東 海 大 學 會 計 學 系 碩 士 班

碩　士　論　文



# Basel 3 與 IFRS 9 之實施：以臺灣銀行業為例

指導教授：林秀鳳　博士
黃琛瑞　博士

研 究 生：施瑋哲　　撰

中　華　民　國　１０８　年　７　月

# 東海大學會計學系碩士班

施瑋哲　君　所撰碩士論文：

Basel 3 與 IFRS 9 之實施：以臺灣銀行業為例

業經本委員會審議通過

碩士論文考試委員會委員

[illegible]　[illegible]

林秀鳳　鍾宇軒

陳佳煇

指導教授　[illegible]　林秀鳳

系所主任　林秀鳳

中華民國　108　年　7　月　18　日

# ACKNOWLEDGEMENT

Foremost, I would first like to express my sincere gratitude to my advisors Prof. Chen-Jui Huang and Prof. Hsiu-Feng Lin for their continuous supports to my graduate study and for their patience, enthusiasm, inspiration, and immense professional knowledge. The doors to faculty rooms were always open whenever I ran into a trouble or had a question about my research or writing. Their insightful direction and guidance helped me out of a tight spot whenever I lost myself in the labyrinth for writing this thesis. I could not imagined having better advisors and mentors at my graduate school.

Apart from my advisors, I am gratefully indebted to the rest of my thesis committee: Prof. Chia-Hui Chen, Prof. Yu-Hsuan Chung, and Prof. Yufen Fu for their invaluable comments and encouragement, but also for the tough subject that inspired me to broaden my research from diverse perspectives. My sincere thanks also go to all the professors who have taught me ever for offering me the professional knowledge in my campus life.

I am also grateful to my classmates and team members in graduate school, Jui Sheng, Yu Chen, Yi Ju, Chi Han, Cheng Chih, Hsin Yu, Pei Yu, Tzu Hui, Tzu Hsien, and Yun Chien, for their brainstorming and stimulating discussions, for the sleepless nights where we were trying to complete the assignments together around-the-clock before the approaching deadlines, and for all the fun we have had in the last two years.

Last but not the least, my family and grandfather in heaven are not only my contributors but also the foundation from whom I am. I must appreciate unfailing support for spiritual and continuous encouragement from them throughout the years of study, the process of writing this thesis, and my life in general. This achievement would not have been possible without them. Maybe one day I have a chance to share my pride and joy with my grandfather for exchanging his story from heaven.

Wei-Che Shih

Department of Accounting, Tunghai University

July 2019

# Basel 3 與 IFRS 9 之實施：以臺灣銀行業為例

指 導 教 授：林秀鳳 博士

黃琛瑞 博士

研究生姓名：施瑋哲

研究生學號： G06430105

## 摘要

本研究針對銀行監理規範《巴塞爾資本協定第三版》和《國際財務報導準則第九號》在臺灣銀行業的實施進行實證研究，並試圖研究其與銀行資本與流動性的關聯。主要實證研究結果如下：(1)銀行資本增加僅動態降低長期流動性，並未降低短期流動性，此結果與文獻中的風險吸收假說一致；(2)透過資本適足率所衡量的銀行資本僅在靜態水準正向影響短期流動性，此結果呼應文獻中的金融脆弱性排擠假說；(3)國際財務報導準則第九號的實施，透過權益和債務工具重分類，對資本適足率產生動態效果影響；(4)重分類效果僅透過債務工具，在靜態水準影響巴塞爾資本協定第三版定義的短期與長期流動性。未來研究方向可以延伸至其他金融服務業或加入非銀行變數的跨國分析。

關鍵字：巴塞爾資本協定第三版、國際財務報導準則第九號、

銀行資本、流動性、臺灣

# Implementation of Basel 3 and IFRS 9: Analysis of Taiwan's Banking Industry

Advisor: Dr. Hsiu-Feng Lin;
Dr. Chen-Jui Huang

Graduate Student Name: Wei-Che Shih

Graduate Student Number: G06430105

## ABSTRACT

This paper empirically examines implementation of Basel 3 and IFRS 9 in Taiwan's banking industry and attempts to study its linkages with bank capital and liquidity. Major empirical findings are as follows. (1) An increase in bank capital dynamically reduces long-term liquidity rather than short-term liquidity, which is consistent with the risk absorption hypothesis in literature. (2) Bank capital gauged by CAR defined by Basel 3 only positively affects short-term liquidity at the static level, which echoes the financial-fragility-crowding-out hypothesis in past literature. (3) Reclassification for both equity and debt instruments following the implementation of IFRS 9 dynamically creates an impact on CAR. (4) There appears a significant reclassification effect on both short-term and long-term liquidity defined by Basel 3 only for debt instruments and only at the static level. Future research may extend to other financial services or cross-country analysis with non-bank variables over time.

Keywords: Basel 3; IFRS 9; Bank Capital; Liquidity; Taiwan

# TABLE OF CONTENTS

# LIST OF FIGURES



# LIST OF TABLES

# 1. INTRODUCTION

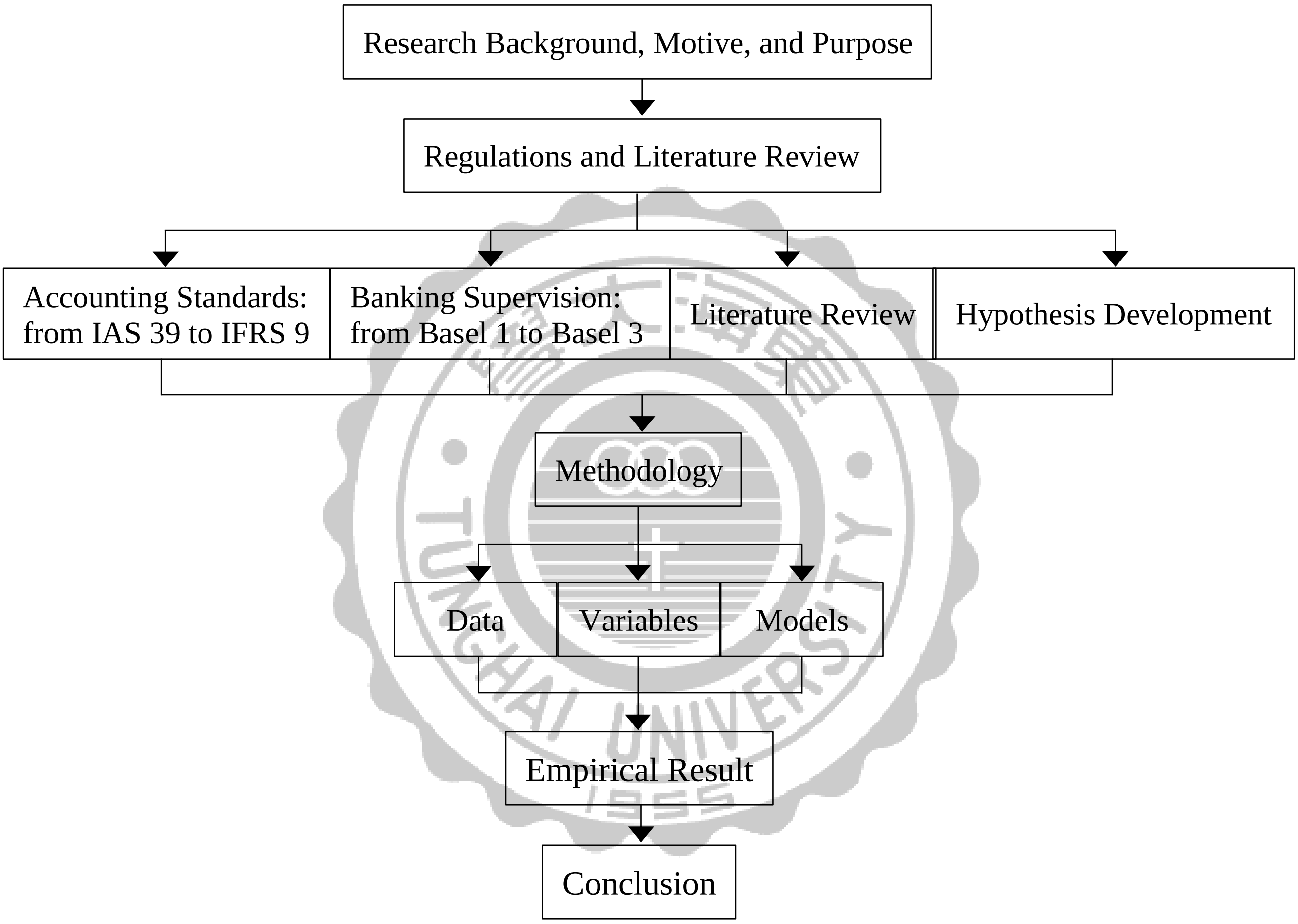
The banking industry is highly regulated and subject to government policies across countries worldwide. The purpose of this study consists in examining bank capital and liquidity following implementation of Basel 3 and IFRS 9 with focus placed on the sample of 36 commercial banks in Taiwan. The analysis serves to contribute new implications for both accounting and banking supervisory authorities and standards.

The commercial bank acts as a crucial intermediary that redistributes financial resources in the global economy in addition to transferring non-systematic risk, accelerating market liquidity creation, and improving information transparency. Furthermore, efficiency achieved by the commercial bank in the financial system also plays an important role in economic growth and macroeconomic stability. As marked by Caprio and Klingebiel (1996), the insolvency problem inherent in the banking sector may lead to a systemic crisis in global financial markets. Brissimis, Delis and Papanikolaou (2008) also stress that economies organized with a well-functioning banking sector have higher ability against adverse shocks and promote stability on the financial system.

Moreover, as the degree of openness of the international financial system tends to become higher, advances in risk management technology, financial liberalization, financial instrument innovation become more rapid. The continual growth in more complex financial instruments and rising demand for more efficient risk management tools have forced both national and international regulatory authorities to revise and propose more accurate and practice-aligned accounting standards to meet challenges from dynamically changing economic and business scenarios. With a growing size of risk-sensitive investment portfolios held by financial institutions, these standards substantially highlight the importance of fair value accounting for regulatory purposes. As Hodder, Kohlbeck and McAnally (2002) point out, the need for accounting alternatives implies an critical trade-off. Additionally, measurement at the fair value creates uncertain volatility into regulatory capital for financial institutions, which might also devote regulatory intervention in excess. Dewatripont and Tirole (1994) argue that capital adequacy requirements based on the fair value might reduce incentives to take risks premium. This thesis empirically investigates risk-based capital and liquidity measures in light of financial asset reclassification behavior for commercial banks in Taiwan with special attention paid to international standards both in banking (Basel 3) and in accounting (IFRS 9).

The research framework for this study is presented in Figure 1-1 below. With a general preview of the research background, motive, and purpose, the study begins with an extensive literature review of existing studies that have examined the impact of fair value accounting on reclassification decision and accounting manipulation under capital regulation. Then the methodology including data, variables, models, and hypotheses is proposed before further empirical analysis.

**Figure 1-1 Research Framework**




The remainder of this study is organized as follows. Section 2 reviews relevant regulations in accounting and banking standards and key studies in accounting reclassification decision and manipulation. Section 3 presents data and associated models and hypotheses. Section 4 discusses major empirical findings and summarizes key implications for supervisory authorities. Section 5 concludes with suggestions for associated research in the future.

# 2. REGULATIONS AND LITERATURE REVIEW

This section presents major changes in accounting and banking regulations over the past decades and reviews major relevant studies in literature. First, the study provides a brief review of the accounting standards on financial instrument from IAS 39 to IFRS 9 and of international regulatory framework for the banking system from Basel 1 to Basel 3. Second, we turn to the empirical literature review on two strands: the association between risk-taking behavior and reclassification of financial assets on one hand and funding liquidity in the financial sector on the other. Finally, the testing hypotheses are developed and explained.

## 2.1 ACCOUNTING STANDARDS: FROM IAS 39 TO IFRS 9

After more than six years of efforts, the International Accounting Standards Board (IASB) officially released the final version of the International Financial Reporting Standard 9 (IFRS 9), "Financial Instruments in July 2014 as mandatory from January 1, 2018". This brings together the classification, measurement, impairment, and hedge accounting topics for complete substitution of the accounting treatment under the International Accounting Standards 39 (IAS 39), "Financial Instruments: Recognition and Measurement" adopted in April 2001. In response to the global financial crisis, the standard revision was launched in 2008, being the first accounting standard in the financial sector that requires alignment and convergence with risk management frameworks. Many users of financial reports and other stakeholders believe that the treatments of the IAS 39 are too obscure to understand, practice, and interpret. They have consistently requested the IASB to simplify accounting treatment for financial instruments and enhance the transparency of financial statements in order to improve its usefulness for decision makers. The IASB has responded by developing the new and less-complicated IFRS 9 in accounting practices for financial instruments.

The IFRS 9 essentially covers three major issues: the classification and measurement of financial assets and liabilities, impairment method, and hedge accounting. The classification of financial assets under IFRS 9 is no longer based on the intention and ability for holding the asset as specified in IAS 39 that applies a rules-based approach to determining classification methods.

Table 2-1 summarizes asset classification under the IAS 39. As the intention and ability is to hold debt instruments to maturity, these instruments can be classified into Held-to-Maturity (HTM). If the holder intends to transaction debt or equity instruments in the short term for trading purposes, these instruments should be classified into Fair Value through Profit or Loss (FVTPL). Instruments classified into neither HTM or FVTPL must be classified as Available-for-Sale (AFS).

**Table 2-1 Classification under IAS 39**

| **Financial instrument** | | | **Measurement** | **Recognition of Changes in Fair Value** | **Disposal of Profit or Loss (P&L)** |
|---|---|---|---|---|---|
| **Equity** | Significant Influence | Investment Affiliate | Equity Method | N/A | Net Income |
| | Non-Significant Influence | FVTPL | Fair Value | Net Income | N/A |
| | | AFS | | Other Comprehensive Income | Recycle through P&L |
| **Debt** | FVTPL | | Fair Value | Net Income | N/A |
| | AFS | | | Other Comprehensive Income | Recycle through P&L |
| | HTM | | Amortized Cost | N/A | Net Income |

Note. FVTPL stands for Fair Value through Profit of Loss; AFS stands for Available-for-Sale; HTM stands for Held-to-Maturity; P&L stands for Profit or Loss.

In order to reduce the complexity of accounting judgments and make users more aware of the implication of financial assets in reports, the IFRS 9 embraces principle-based approaches and is driven by two principles: “entity’s business model” and “contractual cash flow characteristics” to determine the classification of financial assets. This contrasts with the mere assertion under IAS 39. More specifically, while the IAS 39 focuses on how the entity intends to realize individual assets in classifying financial assets, the IFRS 9 focuses on the business model or models that the entity uses to realize them.

The entity’s business model adopted as the first of the two testing principals by the IFRS 9 is determined at a level that reflects how groups of financial assets or portfolio are managed together to achieve a particular business objective in order to generate cash flows in the future. The IFRS 9 employs the term in relation to how asset groups or portfolios are managed and the extent to which cash flows will result from collecting contractual cash flows, selling financial assets, or both. Based on objectives of the business model, IFRS 9 classifies each asset group or portfolio as being held to collect, held to collect and to sell, or other. If a business model whose objective is to hold the financial asset to collect contractual cash flows, the asset is identified as held to collect. On the other hand, the asset for a business model by which assets are managed to realize a specific objective by both collecting contractual cash flows and selling financial assets is identified as held to collect and to sell.

If debt instruments are not managed under either of these two models, they should be measured by fair value through profit or loss. Basically, the “business model test” is relevant only for debt instruments such as receivables, loans, and other debt securities. Accordingly, the forward-looking assessment does not rely on the asset manager’s intentions for individual financial instruments but is based on an upper level of aggregation.

The “contractual cash flow characteristics test” is the second of the two testing principals by the IFRS 9. For the test to be qualified, the contractual terms of the financial asset must give rise on specified dates to cash flows that are solely payments of principal and interest (SPPI) on the principal amount outstanding. This is consistent with the basic loan agreement where the interest is only reflected by the time value, credit risk, and other lending risks combined with the cost and profit margin. The objective of the SPPI test is to determine whether an arrangement pays only interest and principal, as defined, not to quantify their respective amounts. It is only possible to classify a financial asset into Amortized Cost (AC) or Fair Value through Other Comprehensive Income (FVTOCI) where the test is qualified. The IFRS 9 recommends applying the business model test before applying the SPPI test since this may eliminate the need to apply the more detailed SPPI test. However, the ordering of the tests will not change the classification outcome. Table 2-2 below summarizes asset classification under the IFRS 9.

**Table 2-2 Classification under IFRS 9**

| **Financial instrument** | | | **Measurement** | **Recognition of Changes in Fair Value** | **Disposal of Profit or Loss (P&L)** |
|---|---|---|---|---|---|
| **Equity** | Significant Influence | Investment Affiliate | Equity Method | N/A | Net Income |
| | Non-Significant Influence | FVTPL | Fair Value | Net Income | N/A |
| | | FVTOCI | | Other Comprehensive Income | Recycle through RE |
| **Debt** | FVTPL | | Fair Value | Net Income | N/A |
| | FVTOCI | | | Other Comprehensive Income | Recycle through P&L |
| | AC | | Amortized Cost | N/A | Net Income |

Note. FVTPL stands for Fair Value through Profit of Loss; FVTOCI stands for Fair Value through Other Comprehensive Income; AC stands Amortized Cost; RE stands for Retained Earnings; P&L stands for Profit or Loss.

Global financial stability has been shocked by the financial crisis in 2008. The disclosure of financial instruments in the financial statements appears controversial. In particular, the IAS 39 assesses the impairment of financial assets by the “Incurred Loss Model” that makes firms not fully prepared to deal with substantial losses only when the event is identified. Investors doubt why numerous financial institutions suddenly recognize huge loss from financial instruments and believe that, under the IAS 39, there may be suspect about delayed loss recognition since there are multiple channels to measure losses, which are more complicated and puzzling to understand, apply, and interpret. As a result, the IFRS 9 has introduced a forward-looking “expected credit loss model”, which recognizes credit loss before actual event occurs to replace the current “incurred loss model” in response to the key concern that have emerged over the financial crisis.

The expected credit loss model is applicable to debt instrument classified into FVTOCI and AC in addition to the revenue from contracts with customers such as receivables from insurers and reinsurance receivables and payments in IFRS 15. Under this forward-looking model, expected credit losses would be recognized from the original point where financial instruments are acquired. With limited exceptions, a 12-month expected credit loss must be recognized initially for debt instruments subject to impairment. Based on the credit quality since initial recognition, the model requires to evaluate whether there is a significant increase in credit risk at each reporting date, that is, by comparing the relative default probability between the two date rather than on the absolute balance-sheet date.

## 2.2 BANKING SUPERVISION: FROM BASEL 1 TO BASEL 3

Since the financial crisis in 2008, numerous financial institutions have suffered from huge loss. In particular, it has caused bankruptcy or takeover in many large-scale financial institutions such as Bear Sterns, Fannie Mae, Freddie Mac, Merrill Lynch, and Lehman Brothers. It has hit the whole financial system and real economy in countries around the world. In response, the G20 Summit was held in Washington in November 2008 and emphasized that reforms would be undertaken in order to stabilize the financial system. The Basel Committee on Banking Supervision (BCBS) of the Bank for International Settlements (BIS) hence proposed Basel 3 that served to reform Base 2 and aimed to reinforce the soundness of the financial sector, increase the resilience to economic recession, and reduce spillover effects from the financial sector to the real economy over the crisis. Overall, Basel 3 aims to strengthen the regulation, supervision, and risk management of the whole financial sector.

The history of Basel Accord proposed by the BCBS can be traced back to the 1980s. At that time, a wide variety of financial innovations have emerged across international financial markets and many advanced countries have gradually engaged in financial globalization and liberalization. Meanwhile, financial innovations and liberalization induce higher volatility in financial markets. Central banks in advanced countries however set relatively low requirements for statutory bank capital and hence ignored potential risk factors in financial instruments. This has exposed most financial intermediaries including commercial banks to significant risks associated with more complex financial instruments. To strengthen stability of the financial system and to reduce unfair competition due to differences in capital requirements across countries, the BCBS formulated the bank supervision principles that mainly regulated credit risk with specific capital ratios applied to commercial banks. In 1988, the Basel Capital Accord (Basel 1) was released and fully implemented at the end of 1992. This accord required international member banks to comply with the minimum requirement that the capital adequacy ratio (CAR), defined as the bank's own capital to credit-risk-weighted assets (RWAs) and aimed to serve as a buffer against bank insolvency, cannot be lower than 8%. Basel 1 primarily contributes three critical advances. First, it introduced risk weights, that is, identified that not all asset positions have identical risk. Second, it originated capital requirements on off-balance sheets activities forcibly. Third, it synchronized capital requirements across countries to improve consistency.

Since the implementation of Basel 1, there have been a wave of integration of the global banking industry through mergers and acquisitions, which had reduced the number of banks and increased the degree of concentration in the banking sector. Moreover, major international banks or financial groups began to extend to more complicated and risk-taking businesses and create diverse structured financial instruments. As financial markets and institutions have been closely linked with each other on a global scale, a domino effect may be boosted when a single major bank faces insolvency and failure. In 1996, Basel 1 added the market risk in the framework of the bank's RWAs beyond the credit risk with a view to reflecting great changes in the global financial industry.

