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Bank Capital Management: An Examination of Loan Loss Provisions under Regulatory Pressure

An empirical study of the Nordic banking sector

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Master thesis in Business Analysis and Performance Management

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June 17th, 2016

Abstract

We study whether and how capital regulation affects banks' loan loss provisions. Using handpicked data on 46 Nordic banks, we find that banks use discretion to reduce loan loss provisions for regulatory capital management purposes. Exercising discretion to reduce provisions shifts capital from the expected loss buffer to the unexpected loss buffer at the expense of banks' overall ability to absorb loan losses. Controlling for non-discretionary determinants of loan loss provisions, we find that banks reduce provisions when an increase in capital requirements puts pressure on eligible capital for regulatory purposes. Additionally, we find that banks' regulatory capital position influences provisioning behavior. We show that a stronger regulatory capital position coming into the year yields higher levels of loan loss provisions, while an improvement in regulatory capital position during the year constitutes a reduction in loan loss provisions. When studying SIFI-banks and IRB-banks, we find no evidence indicating that newly enacted regulations are effective in limiting discretionary provisions for regulatory purposes. Our analyses indicate that banks exercise discretionary provisioning behavior when circumventing regulatory capital requirements.

Keywords: Banks, Bank regulation, Loan loss provisions, Basel capital requirements.

Preface

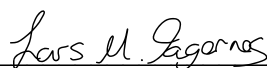
This thesis is written as a part of the master program in Economics and Business Administration at the Norwegian School of Economics. It comprises 30 credits of our major in Business Analysis and Performance Management.

The process of writing this thesis has been both educational and challenging. In addition to applying knowledge from previous studies, we have used this opportunity to expand our understanding within the field of bank capital regulation and econometrics. The study has provided us with useful experience, likely to be beneficial in our future work.

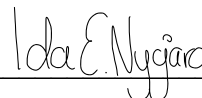
We contribute to the literature on bank capital regulation and regulatory capital management by studying banks' provisioning behavior from a Nordic perspective. Knowledge on these topics is relevant for effective regulatory supervision and development of appropriate accounting standards. We find regulatory capital management to be of current interest, as newly enacted regulations have been, and will be, shaping the banking industry in the 21st century.

We are thankful for the constructive feedback and advice we have received from friends and family while writing this thesis. We extend our gratitude to our supervisor, Professor Konrad Raff. While encouraging us to work independently, Professor Raff has provided illuminating discussions and guidance with his knowledge. Nevertheless, this thesis is written solely by us, thus making all potential errors our own.

Oslo, June 17th, 2016



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“As the financial crisis of 2007-2008 has compellingly shown, highly indebted financial institutions create negative externalities that can greatly harm the economy and society. When a bank has little equity that can absorb losses, even a small decrease in asset value can lead to distress and potential insolvency. In a deeply interconnected financial system, this can cause the system to freeze, ultimately leading to severe repercussions for the rest of the economy.”

Admati, DeMarzo, Hellwig, and Pfleiderer (2013, p. i)

1.0 Introduction

The objective of bank regulation is to ensure financial stability by enhancing the solidity and liquidity of the banking sector. The regulatory frameworks imposed upon banks by the Basel Committee on Banking Supervision have seemingly strengthened banks' capital positions. Higher capitalized banks are better able to handle downturns, thus the likelihood, and potential impact, of financial crises occurring in the future is reduced. Previous research document how bank capital regulation influences banks' economic behavior. We add to this research by examining how banks' accounting choices change in response regulatory pressure imposed by bank capital regulation. We seek to answer the following research question: *How does regulatory pressure affect loan loss provisions in Nordic banks?*

Loan loss provisions, accumulated in the allowance account, comprise banks' defense against expected losses. Eligible capital for regulatory purposes, consisting of i.e. retained earnings and shareholder equity, is necessary to maintain solvency in periods when unexpected losses cause a hit to capital. Loan loss provisions ultimately reduce eligible capital, as an increase in loan loss provisions will decrease earnings before taxes on a dollar-for-dollar basis. We hypothesize that this trade-off incentivizes banks to reduce loan loss provisions for regulatory purposes. Reducing provisions will inflate eligible capital set aside to cover unexpected losses at the expense of the allowance account for expected losses. If pressure on eligible capital is met by reducing provisions, risk-based capital ratios will improve while banks' overall solidity is unaffected. Banks appear to be better capitalized, but the overall loss buffer is unchanged. Thus, the trade-off creates a regulatory arbitrage through loan loss provisions.

Using a handpicked dataset containing annual data on 46 listed Nordic banks in the period 2005 to 2014, we investigate whether and how Nordic banks exercise discretion for regulatory purposes when accounting for loan losses. We believe that higher capital requirements will

come at the expense of banks creating generally lower, and potentially insufficient, loan loss provisions. We run fixed effects regressions with standard errors clustered at bank level to examine whether capital requirements and banks' capital position influence discretionary loan loss provisions. To examine the robustness of our findings, we provide results from three models of discretionary loan loss provisions used in previous literature. Furthermore, we conduct analyses on banks granted to use internal models to calculate credit risk, as well as banks defined as systemic important. These analyses provide additional insights into the effectiveness of regulatory frameworks in limiting discretionary provisioning behavior.

We find that banks use discretion to reduce loan loss provisions for regulatory capital management purposes. Controlling for non-discretionary determinants of loan loss provisions, we find that banks reduce provisions when an increase in capital requirements puts pressure on eligible capital for regulatory purposes. Additionally, we find that banks' regulatory capital position influences provisioning behavior. We show that a stronger regulatory capital position coming into the year yields higher levels of loan loss provisions, while an improvement in regulatory capital position during the year constitutes a reduction in loan loss provisions. When studying SIFI-banks and IRB-banks, we find no evidence indicating that newly enacted regulations are effective in limiting discretionary provisions for regulatory purposes. Our analyses indicate that banks' exercise discretionary provisioning behavior when circumventing regulatory capital requirements.

To our knowledge, this study is the first to investigate how discretionary loan loss provisions are used for regulatory purposes in Nordic banks. Our findings provide valuable understanding for regulators on the effectiveness of current frameworks and provide insights into bank behavior following regulatory pressure. We contribute to the research on capital management and loan loss provisions by comparing results from three loan loss provisioning discretion models, highlighting the implications of applying various models. Based on our findings, we discuss loan loss provisions in a forward-looking perspective commenting on implications of future regulations.

The remainder of the paper is organized as follows. In section 2 we provide a brief overview of the basic characteristics of financial institutions. In section 3 we describe the regulatory frameworks governing European banks, while section 4 describes the Nordic banking sector. Section 5 provides an extensive discussion of the regulatory trade-off of loan loss provisions. In section 6 we provide a review of previous literature and methodology, and section 7 outlines our hypotheses. In section 8 we present the data and collection process, followed by

the chosen methodology in section 9. Section 10 provides regression results and analyses. In section 11 we provide a forward-looking perspective on loan loss provisions and regulations, while section 12 addresses limitations and weaknesses. Lastly, section 13 concludes.

2.0 Characteristics of banks

Financial institutions are entities that intermediate between providers and users of capital (Greenbaum, Thakor, & Boot, 2016). Banks are one of several types of financial institutions, and perform two main activities: brokerage and qualitative asset transformation. When banks are involved in brokerage, they bring together financial transactors with complementary needs. By exploiting an information advantage, they serve as a matchmaker for borrowers and lenders. Banks' ability to reuse information about clients and form long-term relationships reduces problems of duplicated screening, adverse selection and moral hazard (Greenbaum, Thakor, & Boot, 2016). Quantitative asset transformation is exerted when banks transform the maturity and size of deposits, as wants and needs of depositors and borrowers rarely coincide. Deposits are usually small, divisible and liquid, while loans typically are large, indivisible and illiquid.

2.1 Balance sheet and income statement

Banks' financial statements differ from those of non-financial firms. A balance sheet comparison is shown in Figure 1. Net loans and leases usually constitute between 60-70% of banks' assets (Beatty & Liao, 2014), and comprise of claims on clients' future cash flows. The allowance account for loan losses constitutes capital set aside for expected loan losses and is netted against the value of loans and leases. In contrast, non-financial firms usually hold physical or intangible assets, such as property, plant and equipment, inventory and patents. On the liability side of the balance sheet, both banks and non-financial firms are financed by debt and equity. However, banks tend to have higher leverage ratios (Berg & Gider, 2016). Customer deposits are the main financing source of banks, often constituting around 70% of the funding. Non-financial firms have on average about 50% equity financing, while current and long-term liabilities comprise the debt financing (Berg & Gider, 2016).

An income statement comparison is shown in Figure 2. Banks' main source of revenue is net interest income. It constitutes the spread between interest received from borrowers and interest paid to depositors. Non-interest income includes fees on transactions and loan commitments, while non-interest expenses are related to operational costs. Provisions for loan losses represent the impaired value of the loan portfolio during a given period and can constitute a large expense, especially in periods of economic downturn. The annual provisions are withdrawn from earnings and accumulated in the allowance account to serve as a buffer against expected loan losses. Non-financial firms receive most of their income from the sale

of goods and services. Cost of goods sold constitute the main expense, together with operating expenses such as salaries, sales, general and administrative costs and impairments. Taxes are treated the same way for both financial and non-financial firms.

Figure 1: Balance sheet comparison

This figure shows a stylized comparison of the balance sheet of banks and non-financial firms, respectively.

Banks		Non-financial firms	
Assets	Liabilities	Assets	Liabilities
Net loans and leases	Core deposits	Property, plant and equipment	Current liabilities
Debt securities	Non-core funding	Inventory and current assets	Long term debt
Other assets	Equity	Cash	Equity
Other assets		Other assets	

Gross loans and leases less allowances for loan losses

Source: Based on Beatty & Liao (2014)

Figure 2: Income statement comparison

This figure shows a stylized comparison of the income statement of banks and non-financial firms, respectively.

Banks		Non-financial firms	
-	Interest income	-	Sales revenue
-	Interest expenses	-	Cost of goods sold
=	Net interest income	=	Gross margin
+	Non-interest income	+	Operating expenses
=	Total revenue	=	Operating income
-	Non-interest expenses	-	Net financial expenses
-	Loan loss provisions	-	Other income/expenses
=	Earnings before taxes	=	Earnings before taxes
-	Income taxes	-	Income taxes
=	Net income	=	Net income

Source: Authors

2.2 Capital Structure

Banks' capital structure is of great interest to regulators. As banks are better able to withstand economic downturns and absorb unexpected losses when capital levels are higher, raising capital levels has been the main objective of prior and current regulation (Greenbaum, Thakor, & Boot, 2016). Drivers behind banks' capital structure decisions have been discussed extensively in previous literature (see for instance Miller (1995), Gropp and Heider (2010), and Berg and Gider (2016)). While not being directly within the scope of this thesis, insights into bank capital structure, and its determinants, is necessary to understand the need for regulating banks.

Banks finance their activities by issuing equity and taking on debt obligations. Banks' debt obligations usually comprise of large quantities of customer deposits and smaller amounts of debt securities. Berg and Gider (2016) find that U.S. banks in the period from 1963 to 2013 had a median book-equity-to-asset ratio of 9%, while non-financial firms had a median of 50%. Several theories try to explain why banks typically have a different capital structure than non-financial firms. However, the academic field has reached no consensus, as empirical evidence is contradictory.

The original Miller & Modigliani [M&M] proposition argues that the value of the firm is independent of its capital structure (Modigliani & Miller, 1958). The proposition suggests that cost of equity is a function of banks' capital structure. Investors require a lower return when faced with lower risk. Thus, in a perfect market, the weighted average cost of capital should be unaffected by capital structure. The M&M proposition has faced critique, mostly because it is based on strict and unrealistic assumptions. When discussing whether the M&M propositions will hold for banks, Miller (1995, p. 487) writes, "Taken literally, they would not apply anywhere else either". Banks' real world capital choices are influenced by market imperfections not present in the M&M world.

In 1963, corporate income tax was added to the original M&M proposition. The new proposition provides a rationale for debt as the preferred financing source (Modigliani & Miller, 1963). Kraus and Litzenberger (1973) later argue that leverage has a positive effect on firms' market value when earnings exceed debt obligations. At the same time, they highlight the potential bankruptcy costs of excess levels of debt. They suggest that higher leverage increases expected costs of bankruptcy. Taxation of corporate profits make debt the cheaper financing source, while costs of potential bankruptcy and agency issues, increase the cost of debt relative to equity (Frank & Goyal, 2008). Inclusion of the corporate tax shield and other

market imperfections in capital structure models laid the foundation for the trade-off theory. The trade-off theory implies that the leverage level should reflect an equilibrium, where costs and benefits of debt are balanced (Frank & Goyal, 2008).

Market imperfections that impact the financial sector alone can explain banks' preference for debt financing beyond that of non-financial firms. The solidity of banks is of vital importance for the real economy (Greenbaum, Thakor, & Boot, 2016). Due to this, national authorities provide a "safety net" for banks to prevent financial instability. The safety net comprises of a deposit insurance scheme, central bank lending as a last resort, and a bailout guarantee for banks considered "too big to fail". While governments' objective is to prevent financial instability, studies suggest that the safety net leads to a lack of market discipline, in which banks take on more risk as a result of moral hazard (see i.e. Calomiris (1999)).

As a consequence of the deposit insurance scheme, depositors accept a lower interest rate in knowledge of authorities guaranteeing their savings (Cummings & Wright, 2016). Calomiris (1999) argues that banks are incentivized to increase leverage and take on excessive risk, as government initiatives to prevent illiquidity and bank-runs reduce the cost of debt. Similarly, Cummings and Wright (2016) find the safety net to reduce the cost of debt relative to equity, unless priced fairly according to risk. Contradictory to these arguments, Berger, Herring, and Szego's (1995) analysis of US Banks showed that leverage levels were rising also before the introduction of the federal deposit insurance scheme.

Several studies explain banks' capital structure decisions by emphasizing the higher cost of equity. Becht, Bolton, and Röell (2011) argue that the higher cost of equity is a consequence of banks being more difficult to value than non-financial firms. They claim that banks are risky entities with illiquid, opaque portfolios, and complex asset and liability structures. Hence, as asymmetric information adds costs to outside equity financing, potential bank investors require a larger discount. This argument is in line with the pecking order view of financing, suggesting that firms prefer internal sources of funds when investing in new projects. If banks are to exploit external sources of capital, issuing bonds will be preferred before issuing equity (Myers & Majluf, 1984). While this theory provides rationale for banks' preference for debt financing, empirical evidence is contradictory.

Researchers are still looking into ways of explaining the high leverage in banks. Berg and Gider (2016) find, in a recent study, asset risk to be a determinant of banks' capital structure choices. Since banks' assets are more diversified, they argue that banks' assets are less risky than those of non-financial firms. Controlling for the difference in asset risk, Berg and Gider

(2016) find the leverage gap between banks and non-financial firms to be reduced from 40% to 5%.

Even though academia has reached no consensus in explaining why banks hold more leverage than non-financial firms, the need for regulating banks is agreed upon. Banks' influence on systemic risk and overall economic conditions make regulators concerned about bank solidity. In addition, banks' ability to take on and transfer excessive risk provide a strong basis for regulating banks.

3.0 Bank regulation

The Basel Committee on Banking Supervision has been a pioneer within the field of bank regulation the past four decades. With the turmoil and instability following the collapse of the Bretton Woods system in 1973, the governments of the Group of Ten¹ countries established the Basel Committee in 1974². The objective of the Committee is to “enhance financial stability by improving supervisory knowhow and the quality of banking supervision worldwide” (Basel Committee on Banking Supervision, 2015, p. 1). The Committee seeks to achieve this objective by designing international standards for bank regulation and supervision. The three Basel Accords have been governing banks over the last 30 years.

3.1 Basel I³

The first Basel Accord marked the beginning of convergence towards a unified supervisory environment for banks. In the early 80’s, capital adequacy was on the top of the agenda for the newly founded Basel Committee. Banks’ capital ratios were deteriorating at a time when banks experienced higher risks, and the differences in national minimum capital ratios were significant. The first Basel Capital Accord was released in 1988, and implementation was expected by 1992. Basel I introduced a risk-based capital framework, where both on- and off-balance sheet risks were considered when calculating required capital levels. A minimum risk-based capital ratio was implemented to level the competitive playing field across countries. Following the new capital ratio, computation of both numerator and denominator changed. Previously, total assets constituted the denominator, while the new framework introduced risk-weighted assets. Risk-weighted assets are calculated by assigning different risk-weights to different asset classes based on the asset’s inherent risk. Low risk asset classes, i.e. cash and government bonds, are assigned a low risk-weight, while asset classes containing higher risk, i.e. loans to corporations, are assigned a higher risk-weight. The minimum risk-based capital ratio determines the required level of capital a bank has to hold for a given level of risk-weighted assets:

$$\text{Minimum risk-based capital ratio} = \frac{\text{Capital requirement}}{\text{Risk-weighted assets}}$$

¹ The original Group of Ten members: Belgium, Canada, France, Germany, Italy, Japan, the Netherlands, Sweden, Switzerland, United Kingdom, and United States.

