

**Do Federal Reserve Policies Motivate FX Speculation by Emerging Market Banks?
Evidence from the Korean Banking Industry**

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Abstract

This paper examines the relationship between external monetary policy shocks, emerging market banks' foreign exchange risk management, speculation, and bank value. Using a unique and granular dataset of Korean banks' currency maturity gaps and derivatives hedging, the study finds that dollar interest rates are positively correlated with banks' currency duration gaps. Additionally, a bank's foreign exchange (FX) spot position is positively correlated with exchange rates, while its forward position is negatively correlated. However, banks' composite FX positions are negatively correlated with exchange rates, implying that banks engage in speculation in FX markets based on dollar interest rates rather than exchange rate movements. The empirical results suggest that emerging market banks speculate according to the Federal Reserve's monetary policy stance and attempt to hedge FX exposure with derivatives while timing their hedges. Finally, this study finds that foreign currency risk management by banks contributes to enhanced bank value.

Keywords: foreign currency, duration gap, risk management, speculation, hedge, default likelihood, firm value, monetary policy

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1. Introduction

Existing studies have extensively examined whether firms engage in hedging or speculation in financial markets. However, comparatively little research has focused on whether commercial banks practice sound risk management or attempt to speculate. Banks are arguably the most experienced experts in risk management, actively trading securities, commodities, and derivatives. Notably, banks transact trillions of dollars daily in interbank currency markets, often with speculative intent. Despite this, the ultimate determinants of banks' foreign exchange (FX) positions remain underexplored. Banks' FX spot positions, defined as foreign currency (FC) assets minus liabilities, may reflect strategies aimed at maximizing net worth or managing risk. If net worth maximization is the objective, banks would likely reduce asset-liability duration gaps as interest rates rise, possibly shrinking assets more rapidly than liabilities. However, as banks prioritize risk management, their approaches to duration gap management may vary, which can consequently affect their overall asset and liability compositions.

This study investigates whether emerging market banks' FX positions are significantly influenced by Federal Reserve monetary policy shocks. We first explore the relationship between banks' FC duration gaps and dollar interest rates, then examines how banks' FX spot, forward, and composite positions respond to external interest rate shocks. Additionally, the study investigates the relationship between FX positions and exchange rates to assess whether banks hedge or speculate in the FX market. Finally, it evaluates whether banks' FC risk management practices contribute to their market valuations. Using a unique data set from all Korean banks from 1999 to 2023, this study investigates banks' FC duration and FX position management strategies.

This study contributes to the literature on banking, international finance, and risk management in several important ways. First, the findings demonstrate that Federal Reserve monetary policy shocks significantly affect the balance sheets of emerging market banks. Empirical evidence suggests that as the Federal Reserve raises the federal funds rate, banks increase their foreign currency (FC) duration gaps. Specifically, banks reduce their FC long-term borrowings when dollar interest rates rise, while expanding such borrowings when FC interest rates decline. This implies that banks do not primarily seek to maximize net worth on their FC balance sheets; rather, they emphasize liquidity risk management during periods of Fed tightening and exhibit greater risk-taking during easing cycles.¹ These findings are consistent with prior studies suggesting that risk-taking can be an effective strategy for firms possessing comparative advantages in the market.²

Second, we find that banks' foreign exchange (FX) spot positions are negatively associated with their foreign currency (FC) interest rates, while their FX forward positions exhibit a positive association. This suggests that banks decrease FC assets more rapidly than liabilities during Fed tightening, and increase FC liabilities more rapidly than assets when the Fed eases monetary policy. As dollar interest rates rise, banks reduce FC long-term liabilities and decrease FC assets at an even faster pace, with the opposite occurring when interest rates fall. Importantly, banks increase their FX forward positions to a greater extent than they reduce spot positions as FC interest rates rise. Consequently, banks' composite FX positions are positively correlated with dollar interest rates. These results imply that although banks use forwards to hedge spot exposure, they tend to overhedge, effectively engaging in speculative behavior. If banks anticipate dollar appreciation

¹ These findings align with those in Kim (2025) but this study repeats these findings to explore the relationship with banks' FX positions.

² For example, see Stulz (1996) and Stulz (2013).

alongside rising dollar interest rates, they may be inclined to maintain positive composite positions, thereby timing their hedges. This evidence supports previous findings that banks' FX hedging activities incorporate speculative timing elements consistent with market expectations of currency movements.

Third, by combining the positive relationship between banks' foreign currency (FC) duration gaps and FC interest rates with the negative (positive) relationship between banks' FX spot (forward) positions and FC interest rates, we identify a significant negative (positive) association between banks' FC duration gaps and their FX spot (forward) positions. To our knowledge, this study is the first to document this relationship between banks' FC duration gaps and FX positions. These findings suggest that Federal Reserve monetary policy shocks materially influence emerging market banks' FC asset-liability durations as well as the scale of their FC asset and liability holdings. This evidence contributes to the understanding of how exogenous monetary policy shocks affect banks' balance sheet structures and currency risk management strategies.

Fourth, we find that banks' foreign exchange (FX) spot positions are positively associated with the won/dollar exchange rates, whereas their forward positions are negatively associated with exchange rates. However, the stronger negative relationship between forward positions and exchange rates relative to the positive relationship between spot positions and exchange rates implies that banks are not engaging in successful speculation in the FX market. Consequently, banks' composite FX positions are negatively correlated with exchange rates. This suggests that banks tend to incur losses when speculating in FX markets. These results indicate that banks chiefly determine their FX positions based on dollar interest rates rather than exchange rates. Since exchange rates are influenced both by dollar and local interest rates, encompassing external Federal Reserve and domestic central bank policy shocks, banks' speculative attempts in FX

markets may often be unsuccessful.

Finally, we find that banks' market values, measured by Tobin's Q, are significantly positively associated with their foreign currency (FC) duration gaps and their allowance for loan loss to non-performing loan (ALL/NPL) ratios. During the Federal Reserve's easing periods, banks increase their FC long-term debt, thereby expanding their FC duration gaps and reducing overall FC funding costs. Concurrently, as banks emphasize FC liquidity risk management through duration gap adjustments, the likelihood of FC defaults diminishes, contributing to higher bank valuations. Moreover, active management of credit default risk also appears to enhance bank value, as reflected in the significant positive correlation between Tobin's Q and ALL/NPL ratios.³ These results align with prior studies documenting that effective hedging strategies increase firm value (e.g., Smith and Stulz, 1985; Allayannis and Weston, 2001; Graham and Rogers, 2002; Carter, Rogers, and Simkins, 2006). Furthermore, risk-taking behavior, such as increasing FC long-term borrowings amid easing monetary policy, may also augment bank value, as long-term dollar borrowings are more stable relative to short-term borrowings, which banks can adjust more rapidly within credit limits.

The remainder of the paper is structured in the following manner. Section 2 reviews prior research on risk management and duration gaps. Section 3 presents a conceptual framework for analyzing foreign currency duration gaps, the likelihood of defaults, risk management, and bank value. Section 4 provides empirical methods and data descriptions. In Section 5, I present empirical findings, followed by conclusions in Section 6.

³ Banks could reduce duration gap by increasing long-term borrowings. Long-term dollar borrowings may take longer than short-term borrowing. Banks could more easily adjust short-term dollar borrowings because banks borrow dollars through online communications within their credit limits.

2. Literature Review

Firms have no incentives to hedge in the frictionless world outlined by Modigliani and Miller (1958). However, in practice, firms must address real-world frictions such as taxes, bankruptcy costs, and financial distress. As a result, firms hedge to stabilize cash flows and mitigate these costs, ultimately increasing firm value. Smith and Stulz (1985) explain that hedging reduces expected tax liabilities and the probability of financial distress while increasing debt capacity. Froot, Scharfstein, and Stein (1993) argue that for firms with high external financing costs, hedging allows them to maintain investment in profitable opportunities by reducing cash flow volatility. Breeden and Viswanathan (2016) suggest that capable managers hedge to lock in their advantage and minimize exposure to uncontrollable risks. Myers (1977) introduces the debt overhang problem, emphasizing how risky debt can lead firms to underinvest, which hedging can help alleviate.

Numerous empirical studies support the idea that hedging improves firm value by reducing cash flow volatility and associated costs. Bodnar, Hayt, and Marston (1998) show that over 80% of large firms use derivatives for hedging. Mian (1996) finds that more than 500 firms disclose hedging activity, with over 200 actively using derivatives. Hentschel and Kothari (2001) also find widespread participation in derivatives markets among major firms. Mayers and Smith (1982) demonstrate that using insurance reduces expected bankruptcy and tax costs. Nance, Smith, and Smithson (1993) show that firms with significant growth options benefit from hedging through reduced agency costs. Berkman and Bradbury (1996) find a positive relationship between derivative use and growth option value. Geczy, Minton, and Schrand (1997) highlight that financially constrained firms with high growth potential are more likely to hedge. Haushalter (2000) investigates how hedging influences firms' financing costs and leverage. Rountree, Weston, and

Allayannis (2008) establish an inverse relationship between cash flow volatility and firm value. Campello et al. (2011) find that hedging lowers borrowing costs and facilitates investment. Bartram, Brown, and Conrad (2011) demonstrate that derivatives reduce both total and systematic risk while increasing firm value. DeMarzo and Duffie (1995) argue that hedging improves earnings quality, thereby enhancing firm value.

Bessembinder (1991) links hedging to reductions in agency costs and underinvestment, thereby increasing firm value. Allayannis and Weston (2001) find a positive association between derivative use and firm value. Graham and Rogers (2002) attribute value increases to tax benefits and greater debt capacity. Carter, Rogers, and Simkins (2006) find a strong positive link between airline fuel hedging and firm value. Nelson, Moffitt, and Affleck-Graves (2005) report that hedging firms outperform non-hedgers by 4.3% annually. Mackay and Moeller (2007) demonstrate that risk management significantly enhances firm value. Cornaggia (2013) finds a positive impact of hedging on agricultural productivity. Pérez-González and Yun (2013) show that using weather derivatives adds value. In contrast, Jin and Jorion (2006) argue that hedging has little impact on oil and gas firm valuations. Guay and Kothari (2003) similarly find minimal value added by derivative portfolios.

Stulz (1996) suggests firms should manage risk strategically, using their comparative advantage to retain risks they can bear while transferring others. Stulz (2013) emphasizes that firms should hedge market-wide risks and manage core risks internally. Schrand and Unal (1998) also argue that firms can create economic value by retaining and managing core-business risks effectively. Some scholars, however, contend that firms engage in speculative behavior rather than pure hedging. For example, Baker and Wurgler (2002), Allayannis, Brown, and Klapper (2003), Faulkender (2005), Manchiraju, Pierce, and Sridharan (2014), and Cheng and Xiong (2014)

suggest that firms' financial decisions sometimes reflect speculative motives. Brown (2001) and Beber and Fabbri (2012) demonstrate that risk management strategies evolve dynamically based on previous outcomes.