In the early 2000s, the CAR defined by the BIS using one-size-fits-all risk-weighted measurement is no longer a suitable indicator for soundness in the banking system. The BCBS released the revised version, Basel 2, in 2004, which intended to align the minimum capital requirement with the underlying risks and concentrated on the denominator of the CAR. More specifically, the Basel 2 encompasses the basis of three pillars for the minimum capital requirements, supervisory review process, and market discipline. It aims to promote a more comprehensive set of indicators for global financial supervision in the banking system. The first pillar, the minimum capital requirements, entails banks to hold a minimum regulatory capital against risky assets held by banks. By raising bank capital and putting own wealth of bank shareholders into risk, the first pillar moderates risk-taking incentives. The risks included in the denominator of the CAR are now comprised of the credit risk, market risk, and operational risk. The second pillar, supervisory review, makes supervisors available to review internal assessments policy in the banking sector with their discretion and to impose more strict capital requirements. The third pillar, market discipline, requires transparent reporting to make capital markets act as a supplementary force to discipline bank behavior. Basel 2 may well avoid the problem of a single financial institution. However, the subprime mortgage crisis occurred in 2007 has proved its limits as to effectively reduce risk-taking behavior of the whole financial system. Afterwards, the Dodd–Frank Wall Street Reform and Consumer Protection Act enacted on July 21, 2010 prohibits credit ratings in regulations practice, which made it unworkable to fulfil Basel 2 completely.

The 2008 financial crisis disclosed significant shortcoming from Basel 1 and Basel 2. Both of them failed to enhance adequate incentives to reserve sufficient capital for banks. The Basel 3 that further revises Basel 2 is hence proposed to strengthen financial sector regulations and promote more transparent disclosure through raising both the level and the quality of capital, enhancing risk capture, constraining leverage, improving liquidity, and limiting procyclicality.

To raise both the level and the quality of capital, the banking institutions are now required to maintain more higher quality capital to cover and absorb unexpected losses. The bank has to rearranging the structure of regulatory capital and increase risk coverage by adding requirements for counterparty credit risk exposures. Even though Basel 3 keeps the minimum CAR unchanged at 8%, the minimum Tier-1 capital ratio is now increased from 4% in Basel 2 to 6% in Basel 3 while the capital must be of the highest quality for at least three quarters. The Basel 3 also adds a minimum ratio for Common Equity Tier-1 (CET1) at 4.5% to make sure that banks hold adequate loss-absorbing capital. Besides, global systemically important banks (G-SIBs) and their banking subsidiaries are subject to additional capital requirements from 1% to 3.5%.

To enhance risk capture, the capital requirements for market risk are calculated on the basis of 12-month market stress and cover credit valuation adjustment risk. In 2017, revisions to the standardized approaches for calculating credit risk, market risk, credit valuation adjustment, and operational risk are also suggested to better accommodate sensitivity and comparability in bank risks. Finally, Basel 3 constrains an output floor that limits benefits derived from applying internal models to calculate minimum capital requirements and hence limits regulatory arbitrage, a common practice having been perceived across international banks.

To constrain leverage and avoid the modeling risk and measurement error, a non-risk-based leverage ratio based on Tier-1 capital over on- and off-balance sheet assets is complemented with a minimum of 3%. In 2017 revisions to Basel 3, G-SIBs are subject to higher leverage ratio requirements. These measures serve to minimize the bank's risk-taking behavior that could increase the probability of insolvency.

To improve liquidity, Basel 3 progresses beyond capital regulations and proposes two liquidity requirements. The first is the liquidity coverage ratio (LCR) on short-term resilience that requires banks to hold sufficient high-quality liquid assets to survive over a 30-day horizon during times of stress scenario. The second is the net stable funding ratio (NSFR) on long-term resilience that requires banks to maintain a sufficient level of available stable funding (ASF) in order to cover their required stable funding (RSF) over a one-year period and better match the duration of on-and-off-balance-sheet assets and liabilities.

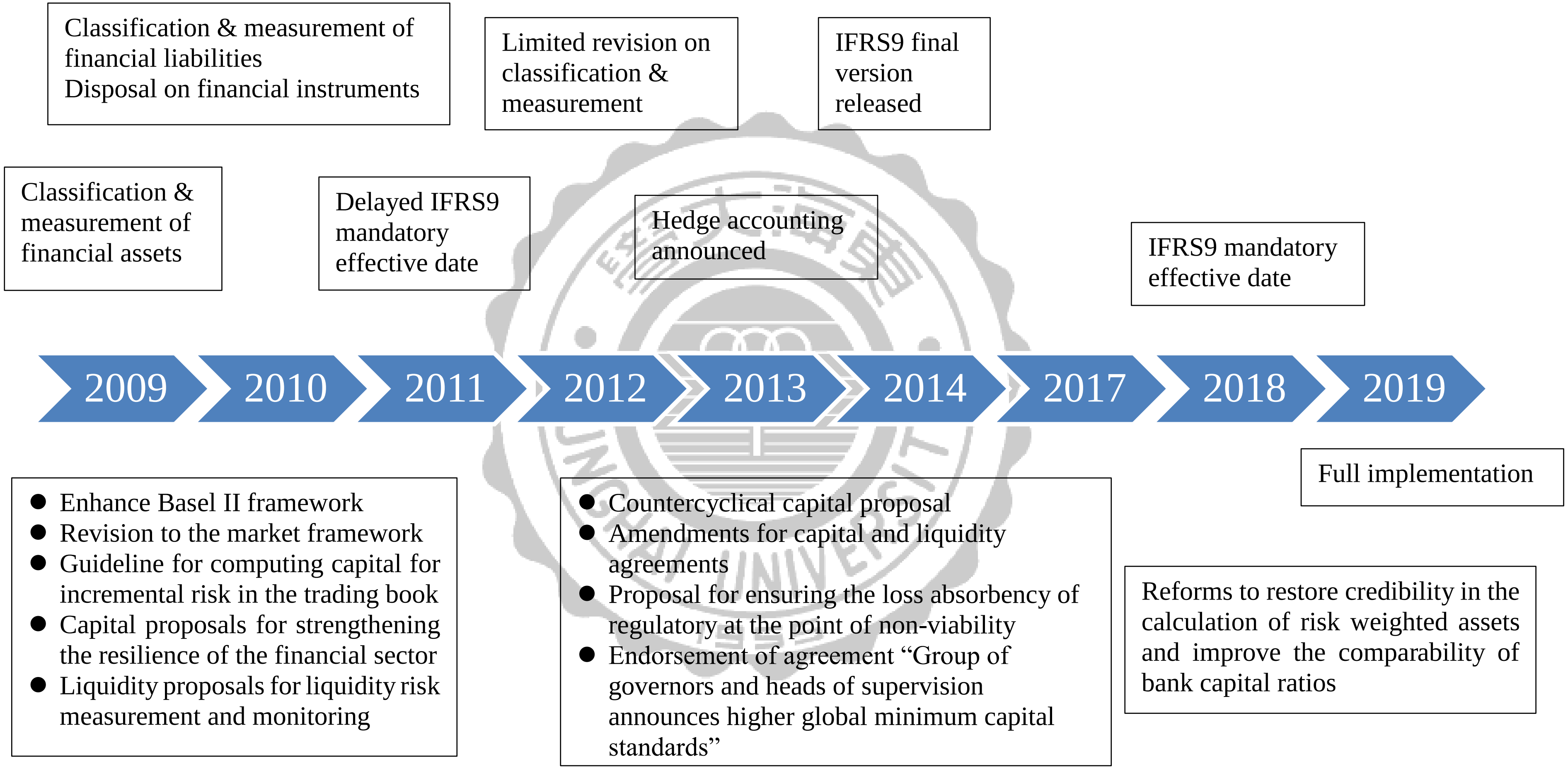
To limit procyclicality, Basel 3 introduces a capital conservation buffer with an additional 2.5% for CET1 against total exposures. This buffer is to be fully phased as of 2019 and aims to reduce procyclicality and withstand against future stress. In order to reduce systemic risk due to excessive expansion on credit, regulators can impose a counter-cyclical capital buffer accumulated during economic boom and consumed over an economic downturn. Table 2-3 below recapitulates phase-in arrangements for Basel 3 over the period between 2013 and 2019, whereas Figure 2-1 compares the timeline for IFRS 9 and Basel 3.

**Table 2-3 Basel 3 Phase-In Arrangements**

| Phases as of 1 January in Each Year | | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 |
|---|---|---|---|---|---|---|---|---|
| **Capital** | Leverage ratio | Parallel run 2013 – 2017; Disclosure starts 2015 | | | | | Migration to Pillar 1 | |
| | Minimum common equity capital ratio | 3.5% | 4.0% | 4.5% | | | | 4.5% |
| | Capital conservation buffer | | | | 0.625% | 1.25% | 1.875% | 2.5% |
| | Minimum common equity plus capital conservation buffer | 3.5% | 4.0% | 4.5% | 5.125% | 5.75% | 6.375% | 7.0% |
| | Phase-in of deductions from CET1* | | 20% | 40% | 60% | 80% | 100% | 100% |
| | Minimum Tier 1 capital | 4.5% | 5.5% | 6.0% | | | | 6.0% |
| | Minimum total capital | | 8.0% | | | | | 8.0% |
| | Minimum total capital plus conservation buffer | | 8.0% | | 8.625% | 9.25% | 9.875% | 10.5% |
| | Capital instruments that no longer qualify as non-core Tier-1 capital or Tier-2 capital | | Phased out over 10 year horizon beginning 2013 | | | | | |
| **Liquidity** | Liquidity coverage ratio – minimum requirement | | | 60% | 70.0% | 80% | 90% | 100% |
| | Net stable funding ratio | | | Introduce minimum standard in 2018 | | | | 100% |

Source: Bank for International Settlements. Note: * includes amounts exceeding the limit for deferred tax assets (DTAs), mortgage servicing rights (MSRs) and financials.

**Figure 2-1 Timeline of IFRS 9 and Basel 3**



## 2.3 LITERATURE REVIEW

This study examines bank capital and liquidity following implementation of Basel 3 and IFRS 9. A core concept concerns the risk, first proposed by Haynes (1895) who defined risk as "the possibility of loss". Williams and Heins (1964) argue that risk is the difference between expected and actual results. The greater the difference, the greater the risk. The risk is composed of risk factors, risk accidents, and risk loss. Risk factors are the reasons and conditions for causing or increasing the chance of a risk accident or expanding the loss. The more conditions that constitute the risk factor, the greater the probability of loss, and the more serious the loss will be. As of Basel 2, the credit risk, market risk, and operational risk constitute the core for risk management in the global banking sector. In Basel 3, liquidity risk is added into the supervisory framework.

In 1993, the Financial Accounting Standards Board (FASB) issued Statements of Financial Accounting Standards No.115 (SFAS No.115): Accounting for Certain Investments in Debt and Equity Securities. It regulates the accounting treatment of financial instrument classifications and encouraged the financial sector in the US to deviate from portfolio and risk benchmarks when they adopt the standard. After the implementation of SFAS No. 115, there has been significant impact on the accounting treatment. Most financial instruments must be evaluated at fair value, which increases the numerical volatility of financial statements. Moreover, with more restrictions on the reclassification into Held-to-Maturity (HTM), it limited the self-determination by the firm to manage capital turnover, hence making the firm to face high liquidity risk. To understand how the management makes decisions to achieve a desired earnings level on classifications, scholars started to study the impact of decisions on financial instrument classifications and earnings manipulation. They observe that some firms often use characteristics of classification on financial instruments to avoid business risks. Or alternatively, they engage in selectively selling securities with the realized gains and losses affecting income for earnings management. Wampler and Phillips (1994) pointed out that the classification of financial instruments into Available-for Sale (AFS) would increase opportunities for engaging in earnings management.

Beatty (1995) reports systematic differences in investment behavior of bank holding companies (BHCs) between earlier and later adopters of the SFAS No. 115 and provides evidence that earlier adoption aimed to increase reported capital. Beatty (1995) also reports that BHCs reduced their level of securities holdings and shortened the average maturity of their securities portfolios in the quarter of adoption. Beatty

(1995) separately examines whether the AFS portfolio size is significantly related to reducing capital volatility, maintaining liquidity and interest-rate risk flexibility, and influencing reported earnings. But the author fails to find the relevance with the level of regulatory capital. Beatty, Chamberlain and Magliolo (1995) further find that the stock prices for banks and insurance companies reacted negatively to several SFAS No. 115 standard-setting events but they did not directly consider whether increased regulatory risk encouraged firms to act strategically.

Ivancevich, Cocco and Ivancevich (1996) observe that there is significant impact on the earnings per share, debt-to-equity ratio, and current ratio when classifying the same portfolio of securities in different categories of financial instruments. Thus, firms can influence the user's judgment by classifying financial instruments into different categories.

Jordan, Clark and Smith (1998) provide empirical evidence that firms keep exhibiting earnings management behavior under the SFAS No. 115 which allows unrealized holding gains and losses on AFS. In the insurance industry, firms tend to bypass income and directly flow to shareholder equity, creating opportunities for gains trading and earnings management. The authors use the ratio of the realized gains and losses to the ending amount for AFS and the ratio of realized and unrealized holding gains and losses as a dependent variable to measure the firm's behavior engaged in "gains trading".

Godwin, Petroni and Wahlen (1998) study implementation decisions on SFAS No.115 in property-liability insurance companies and document that insurance companies weigh liquidity and volatility risks when applying the new standard. They also find that reclassification decisions are primarily driven by volatility risk in the insurance companies. Lee, Petroni and Shen (2006) also found that firms perform earnings management through the point of sale of AFS.

Hodder et al. (2002) provides evidence that regulatory requirement affects the accounting choices and risk-management decisions with a sample containing 230 listed BHCs. Following the implementation of SFAS No.115, the BHCs choose to reclassify a lower proportion to AFS for reducing the impact of unrealized gains and losses on volatility of the regulatory capital. This also serves to decrease the risk of being regulated.

Lifschutz (2002) show that implementation of SFAS No.115 leads to a relation between classification of financial instruments and earnings management with a sample of 88 BHCs over the years 1997-2000 on a quarterly basis. They conclude that the bank management's motivation to manipulate earnings by realizing securities gains and losses is negatively related to earnings before realized gains and losses. It implies that the bank with poor profitability probably conduct "gains trading" by financial instrument reclassification to increase earnings.

The literature on the SFAS No.115 overall substantiates that firms tend to make appropriate trade-offs between earnings volatility and liquidity risk by managing financial instruments in terms of the classification, projects, ratios, and holding periods. This hence gives rationales for the IAS 39 and IFRS 9.

Under the IAS 39, earlier possibilities to reclassify financial instruments were very limited since it only permits reclassification from HTM to AFS. With the Amendment for the IAS 39, the possibilities increased with three channels. First, the asset can be reclassified from HFT to AFS if the asset is no longer held for selling or repurchasing it in the near term. Second, the asset can be reclassified from HFT to L&R and HTM if the entity has the intention and ability to hold the financial asset for the foreseeable future or until maturity. Third, the asset can be reclassified from AFS to L&R if the entity has the intention and ability to hold the financial asset for the foreseeable future or until maturity. Table 2-4 summarizes changes in the asset reclassification from the IAS 39 to the IAS 39 Amendment.

**Table 2-4 The IAS 39 Amendment**

| **From** | | **To** | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | **IAS 39** | | | | | **IAS 39 Amendment** | | | | |
| | | FVTPL | AFS | | HTM | L&R | FVTPL | AFS | | HTM | L&R |
| | | | Debt | Equity | | | | Debt | Equity | | |
| FVTPL | Debt | | | | | | | | | | |
| | Equity | | | | | | | | | | |
| AFS | Debt | | | | V | | V | | | V | |
| | Equity | | | | | | V | | | | |
| HTM | | | V | | | | V | V | | | |
| L&R | | | V | | | | V | V | | | |

Note. FVTPL stands for Fair Value through Profit of Loss; AFS stands for Available-for-Sale; HTM stands for Held-to-Maturity; L&R stands for Loans and Receivables.

Kholmy and Ernstberger (2010) examine 101 banks in 15 European countries and study influencing factors and economic consequences of the reclassification by banks. They found that banks with lower profitability and share price performance, larger asset size, or fewer analyst coverage before reclassification tend to reclassify financial assets. They also demonstrate that reclassifying banks exhibit significantly increased information asymmetries after reclassification, presumably because such banks stop providing fair value information and adopt the option of accounting methods to avoid the risk of renewing the impairment in the future.

Fiechter (2011) exploit a descriptive study by observing changes in financial indicators before and after the reclassification of 219 banks adopting IFRS in Europe. They evidence that about one-third of the banks in their samples engage in reclassification, which account for about 3.9% of total assets or 131% of the book value of equity. Most of the sample banks with reclassification choose to reclassify fair value evaluation items into cost or amortization evaluation items so that they significantly improve their return on assets, return on equity, and capital adequacy. In particular, the behavior leads to a strong impact on return on equity that has turn positive from being originally negative.

Paananen, Renders and Shima (2012) attempt to understand the determinants of the accounting choice of reclassification by using a worldwide sample of 129 banks. They start from the hypothesis that reclassification could allow capital management through a logit regression. They find reclassification is related to the level of exposure to fair value measurement and observe that reclassification results in the increase in the investor's reliance on reported profit after the reclassification.

Generally, the banking sector serves the core function of capital circulation, which issues long-term loans financed by a mixture of deposits from the public and equity from shareholders of banks. Thus, the liquidity among the banks must be sufficient and then meet clients' needs instantly. The liquid assets held by banks must achieve high quality and be able to avoid capital runs. Liquidity creation is one of the main existing functions of the banking sector. Banks hold high-liquidity liabilities such as transactional deposits on the balance sheet and generate liquidity by financing relatively illiquid assets such as business loans while allowing depositors to withdraw funds at par value at any time. The banking system is said to create liquidity since it is the bank that reserves the illiquid claim against the borrowers while the depositors get off with a liquid claim against banks. Diamond and Dybvig (1983) argue that banks use their balance sheets for liquidity creation, which is executed through short-term liquid financial liabilities to create long-term illiquid financial assets. Then, the more liquid liabilities and illiquid assets held by banks, the stronger the sound effects of liquidity creation. Additionally, they find that the effect of bank liquidity creation not only causes bank runs but initiates financial crises. While the liquidity created by the banking sector has the capability of driving economic growth, it also brings in liquidity risk, which may boost the insolvency probability.

Deep and Schaefer (2004) construct a liquidity transformation gap to measure the liquidity creation by sampling 200 large banks in the US from 1997 to 2001. The results suggest that most banks have liquidity creation gaps by about 20%. However, their model of the liquidity transformation gap is only measured by on-balance-sheet items without consideration of off-balance-sheet items of banks.

Furthermore, according to the minimum capital requirements in the first pillar of Basel 3, the bank's CAR must reach 8% or above. There is a correlation between capital and liquidity. The higher the CAR, the greater the capital cost of the bank, which will lead to a lack of liquidity, resulting in crowding-out effects against liquidity created by the bank.

Diamond and Rajan (2001) launch a theoretical model to explore how banks absorb deposits through depositors from households and then lend to firms to create liquidity. When the savers of the households intend to invest in the securities issued by the firms directly, there is a significant problem of information asymmetry that they are obliged to face since they need to collect costly information for supervising the firms' operations. As the banks have the information advantage of monitoring the operation of firms and directly invest in the firms by financing funds from public, they can assess the private information of the firms on behalf of the depositors and reduce information asymmetry so that savers are willing to deposit funds into the banks and receive a fixed income. However, banks may not supervise the responsibility of the firms completely and then derive the agency problem. Once banks have a slack in managing the problem, depositor can pressure the bank to perform its duties by exercising bank runs. Consequently, if banks hold a fragile capital structure with a high proportion of deposits, it can increase the willingness of savers to deposit and encourage absorption of deposits to create a liquidity for the macroeconomy. Conversely, banks with higher capital structure not only raise the possibility of agency problems but limit the willingness of savers to deposit, thereby reducing liquidity creation. Diamond et al. (2001) believe that financial fragility plays a key role in this process.

Until recently, comprehensive empirical analysis of liquidity creation has appeared rare. Prior large-scale empirical studies widely concentrated on total assets, total loans, or diverse kinds of lending to measure the output of the banking sector. Inspired by past theories, Berger and Bouwman (2009) initiate several measurements of liquidity creation. Berger et al. (2009) present that large banks with assets over one billion seize more than 80% liquidity over the banking sector in the US. Furthermore, they also provide evidence that banks create nearly half of liquidity off the balance sheet by loan commitment contracts. Generally, most banks create positive liquidity; however, some liquidity absorbers create negative liquidity.

Gorton and Winton (2017) argue that banks with high capital reduce liquidity creation through capital crowding-out effects. For investors, investors hold demand deposits redeemed at any time to cover against potential liquidity troubles. On the other hand, the redemption price of information-sensitive equity securities varies depending on the operating conditions of banks and liquidity within the stock market. Under the case of a single and undivided capital market, strengthened bank capital implies that funds are transferred from high-liquidity demand deposits to illiquidity bank capital, which moderates the degree of liquidity creation.

Giordana and Schumacher (2011) and Giordana and Schumacher (2013) focus on banks in Luxembourg and examine the two BIS liquidity ratios, LCR and NSFR. They study the relationship between the constituents of the two ratios and the Z-score with the generalized method of moments (GMM). The results indicate that only the composition factor of NSFR has a significant impact on Z-Score. They also find that the numerator of the NSFR, Available Stable Funding (ASF), exerts a significantly positive correlation with the Z-score. In contrast, the denominator of the NSFR, Required Stable Funding (RSF), shows a significantly negative effect on Z-score.