² For details on the history of the Basel Committee we refer to Basel Committee on Banking Supervision’s publication, *The History of the Basel Committee*, October 2015.

³ For details on the Basel I Capital framework we refer to Basel Committee on Banking Supervision’s publication, *International Convergence of Capital Measurement and Capital Standards*, July 1988.

Basel I required banks to hold a minimum risk-based capital ratio of 8% by 1992. At least 50% of the required capital has to comprise of Tier I capital, such as common equity, retained earnings and convertible instruments (Basel Committee on Banking Supervision, 1988). Hybrid capital and subordinated debt are considered Tier II capital. A significant change from the pre-Basel era is that the allowance account for loan losses is excluded from the calculation of Tier I capital. Inclusion of the allowance account in Tier II capital is limited to 1.25% of risk-weighted assets. The sum of Tier I- and Tier II capital constitutes banks' eligible capital for regulatory purposes. Banks' capital position is determined by the risk-based capital ratio:

$$\text{Risk-based capital ratio} = \frac{\text{Eligible capital}}{\text{Risk-weighted assets}}$$

3.2 Basel II⁴

The first revision of the 1988 accord was introduced in 2006: The Basel II capital framework. The objective of Basel II is to further “strengthen the soundness and stability of the international banking system” (Basel Committee on Banking Supervision, 2006, pp. 2-3). Three closely linked pillars are introduced to increase the framework's sensitivity to risk, while the minimum risk-based capital ratio of 8% from Basel I is extended (Basel Committee on Banking Supervision, 2006).

The first pillar considers the calculation of risk-weighted assets, and thus affects banks' capital requirements. Risk-weighted assets are either calculated in accordance with the standardized approach, using risk-weights pre-assigned by national authorities, or the internal ratings-based [IRB] approach, using internal models to determine risk-weights⁵. Furthermore, Basel II introduced the Basel I-floor to prevent a too substantial, too rapid, reduction of risk-weighted assets for banks shifting to the IRB-method. The second pillar concerns the supervisory review process, encouraging banks to develop adequate risk management processes to better monitor and manage risks (Basel Committee on Banking Supervision, 2006). The third pillar outlines the regulatory disclosure requirements. By requiring banks to publish annual risk and capital management reports, professional investors and financial

⁴ For details on the Basel II capital framework we refer to Basel Committee on Banking Supervision's publication, *International Convergence of Capital Measurement and Capital Standards: A revised version*, June 2006.

⁵ This is a simplified description of the process of calculation risk-weighted assets. Risk-weighted assets are calculated by adding credit, market, and operational risk. Standardized- and IRB-methods only apply to calculation of credit risk.

analysts are able to monitor banks, complementary to supervisory authorities (Greenbaum, Thakor, & Boot, 2016).

3.3 Basel III⁶

The Basel Committee presented the Basel III framework in 2010. Similar to Basel II, Basel III was a revision to cover weaknesses of the existing framework, as well as a response to the global financial crisis. The objective of Basel III is to increase the resilience of the banking sector and individual banks' ability to absorb losses (Basel Committee on Banking Supervision, 2011). The second revision carries forward the three pillars from Basel II, with additional regulatory requirements to be gradually implemented over the period 2013-2019 (see Appendix A).

Basel III raises both the quantity and quality of eligible capital for regulatory purposes. The required level of Tier I capital increases as a result of a higher minimum risk-based capital ratio. Additionally, several capital buffers⁷ can be implemented. National authorities are given freedom to determine the appropriate size of these buffers based on domestic macroeconomic conditions. A minimum leverage ratio of 3% independent of risk, as well as two new liquidity ratios, is also introduced (Greenbaum, Thakor, & Boot, 2016). Furthermore, Basel III recommends prolonging the Basel I-floor through to 2017, though this decision rests on national authorities.

The European Parliament and the European Council ratified Basel III on June 26th 2013. Two legislations, the Capital Requirement Directive IV [CRD IV] and the Capital Requirement Regulation [CRR], have replaced the old Basel II directives (European Banking Authority, 2016). CRD IV and CRR seek to provide a "single rule book" to ensure that all EU-countries apply the same regulatory standards to the financial sector. This aim is in line with the original objective of the Basel Committee: to converge national bank regulation. However, both CRD IV and CRR open up for significant national adaptation (Næss, 2014). As a result, the respective authorities of the Nordic countries have chosen a somewhat different interpretation and implementation of the new framework.

⁶ For details on the Basel III capital framework we refer to Basel Committee on Banking Supervision's publication, *Basel III: A global regulatory framework for a more resilient banking system*, June 2011.

⁷ The Basel III framework proposes the following buffers: A countercyclical buffer (0-2.5% of RWA), a systemic risk buffer (0-5% of RWA) and a systemic important financial institution buffer (0-2% of RWA).

4.0 The Nordic banking sector

All Nordic countries are subject to regulation in accordance with current EU-directives, CRD IV and CRR. Further cooperation across Nordic countries on regulation and supervision contributes to a “level playing field” within the Nordic banking sector (Nordic Working Group on Basel III/CRD IV, 2012, p. 4) Nevertheless, both Basel II and III open up for national authorities to use supplementary measures whenever needed to stabilize the financial sector⁸. Additionally, the Basel I-floor is interpreted differently across the Nordic countries (see Appendix B). As it creates regulatory differences within the Nordics, Norwegian banks argue this to hamper the competitive playing field.

The financial sectors in the Nordics are highly integrated. The large majority of banks operating in one Nordic country are either domestic banks or banks resident in one of the other Nordic countries (see Appendix C) (Nordic Working Group on Basel III/CRD IV, 2012). Following the high level of integration, financial stability in one Nordic country is influenced by the financial stability in the other Nordic countries. However, each Nordic country experienced different consequences of the financial crisis of 2008 and 2009. Following bankruptcies of the largest Icelandic banks, Iceland entered into a banking crisis resulting in years of economic difficulties. Finland has faced an economic downturn in recent years following the financial crisis coinciding with struggling export industries. The remaining countries, Norway, Sweden, and Denmark, have experienced more similar and favorable economic conditions the last decade (see Appendix D). Moreover, national authorities of the Scandinavian countries have been able to exert monetary policy to dampen the negative impact of the crisis on domestic industries.

Due to the level of integration and similar economic conditions, the Scandinavian countries serve well for a Nordic study. As a result of the Icelandic bank crisis of 2008 and the Finnish recession in recent years, banks from these countries are excluded from our sample. In the analyses to come, Norway, Sweden, and Denmark are therefore referred to as the Nordics.

⁸ As an example: Increased risk-weights on mortgages were recently imposed on Norwegian banks to mitigate instability in the financial sector, following potential future credit losses arising from drops in real estate prices.

5.0 Loan loss provisions and the regulatory trade-off

Regulators seek to build solid banks by imposing a minimum risk-based capital ratio and precise guidelines for how to calculate eligible capital and risk-weighted assets. Higher capitalized banks will improve individual banks' ability to handle unexpected losses and increase the resilience of the financial sector.

We define regulatory capital management as considerate decisions made by banks to optimize capital structure for regulatory purposes. As regulators determine the minimum risk-based capital ratio, increasing the numerator or decreasing the denominator of the risk-based capital ratio constitutes regulatory capital management. The numerator, eligible capital, can be raised through equity issuances or a restrictive payout policy. Changing the asset composition, securitizing loans, and decreasing lending can reduce the denominator, as altering the loan portfolio to constitute less risk, yields more assets being applied lower risk-weights.

Accountants are concerned with the truthfulness of financial statements and provide international standards to achieve transparency and convergence of accounting rules across countries. The guidelines for how to account for loan losses are outlined in the International Accounting Standard 39: Financial Instruments [IAS 39], published by the International Accounting Standards Board in 2005⁹. In accordance with IAS 39, loans are tested for objective evidence of impairment on both individual and collective level every reporting period. Impairment is only to be recognized if the loss event has occurred, and no impairment should be recognized if losses are anticipated as a result of future events. In case of impairment, accountants apply an expected loss model to determine individual and collective provisions. The loss amount shall be recognized in the profit and loss statement, and the loan value shall either be reduced directly or through an allowance account for loan losses [ALL]. The allowance account comprises of the accumulated individual and collective provisions for bad and doubtful loans up until the last reporting date.

Even though accounting supervisors seek to prevent management discretion being used for unwanted purposes, IAS 39 is a principle-based standard (Gaston & Song, 2014). This means that management are encouraged to rely on "experienced judgment" when determining the size of impairment losses (IAS 39, §62). However, by relying on experienced judgment, IAS 39 opens up for discretionary accounting behavior from management's side. Discretionary

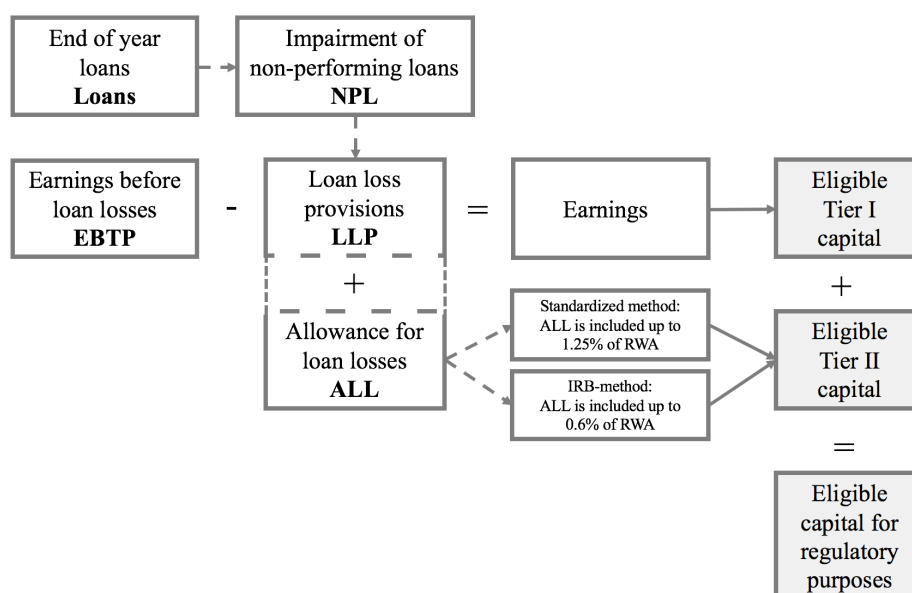
⁹ For details on IAS 39 we refer to International Accounting Standards Board's publication *International Accounting Standard 39: Financial Instruments*, 2005.

behavior could for instance be exploited to build hidden reserves by creating too high provisions, or to improve capital position by reducing provisions to inflate eligible capital.

Banks are required to comply with both accounting and regulatory standards. Figure 3 describes the relation between accounting for loan losses and eligible capital for regulatory purposes. Loans are subject to an impairment test on individual and collective level as required by IAS 39. If objective evidence of impaired value exists, non-performing loans are identified and the bank is obliged to take provisions to cover expected loan losses. The individual and collective provisions are added to the allowance account, improving the bank's ability to bear expected losses. As loan loss provisions reflect an expense, a dollar increase in loan loss provisions constitutes a dollar decrease in earnings before taxes. Earnings after taxes are added to capital eligible as Tier I, meaning loan loss provisions reduce Tier I capital on a (1-taxrate) basis. In addition, a dollar increase in loan loss provisions constitutes a dollar increase in Tier II capital, given that the Tier II quota of the allowance account is not exhausted¹⁰. The allowance account can be included in Tier II capital up to 1.25% of risk-weighted assets if banks apply the standardized method, and 0.6% if banks apply the IRB-method. To sum up, an increase in loan loss provisions leads to a reduction in earnings and eligible capital. This relation represents the regulatory trade-off of loan loss provisions.

Figure 3: The relation between loan loss provisions and capital regulation

This figure shows the relation between accounting and regulatory functions of loan loss provisions. Please note that this is a simplified illustration disregarding effects of taxes, not necessarily reflecting the true complexity of the relations.



Source: Authors

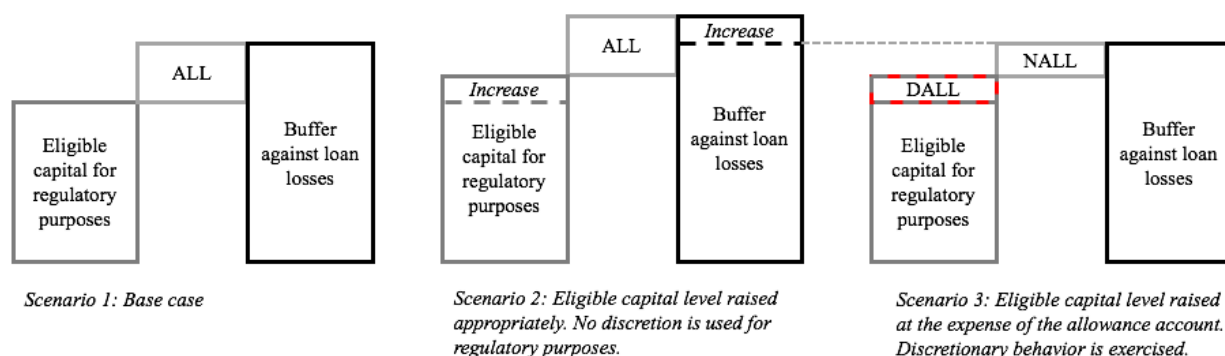
¹⁰ When discussing economic magnitudes, we disregard the minor effects loan loss provisions could have on Tier II capital.

Accumulated provisions in the allowance account together with eligible capital for regulatory purposes, constitute banks' overall loss buffer, expected and unexpected respectively. Nevertheless, the amount of loan loss provisions is not arbitrary for banks' overall ability to bear losses in periods when banks face increased regulatory pressure. If pressure on eligible capital is met by a reduction in provisions, risk-based capital ratios will improve while banks' overall solidity is reduced. Banks appear to be better capitalized, but the overall loss buffer is unchanged. Thus, the trade-off creates a regulatory arbitrage through loan loss provisions.

Figure 4 shows how banks' overall ability to absorb losses is reduced when an increase regulatory requirements is met at the expense of insufficient provisions. Scenario 1 describes the base case. The sum of the allowance account for loan losses and eligible capital, constitute the bank's buffer against loan losses. In scenario 2, eligible capital has been raised without compromising the allowance account. The bank's buffer against loan losses has increased, while the ability to handle losses, relative to the capital position, is maintained. In scenario 3 the bank raises capital levels by adding the discretionary component of the allowance account, DALL, to eligible capital. As a consequence, the allowance account falls below the appropriate level. Even though the bank appears to be equally capitalized as in scenario 2, the ability to absorb losses is lower and the bank is more vulnerable. Capital is shifted from the expected- to the unexpected loss buffer, while the total buffer against loan losses is not raised. The regulatory trade-off is revealed.

Figure 4: Illustration of the regulatory trade-off

This figure illustrates the regulatory trade-off between allowance account for loan losses and eligible capital for regulatory purposes, and its impact on banks' ability to absorb losses. Please note that this is a simplified illustration, not necessarily reflecting the true complexity of the relationships. ALL illustrates the allowance account for loan losses. NALL and DALL are the non-discretionary and discretionary components of the allowance account, respectively.



Source: Authors

Although loan loss provisions are to be determined independent from regulatory considerations, the regulatory trade-off creates mixed incentives for banks, and encourages coordination of accounting- and regulatory decision-making.

6.0 Related literature

Kane (1988) was among the first to discuss capital management theory. His description of the “regulatory dialectic” explains avoidance behavior of regulated firms. For banks, such avoidance behavior can imply adjusting the denominator and the numerator of the capital ratio to comply with capital regulation (Jones & John, 1998). Jackson (1999) suggests that when banks are constrained by the regulatory minimum risk-based capital ratio, they adjust the level of lending and the composition of assets if it is costly to increase the numerator. In line with Jackson (1999), several papers find banks to alter asset composition when facing binding risk-based capital ratios, by shifting away from high-risk assets (see for instance Nigro and Jacques (1997), Aggarwal and Jacques (2001), and Milne (2002)). While these findings prevail for low capitalized banks, researchers are unable to conclude whether adjustments to the denominator are a result of regulatory pressure. On the other hand, Rime (2001) finds Swiss banks’ capital position to be improved by increasing eligible capital, and not by reducing risk-weighted assets. His results indicate that increasing the risk-based capital ratio through the numerator is less costly than reducing risk-exposure for Swiss banks. The following section is limited to include literature on discretionary behavior with respect to the numerator of the capital ratio.

6.1 Pre-Basel studies

Shrieves and Dahl (1992) study the relationship between risk and capital in US Banks in the pre-Basel era. They find that low capitalized banks increase capital levels and reduce risk-exposure in response to regulation. This behavior is in line with supervisory authorities’ expectations. Additionally, banks raise capital levels when risk increases, unconditional to the capital level coming into the year. They conclude that risk-exposure and capital levels are simultaneously related, while the effect of regulatory influence prevails in capital-constrained banks.

