CAPITAL MANAGEMENT AT THE DAWN OF IFRS 9

WERE LOAN LOSS PROVISIONS USED TO MANAGE REGULATORY CAPITAL IN EUROPEAN BANKS DURING THE TRANSITION TO IFRS 9?

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Capital Management at the Dawn of IFRS 9: Were loan loss provisions used to manage regulatory capital in European banks during the transition to IFRS 9?

Abstract: On January 1, 2018 IFRS 9 and the Expected Credit Loss model were mandatorily adopted by all IFRS compliant entities (IASB, 2017). Recent research has criticized the Expected Credit Loss model for increasing bank managers' discretion over loan loss provisions and noted its potential implications for financial stability (Bushman & Williams, 2012; Novotny-Farkas, 2016; Krüger et al., 2018). Previous literature has investigated the relationship between loan loss provisions and regulatory capital, finding evidence that loan loss provisions are used to inflate regulatory capital and avoid the costs associated with breaching minimum thresholds set by the regulator (Beatty & Liao, 2014). The aim of this thesis is to investigate whether loan loss provisions were used to manage regulatory capital during the transition to IFRS 9. The study is conducted on two samples of listed European banks: one panel data sample covering the years 2013-2017 and one cross-sectional sample at the transition to IFRS 9. The results provide significant evidence of capital management previous to the introduction of IFRS 9 but does not support capital management behaviour at the transition to IFRS 9. The results from this thesis contribute with new insights to academics, regulators, standard setters and analysts alike, and they provide an ample starting point for future capital management research focusing on loan loss provisions under IFRS 9.

Keywords: capital management, loan loss provisions, expected credit loss model, IFRS 9, regulatory capital

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1. Introduction

> A banker who is allowed to borrow money at X and lend it out at X plus Y will just go crazy and do too much of it if the civilization does not have rules that prevent it. What happened in Cyprus is very similar to what happened in Iceland, it was stark raving mad in both cases [...] I do not think you can trust bankers to control themselves. They are like heroin addicts.
>
> – Charlie Munger, Vice Chairman of Berkshire Hathaway (2013)[1]

The above comment are the words of the legendary investor Charlie Munger while reflecting on the 2013 banking crisis in Cyprus, which ended with a € 10 billion joint emergency bailout by the European Commission, International Monetary Fund and European Central Bank (European Commission, 2013). In the above quote, Mr. Munger notes that while similar crises have appeared numerous times before, they do not stop appearing, implying that bank managers seem incapable of learning from past mistakes. Indeed, in the last decades, the world has experienced some of the worst economic crises in history triggered by adverse behaviour in the banking sector (Diamond & Rajan, 2009). Inherent in their business model, financial institutions hold a relatively low percentage of equity capital in relation to other funding, such as deposits or other debt financing, which makes them sensitive to default risk (Finansinspektionen [FI], 2014). To ensure that banks hold a sufficient level of subordinated capital to absorb unexpected losses, financial institutions in countries which have ratified the Basel Accords[2] are required to follow certain capital adequacy ratios defined by the Basel Committee on Banking Supervision (Basel Committee on Banking Supervision [BCBS], 2011; FI, 2014). Failing to hold capital above the minimum threshold, the local regulatory authority holds mandate to impose severe costs on financial institutions to ensure compliance (Directive 2013/36/EU).

In its response to the global financial crisis of 2008, the BCBS noted that the crisis had been amplified by severe weaknesses in regulation of the banking sector (BCBS, 2010). Especially, the BCBS found that inadequate and low-quality regulatory capital had increased the severity of the financial crisis globally (BCBS, 2010). Specific critique was also directed towards the failure of financial accounting to adequately expose such weaknesses (BCBS, 2009). Loan loss provisions (LLPs) – broadly defined as provisions aimed at covering potential, future loan losses – were singled out as being particularly ineffective in reflecting the underlying economic value of loans during the financial crisis (BCBS, 2009; International Accounting Standards Board [IASB], 2013; Huizinga & Laeven, 2016). Specifically, LLPs under the prevailing accounting standard IAS 39 were considered too little, too late, which amplified credit deterioration during the crisis (BCBS, 2009), rather than serving its purpose of being a countercyclical reserve (IASB, 2013; Cohen & Edwards Jr., 2017). The critique against LLPs following the financial crisis triggered a joint response from leaders of the G20 countries and the BCBS to prompt the IASB to revise the prevailing provisioning model (BCBS, 2009; IASB, 2013; Cohen & Edwards Jr., 2017). The Incurred Loss Model (ILM) in IAS 39, which required