Studies on hedge timing further support the idea that firms act strategically in managing risk. Tufano (1996), Adam and Fernando (2006), and Brown, Crabb, and Haushalter (2006) argue that gold mining firms time their hedges based on market conditions. Chance and Kim (2018) show that firms managing currency risk often engage in market timing under the guise of hedging.

While corporate data on risk-taking and risk management can be limited, the banking literature provides useful insights. Kim (2023) measures banks' risk-taking through currency carry trades and evaluates risk management via loan loss provisions. Jin, Kanagaretnam, and Lobo (2018) find that allowances for loan losses reflect banks' proactive risk management strategies.

In banking, the literature supports hedging as a tool for increasing firm value when currency and interest rate risks are not fully diversified. Diamond (1984) argues that banks should diversify internally or avoid risks they cannot mitigate. Grammatikos, Saunders, and Swary (1986) analyze U.S. banks' foreign currency portfolios and show that diversification generates positive returns from exchange rate changes. Purnanandam (2007) studies how macroeconomic shocks affect banks' interest rate risk management using derivatives. Esposito et al. (2015) suggest that banks restructure their balance sheets to manage interest rate exposure.

The global dimension of monetary policy is another key theme. Miranda-Agrippino and Rey (2020) and di Giovanni et al. (2022) show that Federal Reserve policy affects global credit markets, especially in emerging economies. Shin (2005) and Cowan, Hansen, and Herrera (2005) associate financial crises with monetary policy shocks. Adrian and Shin (2010) note that banks' leverage is procyclical, influenced by balance sheet adjustments during monetary shifts. Hardy and

Peter (2023) find that recent Fed tightening has significantly reduced global dollar liquidity, especially foreign currency lending. Avdjiev et al. (2019) link the Fed's quantitative tightening to capital outflows from emerging markets. Correa et al. (2024) highlight the role of bank reserves in ensuring dollar liquidity and how the Fed's decisions impact global financial conditions.

Finally, the transmission mechanism of monetary policy to banking operations has been extensively explored. Bernanke and Gertler (1995) propose the credit channel theory, linking monetary shocks to lending capacity. Black, Hancock, and Passmore (2010) analyze the lending behavior of banks in response to monetary policy within the mortgage market. Friedman (1972) warns of the "long and variable lags" in monetary effects. Batini and Nelson (2001) find that it typically takes over a year for monetary policy to impact inflation. Goodhart (2001) adds that policy lags complicate rate-setting decisions.

3. Analytical Framework for Bank Foreign Currency Risk Management and Duration Gap

3.1. Foreign exchange rate risk management

Foreign currency trading and lending contribute the primary sources of profit banks derive from foreign currency ("FC") operations. These FC activities determine the bank's currency spot position. Formally, the foreign exchange ("FX") spot position at time t , denoted as ς_t , is defined as the difference between a bank's total FC assets and liabilities:

$$\varsigma_t = FCA_t - FCL_t \quad (1)$$

where FCA_t and FCL_t represent the bank's total foreign currency assets and liabilities at time t , respectively. Fluctuations in exchange rates directly affect the value of a bank's spot position when measured in the home currency, as well as its income statement. The net profit resulting from changes in exchange rates can be expressed as:

$$\pi_t = (\varsigma_t) \Delta e_t \quad (2)$$

where π_t and Δe_t represent the bank's net profit and the change in exchange rate at time t , respectively. The exchange rate (e) indicates the price of one unit of foreign currency (e.g., USD) expressed in the local currency (e.g., KRW). If a bank holds a positive spot position, it incurs a net loss when the exchange rate declines. Conversely, a bank with a negative spot position suffers a net loss if the exchange rate increases.

A bank can utilize two primary strategies to manage its exposure to exchange rate risk. First, it can eliminate currency risk by adjusting its currency spot position to zero, effectively matching foreign currency assets with liabilities on its balance sheet. This natural hedging strategy minimizes net currency exposure. Second, a bank can hedge its currency spot exposure using derivatives. To do so effectively, the bank's derivative position should be taken in the opposite direction to its FX spot position:

$$(\varsigma_t) \delta_t < 0 \quad (3)$$

where δ_t represents the bank's FX derivative position at time t , indicating the net exposure taken through derivative instruments such as forwards, futures, swaps, or options to offset or manage currency risk.

Consider a bank that hedges a positive spot position with a negative derivative position. If the exchange rate falls, the bank may incur a net loss on its spot position but realize a gain from its derivative position, and vice versa. Thus, the net income of a bank employing a derivative hedging strategy depends on its composite position, defined as the sum of its spot position and derivative position:

$$\gamma_t = \varsigma_t + \delta_t \quad (4)$$

where γ_t represents a bank's FX composite position at time t . A bank that fully hedges its currency exposure maintains a composite position of zero, indicating a perfect balance between its foreign exchange (FX) spot and derivatives positions. Conversely, a bank that hedges only partially holds a composite position that is either positive or negative. Thus, a non-zero composite position signifies speculative activity in the foreign exchange market. Banks may attempt to time the market by maintaining a positive composite position when exchange rates are expected to rise, or a negative composite position when exchange rates are anticipated to fall.

3.2. Foreign interest-rate risk management

Consider a bank that provides foreign currency (FC) loans. The bank borrows L units of foreign currency from an international institution at an interest rate of i_b for N_1 days, then lends the same amount at an interest rate i_l for N_2 days, where $N_2 > N_1$. Assume the exchange rate in N_1 days is e_1 . The bank's profit from the FC loan over N_1 days can be expressed as:

$$\pi_{N_1} = L(\text{NIM})e_1 \quad (5)$$

where $\text{NIM} = i_l - i_b$ represents the net interest return on the loan.

To maximize profits, banks typically pursue an asset-liability maturity mismatch strategy, lending at longer terms while borrowing short term, thus increasing the NIM. However, if the borrowing interest rate rises to i_b' , the NIM shrinks to $i_l - i_b'$. Because the loan interest rate i_l is fixed initially, increased borrowing costs compress the bank's profitability. Consequently, bank profitability is negatively impacted by rising borrowing rates during periods of monetary tightening. Moreover, as interest rates rise, the value of both assets and liabilities adjusts, but in opposite directions depending on their maturities. Longer-maturity assets decline more in value, prompting banks to reduce asset maturities to mitigate risk. Conversely, liabilities with longer maturities decrease more in value, incentivizing banks to extend their liability maturities. During

tightening periods, banks strategically shorten asset maturities and lengthen liability maturities to manage interest rate risk and sustain profitability. This active asset-liability maturity management helps banks balance interest-rate risk exposure on their balance sheets.

Specifically, banks use the duration gap (“Dgap”) to manage their exposure to interest rate risk. The duration gap is defined as:

$$Dgap_t = DA_t - \left(\frac{TL_t}{TA_t} \right) DL_t \quad (6)$$

where DA_t and DL_t the average durations of assets and liabilities at time t , respectively, and TL_t/TA_t is the ratio of total liabilities to total assets. A bank's asset (liability) duration is calculated using the weighted average maturity of its assets (liabilities).

If interest rates increase by Δi , the approximate change in a bank's net worth (NW) relative to total assets is:

$$\frac{\Delta NW}{TA} = -Dgap \frac{\Delta i}{1+i} \quad (7)$$

where net worth is defined as the difference between total assets and total liabilities. Equation (7) implies that an increase in interest rates reduces the bank's net worth, and vice versa. Therefore, anticipating rising interest rates, a bank typically seeks a shorter duration gap.

However, emerging market banks adjust their foreign currency (FC) duration gaps differently due to unique market conditions. Long-term FC loans are illiquid and hard to sell, so banks often adjust liabilities rather than assets to manage duration gaps—a pattern especially evident in Korean banks, which have fixed long-term assets but flexible foreign currency borrowing options in euro-dollar and Eurobond markets. A bank's duration gap increases when long-term assets grow or long-term liabilities shrink. Assuming banks can borrow FC short- and

long-term but lend long-term, rising foreign interest rates may deter growth in long-term assets. During Fed tightening, banks may replace long-term liabilities with short-term borrowings, increasing duration gaps. Banks maintain short-term FC borrowings during the Fed tightening via established overseas credit lines. Due to illiquid long-term FC loans, banks adjust liabilities more flexibly to modify duration gaps. Conversely, when the Fed lowers rates, banks may expand long-term FC assets and finance this by increasing long-term FC liabilities, reducing the duration gap and signaling greater risk-taking.

This suggests that during the Fed's tightening periods, banks prioritize liquidity risk management, whereas during easing periods, they tend to pursue greater risk-taking by simultaneously increasing long-term assets and liabilities. Banks may pursue different objectives in managing foreign versus domestic interest rate risk. While domestic management often focuses on maximizing net worth by adjusting duration gaps in response to interest rate changes, emerging market banks also prioritize liquidity risk. Deteriorating global liquidity, exacerbated by rate hikes from the Federal Reserve and other major central banks, has triggered financial turmoil in emerging markets.

Banks also use derivative instruments like interest rate swaps to hedge interest rate risk off the balance sheet, reducing funding cost volatility by converting floating rates to fixed rates. Rising foreign interest rates increase borrowing costs and, coupled with potential foreign exchange rate increases, raise the domestic currency expense of foreign debt. Derivatives thus provide valuable protection during tightening periods. However, expanding loan portfolios during the Fed easing heightens default risk, which banks manage by increasing allowances for loan losses (ALLs) relative to non-performing loans (NPLs), using the ALL/NPL ratio as a safeguard against asset quality deterioration.

4. Empirical Methods and Data

4.1. Measurement of variables

This subsection details the measurement of variables used in empirical models. The main dependent variables include a bank's foreign currency (FC) positions, default likelihood, and bank value. Independent variables comprise FC interest rates and risk management indicators. The duration gap serves as both an independent and dependent variable in different model specifications.

(1) Duration gap

The duration gap is calculated as the difference between asset and liability durations. However, banks rarely disclose durations of their foreign currency (FC) assets and liabilities. Korean banks report FC maturity gaps across seven categories: one week, one month, three months, six months, one year, three years, and over three years, with maturities measured in bank days (e.g., $T = 7, 30, 90, 180, 360, 1,080, \text{ or } >720$). Equation (6) can be applied to calculate the duration gap, which can be rewritten as:

$$Dgap_t = \sum_{t=1}^T tMgap_{t-1,t} \quad (8)$$

where $Mgap_{t-1,t}$ is the asset-liability maturity gap for assets and liabilities maturing between $t - 1$ and t periods. Thus, the duration gap is the time-weighted average of the maturity gaps.