Several studies examine how bank capital regulation affects loan loss provisions. In the pre-Basel era, the allowance account was included in the calculation of eligible capital for regulatory purposes, incentivizing banks to create higher loan loss provisions to raise capital ratios. Moyer (1990) uses capital in excess of the minimum capital ratio to investigate whether capital-constrained banks in the US created higher loan loss provisions to avoid costs related to regulatory intervention. She finds a negative relation between excess capital and the level of loan loss provisions, meaning capital constrained banks in the pre-Basel era created

higher provisions to inflate eligible capital. Studying US banks in the period 1987 to 1989, Beatty, Chamberlain, and Magliolo (1995) find accruals, such as loan loss provisions, loan charge-offs, and securities gains and losses, to be jointly determined for regulatory capital management purposes. They use the primary capital ratio to test whether provisions are used to inflate eligible capital when external sources of capital are costly, and find results similar to Moyer (1990). Studies from the pre-Basel era show that including the allowance account in the eligible capital calculation incentivizes banks to use discretion to create higher loan loss provisions.

6.2 Pre-Basel versus Post-Basel studies

The implementation of Basel I served as a clean and exogenous shock, and several pre-Basel versus post-Basel studies have been conducted. Basel I better linked capital with risk, as banks were required to hold higher levels of eligible capital when risk-exposure increased. As the allowance account was limited in the calculation of eligible capital, banks' incentives to use loan loss provisions for regulatory purposes changed.

Kim and Kross (1998) exploit the 1989 change in US capital regulation to examine if low capitalized banks use accounting accruals for regulatory capital management purposes. They find low capitalized banks to reduce loan loss provisions and increase loan write-offs in the post-Basel era compared to pre-Basel. High capitalized banks exhibited no difference in accrual accounting across the regulatory regimes. Their findings infer that excluding the allowance account from the calculation of eligible capital changed banks' provisioning behavior. Ahmed, Takeda, and Thomas (1999) exploit the same change in capital adequacy regulations to test hypotheses of capital management, earnings management and signaling effects through loan loss provisions. They include the regulatory capital ratio to investigate whether its relation to loan loss provisions is less negative in the post-Basel period. They find evidence supporting this hypothesis, suggesting the discretionary application of provisions is opposite in the new regime. Results from pre-Basel versus post-Basel studies indicate that loan loss provisions are still used for regulatory capital management, though under the new risk-based framework the incentives are reversed, encouraging lower provisions.

6.3 Post-Basel studies

Several studies investigate the impact of regulations on loan loss provisions in the years after Basel frameworks were implemented. Collins, Shackelford, and Wahlen (1995) identify a positive relation between pro forma primary capital ratios and loan loss provisions in the post-

Basel years. They find that low capitalized banks in the US reduced loan loss provisions after the allowance account was limited in the eligible capital calculation. A later study by Shrives and Dahl (2003) finds evidence of Japanese banks using accounting discretion as a means of earnings management, however, they find the subset of capital-constrained banks to manage earnings for regulatory purposes. In the same study, Shrives and Dahl (2003) suggest that capital-constrained banks use discretion to reduce loan loss provisions if external funding is expensive.

More recent studies investigate the implications of the increasingly stringent regulative frameworks on capital management behavior through loan loss provisions. Cummings and Durrani (2014) investigate the effect of the Basel II accord on loan loss provisions in Australian banks in the period 2004 to 2012. They examine the impact of excess regulatory capital, risk-weighted assets, and earnings levels on specific and general provisions. They find that banks use part of surplus capital to pre-fund future credit losses and create lower loan loss provisions when discretionary risk-weighted assets increase. In addition, they test whether banks applying internal ratings-based models to determine credit risk exercise a different provisioning behavior than banks applying the standardized method. Their results suggest that IRB-banks create higher provisions when excess levels of capital are higher. Norden and Stoian (2014) study earnings management and loan loss provisions from risk and profitability perspectives, using supervisory data on 85 Dutch banks from 1998 to 2012. They include changes in discretionary risk-weighted assets in order to examine the relation between accounting for loan losses and regulatory capital. They find loan loss provisions to be lower when discretionary risk-weighted assets increase. Finding from recent studies supports that the trade-off between eligible capital and loan loss provisions creates incentives for banks to reduce provisions.

7.0 Hypotheses

Supervisory authorities can impose regulatory pressure by applying higher risk-weights, enforcing a higher minimum risk-based capital ratio or by redefining what types of capital is considered eligible. The capital requirement constitutes the required level of eligible capital a bank has to hold for a given level of risk-weighted assets and minimum risk-based capital ratio. An increase in regulatory pressure is thus equivalent to an increase in the capital requirement. Regulatory pressure should not influence banks' accounting decisions. However, following the trade-off between loan loss provisions and eligible capital for regulatory purposes, banks have incentives to consider regulatory requirements when accounting for loan losses.

As regulators set the minimum risk-based capital ratio, changes in risk-weighted assets, ΔRWA , serve as a proxy for the change in capital requirements through the year. If banks face an increase in capital requirements, creating lower provisions can improve the risk-based capital ratio. Thus, the numerator of the regulatory capital ratio will be relatively higher. We hypothesize:

H1: Banks will exercise discretion to reduce loan loss provisions when facing an increase in capital requirements through the year.

We expect a negative coefficient on ΔRWA if banks exercise discretion to reduce loan loss provisions when facing an increase in capital requirements.

Higher capital requirements in the future encourage banks to improve the capital position today. When banks increase the risk-based capital ratio through the year, prior to any additions from this year's earnings, banks' capital position is improved. We use the end of year risk-based capital ratio adjusted for earnings, $AdjCap$, as a proxy for banks' improvement in capital position through the year. This allows us to study how changes in banks' capital position affect loan loss provisions. We examine if banks reduce loan loss provisions to inflate eligible capital when actions are taken to improve capital position through the year. We hypothesize:

H2: Banks will exercise discretion to reduce loan loss provisions when improving capital position through the year.

We expect a negative coefficient on *AdjCap* if banks use discretion to reduce loan loss provisions when improving capital position.

We include beginning of year risk-based capital ratio, *BCap*, to test if banks with higher risk-based capital ratios coming into the year create higher provisions. A better capital position coming into the year should entail fewer incentives to exploit provisions for regulatory purposes. Additionally, we include a dummy variable, *Constrained*, to identify capital-constrained banks. The dummy is interacted with *BCap* to examine the behavior of banks in the lowest quartile of beginning of year risk-based capital ratio. We hypothesize:

H3a: Banks with higher risk-based capital ratios coming into the year will exercise discretion to boost loan loss provisions.

H3b: Capital-constrained banks will exercise discretion to provision less for loan losses than non-capital-constrained banks.

We expect a positive coefficient on *BCap* if higher regulatory capital ratios coming into the year cause banks to boost loan loss provisions. We expect a negative coefficient on the interaction term *Constrained x BCap* if capital-constrained banks provision less for loan losses than non-capital-constrained banks.

We perform additional analyses of discretionary behavior with respect to loan loss provisions of SIFI-banks and IRB-banks. As SIFI-banks are subject to a higher minimum risk-based capital ratio, these banks have additional incentives to boost eligible capital by reducing provisions. However, it is possible that SIFI-banks are monitored more closely by supervisory authorities due to their critical role in the economy. This could potentially lead to less discretionary behavior being exercised compared to non-SIFI-banks. We include a dummy variable, *SIFI*, to identify systemic important banks. The dummy is interacted with ΔRWA and *AdjCap* to examine if SIFI-banks' provisioning behavior, when faced with regulatory pressure, differs from that of non-SIFI-banks. We hypothesize:

H4: Banks considered systemic important exercise discretion to reduce loan loss provisions for regulatory purposes to a greater extent than non-SIFI-banks.

We expect negative coefficients on the interaction terms *SIFI x ΔRWA* and *SIFI x AdjCap*, if SIFI-banks exercise discretion to reduce loan loss provisions to a greater extent than non-SIFI-banks when facing regulatory pressure.

IRB-banks are permitted to use internal models to determine credit risk. As a result, IRB-banks are able to exercise discretion with regards to the denominator in the capital ratio, as opposed to banks applying the standardized method to determine credit risk. When the denominator of the capital ratio is subject to more discretion, incentives to inflate eligible capital levels through reduced loan loss provisions are potentially lower. We include a dummy variable, *IRB*, to identify banks applying internal ratings-based models to determine credit risk. The dummy is interacted with ΔRWA and *AdjCap* to examine if IRB-banks' provisioning behavior, when faced with regulatory pressure, differs from that of banks applying the standardized approach. We hypothesize:

H5: Banks applying internal ratings-based models to determine credit risk exercise discretion to reduce loan loss provisions for regulatory purposes to a lesser extent than banks using the standardized method.

We expect positive coefficients on the interaction terms *IRB* \times ΔRWA and *IRB* \times *AdjCap* if IRB-banks reduce loan loss provisions to a lesser extent than banks applying the standardized method when faced with regulatory pressure.

8.0 Data

We construct a new dataset consisting of 421 bank year observations of listed Nordic banks. The handpicking process yields a dataset containing annual information on 46 banks in the period between 2005 and 2014, comprising 21 Danish, 21 Norwegian, and four Swedish banks. Bank year observations with incomplete financial data were excluded, resulting in an unbalanced panel dataset. The collected data is not adjusted for revisions.

We chose time horizon and geographical area carefully. From 2005 and onwards, all listed companies in EU and EEA, including banks, were subject to the International Accounting Standards (Deloitte, 2002). Collecting data from 2005 thus seem reasonable, as potential noise from changing accounting regimes is mitigated. We collect consolidated numbers; the International Accounting Standards only apply to consolidated financial statements. Our preferred geographical area of study was the Nordic countries. To our knowledge, no prior research on loan loss provisions and bank capital regulation has applied Nordic bank data. In this respect, our study will be an important contribution to existing literature on bank regulation and capital management.

8.1 Descriptive statistics

Table 2 reports descriptive statistics of the main variables. The data is winsorized at 1 and 99% level to deal with potential outliers. We winsorize the dataset instead of trimming it to prevent losing bank year observations. A Pearson correlation matrix of the same variables is presented in Table 3.

Loan loss provisions scaled by average loans have a mean (median) equal to 1.04% (0.40%). Ahmed, Takeda, and Thomas (1999) find loan loss provisions to constitute 0.8% (0.5%) of average loans for American banks in the period 1987 to 1995. Studying banks across 40 countries, Fonseca and González (2008) find loan loss provisions to constitute 1.1% (0.5%) of assets beginning of year in the period 1995 to 2002. Our sample of Nordic banks is thus comparable to previous studies on loan loss provisions, and to aggregated numbers provided by the European Banking Authority (see Appendix E). Non-performing loans equal 4.67% (2.11%) of average loans, while the one-year-ahead change in non-performing loans are 0.53% (0.1%) of end of year loans. These numbers are somewhat higher than those of previous studies, and are likely influenced by the financial crisis. The allowance account for loan losses constitutes on average 2.16% (0.96%) of average loans, while the average leverage ratio described by loans to assets end of year is 79% (80%). The allowance account

in Nordic banks is somewhat larger than findings in previous research on different time periods and countries (see Kanagaretnam, Krishnan, and Lobo (2010) and Beatty and Liao (2014)). We find Nordic banks' leverage ratios to be comparable to findings from previous research (see for instance Berg and Gider (2016)).

As a proxy for increased capital requirements, we use change in risk-weighted assets with a mean (median) of 3.42% (2.54%) scaled by total assets. This finding indicates that Nordic banks on average experience a pressure on capital eligible for regulatory purposes in the period. Two measures of capital position are included; capital beginning of year equals 14.46% (14,1%) of risk-weighted assets beginning of year, and end of year capital adjusted for provisions equals 13,95% (13.82%) of end of year risk-weighted assets. Nordic banks are well capitalized and hold a significant cushion of eligible capital above the minimum capital requirement. These ratios are slightly higher than findings in earlier studies. Fonseca and Gonzalez (2008) find risk-based capital ratios across 41 countries in the period 1995-2005 to have a median of 11.1%. In a more recent study, Cummings and Durrani (2014) find Australian banks in the period 2004 to 2012 to have a risk-based capital ratio of 13.4% (12.3%). To control for potential influence of earnings levels on loan loss provisions, we include earnings before taxes and provisions, constituting on average 1.37% (1.25%) of assets end of year. Similarly, Fonseca and Gonzalez (2008) find a mean of 1.17% of median earnings before taxes and provisions to lagged total assets across Norway, Sweden and Denmark in the period 1995-2002.

8.2 Data collection and weaknesses with the data collection process

We had access to two databases containing regulatory and accounting data on banks: SNL and Bankscope. We chose to collect the necessary data manually after discovering significant inconsistencies in the databases' definitions of important variables, both over time and between banks¹¹. Banks included in the SNL dataset were used as a basis for our sample. After excluding all banks listed on other stock exchanges than Oslo, Stockholm, and Copenhagen, we were left with 50 banks. Out of these 50, four banks were excluded due to insufficient bank year observations and missing financial statements. We collect data from financial statements and risk management reports found through banks' webpages or stock exchange archives of company disclosures.

¹¹ We found data on non-performing loans (*NPL*) and allowance account for loan losses (*Allowance*) to be inconsistent. Data provided for these variables were calculated alternating on an individual and collective level, resulting in extreme volatility within and across banks and time.

Financial statements have different wording, language, and design across banks and time. Thus, identifying the same number from one year to another was challenging. 39 bank year observations were deleted when uncertainty regarding the definition of a variable could cause potential inconsistencies. The study is one of relative discretionary behavior, making currency adjustments unnecessary.

Weaknesses and potential implications of the data collection process should be addressed. Handpicking data is based on judgment. Although trying to make consistent decisions, we may have made errors. We tried to minimize this problem by creating explicit definitions of each explanatory variable (see Appendix F). However, using discretion in the collection process was necessary, as presentation and layouts in financial statements changed frequently, and wording differed across languages. We have exercised discretion to the best of our efforts to minimize the possibility of faults, and excluded observations whenever the risk of error was imminent. Nevertheless, we cannot be certain of the avoidance of human errors, such as punching and calculation mistakes. To ensure comparability throughout the period, we closely monitored the development in the figures from year to year.

9.0 Methodology

9.1 Model of choice

In order to explain banks' discretionary behavior with respect to loan loss provisions, we construct a model inspired by Wahlen (1994) and Ahmed, Takeda, and Thomas (1999). Wahlen (1994) applies a two-stage loan loss expectations model in order to separate the non-discretionary loan loss provisions from the discretionary component. While Wahlen (1994) studies unexpected changes in loan loss provisions from an investor's perspective, we examine bank behavior and thus adjust the model to reflect an explanatory model. Similar to Ahmed, Takeda, and Thomas (1990), we apply a one-stage regression model to examine discretionary loan loss provisions. We include capital variables to capture discretionary provisioning behavior for regulatory purposes, and control for non-discretionary determinants of loan loss provisions. As it is uncertain whether non-discretionary variables are free of discretionary influence, this approach is less restrictive than a two-stage model (Beatty and Liao (2014)). Corresponding to the majority of research on the topic, we adopt an income statement approach to investigate the impact of regulations on annual loan loss provisions. Due to lack of consensus in how to best model discretionary behavior, we also apply a two-stage income statement model similar to Wahlen (1994) and a two-stage balance sheet approach similar to Beaver and Engel (1996). Although being more restrictive, these analyses allow us to test the robustness of our results, and compare findings from alternative models applied in previous research.

9.1.1 Analyzing panel data

We analyze panel data consisting of observations on 46 banks over 10 time periods. When analyzing panel data, we can rely on three common regression models: Pooled ordinary least squares [OLS], fixed effects [FE], or random effects [RE] model.

OLS, FE, and RE have different assumptions with respect to unobserved individual effects present in the panel data. There is a high likelihood of unobserved individual effects influencing our panel, such as bank geography or market knowledge individual to each bank. We are likely unable to specify a model capturing all unobserved individual effects influencing loan loss provisions, thus the pooled OLS estimates are potentially biased. To account for unobserved individual effects, a RE or FE model should be applied.

For a RE estimator to be unbiased, the unobserved individual effects must be randomly distributed and uncorrelated with the regressors. FE estimation assumes that the unobserved

individual effects are time-invariant and solves the estimation through first-differencing, allowing the unobserved individual effects to correlate with the regressors. As a result, the assumptions are less restrictive for FE estimation. To determine whether to apply a RE or FE model, we perform a Hausman test. The Hausman test determines if coefficients from running a FE model significantly differ from those of a RE model, and if so, the FE model is the preferred model (Hausman, 1978). We apply the Hausman test to all regression models, and find the coefficients from RE and FE estimation to differ significantly for all regressions. Therefore, we apply FE models when testing our hypotheses. We include results from the Pooled OLS and RE estimator for comparability.