Hong, Huang and Wu (2014) conduct empirical analysis of commercial banks in the US with the discrete time hazard model and find that although the liquidity risk of the banking system is higher than that of individual banks, a higher NSFR can still significantly reduce the default intensity of individual banks.

## 2.4 HYPOTHESIS DEVELOPMENT

The core bank business resides in the conversion of financial liabilities from depositors into yield-earning assets to create the interest spread. Basically, financial assets and liabilities of banks are inherently maturity mismatch for the reason that the term of loan asset is generally longer than the deposit liability, which exposes banks to liquidity risk. In addition, lending assets can become non-performing loans, exposing banks to default risk. In other words, the bank's spread reflects the liquidity and risk premium on interest rates. Drehmann and Nikolaou (2013) document that liquidity risk is related to market liquidity negatively. In a booming economy with loose monetary policy, banks depend on relatively cost-less and abundant short-term wholesale funding to support long-term illiquid assets.

As pointed out in Bernanke (1983), bank liquidity creation is important for the macroeconomy. However, the venture of liquidity creation exposes banks to liquidity risk, which can be moderated by warehousing high-liquid assets to some extent. That is why liquidity requirements in Basel 3 mandates that banks maintain a minimum level of liquidity. Likewise, bank capital performs as a buffer against failure and insolvency. Conventional approaches to banking regulation, such as Dewatripont et al. (1994), highlight the positive aspects of capital adequacy requirements. Moreover, the tendency for banks to engage in higher risk activities is subject to greater capital requirement at risk due to limited liability.

Gorton et al. (2017) demonstrate that intensifying statutory capital forces banks to hold more position to provide less deposits in a steady-state condition, which reduces the bank's ability to create liquidity. Allen and Gale (2004) state that liquidity creation increases the bank's exposure to risk as its losses increase with the level of illiquid assets to meet the liquidity demands of clients. Repullo (2004) finds that capital allows the bank to absorb greater risk. Consequently, the higher the bank's capital ratio, the higher its liquidity creation.  Wagner (2007) theoretically models the relationship between the liquidity of bank assets and banking stability and finds that an increased liquidity of bank assets reduces banking stability during financial crises but not during normal periods.

In Diamond et al. (2001) and Gorton et al. (2017) who respectively examine the perspective of financial fragility and the capital crowding-out effect, it is concluded that banks having raised capital will reduce liquidity creation. Berger et al. (2009) integrate the two studies and propose the financial-fragility-crowding-out hypothesis, which states that an increase in bank capital will discourage liquidity creation. However, their risk-absorption hypothesis argues that a higher capital will enhance the bank's ability to create liquidity, which in turn expands the bank's exposures. Our study hence focuses on the hypothesis that bank regulatory capital will affect the liquidity risk, with an associated link with the bank's insolvency risk measured by the Z-score.

As reviewed in relevant studies by Diamond et al. (2001), Allen et al. (2004), Berger et al. (2009), and Gorton et al. (2017), it is perceived that the authors deliver contradictory and inconsistent expectations as to whether the enforcement of capital requirements will have effects on liquidity. Furthermore, according to the minimum capital requirements in the first pillar of Basel 3, the bank's CAR must reach 8% or above. There is a correlation between capital and liquidity so that banks with greater CAR can be anticipated to have a strong motivation to take more risk portfolio due to higher capital cost of the bank, which lead to a lack of liquidity and thus impair NSFR since more short-term money are sustained in the funding structure.

This study concentrates on the impact of bank regulatory capital enhanced by the Basel 3 reform on liquidity. As stated by the financial-fragility-crowding-out hypothesis, banks raising regulatory capital exhibit a negative effect on liquidity creation, further reducing liquidity risk. On the contrary, from the point of view on the risk-absorption hypothesis by Berger et al. (2009), which advocates that higher risk-absorption capital will expand the risk tolerance of banks and thus enhance their ability to create liquidity, the higher the liquidity creation, the greater the liquidity risk. Allen et al. (2004) argue that banks engaging in liquidity creation activities intensively bear higher liquidity risks and affect the bank's future operations. The more private banks have their own capital, the greater the risk tolerance of banks, the loss of their operations, and the ability of banks to create more liquidity for the economy. This study hypothesizes that the implementation of bank capital regulation in Basel 3 will affect liquidity creation, but its tendency is ambiguous. The analysis is conducted at both the static level and the dynamic level.

(1) Testing Hypothesis 1

H1. *Implementation of Basel 3 creates an impact on bank liquidity*.

H1a. *Basel 3 capital statically affects bank long-term liquidity*.

H1b. *Basel 3 capital dynamically affects bank long-term liquidity*.

H1c. *Basel 3 capital statically affects bank short-term liquidity*.

H1d. *Basel 3 capital dynamically affects bank short-term liquidity*.

Under capital requirements based on the fair value, banks change behavior in portfolio investment with an expectation of the higher possibility of intervention by regulatory authorities. The Basel 3 framework raises both the quantity and the quality of the bank regulatory capital. However, objectives between financial reporting and bank supervision are inconsistent since regulators use information from financial statement to calculate regulatory capital components. Past studies find that the bank's loan loss provisions are the crucial accrual item in financial statements for the banking sector and have a significant association with earnings and regulatory capital. Both regulators and accounting standard setters are interested in asset impairment but each pursue different objectives. The primary objective for bank supervisors consists in lowering the risk level carried by depositors and sustaining financial stability. On the other hand, the core objective for financial reporting is to offer useful information to unspecified users to support their decision-making.

To compute regulatory capital, bank regulators apply numerous items from accounting input. In general, the expected credit loss (ECL) approach under the IFRS 9 brings expected losses closer to the methodology by regulators. In particular, both of the ECL approach at the first stage and the regulatory expected loss are similar in a 12-month window. However, regulatory estimates of the probability of default (PD) and loss given default (LGD) depend on whether banks use the standardized approach (SA) or the internal ratings-based (IRB) approach for credit risk. These estimates are distinct from the ECL approach under the IFRS 9. Therefore, certain adjustments are necessary to keep the prudential part of the regulatory capital. Moreover, estimation of PD applies a point-in-time (PIT), through-the-cycle (TTC), or hybrid approach, which assesses short, long, and mixed horizons. The IASB clarifies that the TTC approach is inconsistent with the ECL approach under the IFRS 9 since it considers a wide range of economic outlooks rather than actual prospects at the reporting date, which leaves provisions unable to reflect the features of economics on financial instruments at the reporting date precisely.

Under the IAS 39, investment securities without trading purpose can be classified as HTM or AFS. Debt instruments may only be classified as HTM recognized at amortized cost in case that banks hold them until maturity with the positive intents and abilities. A characteristic of HTM is that disposals earlier than maturity are constrained to rare events. Besides, any unrealized fair value gains and losses on AFS are directly charged in other equity as a part of the OCI. However, bank regulators essentially use equity in accounting-based balance sheet to determine regulatory capital. The literature on the SFAS No. 115 adoption overall substantiates that firms tend to make appropriate investment strategy between volatility and liquidity by managing financial instruments in terms of the classification, projects, ratios and holding periods. This hence gives rationales for the IAS 39 and IFRS 9. Harris, Khan and Nissim (2018) find that the expected rate of credit losses is incrementally useful for predicting bank failures over the next year. After the IFRS 9 is put into practice, financial institutions would tend to recognize more credit impairment under the expected credit losses model. As a result, the bank's profitability in terms of the ROA and ROE falls, causing a decrease in the Z-score.

Across various types of asset reclassification, three are worth being deepened. First, the reclassification into FVTPL resulting in the fair value change through income directly increases the volatility of statutory capital and the variability of ROA, which in turn increases the uncertainty of future regulatory risk and reduces the bank's Z-score or equivalently raises its insolvency risk. Second, the reclassification into FVTOCI resulting in the fair value change through OCI directly also increases the volatility of statutory capital and the variability of ROA, which in turn also increases the uncertainty of future regulatory risk and reduces the bank's Z-score or equivalently raises its insolvency risk. Third, the reclassification into AC resulting in the fair value change does not increase the volatility of statutory capital and the variability of ROA, which in turn decreases the uncertainty of future regulatory risk and increases the bank's Z-score or equivalently lowers its insolvency risk. Based on the above analysis, we expect the implementation of IFRS 9 will affect CAR and liquidity defined by Basel 3, leading to the following two sets of hypotheses.

(2) Testing Hypothesis 2
H2. *Implementation of IFRS 9 creates an impact on CAR defined by Basel 3*.
H2a. *Asset reclassification by IFRS 9 statically affects CAR*.
H2b. *Asset reclassification by IFRS 9 dynamically affects CAR*.

(3) Testing Hypothesis 3
H3. *Implementation of IFRS 9 creates an impact on liquidity defined by Basel 3*.
H3a. *IFRS 9 implementation statically affects bank long-term liquidity*.
H3b. *IFRS 9 implementation dynamically affects bank long-term liquidity*.
H3c. *IFRS 9 implementation statically affects bank short-term liquidity*.
H3d. *IFRS 9 implementation dynamically affects bank short-term liquidity*.

# 3. DATA AND METHODOLOGY

In this section, the study first briefly describes the sample and source of data, with definition of variables to be included in subsequent investigation. The analysis then demonstrates the empirical methodology and associated regression equations.

## 3.1 DATA AND SAMPLE

This study empirically examines implementation of Basel 3 and IFRS 9 in Taiwan's Banking Industry and attempts to understand the relations between bank capital and liquidity. The research focus is placed on the sample of both listed and unlisted commercial banks in Taiwan. Data are obtained from the Market Observation Post System (MOPS) of the Taiwan Stock Exchange (TWSE) and the database of Taiwan Economic Journal (TEJ), which contains quarterly accounting and financial information filed to supervisory authorities that regulates the banking sector. Due to mandatory implementation of the IFRS 9 as of 2018, the sample extends over the period from 2013 to 2017 for calculating the Z-score to be explained later. The changes in the measurement categories from IAS 39 to IFRS 9 for each category of financial assets are disclosed in notes on the 2018 consolidated financial statements reported to the MOPS.

A summary list of sample banks is presented in Table 3-1. Excluding the state-owned Export-Import Bank of the Republic of China established to promote credits to exporters and importers over the supervision of the Ministry of Finance, the sample for our analysis consists of 36 public commercial banks, where 10 of them are listed on the Taiwan Stock Exchange. Of those remaining 26 unlisted commercial banks, 15 are subsidiary banks of financial holding companies (FHC) marked with an asterisk. After the implementation of the Financial Holding Company (FHC) Act in Taiwan as of 2001, FHCs have been successively established to create comprehensive operating efficiency across different types of financial institutions, strengthen the unified financial supervision against cross-industry operations, promote the robust development of financial markets, and protect public interests. For instance, in 2016, the Yuanta FHC acquired the entire equity of Ta Chong Commercial Bank with $56.55 billion new Taiwan dollars. The bank was delisted on March 22 of the same year and became a subsidiary bank of the Yuanta FHC. On January 1, 2018, Ta Chong Commercial Bank was merged into Yuanta Commercial Bank.

**Table 3-1 Bank Sample**

| Bank Name in English | Bank Name in Chinese | Ticker |
|---|---|---|
| **Panel (1): Listed Commercial Banks** | | |
| Chang Hwa Commercial Bank | 彰化商業銀行股份有限公司 | 2801 |
| King's Town Bank | 京城商業銀行股份有限公司 | 2809 |
| Taichung Commercial Bank | 台中商業銀行股份有限公司 | 2812 |
| Taiwan Business Bank | 臺灣中小企業銀行股份有限公司 | 2834 |
| Bank of Kaohsiung | 高雄銀行股份有限公司 | 2836 |
| Union Bank of Taiwan | 聯邦商業銀行股份有限公司 | 2838 |
| Far Eastern International Bank | 遠東國際商業銀行股份有限公司 | 2845 |
| EnTie Commercial Bank | 安泰商業銀行股份有限公司 | 2849 |
| O-Bank | 王道商業銀行股份有限公司 | 2897 |
| The Shanghai Commercial & Savings Bank | 上海商業儲蓄銀行股份有限公司 | 5876 |
| **Panel (2): Unlisted Commercial Banks** | | |
| Standard Chartered Bank (Taiwan) | 渣打國際商業銀行股份有限公司 | 2807 |
| KGI Bank* | 凱基商業銀行股份有限公司 | 2837 |
| Shin Kong Commercial Bank* | 臺灣新光商業銀行股份有限公司 | 2893 |
| Sunny Bank | 陽信商業銀行股份有限公司 | 2895 |
| Hwatai Bank | 華泰商業銀行股份有限公司 | 5827 |
| Cota Bank | 三信商業銀行股份有限公司 | 5830 |
| Cathay United Bank* | 國泰世華商業銀行股份有限公司 | 5835 |
| Taipei Fubon Commercial Bank* | 台北富邦商業銀行股份有限公司 | 5836 |
| Hua Nan Commercial Bank* | 華南商業銀行股份有限公司 | 5838 |
| CTBC Bank* | 中國信託商業銀行股份有限公司 | 5841 |
| Mega International Commercial Bank* | 兆豐國際商業銀行股份有限公司 | 5843 |
| First Commercial Bank* | 第一商業銀行股份有限公司 | 5844 |
| E.Sun Commercial Bank* | 玉山商業銀行股份有限公司 | 5847 |
| Taishin International Bank* | 台新國際商業銀行股份有限公司 | 5848 |
| Bank SinoPac* | 永豐商業銀行股份有限公司 | 5849 |
| Jih Sun International Bank* | 日盛國際商業銀行股份有限公司 | 5850 |
| Yuanta Commercial Bank* | 元大商業銀行股份有限公司 | 5852 |
| Taiwan Cooperative Bank* | 合作金庫商業銀行股份有限公司 | 5854 |
| Land Bank of Taiwan | 臺灣土地銀行股份有限公司 | 5857 |
| Bank of Taiwan* | 臺灣銀行股份有限公司 | 5858 |
| Bank of Panhsin | 板信商業銀行股份有限公司 | 5862 |
| Taipei Star Bank | 瑞興商業銀行股份有限公司 | 5863 |
| Citibank (Taiwan) | 花旗(台灣)商業銀行股份有限公司 | 5870 |
| HSBC Bank (Taiwan) | 匯豐(台灣)商業銀行股份有限公司 | 5872 |
| DBS Bank (Taiwan) | 星展(台灣)商業銀行股份有限公司 | 5875 |
| ANZ Bank (Taiwan) | 澳盛(台灣)商業銀行股份有限公司 | 5879 |

Note. The subsidiary bank of a financial holding company (FHC) is marked with an asterisk.

## 3.2 VARIABLES

The variables to be analyzed in this study essentially extend those proposed by Rivard and Thomas (1997), Demirgüç-Kunt and Huizinga (2000), Hassan and Bashir (2003), Iannotta, Nocera and Sironi (2007), and Berger et al. (2009). The variables are classified into six major categories.

(1) Bank-Capital Variables

The first category of variables includes four bank-capital variables defined by the BIS: the Capital Adequacy Ratio (CAR), Common Equity Tier-1 Ratio (CET1), Tier-1 Capital Ratio (CT1), and Leverage Ratio (LEV). The definition and unit of measurement for each bank-capital variable are summarized in Table 3-2.

**Table 3-2 Variable Description: Bank Capital**

| Variable Name and Full Term | | Definition | Unit |
|---|---|---|---|
| CAR | Capital Adequacy Ratio | Tier-1 and tier-2 capital over risk-weighted assets (RWAs) defined in Basel 3 by Bank for International Settlements (BIS) | Percentage |
| CET1 | Common Equity Tier-1 Ratio | BIS-defined common equity tier-1 capital over RWAs | Percentage |
| CT1 | Tier-1 Capital Ratio | Tier-1 capital over RWAs | Percentage |
| LEV | Leverage Ratio | Non-risk-based leverage ratio proposed by Basel 3; Tier-1 capital over consolidated assets and off-balance-sheet exposures | Percentage |

(2) Bank-Liquidity Variables

The second category of variables includes two liquidity variables defined by the BIS in Basel 3 to reduce bank liquidity problems that have emerged over the global financial crisis in 2008: the Liquidity Coverage Ratio (LCR) and the Net Stable Funding Ratio (NSFR). The definition and unit of measurement for each bank-liquidity variable are summarized in Table 3-3.

**Table 3-3 Variable Description: Bank Liquidity**

| Variable | Name and Full Term | Definition | Unit |
|---|---|---|---|
| LCR | Liquidity Coverage Ratio | Reserves of high-quality liquid assets over net cash outflows in a 30-day stressed funding scenario | Percentage |
| NSFR | Net Stable Funding Ratio | Ratio which relates the bank's available stable funding (ASF) to its required stable funding (RSF) over a long-term horizon | Percentage |

The LCR regulation by the BIS requires a bank to hold sufficient high-quality liquid assets to cover its total net cash outflows against a 30-day stressed funding scenario. This ratio is designed to ensure that banks hold a sufficient reserve of high-quality liquid assets (HQLA) to allow banks to survive a period of significant liquidity stress lasting 30 calendar days. The supervisory scenario capturing the period of stress combines elements of bank-specific liquidity and market-wide stress and includes many of the past shocks as those over 2007-2012.

In contrast to the LCR which mainly focuses on the bank's short-term liquidity management, the NSFR looks into the long term, covers the entire balance sheet, and provides incentives for banks to use stable sources of funding. The NSFR is designed to address liquidity mismatches and encouraging banks to better match the duration of their assets and liabilities. The NSFR is defined as the amount of available stable funding relative to the amount of required stable funding. It should be equal to at least 100% on an ongoing basis. The available stable funding (ASF) is defined as the portion of capital and liabilities expected to be reliable over the time horizon considered by the NSFR, which extends to one year. The required stable funding (RSF) is a function of the liquidity characteristics for each institution and residual maturities of various assets held by that institution as well as those of its off-balance sheet exposures. To determine total amounts of the ASF and RSF, factors reflecting supervisory assumptions are assigned to the bank's sources of funding and to its exposures, with these factors reflecting the liquidity characteristics of each category of the instruments held by the institution. More details for components included in calculation of the NSFR are presented in Appendix.

(3) Bank-Profitability Variables

The third category of variables includes four bank-profitability variables: the Return on Assets (ROA), Return on Equity (ROE) and Z-score (ZSR). The definition and unit of measurement for each bank-profitability variable are summarized in Table 3-4 below.

**Table 3-4 Variable Description: Bank Profitability**

| Variable | Name and Full Term | Definition | Unit |
|---|---|---|---|
| ROA | Return on Assets | Bank net income divided by average total assets | Percentage |
| ROE | Return on Equity | Bank net income divided by average total equity | Percentage |
| ZSC | Insolvency Risk in Z-score | Degree of bank solvency measured by implied distance to default; sum of ROA and capital-to-assets ratio over standard deviation of ROA | |

Bringing together consideration to portfolio and leverage risk, the study adopts the bank’s Z-score as the gauge for its insolvency risk. The Z-score is equal to the ROA plus the capital-to-assets ratio over the standard deviation of the ROA. As highlighted in Roy (1952), the Z-score represents the distance from insolvency, defined as a state in which losses surmount equity, or $E < -\pi$ where E stands for equity and $\pi$ stands for profit. The probability of insolvency, therefore, can be expressed as $Prob(-ROA < E/A)$ where ROA is the return on assets ($\pi/A$) and E/A is the capital-to-assets ratio. If profit is normally distributed, then the inverse of the probability of insolvency equals $(ROA + E/A)/\sigma(ROA)$, where $\sigma(ROA)$ stands for the standard deviation or equivalently the volatility of the ROA. Following the literature, we define the inverse of the probability of insolvency as the Z-score. A higher Z-score indicates that the bank is more stable and is therefore less likely to become insolvent since the degree of solvency measured by the implied distance to default appears higher.

(4) Credit-Management Variables

The fourth category of variables includes four credit-management variables: the Loan Loss Provisions (LLP), Non-Performing Loans (NPL), NPL Coverage (NPLC), and Net Interest Margin (NIM). The definition and unit of measurement for each credit-management variable are summarized in Table 3-5.

**Table 3-5 Variable Description: Credit Management**

| Variable | Name and Full Term | Definition | Unit |
|---|---|---|---|
| LLP | Loan Loss Provisions | Expenses recognized as allowance for bad loans based on statistics of defaults of the bank's borrowers | Thousand new Taiwan dollars |
| LLLP | | LLP in Logarithm | |
| NPL | Non-Performing Loans | Impaired loans over gross loans | Percentage |
| NPLC | NPL Coverage | Loan loss provisions divided by non-performing loans | Percentage |
| NIM | Net Interest Margin | Interest income minus interest expense over total assets | Percentage point |

(5) Bank-Character Variables

The fifth category of variables includes three bank-character variables: Subsidiary Bank of FHC (FHC), Exchange-Listed Bank (LSTD), and Business Diversification (DVSF). The definition and unit of measurement for each bank-character variable are summarized in Table 3-6

**Table 3-6 Variable Description: Bank Characters**

| Variable | Name and Full Term | Definition | Unit |
|---|---|---|---|
| FHC | Subsidiary Bank of FHC | Dummy variable with a value of 1 for a bank acting as the subsidiary bank of a financial holding company (FHC) and 0 otherwise | 0/1 Dummy |
| LSTD | Exchange-Listed Bank | Dummy variable with a value of 1 for a bank listed on the Taiwan Stock Exchange and 0 otherwise | 0/1 Dummy |
| DVSF | Business Diversification | Measure of the degree of diversification other than deposit and loan business, which equals the total net revenues and gains other than interest divided by the total net revenues | Percentage |

(6) Asset-Reclassification Dummy Variables

The final category of variables includes ten asset-reclassification dummy variables for the instruments held by the bank. These dummy variables can be regrouped in two classes: the Reclassification in Equity Instruments (RCE) on one hand and the Reclassification in Debt Instruments (RCD) on the other. The definition and unit of measurement for each asset-reclassification variable are summarized in Table 3-7 below.