[1] Quote from televised interview with CNBC, aired May 3, 2013.
[2] The harmonization of capital adequacy regulation ratified by, among others, the European Union (BCBS, 1988; BCBS, 2011).

financial institutes to make provisions for credit losses only after a triggering event had occurred, was to be replaced by a more timely loan loss provisioning model, the Expected Credit Loss (ECL) model (IASB, 2017; Cohen & Edwards Jr., 2017). The new ECL model is included in IFRS 9, the new accounting standard for financial instruments, which was mandatorily adopted by all IFRS compliant entities on January 1, 2018 (IASB, 2017).

Generally being considered one of the most important accounting accruals for financial institutions, LLPs have drawn a lot of attention from academics (Beatty & Liao, 2014). As with all accounting accruals, LLPs are subject to a certain degree of managerial discretion, exposing LLPs to potential manipulation (Wahlen, 1994; Bushman, 2014). A large literature has focused on investigating LLP manipulation, finding evidence of it being used to smooth earnings, inflate capital or cover up increasingly risky loan portfolios (Bushman, 2014; Beatty & Liao, 2014), further proving the point made in the initial quote by Mr. Munger. Especially, one strain of research focuses on the use of managerial discretion in LLPs to inflate regulatory capital in order to avoid the costs associated with breaching the required levels set by the regulator, so called *capital management* (Beatty & Liao, 2014).

A majority of early capital management research focuses on U.S. banks (see e.g. Beatty, Chamberlain, & Magliolo, 1995; Ahmed, Thomas, & Takeda, 1999), while later studies have shifted focus to non-American samples (see e.g. Anandarajan, Hasan, & Lozano-Vivas, 2003; Anandarajan, Hasan, & McCarthy, 2007; Leventis, Dimitropoulos, & Anandarajan, 2011; Curcio & Hasan, 2015). In addition, the research on capital management differs with regards to the prevailing regulatory framework. In the period before the introduction of the first Basel Accord, most studies find that banks manipulate their LLPs in order to increase regulatory capital (Moyer, 1990; Beatty et al., 1995; Kim & Kross, 1998; Ahmed et al., 1999). In the period following the introduction of the first Basel Accord, the incentives to manage capital using LLPs are changed (Ahmed et al. 1999). Some studies focused on the post-Basel period continue to find evidence of capital management under certain circumstances (Ahmed et al., 1999; Shrieves & Dahl, 2003; Anandarajan et al., 2007; Bouvatier & Lepetit, 2008; Curcio & Hasan, 2015), while other studies find opposing results (Anandarajan et al., 2003; Leventis et al., 2011). A particular strain of capital management research has successfully utilized such regulatory shifts, which change bank managers' incentive or capability to manage capital using LLPs, to ascertain if capital management is present before or after the shift (Kim & Kross, 1998; Ahmed et al., 1999; Anandarajan et al., 2003; 2007; Leventis et al., 2011).

As mentioned above, the implementation of IFRS 9 changes the rules governing LLPs. Already, critique has been put forward against IFRS 9 and the ECL model pointing out that the ECL model will increase bank managers' discretion when recognizing LLPs (Bushman & Williams, 2012; Novotny-Farkas, 2016; BCBS, 2017; Krüger, Rösch, & Scheule, 2018). Consequently, the initial impact on LLP reserves due to the transition to IFRS 9 provides the first ample opportunity for banks to manipulate regulatory capital under the new accounting standard (Novotny-Farkas, 2016; Krüger et al., 2018; European Banking Authority [EBA], 2018). Except for increased discretion, the transition to IFRS 9 also includes elements of changed incentives for bank managers to manipulate regulatory capital using LLPs (see section 2.3; Ahmed et al., 1999; EU, 2017/2395), further making the transition an interesting opportunity for capital management research. Following previous research on capital

management utilizing regulatory change, the aim of this paper is to investigate if capital management behaviour can be detected among European banks at the IFRS 9 transition. The following research question is to be investigated:

Were loan loss provisions used to manage regulatory capital in European banks during the transition to IFRS 9?