We address endogeneity concerns to highlight potential weaknesses and mitigate inconsistent estimates of coefficients in our loan loss provisions models. A variable is said to be endogenous if correlated with the error term. Plausible sources of endogeneity are omitted variable bias [OVB], measurement error, and simultaneity (Wooldridge, 2013). As a result of data unavailability and lack of consensus on how to best model loan loss provisions, both discretionary and non-discretionary determinants of loan loss provisions are potentially omitted. A bias exists if the remaining variables under- or overestimate the dependent variable, loan loss provisions, as a result of these omitted variables. Being an imperfect measure of increases in current capital requirements, the capital variable ΔRWA can potentially suffer from measurement error. Similar weakness exists with the variable *AdjCap*, as we would preferably include variables explaining changes in capital position more accurately, such as equity issuances and dividend payouts. These variables are sources of endogeneity if the measurement error included in the error term correlates with ΔRWA and *AdjCap* (Wooldridge, 2010). Furthermore, endogeneity is a concern if any of the included explanatory variables are simultaneously determined with loan loss provisions.

We are to some degree able to control for potential endogeneity by applying a FE model. If unobservable cross-bank heterogeneity is constant over time, the endogeneity problem is mitigated through first-differencing. Additionally, we apply a dynamic model where the lagged dependent variable is included as an explanatory variable. Wooldridge (2013) suggest lags of the dependent variable to be included as explanatory variables when suspecting one or more explanatory variables being correlated with an unknown omitted variable. Using a dynamic model allows us to control for previous provisions, and thus reduce endogeneity problems. Laeven and Majnoni (2003) and Fonseca and Gonzalez (2008) suggest applying generalized-method-of-moments [GMM] estimators to control for potential endogeneity.

GMM applies lagged variables as instruments over several periods. Although we would prefer to apply GMM estimation, lagging independent variables over several periods would entail losing too many bank year observations. This could potentially lead to overfitting the model.

We cluster-standard errors at bank level in all regression models, as suggested by White (1980) and adopted by Ahmed, Takeda, and Thomas (1999). Cluster-robust standard errors mitigate potential effects of serial correlation and heteroscedasticity. Cameron and Miller (2015) suggest to use cluster-robust standard errors when there is an appreciable difference between the two. We apply cluster-robust standard errors, as we find these to deviate from default standard errors.

9.2 The one-stage main model

We construct a one-stage income statement regression to model loan loss provisions. The regression includes discretionary capital variables and controls for non-discretionary determinants of loan loss provisions. The dependent variable is *LLP*, defined as this year's loan loss provisions adjusted for reversals of previous loan charge-offs, scaled by average loans. The variable reflects net provisions in year t for bank i . The one stage regression model is defined as follows:

$$LLP_{i,t} = \gamma_0 + \gamma_1 Loans_{i,t} + \gamma_2 NPL_{i,t} + \gamma_3 \Delta NPL_{i,t} + \gamma_4 Allowance_{i,t} + \gamma_5 \Delta RWA_{i,t} + \gamma_6 AdjCap_{i,t} + \gamma_7 BCap_{i,t} + \gamma_8 EBTP_{i,t} + \varepsilon_{i,t} \quad (1)$$

We apply the following variables to examine loan loss provisions in Nordic banks: *Loans* is defined as end of year gross loans scaled by average assets. *NPL* reflects end of year non-performing loans to average loans, while ΔNPL is defined as one-year-ahead change in non-performing loans as a fraction of end of year loans. *Allowance* is defined as end of year allowance account for loan losses adjusted for provisions scaled by average loans. ΔRWA is defined as this year's change in risk-weighted assets scaled by assets end of year. *AdjCap* represents eligible capital adjusted for this year's provisions, scaled by end of year risk-weighted assets. *BCap* is defined as eligible capital coming into the year, scaled by risk-weighted assets beginning of year. *EBTP* is defined as earnings before taxes and provisions scaled by end of year assets.

We use three variables to examine the relation between regulatory capital management and discretionary loan loss provisions. Similar to Norden and Stoian (2014), we use ΔRWA as a proxy for the change in banks' regulatory capital requirements. All else equal, an increase in

risk-weighted assets will lead to an increase in the capital requirement, if banks are to maintain the same risk-based capital ratio. If banks use discretion to reduce loan loss provisions when an increase in capital requirements puts pressure on eligible capital, we expect ΔRWA to have a negative coefficient. If this is the case, hypothesis H1 is confirmed, and increases in risk-weighted assets induce discretionary reduction in loan loss provisions.

We include two capital ratio variables to measure if banks' existing capital positions influence the use of discretion in provisioning for loan losses. *AdjCap* examines how improvements in capital position through the year impact loan loss provisions. When banks increase risk-based capital ratios through the year, the capital position is improved. Banks can improve their capital position by adjusting the numerator or denominator of the capital ratio. *AdjCap* will capture if banks that improve capital position through the year, also use discretion to reduce loan loss provisions to inflate earnings. If so, we expect that banks improve risk-based capital ratios during the year create lower loan loss provisions, hence the coefficient on *AdjCap* will be negative. This would confirm hypothesis H2.

Similar to Ahmed, Takeda, and Thomas (1999), we include *BCap* to examine how capital ratios coming into the year influences provisioning behavior. Higher risk-based capital ratios coming into the year imply better capitalized banks, hence fewer incentives to use loan loss provisions to improve capital position. On the other hand, lower risk-based capital ratios coming into the year incentivize banks to exercise discretionary behavior to reduce provisions and inflate eligible capital. A positive coefficient on *BCap* would confirm hypothesis H3a, that banks use discretion to create higher provisions when capital ratios coming into the year are higher. To investigate whether capital-constrained banks create lower provision to inflate eligible capital, we include a dummy variable with the value 1 if the bank year observation is in the lower quartile of risk-based capital ratios coming into the year, and interact the dummy variable with *BCap*. The resulting interaction term, *BCap x Constrained*, examines if Nordic banks coming into the year with risk-based capital ratios between 8.88% and 11.93% create lower provisions to improve capital position. If capital-constrained banks reduce provisions to inflate eligible capital, we expect a negative coefficient on the interaction term in line with hypothesis H3b.

To appropriately examine whether and how banks use discretion for regulatory purposes when creating loan loss provisions, we control for non-discretionary determinants of loan loss provisions. Previous research argues that the non-discretionary variables in equation (1) are viable factors in examining the level of loan loss provisions. *Loans* reflect default risk in the

loan portfolio not captured by non-performing loans (*NPL*). Banks expanding their loan portfolio should experience a higher exposure to loan losses and thus create higher loan loss provisions. Beaver and Engel (1996) and Kim and Kross (1998) find *Loans* to be significant in explaining the allowance and provision for loan losses. These findings underpin the relevance of the size of the loan portfolio in explaining provisions. We expect *Loans* to have positive coefficient, as an increase in lending should entail higher loss exposure, and thus loan loss provisions¹².

NPL reflects non-performing loans considered as in default or close to default, typically defined as loans more than 90 days overdue. Beaver, Eger, Ryan, and Wolfson (1989) are among the researchers that emphasize the importance of non-performing loans as an indicator of default risk. Building on prior research on loan loss provisions, we expect *NPL* to have a positive coefficient. An increase in non-performing loans should entail banks to create higher loan loss provisions, as non-performing loans serve as an indicator of losses to come. Similar to Beaver and Engel (1996), ΔNPL is used as a proxy for management's knowledge about the quality of the loan portfolio in time t , not included in *NPL*. If this knowledge is reflected in this year's provisions, management increase provisions today to account for future deterioration of the loan portfolio. Thus, ΔNPL is expected to have a positive coefficient,

Allowance reflects previous accumulated provisions net of reversals and write-offs, adjusted for provisions. Higher provisions in the past should imply lower need for current provisions. Wahlen's (1994) study on loan loss provisions find the allowance account to be significant, underpinning this argument. When loans are impaired on a collective level, a collective provision is added to the allowance account. Subsequently, if the same loan is impaired on an individual level, additional provisions will be lower, as the previous collective provisions to some degree account for the impaired value of the loan. *Allowance* is thus expected to have a negative coefficient.

In addition to non-discretionary determinants of loan loss provisions, we include *EBTP* to control for any influence earnings levels may have on loan loss provisions. Previous studies on loan loss provisions, by, among others, Ahmed, Takeda, and Thomas (1999) and Fonseca and González (2008), include the variable *EBTP* to test for earnings management through loan loss provisions. They argue that banks use loan loss provisions to smooth income,

¹² Preferably, we would apply variables capturing the riskiness of the loan portfolio composition, similar to Kim and Kross (1998) and Norden and Stoian (2014). While their results were insensitive to loan composition, such variables could explain not only the degree of lending in relation to assets, but also how the riskiness of different engagements yields different loss exposures.

meaning managers take higher provisions in good periods and lower provisions in downturns. If banks provision more for loan losses in good years, we expect *EBTP* to have a positive sign.

We include GDP growth to control for the impact of macro economic development on loan loss provisions.

9.3 Robustness tests

While our main approach is a one-stage model, previous research on loan loss provisions and capital regulation is conducted using various models. In order to test the robustness of our results and compare findings across models, we apply two additional models suggested by Wahlen (1994), Beaver and Engel (1996), and Norden and Stoian (2014).

9.3.1 The two-stage income statement model

We construct a two-stage income statement model inspired by Wahlen (1994) and Norden and Stoian (2014). We estimate the non-discretionary component of loan loss provisions, *NLLP*, before defining the discretionary component of loan loss provisions, *DLLP*, as the difference between the actual loan loss provisions and the estimated non-discretionary component. We define the non-discretionary provisions for loan losses as follows:

$$NLLP_{i,t} = \beta_0 + \beta_1 Loans_{i,t} + \beta_2 NPL_{i,t} + \beta_3 \Delta NPL_{i,t} + \beta_4 Allowance_{i,t} + u_{i,t} \quad (2)$$

NLLP is defined as the non-discretionary component of loan loss provisions scaled by average loans. The definitions and predicted signs on the coefficient of the explanatory variables are similar to those of the main model in equation (1). As *NLLP* cannot be examined directly, we regress *LLP* on the explanatory variables in equation (2) in order to estimate *NLLP*:

$$LLP_{i,t} = \beta_0 + \beta_1 Loans_{i,t} + \beta_2 NPL_{i,t} + \beta_3 \Delta NPL_{i,t} + \beta_4 Allowance_{i,t} + \varepsilon_{i,t} \quad (3)$$

where $\varepsilon_{i,t} = DLLP_{i,t} + u_{i,t}$. If the explanatory variables in equation (2) are free of discretion, the error term u will be zero, and we estimate *DLLP* without error. As *LLP* consists of both a non-discretionary and a discretionary component, the discretionary loan loss provisions are by definition:

$$DLLP_{i,t} = LLP_{i,t} - NLLP_{i,t} \quad (4)$$

In the second stage regression, we regress *DLLP* on discretionary capital variables in order to test our hypotheses on regulatory capital management. Similar to the main model, we include

an earnings variable to control for potential impact of earnings levels on provisioning behavior. Following previous studies, we consider *EBTP* to reflect discretionary behavior. The predicted signs on the coefficients of the variables are similar to those of equation (1). The second-stage regression is defined as follows:

$$DLLP_{i,t} = \beta_0 + \beta_1 \Delta RWA_{i,t} + \beta_2 AdjCap_{i,t} + \beta_3 BCcap_{i,t} + \beta_4 EBTP_{i,t} + u_{i,t} \quad (5)$$

9.3.2 The two-stage balance sheet model

Additionally, we apply a two-stage balance sheet model inspired by Beaver and Engel (1996). Beaver and Engel (1996) estimate the components of the allowance account for loan losses to study the valuation implications of the non-discretionary and discretionary component, respectively. Although we do not estimate the value of the components of the allowance account, we find their model of non-discretionary allowance for loan losses to be a feasible one in order to study how regulation impact accumulated discretionary provisions.

The applied balance sheet model is somewhat similar to the two-stage income statement model. However, instead of estimating non-discretionary loan loss provisions, we estimate the non-discretionary component of the allowance account for loan losses, *NALL*. Next, we define the discretionary component of the allowance account, *DALL*, as the difference between the actual allowance account for loan losses and the estimated non-discretionary component. We define the non-discretionary component of the allowance account as follows:

$$NALL_{i,t} = \alpha_0 + \alpha_1 Loans_{i,t} + \alpha_2 NPL_{i,t} + \alpha_3 \Delta NPL_{i,t} + \alpha_4 NCO_{i,t} + u_{i,t} \quad (6)$$

The definitions of the variables and predicted signs on the coefficients are similar to those of the main model in equation (1), as they account for non-discretionary changes in the allowance account. Both *NALL* and *DALL* are scaled by average loans. We include net charge-offs, *NCO*, defined as this year's gross write-offs netted with reversals of previously written off loans scaled by average loans. Although having a direct impact on the allowance account for loan losses, net charge-offs can provide information about future provisions and thus the collectability of current loans (Beaver & Engel, 1996). As a result, the predicted sign on the coefficient of *NCO* is ambiguous. As with the two-stage income statement model we are unable to estimate *NALL* directly. Thus, we regress *ALL*, defined as the allowance account

for loan losses scaled by average loans¹³, on the explanatory variables from equation (6) in order to estimate $NALL$:

$$ALL_{i,t} = \alpha_0 + \alpha_1 Loans_{i,t} + \alpha_2 NPL_{i,t} + \alpha_3 \Delta NPL_{i,t} + \alpha_4 NCO_{i,t} + \varepsilon_{i,t} \quad (7)$$

where $\varepsilon_{i,t} = DALL_{i,t} + u_{i,t}$. Following the estimation of ALL , we define the discretionary component of the allowance account, $DALL$, as the difference between the actual allowance account and the estimated non-discretionary component:

$$DALL_{i,t} = ALL_{i,t} - NALL_{i,t} \quad (8)$$

Next, we regress $DALL$ on the same explanatory variables as in the two-stage income statement model. The expected signs on the coefficients are similar to those of the two previous approaches. The second-stage regression is defined as follows:

$$DALL_{i,t} = \alpha_0 + \alpha_1 \Delta RWA_{i,t} + \alpha_2 AdjCap_{i,t} + \alpha_3 BCap_{i,t} + \alpha_4 EBTP_{i,t} + u_{i,t} \quad (9)$$

9.4 Analyses of SIFI- and IRB-banks

We perform two additional analyses to examine if newly enacted regulation limits discretionary loan loss provisions being used for regulatory purposes. First, we study if the definition of a bank as systemic important, and the resulting increase in minimum risk-based capital ratio, entails banks to create lower provisions. Second, we investigate if banks granted to apply internal credit risk models to calculate risk-weighted assets create higher provisions than banks applying the standardized approach. The one-stage main model is used when conducting the analyses of SIFI- and IRB-banks.

9.4.1 Discretionary behavior of SIFI-banks

The Basel Committee encourages financial authorities to levy an additional capital buffer on systemic important banks to reduce the likeliness and potential impact of financial distress. The additional requirement may incentivize SIFI-banks to reduce provisions for regulatory purposes. At the same time, it is reasonable to assume that financial authorities will monitor SIFI-banks' capital management processes more closely, possibly limiting the use of discretion due to fear of regulatory intervention.

¹³ Please note that while *Allowance* reflects the allowance account end of year adjusted for provisions, ALL reflects the allowance account end of year, unadjusted.

We examine whether banks defined as systemic important exercise discretion to create lower loan loss provisions for regulatory purposes than non-SIFI-banks. We include a dummy variable, *SIFI*, with the value of 1 if bank *i* is considered systemic important in year *t*, otherwise 0, and interact the SIFI-dummy with the regulatory capital variables ΔRWA and *AdjCap*. Equation (10) examines whether and how SIFI-banks exercise discretion in reaction to higher capital requirements compared to non-SIFI-banks:

$$LLP_{i,t} = \gamma_0 + \gamma_1 Loans_{i,t} + \gamma_2 NPL_{i,t} + \gamma_3 \Delta NPL_{i,t} + \gamma_4 Allowance_{i,t} + \gamma_5 \Delta RWA_{i,t} + \gamma_6 AdjCap_{i,t} + \gamma_7 BCap_{i,t} + \gamma_8 EBTP_{i,t} + \gamma_9 SIFI_{i,t} + \gamma_{10} SIFI_{i,t} \times \Delta RWA_{i,t} + \varepsilon_{i,t} \quad (10)$$

We expect the coefficient on the interaction term *SIFI* \times ΔRWA to be negative if SIFI-banks create lower loan loss provisions than non-SIFI-banks when an increase in risk-weighted assets puts pressure on eligible capital.