(2) Market value measure

This study employs Tobin's Q to assess bank market value, following formulas recommended by Allayannis and Weston (2001) and Chung and Pruitt (1994). Tobin's Q is calculated as the ratio of the market value of a bank's assets (equity market value plus liabilities) to the replacement cost or book value of those assets:

$$\text{Tobin's } Q = \frac{\text{Market value of common stock} + \text{preferred stock} + \text{debts}}{\text{Book value of total assets}} \quad (9)$$

(3) Risk management measures

Derivatives can be used by banks for both hedging and speculation in foreign exchange and interest rate markets. Therefore, assessing a bank's risk management based solely on total derivative volume can be misleading. This study measures derivatives used exclusively for hedging by dividing the notional amount of currency and interest rate derivatives—such as forwards, futures, swaps, and options—by total assets:

$$\text{Market risk hedge} = \frac{\text{Derivatives for hedging purposes}}{\text{Total assets}} \quad (10)$$

Credit default risk management is proxied by the ratio of allowances for loan losses (ALLs) to non-performing loans (NPLs):

$$\text{Credit risk hedge} = \frac{ALLs}{NPLs} \quad (11)$$

(4) FC interest rate and exchange rate measures

Recent data from the Bank of Korea show that U.S. dollar transactions account for nearly 90% of Korean banks' foreign exchange activities. Given the dollar's dominance, this study uses U.S. dollar interest rates to represent foreign currency rates. The Federal Reserve's monetary policy primarily influences short-term dollar rates, including the federal funds rate target ("FF Target"), the effective federal funds rate ("EFFR"), and the 3-month dollar certificate of deposit rate ("CD rate"). The federal funds rate is the overnight rate at which banks lend reserves to each other, with the Federal Open Market Committee (FOMC) setting its target range. The EFFR reflects the market's average overnight federal funds rate. This study uses the upper bound of the

FF Target and the 3-month CD rate as proxies for foreign currency interest rates. Figures 1 and 2 depict the federal funds rates and CD rates relative to monetary policy from 1999 to 2023. Additionally, the Korean won–U.S. dollar exchange rate (scaled by 1,000) is used as a proxy for the foreign exchange rate (“Exchange Rate”), as visualized in Figures 3 and 4 alongside Korean banks’ foreign exchange positions and duration gaps over the sample period.

(5) Control variables

A bank’s duration gap, the likelihood of default, and bank value may be affected by its size through economies of scale. This study controls for size using the logarithm of the bank’s total assets (*Size*). The dependent variables may also be influenced by a bank’s solvency and liquidity. A bank’s capital ratio, defined as the ratio of its total equity capital to its total assets, is included as a control variable (*Solvency*). This ratio reflects the bank’s cushion to absorb losses and maintain financial stability. Also, a bank’s liquidity ratio, which is computed by dividing its total liquid liabilities maturing in three months by its total liquid assets maturing in three months are included (*Liquidity*). In addition, a bank’s non-performing loan (NPL) ratio, which is calculated by dividing non-performing loans by total loans, is used to control for the quality of its assets (*Asset Quality*). To control for the effects of a bank’s profitability on the dependent variables, this study employs its return on assets (*ROA*). As a control variable for a bank’s core interest-earning activities, net interest margin (*NIM*) is incorporated into the analysis. NIM measures the difference between interest income generated by banks and the amount of interest paid out to their lenders, reflecting the profitability of a bank’s fundamental lending and borrowing operations. In order to account for the effects of a bank’s risk management activities on the dependent variables, the ratio of the use of derivatives for hedging purposes to total assets (*Market Risk Hedge*) is used as a control variable in certain regressions. Furthermore, the real GDP growth rate of South Korea for over a quarter is

used (*GDP Growth*) is employed to account for the effects of domestic macroeconomic environment.

4.2. Empirical Design

This study employs panel regression models to analyze 1,955 quarterly observations from 38 banks spanning 24 years, from 1999 to 2023. Panel data, which combine cross-sectional and time-series dimensions, increase degrees of freedom, reduce collinearity, and enhance estimation efficiency. Such regressions are well-suited for analyzing data exhibiting both cross-sectional and time-series variability. Random-effects models are generally appropriate when individual-specific effects are random and uncorrelated with regressors. Conversely, fixed-effects models are used if unobserved individual-specific characteristics correlate with independent variables, as these models control for time-invariant individual heterogeneity, improving unbiased estimation. Factors such as a bank's size, asset quality, profitability, and risk management may be linked to unobserved, time-invariant traits, including location, reputation, staff expertise, and customer relationships. Hence, previous research often applies fixed-effects models to remove confounding from these factors. However, random-effects models allow for both within- and between-entity variation and tend to be more efficient when assumptions are met. This study uses Hausman tests to decide between models, selecting random effects when the test's p-value exceeds 0.05. The fixed effects model is used otherwise. The following panel regression model is employed:

$$y_{i,t} = \beta_1 X_{i,t} + \sum_{j=2}^J \beta_j CV_{j,t} + \alpha_i + u_{i,t} \quad (12)$$

where $y_{i,t}$, $X_{i,t}$, and $CV_{j,t}$ represent the dependent variable, the independent variable, and the control variables for i^{th} bank at time t , respectively. The control variables include the size, solvency, liquidity, asset quality, ROA, NIM, derivative hedge, and GDP growth. In addition to the control

variables, the MP (monetary policy) dummy is also included in the fixed effects model to control for quarterly time-invariant effects.⁴ This dummy has a value of 1 if the foreign monetary policy stance is tightening, and 0 otherwise. Using these regression models, this study tests four hypotheses.

First, this study examines whether banks manage external interest rate risk through the duration gap between their foreign currency (FC) assets and liabilities. If banks aim to maximize net worth, they will reduce FC duration gaps as FC interest rates rise. However, when prioritizing dollar rollover and liquidity risk management, banks may increase FC duration gaps by decreasing FC long-term debts during periods of Federal Reserve tightening. Conversely, as the Fed eases monetary policy and cuts interest rates, banks may actively increase FC long-term debts, resulting in a reduction of FC duration gaps.

Second, this study analyzes the relationship between foreign currency (FC) interest rates and banks' foreign exchange (FX) positions. Under full hedging of FX spot exposures, a bank's FX composite position—defined as spot positions net of forward contracts—would be zero. However, if banks speculate based on dollar interest rates, their FX composite positions are expected to be positively associated with FC interest rates.

Third, this study examines the relationship between foreign exchange (FX) rates and banks' FX positions. Under full hedging of FX spot exposures, a bank's FX composite position—defined as the net of spot positions and forward contracts—would be zero. However, if banks speculate based on exchange rate movements, their FX composite positions are expected to exhibit a positive association with exchange rates.

Finally, this study investigates the relationship between a bank's foreign currency (FC)

⁴ The dummy variable is used to account for unobserved common macroeconomic shocks, such as monetary policy shocks and financial cycle shocks to banks.

duration gap, its risk management activities, and its market value. During periods of Federal Reserve easing, banks may expand their long-term assets in conjunction with increased long-term debts, leading to an enlargement of their FC duration gaps and enhanced profitability. If a bank increases its duration gap to mitigate the likelihood of default, its market value, as measured by Tobin's Q, may also rise, consistent with prior literature. Accordingly, this study tests the following hypothesis concerning the interplay between a bank's duration gap, risk management strategies, and bank value.

4.3. Data Description

Since the 1997 Financial Crisis, the Korean banking industry has provided comprehensive information regarding a bank's financing and investing operations, liquidity and asset quality, and risk management activities. Using the information, this study constructs a unique bank-level data set that encompasses a bank's foreign currency positions, currency maturity gaps, and the use of derivatives for hedging purposes. These data are rarely available in other countries. Data for a total of 1,952 bank quarters from 1999 to 2023 are collected, including all 38 domestic commercial and merchant banks in Korea. A bank's business reports provide information on its foreign currency spot, forward, and composite positions, as well as its foreign currency maturity gaps and the maturities of its foreign currency assets and liabilities. Additionally, the reports include data on the bank's usage of interest-rate and currency derivatives. The business reports are published quarterly and can be accessed on the website of the Korea Federation of Banks (<http://www.kfb.or.kr>). The costs of a bank's foreign currency borrowings and the returns on foreign currency loans are gathered on the bank's annual reports, which are available on the Financial Supervisory Service's DART (Data Analysis, Retrieval, and Transfer) website (<http://dart.fss.or.kr>). The Korean Financial Supervisory Service's Financial Statistics Information System website

(<http://fisis.fss.or.kr>) provides information on a bank's quarterly funding and investment activities, asset and liability balances, capital, liquidity, non-performing loans, profitability, and other accounting data. The stock prices and number of outstanding shares of a bank are obtained from its annual reports, the Korea Exchange website (<http://www.krx.co.kr>), and the Trading View website (tradingview.com). The effective federal funds rates, the interest rates on the three-month dollar certificates of deposit (CDs), and other financial and macroeconomic data in the United States are retrieved on the Federal Reserve Bank of St. Louis's website (<https://research.stlouisfed.org>) and the US Bureau of Labor Statistics' website (<http://www.bls.gov>). The Federal Reserve's targets for federal funds rate and the Fed's monetary policy data are collected on the Board of Governors of the Federal Reserve System's website (<https://www.federalreserve.gov/monetarypolicy/fomccalendars.htm>).