The IFRS 9 excludes not only the AFS category but also the AFS impairment treatment. Financial assets are classified according to the business model and contractual cash flow characteristics. Essentially, if a financial asset is a common debt instrument such as the loan and receivable, it is measured at amortized cost since the objective of the business model is to hold and collect its contractual cash flows and such cash flows pass the solely payments of principal and interest (SPPI) test.

**Table 3-7 Variable Description: Asset Reclassification**

| **Variable Name and Full Term** | | **Definition** | **Unit** |
|---|---|---|---|
| RCE | Reclassification in Equity Instruments | 4 categories of reclassification marked by the sign "→" in equity instruments as follows<br><br>1. FVTPL→FVTOCI<br>2. AFS→FVTPL<br>3. Cost→FVTPL<br>4. Cost→FVTOCI | Dummy variable for each category |
| RCD | Reclassification in Debt Instruments | 6 categories of reclassification marked by the sign "→" in debt instruments as follows<br><br>1. FVTPL→FVTOCI<br>2. FVTPL→AC<br>3. AFS→FVTPL<br>4. AFS→AC<br>5. HTM→FVTPL<br>6. HTM→FVTOCI | Dummy variable for each category |

Note. FVTPL stands for Fair Value through Profit or Loss; FVTOCI stands for Fair Value through Other Comprehensive Income; AFS stands for Available-for-Sale; Cost stands for Financial Assets Carried at Cost; AC stands for Amortized Cost; HTM stands for Held-to-Maturity.

Under the IAS 39 incurred loss model, the bank is required to charge credit risk only when objective evidence of the impairment exists as of reporting date, which disallows the outcomes of future events happening after the reporting date whether they are available to expect or not. The results of the incurred loss model attribute to the impairments loss just recognized too late before default. In contrast, the forward-looking ECL impairment framework under the IFRS 9 broadens consideration of past, current, and forecast information for measurement of ECL significantly. More specifically, it requires the bank to recognize ECL whenever it is deemed necessary to renew the account of ECL to evaluate the fluctuation in credit risk of debt instrument at each reporting date periodically. It is hence a more consistent approach than its predecessor and will result in more timely recognition of credit losses. As a matter of fact, incurred impairment losses on debt instrument in illiquid markets based on the fair value have often led to reporting an impairment loss that exceeded the credit loss management expected. The IFRS 9 serves to minimize this problem. In addition, the unrealized gains and losses on AFS securities are excluded from Tier-1 regulatory capital and only 45% of these gains and losses are included in Tier-2 capital. Therefore, Basel 3 requires banks to hold enough quality assets to meet the requirement for the liquidity coverage ratio.

## 3.3 DESCRIPTIVE STATISTICS

Major descriptive statistics are presented in three tables. Table 3-8 reports those for the two asset-reclassification variables, whereas

Table 3-9 reports those for the five categories of bank variables discussion in 3.2. Finally, Table 3-10 reports those for the changes in the five categories of bank variables.

Table 3-8 provides the descriptive statistics for the two groups of dummy variables, RCE and RCD, which represent asset reclassification at the beginning of 2018. In terms of the frequency for RCE variables, 50.94% of the banks reclassify equity securities measured at cost to FVTOCI. One possible reason is that the IFRS 9 enforces that all equity securities are measured at fair value. Previous non-sale intention securities measured as cost are hence forced to be measured by fair value with irrevocable options.

In terms of the frequency for RCD variables, 30% of HTMs are reclassified to fair value measurement. Banks seem to prefer reclassify debt instruments measured by fair value such as FVTPL and FVTOCT to AC from the original measurement at fair value to amortized cost. It is also worth noting that debt instruments classified as AFS, a controversial category in the past literature, are reclassified to AC more than to FVTPL.

**Table 3-8 Descriptive Statistics for Reclassification Variables**

| **Dummy Variable** | **Frequency** | **Percent** | **Cumulative Percentage** |
|---|---|---|---|
| **Panel A: Reclassification in Equity Instruments (RCE)** | | | |
| **1. FVTPL→FVTOCI** | 4 | 7.55 | 7.55 |
| **2. AFS→FVTPL** | 16 | 30.19 | 37.74 |
| **3. Cost→FVTPL** | 6 | 11.32 | 49.06 |
| **4. Cost→FVTOCI** | 27 | 50.94 | 100.00 |
| **Panel B: Reclassification in Debt Instruments (RCD)** | | | |
| **1. FVTPL→FVTOCI** | 3 | 6.00 | 6.00 |
| **2. FVTPL→AC** | 4 | 8.00 | 14.00 |
| **3. AFS→FVTPL** | 13 | 26.00 | 40.00 |
| **4. AFS→AC** | 15 | 30.00 | 70.00 |
| **5. HTM→FVTPL** | 2 | 4.00 | 74.00 |
| **6. HTM→FVTOCI** | 13 | 26.00 | 100.00 |

Note. FVTPL stands for Fair Value through Profit or Loss; FVTOCI stands for Fair Value through Other Comprehensive Income; AFS stands for Available-for-Sale; Cost stands for Financial Assets Carried at Cost; AC stands for Financial Assets measured as Amortized Cost; HTM stands for Held-to-Maturity.

## Table 3-9 Descriptive Statistics for Bank Variables

| Variable | Mean | Median | Minimum | Maximum | Std. Dev. |
|---|---|---|---|---|---|
| (1) Bank Capital | | | | | |
| **CAR** | 14.2453 | 13.9250 | 11.0500 | 29.5800 | 2.8701 |
| **CET1** | 11.2142 | 10.5450 | 8.1400 | 28.6300 | 3.4594 |
| **CT1** | 12.0261 | 11.6300 | 8.5100 | 28.6300 | 3.1852 |
| **LEV** | 7.0542 | 6.6600 | 4.1200 | 15.3300 | 1.9394 |
| (2) Bank Liquidity | | | | | |
| **LCR** | 155.7372 | 131.5800 | 90.1800 | 371.7700 | 63.7162 |
| **NSFR** | 131.2486 | 131.6550 | 97.0700 | 161.6800 | 13.3147 |
| (3) Bank Profitability | | | | | |
| **ROA** | 0.5486 | 0.5750 | 0.0400 | 1.3800 | 0.2775 |
| **ROE** | 7.0783 | 7.7250 | 0.2100 | 11.2000 | 2.8894 |
| **ZSC** | 8.5329 | 7.1102 | 0.3892 | 20.2808 | 5.3501 |
| (4) Credit Management | | | | | |
| **LLP** | 11,074,207 | 6,328,953 | 352,449 | 39,387,484 | 10,472,166 |
| **LLLP** | 15.6795 | 15.6601 | 12.7727 | 17.4890 | 1.1724 |
| **NPL** | 0.3289 | 0.2450 | 0.0200 | 1.2400 | 0.2568 |
| **NPLC** | 1009.1525 | 550.1150 | 116.5800 | 9769.9199 | 1869.4509 |
| **NIM** | 1.0928 | 1.1300 | -0.2600 | 1.9500 | 0.3947 |
| (5) Bank Character | | | | | |
| **FHC** | 0.4167 | 0.0000 | 0.0000 | 1.0000 | 0.5000 |
| **LSTD** | 0.2778 | 0.0000 | 0.0000 | 1.0000 | 0.4543 |
| **DVSF** | 39.2423 | 35.4493 | 11.0001 | 133.4305 | 22.6312 |

Note. CAR/CET1/CT1/LEV/LCR/NSFR/ROA/ROE/NPL/NPLC/DVSF in percentage; LLP in thousand new Taiwan dollars; NIM in percentage point; FHC/LSTD as dummy 0 or 1.

## Table 3-10 Descriptive Statistics for Changes in Bank Variables

| Variable | Mean | Median | Minimum | Maximum | Std. Dev. |
|---|---|---|---|---|---|
| (1) Bank Capital | | | | | |
| **ΔCET1** | -0.2261 | -0.1700 | -6.0500 | 1.6500 | 1.1825 |
| **ΔCT1** | -0.0789 | 0.0650 | -6.0500 | 1.3400 | 1.1954 |
| **ΔCAR** | -0.2294 | -0.1350 | -6.1200 | 1.3100 | 1.2302 |
| **ΔLEV** | 0.0808 | 0.1600 | -2.8000 | 1.1400 | 0.6417 |
| (2) Bank Liquidity | | | | | |
| **ΔLCR** | -18.6915 | -2.3963 | -367.9800 | 104.4100 | 78.8871 |
| **ΔNSFR** | -0.5026 | -1.5000 | -7.9675 | 19.8361 | 6.6665 |
| (3) Bank Profitability | | | | | |
| **ΔROA** | 0.0028 | 0.0250 | -1.1400 | 0.8300 | 0.2539 |
| **ΔROE** | 0.2708 | 0.2100 | -8.1000 | 12.4600 | 2.7106 |
| (4) Credit Management | | | | | |
| **ΔLLP** | 708,727 | 380,427 | -692,222 | 6,345,622 | 1,244,934 |
| **ΔNPL** | -0.0275 | -0.0150 | -0.5600 | 0.3000 | 0.1421 |
| **ΔNPLC** | 298.4355 | 59.1600 | -497.0700 | 9188.4004 | 1538.9769 |
| **ΔNIM** | -0.0483 | -0.0200 | -0.6300 | 0.2300 | 0.1484 |
| (5) Bank Character | | | | | |
| **ΔDVSF** | 0.8760 | -0.5302 | -23.2444 | 51.0856 | 11.0695 |

Table 3-9 provides the descriptive statistics for bank variables that cover the full sample, which consists of 36 commercial banks in Taiwan's banking sector as of 2018. Additionally, Table 3-10 provides the descriptive statistics for dynamic changes in these variables between 2017 and 2018. The mean, median, minimum, maximum, and standard deviation (Std. Dev.) are presented for each variable of the first five categories of variables presented in 3.2.

In (1) Bank Capital, the mean ratio of CAR, CET1, CT1, and LEV is respectively 14.2453%, 11.2142%, 12.0261%, and 7.0542%. Moreover, all of their minimum values, which are 11.0500%, 8.1400%, 8.5100%, and 4.1200% for CAR, CET1, CT1, and LEV respectively, meet the minimum requirement by Basel 3 phase-in arrangements at the beginning of 2018 and 2019. In addition, the mean ratio of CET1 is twice the minimum requirement at the beginning of 2019. It is worth noting that the conservation buffer in 2018 is 1.875. Therefore, all of the sample banks are qualified in terms of CAR since the minimum total capital ratio 8% plus the conservation buffer is equal to 9.875% (8% + 1.875%). It is noted that since 2019 banks have to add the conservation buffer at 2.5%, implying a higher level for the CAR at 10.5%.

In (3) Bank Liquidity, LCR, the short-term liquidity indicator, ranges from a minimum of 90.18% to a maximum of 371.77%, while the NSFR, the long-term liquidity indicator, ranges from a minimum of 97.07% to a maximum of 161.68% across the 36 commercial banks in Taiwan, with a mean of 155.7372% for the LCR and 131.2486% for the NSFR. The minimum value of the short-term liquidity gauged by LCR is complied with the regulation by Basel 3 in 2018 but unqualified at the beginning of 2019. However, the minimum value of the long-term liquidity gauged by NSFR is unqualified for the regulation by Basel 3 both in 2018 and at the beginning of 2019, suggesting certain banks in the sample have not met the minimum requirement by Basel 3 and call for further actions.

In (4) Bank Profitability, the variables include ROA, ROE, and ZSC. The bank insolvency risk measured by ZSC ranges from a low of 0.3892 to a high of 20.2808 with the average at 8.5329 and the standard deviation at 5.3501, suggesting that there is a low divergence of default risk across the sample banks. The maximum, minimum, and mean are 1.3800, 0.0400, and 0.5486 for ROA and 11.2000, 0.2100, and 7.0783 for ROE. It can be perceived by the standard deviation that both ROA and ROE exhibit a concentration trend of profitability in Taiwan's commercial banks.

In (5) Credit Management, the variables in this category include LLP, NPL, and NPLC. LLP, the discretion account by bank management, ranges from a low of 352,449 to a high of 39,387,484 with the mean at 11,074,207 and the standard deviation at 10,472,166 in thousand new Taiwan dollars. The NPL, impaired loans over gross loans, ranges from a low of 0.0200% to a high of 1.2400% and averages at 0.3289% with a median of 0.2450%, which suggests that banks in Taiwan essentially manage the client's credit effectively over the sample period. On the other hand, the NPLC seem to be highly divergent among the banks in the sample, which averages at 1009.1525% but with the standard deviation at 1869.4509% and ranges between 116.5800% to 9769.9199%, suggesting that even though the credit management within banks is comparable, the NPLC is inconsistent with high divergence. Past literatures point out that such a possible cause is a discretionary accrual account from LLP for the purpose of earnings management by banks. At last, the NIM averages at 1.0928 with a lower standard deviation of 0.3947, implying a relatively narrow spread and hence greater challenges for traditional deposit-taking and loan-making business. In contrast, NIM ranges from a low of -0.2600 to a high of 1.9500 with a lower standard deviation of 0.3947 in comparison with that for ROA and ROE. It is worth noting that a negative NIM is present for certain banks which suffer losses in the core deposit business.

In (6) Bank Character, DVSF stands for the degree of operational diversification between the core business in deposits and loans and emerging business based on fee activities. The DVSF averages at 39.2423 with a median 35.4493, implying that about a half of bank net revenues originate from non-traditional business and hence demonstrating a certain level of diversification for Taiwan's commercial banks. The sample is made up of 10 listed and 26 unlisted commercial banks in which 15 are subsidiary banks of FHC.

Before proceeding to the regression analysis, we add one more set of dynamic variables on the basis of the variables previously presented. Table 3-10 shows that bank capital and liquidity have been declining except for non-risk-based LEV, suggesting that the regulations by Basel 3 and IFRS 9 may have adverse impacts on bank capital and liquidity. More specifically, changes in short-term liquidity within a half of banks sample suffer a shortfall by 18.6915% in average. However, a half of bank profitability in terms of ROA exhibit an opposite trend, with an average increase by 0.0028%. The performance on credit management is better than 2017 for the reason that NPL within 50% banks falls and NPLC better withstands against credit default shocks despite the decline in NIM from 2017 to 2018.

## 3.4 EMPIRICAL MODELS

The study examines bank regulatory capital and implementation of IFRS 9 with analysis of bank liquidity at both static and dynamic levels. We adopt the ordinary least squares (OLS) with static and dynamic models to analyze the linkages between bank capital, bank liquidity, bank profitability, credit management, bank characters, and implementation of the IFRS 9. The research specifically incorporates the effects of reclassification in instruments held by bank following implementation of the IFRS 9 and differentiates its direct or indirect impact on bank management.

To test Hypothesis (1) introduced in 2.4, we regress bank liquidity on bank independent variables with both static and dynamic models to analyze the linkages between bank capital, bank liquidity, bank profitability, credit management, and bank characters. The two models are represented by Equations (1) and (2).

$$Liquidity_i = a_0 + a_1BankCapital_i + a_3BankProfitability_i + a_4CreditManagement_i + a_5BankCharacter_i + e_i \quad (1)$$

$$\Delta Liquidity_i = a_0 + a_1\Delta BankCapital_i + a_3\Delta BankProfitability_i + a_4\Delta CreditManagement_i + a_5\Delta BankCharacter_i + e_i \quad (2)$$

Following the Basel 3 framework for liquidity assessment in the banking sector, the study applies the net stable funding ratio and liquidity coverage ratio as long-term and short-term liquidity measures respectively. The higher RSF over the ASF, the more illiquid position a bank holds. As mentioned above, a higher value of the liquidity indicator points out higher liquidity and hence lower liquidity risk. Bank capital is defined by the BIS and includes the CAR, CET1, CT1, and LEV as presented in our previous analysis.

To investigate Hypothesis (2), we examine how asset reclassification following implementation of IFRS 9 affects bank capital gauged by the CAR, at both static and dynamic levels. Equations (3) to (6) below are adopted and include major bank variables summarized from Table 3-2 to Table 3-7 and RCE and RCD presented in Table 3-8 respectively.

$$CAR_i = a_0 + a_3 BankProfitability_i + a_4 CreditManagement_i + a_5 BankCharacter_i + a_6 RCE_i + e_i \quad (3)$$

$$CAR_i = a_0 + a_3 BankProfitability + a_4 CreditManagement_i + a_5 BankCharacter_i + a_6 RCD_i + e_i \quad (4)$$

$$\Delta CAR_i = a_0 + a_3 \Delta BankProfitability_i + a_4 \Delta CreditManagement_i + a_5 BankCharacter_i + a_6 RCE_i + e_i \quad (5)$$

$$\Delta CAR_i = a_0 + a_3 \Delta BankProfitability + a_4 \Delta CreditManagement_i + a_5 BankCharacter_i + a_6 RCD_i + e_i \quad (6)$$

According to the pecking order theory in finance, it is costly to raise additional capital and cost-less capital can be accumulated by internal finance. Berger (1995) finds a positive association between capital-to-asset ratio and ROE. Therefore, the study expects a positive correlation between bank long-term liquidity and profitability, which takes the ROA as a proxy of bank profitability. Bank profitability is the ability to create revenue beyond cost, concerning the bank's capital base. Bank profitability serves to make banks have more advantages in terms of income stability, which in turn leads to a fall in liquidity risk.

There have been many literatures suggesting the varying relationship between bank profitability and liquidity. Bourke (1989) documents a positive relationship between liquid ratios and profitability for banks in advanced countries. However, replicating the methodology by Bourke (1989), Molyneux and Thornton (1992) find evidence that profitability was negatively associated with liquidity across European banks between 1986 and 1989. Consequently, this study expects that the bank profitability is linked with bank capital and liquidity, but its relation is ambiguous.

Earlier literatures such as Lifschutz (2002), Beatty et al. (1995), Collins, Shackelford and Wahlen (1995) have demonstrated the existence of earnings management in banks through the bank manager's income-smoothing by discretionary LLP. Banks with below-average profits are more likely to use this option as it enables them to avoid further losses for that period. Accordingly, considering that bank credit management is relevant with liquidity, we take the NPLC and NIM as the proxy of credit management in all equations. It is noted that the expected sign for the association between credit management and bank capital is ambiguous. NPLC is defined as LLP divided by NPL. For the denominator of NPLC, the higher the NPL, the worse credit management, which impairs bank capital. For the numerator of NPLC, LLP is an allowance deduction for asset item held by banks as well as bank equity. However, overall, banks with greater NPLC have greater ability against default, which can be regarded as a default buffer against risky assets so that banks will be willing to bear higher liquidity risk. Finally, the study expects a positive effect of both FHC and LSTD given advantages in economies scales and economies of scope for larger listed banks.

Similar to Equations (3) to (6), Equation (7) to Equation (10) include major bank variables summarized from Table 3-2 to Table 3-7. The IFRS 9 released by the IASB covers actually classification, measurement, impairment, and hedge accounting to permit reclassification of non-derivative financial assets on the basis of the entity's business model and contractual cash flow characteristics. To examine Hypothesis (3) in 2.4, we include asset reclassification variable (RCE and RCD) presented in Table 3-8 respectively to test effects of implementation of IFRS 9 for financial instruments held by the bank on its liquidity defined by Basel 3. Similar to Equation (3) to Equation (6), Hypothesis (3) is tested at both static and dynamic levels.

$$Liquidity_i = a_0 + a_6 RCE_i + a_3 BankProfitability_i + a_4 CreditManagement_i + a_5 BankCharacter_i + e_i \quad (7)$$

$$Liquidity_i = a_0 + a_6 RCD_i + a_3 BankProfitability_i + a_4 CreditManagement_i + a_5 BankCharacter_i + e_i \quad (8)$$

$$\Delta Liquidity_i = a_0 + a_6 RCE_i + a_3 \Delta BankProfitability_i + a_4 \Delta CreditManagement_i + a_5 BankCharacter_i + e_i \quad (9)$$

$$\Delta Liquidity_i = a_0 + a_6 RCD_i + a_3 \Delta BankProfitability_i + a_4 \Delta CreditManagement_i + a_5 BankCharacter_i + e_i \quad (10)$$

# 4.EMPIRICAL RESULTS

In this section, the study begins with correlation analysis in order to preview relevance between the variables to be examined and detect potential multicollinearity for subsequent regression analysis. Then we present major empirical results that relate the bank's capital, liquidity, insolvency, and asset reclassification associated with implementation of Basel 3 and IFRS 9. Finally, key findings are summarized and discussed.

## 4.1 CORRELATION ANALYSIS

Table 4-1 and Table 4-2 present the matrix of Person and Spearman's rank correlations across the variables examined. The lower-triangular cells report Pearson's correlation coefficients whereas the upper-triangular cells report Spearman's rank correlation coefficients. The correlation coefficient marked with an asterisk denotes significance at the 5% level. It is noted that LLP is taken in logarithm in order to eliminate the size effect of our sample banks.