Equation (11) examines whether and how SIFI-banks exercise discretion when capital position has improved through the year compared to non-SIFI-banks:

$$LLP_{i,t} = \gamma_0 + \gamma_1 Loans_{i,t} + \gamma_2 NPL_{i,t} + \gamma_3 \Delta NPL_{i,t} + \gamma_4 Allowance_{i,t} + \gamma_5 \Delta RWA_{i,t} + \gamma_6 AdjCap_{i,t} + \gamma_7 BCap_{i,t} + \gamma_8 EBTP_{i,t} + \gamma_9 SIFI_{i,t} + \gamma_{10} SIFI_{i,t} \times AdjCap_{i,t} + \varepsilon_{i,t} \quad (11)$$

We expect the coefficient on the interaction term *SIFI* \times *AdjCap* to be negative if SIFI-banks reduce provisions to a greater degree than non-SIFI-banks when capital position has improved during the year.

If SIFI-banks exercise discretion to reduce provisions for regulatory purposes to a greater extent than non-SIFI-banks, we expect the coefficient γ_{10} in equation (10) and (11) to be negative, in line with hypothesis H4.

9.4.2 Discretionary behavior of IRB-banks

IRB-banks are able to manage both the denominator and the numerator of the risk-based capital ratio. As a result, we hypothesize that IRB-banks will be less influenced by regulatory pressure when creating loan loss provisions compared to banks using the standardized approach. We test this hypothesis by combining an IRB-dummy with the value 1 if bank *i* uses the IRB-approach in year *t*, with the regulatory capital variables ΔRWA and *AdjCap*. Equation (12) examines if IRB-banks' provisioning behavior differ from that of banks using the standardized approach when capital requirements increase:

$$LLP_{i,t} = \gamma_0 + \gamma_1 Loans_{i,t} + \gamma_2 NPL_{i,t} + \gamma_3 \Delta NPL_{i,t} + \gamma_4 Allowance_{i,t} + \gamma_5 \Delta RWA_{i,t} + \gamma_6 AdjCap_{i,t} + \gamma_7 BCap_{i,t} + \gamma_8 EBTP_{i,t} + \gamma_9 IRB_{i,t} + \gamma_{10} IRB_{i,t} \times \Delta RWA_{i,t} + \varepsilon_{i,t} \quad (12)$$

We expect the coefficient on the interaction term $\Delta RWA \times IRB$ to be positive if IRB-banks reduce loan loss provisions to a lesser extent compared to banks using the standardized approach when an increase in risk-weighted assets puts pressure on eligible capital.

Equation (13) examines if IRB-banks' provisioning behavior differ from that of banks using the standardized approach when the capital position has improved during the year:

$$LLP_{i,t} = \gamma_0 + \gamma_1 Loans_{i,t} + \gamma_2 NPL_{i,t} + \gamma_3 \Delta NPL_{i,t} + \gamma_4 Allowance_{i,t} + \gamma_5 \Delta RWA_{i,t} + \gamma_6 AdjCap_{i,t} + \gamma_7 BCap_{i,t} + \gamma_8 EBTP_{i,t} + \gamma_9 IRB_{i,t} + \gamma_{10} IRB_{i,t} \times AdjCap_{i,t} + \varepsilon_{i,t} \quad (13)$$

We expect the coefficient on the interaction term $SIFI \times AdjCap$ to be positive if IRB-banks reduce provisions to a lesser extent than banks using the standardized approach when capital position has improved during the year.

If IRB-banks exercise discretion to reduce loan losses provisions for regulatory purposes to a lesser extent than banks using the standardized approach, we expect the coefficient γ_{10} in equation (12) and (13) to be positive, in line with hypothesis H5.

10.0 Regression results

This section presents results and analyses in order to answer our research question: *How does regulatory pressure affect loan loss provisions in Nordic banks?* First, we present results from the one-stage main model. The one-stage model relaxes underlying assumptions of the variables, allowing each variable to contain both non-discretionary and discretionary elements. Second, we present findings from two-stage income statement- and balance sheet models, to test the robustness of our results.

10.1 Regression results from the one-stage main model

Results from the main model are reported in Table 4. Coefficients of the discretionary capital variables confirm that Nordic banks exercise discretion for regulatory purposes when creating loan loss provisions. ΔRWA is significant at 1% with predicted sign on the coefficient. Evidence suggests that Nordic banks reduce loan loss provisions to offset pressure on eligible capital that results from an increase in risk-weighted assets. Keeping all other factors constant, a 1% increase in change in risk-weighted assets constitutes a 3% decrease in loan loss provisions. This finding underpins hypothesis H1, stating banks create lower loan loss provisions in periods of increasing capital requirements. Our result supports that of Norden and Stoian (2014) on Dutch banks in the post-Basel era.

Both of the risk-based capital ratio variables are significant with predicted signs on the coefficients. $AdjCap$ is significant at 5% level, supporting hypothesis H2. A 1% increase in risk-based capital ratio adjusted for provisions constitutes a 6% decrease in loan loss provisions. This finding suggests that banks exercise discretion to reduce loan loss provisions when improving capital position through the year. $BCap$ tests if banks with higher risk-based capital ratios coming into the year exercise discretion to create higher loan loss provisions. The variable is positive and significant at 1%, supporting hypothesis H3a. A 1% higher risk-based capital ratio coming into the year constitutes an 8.5% increase in loan loss provisions. Cummings and Durrani (2014) find Australian banks to allocate more provisions when Tier I capital ratios before provisions were stronger. They argue that this is a result of banks prioritizing to prepare for the more stringent capital requirements of Basel III over boosting loan loss provisions. We also examine if capital-constrained banks in the Nordics create lower provisions than non-capital-constrained banks. The results are reported in Table 9, showing that the coefficient on the interaction term $Constrained \times BCap$ is negative, but not significant at any conventional level. Thus, we find no evidence suggesting different discretionary

behavior with respect to loan loss provisions in capital-constrained banks. We therefore reject hypothesis H3b. This finding is contradictory to previous research (see for instance Kim and Kross (1998) and Cummings and Durrani (2014)) arguing that capital-constrained banks exercise discretion to reduce loan loss provisions to a greater extent than banks being sufficiently capitalized.

The signs on the coefficients of the non-discretionary control variables are in line with the predictions, though the variables are of varying significance. *Loans* is not significant at any conventional level, suggesting that the size of the loans portfolio is disregarded when determining the level of loan loss provisions in Nordic banks¹⁴. *NPL* is significant at 1% with the predicted sign on the coefficient. This result emphasizes non-performing loans as a non-discretionary determinant of loan loss provisions. Keeping all other factors constant, a 1% increase in non-performing loans will increase provisions for loan losses by 19%. This result is similar to findings of Wahlen (1994), Collins, Shackelford, and Wahlen (1995) and Kim and Kross (1998). ΔNPL is not significant at any conventional level, indicating that bank managers' knowledge on future quality of loans (not included in *NPL*) is not reflected in loan loss provisions. This suggests that only public information on loan quality explains loan loss provisions in Nordic banks, contrary to findings of Beaver and Engel (1996). *Allowance* is significant at 1% with the predicted sign on the coefficient. Accumulated previous provisions are thus of importance when this year's loan loss provisions are determined. A 1% increase in the allowance account for loan losses constitutes a reduction in loan loss provisions of 17%.

We find loan loss provisions to reflect somewhat meaningful assessments of changes in banks' relative quantity and quality of loans. Similar studies, such as Ahmed, Takeda, and Thomas (1999) and Beaver and Engel (1996), find more non-discretionary variables to explain loan loss provisions. For Nordic banks in our sample, fewer loan quality and quantity variables explain non-discretionary loan loss provisions. Testing various lags and specifications of explanatory variables could provide insights into whether other non-discretionary elements better explain loan loss provisions in our sample.

EBTP is not significant at any conventional level, indicating that higher earnings levels do not constitute higher levels of loan loss provisions. This result is consistent with the finding of Ahmed, Takeda, and Thomas (1999) on American banks. As expected, a decrease in GDP growth is associated with higher loss exposure, and thus with higher loan loss provisions.

¹⁴ Additional analysis was done using change in loans instead of *Loans*. This yields similar results.

The one-stage main model provides significant coefficients with expected signs, except for the variables *Loans*, ΔNPL , and *EBTP*. The findings are robust to various specifications and deflators¹⁵. We find that banks use discretion to reduce loan loss provisions to inflate eligible capital for regulatory purposes in reaction to an increase in capital requirements. Also, we find that banks with stronger capital position coming into the year create higher levels of loan loss provisions, and banks with improved capital position through the year create lower provisions. The coefficients on the discretionary capital variables are consistent across the pooled OLS-, RE-, and dynamic model. Moreover, our results highlight non-performing loans as a non-discretionary determinant of loan loss provisions, and indicate that banks use backward-looking information when creating provision. However, the coefficients on non-discretionary variables are sensitive to application of different estimators.

10.2 Regression results from robustness tests

The robustness tests are two-stage regression models of provisions- and allowance figures, respectively. When separating the non-discretionary and discretionary variables, the model assumptions become more rigid. There is no consensus throughout the literature regarding non-discretionary variables, and uncertainty exists whether defined non-discretionary variables are free of discretion.

10.2.1 Regression results from the two-stage income statement model

Results from the two-stage income statement model are reported in Table 5, with results from the first-stage regression, estimating non-discretionary loan loss provisions, reported in Panel A. Similar to the main model, *Loans* is not significant at any conventional level, while *NPL* is significant and positive at 1%. A 1% increase in non-performing loans constitutes an increase in non-discretionary loan loss provisions of 22%. This finding is fairly similar to that of the main model. Contradictory to the main model, ΔNPL is significant, though only marginally at 10%. The coefficient is positive, indicating that management use knowledge about future quality of the loan portfolio when determining loan loss provisions. A 1% increase in one-year-ahead change in non-performing loans constitutes a 4.5% increase in non-discretionary loan loss provisions. This is similar to findings from the main model for all estimators but FE. *Allowance* is not significant at any conventional level, suggesting that information on previous provisions is of no importance when determining loan loss provisions.

¹⁵ Additional regressions were run with alternative deflators, such as beginning of year loans, yielding similar results.

Results from the second-stage regression, examining discretionary loan loss provisions, are reported in Panel B. ΔRWA is marginally significant at 10% with a negative coefficient, suggesting a 1% increase in the change in risk-weighted assets constitutes a discretionary reduction in loan loss provisions of 1.4%. Neither of the capital ratio variables, $AdjCap$ nor $BCap$, are significant at any conventional level. This indicates that capital position coming into the year and improvements in capital positions during the year are of no importance when determining loan loss provisions. We find no indication of earnings levels influencing loan loss provisions, which is consistent with findings of the main model.

Results from the two-stage income statement model clearly differ from those of the one-stage main model. Inconsistencies in results across models have also been discovered in previous studies. Collins, Shackelford, and Wahlen (1995) apply a one-stage model of loan loss provisions and subsequently compare these results to those of a two-stage model, finding inconsistencies. They attribute the different results to the presence of correlated omitted variables in the first-stage regression. Similarly, omitted variables could potentially cause inconsistencies in our results. However, by applying the two-stage income statement model, we find that banks respond to increases in capital requirements by exercising discretion to reduce loan loss provisions. This finding supports the results of the main model and hypothesis H1.

10.2.2 Regression results from the two-stage balance sheet model

Results from the two-stage balance sheet model are reported in Table 6, with results from the first-stage regression, estimating the non-discretionary component of the allowance account for loan losses, reported in Panel A. The balance sheet model only finds NPL of the non-discretionary variables to be significant in explaining the allowance account. Beaver and Engel (1996) detects the same relationship with respect to NPL , though they also find the other non-discretionary explanatory variables to be significant. We find NPL to be significant at 1%, and a 1% increase in non-performing loans reads as a 46% increase in the allowance account for loan losses. The coefficient on NPL is about double the size of the coefficient found by Beaver and Engel (1996). The importance of non-performing loans as an indicator of loan loss provision level is incontestable, as the allowance account represents the expected losses arising from loans defined as “non-performing”.

Results from the second-stage regression, examining the discretionary component of the allowance account for loan losses, are reported in Panel B. The results deviate from those of the main model. We do not find an increase in risk-weighted assets to constitute discretion

being used to reduce the allowance account. A plausible explanation is that *DALL* represents discretionary behavior with respect to loan loss provisions over time and potentially reflect longer-term discretionary behavior in response to regulatory pressure. ΔRWA however, represents this year's change in capital requirements, and thus is less likely to explain the allowance account. *AdjCap* is significant at 10% with a negative coefficient, indicating that discretion is used to reduce the allowance account when banks improve capital position through the year. A 1% increase in the end of year risk-based capital ratio adjusted for provisions constitutes a 7.7% decrease in the discretionary component of the allowance account. This finding is similar to that of the main model and supports H2. The risk-based capital ratio coming into the year, *BCap*, is however not significant at any conventional level. *EBTP* is positive and significant at 1%, while not being significant at any conventional level in the main model or the two-stage income statement model.

The balance sheet approach seems to be more sensitive to model specifications than the one-stage model. Similar to the two-stage income statement model, the differences in findings compared to the main model could be attributed to the definition of variables as either strictly non-discretionary or discretionary. Additionally, we have concerns about the specification of the balance sheet model. Including other lagged loan quantity- and quality variables could mitigate problems of potential omitted variables bias¹⁶. The balance sheet model appears to provide less reasonable results and further research on appropriate explanatory variables should be conducted.

10.3 Regression results from SIFI- and IRB-banks

Regression results from SIFI- and IRB-banks can be found in Table 7 and Table 8, respectively. The analyses of SIFI- and IRB-banks are conducted by applying the one-stage main model.

10.3.1 Regression results from SIFI-banks

The coefficient on the interaction term, $SIFI \times \Delta RWA$, is negative and significant at all conventional levels. The results indicate that SIFI-banks react to an increase in capital requirements with a larger discretionary reduction in loan loss provisions than non-SIFI-banks. This suggests a that 1% increase in risk-weighted assets constitutes an additional 5.4% reduction in loan loss provisions for SIFI-banks. Following the higher minimum risk-based capital ratios levied on SIFI-banks, a given level of increase in risk-weighted assets would, all

¹⁶ Alternative lags and specifications of explanatory variables were not tested for the balance-sheet approach.

else equal, constitute a larger increase in capital requirements compared to non-SIFI-banks. The finding indicates that this additional increase in capital requirement constitutes an additional reduction in provisions, supporting hypothesis H4. The interaction term $SIFI \times AdjCap$ is, however, not significant at any conventional level. Contradictory to hypothesis H4, we do not find evidence of SIFI-banks using discretion to create lower provisions than non-SIFI-banks when the capital position is improved through the year. This finding could be a result of SIFI-banks in general being well capitalized and that authorities monitor SIFI-banks' capital management processes more closely.

Our findings from SIFI-banks are ambiguous. The mixed results could be a consequence of insufficient data. As the SIFI-buffer was implemented following Basel III, only observations from seven Nordic banks through a period of two to three years are analyzed. Even though drawing conclusions on the basis of limited data involve uncertainty, we find SIFI-banks' to be more sensitive than non-SIFI-banks to an increase in capital requirements. As we do not find evidence of SIFI-banks exercising different provisioning behavior when capital position is improved through the year, hypothesis H4 unconfirmed, though not rejected.

10.3.2 Regression results from IRB-banks

The coefficients of the interaction terms $IRB \times \Delta RWA$ and $IRB \times AdjCap$ are not significant at conventional levels. We do not find IRB-banks to exercise discretion for regulatory purposes differently than banks using the standardized approach when creating loan loss provisions. As we do not find evidence of different provisioning behavior in response to regulatory pressure for IRB- and standardized banks, we reject hypothesis H5.

Our results indicate that IRB-banks exploit discretion in provisioning for loan losses for regulatory purposes similarly as banks using risk-weights pre-determined by regulators. As the IRB-approach allows for more discretion to be used in the calculation of risk-weighted assets, IRB-banks can potentially exercise discretionary behavior with respect to both components of the risk-based capital ratio. Our findings suggest that the approach is not effective in limiting discretionary behavior to inflate the numerator of the risk-based capital ratio. However, we are unable to conclude if IRB-banks use discretion to reduce risk-weighted assets. This could potentially influence our results¹⁷.

¹⁷ As suggested by Cummings and Durrani (2014), we conduct an additional analysis with a different specification of $AdjCap$. We use assets as the denominator instead of risk-weighted assets, to avoid using the endogenously determined risk-based capital ratio in the regression. This specification yields similar results.

11.0 Capital regulation: A forward-looking perspective

We find that regulatory pressure affects Nordic banks' creation of loan loss provisions in the period 2005 to 2014. Regulatory pressure can prevail through stricter calculation of risk-weighted assets, higher minimum risk-based capital ratios or redefinition of capital eligible for regulatory purposes. Following the implementation of Basel III, banks are levied higher minimum risk-based capital ratios and additional capital buffers. Additionally, Basel IV¹⁸ is being circulated for comments, likely to propose changes in the calculation of risk-weighted assets and limit the use of internal models to determine credit risk. Based on our findings, we discuss potential implications of regulatory pressure imposed by Basel III and IV on banks' future provisioning behavior.