Previous literature on capital management have mainly focused on samples of U.S. banks (Beatty & Liao, 2014). While some later studies have focused on European samples, they provide inconclusive evidence on capital management (Leventis et al., 2011; Curcio & Hasan, 2015). In addition, no capital management research has been performed on European banks in a post-financial crisis setting, where the regulatory pressure on banks has intensified following the implementation of the Basel III framework (BCBS, 2011). With the lack of research covering a recent European sample, the authors find it important, in order to answer the research question, to also investigate the relation between LLPs and regulatory capital in the period leading up to the implementation of IFRS 9. This provides a foundation for comparing banks' provisioning behaviour during ordinary course of business and during the transition to IFRS 9, further increasing the understanding of the impact of IFRS 9 on LLPs (Ahmed et al., 1999).

It is hypothesised that capital management is present among European banks in the period preceding, and at, the transition to IFRS 9 (Ahmed et al., 1999; Anandarajan et al., 2007; Shrieves & Dahl, 2003; Bouvatier & Lepetit, 2008; Curcio & Hasan, 2015; Novotny-Farkas, 2016; Krüger et al., 2018; EBA, 2018). The results from this study find evidence of capital management using LLPs among European banks in years 2013-2017 preceding the implementation of IFRS 9, in-line with the results from several previous studies (Ahmed et al., 1999; Anandarajan et al., 2007), but opposing the findings of some later research focusing on European samples (Anandarajan et al., 2003; Leventis et al., 2011; Curcio & Hasan, 2015). However, the study finds no support for capital management using LLPs at the transition to IFRS 9, in contrast to the hypothesised behaviour. The combined results show that banks do not engage in capital management during the transition to IFRS 9 in the same way as they have in the preceding period.

The findings of this study contribute to academic research on capital management in three distinct areas. First, this study is the first post-financial crisis study investigating the relation between LLPs and regulatory capital in European banks. Specifically, the results contrast previous research on capital management on European banks from earlier periods (Leventis et al., 2011; Curcio & Hasan, 2015) by providing new evidence of capital management in the period 2013-2017. Second, this study is the first to investigate capital management during the transition IFRS 9 and the new ECL model, providing a first indication of how the new provisioning model might affect capital management behaviour. Third, by focusing on the transition to IFRS 9 and changed incentives for capital management in specific sub-groups of banks[3], this study contributes to the specific strain of capital management research focusing on

[3] See H2 and H3 in section 2.3.

regulatory changes which alter the incentives for banks to manage capital (Ahmed et al., 1999; Anandarajan et al., 2003; 2007; Leventis et al., 2011).

In addition, the results from this study contribute with practical insights to regulators, standard setters and analysts alike. For standard setters, it is of great importance to understand if new accounting standards serve their intended purpose or allow for any adverse behaviour, such as capital management (BCBS, 2010). For regulators, the impact of new accounting standards on regulation needs to be understood to ascertain its effectiveness (European Systemic Risk Board [ESRB], 2017). For analysts, the information contained in financial reports needs to reflect the reality of the underlying business to be useful (IASB, 2017). By investigating potential capital management using LLPs during the transition to IFRS 9, this thesis contributes with new findings and practical insights to all three.

1.1. Delimitations

The focus of this thesis is on capital management during the transition to IFRS 9. To ensure consistency in the results, this study will be limited to International Financial Reporting Standards (IFRS) compliant banks operating under a single regulatory framework (BCBS, 2011). In practice, this means that the study will focus on listed, commercial banks registered in a country compliant with EC 1606/2002[4] as these banks are mandated to apply IFRS and the regulatory requirements as set out by the Basel Accords.

Focusing on capital management during the transition to IFRS 9, this study will conduct tests on data from before and at the first-time implementation of IFRS 9. The period for investigating capital management prior to the introduction of IFRS 9 is limited to years 2013-2017. This limitation focuses the study on the period following the financial and European debt crises, where banks are impacted by Basel III regulation, which was implemented starting in 2013 (BCBS, 2011). This limitation also ensures that the test for capital management prior to the introduction of IFRS 9 is conducted in a similar regulatory environment as the following tests. The main test for capital management at the transition to IFRS 9 will be conducted on cross-sectional data using the first-day change in total LLP reserves due to the transition to IFRS 9.