Panel A of Table 1 provides a summary of the financial characteristics of the sample banks. During the sample period, the banks' total assets averaged \$80 billion, with loans representing 40 percent of the total assets. The banks possess deposits amounting to \$49.7 billion and have a total shareholders' equity of \$5.6 billion. On average, their total revenue amounts to \$1.9 billion. In addition, the banks maintain an average of \$11.4 billion in foreign currency assets, which includes \$2.5 billion in loans. Furthermore, the banks hold \$2.8 billion in foreign currency deposits and \$4.9 billion in foreign currency borrowings. The average FC spot position of the banks is \$-252 million, while their forward position is \$344 million. Panel B of Table 1 presents an overview of the banks' descriptive statistics for key variables. On average, sample banks exhibit a foreign currency duration gap of -0.15 months, a credit rating score of 2.92, and a Tobin's Q of 0.98. The average net return on their FC loans is 1.2%, with a liquidity ratio of roughly 133%, a nonperforming loan ratio of approximately 2.8%, an ROA of approximately 0.7%, and an

ALL/NPL ratio of 194%. The average quarterly real GDP growth rate of South Korea was approximately 3.3%, while the average exchange rate between the South Korean won and the US dollar was around 1,151 during the sample period.⁵

5. Empirical Results

5.1. FC Interest Rates and Duration Gap

This section examines whether an increase in foreign interest rates leads to an increase in a bank's foreign currency (FC) duration gap. Univariate test results are presented in Table 2. Panel A of Table 2 shows that foreign interest rates and the net return on banks' FC loans are significantly negatively correlated. This implies that as foreign interest rates rise, the profitability of banks' FC loans deteriorates. This may be because banks fund long-term FC loans with short-term FC borrowings. When the Federal Reserve raises the federal funds rate, banks' short-term borrowing costs increase, while their loan returns remain relatively constant. Therefore, if banks aim to protect their FC loan profitability, they would reduce their short-term FC borrowings and increase their long-term FC assets. However, if banks prioritize managing FC liquidity risk, they may avoid increasing FC assets while increasing short-term borrowings. Conversely, when the Federal Reserve lowers the federal funds rate, banks may be more inclined to increase their long-term FC borrowings. Panel B of Table 2 shows that increases in the federal funds rate are significantly positively correlated with banks' foreign currency (FC) asset durations, liability durations, and duration gaps. As FC interest rates rise, banks might raise their FC asset durations by choosing not to roll over short-term assets, thereby lengthening asset durations. Conversely, when FC interest rates decline, banks tend to increase long-term FC borrowings, resulting in shorter FC liability

⁵ The won/dollar exchange rate is divided by 1,000 to adjust the currency units of the Korean won.

durations. Overall, as foreign interest rates rise, banks' FC duration gaps widen, while they contract when rates fall.

Table 3 presents the results of the Two-Stage Least Squares (2SLS) fixed effects regressions. Model (1) shows that the 3-month dollar CD rates are significantly positively associated with banks' FC duration gaps. Similarly, Model (2) demonstrates that the effective federal funds rates are also significantly positively correlated with the FC duration gaps. As a robustness check, we conduct 2SLS fixed effects regressions separately for the Fed's tightening and easing periods. The regression results are reported in Table 4, with Model (1) presenting estimates for the tightening period and Model (2) for the easing period. Both models indicate that FC interest rates are significantly positively correlated with banks' FC duration gaps during these respective periods. Furthermore, Table 5 compares the average foreign currency (FC) duration gaps between the Federal Reserve's tightening and easing periods. The mean duration gap during the tightening period is negative, whereas it is positive during the easing period. This suggests that as the Federal Reserve lowers the federal funds rate, banks tend to reduce their positive duration gaps on average. Conversely, when the Fed raises interest rates, banks increase their negative duration gaps. During tightening periods, banks assume greater risk by increasing long-term debt, resulting in a negative duration gap. In contrast, during easing periods, banks focus more on liquidity risk management by reducing long-term debt, which leads to a positive duration gap.

5.2. FC Interest Rates and Foreign Exchange Positions

This section examines the relationships between foreign currency (FC) interest rates and banks' foreign exchange (FX) spot, forward, and composite positions. If banks increase FC assets more rapidly than borrowings as FC interest rates decline, their FX spot position is expected to be negatively associated with FC interest rates. When banks hedge their spot positions using forward

contracts, the spot and forward positions should exhibit a negative correlation. However, if banks anticipate a positive correlation between FC interest rates and exchange rates and continue to speculate in the FX market beyond hedging their spot positions, their FX composite position—the sum of FX spot and forward positions—would be positively correlated with FC interest rates. Table 6 presents the univariate test results among foreign exchange (FX) spot, forward, and composite positions. The results show that banks' FX spot positions are significantly negatively correlated with their FX forward positions, suggesting that banks actively use forward contracts to hedge their spot exposures. However, composite positions are significantly positively correlated with forward positions and weakly negatively correlated with spot positions. This pattern may indicate that banks engage in imperfect hedging by taking forward positions opposite to their spot positions but still speculate on the FX market by not fully offsetting their exposures. Such behavior suggests that banks may be timing their hedges based on market conditions.

Table 7 presents the results of the 2SLS fixed effects regressions of banks' FX spot, forward, and composite positions (scaled by total assets) on 3-month dollar CD rates and control variables. Model (1) shows that banks' FX spot positions are significantly negatively correlated with FC interest rates. These results imply that when the Federal Reserve lowers interest rates, banks may increase their FC liabilities more rapidly than FC assets, whereas when the Fed raises rates, banks may reduce their FC liabilities more quickly than their assets. In the foreign exchange (FX) spot market, banks tend to take on greater risk in FC funding during the Federal Reserve's easing periods, whereas they are more inclined to prioritize liquidity risk management during tightening periods. This behavior reflects banks' strategic adjustments in response to changes in monetary policy stance, balancing risk-taking and liquidity considerations accordingly. In addition, Model (2) demonstrates that banks' FX forward positions are significantly positively associated

with FC interest rates. The positive forward coefficient (0.189) exceeds the magnitude of the negative spot coefficient (-0.145), indicating that banks' forward positions are more responsive to FC interest rate changes than their spot positions. This suggests that banks not only hedge their spot exposures with forward contracts but also engage in speculative activities in the FX market using forwards. Consequently, Model (3) reports a significant positive correlation between banks' FX composite positions (i.e., spot plus forward positions) and FC interest rates. Banks anticipating a positive relationship between FC interest rates and exchange rates tend to increase their FX composite positions as FC interest rates rise. These findings imply that banks engage in imperfect FX hedging and hedge timing strategies in the currency market.

5.3. FC Duration Gap and Foreign Exchange Position

This section examines the relationships between banks' foreign exchange (FX) positions and their foreign currency (FC) duration gaps. If banks expand their FC duration gaps to manage liquidity risk during periods when the Federal Reserve raises interest rates, but increase spot positions by investing more in FC assets as interest rates decrease, their FX spot positions may be negatively associated with their FC duration gaps. Table 8 presents results from 2SLS fixed effects regressions of banks' FC duration gaps on their FX spot, forward, and composite positions. Model (1) indicates that banks' FX spot positions are significantly negatively correlated with their FC duration gaps, while Model (2) shows that banks' forward positions are significantly positively correlated with their FC duration gaps. These results suggest that banks attempt to hedge their FX spot positions with forward contracts, resulting in a negative association between spot and forward positions. However, the relationship between banks' composite positions and FC duration gaps is not statistically significant. Furthermore, the findings imply that as the Federal Reserve tightens monetary policy, banks' FC duration gaps on their balance sheet tend to widen due to a reduction

in the average duration of FC liabilities, while FX spot positions decrease as banks reduce FC assets faster than FC liabilities. To the best of current knowledge, this study is the first to systematically examine the relationship between a bank's duration gap and its foreign exchange positions.

5.4. Exchange Rates and Foreign Exchange Positions

This section examines whether banks' foreign exchange (FX) positions are significantly associated with exchange rate changes, along with their implications for the bank's foreign currency risk management. The test results of investigating the relationships between banks' FX positions and the exchange rate are reported in Table 9. Panel A of the table presents the pairwise correlation coefficients between the won/dollar exchange rate, FX spot positions, forward positions, and composite positions as part of a univariate test.

The estimation results indicate a significant positive correlation between banks' FX spot positions and exchange rates. Specifically, as the exchange rate rises and the U.S. dollar strengthens relative to the Korean won, banks tend to hold more foreign currency (FC) assets than liabilities, resulting in a positive FX position. This relationship suggests that exchange rate movements may influence banks' FX spot positions, possibly due to active speculation in the foreign exchange market. Indeed, banks frequently engage in intraday FX trading and may choose to maintain positive (negative) spot positions in anticipation of rising (falling) exchange rates. Furthermore, banks commonly use currency forwards to hedge their FX spot exposures. The significant negative correlation observed between FX spot and forward positions, such as the -0.96 mentioned earlier, highlights banks' tendency to offset spot exposures by taking opposite positions in forward contracts. As a result, forward positions may show a significant negative correlation with exchange rates. If banks fully hedge their FX spot positions with forward positions, FX

composite positions (the sum of spot and forward) would typically show no significant correlation with exchange rates. However, evidence of significant negative association between FX composite positions in Panel A suggests potential over-hedging or speculative behavior by banks.

The findings from the fixed effects regressions provide further insight into Korean banks' foreign currency risk management strategies. Panel B of Table 9 presents the outcomes of the 2SLS fixed effects regressions. Models (1) and (2) show that banks' FX spot positions are significantly positively associated with the exchange rate, while their forward positions are significantly negatively correlated with the exchange rate. Model (3) reveals that banks' composite positions are also significantly negatively correlated with the exchange rate. These results broadly infer that Korean banks, while actively participating in the interbank FX market, utilize derivatives such as currency forwards to hedge their currency spot exposures rather than purely speculating on spot exchange rate movements. Importantly, banks may overhedge or underhedge their FX spot positions relative to movements in FC interest rates. For example, banks often take positive forward positions that exceed their negative spot positions when FC interest rates rise, anticipating future U.S. dollar strength.⁶ This behavior results in positive composite positions during periods of Fed tightening. Thus, banks appear to speculate on interest rate movements with forwards, often actively timing the market by overhedging spot positions. The observed negative association between FX composite positions and exchange rates may be an outcome of monetary policy actions taken by the Bank of Korea. Even when the Fed raises U.S. dollar interest rates, a concurrent increase in won interest rates by the Bank of Korea can still drive the won/dollar

⁶ When the Fed raises interest rates, the U.S. dollar tends to strengthen. As the Federal Reserve tightens, higher U.S. interest rates attract investors to the U.S. capital markets. Tighter monetary policy can also slow inflation. Empirical evidence indicates that the U.S. dollar index surged as the Fed tightens, as seen in 2022 and 2015-2018 tightening cycles.

exchange rate lower.

Kim and Chance (2018) show that non-financial firms time the currency market when deciding whether to hedge their spot positions; specifically, the likelihood of firms increasing their foreign currency (FC) composite positions rises by 30.2% following an exchange rate increase from the prior period. In contrast, banks do not merely speculate on FX market movements based on their balance sheets. Instead, they strategically use forwards to time both their hedges and the magnitude of their currency risk management. This behavior suggests that emerging market banks' currency risk management is influenced by monetary policy decisions of both the Federal Reserve and their local central banks. Banks dynamically adjust their hedging tactics in response to shifts in monetary conditions and exchange rates, rather than passively participating in speculation.