For static analysis, Table 4-1 shows that short-term liquidity gauged by LCR is negatively associated with LLP and D_3 in terms of Spearman's rank correlation, indicating that banks with more liquid asset actually experience lower LLP due to the possible reason that most high-quality liquid assets are measured at fair value and tend to be reclassified from AFS to FVTPL. However, this relation appears insignificant in terms of Pearson correlation. For both Pearson and Spearman's rank correlations, long-term liquidity gauged by NSFR is positively correlated to LCR and negatively correlated to NPLC at the 5% significance level. ROA is significantly negatively related to LCR but irrelevant to NSFR in terms of Pearson correlation. Bank capital proxied by CAR is negatively associated with NIM, suggesting a significant negative relationship between credit management and bank capital. However, this relation disappears in terms of Spearman's rank correlation.

Table 4-1 suggests a close link between the bank's short-term liquidity management and long-term one. In terms of Pearson correlation, the correlation coefficients of CAR, CET1, CT1, LEV, NSFR, NPL, and DVSF are all positive whereas the others mostly have a negative relationship with LCR. However, the correlation coefficients of ZSC, NPLC, NIM, FHC, LSTD and E_1, E_2, E_4, D_1, D_3, D_5, D_6 exhibit a negative relationship with NSFR, suggesting that more capital stability effectively diminishes the bank's liquidity. Especially, D_3 is negatively associated with NSFR both in Pearson correlation and in Spearman's rank correlation, which implies that banks reclassifying AFS to FVTPL may weaken the long-term liquidity.

For dynamic analysis, Table 4-2 shows that ΔLCR is negatively associated to ΔROA in terms of Pearson correlation at the 5% significance level, indicating that the change in profitability reduces the change in short-term liquidity. However, this relation with in ΔNSFR appears insignificant. In terms of Pearson correlation, changes in all of bank capital measures defined by BIS are negatively correlated to ΔNSFR rather than ΔLCR. This supports Hypothesis (1) in 2.4 from a dynamic perspective and suggests that the increase in bank capital moderates the increase in long-term liquidity. Moreover, NPLC acts as a buffer against default on the bank's investment position. Hence, a positive ΔNPLC represents an increase in ΔNSFR. Conversely, the change in NIM impacts the change in NSFR, indicating that better credit management lowers the increase in long-term liquidity.

It is noted that this study makes a careful assessment of the correlation between independent variables. The relationship between independent variables signals the multicollinearity problem in the regression analysis. Some highly correlated independent variables may need to be excluded in the regression as significant multicollinearity is found. By Table 4-1 and Table 4-2, potential multicollinearity appears present for bank-capital variables (CAR, CET1, CT1, and LEV) and bank-profitability variables (ROA, ROE, and ZSC). Similarly, credit-management variable such as NPL and NPLC seem to exhibit multicollinearity as well.

## Table 4-1 Correlation Matrix for Static Variables

| | CAR | CET1 | CT1 | LEV | LCR | NSFR | ZSC | ROA | NIM | LLP | NPL | NPLC | FHC | LSTD | DVSF | E_1 | E_2 | E_3 | E_4 | D_1 | D_2 | D_3 | D_4 | D_5 | D_6 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CAR | | 0.60 * | 0.77 * | 0.55 * | 0.10 | 0.18 | 0.18 | 0.54 * | 0.10 | 0.13 | -0.24 | 0.27 | 0.25 | -0.11 | 0.65 * | -0.10 | 0.10 | 0.17 | -0.11 | 0.17 | -0.02 | 0.08 | -0.23 | 0.26 | -0.09 |
| CET1 | 0.91 * | | 0.82 * | 0.58 * | -0.17 | 0.11 | -0.25 | 0.40 * | 0.02 | 0.00 | -0.18 | 0.23 | 0.26 | -0.17 | 0.43 * | -0.23 | 0.11 | 0.28 | 0.03 | 0.12 | -0.04 | -0.19 | -0.22 | -0.19 | -0.38 * |
| CT1 | 0.95 * | 0.97 * | | 0.70 * | -0.01 | 0.17 | -0.19 | 0.48 * | 0.25 | -0.04 | -0.19 | 0.23 | 0.20 | -0.11 | 0.62 * | -0.19 | 0.05 | 0.20 | 0.03 | 0.16 | -0.11 | -0.15 | -0.34 * | 0.14 | -0.24 |
| LEV | 0.79 * | 0.84 * | 0.86 * | | -0.21 | -0.18 | -0.11 | 0.48 * | 0.45 * | -0.10 | -0.06 | 0.06 | 0.23 | 0.07 | 0.22 | -0.12 | 0.06 | 0.20 | 0.01 | 0.08 | -0.08 | -0.08 | -0.09 | -0.02 | -0.18 |
| LCR | 0.24 | 0.17 | 0.19 | 0.02 | | 0.51 * | -0.11 | -0.31 | -0.05 | -0.42 * | 0.23 | -0.24 | -0.30 | -0.08 | 0.03 | 0.00 | -0.10 | -0.04 | -0.18 | 0.05 | 0.11 | -0.34 * | -0.14 | 0.30 | -0.03 |
| NSFR | 0.24 | 0.23 | 0.23 | -0.01 | 0.51 * | | -0.11 | -0.05 | -0.10 | 0.04 | 0.38 * | -0.36 * | -0.10 | -0.17 | 0.33 * | -0.06 | -0.04 | 0.04 | 0.01 | -0.13 | 0.02 | -0.39 * | 0.05 | -0.05 | -0.05 |
| ZSC | -0.04 | -0.25 | -0.22 | -0.19 | -0.24 | -0.14 | | 0.40 * | -0.02 | 0.49 * | -0.14 | 0.15 | 0.17 | 0.11 | -0.11 | 0.17 | -0.14 | -0.15 | -0.32 | 0.17 | 0.20 | 0.26 | 0.32 | 0.22 | 0.40 * |
| ROA | -0.04 | 0.00 | -0.02 | 0.13 | -0.38 * | 0.00 | 0.35 * | | 0.43 * | 0.46 * | -0.32 | 0.32 | 0.34 * | 0.08 | 0.30 | 0.06 | 0.01 | -0.03 | 0.06 | 0.14 | -0.08 | 0.07 | -0.02 | 0.11 | 0.04 |
| NIM | -0.49 * | -0.45 * | -0.44 * | -0.11 | -0.17 | -0.19 | 0.09 | 0.54 * | | -0.06 | 0.17 | -0.17 | 0.03 | 0.14 | -0.20 | -0.01 | -0.22 | -0.12 | 0.11 | 0.12 | 0.00 | 0.00 | -0.11 | 0.16 | 0.12 |
| LLP | -0.13 | -0.17 | -0.19 | -0.31 | -0.26 | 0.09 | 0.35 * | 0.21 | -0.05 | | -0.34 * | 0.36 * | 0.62 * | -0.18 | 0.08 | -0.04 | 0.32 | 0.09 | -0.06 | 0.11 | -0.03 | 0.27 | 0.33 * | 0.08 | 0.25 |
| NPL | -0.01 | 0.06 | 0.04 | 0.05 | 0.29 | 0.31 | -0.30 | -0.43 * | 0.03 | -0.31 | | -0.98 * | -0.31 | 0.03 | -0.19 | -0.07 | -0.34 * | -0.15 | 0.06 | -0.02 | 0.27 | -0.30 | 0.12 | -0.30 | 0.11 |
| NPLC | -0.05 | 0.06 | 0.03 | 0.15 | -0.17 | -0.44 * | -0.18 | 0.09 | 0.00 | -0.15 | -0.41 * | | 0.27 | -0.02 | 0.23 | 0.06 | 0.35 * | 0.21 | -0.10 | 0.02 | -0.29 | 0.31 | -0.09 | 0.30 | -0.10 |
| FHC | 0.00 | -0.03 | -0.03 | -0.02 | -0.33 | -0.05 | 0.13 | 0.21 | 0.06 | 0.60 * | -0.34 * | -0.16 | | -0.52 * | 0.06 | -0.12 | 0.26 | 0.08 | -0.03 | 0.36 * | 0.06 | 0.19 | 0.20 | 0.04 | 0.07 |
| LSTD | -0.16 | -0.14 | -0.12 | 0.07 | -0.06 | -0.25 | 0.08 | 0.12 | 0.15 | -0.28 | 0.00 | 0.34 * | -0.52 * | | -0.02 | 0.37 * | -0.18 | -0.11 | 0.36 * | -0.19 | 0.18 | 0.05 | 0.10 | 0.12 | 0.05 |
| DVSF | 0.81 * | 0.77 * | 0.81 * | 0.52 * | 0.21 | 0.36 * | -0.18 | -0.03 | -0.65 * | -0.17 | -0.04 | 0.05 | -0.10 | -0.13 | | -0.01 | 0.13 | 0.34 * | 0.09 | 0.05 | -0.14 | 0.03 | -0.39 * | 0.23 | -0.25 |
| E_1 | -0.12 | -0.17 | -0.14 | -0.13 | 0.15 | -0.05 | 0.07 | 0.06 | 0.02 | -0.10 | 0.01 | -0.08 | -0.12 | 0.37 * | -0.06 | | -0.14 | -0.16 | 0.20 | -0.11 | 0.16 | 0.10 | 0.24 | 0.30 | 0.10 |
| E_2 | 0.20 | 0.18 | 0.16 | 0.15 | -0.02 | -0.03 | -0.06 | 0.00 | -0.20 | 0.43 * | -0.25 | 0.28 | 0.26 | -0.18 | 0.16 | -0.14 | | 0.35 * | 0.00 | -0.07 | -0.32 | 0.26 | -0.08 | 0.03 | 0.03 |
| E_3 | 0.38 * | 0.42 * | 0.40 * | 0.27 | 0.03 | 0.03 | -0.17 | 0.05 | -0.21 | 0.19 | -0.12 | 0.28 | 0.08 | -0.11 | 0.36 * | -0.16 | 0.35 * | | -0.26 | -0.13 | -0.16 | -0.03 | -0.08 | -0.11 | -0.34 * |
| E_4 | -0.30 | -0.21 | -0.21 | -0.10 | -0.05 | -0.10 | -0.34 * | 0.00 | 0.13 | -0.15 | 0.11 | 0.13 | -0.03 | 0.36 * | -0.09 | 0.20 | 0.00 | -0.26 | | -0.06 | 0.20 | -0.10 | -0.03 | -0.14 | -0.23 |
| D_1 | 0.04 | 0.01 | 0.02 | 0.00 | -0.08 | -0.04 | 0.19 | 0.09 | 0.08 | 0.14 | -0.10 | -0.07 | 0.36 * | -0.19 | -0.04 | -0.11 | -0.07 | -0.13 | -0.06 | | 0.53 * | -0.02 | -0.05 | 0.37 * | 0.19 |
| D_2 | -0.09 | -0.07 | -0.11 | -0.10 | 0.00 | 0.03 | 0.19 | -0.09 | 0.03 | -0.02 | 0.14 | -0.13 | 0.06 | 0.18 | -0.15 | 0.16 | -0.32 | -0.16 | 0.20 | 0.53 * | | -0.27 | 0.24 | -0.09 | -0.08 |
| D_3 | -0.07 | -0.22 | -0.17 | -0.16 | -0.26 | -0.44 * | 0.25 | 0.06 | 0.05 | 0.24 | -0.34 * | 0.14 | 0.19 | 0.05 | -0.12 | 0.10 | 0.26 | -0.03 | -0.10 | -0.02 | -0.27 | | -0.05 | 0.32 | 0.40 * |
| D_4 | -0.23 | -0.22 | -0.27 | -0.21 | -0.16 | 0.11 | 0.23 | -0.03 | 0.00 | 0.33 | 0.00 | -0.22 | 0.20 | 0.10 | -0.36 * | 0.24 | -0.08 | -0.08 | -0.03 | -0.05 | 0.24 | -0.05 | | -0.20 | 0.30 |
| D_5 | 0.08 | -0.12 | 0.02 | -0.06 | 0.26 | -0.01 | 0.24 | 0.07 | 0.09 | 0.07 | -0.18 | -0.01 | 0.04 | 0.12 | 0.08 | 0.30 | 0.03 | -0.11 | -0.14 | 0.37 * | -0.09 | 0.32 | -0.20 | | 0.32 |
| D_6 | -0.13 | -0.30 | -0.22 | -0.21 | -0.09 | -0.04 | 0.36 * | 0.01 | 0.12 | 0.24 | -0.04 | -0.20 | 0.07 | 0.05 | -0.27 | 0.10 | 0.03 | -0.34 * | -0.23 | 0.19 | -0.08 | 0.40 * | 0.30 | 0.32 | |

Note. Lower-triangular (upper-triangular) cells report Pearson's (Spearman's rank) correlation coefficients; * indicates coefficients at the 5% significance level.

# Table 4-2 Correlation Matrix for Dynamic Variables

| | ΔCAR | ΔCET1 | ΔCT1 | ΔLEV | ΔLCR | ΔNSFR | ΔZSC | ΔROA | ΔNIM | ΔLLP | ΔNPL | ΔNPLC | ΔDVSF | FHC | LSTD | E_1 | E_2 | E_3 | E_4 | D_1 | D_2 | D_3 | D_4 | D_5 | D_6 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ΔCAR | | 0.79 * | 0.85 * | 0.65 * | 0.11 | -0.05 | 0.34 * | 0.18 | -0.01 | -0.07 | 0.25 | -0.23 | -0.01 | -0.01 | 0.08 | 0.05 | -0.26 | -0.25 | 0.02 | -0.04 | 0.15 | -0.01 | 0.27 | -0.16 | 0.33 |
| ΔCET1 | 0.90 * | | 0.83 * | 0.73 * | 0.05 | 0.15 | 0.28 | 0.25 | 0.10 | 0.17 | 0.34 * | -0.25 | -0.01 | 0.04 | -0.09 | -0.14 | -0.20 | -0.25 | -0.18 | -0.05 | -0.09 | 0.06 | 0.27 | 0.04 | 0.42 * |
| ΔCT1 | 0.94 * | 0.97 * | | 0.79 * | 0.07 | 0.16 | 0.42 * | 0.21 | -0.04 | -0.05 | 0.30 | -0.26 | -0.01 | 0.02 | 0.08 | -0.04 | -0.29 | -0.22 | -0.12 | 0.06 | 0.13 | 0.11 | 0.22 | -0.07 | 0.36 * |
| ΔLEV | 0.87 * | 0.94 * | 0.95 * | | 0.05 | 0.14 | 0.54 * | 0.25 | 0.04 | 0.05 | 0.40 * | -0.31 | -0.08 | -0.03 | 0.06 | -0.01 | -0.24 | -0.06 | -0.23 | -0.11 | -0.04 | 0.06 | 0.32 | -0.02 | 0.23 |
| ΔLCR | 0.02 | 0.04 | 0.05 | -0.01 | | 0.22 | -0.05 | -0.25 | -0.14 | 0.24 | 0.01 | 0.17 | 0.13 | -0.03 | 0.19 | -0.02 | 0.09 | 0.04 | 0.24 | -0.15 | -0.03 | 0.10 | 0.06 | 0.05 | 0.07 |
| ΔNSFR | -0.39 * | -0.34 * | -0.34 * | -0.31 | 0.12 | | -0.10 | -0.20 | -0.21 | -0.07 | -0.01 | 0.01 | -0.02 | -0.24 | 0.15 | -0.07 | -0.02 | 0.19 | -0.03 | 0.00 | -0.22 | 0.06 | -0.23 | 0.30 | -0.02 |
| ΔZSC | 0.36 * | 0.34 * | 0.40 * | 0.45 * | -0.05 | -0.14 | | 0.36 * | 0.04 | 0.03 | 0.03 | -0.01 | 0.09 | 0.30 | -0.04 | 0.09 | -0.26 | -0.24 | 0.00 | 0.29 | 0.26 | 0.04 | 0.27 | 0.07 | 0.08 |
| ΔROA | 0.29 | 0.34 * | 0.33 | 0.40 * | -0.43 * | -0.10 | 0.37 * | | 0.20 | 0.05 | -0.19 | -0.07 | 0.18 | 0.06 | -0.07 | -0.06 | -0.32 | -0.37 * | 0.06 | -0.05 | -0.09 | 0.02 | 0.26 | -0.08 | 0.17 |
| ΔNIM | 0.30 | 0.22 | 0.27 | 0.19 | -0.08 | -0.33 * | 0.01 | 0.11 | | 0.23 | 0.03 | -0.16 | -0.38 * | 0.13 | -0.16 | -0.02 | -0.03 | 0.00 | -0.08 | 0.16 | -0.03 | 0.20 | 0.29 | 0.08 | 0.15 |
| ΔLLP | 0.06 | 0.18 | 0.10 | 0.15 | 0.19 | -0.23 | -0.08 | 0.00 | 0.04 | | -0.07 | 0.33 | 0.06 | 0.56 * | -0.23 | -0.09 | 0.40 * | 0.16 | -0.24 | -0.15 | -0.45 * | 0.39 * | 0.24 | 0.15 | 0.23 |
| ΔNPL | 0.16 | 0.08 | 0.12 | 0.12 | 0.43 * | -0.14 | 0.01 | -0.40 * | 0.01 | -0.03 | | -0.73 * | -0.06 | -0.27 | 0.16 | 0.15 | -0.26 | -0.15 | -0.13 | -0.30 | 0.03 | -0.21 | 0.11 | -0.02 | 0.13 |
| ΔNPLC | 0.01 | -0.02 | 0.03 | 0.02 | 0.06 | 0.53 * | -0.09 | -0.07 | -0.02 | -0.03 | -0.30 | | 0.05 | 0.28 | 0.02 | -0.06 | 0.30 | 0.06 | 0.15 | 0.20 | -0.10 | 0.25 | -0.08 | 0.15 | -0.09 |
| ΔDVSF | -0.56 * | -0.51 * | -0.54 * | -0.44 * | 0.03 | 0.39 * | -0.08 | 0.11 | -0.45 * | 0.05 | 0.01 | -0.06 | | 0.00 | -0.04 | -0.10 | 0.08 | 0.06 | 0.01 | -0.06 | 0.09 | -0.05 | 0.08 | -0.01 | -0.07 |
| FHC | 0.10 | 0.14 | 0.11 | 0.12 | 0.12 | -0.27 | 0.29 | 0.05 | 0.00 | 0.45 * | -0.12 | -0.11 | -0.12 | | -0.52 * | -0.12 | 0.26 | 0.08 | -0.03 | 0.36 * | 0.06 | 0.19 | 0.20 | 0.04 | 0.07 |
| LSTD | 0.09 | 0.05 | 0.10 | 0.02 | 0.13 | 0.11 | -0.09 | -0.23 | 0.04 | -0.24 | 0.17 | 0.27 | -0.14 | -0.52 * | | 0.37 * | -0.18 | -0.11 | 0.36 * | -0.19 | 0.18 | 0.05 | 0.10 | 0.12 | 0.05 |
| E_1 | 0.05 | 0.00 | 0.00 | -0.05 | 0.00 | -0.11 | 0.12 | 0.02 | 0.06 | -0.14 | 0.21 | -0.07 | -0.06 | -0.12 | 0.37 * | | -0.14 | -0.16 | 0.20 | -0.11 | 0.16 | 0.10 | 0.24 | 0.30 | 0.10 |
| E_2 | -0.30 | -0.29 | -0.32 | -0.31 | 0.16 | 0.07 | -0.28 | -0.33 | -0.04 | 0.40 * | -0.16 | 0.22 | 0.11 | 0.26 | -0.18 | -0.14 | | 0.35 * | 0.00 | -0.07 | -0.32 | 0.26 | -0.08 | 0.03 | 0.03 |
| E_3 | -0.38 * | -0.32 | -0.35 * | -0.26 | 0.08 | 0.33 * | -0.11 | -0.12 | 0.01 | 0.30 | -0.10 | 0.36 * | 0.33 * | 0.08 | -0.11 | -0.16 | 0.35 * | | -0.26 | -0.13 | -0.16 | -0.03 | -0.08 | -0.11 | -0.34 * |
| E_4 | 0.19 | 0.08 | 0.12 | 0.01 | -0.01 | -0.04 | 0.14 | 0.02 | 0.16 | -0.34 * | -0.14 | 0.13 | -0.25 | -0.03 | 0.36 * | 0.20 | 0.00 | -0.26 | | -0.06 | 0.20 | -0.10 | -0.03 | -0.14 | -0.23 |
| D_1 | 0.00 | 0.05 | 0.06 | 0.02 | -0.02 | -0.04 | 0.22 | 0.01 | 0.11 | -0.12 | -0.16 | -0.03 | -0.08 | 0.36 * | -0.19 | -0.11 | -0.07 | -0.13 | -0.06 | | 0.53 * | -0.02 | -0.05 | 0.37 * | 0.19 |
| D_2 | 0.15 | 0.05 | 0.13 | 0.06 | -0.07 | -0.19 | 0.23 | 0.01 | 0.05 | -0.28 | 0.11 | -0.06 | -0.03 | 0.06 | 0.18 | 0.16 | -0.32 | -0.16 | 0.20 | 0.53 * | | -0.27 | 0.24 | -0.09 | -0.08 |
| D_3 | 0.08 | 0.16 | 0.16 | 0.10 | 0.20 | 0.05 | 0.01 | 0.06 | 0.21 | 0.15 | -0.08 | 0.23 | -0.07 | 0.19 | 0.05 | 0.10 | 0.26 | -0.03 | -0.10 | -0.02 | -0.27 | | -0.05 | 0.32 | 0.40 * |
| D_4 | 0.27 | 0.27 | 0.26 | 0.33 | 0.05 | -0.27 | 0.06 | 0.14 | 0.05 | 0.27 | 0.14 | -0.14 | -0.02 | 0.20 | 0.10 | 0.24 | -0.08 | -0.08 | -0.03 | -0.05 | 0.24 | -0.05 | | -0.20 | 0.30 |
| D_5 | -0.09 | 0.07 | -0.02 | -0.08 | 0.13 | 0.12 | 0.11 | 0.00 | 0.09 | 0.04 | 0.00 | -0.03 | -0.03 | 0.04 | 0.12 | 0.30 | 0.03 | -0.11 | -0.14 | 0.37 * | -0.09 | 0.32 | -0.20 | | 0.32 |
| D_6 | 0.25 | 0.30 | 0.27 | 0.22 | 0.16 | -0.14 | -0.06 | 0.10 | -0.02 | 0.11 | 0.14 | -0.14 | -0.10 | 0.07 | 0.05 | 0.10 | 0.03 | -0.34 * | -0.23 | 0.19 | -0.08 | 0.40 * | 0.30 | 0.32 | |

Note. Lower-triangular (upper-triangular) cells report Pearson’s (Spearman’s rank) correlation coefficients; * indicates coefficients at the 5% significance level.