We find that Nordic banks use discretion to reduce provisions for loan losses when improving capital position through the year. In the years to come, Nordic financial authorities will implement capital buffers in accordance with Basel III, inducing banks to increase their risk-based capital ratio. Our findings suggest that Nordic banks will exploit the regulatory trade-off when improving capital position. This implies that banks inflate eligible capital by reducing loan loss provisions. We show that this trade-off comes at the expense of the allowance account and banks' overall ability to absorb losses. As additional capital buffers will impose higher minimum risk-based capital ratios for Nordic banks in the near future, we encourage accounting and regulatory supervisors to implement means to ensure sufficient loan loss provisions are upheld when banks improve their capital position.

We find that pressure on banks' eligible capital, following an increase in risk-weighted assets, induces banks to create lower loan loss provisions, exploiting the regulatory trade-off to shift capital from the expected to the unexpected loss buffer. In the years to come, two potential regulatory changes will alter how banks calculate risk-weighted assets. Both of these changes are likely to increase risk-weighted assets from today's levels, raising the minimum capital requirements. First, Basel III opens up for national adaption of regulatory frameworks if necessary to maintain the solidity and resilience of the financial sector. Second, Basel IV is assumed to impose changes in both internal- and standardized methods for calculation of credit risk. To make sure that potential national adaptations, such as applying higher risk-weights, strengthen the capital position without compromising provisions and the overall

¹⁸ For details on what is commonly called "Basel IV" we refer to KPMG's publication "*Basel 4 revisited: The fog begins to clear*", September 2015.

ability to bear losses, supervisory authorities should pay close attention to bank behavior in response to policy changes.

One of the proposed suggestions in Basel IV limits the use of internal models to calculate credit risk. If enacted, a valid assumption is that IRB-banks will face an abrupt increase in risk-weighted assets. We do not find IRB-banks to exercise different provisioning behavior than banks applying the standardized method in response to increases in risk-weighted assets, meaning the IRB-method is inefficient in limiting discretionary behavior with respect to loan loss provisions. A potential abrupt increase in risk-weighted assets, following the proposal to limit the use of internal ratings-based models, would put pressure on eligible capital. Thus, we urge regulators and accounting supervisors to monitor IRB-banks closely, to prevent potential discretion being used to reduce loan loss provisions, if such a change is to be implemented. However, we have no knowledge of whether IRB-banks exercise discretion with respect to the calculation of risk-weighted assets, as this is not investigated in this study. It is therefore difficult to draw conclusions for predicted change in discretionary behavior of IRB-banks. We suggest further research to be conducted on discretionary behavior for regulatory purposes in IRB-banks.

12.0 Limitations

We have conducted this research project to the best of our knowledge. Still, certain weaknesses in our study, and limitations of regulatory capital management studies in general, have to be addressed.

12.1 Dataset and variables

Our results are potentially influenced by undesirable noise. First of all, the dataset comprises a period of extreme economic conditions in the financial sector. We are unable to control for possible changes in bank behavior following the financial crisis of 2008 and 2009, potentially polluting our results. Furthermore, there is a risk that the analyses pick up noise from national regulatory adaptations, such as the different application of the Basel I-floor in Norway versus Sweden and Denmark, respectively. For Norwegian banks, the floor is binding in more scenarios than for Swedish and Danish banks, and Norwegian banks appear less capitalized for the same level of risk and capital when this is the case. We do not conduct any analyses on Norwegian banks to test whether this additional pressure on eligible capital constitutes different provisioning behavior. We are therefore unable to determine if this influences the results.

The analyses are weakened by the uneven distribution of banks from different countries. Banks from Norway and Denmark separately comprise more than 45% of our sample, while Swedish banks comprise less than 9%. Additionally, the Swedish banks are among the largest in our sample, are considered systemic important, and apply the IRB-method to calculate credit risk. As a result, the study is likely unable to fully explain the impact of regulatory pressure on loan loss provisions for the Swedish banking sector as a whole.

We handpicked the applied dataset, making time constraints and data availability factors limiting the collection of variables. This has especially prevailed in two adverse scenarios. First, we did not collect information on the composition of loan portfolios. This information can explain the loss exposure of different engagements, thus being a better non-discretionary determinant of loan loss provisions. Second, there are weaknesses with using *AdjCap* to measure whether banks improve capital position through the year. Applying explanatory variables containing information on capital structure decisions, such as issuances of equity or dividend payments, would yield more precise indicators of actions taken to improve eligible capital for regulatory purposes. Using variables to control for such events would possibly mitigate measurement error, and thus reduce endogeneity problems.

The different application of the Basel I-floor across the Nordic countries could affect the size of the variable ΔRWA . As the floor binds at different levels for Norwegian compared to Swedish and Danish banks, data used to calculate the variable ΔRWA will be higher for Norwegian banks when the floor is binding. Due to the stricter interpretation of the Basel I-floor, there is a risk of Norwegian banks being included in the lowest quartile of risk-based capital ratio coming in to the year, defined as “capital-constrained” banks. Moreover, the findings from these analyses are not representative for behavior of truly capital-constrained banks, as Nordic banks are generally well capitalized in the period of study. The results merely reflect discretionary behavior of banks with beginning of year risk-based capital ratios between 8.88% and 11.93%. As these banks also hold capital in excess of the minimum capital requirement, the analysis of capital-constrained banks reflect banks with relatively low ratios of capital compared to their Nordic competitors.

12.2 Methodological concerns

Two articles doing meta-studies on empirical regulatory research address limitations of applied methodology. Beatty and Liao (2014) examine nine research papers on loan loss provisions and capital regulation. They find that much of the research is characterized by methodological concerns related to the evaluation of regulatory changes. When examining implications of newly enacted regulation, it is especially challenging to determine if the identified variations observed in bank behavior can be attributed to regulatory change. Moreover, when researchers predict the impact of future regulations, it is difficult to incorporate potential deviating behavior as banks attempt to circumvent the new policies. Most studies rely on the common assumption that banks maintain their present conduct when faced with new regulatory requirements, though this weakens the validity of the results. Our conclusions are drawn on similar assumptions, and thus suffer from the same limitations.

Jackson (1999) addresses the consequences of the implementation of the first Basel Accord. Similar to Beatty and Liao, her main concern is related to causality. Even though most of the empirical studies find banks to increase capital ratios following the implementation of Basel I, there is insufficient evidence to conclude that this is solely a consequence of the new regulatory framework. An alternative explanation can be that banks were subject to market pressure to increase their capital ratios during the same time period. Our analyses also suffer from insufficient evidence to point out causal effects from regulatory changes, and no control group exists to conclude that the observed changes can be attributed to regulatory pressure.

13.0 Conclusion

In this thesis we set out to answer the following research question: *How does regulatory pressure affect loan loss provisions in Nordic banks?* The study adds to the literature on loan loss provisions and capital management, and contributes to the knowledge on capital regulation in the Nordic banking sector.

We construct a new dataset consisting of annual accounting- and regulatory data on 46 Nordic banks in the period 2005 to 2014. We address the research question by studying how changes in capital requirements and risk-based capital position impact banks' use of discretion with respect to loan loss provisions. We apply three models of discretionary loan loss provisions used in previous research. We discover the approaches to yield inconsistent results.

Our results from the one-stage main model, suggest that Nordic banks respond to an increase in capital requirements by exercising discretion to reduce loan loss provisions. Although banks' provisions should be unaffected by pressure on banks' eligible capital, the findings imply that discretion in accounting for loan losses is exploited to mitigate a weakening of the risk-based capital ratio. In terms of banks' capital position, we find that banks coming into the year with a better capital position exercise discretion to create higher loan loss provisions. However, we find no evidence of our prediction that capital-constrained banks, in order to inflate eligible capital, exercise different provisioning behavior than non-capital-constrained banks. A plausible explanation is that Nordic banks are generally well capitalized and not in urgent need of improving risk-based capital ratios. Moreover, we find that banks exercise discretion to reduce loan loss provisions when improving the capital position through the year. As Nordic banks are expected to be levied higher risk-based capital ratios in the years to come, our findings predict that banks will exploit discretionary loan loss provisions to inflate eligible capital following the new regulatory requirements.

Our findings indicate that when faced with an increase in capital requirement, banks defined as systemic important exercise discretion to reduce provisions to a greater extent than non-SIFI-banks. However, we find no evidence of SIFI-banks exercising a different provisioning behavior than non-SIFI-banks when improving capital position through the year. Additionally, we find no evidence of IRB-banks exercising discretion with respect to loan loss provisions differently from banks using standardized methods to determine credit risk. However, we have no knowledge of whether IRB-banks exercise discretion with respect to calculation of risk-weighted assets.

Conclusively, our findings indicate that regulatory capital management is exercised at the expense of loan loss provisions. By exploiting the regulatory trade-off, banks shift capital from the expected to the unexpected loss buffer by exercising accounting discretion. Discretionary reductions in provisions impair the overall loan loss buffer and thus bank solidity. With further regulatory pressure being imposed by Basel III and Basel IV, interaction between accounting- and regulatory supervisors is needed to prevent banks from circumventing new policies.

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Tables

Table 1: Definitions and abbreviations

This table provides a description of the definitions and abbreviations used throughout the thesis. In addition, it includes a description of the variables used in the regressions.

Abbreviation	Explanation
M&M	Miller & Modigliani
EBA	European Banking Authority
IRB	Internal ratings-based (method to determine credit risk when calculating risk-weighted assets)
SIFI	Systemic important financial institutions
CRD IV	Capital Requirement Directive IV
CRR	Capital Requirement Regulation
IAS	International Accounting Standard
ALL	Allowance account for loan losses
GDP	Gross Domestic Product
LLP	Loan loss provisions
FE	Fixed Effects
RE	Random Effects
OLS	Ordinary Least Squares
GMM	Generalized Method of Moments
SE	Standard error
Variable	Explanation
<i>ALL</i>	Allowance account for loan losses scaled by average loans
<i>NALL</i>	Non-discretionary component of the allowance account for loan losses scaled by average loans
<i>DALL</i>	Discretionary component of the allowance account for loan losses scaled by average loans
<i>ΔGDP</i>	Change in GDP growth
<i>LLP</i>	Loan loss provisions adjusted for reversals of previously written of loans scaled by average loans

<i>NLLP</i>	Non-discretionary loan loss provisions adjusted for reversals of previously written of loans scaled by average loans
<i>DLLP</i>	Discretionary loan loss provisions adjusted for reversals previously written of loans scaled by average loans
<i>Loans</i>	End of year loans scaled by average assets
<i>NPL</i>	Non-performing loans scaled by average loans
<i>ΔNPL</i>	One-year-ahead change in non-performing loans scaled by end of year loans
<i>Allowance</i>	Allowance account for loan losses adjusted for provisions scaled by average loans
<i>ΔRWA</i>	Change in risk-weighted assets scaled by end of year assets
<i>AdjCap</i>	Eligible capital for regulatory purposes adjusted for provisions scaled by risk-weighted assets end of year
<i>BCap</i>	Eligible capital for regulatory purposes scaled by risk-weighted assets beginning of year
<i>EBTP</i>	Earnings before taxes and provisions scaled by end of year assets
<i>NCO</i>	Gross write-offs adjusted for reversals of previously written of loans scaled by average loans
<i>IRB</i>	Dummy variable taking the value 1 if bank is applying IRB-method when calculating credit risk, 0 if not
<i>SIFI</i>	Dummy variable taking the value 1 if bank is considered a systemic important financial institution, 0 if not
<i>Constrained</i>	Dummy variable taking the value 1 if bank year observation is within the lower quartile of risk-based capital ratio coming into the year, 0 if not

Table 2: Summary statistics

This table shows descriptive statistics for main variables. *LLP* is loan loss provisions to average loans. *Loans* is loans to average assets. *NPL* is non-performing loans to average loans, while ΔNPL is the one-year-ahead change in non-performing loans to loans end of year. *ALL* is the allowance account adjusted for provisions scaled by average loans. ΔRWA is the change in risk-weighted assets to assets. *AdjCap* is the end of year risk-based capital ratio adjusted for provisions, while *BCap* is the risk-based capital ratio coming into the year. *EBTP* is earnings before taxes and provisions scaled by assets.

	Mean	Median	SE	10%	90%
LLP	0.0104	0.0040	0.1401	0.0301	0.1401
Loans	0.7924	0.8035	0.1170	0.6275	0.9351
NPL	0.0467	0.0211	0.0572	0.0067	0.1190
ΔNPL	0.0053	0.0010	0.0203	-0.0073	0.0206
ALL	0.0216	0.0098	0.0269	0.0034	0.0555
ΔGDP	0.0093	0.0113	0.0206	-0.0162	0.0293
ΔRWA	0.0342	0.0254	0.0887	-0.0484	0.1240
AdjCap	0.1395	0.1382	0.0339	0.1024	0.1807
BCap	0.1446	0.1410	0.0318	0.1062	0.1876
EBTP	0.0137	0.0125	0.0068	0.0070	0.0235

Table 4: Regression results from the one-stage main model

This table shows regressions of loan loss provisions during the period 2005-2014 on Nordic banks. We report coefficients (p-values in parenthesis) from our Fixed Effects, Pooled OLS, Random Effects and Dynamic Fixed Effects regressions. The dependent variable, LLP , is loan loss provisions to average loans. $Loans$ is loans to average assets. NPL is non-performing loans to average loans, while ΔNPL is the one-year-ahead change in non-performing loans to loans end of year. $Allowance$ is the allowance account adjusted for provisions scaled by average loans. ΔRWA is the change in risk-weighted assets to assets. $AdjCap$ is the end of year risk-based capital ratio adjusted for provisions, while $BCap$ is the risk-based capital ratio coming into the year. $EBTP$ is earnings before taxes and provisions scaled by assets. LLP_{t-1} is the lagged dependent variable. Standard errors are clustered on bank level. One, two, or three asterisks mean that the coefficients are significant at 10%, 5%, and 1% respectively.

	(1)	(2)	(3)	(4)
	LLP	LLP	LLP	LLP
Loans	0.004 (0.425)	0.004 (0.288)	-0.002 (0.586)	-0.002 (0.640)
NPL	0.188*** (0.000)	0.147*** (0.000)	0.181*** (0.000)	0.197*** (0.000)
ΔNPL	0.031 (0.150)	0.040** (0.041)	0.053*** (0.004)	0.040** (0.039)
Allowance	-0.169*** (0.010)	-0.010 (0.835)	-0.084** (0.035)	-0.264** (0.014)
ΔGDP	-0.084*** (0.000)	-0.100*** (0.000)	-0.101*** (0.000)	-0.070*** (0.000)
ΔRWA	-0.027*** (0.000)	-0.025*** (0.001)	-0.023*** (0.002)	-0.021*** (0.008)
AdjCap	-0.063** (0.035)	-0.057* (0.053)	-0.058*** (0.032)	-0.061* (0.054)
BCap	0.084*** (0.002)	0.049** (0.048)	0.063*** (0.026)	0.054** (0.019)
EBTP	0.019 (0.810)	0.100 (0.368)	0.125 (0.173)	0.153 (0.124)
LLP_{t-1}				0.224* (0.071)
Country dummy	No	Yes	No	No
Model Specification	Fixed Effects	Pooled OLS	Random Effects	Dynamic FE
R^2	0.72	0.78	0.77	0.79
SE clustered on bank	Yes	Yes	Yes	Yes
Observations	421	421	421	373

Regression (1), (2), (3):

$$LLP_{i,t} = \gamma_0 + \gamma_1 Loans_{i,t} + \gamma_2 NPL_{i,t} + \gamma_3 \Delta NPL_{i,t} + \gamma_4 Allowance_{i,t} + \gamma_5 \Delta RWA_{i,t} + \gamma_6 AdjCap_{i,t} + \gamma_7 BCap_{i,t} + \gamma_8 EBTP_{i,t} + \varepsilon_{i,t}$$

Regression (4):

$$LLP_{i,t} = \gamma_0 + \gamma_1 Loans_{i,t} + \gamma_2 NPL_{i,t} + \gamma_3 \Delta NPL_{i,t} + \gamma_4 Allowance_{i,t} + \gamma_5 \Delta RWA_{i,t} + \gamma_6 AdjCap_{i,t} + \gamma_7 BCap_{i,t} + \gamma_8 EBTP_{i,t} + \gamma_9 LLP_{i,t-1} + \varepsilon_{i,t}$$

Table 5: Regression results from the two-stage income statement model

This table shows two-stage regressions of loan loss provisions during the period 2005-2014 on Nordic banks. We report coefficients (p-values in parenthesis) from our Fixed Effects, Pooled OLS, and Random Effects regressions. Panel A shows the first-stage regression results. The dependent variable, *LLP*, is loan loss provisions to average loans. *Loans* is loans to average assets. *NPL* is non-performing loans to average loans, while ΔNPL is the one-year-ahead change in non-performing loans to loans end of year. *Allowance* is the allowance account adjusted for provisions scaled by average loans. Panel B shows the second-stage regression results. The dependent variable, *DLLP*, is discretionary loan loss provisions to average loans. ΔRWA is the change in risk-weighted assets to assets. *AdjCap* is the end of year risk-based capital ratio adjusted for provisions, while *BCap* is the risk-based capital ratio coming into the year. *EBTP* is earnings before taxes and provisions scaled by assets. Standard errors are clustered on bank level. One, two, or three asterisks mean that the coefficients are significant at 10%, 5%, and 1% respectively.