5.5. Duration Gap, Risk Management, and Bank Value

This section examines whether a bank's risk management is significantly correlated with its market value. Table 10 reports the estimation results investigating the relationship between banks' foreign currency (FC) duration gaps and their bank values, measured by Tobin's Q ratios. Panel A of the table presents the pairwise correlation between the FC duration gap and Tobin's Q. The results suggest a significant positive correlation, indicating that banks with larger duration gaps tend to have higher Tobin's Q ratios, which may reflect risk management practices impacting perceived bank value.

Panel B of Table 10 presents the estimation results from 2SLS fixed effects regressions of the logarithm of a bank's Tobin's Q on its foreign currency (FC) duration gap and control variables. The table also reports regression results incorporating banks' allowance for loan losses to non-performing loans (ALL/NPL) ratios, which serve as a proxy for credit risk hedging. Model (1) shows a significant positive correlation between a bank's Tobin's Q and its FC duration gap. Model

(2) reveals a significant positive association between Tobin's Q and the credit risk hedge proxy. Moreover, Model (3) indicates that the interaction between the duration gap and credit risk hedge is positively and statistically significantly correlated with Tobin's Q at the 1% significance level. These findings suggest that banks may enhance their market value by increasing either their duration gaps or credit risk hedges. The positive relationship may reflect a decreased likelihood of default as these risk management measures strengthen. Additionally, Table 10 shows that bank values are negatively affected by the exchange rate, consistent with the interpretation that a stronger U.S. dollar raises banks' FC borrowing costs and thereby reduces FC profitability. This aligns with theoretical and empirical research demonstrating how interest rate risk and credit risk management influence bank valuation through Tobin's Q.

6. Conclusions

This study investigates whether external monetary shocks significantly influence emerging market banks' foreign exchange (FX) risk management. It further explores the channels through which monetary policy shocks impact banks' FX positions, focusing on foreign currency (FC) duration gaps as a key mechanism. Additionally, the study examines the effects of banks' FC risk management on their market value. Four hypotheses are tested using unique data from the Korean banking industry.

First, this study examines whether banks' foreign currency (FC) duration gaps are significantly affected by FC interest rates, extending the findings of Kim (2025). The estimation results reveal that emerging market banks' FC duration gaps are significantly positively correlated with three-month U.S. dollar CD rates and effective federal funds rates. This indicates that banks tend to increase their FC duration gaps as dollar interest rates rise and conversely decrease their FC duration gaps as these rates fall. These results are consistent with Kim (2025), who argues that

banks may increase their FC duration gaps primarily by reducing the average maturity of their FC liabilities, given the high illiquidity of FC long-term assets which makes their maturity harder to adjust quickly. During periods of Federal Reserve tightening, banks appear to focus on managing FC liquidity risk by shortening the duration of their liabilities. In contrast, when the Fed eases monetary policy, banks extend the maturities of their FC liabilities and increase long-term debt as global liquidity improves, thus decreasing their FC duration gaps and prioritizing risk-taking.

Second, this study examines whether banks' foreign exchange (FX) positions are significantly associated with their foreign currency (FC) interest rates. The results find that banks' FX spot positions are significantly negatively correlated with FC interest rates, while their FX forward positions are significantly positively correlated. Notably, the positive correlation between FC interest rates and forward positions is stronger than the negative correlation between FC interest rates and spot positions. Consequently, FC interest rates are significantly positively correlated with banks' FX composite positions, defined as the sum of spot and forward positions. These findings suggest that banks' on-balance-sheet FX positions are substantially influenced by the Federal Reserve's monetary policy stance. Banks tend to increase risk exposure through forward contracts when anticipating dollar appreciation during Fed tightening cycles. By overhedging their spot exposure with forwards, banks effectively speculate based on dollar interest rate movements, aligning with insights on dynamic hedging and currency speculation in banking.

Third, combining the positive association between foreign currency (FC) interest rates and banks' FC duration gaps with the negative (positive) association between FC interest rates and their FX spot (forward) positions, we find that banks' FX spot and forward positions are significantly negatively correlated with their FC duration gaps. These findings suggest that banks adjust their FX positions in response to changes in duration gaps, reflecting strategic risk

management behaviors. Furthermore, the results indicate that banks' FX positions are significantly influenced by the Federal Reserve's interest rate policy, highlighting the interconnectedness of monetary policy and bank-level currency risk management.

Fourth, this study finds that banks do not appear to determine their on-balance-sheet foreign exchange (FX) positions solely based on exchange rates. Specifically, banks' composite FX positions are significantly negatively associated with the exchange rate. This outcome arises because banks tend to overhedge positive spot positions with even larger negative forward positions, and vice versa. The negative relationship between exchange rates and banks' composite FX positions suggests that banks often incur losses from their FX holdings. Nonetheless, despite apparent failures in speculative FX positions, banks may benefit overall by effectively managing liquidity and credit risks. These findings align with prior research indicating that banks' FX position decisions reflect broader risk management objectives beyond pure exchange rate speculation.

Finally, this study investigates whether banks' foreign currency (FC) liquidity risk management and credit risk management contribute to their market values. Specifically, we examine the relationship between banks' Tobin's Q and two key risk management measures: FC duration gaps and allowances for loan losses divided by non-performing loans (ALL/NPL) ratios. The results indicate that banks' Tobin's Q ratios are significantly positively correlated with both their FC duration gaps and ALL/NPL ratios. This suggests that by increasing long-term debt during the Federal Reserve's easing periods, banks may reduce their FC funding costs and, concurrently, a lower likelihood of FC defaults may enhance bank value. These findings align with prior research demonstrating the positive impact of effective risk management on firm values.

This study contributes to the literature by investigating banks' foreign exchange rate risk

management and elucidating the channels through which the Federal Reserve's monetary policy shocks influence their foreign currency (FC) duration gaps, FX positions, and ultimately bank values. Utilizing granular hedging and FC asset and liability maturity data from Korean banks, the analysis provides novel insights into the interplay between monetary policy and bank-level currency risk management. Future research could extend this framework to non-financial sectors and other regions or countries, enriching the understanding of currency risk management across varied institutional contexts. Additionally, while this study focuses on the Federal Reserve's monetary policy shocks, further work might consider the effects of domestic central bank policies. The relationship between banks' speculative profits and their FX position decisions also presents an intriguing area for future inquiry.

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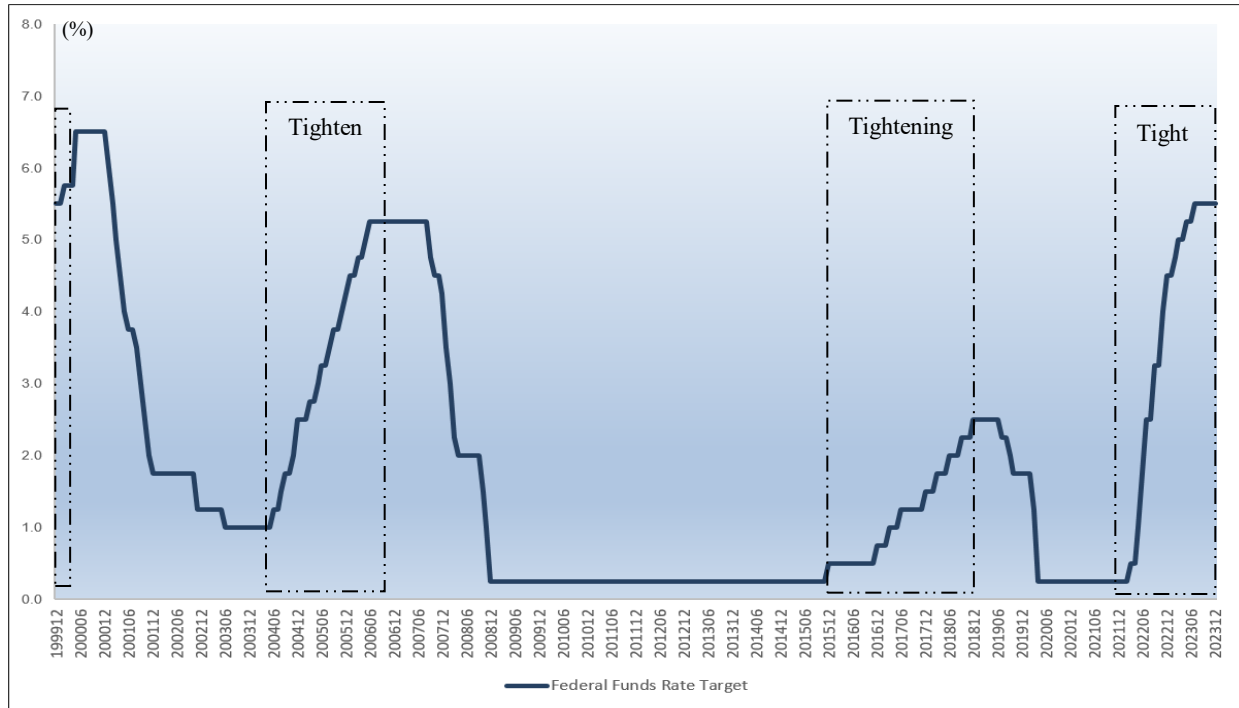


Figure 1. Federal Funds Rates and Federal Reserve’s Monetary Policy Stances

This figure illustrates the Federal Reserve’s targets for the federal funds rate (*FF target*), which is the central bank’s monetary policy interest rate in the United States. For periods after December 2008, the figure shows the upper bounds of the federal funds rate target ranges, as the Federal Reserve began to specify a range—typically 25 basis points—rather than a single target rate during that time.