## 4.2 REGRESSION ANALYSIS: BANK CAPITAL AND LIQUIDITY

In section 3.4, we present ten empirical models to investigate bank capital, liquidity, and asset reclassification with implementation of Basel 3 and IFRS 9. The empirical study begins with regression analysis of bank liquidity based on Equation (1) and Equation (2) with focus placed on the bank's liquidity and capital measures defined by Basel 3.

Table 4-3 and Table 4-4 report the results from two sets of the ordinary least squares (OLS) regressions of bank short-term and long-term liquidity on bank capital and other bank variables over the period of 2018 respectively at static and dynamic levels. The regressions are essentially in line with Equation (1) and Equation (2) specified in 3.4. All regressions cover the whole sample of 36 commercial banks. To avoid multicollinearity, bank regulatory capital is respectively proxied by the CAR, CET1, CT1, and LEV.

For the static perspective, Table 4-3 reports regression results from Equation (1). Specification (1) to Specification (5) using the long-term liquidity NSFR as the dependent variable focus on the effect of bank regulatory capital on long-term liquidity without considering LCR due to complementary effect. There seems no obvious difference in terms of the impact of bank capital on bank liquidity in the long term regardless of the capital ratio adopted. However, the results from Specification (6) to Specification (10) using the short-term liquidity LCR as the dependent variable are interesting. They suggest that CAR only positively affects short-term rather than long-term liquidity in the static view. Accordingly, banks with a higher level of CAR improve short-term liquidity in average, that is, lower the liquidity risk.

Furthermore, additional findings from Specification (7) to Specification (9) in Table 4-3 show that bank profitability measured by ROA is associated with LCR negatively after including bank capital by CAR, CET1, and CT1 in the regressions. Bank credit management measured by NPLC has a negatively impact on liquidity in the long term rather than in the short term. However, FHC, which represents the scale effect on bank operations, is only associated with short-term liquidity with an inverse relation. Finally, Specification (7) to Specification (9) in Table 4-3 show that bank profitability measured by ROA is associated with LCR negatively after including bank capital by CAR, CET1, and CT1 in the regressions.

Among dynamic variables presented in Table 3-10, bank capital and liquidity both have been declining except for LEV, suggesting that the regulations by Basel 3 and IFRS 9 may have adverse impacts on bank capital and liquidity. Furthermore, changes in short-term liquidity suffer a shortfall. However, the bank's credit management is improved from 2017 to 2018 given the reduction in NPL and enhancement in NPLC against credit default. These findings lead to examination of Equation (2) from the dynamic perspective. Major estimation results are summarized in Table 4-4.

In Table 4-4, it is found that the change in bank capital proxied by ΔCAR, ΔCT1, and ΔLEV reduces ΔNSFR significantly. But this effect is absent for ΔLCR, which is distinct from regression results at the static level. Meanwhile, we find the adjusted $R^2$ from Specification (1) to Specification (5) in Table 4-4 are overall increasing in long-term liquidity in terms of NSFR compared to the static regressions. Additionally, Table 4-4 shows that the influence of NPLC on long-term liquidity is significantly negative in the static relation but the change in NPLC have an opposite impact on the change in NSFR.

Consistent with H1b and H1c in Hypothesis (1) proposed in 2.4, our empirical findings support that implementation of Basel 3 creates an impact on bank liquidity. Short-term liquidity and long-term liquidity are respectively consistent with the financial-fragility-crowding-out hypothesis from the static view and the risk absorption hypothesis from the dynamic view. In other words, banks with more capital will reduce short-term liquidity risk in the static relation, However, in a dynamic framework it is demonstrated that banks having raised capital will induce an increase in long-term liquidity risk.

## Table 4-3 OLS Regression Results (1)

| | Long-term | | | | | Short-term | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | (1) NSFR | (2) NSFR | (3) NSFR | (4) NSFR | (5) NSFR | (6) LCR | (7) LCR | (8) LCR | (9) LCR | (10) LCR |
| ROA | 13.3201 | 11.8955 | 10.9016 | 11.2512 | 13.3867 | -64.2609 | -91.6413 * | -85.0103 * | -83.2632 * | -70.1669 |
| | (1.4804) | (1.2259) | (1.1235) | (1.1764) | (1.4296) | (-1.4381) | (-1.9927) | (-1.7949) | (-1.7887) | (-1.5182) |
| NIM | -9.4411 | -7.6437 | -6.7204 | -6.9725 | -9.4864 | 6.3357 | 40.8831 | 29.6778 | 29.0102 | 10.3558 |
| | (-1.5467) | (-1.0240) | (-0.9246) | (-0.9780) | (-1.4931) | (0.2090) | (1.1556) | (0.8365) | (0.8360) | (0.3302) |
| NPLC | -0.0031 ** | -0.0031 ** | -0.0031 ** | -0.0031 ** | -0.0031 ** | -0.0048 | -0.0043 | -0.0054 | -0.0051 | -0.0053 |
| | (-2.6834) | (-2.6166) | (-2.7074) | (-2.6792) | (-2.6166) | (-0.8499) | (-0.7738) | (-0.9511) | (-0.8982) | (-0.9051) |
| FHC | -7.6558 | -7.3940 | -7.0938 | -7.1694 | -7.6605 | -50.4331 * | -45.4023 * | -45.6113 * | -45.9655 * | -50.0153 * |
| | (-1.5386) | (-1.4551) | (-1.3960) | (-1.4141) | (-1.5131) | (-2.0409) | (-1.8854) | (-1.8389) | (-1.8627) | (-2.0016) |
| LSTD | -7.0872 | -6.7354 | -6.3097 | -6.5098 | -7.0847 | -27.1315 | -20.3685 | -20.4605 | -21.8274 | -27.3565 |
| | (-1.2548) | (-1.1644) | (-1.0875) | (-1.1302) | (-1.2332) | (-0.9673) | (-0.7430) | (-0.7224) | (-0.7786) | (-0.9648) |
| CAR | | 0.3750 | | | | | 7.2077 * | | | |
| | | (0.4306) | | | | | (1.7463) | | | |
| CET1 | | | 0.4995 | | | | | 4.2853 | | |
| | | | (0.7039) | | | | | (1.2373) | | |
| CT1 | | | | 0.5150 | | | | | 4.7305 | |
| | | | | (0.6874) | | | | | (1.2971) | |
| LEV | | | | | -0.0369 | | | | | 3.2712 |
| | | | | | (-0.0336) | | | | | (0.6029) |
| Constant | 142.5280 *** | 135.7665 *** | 134.8946 *** | 134.4327 *** | 142.7979 *** | 217.5121 *** | 87.5542 | 152.0207 ** | 143.1563 ** | 193.5823 *** |
| | (22.6376) | (8.0093) | (10.7348) | (10.0464) | (13.8906) | (6.9564) | (1.0899) | (2.4783) | (2.1980) | (3.8153) |
| $R^2$ | 0.3168 | 0.3212 | 0.3283 | 0.3278 | 0.3169 | 0.2642 | 0.3342 | 0.3011 | 0.3046 | 0.2733 |
| Adj. $R^2$ | 0.2030 | 0.1807 | 0.1893 | 0.1887 | 0.1755 | 0.1416 | 0.1965 | 0.1565 | 0.1607 | 0.1230 |

Note. OLS regression with t-value in parenthesis; ***/**/* stand for significance at the 1%/5%/10% level.

## Table 4-4 OLS Regression Results (2)

| | Long-term | | | | | Short-term | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) |
| | ΔNSFR | ΔNSFR | ΔNSFR | ΔNSFR | ΔNSFR | ΔLCR | ΔLCR | ΔLCR | ΔLCR | ΔLCR |
| ΔROA | -1.5173 | 0.9259 | 0.8225 | 0.9206 | 1.3284 | -123.9480 ** | -138.0344 ** | -144.2264 ** | -146.6163 ** | -146.1314 ** |
| | (-0.4122) | (0.2508) | (0.2139) | (0.2406) | (0.3384) | (-2.3874) | (-2.5025) | (-2.5840) | (-2.6398) | (-2.5493) |
| ΔNIM | -13.7343 ** | -10.3577 * | -11.8417 * | -11.1075 * | -12.1823 * | -23.8792 | -43.3473 | -40.2824 | -48.3049 | -35.9778 |
| | (-2.2426) | (-1.7137) | (-1.9538) | (-1.8166) | (-2.0310) | (-0.2764) | (-0.4800) | (-0.4579) | (-0.5442) | (-0.4108) |
| ΔNPLC | 0.0023 *** | 0.0023 *** | 0.0023 *** | 0.0023 *** | 0.0023 *** | 0.0007 | 0.0009 | 0.0010 | 0.0006 | 0.0006 |
| | (3.7979) | (3.9588) | (3.8468) | (3.9439) | (3.9429) | (0.0857) | (0.1001) | (0.1205) | (0.0739) | (0.0742) |
| FHC | -4.2557 * | -3.3737 | -3.4203 | -3.3819 | -3.5373 | 34.7691 | 29.6839 | 27.5288 | 26.6444 | 29.1693 |
| | (-2.0030) | (-1.6352) | (-1.6092) | (-1.5983) | (-1.6852) | (1.1602) | (0.9630) | (0.8922) | (0.8674) | (0.9517) |
| LSTD | -2.8979 | -1.7031 | -1.9397 | -1.7680 | -2.0738 | 27.4070 | 20.5181 | 19.1020 | 16.9002 | 20.9827 |
| | (-1.1687) | (-0.7021) | (-0.7827) | (-0.7114) | (-0.8472) | (0.7837) | (0.5662) | (0.5310) | (0.4685) | (0.5870) |
| ΔCAR | | -1.6142 ** | | | | | 9.3068 | | | |
| | | (-2.0609) | | | | | (0.7953) | | | |
| ΔCET1 | | | -1.3819 | | | | | 11.9772 | | |
| | | | (-1.6604) | | | | | (0.9914) | | |
| ΔCT1 | | | | -1.4531 * | | | | | 13.5113 | |
| | | | | (-1.7444) | | | | | (1.1173) | |
| ΔLEV | | | | | -2.6649 * | | | | | 20.7741 |
| | | | | | (-1.7295) | | | | | (0.9234) |
| Constant | 0.7260 | -0.1806 | -0.1054 | 0.0503 | 0.4766 | -41.8213 * | -36.5937 | -34.6151 | -35.5381 | -39.8766 |
| | (0.4353) | (-0.1099) | (-0.0621) | (0.0303) | (0.2939) | (-1.7776) | (-1.4895) | (-1.4054) | (-1.4749) | (-1.6841) |
| $R^2$ | 0.4529 | 0.5228 | 0.5004 | 0.5048 | 0.5040 | 0.2227 | 0.2393 | 0.2482 | 0.2548 | 0.2449 |
| Adj. $R^2$ | 0.3617 | 0.4240 | 0.3970 | 0.4024 | 0.4014 | 0.0931 | 0.0819 | 0.0926 | 0.1006 | 0.0886 |

Note. OLS regression with t-value in parenthesis; ***/**/* stand for significance at the 1%/5%/10% level.

## 4.3 REGRESSION ANALYSIS: IMPLEMENTATION OF IFRS 9

In the previous section, we discuss regression analysis developed from Equation (1) and Equation (2) presented in 3.4. We continue by conducting additional regression analysis which focuses on the role for asset reclassification by IFRS 9 in the bank's capital and liquidity with estimation of Equations (3) to (10) presented in 3.4. Similar to previous regressions, the analysis concerns the original sample of 36 banks. Table 4-5 to Table 4-10 report estimation results for regressions that include dummy variables associated to implementation of the IFRS 9. The analysis is also conducted at both static and dynamic levels.

We start with the analysis of the relationship between core bank capital gauged by CAR and asset reclassification by IFRS 9 including RCE (E_1 to E_4) and RCD (D_1 to D_6) in the static view. The results are reported in Table 4-5. It is noted that Specification (2) to Specification (5) focus on reclassification in equity instruments and the remaining concern reclassification in debt instruments. Statically, the effects of IFRS 9 on CAR excluding liquidity presented in Table 4-5 suggest that both RCE and RCD are statistically insignificant on CAR with all benchmarks. Therefore, it appears that the IFRS 9 exert no effect on bank capital.

However, the results of this relationship from dynamic analysis reported in Table 4-6 seem to have some significant correlations. For equity instruments, with FVTPL to FVTOCI, AFS to FVTPL, and Cost to FVTOCI as benchmarks, Cost to FVTPL leads to a fall in bank capital. Moreover, for debt instruments, HTM to FVTOCI is positively related to the change in CAR significantly with AFS to AC and HTM to FVTPL as the benchmarks.

We continue to analyze the relationship between bank liquidity and asset reclassification by IFRS 9 from a static view. The results for long-term liquidity and short-term liquidity are respectively presented in Table 4-7 and Table 4-9. For the long-term liquidity measured by NSFR from a static perspective, the effects of IFRS 9 on NSFR show, in Table 4-5, that only RCD is correlated significantly to NSFR over all benchmarks except AFS to FVTPL.

Next, we further examine the results for short-term liquidity in Table 4-9. In a static view, similar to the NSFR, the LCR is affected by IFRS 9 only for debt instruments (RCD) across all benchmarks except HTM to FVTPL. Once again, the IFRS 9 effect by RCE appears irrelevant to bank liquidity.

Tables 4-8 and 4-10 deepen this relationship from a dynamic perspective. For the long-term liquidity, the correlation between IFRS 9 effects and changes in NSFR disappear relative to the static view. In addition, Table 4-10 shows that all of the regressions that include RCE and RCD dummy variables show negative adjusted $R^2$ relative to those in Table 4-4. The reason for this problem may essentially reflect a fundamental lack of the explanatory power for IFRS 9 effects and insufficient observations in our sample.

Compared with IAS 39, a significant divergence is that IFRS 9 now directs the identical impairment model for debt instruments at FVTOCI as for debt instruments measured at amortized cost. However, there is no separate allowance account for FVTOCI assets. As pointed out in Gebhardt (2016), impairment gains and losses are recognized in the revaluation reserve in other equity and charged against profit or loss. Conceptually, this means that management estimates of 12-month or lifetime ECLs are charged to income, while other credit related changes in fair value (e.g. due to changes in market credit default swap spreads) and non-credit related changes (due to changes in interest rates and liquidity) are recognized in other equity. The new requirement will lead to an earlier recognition of credit risk associated with listed debt instruments in profit or loss, which is particularly relevant for riskier securities that are currently held in AFS portfolio of banks which might be classified as FVTOCI under IFRS 9.

The purpose of the reform by IFRS 9 is to respond to the financial crisis where financial institutions are criticized for delayed recognition of the incurred loss approach and to enable financial institutions to reserve more provisions in the procyclicality to avoid the excessive impact of profit and loss during market fluctuation. From our empirical analysis, this function appears limited or insignificant and may require more time to be substantiated.

## Table 4-5 OLS Regression Results (3)

| | (1) CAR | (2) CAR | (3) CAR | (4) CAR | (5) CAR | (6) CAR | (7) CAR | (8) CAR | (9) CAR | (10) CAR | (11) CAR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ROA | 3.7987 * | 2.9640 | 3.0458 | 3.3795 * | 3.2553 | 3.4732 | 3.4926 * | 3.5091 | 3.5256 | 3.3639 | 3.4589 |
| | (1.9865) | (1.5340) | (1.5739) | (1.7167) | (1.6816) | (1.6848) | (1.7280) | (1.6747) | (1.6535) | (1.6092) | (1.6612) |
| NIM | -4.7931 *** | -4.0080 *** | -4.1831 *** | -4.4331 *** | -4.1915 *** | -4.8479 *** | -4.8532 *** | -4.8305 *** | -4.7370 *** | -4.8344 *** | -4.8465 *** |
| | (-3.6947) | (-2.9816) | (-3.1334) | (-3.2575) | (-3.0845) | (-3.5213) | (-3.5359) | (-3.4919) | (-3.3777) | (-3.4922) | (-3.5512) |
| NPLC | -0.0001 | -0.0002 | -0.0002 | -0.0002 | -0.0003 | -0.0001 | -0.0001 | -0.0002 | -0.0001 | -0.0002 | -0.0001 |
| | (-0.3240) | (-0.8939) | (-0.8763) | (-0.6691) | (-1.0304) | (-0.5266) | (-0.5235) | (-0.6089) | (-0.4000) | (-0.6328) | (-0.5359) |
| FHC | -0.6980 | -0.5925 | -0.4401 | -0.5363 | -0.7318 | -0.1175 | -0.1328 | -0.3298 | -0.6800 | -0.1039 | -0.1288 |
| | (-0.6600) | (-0.5420) | (-0.4100) | (-0.4761) | (-0.6739) | (-0.0903) | (-0.0995) | (-0.2615) | (-0.5460) | (-0.0776) | (-0.0985) |
| LSTD | -0.9383 | -0.0982 | 0.0705 | 0.1030 | -0.2415 | -0.3792 | -0.4023 | -0.4395 | -0.7292 | -0.0955 | -0.3560 |
| | (-0.7817) | (-0.0757) | (0.0512) | (0.0723) | (-0.1822) | (-0.2555) | (-0.2865) | (-0.2799) | (-0.4663) | (-0.0644) | (-0.2264) |
| E_1FVTPLFVTOCI | | | -0.7483 | -0.8413 | -0.8158 | | | | | | |
| | | | (-0.5049) | (-0.5533) | (-0.5462) | | | | | | |
| E_2AFSFVTPL | | 0.4769 | | 0.7536 | 0.3739 | | | | | | |
| | | (0.4846) | | (0.7651) | (0.3787) | | | | | | |
| E_3CostFVTPL | | 1.7418 | 1.8440 | | 1.9800 | | | | | | |
| | | (1.3356) | (1.4490) | | (1.5488) | | | | | | |
| E_4CostFVTOCI | | -0.9845 | -0.8925 | -1.2997 | | | | | | | |
| | | (-0.8959) | (-0.8155) | (-1.1852) | | | | | | | |
| D_1FVTPLFVTOCI | | | | | | | -0.0055 | 0.3408 | 0.8727 | 0.7586 | 0.1197 |
| | | | | | | | (-0.0028) | (0.1224) | (0.3146) | (0.3046) | (0.0455) |
| D_2FVTPLAC | | | | | | -0.0771 | | -0.0968 | -0.7341 | -0.5339 | -0.1474 |
| | | | | | | (-0.0478) | | (-0.0415) | (-0.3193) | (-0.2438) | (-0.0665) |
| D_3AFSFVTPL | | | | | | -0.5204 | -0.5071 | | -0.2906 | -0.4105 | -0.5154 |
| | | | | | | (-0.4560) | (-0.4384) | | (-0.2503) | (-0.3590) | (-0.4858) |
| D_4AFSAC | | | | | | -1.2164 | -1.2216 | -1.1047 | | -1.3082 | -1.2071 |
| | | | | | | (-1.0659) | (-1.0662) | (-0.9479) | | (-1.1223) | (-1.1455) |
| D_5HTMFVTPL | | | | | | 1.2710 | 1.2742 | 1.0064 | 1.7108 | | 1.2134 |
| | | | | | | (0.5612) | (0.5282) | (0.3966) | (0.6639) | | (0.4738) |
| D_6HTMFVTOCI | | | | | | 0.0095 | 0.0141 | -0.2346 | -0.5926 | 0.0427 | |
| | | | | | | (0.0080) | (0.0117) | (-0.2021) | (-0.5159) | (0.0338) | |
| Constant | 18.0303 *** | 17.7504 *** | 17.9857 *** | 18.3474 *** | 17.2914 *** | 18.5695 *** | 18.5628 *** | 18.5048 *** | 18.3244 *** | 18.6076 *** | 18.5755 *** |
| | (13.4742) | (11.3624) | (11.8579) | (11.8409) | (11.8245) | (12.6761) | (12.7295) | (12.5949) | (12.3709) | (12.5936) | (12.6408) |
| $R^2$ | 0.3358 | 0.4203 | 0.4208 | 0.3890 | 0.4096 | 0.3921 | 0.3921 | 0.3874 | 0.3670 | 0.3867 | 0.3922 |
| Adj. $R^2$ | 0.2252 | 0.2486 | 0.2491 | 0.2079 | 0.2347 | 0.1490 | 0.1489 | 0.1424 | 0.1138 | 0.1414 | 0.1490 |

Note. OLS regression with t-value in parenthesis; ***/**/* stand for significance at the 1%/5%/10% level.