Previous studies on capital management using LLPs have often included additional tests for earnings management and signalling effects (Beatty & Liao, 2014). Potential earnings management will be controlled for in the period leading up to IFRS 9, but will not be part of the main test as the change in LLP reserves due to the transition to IFRS 9 does not affect earnings (IASB, 2017). With regards to tests for signalling, these are outside the scope of this thesis as they need to be conducted on data with sufficient time-series to identify the effect of the signal (Ahmed et al., 1999). With IFRS 9 being mandatorily adopted on January 1, 2018, tests of a signalling effect cannot be conducted due to the recent adoption.

Following the sequent introduction to the empirical setting in section 1.2, this paper will continue with a discussion of relevant literature regarding capital management before the

[4] This includes all countries in the European Union, Norway and Iceland. From now on referred to as *European Banks* in this thesis, with regards to the banks included in the investigated samples.

development of the hypotheses is made in section 2. In section 3, the method used to investigate the research question is described, including the statistical models used to perform formal hypothesis tests. The results will be presented in section 4, followed by an analysis and discussion in section 5, together with an overview of the study's limitations. The thesis will be closed with a summary of the conclusions and implications from the results in section 6.

1.2. Empirical setting

1.2.1. Moving from IAS 39 to IFRS 9

As of 1 January 2018, all financial institutions compliant with IFRS are required to measure and recognize their financial instruments in accordance with the new IFRS 9 accounting standard (IASB, 2017). The prior accounting standard, IAS 39, was generally considered to recognize LLPs too late, inciting criticism after the recent financial crises (BCBS, 2009; IASB, 2013). LLPs under IAS 39 were accounted for under the ILM, which required financial institutions to make provisions for credit losses only after a triggering event had occurred (IASB, 2017). In practice, this meant that financial institutions often had to wait until the creditee had defaulted on payments before recognizing a credit loss on that loan (IASB, 2013; 2017). The new ECL model introduced by IFRS 9 has the objective of increasing transparency towards investors and to allow a more timely recognition of credit losses (IASB, 2017; Frykström & Li, 2018). Applied properly, the ECL model gives investors earlier signs of worsening credit quality, since the model requires holders of financial assets to recognise expected credit losses on all applicable assets at all times, taking into account past events, current conditions and forecasted information, thus stepping away from the previous reliance on triggering events (Financial Stability Institute, 2017).

Table 1. Provisioning models under IAS 39 and IFRS 9

	Applicable Assets	**Impairment Model**	**Model spec.**
IAS 39	For all Financial Assets not recorded at fair value through P&L	Incurred Loss Model (ILM)	LLPs recognised only when a required triggering event has occurred
IFRS 9	For all Financial Assets not recorded at fair value through P&L	Expected Credit Loss Model (ECL model)	LLPs recognised for all assets in a three-stage model. - **Stage 1:** 12-month ECL - **Stage 2:** Lifetime ECL. Reclassification from stage 1 through SICR. - **Stage 3:** Lifetime ECL. Reclassification from stage 1/2 through default

The ECL model is based on a relative assessment of credit risk compared to the level of risk present at initial recognition of the financial asset (IASB, 2017). This means that banks and financial institutions continuously have to estimate the changes in credit quality of their loans and record LLP expenses accordingly. To determine an appropriate level of LLPs, the ECL model classifies all applicable financial assets into one of three possible stages (IASB, 2017). Table 1 summarizes the main differences between IAS 39 and IFRS 9.

Two main features of the ECL model are important to understand the motivation of this thesis. First, when moving from IAS 39 to IFRS 9, the total LLP reserve is expected to increase significantly (BCBS, 2017; EBA, 2018; Krüger et al., 2018). The increase will generally stem from the fact that expected credit losses are to be recorded on all loans, not just the ones who have suffered a triggering event as per the ILM (BCBS, 2017; EBA, 2018; Krüger et al., 2018). Roughly, loans classified as stage 3 in the ECL model correspond to loans which have suffered a triggering event under the ILM, thus provisions on all other loans classified as stage 1 and 2 will increase the total LLP reserve (IASB, 2017; BCBS, 2017). The increase in LLP reserve due to the introduction of the ECL model is to be recorded in opening balance financial statements at the time of adoption[5] (IASB, 2017). In practice, this means that most banks will record a decrease in accounting equity between closing balance 2017 and opening balance 2018 (IASB, 2017), which also impacts regulatory capital ratios (BCBS, 2017). Second, if a financial asset is reclassified from stage 1 to stage 2, the ECL model stipulates that lifetime expected credit losses must now be provisioned for on that asset, resulting in an increased LLP for that asset (IASB, 2017; BCBS, 2017). For an asset to be reclassified from stage 1 to stage 2, a *significant increase in credit risk* (SICR) must have occurred since the asset's initial recognition (IASB, 2017). What constitutes a SICR is not explicitly defined by the standard setter (see §§ 5.5.9-5.5.12 IASB, 2017). This has incited critique of the ECL model, as the introduction of the SICR criteria increases the bank management's discretion over LLPs, which might lead to increased risk of LLP manipulation (Bushman & Williams, 2012; Novotny-Farkas, 2016; Krüger et al., 2018).