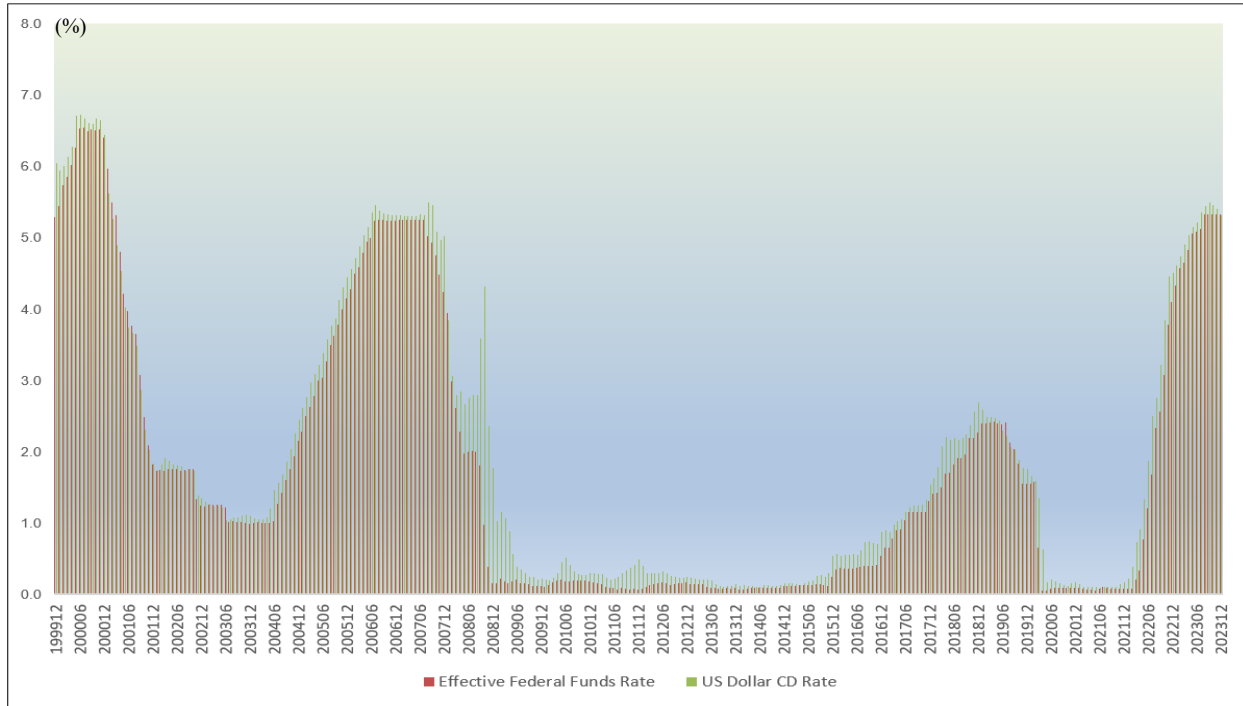


Figure 2. Federal Funds Rates and Dollar CD Rates

This figure plots the effective federal funds rates (*EFFR*)—the overnight interest rate at which banks lend their reserves to each other in the federal funds market—alongside the three-month interest rates on U.S. dollar certificates of deposit (CDs).

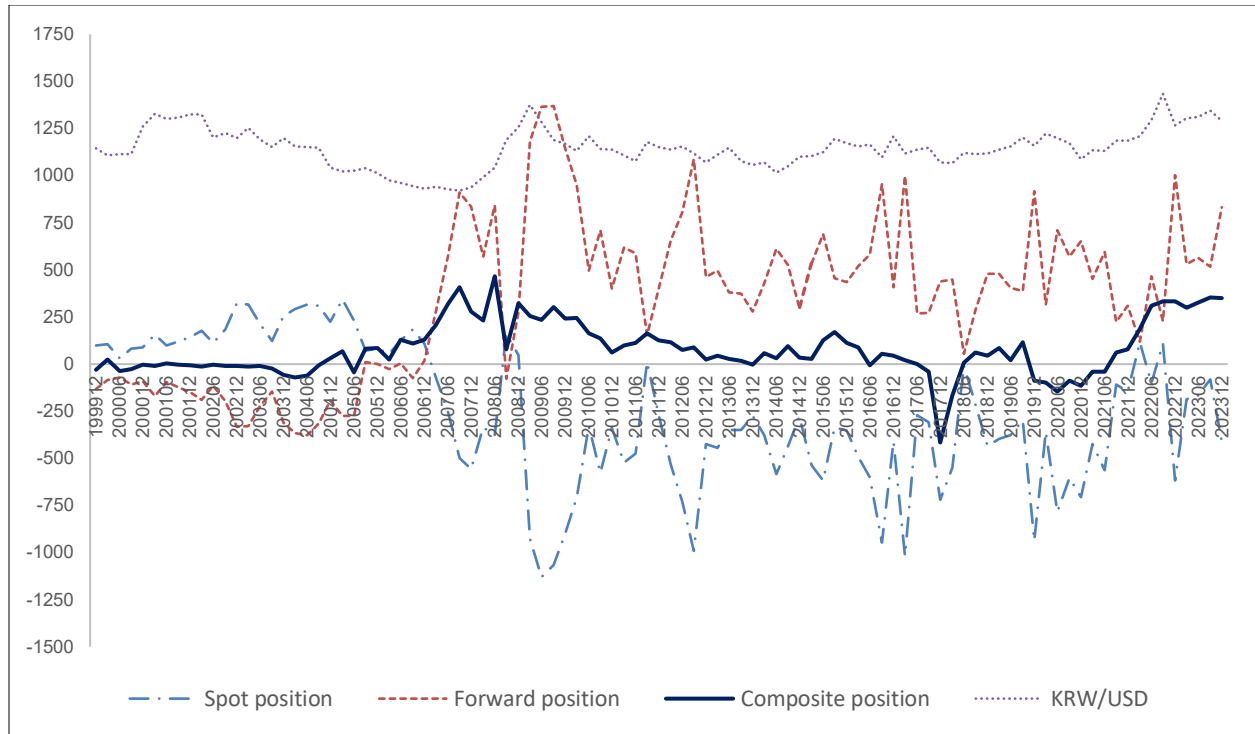


Figure 3. Foreign Exchange Rates and Foreign Currency Positions

This figure presents the average foreign currency spot position, forward position, and composite position for sample banks, alongside the KRW/USD exchange rates. The composite position is the sum of the spot and forward positions.

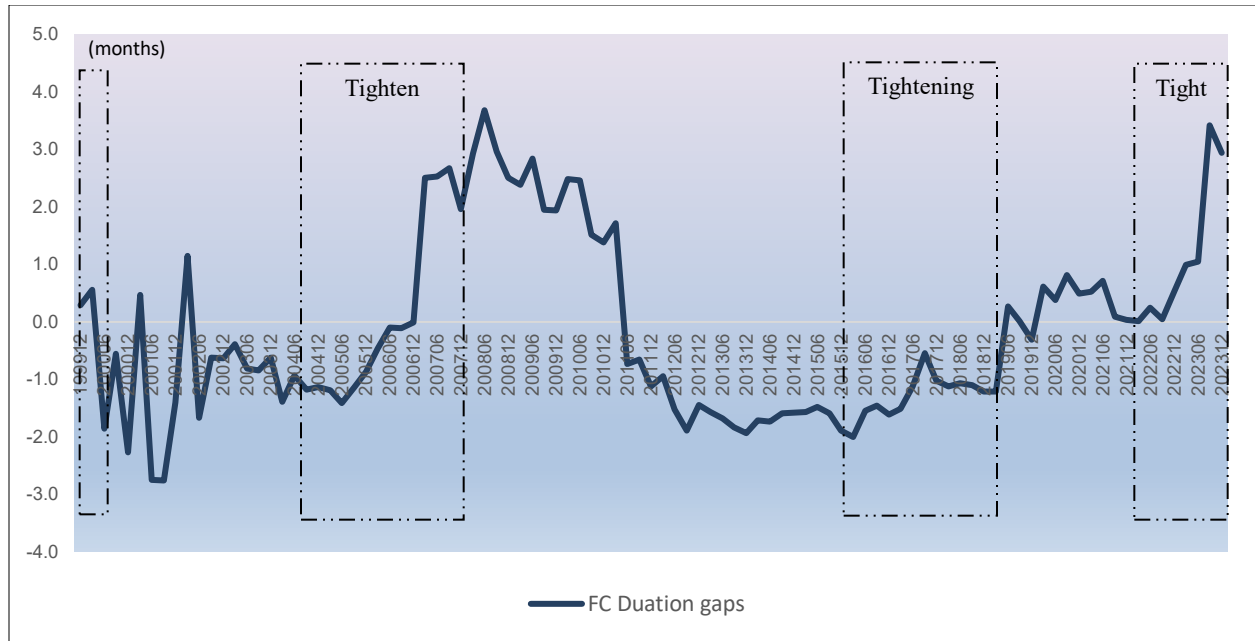


Figure 4. FC Interest Rates Duration Gaps

This figure plots the average foreign currency (FC) duration gaps of the sample banks. The FC duration gap is computed as the difference between a bank's FC asset duration and its FC liability duration.

Table 1. Summary Statistics

This table provides summary statistics for financial characteristics of the sample banks and variables, measured quarterly from 1999 to 2023. The sample includes 1,959 bank quarters for 38 domestic banks in South Korea. FC and LC denote foreign currency and local currency (won), respectively. *ALL/NPL* represents the ratio of allowance for loan losses to non-performing loans. Definitions of the variables are provided in Table 11.

Panel A: Summary Statics of Sample Bank's Financial Characteristics

Variable	Mean	Std. Dev.	(U.S. dollar millions)
			% of total assets
Total assets	80,127	94,651	100.0%
Total loans	32,389	43,196	40.4%
Total borrowings	18,080	28,124	22.6%
Total deposits	49,701	65,665	62.0%
Total shareholders' equity	5,577	7,130	7.0%
Total revenue	1,932	2,667	2.4%
EBITs	138	266	0.2%
FC assets	11,354	14,552	14.2%
FC loans	2,521	3,590	3.1%
FC deposits	2,784	5,016	3.5%
FC borrowings	4,852	7,393	6.1%
FC spot position	-252	1,007	-0.3%
FC derivatives position	344	1,056	0.4%
FC composite position	81	443	0.1%

Panel B: Summary Statistics of Dependent, Independent, Control Variables

Variable	Mean	Std. Dev.	Median
FC duration gap (months)	-0.147	5.723	-0.630
Tobin's Q	0.983	0.044	0.978
Capital ratio	0.108	0.071	0.104
Liquidity ratio	0.013	0.009	0.012
Asset Quality	0.028	0.048	0.013
ROA	0.007	0.064	0.007
NIM	0.022	0.007	0.022
ALL/NPL	1.938	20.357	1.147
GDP growth	0.033	0.026	0.032
Exchange rate	1.151	0.105	1.150

Table 2. Correlations between FC Interest Rates, Duration Gaps, and Bank Value

This table reports pairwise correlation coefficients. Panel A provides the correlation coefficient between a bank's net return on foreign currency (FC) loans and the FC interest rate, which corresponds to the rates of three-month dollar certificates of deposit. Panel B presents the correlation coefficients among the FC interest rate, a bank's FC duration gap, FC asset duration, and FC liability duration. Panel C displays the correlation coefficient between a bank's FC duration gap and its Tobin's Q, a measure of the bank's market value. ***, **, and * indicate the coefficient is significant at the 1%, 5%, and 10% level, respectively.