## Table 4-6 OLS Regression Results (4)

| | (1) ΔCAR | (2) ΔCAR | (3) ΔCAR | (4) ΔCAR | (5) ΔCAR | (6) ΔCAR | (7) ΔCAR | (8) ΔCAR | (9) ΔCAR | (10) ΔCAR | (11) ΔCAR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ΔROA | 1.5136 * | 0.9153 | 1.2639 | 1.0023 | 0.9399 | 1.3732 | 1.3860 | 1.2698 | 1.2581 | 1.2543 | 1.3841 |
| | (1.8571) | (1.0864) | (1.5866) | (1.1036) | (1.1202) | (1.6037) | (1.6265) | (1.4858) | (1.5022) | (1.4784) | (1.5377) |
| ΔNIM | 2.0918 | 2.2883 * | 2.3091 * | 2.0520 | 2.2676 * | 2.5684 * | 2.7521 * | 2.4859 * | 2.7674 * | 2.8826 * | 2.1650 |
| | (1.5425) | (1.7627) | (1.7535) | (1.4794) | (1.7761) | (1.7728) | (1.8666) | (1.7767) | (1.9170) | (1.9613) | (1.4404) |
| ΔNPLC | -0.0000 | 0.0002 | 0.0001 | 0.0000 | 0.0001 | 0.0000 | 0.0001 | 0.0000 | 0.0001 | 0.0001 | 0.0000 |
| | (-0.1027) | (1.0876) | (0.8327) | (0.2464) | (0.9967) | (0.3092) | (0.3691) | (0.2820) | (0.5416) | (0.6867) | (0.0266) |
| FHC | 0.5464 | 0.6330 | 0.5826 | 0.6458 | 0.6429 | 0.5782 | 0.7105 | 0.5791 | 0.6539 | 0.7407 | 0.4754 |
| | (1.1614) | (1.3788) | (1.2600) | (1.3042) | (1.4185) | (1.0401) | (1.2185) | (1.0663) | (1.2536) | (1.2748) | (0.8000) |
| LSTD | 0.7402 | 0.3789 | 0.5976 | 0.5333 | 0.4486 | 0.7053 | 0.7458 | 0.4861 | 0.4753 | 0.3853 | 0.5966 |
| | (1.3482) | (0.6529) | (0.9677) | (0.8008) | (0.7648) | (1.0961) | (1.2055) | (0.7286) | (0.7352) | (0.6146) | (0.8475) |
| E_1FVTPLFVTOCI | | | -0.2852 | -0.2535 | -0.2892 | | | | | | |
| | | | (-0.4280) | (-0.3598) | (-0.4421) | | | | | | |
| E_2AFSFVTPL | | -0.4464 | | -0.6772 | -0.4552 | | | | | | |
| | | (-0.9837) | | (-1.4354) | (-1.0174) | | | | | | |
| E_3CostFVTPL | | -1.2300 ** | -1.3811 ** | | -1.2119 ** | | | | | | |
| | | (-2.0559) | (-2.3476) | | (-2.1308) | | | | | | |
| E_4CostFVTOCI | | -0.0772 | -0.1394 | 0.2457 | | | | | | | |
| | | (-0.1539) | (-0.2766) | (0.4784) | | | | | | | |
| D_1FVTPLFVTOCI | | | | | | | -0.4053 | -0.9038 | -1.0125 | -1.5254 | -0.2614 |
| | | | | | | | (-0.4454) | (-0.7327) | (-0.8420) | (-1.3554) | (-0.2110) |
| D_2FVTPLAC | | | | | | 0.2010 | | 0.8450 | 0.7301 | 1.0399 | 0.3124 |
| | | | | | | (0.2818) | | (0.8482) | (0.7720) | (1.1094) | (0.3108) |
| D_3AFSFVTPL | | | | | | -0.3144 | -0.4514 | | -0.3960 | -0.5182 | 0.0396 |
| | | | | | | (-0.5666) | (-0.7893) | | (-0.7202) | (-0.9312) | (0.0745) |
| D_4AFSAC | | | | | | -0.0474 | -0.0670 | -0.0983 | | -0.1360 | 0.2787 |
| | | | | | | (-0.0913) | (-0.1287) | (-0.1864) | | (-0.2557) | (0.5565) |
| D_5HTMFVTPL | | | | | | -1.2197 | -1.0526 | -0.9193 | -0.6595 | | -0.5571 |
| | | | | | | (-1.1794) | (-0.9577) | (-0.8087) | (-0.5825) | | (-0.4572) |
| D_6HTMFVTOCI | | | | | | 0.8578 | 0.9202 | 0.8493 | 0.9583 * | 1.0289 * | |
| | | | | | | (1.5913) | (1.6493) | (1.6503) | (1.8982) | (1.7836) | |
| Constant | -0.5617 | -0.0758 | -0.1999 | -0.4161 | -0.1213 | -0.6907 * | -0.6692 | -0.7345 * | -0.6914 * | -0.6560 | -0.6061 |
| | (-1.5208) | (-0.1531) | (-0.4100) | (-0.8286) | (-0.3030) | (-1.7251) | (-1.6732) | (-1.8773) | (-1.7632) | (-1.6538) | (-1.4480) |
| $R^2$ | 0.2123 | 0.3695 | 0.3513 | 0.2742 | 0.3734 | 0.3207 | 0.3239 | 0.3264 | 0.3392 | 0.3320 | 0.2532 |
| Adj. $R^2$ | 0.0810 | 0.1826 | 0.1591 | 0.0592 | 0.1878 | 0.0490 | 0.0535 | 0.0570 | 0.0749 | 0.0648 | -0.0455 |

Note. OLS regression with t-value in parenthesis; ***/**/* stand for significance at the 1%/5%/10% level.

## Table 4-7 OLS Regression Results (5)

| | (1)<br>NSFR | (2)<br>NSFR | (3)<br>NSFR | (4)<br>NSFR | (5)<br>NSFR | (6)<br>NSFR | (7)<br>NSFR | (8)<br>NSFR | (9)<br>NSFR | (10)<br>NSFR |
|---|---|---|---|---|---|---|---|---|---|---|
| ROA | 13.1334 | 13.3622 | 14.0666 | 12.4825 | 12.6713 | 12.9807 | 15.1343 | 13.7773 | 12.7796 | 13.6543 |
| | (1.3698) | (1.3901) | (1.4714) | (1.3038) | (1.4111) | (1.4900) | (1.5218) | (1.5269) | (1.3800) | (1.5230) |
| NIM | -8.4678 | -8.9983 | -9.4268 | -8.2700 | -9.1427 | -9.1637 | -9.0557 | -9.6214 | -9.2625 | -9.1105 |
| | (-1.2694) | (-1.3571) | (-1.4264) | (-1.2306) | (-1.5245) | (-1.5489) | (-1.3792) | (-1.6211) | (-1.5104) | (-1.5503) |
| NPLC | -0.0035 ** | -0.0035 ** | -0.0034 ** | -0.0035 ** | -0.0024 * | -0.0023 * | -0.0027 * | -0.0022 * | -0.0025 * | -0.0022 * |
| | (-2.6490) | (-2.6655) | (-2.5744) | (-2.5952) | (-1.9670) | (-1.9036) | (-1.9733) | (-1.7769) | (-1.9787) | (-1.8568) |
| FHC | -8.7925 | -8.3180 | -8.6492 | -8.0114 | -6.1927 | -5.0723 | -9.7533 | -3.9345 | -4.7834 | -5.5028 |
| | (-1.6207) | (-1.5602) | (-1.5811) | (-1.4918) | (-1.0932) | (-0.8820) | (-1.6296) | (-0.7465) | (-0.8064) | (-0.9776) |
| LSTD | -7.7324 | -7.3373 | -7.1834 | -5.7202 | -7.4363 | -8.0812 | -11.3147 | -8.5383 | -6.1632 | -9.1932 |
| | (-1.2003) | (-1.0718) | (-1.0387) | (-0.8725) | (-1.1503) | (-1.3351) | (-1.5182) | (-1.2903) | (-0.9378) | (-1.3579) |
| E_1FVTPLFVTOCI | | -1.9834 | -2.1676 | -1.6333 | | | | | | |
| | | (-0.2694) | (-0.2936) | (-0.2211) | | | | | | |
| E_2AFSFVTPL | 1.5749 | | 2.1720 | 1.8745 | | | | | | |
| | (0.3225) | | (0.4541) | (0.3838) | | | | | | |
| E_3CostFVTPL | 3.8076 | 4.1713 | | 2.7321 | | | | | | |
| | (0.5884) | (0.6599) | | (0.4321) | | | | | | |
| E_4CostFVTOCI | 3.2957 | 3.5768 | 2.6261 | | | | | | | |
| | (0.6043) | (0.6580) | (0.4931) | | | | | | | |
| D_1FVTPLFVTOCI | | | | | | -6.5562 | -5.1810 | -11.7393 | -2.4144 | -8.6877 |
| | | | | | | (-0.7790) | (-0.3920) | (-1.0000) | (-0.2188) | (-0.7671) |
| D_2FVTPLAC | | | | | -1.9263 | | 5.4264 | 5.3526 | -0.5587 | 3.0903 |
| | | | | | (-0.2744) | | (0.4908) | (0.5502) | (-0.0576) | (0.3239) |
| D_3AFSFVTPL | | | | | -11.2205 ** | -12.0462 ** | | -12.4084 ** | -10.6979 ** | -11.2626 ** |
| | | | | | (-2.2570) | (-2.4163) | | (-2.5254) | (-2.1118) | (-2.4651) |
| D_4AFSAC | | | | | 3.6947 | 3.1013 | 4.8697 | | 1.2929 | 3.3613 |
| | | | | | (0.7432) | (0.6280) | (0.8804) | | (0.2504) | (0.7408) |
| D_5HTMFVTPL | | | | | 10.5090 | 13.3222 | 10.0162 | 13.8276 | | 15.2286 |
| | | | | | (1.0652) | (1.2811) | (0.8317) | (1.2681) | | (1.3809) |
| D_6HTMFVTOCI | | | | | 0.2013 | 1.1497 | -3.3940 | 3.0743 | 2.4808 | |
| | | | | | (0.0392) | (0.2216) | (-0.6160) | (0.6325) | (0.4434) | |
| Constant | 138.8459 *** | 139.5909 *** | 140.1692 *** | 140.8097 *** | 143.4184 *** | 143.2419 *** | 141.2109 *** | 143.4224 *** | 143.2629 *** | 143.0153 *** |
| | (17.9113) | (18.5291) | (18.6278) | (19.4700) | (22.4752) | (22.7890) | (20.2498) | (22.8805) | (21.8875) | (22.6023) |
| $R^2$ | 0.3368 | 0.3360 | 0.3304 | 0.3291 | 0.4641 | 0.4752 | 0.3588 | 0.4733 | 0.4408 | 0.4763 |
| Adj. $R^2$ | 0.1403 | 0.1393 | 0.1321 | 0.1303 | 0.2497 | 0.2653 | 0.1023 | 0.2626 | 0.2171 | 0.2669 |

Note. OLS regression with t-value in parenthesis; ***/**/* stand for significance at the 1%/5%/10% level.

## Table 4-8 OLS Regression Results (6)

| | (1)<br>ΔNSFR | (2)<br>ΔNSFR | (3)<br>ΔNSFR | (4)<br>ΔNSFR | (5)<br>ΔNSFR | (6)<br>ΔNSFR | (7)<br>ΔNSFR | (8)<br>ΔNSFR | (9)<br>ΔNSFR | (10)<br>ΔNSFR |
|---|---|---|---|---|---|---|---|---|---|---|
| ΔROA | -1.7008 | -0.8705 | -1.7885 | -1.4565 | -1.3213 | -1.4320 | -0.9347 | -0.7645 | -0.6828 | -1.2278 |
| | (-0.4111) | (-0.2248) | (-0.4191) | (-0.3514) | (-0.3361) | (-0.3644) | (-0.2402) | (-0.1985) | (-0.1737) | (-0.3095) |
| ΔNIM | -14.4425 ** | -14.3982 ** | -13.7244 ** | -14.0030 ** | -15.0824 ** | -15.8385 ** | -15.4889 ** | -15.9020 ** | -16.5506 ** | -14.5297 ** |
| | (-2.2656) | (-2.2491) | (-2.1054) | (-2.2204) | (-2.2673) | (-2.3295) | (-2.4309) | (-2.3950) | (-2.4308) | (-2.1929) |
| ΔNPLC | 0.0020 *** | 0.0020 ** | 0.0023 *** | 0.0021 *** | 0.0022 *** | 0.0022 *** | 0.0022 *** | 0.0021 *** | 0.0019 *** | 0.0023 *** |
| | (2.8715) | (2.7553) | (3.4092) | (2.8829) | (3.2519) | (3.1679) | (3.2926) | (2.9534) | (2.7973) | (3.3224) |
| FHC | -4.2057 * | -4.3503 * | -4.1519 * | -4.0140 * | -4.5162 * | -5.0864 * | -4.8709 * | -4.7790 * | -5.2358 * | -4.5474 * |
| | (-1.8654) | (-1.9351) | (-1.7843) | (-1.7931) | (-1.7695) | (-1.8918) | (-1.9695) | (-1.9920) | (-1.9454) | (-1.7360) |
| LSTD | -2.8562 | -2.4049 | -2.8763 | -2.3068 | -3.1440 | -3.4699 | -2.2533 | -2.0677 | -1.4165 | -2.5344 |
| | (-1.0024) | (-0.8011) | (-0.9191) | (-0.7962) | (-1.0642) | (-1.2162) | (-0.7415) | (-0.6954) | (-0.4877) | (-0.8167) |
| E_1FVTPLFVTOCI | | -0.4369 | -0.5285 | -0.3764 | | | | | | |
| | | (-0.1349) | (-0.1596) | (-0.1165) | | | | | | |
| E_2AFSFVTPL | -1.1083 | | -0.4400 | -0.9748 | | | | | | |
| | (-0.4974) | | (-0.1985) | (-0.4410) | | | | | | |
| E_3CostFVTPL | 3.5868 | 3.2174 | | 3.2142 | | | | | | |
| | (1.2209) | (1.1249) | | (1.1441) | | | | | | |
| E_4CostFVTOCI | 0.9953 | 0.8313 | 0.1048 | | | | | | | |
| | (0.4040) | (0.3393) | (0.0434) | | | | | | | |
| D_1FVTPLFVTOCI | | | | | | 1.3192 | 4.5780 | 4.4197 | 7.5961 | 2.7984 |
| | | | | | | (0.3143) | (0.8149) | (0.7991) | (1.4569) | (0.5123) |
| D_2FVTPLAC | | | | | -1.4553 | | -4.3173 | -3.7400 | -5.6364 | -2.9051 |
| | | | | | (-0.4445) | | (-0.9516) | (-0.8598) | (-1.2981) | (-0.6557) |
| D_3AFSFVTPL | | | | | 0.4703 | 1.0892 | | 0.7954 | 1.5344 | -0.2340 |
| | | | | | (0.1846) | (0.4130) | | (0.3145) | (0.5952) | (-0.0998) |
| D_4AFSAC | | | | | 0.3785 | 0.3804 | 0.8147 | | 0.6519 | -0.2159 |
| | | | | | (0.1588) | (0.1584) | (0.3391) | | (0.2647) | (-0.0978) |
| D_5HTMFVTPL | | | | | 6.9629 | 6.4260 | 5.2246 | 4.3890 | | 4.3156 |
| | | | | | (1.4663) | (1.2678) | (1.0093) | (0.8429) | | (0.8034) |
| D_6HTMFVTOCI | | | | | -1.9117 | -2.0986 | -2.3182 | -2.2767 | -2.6161 | |
| | | | | | (-0.7724) | (-0.8157) | (-0.9892) | (-0.9805) | (-0.9790) | |
| Constant | -0.1070 | -0.4086 | 0.8480 | 0.4653 | 0.9995 | 0.9004 | 1.0653 | 1.0182 | 0.8096 | 0.7419 |
| | (-0.0440) | (-0.1724) | (0.3593) | (0.2353) | (0.5436) | (0.4882) | (0.5979) | (0.5646) | (0.4405) | (0.4021) |
| $R^2$ | 0.4823 | 0.4779 | 0.4542 | 0.4794 | 0.5123 | 0.5104 | 0.5243 | 0.5240 | 0.5118 | 0.5059 |
| Adj. $R^2$ | 0.3288 | 0.3232 | 0.2925 | 0.3251 | 0.3173 | 0.3146 | 0.3340 | 0.3336 | 0.3166 | 0.3082 |

Note. OLS regression with t-value in parenthesis; ***/**/* stand for significance at the 1%/5%/10% level.

## Table 4-9 OLS Regression Results (7)

| | (1)<br>LCR | (2)<br>LCR | (3)<br>LCR | (4)<br>LCR | (5)<br>LCR | (6)<br>LCR | (7)<br>LCR | (8)<br>LCR | (9)<br>LCR | (10)<br>LCR |
|---|---|---|---|---|---|---|---|---|---|---|
| ROA | -68.9828 | -72.4316 | -68.2370 | -74.1051 | -69.8798 | -69.4093 | -57.3699 | -60.9538 | -73.0034 | -59.9873 |
| | (-1.4508) | (-1.5595) | (-1.4774) | (-1.6189) | (-1.6065) | (-1.6572) | (-1.2814) | (-1.4234) | (-1.4758) | (-1.4037) |
| NIM | 14.5162 | 16.3230 | 14.4911 | 19.7529 | 7.4638 | 7.7221 | 6.7632 | 5.9622 | 7.0543 | 4.5877 |
| | (0.4388) | (0.5095) | (0.4539) | (0.6147) | (0.2569) | (0.2715) | (0.2288) | (0.2117) | (0.2153) | (0.1638) |
| NPLC | -0.0075 | -0.0048 | -0.0047 | -0.0058 | -0.0038 | -0.0033 | -0.0037 | -0.0019 | -0.0057 | -0.0016 |
| | (-1.1439) | (-0.7658) | (-0.7392) | (-0.8868) | (-0.6522) | (-0.5681) | (-0.6011) | (-0.3277) | (-0.8477) | (-0.2730) |
| FHC | -55.1494 * | -55.0223 ** | -57.9220 ** | -57.1500 ** | -47.3678 * | -39.4375 | -54.1150 * | -40.9848 | -36.3632 | -38.2365 |
| | (-2.0500) | (-2.1359) | (-2.1917) | (-2.2257) | (-1.7262) | (-1.4264) | (-2.0084) | (-1.6387) | (-1.1476) | (-1.4252) |
| LSTD | -24.8281 | -42.3104 | -40.7753 | -38.3306 | -31.2605 | -33.5081 | -50.7006 | -45.4174 | -11.5512 | -45.2469 |
| | (-0.7772) | (-1.2790) | (-1.2204) | (-1.2228) | (-0.9982) | (-1.1515) | (-1.5111) | (-1.4463) | (-0.3290) | (-1.4021) |
| E_1FVTPLFVTOCI | | 46.2183 | 45.2082 | 47.0807 | | | | | | |
| | | (1.2993) | (1.2674) | (1.3330) | | | | | | |
| E_2AFSFVTPL | 12.5813 | | 17.1438 | 13.7336 | | | | | | |
| | (0.5196) | | (0.7419) | (0.5881) | | | | | | |
| E_3CostFVTPL | 20.6049 | 26.8573 | | 21.5594 | | | | | | |
| | (0.6421) | (0.8793) | | (0.7132) | | | | | | |
| E_4CostFVTOCI | 6.9426 | 6.2943 | -0.0271 | | | | | | | |
| | (0.2567) | (0.2396) | (-0.0011) | | | | | | | |
| D_1FVTPLFVTOCI | | | | | | -39.5012 | -55.7591 | -69.4592 | 9.2734 | -76.9895 |
| | | | | | | (-0.9763) | (-0.9371) | (-1.2467) | (0.1574) | (-1.4262) |
| D_2FVTPLAC | | | | | -6.1197 | | 40.2059 | 34.8999 | -12.3456 | 40.2884 |
| | | | | | (-0.1799) | | (0.8078) | (0.7559) | (-0.2382) | (0.8860) |
| D_3AFSFVTPL | | | | | -31.7800 | -37.7694 | | -36.3075 | -23.9282 | -39.5312 * |
| | | | | | (-1.3196) | (-1.5758) | | (-1.5571) | (-0.8843) | (-1.8153) |
| D_4AFSAC | | | | | 5.2090 | 1.9718 | 4.4891 | | -16.0169 | -5.7155 |
| | | | | | (0.2163) | (0.0831) | (0.1803) | | (-0.5807) | (-0.2643) |
| D_5HTMFVTPL | | | | | 124.1574 ** | 141.0430 *** | 139.8536 ** | 155.9321 *** | | 153.5109 *** |
| | | | | | (2.5978) | (2.8211) | (2.5795) | (3.0133) | | (2.9205) |
| D_6HTMFVTOCI | | | | | -18.8509 | -13.4146 | -23.5675 | -8.7212 | -0.6439 | |
| | | | | | (-0.7574) | (-0.5378) | (-0.9501) | (-0.3781) | (-0.0215) | |
| Constant | 200.9503 *** | 202.8326 *** | 204.9353 *** | 200.1409 *** | 228.1113 *** | 227.5260 *** | 219.1951 *** | 223.8062 *** | 228.3209 *** | 223.7815 *** |
| | (5.2275) | (5.5720) | (5.6373) | (5.7879) | (7.3795) | (7.5294) | (6.9820) | (7.5236) | (6.5303) | (7.4199) |
| $R^2$ | 0.2879 | 0.3231 | 0.3176 | 0.3302 | 0.4508 | 0.4703 | 0.4325 | 0.4820 | 0.3033 | 0.4805 |
| Adj. $R^2$ | 0.0768 | 0.1225 | 0.1154 | 0.1317 | 0.2312 | 0.2584 | 0.2055 | 0.2748 | 0.0246 | 0.2727 |

Note. OLS regression with t-value in parenthesis; ***/**/* stand for significance at the 1%/5%/10% level.