Panel A: First-stage regression			
	(1)	(2)	(3)
	LLP	LLP	LLP
Loans	-0.008 (0.131)	-0.007** (0.034)	-0.008 (0.023)
NPL	0.220*** (0.000)	0.164*** (0.000)	0.195*** (0.000)
ΔNPL	0.045* (0.084)	0.054** (0.012)	0.054*** (0.008)
Allowance	-0.132 (0.133)	0.066 (0.176)	-0.025 (0.618)
ΔGDP	-0.093*** (0.000)	-0.125*** (0.000)	-0.110*** (0.000)
Country dummy	No	Yes	No
Model Specification	Fixed Effects	Pooled OLS	Random Effects
R^2	0.73	0.76	0.76
SE clustered on bank	Yes	Yes	Yes
Observations	421	421	421

First-stage regression: $LLP_{i,t} = \beta_0 + \beta_1 Loans_{i,t} + \beta_2 NPL_{i,t} + \beta_3 \Delta NPL_{i,t} + \beta_4 Allowance_{i,t} + \varepsilon_{i,t}$

Panel B: Second-stage regression			
	(1)	(2)	(3)
	DLLP	DLLP	DLLP
ΔRWA	-0.014* (0.084)	-0.115 (0.139)	-0.016** (0.031)
AdjCap	-0.027 (0.446)	-0.012 (0.647)	-0.038 (0.246)
BCap	0.034 (0.142)	0.011 (0.547)	0.043** (0.047)
EBTP	-0.065 (0.417)	0.033 (0.723)	0.043 (0.554)
Country dummy	No	Yes	No
Model Specification	Fixed Effects	Pooled OLS	Random Effects
R^2	0.07	0.02	0.13
SE clustered on bank	Yes	Yes	Yes
Observations	421	421	421

Second-stage regression: $DLLP_{i,t} = \beta_0 + \beta_1 \Delta RWA_{i,t} + \beta_2 AdjCap_{i,t} + \beta_3 BCap_{i,t} + \beta_4 EBTP_{i,t} + u_{i,t}$

Table 6: Regression results from the two-stage balance sheet model

This table shows two-stage regressions of allowance account for loan losses during the period 2005-2014 on Nordic banks. We report coefficients (p-values in parenthesis) from our Fixed Effects, Pooled OLS and Random Effects regressions. Panel A shows the first-stage regression results. The dependent variable, *ALL*, is the allowance account to average loans. *Loans* is loans to average assets. *NPL* is non-performing loans to average loans, while ΔNPL is the one-year-ahead change in non-performing loans to loans end of year. *NCO* is net charge offs to average loans. Panel B shows the second-stage regression results. The dependent variable, *DALL*, is the discretionary component of the allowance account to average loans. ΔRWA is the change in risk-weighted assets to assets. *AdjCap* is the end of year risk-based capital ratio adjusted for provisions, while *BCap* is the risk-based capital ratio coming into the year. *EBTP* is earnings before taxes and provisions scaled by assets. Standard errors are clustered on bank level. One, two, or three asterisks mean that the coefficients are significant at 10%, 5%, and 1% respectively.

Panel A: First-stage regression			
	(1)	(2)	(3)
	ALL	ALL	ALL
Loans	-0.006 (0.185)	-0.011*** (0.009)	-0.008** (0.019)
NPL	0.457*** (0.000)	0.468*** (0.000)	0.465*** (0.000)
ΔNPL	0.067 (0.182)	0.076* (0.053)	0.074*** (0.083)
NCO	0.213 (0.170)	0.410*** (0.016)	0.248* (0.080)
ΔGDP	-0.656 (0.007)	-0.013 (0.468)	-0.781 (0.004)
Country dummy	No	Yes	No
Model Specification	Fixed Effects	Pooled OLS	Random Effects
R ²	0.90	0.91	0.90
SE clustered on bank	Yes	Yes	Yes
Observations	421	421	421

First-stage regression: $ALL_{i,t} = \alpha_0 + \alpha_1 Loans_{i,t} + \alpha_2 NPL_{i,t} + \alpha_3 \Delta NPL_t + \alpha_4 NCO_{i,t} + u_{i,t}$

Panel B: Second-stage regression			
	(1)	(2)	(3)
	DALL	DALL	DALL
ΔRWA	-0.009 (0.336)	-0.001 (0.990)	-0.008 (0.405)
AdjCap	-0.077* (0.055)	-0.064* (0.087)	-0.077** (0.046)
BCap	0.054 (0.115)	0.033 (0.312)	0.050 (0.123)
EBTP	0.268*** (0.000)	0.262*** (0.000)	0.268*** (0.000)
Country dummy	No	Yes	No
Model Specification	Fixed Effects	Pooled OLS	Random Effects
R ²	0.15	0.07	0.12
SE clustered on bank	Yes	Yes	Yes
Observations	421	421	421

Second-stage regression: $DALL_{i,t} = \alpha_0 + \alpha_1 \Delta RWA_{i,t} + \alpha_2 AdjCap_{i,t} + \alpha_3 BCap_{i,t} + \alpha_4 EBTP_{i,t} + u_{i,t}$

Table 7: Regression results from SIFI-banks

This table shows regressions of loan loss provisions during the period 2005-2014 on Nordic banks. We report coefficients (p-values in parenthesis) from our Fixed Effects regressions. The dependent variable, *LLP*, is loan loss provisions to average loans. *Loans* is loans to average assets. *NPL* is non-performing loans to average loans, while ΔNPL is the one-year-ahead change in non-performing loans to loans end of year. *Allowance* is the allowance account adjusted for provisions scaled by average loans. ΔRWA is the change in risk-weighted assets to assets. *AdjCap* is the end of year risk-based capital ratio adjusted for provisions, while *BCap* is the risk-based capital ratio coming into the year. *EBTP* is earnings before taxes and provisions scaled by assets. *SIFI* is a dummy variable with the value 1 if the bank is considered systemic important, and 0 otherwise. *SIFI x ΔRWA* and *SIFI x AdjCap* are interaction terms where the dummy variable is multiplied with the capital variables ΔRWA and *AdjCap*. Standard errors are clustered on bank level. One, two, or three asterisks mean that the coefficients are significant at 10%, 5%, and 1% respectively.

	(1)	(2)
	LLP	LLP
Loans	0.005 (0.271)	0.004 (0.464)
NPL	0.189*** (0.000)	0.188*** (0.000)
ΔNPL	0.031 (0.123)	0.032 (0.115)
Allowance	-0.181*** (0.003)	-0.176*** (0.005)
ΔGDP	-0.090*** (0.000)	-0.088*** (0.000)
ΔRWA	-0.027*** (0.000)	-0.027*** (0.000)
AdjCap	-0.077** (0.047)	-0.071* (0.073)
BCap	0.097*** (0.001)	0.090*** (0.002)
EBTP	0.025 (0.757)	0.024 (0.771)
SIFI	-0.002 (0.158)	-0.010* (0.054)
SIFI x ΔRWA	-0.054** (0.021)	
SIFI x AdjCap		0.056 (0.120)
Country dummy	No	No
Model Specification	Fixed Effects	Fixed Effects
R^2	0.72	0.72
SE clustered on bank	Yes	Yes
Observations	421	421

Regression (1):

$$LLP_{i,t} = \gamma_0 + \gamma_1 Loans_{i,t} + \gamma_2 NPL_{i,t} + \gamma_3 \Delta NPL_{i,t} + \gamma_4 Allowance_{i,t} + \gamma_5 \Delta RWA_{i,t} + \gamma_6 AdjCap_{i,t} + \gamma_7 BCap_{i,t} + \gamma_8 EBTP_{i,t} + \gamma_9 SIFI_{i,t} + \gamma_{10} SIFI_{i,t} \times \Delta RWA_{i,t} + \varepsilon_{i,t}$$

Regression (2):

$$LLP_{i,t} = \gamma_0 + \gamma_1 Loans_{i,t} + \gamma_2 NPL_{i,t} + \gamma_3 \Delta NPL_{i,t} + \gamma_4 Allowance_{i,t} + \gamma_5 \Delta RWA_{i,t} + \gamma_6 AdjCap_{i,t} + \gamma_7 BCap_{i,t} + \gamma_8 EBTP_{i,t} + \gamma_9 SIFI_{i,t} + \gamma_{10} SIFI_{i,t} \times AdjCap_{i,t} + \varepsilon_{i,t}$$

Table 8: Regression results from IRB-banks

This table shows regressions of loan loss provisions during the period 2005-2014 on Nordic banks. We report coefficients (p-values in parenthesis) from our Fixed Effects regressions. The dependent variable, *LLP*, is loan loss provisions to average loans. *Loans* is loans to average assets. *NPL* is non-performing loans to average loans, while ΔNPL is the one-year-ahead change in non-performing loans to loans end of year. *Allowance* is the allowance account adjusted for provisions scaled by average loans. ΔRWA is the change in risk-weighted assets to assets. *AdjCap* is the end of year risk-based capital ratio adjusted for provisions, while *BCap* is the risk-based capital ratio coming into the year. *EBTP* is earnings before taxes and provisions scaled by assets. *IRB* is a dummy variable with the value 1 if the bank is applying internal ratings-based models to determine credit risk, and 0 otherwise. *IRB x ΔRWA* and *IRB x AdjCap* are interaction terms where the dummy variable is multiplied with the capital variables ΔRWA and *AdjCap*. Standard errors are clustered on bank level. One, two, or three asterisks mean that the coefficients are significant at 10%, 5%, and 1% respectively.

	(1)	(2)
	LLP	LLP
Loans	0.004 (0.476)	0.003 (0.545)
NPL	0.188*** (0.000)	0.186*** (0.000)
ΔNPL	0.031 (0.152)	0.032 (0.135)
Allowance	-0.168*** (0.009)	-0.184*** (0.002)
ΔGDP	-0.085*** (0.000)	-0.089*** (0.000)
ΔRWA	-0.027*** (0.000)	-0.027 (0.000)
AdjCap	-0.061* (0.073)	-0.084* (0.060)
BCap	0.084*** (0.003)	0.091*** (0.002)
EBTP	0.018 (0.824)	0.047 (0.200)
IRB	-0.001 (0.532)	-0.007 (0.128)
IRB x ΔRWA	0.001 (0.914)	
IRB x AdjCap		0.056 (0.120)
Country dummy	No	No
Model Specification	Fixed Effects	Fixed Effects
R^2	0.72	0.72
SE clustered on bank	Yes	Yes
Observations	421	421

Regression (1):

$$LLP_{i,t} = \gamma_0 + \gamma_1 Loans_{i,t} + \gamma_2 NPL_{i,t} + \gamma_3 \Delta NPL_{i,t} + \gamma_4 Allowance_{i,t} + \gamma_5 \Delta RWA_{i,t} + \gamma_6 AdjCap_{i,t} + \gamma_7 BCap_{i,t} + \gamma_8 EBTP_{i,t} + \gamma_9 IRB_{i,t} + \gamma_{10} IRB_{i,t} \times \Delta RWA_{i,t} + \varepsilon_{i,t}$$

Regression (2):

$$LLP_{i,t} = \gamma_0 + \gamma_1 Loans_{i,t} + \gamma_2 NPL_{i,t} + \gamma_3 \Delta NPL_{i,t} + \gamma_4 Allowance_{i,t} + \gamma_5 \Delta RWA_{i,t} + \gamma_6 AdjCap_{i,t} + \gamma_7 BCap_{i,t} + \gamma_8 EBTP_{i,t} + \gamma_9 IRB_{i,t} + \gamma_{10} IRB_{i,t} \times AdjCap_{i,t} + \varepsilon_{i,t}$$

Table 9: Regression results from capital-constrained banks

This table shows regressions of loan loss provisions during the period 2005-2014 on Nordic banks. We report coefficients (p-values in parenthesis) from our Fixed Effects regression. The dependent variable, *LLP*, is loan loss provisions to average loans. *Loans* is loans to average assets. *NPL* is non-performing loans to average loans, while ΔNPL is the one-year-ahead change in non-performing loans to loans end of year. *Allowance* is the allowance account adjusted for provisions scaled by average loans. ΔRWA is the change in risk-weighted assets to assets. *AdjCap* is the end of year risk-based capital ratio adjusted for provisions, while *BCap* is the risk-based capital ratio coming into the year. *EBTP* is earnings before taxes and provisions scaled by assets. *Constrained* is a dummy variable with the value 1 if bank year observation is within the lower quartile risk-based capital ratios coming into the year, and 0 otherwise. *Constrained x BCap* is an interaction term where the dummy variable is multiplied with beginning of year capital ratio. Standard errors are clustered on bank level. One, two, or three asterisks mean that the coefficients are significant at 10%, 5%, and 1% respectively.

	(1)
	LLP
Loans	0.004 (0.448)
NPL	0.188*** (0.000)
ΔNPL	0.030 (0.157)
Allowance	-0.170*** (0.009)
ΔGDP	-0.084*** (0.000)
ΔRWA	-0.027*** (0.000)
AdjCap	-0.063** (0.035)
BCap	0.089*** (0.007)
EBTP	0.023 (0.780)
Constrained	0.003 (0.402)
Constrained x BCap	-0.028 (0.416)
Country dummy	No
Model Specification	Fixed Effects
R^2	0.73
SE clustered on bank	Yes
Observations	421

Regression (1):

$$LLP_{i,t} = \gamma_0 + \gamma_1 Loans_{i,t} + \gamma_2 NPL_{i,t} + \gamma_3 \Delta NPL_{i,t} + \gamma_4 Allowance_{i,t} + \gamma_5 \Delta RWA_{i,t} + \gamma_6 AdjCap_{i,t} + \gamma_7 BCap_{i,t} + \gamma_8 EBTP_{i,t} + \gamma_9 Constrained_{i,t} + \gamma_{10} Constrained_{i,t} \times BCap_{i,t} + \varepsilon_{i,t}$$

Appendices

Appendix A: Basel III implementation scheme

This figure presents the planned implementation of Basel III, stretching from 2013 to 2019. As national authorities have the ability to make adaptations to the timeframe, actual implementation may deviate from what is shown below.

Phase-in arrangements

(shading indicates transition periods - all dates are as of 1 January)

	2011	2012	2013	2014	2015	2016	2017	2018	As of 1 January 2019
Leverage Ratio	Supervisory monitoring		Parallel run 1 Jan 2013 – 1 Jan 2017 Disclosure starts 1 Jan 2015					Migration to Pillar 1	
Minimum Common Equity Capital Ratio			3.5%	4.0%	4.5%	4.5%	4.5%	4.5%	4.5%
Capital Conservation Buffer						0.625%	1.25%	1.875%	2.50%
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 (including amounts exceeding the limit for DTAs, MSRs and financials)				20%	40%	60%	80%	100%	100%
Minimum Tier 1 Capital			4.5%	5.5%	6.0%	6.0%	6.0%	6.0%	6.0%
Minimum Total Capital			8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%
Minimum Total Capital plus conservation buffer			8.0%	8.0%	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						

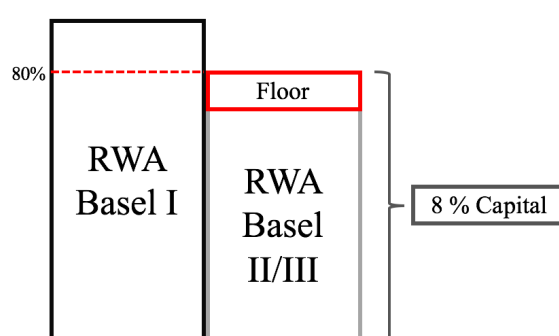
Source: Basel Committee on Banking Supervision (2011)

Appendix B: Interpretation of the Basel I-floor

Following the implementation of Basel II, IRB-banks are subject to a transitional rule called the Basel I-floor. The floor was introduced to avoid a too substantial, too rapid reduction in capital as a consequence of banks being permitted to use internal methods to determine risk-weighted assets (Basel Committee on Banking Supervision, 2006). The Basel I-floor is upheld in the second revision of the Basel Accord, Basel III. The floor represents the lowest level of own funds that banks are required to hold through 2017 (European Banking Authority, 2013, Art. 500). There are two different ways to apply the Basel I-floor, both expressed in CRR Article 500. In Norway, CRR Article 500 (2) is applied, and the Basel I-floor is calculated based on risk-weighted assets. In Denmark and Sweden, the floor is calculated using capital requirements in accordance with Article 500 (1b) (Borchgrevink, 2012).