Panel A: FC Interest Rates and Profitability

	FC loan net return
FC interest rate	-0.397 ***

Panel B: FC Interest Rates and Duration Gaps

	Fed funds rate	FC duration gap	FC asset duration
FC interest rate	1		
FC duration gap	0.264 ***	1	
FC asset duration	0.183 ***	0.331 ***	1
FC liability duration	0.107 *	0.366 ***	0.634 ***

Table 3. FC Duration Gap and the FC Interest Rates

This table reports coefficient estimates from the following fixed effects panel regression:

$$Duration\ gap_{i,t} = \beta\ FC\ interest\ rate_t + \gamma\ Control\ variables_{i,t} + \alpha_i + u_{i,t}.$$

The dependent variable, *duration gap*, represents the difference between a bank's foreign currency (FC) asset duration and liability duration. The first column reports coefficient estimates using the *effective federal funds rate (EFFR)* as the measure of FC interest rate, while the second column uses the three-month interest rate on dollar certificates of deposit (CDs) as the FC rate. The t-values appear in parentheses. ***, **, and * indicate the coefficient is significance at the 1%, 5%, and 10% level, respectively.

Fixed Effects Regression			
Dependent Variable:	FC Duration Gap		
	(1)	(2)	
Dollar CD Rate	59.641 *** (4.46)		
EFFR		58.028 *** (3.98)	
Size	1.003 * (1.68)	1.203 ** (2.00)	
Solvency	0.124 (1.31)	0.097 (1.03)	
Liquidity	0.016 * (1.81)	0.014 (1.59)	
Asset quality	-8.351 (0.71)	-8.184 (0.69)	
ROA	-3.154 (0.35)	-3.212 (0.35)	
NIM	-0.643 (1.61)	-0.569 (1.43)	
Derivatives hedge	-4.450 (0.54)	-4.400 (0.53)	
GDP growth	0.470 (0.08)	-0.478 (0.08)	
Exchange rate	-0.556 (0.41)	-0.460 (0.33)	
MPD	-1.984 *** (4.95)	-1.906 *** (4.64)	
Constants	-19.530 * (1.85)	-22.730 ** (2.12)	
Observations	1,263	1,263	
Within R ²	0.028	0.019	

Table 4. FC Duration Gap and the Federal Reserve's Monetary Policy Stance

This table reports coefficient estimates from the following fixed effects panel regression:

$$Duration\ gap_{i,t} = \beta\ FC\ interest\ rate_t + \gamma\ Control\ variables_{i,t} + \alpha_i + u_{i,t}.$$

The dependent variable, *duration gap*, represents the difference between a bank's foreign currency (FC) asset duration and liability duration. The three-month interest rate on dollar certificates of deposit (CDs) is employed to capture the FC interest rate. The first column reports coefficient estimates during the Federal Reserve tightening period, while the second column reports estimates during the easing period. The t-values appear in parentheses. ***, **, and * indicate the coefficient is significance at the 1%, 5%, and 10% level, respectively.

Fixed Effects Regression			
Dependent Variable:	FC Duration Gap		
	(1) Tightening	(2) Easing	
FC interest rate	44.171 *** (4.08)	81.027 *** (3.40)	
Size	1.067 (1.53)	1.070 (1.12)	
Solvency	-0.069 (0.58)	0.222 (1.58)	
Liquidity	0.011 (0.95)	0.023 * (1.93)	
Asset quality	-7.502 (0.76)	-14.337 (0.44)	
ROA	0.861 (0.13)	-52.273 (1.37)	
NIM	-0.118 (0.25)	-0.746 (1.29)	
Derivatives hedge	-0.998 (0.09)	-0.702 (0.07)	
GDP growth	17.196 * (1.65)	-2.728 (0.36)	
Exchange rate	-0.617 (0.30)	0.738 (0.30)	
Constants	-21.528 * (1.87)	-23.568 (1.31)	
Observations	502	761	
Within R ²	0.052	0.032	

Table 5. FC Duration Gaps between the Federal Reserve's Tightening vs. Easing

This table reports the average foreign currency (FC) duration gap during the Federal Reserve's tightening period and the easing period. The t-values appear in parentheses. ***, **, and * indicate the coefficient is significance at the 1%, 5%, and 10% level, respectively.

<i>(in months)</i>			
FC duration gap	Tightening period	Easing period	Difference (Tighten – Easing)
Mean	-0.5095	0.4350	-0.9445 ** (2.35)
<i>Standard Deviation</i>	<i>3.3127</i>	<i>7.7976</i>	

Table 6. Correlations between Foreign Exchange Positions

This table presents the pairwise correlation coefficients among foreign exchange (FX) spot positions, forward positions, and composite positions.

	FX spot position	FX forward position
FX spot position	1	
FX forward position	-0.961 ***	1
FX composite position	-0.046 *	0.318 ***

Table 7. FC Interest Rates and Foreign Exchange Positions

This table reports coefficient estimates from the following fixed effects panel regression:

$$FX\ position_{i,t} = \beta\ FC\ Interest\ rate_{i,t} + \gamma\ Control\ variables_{i,t} + \alpha_i + u_{i,t}.$$

The dependent variable, *FX position*, represents a bank's foreign exchange spot, forward, and composite positions, each scaled by total assets. The spot position is calculated as the difference between total FC assets and total FC liabilities, while the composite position is the sum of the spot position and forward position. The t-values appear in parentheses. ***, **, and * indicate the coefficient is significance at the 1%, 5%, and 10% level, respectively.

Fixed Effects Regression			
Dependent Variables:	Spot	Forward	Composite
	(1)	(2)	(3)
FC interest rate	-0.145** (2.20)	0.189** (2.51)	0.048*** (5.62)
Size	0.000 (0.14)	0.001 (0.50)	0.001 (1.45)
Solvancy	-0.001** (2.02)	0.002** (2.01)	0.000*** (3.25)
Liquidity	0.000* (1.86)	0.000 (1.57)	0.000 (0.77)
Asset quality	0.037 (1.23)	-0.054 (1.36)	-0.018 (2.52)
ROA	0.000 (0.02)	0.004 (0.29)	0.005 (0.93)
NIM	-0.002 (0.72)	0.003 (0.99)	0.001*** (3.08)
Derivatives hedge	-0.066*** (2.57)	0.077** (2.50)	0.011** (2.27)
GDP growth	0.017** (2.09)	-0.021* (1.79)	-0.006 (1.63)
Exchange rate	0.012** (2.50)	-0.012*** (2.63)	0.000 (0.56)
MPD	0.006*** (2.66)	-0.008*** (2.80)	-0.001*** (5.33)
Constants	0.014 (0.36)	-0.032 (0.73)	-0.013** (1.96)
Observations	1,267	1,267	1,110
R ²	0.126	0.140	0.056

Table 8. FC Duration Gap and Foreign Exchange Positions

This table reports coefficient estimates from the following fixed effects panel regression:

$$FX\ position_{i,t} = \beta\ FC\ Duration\ gap_{i,t} + \gamma\ Control\ variables_{i,t} + \alpha_i + u_{i,t}.$$

The dependent variable, *FX position*, represents a bank's foreign exchange spot, forward, and composite positions, each scaled by total assets. The spot position is calculated as the difference between total FC assets and total FC liabilities, while the composite position is the sum of the spot position and forward position. The t-values appear in parentheses. ***, **, and * indicate the coefficient is significance at the 1%, 5%, and 10% level, respectively.

Fixed Effects Regression			
Dependent Variables:	Spot	Forward	Composite
	(1)	(2)	(3)
FC duration gap (days)	-0.005*** (2.73)	0.005** (2.54)	0.000 (0.11)
Size	0.000 (0.24)	0.000 (0.38)	0.000 (0.99)
Solvancy	-0.001*** (7.44)	0.001*** (7.28)	0.000** (2.12)
Liquidity	0.000 (1.12)	0.000 (0.71)	0.000 (0.78)
Asset quality	0.110*** (2.66)	-0.162*** (3.52)	-0.052*** (3.57)
ROA	-0.028 (0.64)	0.049 (0.99)	0.019 (1.22)
NIM	-0.003*** (3.99)	0.004*** (5.19)	0.001*** (3.70)
Derivatives hedge	-0.066*** (4.63)	0.078*** (4.90)	0.012** (2.33)
GDP growth	0.010 (0.96)	-0.010 (0.92)	-0.002 (0.49)
Exchange rate	0.012*** (5.18)	-0.013*** (4.84)	-0.001 (1.37)
MPD	0.004*** (7.02)	-0.004*** (7.04)	-0.001** (2.56)
Constants	-0.001 (0.06)	-0.014 (0.65)	-0.008 (1.12)
Observations	1,214	1,214	1,063
R ²	0.147	0.163	0.063

Table 9. Exchange Rates and Foreign Exchange Positions

This table shows the relationships between the exchange rate, FX spot position, forward position, and composite position. Panel A presents the pairwise correlation coefficients. Panel B reports coefficient estimates from the following fixed effects panel regression:

$$FX\ position_{i,t} = \beta\ Exchange\ rate_{i,t} + \gamma\ Control\ variables_{i,t} + \alpha_i + u_{i,t}.$$

The dependent variable, *FX position*, represents a bank's foreign exchange spot, forward, and composite positions, each scaled by total assets. The spot position is calculated as the difference between total FC assets and total FC liabilities, while the composite position is the sum of the spot position and forward position. The t-values appear in parentheses. ***, **, and * indicate the coefficient is significance at the 1%, 5%, and 10% level, respectively.

Panel A: Correlations between Exchange Rates and Foreign Currency Positions

	Exchange rate
Exchange rate	1
FC spot position	0.102 ***
FC forward position	-0.096 ***
FC composite position	-0.013

Panel B: Fixed Effects Regressions

Fixed Effects Regression			
Dependent Variables:	Spot	Forward	Composite
	(1)	(2)	(3)
Exchange rate	0.016*** (5.78)	-0.018*** (5.90)	-0.003*** (3.24)
Size	0.000 (0.31)	0.001 (1.01)	0.001 (1.33)
Solvency	-0.001*** (7.75)	0.001*** (7.62)	0.000** (2.21)
Liquidity	0.000 (1.19)	0.000 (0.75)	0.000 (0.81)
Asset quality	0.018 (0.88)	-0.027 (1.20)	-0.009 (1.31)
ROA	0.007 (0.45)	-0.005 (0.28)	0.002 (0.37)
NIM	-0.002*** (3.51)	0.004*** (4.65)	0.001*** (3.38)
Derivatives hedge	-0.065*** (4.56)	0.074*** (4.72)	0.010** (1.99)
GDP growth	0.007 (0.71)	-0.008 (0.75)	-0.002 (0.69)
Exchange rate	0.004*** (7.03)	-0.004*** (6.95)	-0.001*** (2.61)
MPD	0.005 (0.30)	-0.020 (1.01)	-0.007 (1.09)
Constants	1,267 0.140	1,267 0.149	1,110 0.046
Observations	0.016***	-0.018***	-0.003***
R ²	(5.78)	(5.90)	(3.24)

Table 10. Duration Gap, Credit Risk Management, and Bank Value

This table presents the relationships between banks' FC duration gaps and bank value. Panel A reports the pairwise correlation coefficients. Panel B provides coefficient estimates from the following fixed effects panel regression:

$$\text{Bank value}_{i,t} = \beta X_{i,t} + \gamma \text{Control variables}_{i,t} + \alpha_i + u_{i,t}.$$

The dependent variable, *bank value*, represents the log of Tobin's Q. The first column reports coefficient estimates with the duration gap, the second column with the credit risk hedge, and the third column with the *duration gap x credit risk hedge* interaction term as the independent variables. The *credit risk hedge* is measured as the ratio of a bank's allowance for loan losses to its non-performing loans (ALL/NPL). The interaction term is constructed by multiplying a bank's one-quarter lagged duration gap by its ALL/NPL in that quarter. The t-values appear in parentheses. ***, **, and * indicate the coefficient is significance at the 1%, 5%, and 10% level, respectively.