## Table 4-10 OLS Regression Results (8)

| | (1)<br>ΔLCR | (2)<br>ΔLCR | (3)<br>ΔLCR | (4)<br>ΔLCR | (5)<br>ΔLCR | (6)<br>ΔLCR | (7)<br>ΔLCR | (8)<br>ΔLCR | (9)<br>ΔLCR | (10)<br>ΔLCR |
|---|---|---|---|---|---|---|---|---|---|---|
| ΔROA | -122.6600 * | -120.4355 ** | -122.0543 * | -123.5473 ** | -135.9743 ** | -137.4967 ** | -136.1729 ** | -135.0803 ** | -135.3001 ** | -136.5813 ** |
| | (-2.0491) | (-2.1589) | (-2.0296) | (-2.0642) | (-2.4059) | (-2.4459) | (-2.3969) | (-2.4125) | (-2.3924) | (-2.4079) |
| ΔNIM | -20.5991 | -20.3719 | -19.4662 | -24.2853 | -40.3831 | -32.8549 | -15.4370 | -27.4621 | -33.8527 | -43.6355 |
| | (-0.2233) | (-0.2209) | (-0.2119) | (-0.2666) | (-0.4223) | (-0.3378) | (-0.1660) | (-0.2845) | (-0.3455) | (-0.4607) |
| ΔNPLC | 0.0005 | 0.0002 | 0.0007 | -0.0001 | 0.0004 | 0.0013 | 0.0033 | 0.0013 | 0.0004 | 0.0002 |
| | (0.0486) | (0.0157) | (0.0736) | (-0.0074) | (0.0438) | (0.1303) | (0.3402) | (0.1312) | (0.0358) | (0.0157) |
| FHC | 36.9800 | 37.1006 | 37.4545 | 35.9795 | 20.9354 | 25.4543 | 33.2700 | 30.8529 | 25.8188 | 21.2094 |
| | (1.1337) | (1.1457) | (1.1423) | (1.1129) | (0.5706) | (0.6618) | (0.9215) | (0.8847) | (0.6667) | (0.5663) |
| LSTD | 32.3034 | 34.9511 | 34.1640 | 30.7731 | 15.0327 | 11.0701 | 12.1040 | 13.2229 | 17.1991 | 11.2025 |
| | (0.7835) | (0.8082) | (0.7747) | (0.7354) | (0.3540) | (0.2712) | (0.2729) | (0.3059) | (0.4115) | (0.2525) |
| E_1FVTPLFVTOCI | | -6.1799 | -6.3051 | -6.7248 | | | | | | |
| | | (-0.1324) | (-0.1351) | (-0.1441) | | | | | | |
| E_2AFSFVTPL | -2.0365 | | -1.1231 | -3.2391 | | | | | | |
| | (-0.0632) | | (-0.0359) | (-0.1015) | | | | | | |
| E_3CostFVTPL | 5.0212 | 4.2282 | | 8.1642 | | | | | | |
| | (0.1181) | (0.1026) | | (0.2012) | | | | | | |
| E_4CostFVTOCI | -9.3240 | -9.4373 | -10.3459 | | | | | | | |
| | (-0.2616) | (-0.2674) | (-0.3042) | | | | | | | |
| D_1FVTPLFVTOCI | | | | | | -28.9729 | -43.8168 | -40.4020 | -13.9693 | -17.7531 |
| | | | | | | (-0.4826) | (-0.5343) | (-0.5025) | (-0.1862) | (-0.2273) |
| D_2FVTPLAC | | | | | -14.0032 | | 3.1722 | 9.6584 | -6.4586 | -4.7885 |
| | | | | | (-0.2975) | | (0.0479) | (0.1527) | (-0.1034) | (-0.0756) |
| D_3AFSFVTPL | | | | | 24.1574 | 20.4887 | | 17.7433 | 24.1632 | 28.4177 |
| | | | | | (0.6596) | (0.5431) | | (0.4826) | (0.6514) | (0.8473) |
| D_4AFSAC | | | | | 15.5138 | 11.9096 | 6.7918 | | 8.3454 | 19.0896 |
| | | | | | (0.4529) | (0.3466) | (0.1937) | | (0.2355) | (0.6048) |
| D_5HTMFVTPL | | | | | 22.5333 | 34.7218 | 44.6996 | 31.8481 | | 39.0289 |
| | | | | | (0.3301) | (0.4788) | (0.5915) | (0.4208) | | (0.5082) |
| D_6HTMFVTOCI | | | | | 11.6381 | 16.6712 | 27.0070 | 23.1300 | 18.8041 | |
| | | | | | (0.3271) | (0.4530) | (0.7894) | (0.6853) | (0.4890) | |
| Constant | -36.8148 | -37.4966 | -35.6420 | -42.2128 | -52.3796 * | -51.8613 * | -49.0272 * | -50.8059 * | -52.7051 * | -50.7890 * |
| | (-1.0470) | (-1.0984) | (-1.0718) | (-1.4778) | (-1.9819) | (-1.9657) | (-1.8849) | (-1.9379) | (-1.9933) | (-1.9254) |
| $R^2$ | 0.2260 | 0.2264 | 0.2261 | 0.2246 | 0.2804 | 0.2845 | 0.2761 | 0.2817 | 0.2782 | 0.2788 |
| Adj. $R^2$ | -0.0034 | -0.0029 | -0.0032 | -0.0051 | -0.0075 | -0.0017 | -0.0135 | -0.0056 | -0.0105 | -0.0097 |

Note. OLS regression with t-value in parenthesis; ***/**/* stand for significance at the 1%/5%/10% level.

## 4.4 SUMMARY OF MAJOR RESULTS

The study examines bank capital and liquidity defined by Basel 3 and incorporates the effects of reclassification in instruments held by bank following implementation of the IFRS 9 from both static and dynamic perspectives. This study also intends to extend previous literature with comprehensive analysis of banks variables covering the bank profitability, credit management, and bank characters. Major empirical findings are summarized in four points.

First, we find the static and dynamic relationship between liquidity and bank capital defined by Basel 3 after the implementation of IFRS 9. An increase in bank capital significantly reduces long-term liquidity rather than short-term liquidity. This relation is distinct from the static view. Banks with higher capital tend to take more liquidity risk as bank capital can not only absorb risks but also expand risk tolerance, which appears consistent with the risk absorption hypothesis in literature.

Second, CAR only positively affects short-term liquidity from the static view. Banks with a higher level of CAR exhibit lower short-term liquidity risk. Banks with higher capital tend to take less liquidity risk in the short term, which appears consistent with the financial-fragility-crowding-out hypothesis in literature. In other words, banks raising regulatory capital tend to create a negative effect on liquidity creation, further reducing liquidity risk.

Third, implementation of IFRS 9 creates an impact on CAR defined by Basel 3 in a dynamic way. The relationships apply to asset reclassification for both equity instruments and debt instruments. There is however no significant correlation over all benchmarks in the static view after the implementation of IFRS 9.

Fourth, it is found that there are significant reclassification effects on liquidity defined by Basel 3 only for debt instruments from a static perspective. There is a lack of dynamic explanatory power of IFRS 9 implementation for both short-term liquidity and long-term liquidity, partially due to insufficient banks in our sample.

# 5. CONCLUSION

The recent global financial crisis has raised issues on regulatory capital and liquidity for banks worldwide. Basel 3 not only increases minimum capital requirements to respond to emergencies and promote financial stability, but also incorporates regulations for short-term liquidity and long-term liquidity against liquidity risks. Liquidity and capital requirements not only aim to deal with two different problems in banking management but concern the balance sheet on two sides. More specifically, capital regulations require banks to raise own capital with more investment in riskier position in term of asset-substitution risk. However, liquidity regulations manage risk on highly liquid liabilities that finance relatively illiquid assets. Moreover, capital and liquidity may interact together with the accounting standard IFRS 9.

This study empirically examines implementation of Basel 3 and IFRS 9 in Taiwan's banking industry and attempts to understand the relations between bank capital and liquidity and asset reclassification in compliance with the new IFRS 9. The sample period in this study ranges from 2017 to 2018 when the IFRS 9 and Basel 3 were introduced. The sample covers 36 domestic listed and unlisted commercial banks in Taiwan. Major empirical findings are as follows.

First, we capture the relation between bank long-term liquidity and capital defined by Basel 3 after the implementation of IFRS 9 only at the dynamic level. This relation is consistent with the risk absorption hypothesis in past literature.

Second, we substantiate the relation between bank short-term liquidity and capital defined by Basel 3 after the implementation of IFRS 9, however at the static level. This relation appears consistent with the financial-fragility-crowding-out hypothesis in past literature.

Third, we find that the implementation of IFRS 9 creates a dynamic impact on bank capital defined by Basel 3 and this impact applies to asset reclassification for both equity and debt instruments. From the static view, this impact is insignificant.

Lastly, there appears a significant reclassification effect on bank liquidity defined by Basel 3. But this effect is present at the static level and applies only to debt instruments. A lack of dynamic explanatory power of IFRS 9 implementation for both short-term liquidity and long-term liquidity may be partially due to the insufficient number of banks analyzed in our sample. Our empirical findings serve to provide implications for relevant policy-maker and standard setters.

The study is subject to certain limitations, though. For instance, the data are limited to a few years of observations and the sample covers banks in Taiwan only. In addition, the sample selected in this study only covers public commercial banks in Taiwan and excludes other types of financial institutions in the financial industry. Therefore, we suggest that subsequent research may broaden horizons to other financial services such as insurance companies, securities and futures companies, and FHCs in order to help relevant policy-maker and standard setters better understand risk management and information disclosure across the overall financial system. Future extension to the topics explored by this paper may consider cross-country analysis of banks subject to both Basel 3 and IFRS 9 and examine additional effects of non-bank variables over time.

# APPENDIX

## Components of Net Stable Funding Ratio (NSFR) by Basel 3

| Available Stable Funding (ASF) | | Required Stable Funding (RSF) | |
|---|---|---|---|
| **Item** | **Factor** | **Item** | **Factor** |
| Total regulatory capital ex Tier-2 instruments with residual maturity of less than 1 year<br>Other capital instruments and liabilities with effective residual maturity of one year or more | 100 % | 1. Coins and banknotes<br>2. All central bank reserves<br>3. All claims on central banks with residual maturities of less than six months<br>4. "Trade date" receivables arising from sales of financial instruments, foreign currencies and commodities | 0 % |
| Stable demand deposits and term deposits provided by retail and small business customers (non-maturity or residual maturity less than 1 year) | 95 % | Unencumbered Level 1 assets, excluding coins, banknotes and central bank reserves | 5 % |
| | | Unencumbered loans to financial institutions with residual maturities of less than six months, where the loan is secured against Level 1 assets as defined in LCR paragraph 50, and where the bank has the ability to freely rehypothecate the received collateral for the life of the loan | 10 % |
| Less stable deposits of retail and small business customers (non-maturity or residual maturity less than 1 year) | 90 % | 1. All other unencumbered loans to financial institutions with residual maturities of less than six months not included in the above categories<br>2. Unencumbered Level 2A assets | 15 % |
| 1. Operational deposits<br>2. Funding with residual maturity of less than one year provided by non-financial corporate customers, sovereigns, public sector entities (PSEs), multilateral and national development banks<br>3. Other funding with residual maturity between six months and less than one year not included in the above categories, including funding provided by central banks and financial institutions | 50 % | 1. Unencumbered Level 2B assets<br>2. HQLA encumbered for a period of six months or more and less than one year<br>3. Loans to financial institutions and central banks with residual maturities between six months and less than one year<br>4. Deposits held at other financial institutions for operational purposes<br>5. All other assets not included in the above categories with residual maturity of less than one year, including loans to non-financial corporate clients, loans to retail and small business customers, and loans to sovereigns and PSEs | 50 % |
| 1. All other liabilities and equity not included in the above categories, including liabilities without a stated maturity (with a specific treatment for deferred tax liabilities and minority interests)<br>2. NSFR derivative liabilities net of NSFR derivative assets if NSFR derivative liabilities are greater than NSFR derivative assets<br>3. "Trade date" payables arising from purchases of financial instruments, foreign currencies and commodities | 0 % | 1. Unencumbered residential mortgages with a residual maturity of one year or more and with a risk weight of less than or equal to 35% under the Standardized Approach<br>2. Other unencumbered loans not included in the above categories, excluding loans to financial institutions, with a residual maturity of one year or more and with a risk weight of less than or equal to 35% under the standardized approach | 50 % |

Source: Bank for International Settlements.

## Components of Net Stable Funding Ratio (NSFR) by Basel 3 (Continued)

| Available Stable Funding (ASF) | | Required Stable Funding (RSF) | |
|---|---|---|---|
| Item | Factor | Item | Factor |
| | | 1. Cash, securities or other assets posted as initial margin for derivative contracts and cash or other assets provided to contribute to the default fund of a CCP<br>2. Other unencumbered performing loans with risk weights greater than 35% under the standardized approach and residual maturities of one year or more, excluding loans to financial institutions<br>3. Unencumbered securities that are not in default and do not qualify as HQLA with a remaining maturity of one year or more and exchange-traded equities<br>4. Physical traded commodities, including gold | 85 % |
| | | 1. Other loans to retail clients and small business having a maturity less than 1 year<br>2. All assets that are encumbered for a period of one year or more; NSFR derivative assets net of NSFR derivative liabilities if NSFR derivative assets are greater than NSFR derivative liabilities<br>3. 20% of derivative liabilities as calculated according to paragraph 19<br>4. All other assets not included in the above categories, including non-performing loans, loans to financial institutions with a residual maturity of one year or more, non-exchange-traded equities, fixed assets, items deducted from regulatory capital, retained interest, insurance assets, subsidiary interests and defaulted securities | 100 % |

Source: Bank for International Settlements.

# REFERENCES


Allen, F. and D. Gale. 2004. Financial Intermediaries and Markets. *Econometrica* 72 (4):1023-1061.

Basel Committee of Banking Supervision (BCBS). 2014. Basel III: the Net Stable Funding Ratio.

Basel Committee of Banking Supervision (BCBS). 2017. Basel III: Finalising Post-crisis Reforms

Beatty, A. 1995. The effects of fair value accounting on investment portfolio. *Review-Federal Reserve Bank of St. Louis* 77 (1):25.

Beatty, A., S. L. Chamberlain and J. Magliolo. 1995. Managing Financial Reports of Commercial Banks: The Influence of Taxes, Regulatory Capital, and Earnings. *Journal of Accounting Research* 33 (2):231-261.

Berger, A. N. 1995. The Relationship between Capital and Earnings in Banking. *Journal of Money, Credit and Banking* 27 (2):432-456.

Berger, A. N. and C. H. S. Bouwman. 2009. Bank Liquidity Creation. *The Review of Financial Studies* 22 (9):3779-3837.

Bernanke, B. S. 1983. Nonmonetary Effects of the Financial Crisis in the Propagation of the Great Depression. *The American Economic Review* 73 (3):257-276.

Bourke, P. 1989. Concentration and other determinants of bank profitability in Europe, North America and Australia. *Journal of Banking & Finance* 13 (1):65-79.

Brissimis, S. N., M. D. Delis and N. I. Papanikolaou. 2008. Exploring the nexus between banking sector reform and performance: Evidence from newly acceded EU countries. *Journal of Banking & Finance* 32 (12):2674-2683.

Caprio, G. and D. Klingebiel. 1996. Bank insolvency: bad luck, bad policy, or bad banking? Paper read at Annual World Bank conference on development economics.

Collins, J. H., D. A. Shackelford and J. M. Wahlen. 1995. Bank Differences in the Coordination of Regulatory Capital, Earnings, and Taxes. *Journal of Accounting Research* 33 (2):263-291.

Deep, A. and G. Schaefer. 2004. Are Banks Liquidity Transformers? In *Working Paper Series*.

Demirgüç-Kunt, A. and H. Huizinga. 2000. Financial structure and bank profitability.

Dewatripont, M. and J. Tirole. 1994. A theory of debt and equity: Diversity of securities and manager-shareholder congruence. *The Quarterly Journal of Economics* 109 (4):1027-1054.

Diamond, D. W. and P. H. Dybvig. 1983. Bank Runs, Deposit Insurance, and Liquidity. *Journal of Political Economy* 91 (3):401-419.

Diamond, D. W. and R. G. Rajan. 2001. Liquidity Risk, Liquidity Creation, and Financial Fragility: A Theory of Banking. *Journal of Political Economy* 109 (2):287-327.

Drehmann, M. and K. Nikolaou. 2013. Funding liquidity risk: Definition and measurement. *Journal of Banking & Finance* 37 (7):2173-2182.

Fiechter, P. 2011. Reclassification of financial assets under IAS 39: Impact on European banks' financial statements. *Accounting in Europe* 8 (1):49-67.

Giordana, G. and I. Schumacher. 2011. The impact of the Basel III liquidity regulations on the bank lending channel: A Luxembourg case study: Central Bank of Luxembourg.

Giordana, G. and I. Schumacher. 2013. What are the bank-specific and macroeconomic drivers of banks' leverage? Evidence from Luxembourg. *Empirical Economics* 45 (2):905-928.

Godwin, N., K. Petroni and J. Wahlen. 1998. Fair Value Accounting for Property-Liability Insurers and Classification Decisions under FAS 115. *Journal of Accounting, Auditing & Finance* 13 (3):207-239.

Gorton, G. and A. Winton. 2017. Liquidity Provision, Bank Capital, and the Macroeconomy. *Journal of Money Credit and Banking* 49 (1):5-37.

Harris, T. S., U. Khan and D. Nissim. 2018. The Expected Rate of Credit Losses on Banks' Loan Portfolios. *Accounting Review* 93 (5):245-271.
Hassan, M. K. and A.-H. M. Bashir. 2003. Determinants of Islamic banking profitability. Paper read at 10th ERF annual conference, at Morocco.
Haynes, J. 1895. Risk as an Economic Factor. *The Quarterly Journal of Economics* 9 (4):409-449.
Hodder, L., M. Kohlbeck and M. L. McAnally. 2002. Accounting choices and risk management: SFAS No. 115 and US bank holding companies. *Contemporary Accounting Research* 19 (2):225-270.
Hong, H., J. Z. Huang and D. M. Wu. 2014. The information content of Basel III liquidity risk measures. *Journal of Financial Stability* 15:91-111.
Iannotta, G., G. Nocera and A. Sironi. 2007. Ownership structure, risk and performance in the European banking industry. *Journal of Banking & Finance* 31 (7):2127-2149.
Ivancevich, D., A. F. Cocco and S. Ivancevich. 1996. The Effect of SFAS No. 115 on Financial Statement Analysis. *The Ohio CPA Journal* 55 (4):32-37.
Jordan, C. E., S. J. Clark and W. R. Smith. 1998. Earnings management under SFAS No. 115: Evidence from the insurance industry. *Journal of Applied Business Research* 14:49-56.
Kholmy, K. and J. Ernstberger. 2010. Reclassification of financial instruments in the financial crisis–Empirical evidence from the European banking sector.
Lee, Y. J., K. R. Petroni and M. Shen. 2006. Cherry picking, disclosure quality, and comprehensive income reporting choices: The case of property-liability insurers. *Contemporary Accounting Research* 23 (3):655-692.
Lifschutz, S. 2002. The effect of SFAS 115 on earnings management in the banking industry. *Journal of Applied Business Research* 18 (4):1-12.
Molyneux, P. and J. Thornton. 1992. Determinants of European bank profitability: A note. *Journal of Banking & Finance* 16 (6):1173-1178.
Paananen, M., A. Renders and K. M. Shima. 2012. The Amendment of IAS 39:Determinants of Reclassification Behavior and Capital Market Consequences. *Journal of Accounting, Auditing & Finance* 27 (2):208-235.
Repullo, R. 2004. Capital requirements, market power, and risk-taking in banking. *Journal of Financial Intermediation* 13 (2):156-182.
Rivard, R. J. and C. R. Thomas. 1997. The effect of interstate banking on large bank holding company profitability and risk. *Journal of Economics Business* 49 (1):61-76.
Roy, A. D. 1952. Safety First and the Holding of Assets. *Econometrica* 20 (3):431-449.
Wagner, W. 2007. The liquidity of bank assets and banking stability. *Journal of Banking & Finance* 31 (1):121-139.
Wampler, B. M. and T. J. Phillips, Jr. 1994. A case for fair value accounting for debt securities. *Strategic Finance* 75 (9):46-46.