The application of the Basel I-floor in accordance with CRR article 500 (2), as practiced in Norway, is illustrated below. First, banks' risk-weighted assets are calculated in accordance with the Basel II/III-framework, applying the IRB-approach. Second, risk-weighted assets are recalculated using risk-weights from Basel I. Risk-weighted assets under Basel II/III are required to constitute at least 80% of risk-weighted assets calculated using Basel I risk-weights. If not, the floor is binding, meaning an additional share is added to the Basel II/III level of risk-weighted assets. Finally, the minimum capital requirement is determined, applying an 8% ratio of capital to risk-weighted assets under Basel II/III, including the potential capital deficit if the Basel I-floor is binding.

B1: Basel I-floor in Norway

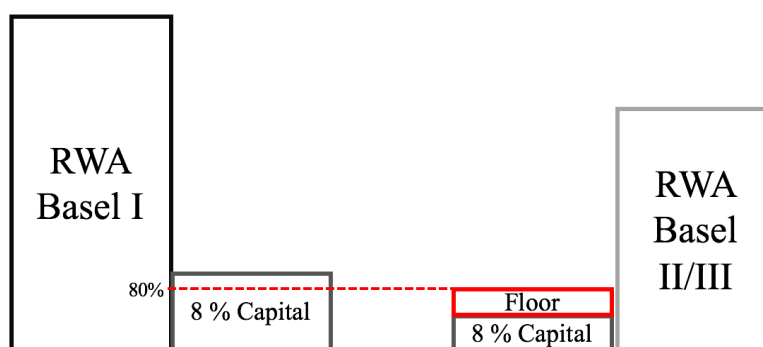


Source: Authors.

The application of the Basel I-floor in accordance with CRR Article 500 (1b), practiced in Sweden and Denmark, is illustrated below. Similar to Article 500 (2), risk-weighted assets are calculated in accordance with both the Basel I and the Basel II/III framework. The capital

requirement is then calculated by applying an 8% capital ratio to the respective risk-weighted assets. The Basel I floor is considered binding if the capital level under Basel II/III is less than 80% of the capital level under Basel I. If so, the deviation will be added to the required regulatory capital in order to achieve a level equal to 80% of eligible capital in accordance with Basel I.

B2: Basel I-floor in Sweden and Denmark



Source: Authors.

The implications of the different interpretations may not be obvious at first, but can be illuminated by a numeric example. The example is based on the Norwegian central bank's calculations of *DNB Bank ASA*'s capital position using the 2011 annual report (Borchgrevink, 2012). Table F3 is based on the application of CRR Article (2), as practiced in Norway. The risk-weights applied using the IRB-method is obviously lower than those applied under the Basel I framework. The bank's eligible capital is higher than the required level, but as the Basel I-floor is binding, the capital ratio is calculated based on the floor level.

B3: Example CRR Article 500 (2)

	CRR Article 500 (2) Norway	Calculations
RWA: Basel II/III (IRB)	975 000	
RWA: Basel I	1 275 000	
Eligible capital	115 000	
Floor RWA: 80% of RWA Basel I	1 020 000	$1\,275\,000 * 0.8 = 1\,020\,000$
Is floor binding?	Yes	$975\,000 < 1\,020\,000$
Capital ratio	11.27%	$115\,000 / 1\,020\,000 = 11.27\%$

Source: Borchgrevink (2012)

Table F4 presents the same figures, with the Basel I-floor being calculated in accordance with CRR Article 500 (1b). As shown, the Basel I-floor is not binding for the given level of

eligible capital. The capital ratio is thus calculated using risk-weighted assets from Basel II/III, resulting in a higher capital ratio than in the example shown in table F3.

B4: Example CRR Article 500 (1b)

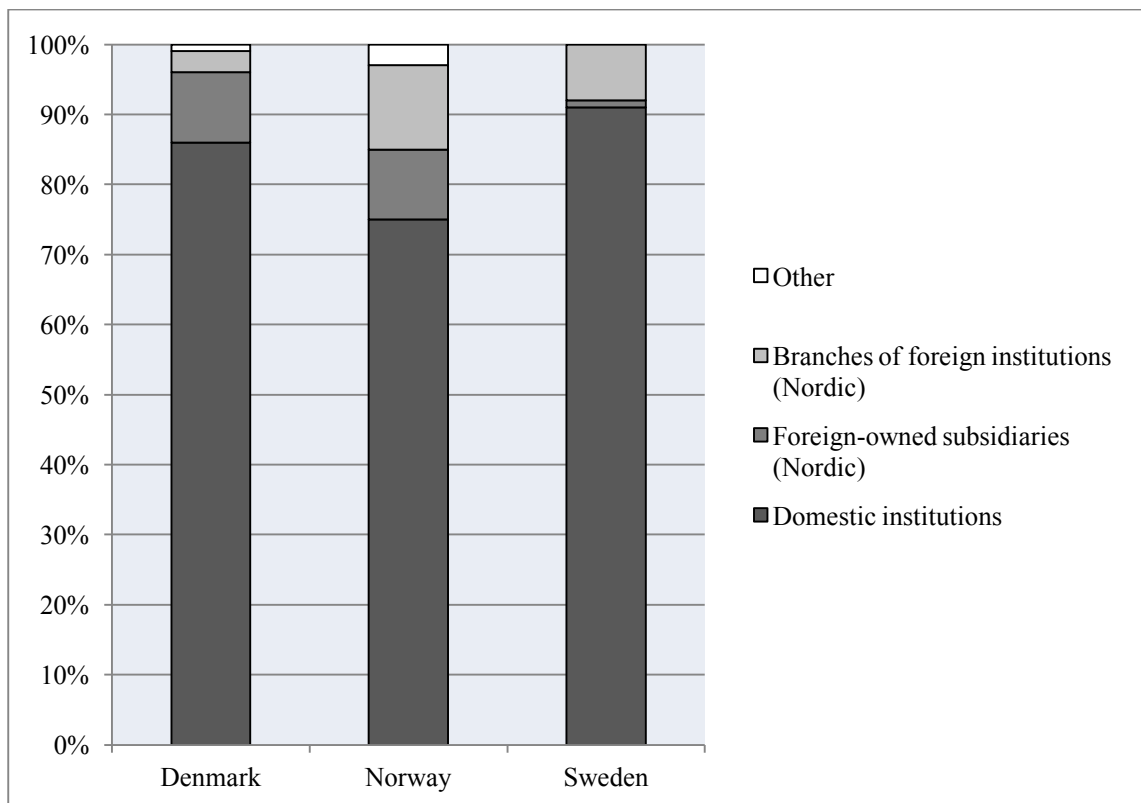
	CRR Article 500 (1b) Sweden/Denmark	Calculations
RWA: Basel II/III (IRB)	975 000	
RWA: Basel I	1 275 000	
Eligible capital	115 000	
Floor: 80% of Basel I required capital level	81 600	$1\,275\,000 * 0.08 * 0.8 = 81\,600$
Is floor binding?	No	$81\,600 < 115\,000$
Capital ratio	11.79%	$115\,000 / 975\,000 = 11.79\%$

Source: Borchgrevink (2012)

When the Basel I floor binds according to CRR Article 500 (2), but not according to 500 (1b), Norwegian banks will achieve a lower regulatory capital ratio for the same level of risk and capital, compared to Swedish and Danish banks. Thus, Norwegian banks could potentially appear less capitalized than banks in the neighboring countries. When the Basel I floor is binding, the denominator in the ratio will be higher, forcing Norwegian banks to hold higher levels of capital for the same level of risk-weighted assets calculated according to Basel II/III.

Appendix C: Bank integration in the Nordics

This figure presents the integration between the banking sectors in Norway, Sweden and Denmark, based on the level of domestic institutions, foreign-owned subsidiaries, branches of foreign institutions and other institutions.

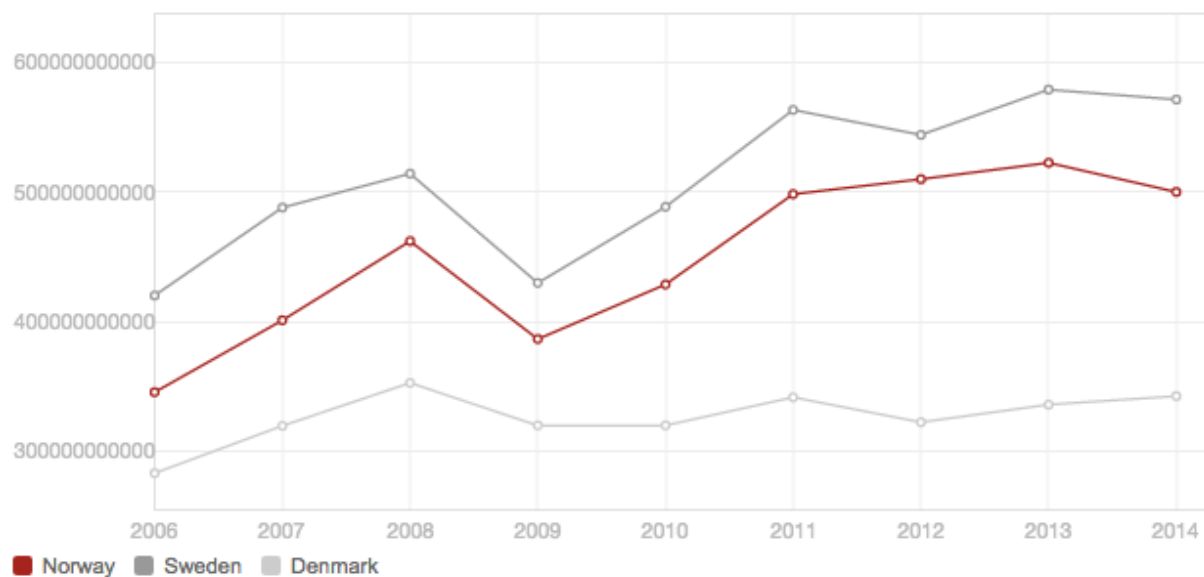


Source: Nordic Working Group on Basel III/CRD IV (2012)

Appendix D: GDP development in the Nordics

D1: Comparison of GDP at market prices

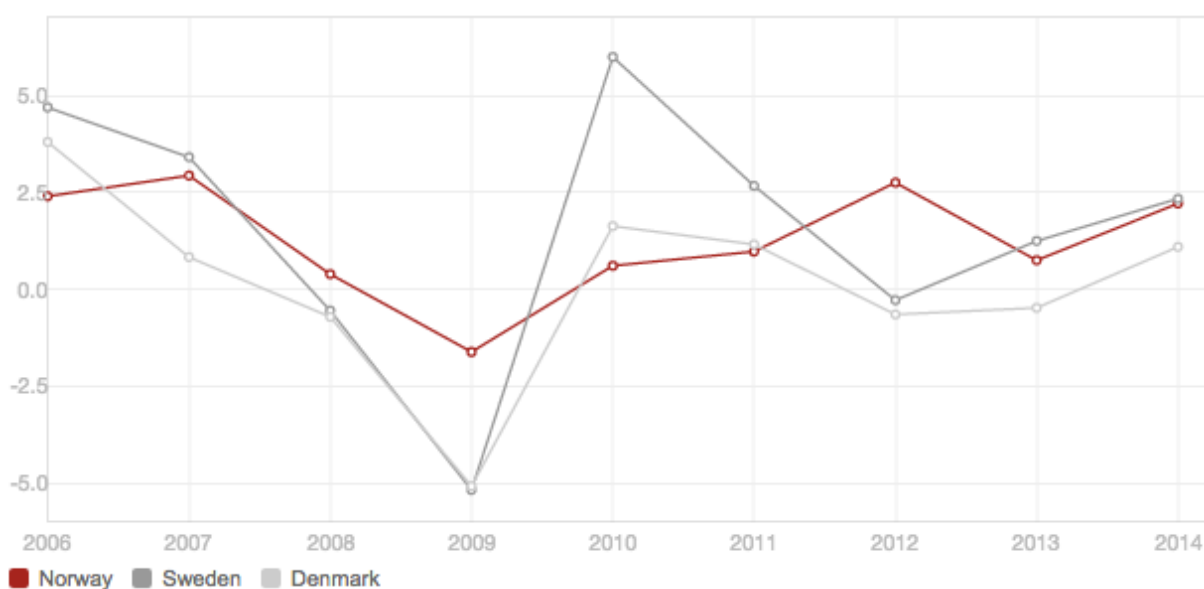
This figure shows the development in GDP at market prices converted to USD in Norway, Sweden and Denmark in the period from 2006 to 2015. The y-axis measures GDP in USD, while time measured in years is shown on the x-axis.



Source: Worldbank (2016)

D2: Comparison of GDP growth

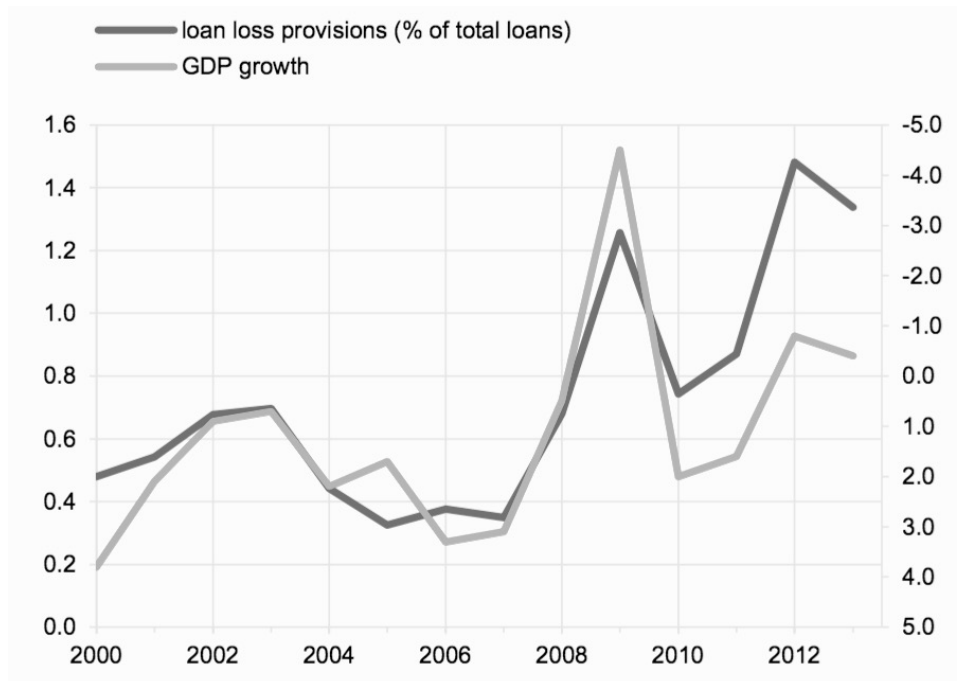
This figure shows annual GDP growth in percent in Norway, Sweden and Denmark, in the period 2006 to 2015. The y-axis measures annual GDP growth in percent, while time measured in years is shown on the x-axis.



Source: Worldbank (2016)

Appendix E: Banks' loan loss provisions and GDP growth

This figure shows loan loss provisions to total loans and GDP growth in the period 2000 to 2013. The left y-axis measures loan loss provisions to loans, while the right y-axis measures inverted GDP-growth. Time, measured in years, is shown on the x-axis.



Source: EBA, Financial Stability Report (2014)

Appendix F: Financial statements expressions

This table provides the expressions used when handpicking variables to construct the dataset applied in the analyses in this paper. We chose to collect the necessary data manually after discovering significant inconsistencies in the SNL and Bankscope databases' definitions of important variables, both over time and between banks. We collect data from financial statements and risk management reports, found through banks' webpages or stock exchange archives of company disclosures. In total, we collect 421 bank year observations on 46 banks over a time period from 2005 to 2014.

Variable	Expression
<i>Loans</i>	Found in: Balance sheet Expression: Gross loans Alternative expression: Net loans plus allowance for loan losses
<i>Assets</i>	Found in: Balance sheet Expression: Assets
<i>LLP</i>	Found in: Income statement Expression: Impairment of loans Comment: Adjusted for reversals of previous written of loans
<i>ALL</i>	Found in: Notes Expression: Accumulated impairments Alternative expression: Reserves for loan losses Comment: Difference between gross and net loans
<i>NPL</i>	Found in: Notes Expression: Individually impaired loans
<i>EBTP</i>	Found in: Income statement Expression: Earnings before taxes and provisions Alternative expression: Earnings after taxes plus impairment of loans
<i>RWA</i>	Found in: Notes Expression: Risk-weighted assets Alternative expression: Risk-based capital, risk-weighted volume
<i>Capital</i>	Found in: Notes Expression: Total eligible capital Alternative expression: Capital base, own funds
<i>NCO</i>	Found in: Notes Expression: Gross write-offs Comment: Adjusted for reversals of previous written off loans