Panel A: Correlation between FC Duration Gap and Bank Value

	FC duration gap
FC duration gap	1
Tobin's Q	0.223 ***

Panel B: Fixed Effects Regressions

Fixed Effects Regression Dependent Variable:	Log Tobin's Q		
	(1)	(2)	(3)
Duration gap	0.002 *** (2.89)		
Credit risk hedge		0.007 *** (4.94)	
Duration gap x credit risk hedge			0.001 *** (3.62)
Size	-0.008 *** (3.06)	-0.010 *** (4.09)	-0.006 ** (2.39)
Solvency	-0.003 *** (7.53)	-0.003 *** (8.04)	-0.003 *** (8.86)
Liquidity	0.000 ** (2.45)	0.000 *** (2.81)	0.000 *** (3.07)
Asset quality	-0.227 *** (2.27)	-0.201 (3.23)	-0.295 (4.97)
ROA	0.281 *** (2.77)	-0.005 *** (0.17)	-0.016 *** (0.50)
NIM	0.020 *** (12.27)	0.020 *** (13.18)	0.020 *** (13.38)
Derivative hedge	-0.055 (1.36)	-0.097 ** (2.39)	-0.059 (1.47)
GDP growth	0.145 *** (6.56)	0.127 *** (6.16)	0.147 *** (7.08)
Exchange rate	-0.065 *** (12.06)	-0.064 *** (12.88)	-0.066 *** (13.16)
MPD	0.002 * (1.89)	0.002 (1.62)	0.002 ** (2.01)
Constants	0.181 *** (4.07)	0.220 *** (5.02)	0.152 *** (3.63)
Observations	874	911	910
R ²	0.685	0.663	0.660

Table 11: Variable Definitions

FC interest rate	Measures the level of foreign currency interest rate. Specifically, the 3-month U.S. dollar CD rate is used to capture the FC interest rate.
AL maturity gap	Measures a bank's asset-liability maturity gap is the difference between the amount of a bank's interest-sensitive assets and liabilities with a specific maturity.
Asset (liability) duration	Measures the weighted average duration or maturity of a bank's assets (liabilities) for a given quarter.
Duration gap	Measures a bank's risk-taking: computed by a bank's asset duration – (L/A)(liability duration), where the L/A ratio indicates the ratio of the bank's total liabilities to its total assets for a given quarter.
Credit risk hedge	Measures a firm's credit risk management: computed by the amount of a bank's allowance for loan losses scaled by its non-performing loans for a given quarter.
Tobin's Q	Measures the firm market value: [Market value of stock + Book value of debt + Book value of preferred stock] / Book value of total assets.
FC net loan return	Measures a bank's foreign currency loan profitability: computed by subtracting the average cost of borrowing foreign currency funds from the average return on loans in foreign currency for a given quarter.
Size	The log of a bank's total assets for a given quarter.
Capital ratio	Measures a bank's solvency: computed by dividing a bank's total equity capital by its total assets.
Liquidity	The ratio of the amount of a bank's total current assets due in three months to the amount of its total current liabilities due in three months for a given quarter.
Asset quality	The ratio of the amount of a bank's nonperforming loans to the total amount of its non-performing loans for a given quarter.
ROA	The ratio of the amount of a bank's earnings before interest and taxes to its total assets for a given quarter.
NIM	The ratio of the amount of a bank's net interest income to its total interest-earning assets. Net interest income is calculated as the difference between the bank's total interest income and its total interest expense.
Derivative hedge	Measures a bank's market risk management: computed by the amount of a bank's interest rate or currency derivatives used for hedging purposes to hedge interest rate or exchange-rate risk, scaled by total assets, for a given quarter.
GDP growth	The quarterly growth rate of real GDP in Korea.
Exchange rate	The exchange rate of Korean won to U.S. dollar divided by 1,000.
MP dummy (Fed tightening)	Measures the Federal Reserve monetary policy stance: represented by a dummy variable that takes the value 1 if the Federal Reserve raises the target for the fed funds rate, and 0 otherwise.
Tightening period	The quarters in which the Federal Reserve raises the target for the federal funds rate.

Table 12: The Federal Reserve Tightening

This table reports the federal funds rate changes in the Federal Reserve's monetary policy stance from November 1999 to December 2023. The FF target indicates the Fed's target (range) for the federal funds rate, which is the Fed's monetary policy interest rate. The data are collected on the Federal Reserve website.

Date	FF Target	Stance	Date	FF Target	Stance
1999.11.16	5.25%	Tighten	2007.12.11	4.25%	
2000.2.2	5.75	Tighten	2008.1.22	3.50	
2000.3.21	6.00	Tighten	2008.1.30	3.00	
2000.5.16.	6.25	Tighten	2008.3.18	2.25	
2001.1.3.	6.00		2008.4.30 – 2018. 9. 16	2.00	
2001.1.31	5.50		2008.10.7	1.50	
2001.3.20	5.00		2008.10.29	1.00	
2001.4.18	4.50		2008.12.16 – 2015. 10. 28	0 - 0.25	
2001.5.15	4.00		2015. 12. 16	0.25 - 0.50	Tighten
2001.6.27	3.75		2016. 12. 14	0.50 - 0.75	Tighten
2001.8.21	3.50		2017. 3. 15	0.75 - 1.00	Tighten
2001.9.17	3.00		2017.5.3	0.75 - 1.00	Tighten
2001.10.2	2.50		2017. 6. 14	1.00 - 1.25	Tighten
2001.11.6	2.00		2017. 12. 13	1.25 - 1.50	Tighten
2001.12.11 – 2002. 9. 24	1.75		2018. 3.21	1.50 - 1.75	Tighten
2002.11.6 – 2003. 5. 6	1.25		2018. 6.13	1.75 - 2.00	Tighten
2003.6.24 – 2004. 5. 4	1.00		2018. 9. 26	2.00 - 2.25	Tighten
2004.6.30	1.25	Tighten	2018. 12. 19	2.25 - 2.50	Tighten
2004.8.10	1.50	Tighten	2019. 1. 30 – 2019. 6. 19	2.25 - 2.50	
2004.9.21	1.75	Tighten	2019.7.31	2.00 - 2.25	
2004.11.10	2.00	Tighten	2019.9.18	1.75 - 2.00	
2004.12.14	2.25	Tighten	2019.10.30 – 2020. 1. 29	1.50 - 1.75	
2005.2.2	2.50	Tighten	2020.3.3.	1.00 - 1.25	
2005.3.22	2.75	Tighten	2020. 3. 15 – 2022. 1. 26	0 - 0.25	
2005.5.3	3.00	Tighten	2022.3.16	0.25 - 0.50	Tighten
2005.6.29	3.25	Tighten	2022.5.4	0.75 - 1.00	Tighten
2005.8.9	3.50	Tighten	2022.6.15	1.50 - 1.75	Tighten
2005.9.20	3.75	Tighten	2022.7.27	2.25 - 2.50	Tighten
2005.11.1	4.00	Tighten	2022.9.21	3.00 - 3.25	Tighten
2005.12.3	4.25	Tighten	2022.11.2	3.75 - 4.00	Tighten
2006.1.31	4.50	Tighten	2022.12.14	4.25 - 4.50	Tighten
2006.3.28	4.75	Tighten	2023.2.1	4.50 - 4.75	Tighten
2006.5.10	5.00	Tighten	2023.3.22	4.75 - 5.00	Tighten
2006. 6. 29	5.25	Tighten	2023.5.3	5.00 - 5.25	Tighten
2006. 8. 8 – 2007. 8 .10	5.25		2023.5.3	5.00 - 5.25	Tighten
2007.9.18	4.75		2023.7.26 –	5.25 - 5.50	Tighten
2007.10.31	4.50				

Appendix: Sample banks

Banks	Periods	Banks	Periods
Kookmin *	1999 – 2001Q3	Kwangju (JB) **	2018Q4 – 2023
Kookmin **	2001Q4 – 2023	iM Bank (Daegu)	1999 – 2023
KEB	1999 – 2015Q2	Busan	1999 – 2023
Shinhan *	1999 – 2006Q1	Jeonbuk	1999 – 2023
Shinhan **	2006Q2 – 2023	Jeju	1999 – 2023
Woori	1999 – 2023	Choongbuk	1999 – 1999Q1
Hana *	1999 – 2002Q3	KakaoBank	2017Q3 – 2023
Hana **	2002Q4 – 2015Q2	K Bank	2017Q2 – 2023
Hana ***	2015Q3 – 2023	Toss	2021Q3 – 2023
IBK	1999 – 2023	KDB	1999 – 2023
Seoul	1999 – 2002Q3	NongHyup *	1999 – 2011Q4
Chohung	1999 – 2006Q1	NongHyup (NH) **	2012 – 2023
Peace	1999 – 2001Q3	Suhyup *	1999 – 2016Q3
KHB	1999 – 2001Q3	Suhyup (Sh) **	2016Q4 – 2023
Standard Chartered	1999 – 2023	Chookhyup	1999 – 2000Q2
Citibank Korea	1999 – 2023	Kumho Merchant	1999 – 2013Q2
Kangwon	1999 – 1999Q2	Woori Investment	2013Q3 – 2023
Kyoungnam	1999 – 2023	Woori Merchant	2001Q4 – 2003Q2
Kwangju *	1999 – 2018Q3	Korea French Merchant	1999 – 2010Q3

* denotes a bank prior to a merger or split, ** indicates after a merger or split, and *** indicates after another merger.