1.2.2. IFRS 9 and Regulatory Capital Adequacy Ratios

Table 2. The impact of LLPs on Regulatory Capital

Impact of a 1 Currency Unit increase in LLPs on Basel III Regulatory Capital				
LLP Expense (Income Statement)	Retained Earnings (Balance Sheet)	Tier 1 capital (Core capital)	Tier 2 capital (Supplementary capital)	Net effect on Total capital
–1	–1 x (1–T)	–1 x (1–T)	+1 (up to a certain threshold[6])	+1 x T

TABLE 2: General impact of a 1 Currency Unit (CU) increase of LLP reserves on Basel III regulatory capital. *T* is the corporate tax rate.

LLPs made under the prevailing accounting standard are included in the accounting definition of common equity through retained earnings (IASB, 2017). Accounting equity forms the initial input to the numerator of core regulatory capital adequacy ratios, why fluctuations in LLPs also have an impact on regulatory capital (BCBS, 2011). The general impact of LLPs on core (Tier

[5] This assumes that the entity has not opted to restate previous periods, under which no initial impact of IFRS 9 will be recorded at adoption (IASB, 2017). For the sample of banks used in this thesis, no single bank had chosen to restate previous periods to avoid disclosing the initial impact (see section 3.1).

[6] The specific threshold depends on several factors, such as the adoption of a standardized or internal rating-based approach for determining credit risk, or the classification of an LLP as a general or specific provision (BCBS, 2011). Generally, previous research has used 1.25% of risk-weighted assets, which is consistent with the threshold when adopting the standardized approach under the Basel Accords (see e.g. Ahmed et al., 1999; Anandarajan et al., 2003; 2007; Bouvatier & Lepetit, 2008; Leventis et al., 2011; Curcio & Hasan, 2015).

1), supplementary (Tier 2), and Total regulatory capital under the Basel Accords is described in Table 2 above. As shown by the table, LLPs decrease Tier 1 capital but generally increase Total capital.

Due to the anticipated increase in LLP reserves stemming from the transition to IFRS 9, researchers and regulators were concerned that the sudden increase in LLPs would have a significant impact on regulatory capital ratios, threatening financial stability (Novotny-Farkas, 2016; BCBS, 2017; Krüger et al., 2018; EBA, 2018). To mitigate the potential adverse impact on regulatory capital, the BCBS introduced the IFRS 9 Transitional Arrangements (BCBS, 2017). The Transitional Arrangements gives banks in EU/EEA countries the possibility to effectively eliminate the first-day change in LLPs from the transition to IFRS 9 on their regulatory capital ratios (EU, 2017/2395; CRR, 473a). Instead, banks which adopt the IFRS 9 Transitional Arrangements phase-in the impact over the following five years (CRR, 473a). The IFRS 9 Transitional Arrangements are voluntarily adopted and only applicable to the change in LLP reserves arising at the first day of the implementation of IFRS 9 (BCBS, 2017). The phase-in under the Transitional Arrangements retains a 5% impact year 1, allowing banks to choose between a linear or dynamic phasing model during the following five years (EU 2017/2395, CRR, 473a). Thus, banks adopting the IFRS 9 Transitional Arrangements will effectively neutralize the connection between the initial increase in LLP reserves due to the transition to IFRS 9 and regulatory capital.

2. Literature Review and Theory

In this section, theories and evidence regarding capital management are reviewed. Initially, concepts and theories underpinning capital management in banks are considered in section 2.1, followed by an extensive review of capital management evidence focusing on the use of LLPs to manage capital in banks. Due to the changing relationship between LLPs and regulatory capital, the section has been subdivided based on capital management research performed on banks before, during or after the implementation of the first Basel Accord.

