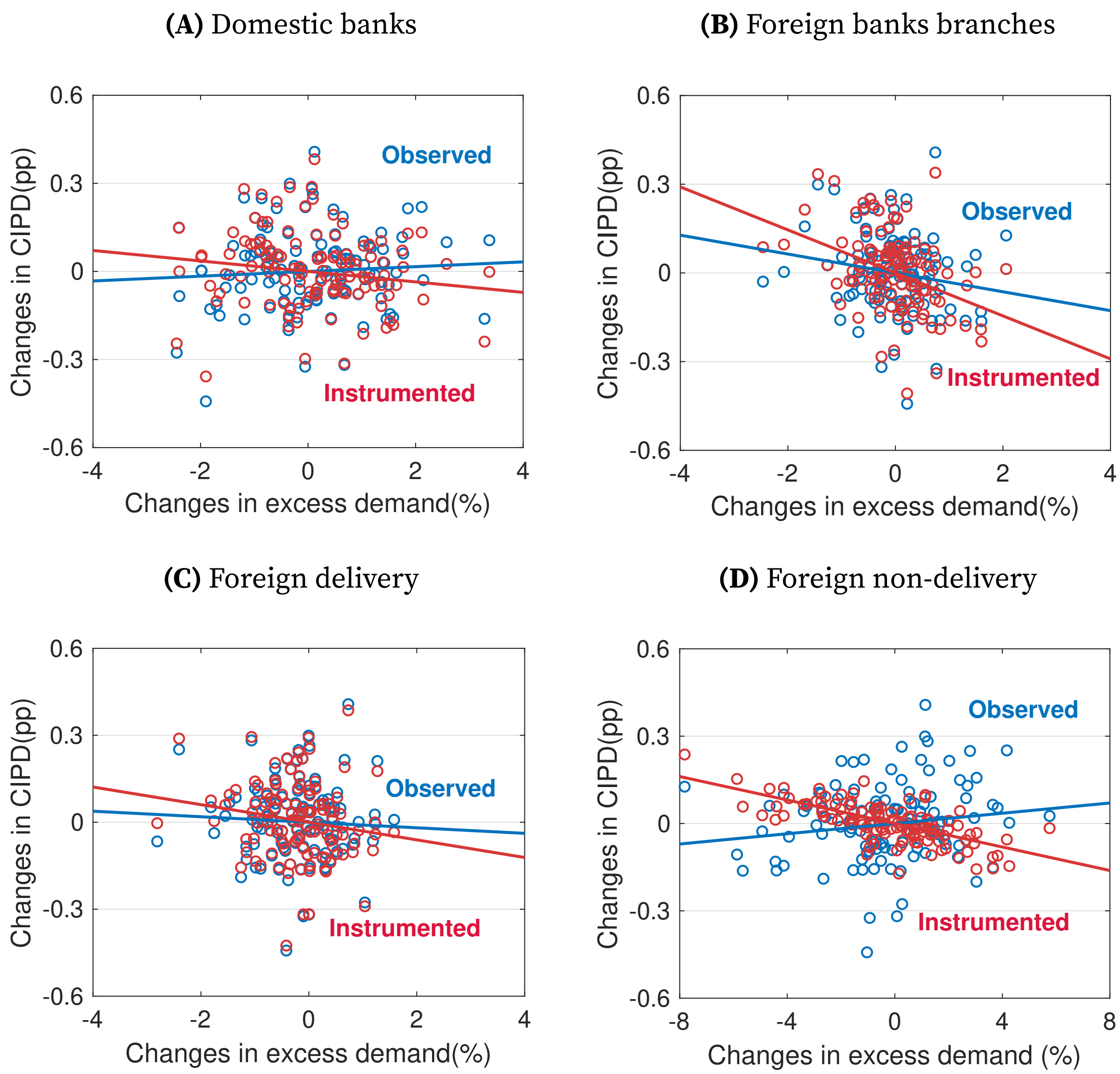
TABLE 2. Sensitivy to Global Risk Factors by Sector

Sector	Share (S_i, %)	λ_i to ϵ_{risk}	λ_i Share (%)
Domestic banks	20.74	-0.07	-1.46
		(-0.41, 0.26)	
Corporates	4.52	-0.61	-2.62
		(-1.71, 0.48)	
Insurance companies	3.11	-0.94	-2.77
		(-2.10, 0.21)	
Securities companies	3.10	-0.06	-0.16
		(-1.19, 1.08)	
Asset managements	2.47	1.59	3.71
		(0.30, 2.87)	
Foreign bank branches	29.26	0.14	3.95
		(-0.07, 0.35)	
Foreign exchange authorities	1.45	-3.30	-4.52
		(-5.83, -0.78)	
Foreign Non-delivery	19.01	5.39	96.83
		(3.15, 7.62)	
Foreign Delivery	15.17	0.53	7.60
		(0.31, 0.75)	
Aggregate	100.00	1.06	100.00
		(0.24, 1.88)	

episodes. who drives this? This tightening in dollar funding conditions appears to be driven primarily by foreign non-deliverable forward (NDF) positions, while foreign exchange authorities help alleviate market stress by easing funding pressures.

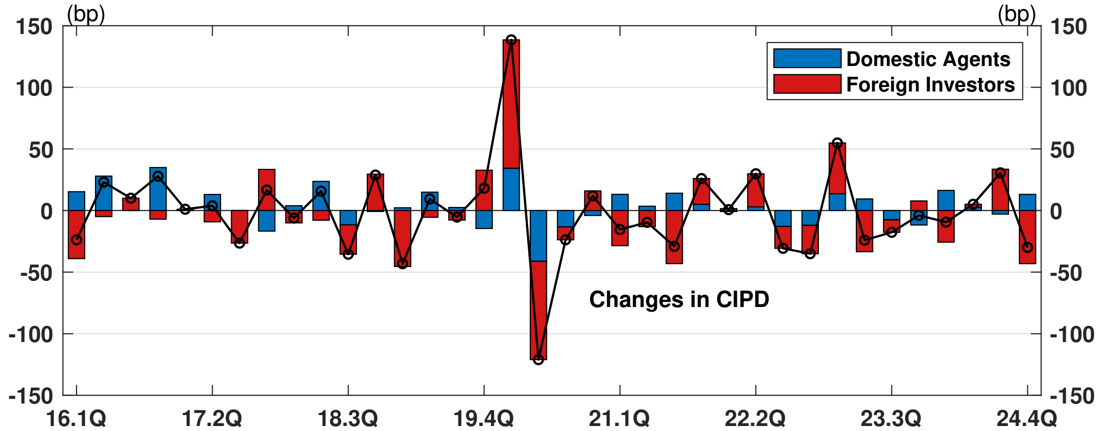
foreign delivery mostly swap non delivery is mostly non deliverable forward (stats)

FIGURE 1. Price elasticity: GIV vs OLS



Notes: These plots compare the estimated price elasticities of excess demand using our identification strategy with the OLS estimates, focusing on four sectors with the largest market shares. In both panels, the blue circles relate the sectoral increase in excess demand (or negative supply) to the observed monthly changes in CIP deviations (3-month), with both variables residualized against the global factors included in our baseline specification. For the red circles, the y-axis plots the predicted price changes using size-weighted idiosyncratic shocks estimated from the GMM procedure. These predicted values are used as instruments for changes in CIP deviations to identify the price elasticity.

FIGURE 2. CIPD Decomposition by Domestic and Foreign Sectors



Notes: The figure describes

5. The implications of CIPD

6. Conclusion

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Appendix

What Makes the Recent KRW Depreciation Episode Different from the Past?

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A1. Data description