2.1. Agency Problems in Banks

Agency problems occur when a principal and an agent, connected by a contractual relationship, have different interests or goals combined with information asymmetry between the agent and the principal (Jensen & Meckling, 1976; Eisenhardt, 1989). Given that both parties are utility maximizers, the agent can utilize the information asymmetry to achieve its own goals, which may not always be in the best interest of the principal (Jensen & Meckling, 1976; Eisenhardt, 1989). One commonly explored relationship within the principal-agent problem is the one between the external shareholders and managers of a company (Eisenhardt, 1989). Shareholders invest equity in a company and expect a certain level of return, but the managers who are in direct control of the company can have other objectives than to deliver strong long-term returns to shareholders (Jensen & Meckling, 1976). Another, similarly important relationship specific to financial institutions, is the one between bank managers and external depositors, which provide the majority of funds to the bank (Jensen & Meckling, 1976; Armstrong, Guay, & Weber, 2010). While shareholders have unlimited upside in their claim

on the excess returns that a bank generates, with their risk limited to their invested money, depositors face a limited upside from their promised return, but still risk all their invested (deposited) capital (Armstrong et al., 2010; Herring & Carmassi, 2015). This means that shareholders and depositors have different risk attitudes, which additionally can differ from the risk attitude of a bank manager (Jensen & Meckling, 1976; Herring & Carmassi, 2015). While shareholders can develop different monitoring mechanisms, measures and incentives to get the managers' objectives in line with their own through the board of directors and annual general meeting, depositors do not hold such direct powers (Armstrong et al., 2010).

To protect the depositors, the European Commission have introduced state sanctioned deposit guarantees, which ensure that depositors will be reimbursed up to a fixed amount in case of bank default (EU 2014/49; Gordy, Heitfield, & Wu, 2015). To reduce the new agency problem of moral hazard arising from the deposit insurance guarantees[7], bank supervisors have also introduced minimum regulatory capital adequacy requirements (Gordy et al., 2015). More specifically, regulatory capital requirements stipulate that banks are required to hold sufficient subordinated capital to absorb unexpected losses, as assurance against potential adverse risk-taking behaviour and to reduce the risk of failure (Berger, Herring, & Szego, 1995; Beatty & Liao, 2014; Gordy et al., 2015). To force banks to hold sufficient capital, regulators hold the power to impose severe costs on banks holding capital below certain thresholds (BCBS, 2011; Gordy et al., 2015).

Accurate and correct financial reporting helps to mitigate the information asymmetry between external shareholders, depositors, governments and banks (Jensen & Meckling, 1976; Armstrong et al., 2010). However, due to managerial discretion, there are still ways for managers to exploit their position as agents to their advantage (Jensen & Meckling, 1976; Healy & Wahlen, 1999; Armstrong et al., 2010; Bushman, 2014). Specifically, managerial discretion increases the possibility for managers to engage in opportunistic accounting behaviour by decreasing the transparency of financial reporting (Bushman, 2014).

2.1.1. Earnings and Capital Management in Banks

One of the most commonly investigated ways of managers' exploitation of managerial discretion, is the manipulation of reported earnings in such a way that they do not reflect the real economic result of a firm, reducing the accuracy of the financial reports (Healy & Wahlen, 1999; Armstrong et al., 2010; Curcio & Hasan, 2015). This is referred to as *earnings management* and can be either accruals-based or real management of earnings. In banks, the possibility to manipulate earnings by utilizing the discretionary elements in LLP accruals is an example of accruals-based earnings management, which has no real impact on the cash flows of the bank (Healy & Wahlen, 1999). In contrast, real earnings management impact cash flows directly and can be exemplified by a bank realizing a gain on a sale of securities to boost earnings for the period (Healy & Wahlen, 1999; Lo, 2008).

[7] A deposit insurance guarantee reduces the incentive for banks to behave prudently by ensuring a bail-out of deposits in case of failure, increasing the probability of adverse risk-taking behaviour (Gordy et al., 2015). See Merton (1977) for underlying evidence of bank risk-shifting behaviour under deposit guarantees.

Due to the special regulatory capital requirements for banks, several scholars have also found it interesting to explore if the level of capital is manipulated in banks (Beatty & Liao, 2014). Previous literature has investigated a similar real or accruals-based manipulation, as found in earnings management research, of regulatory capital levels in banks, so called *regulatory capital management* (capital management) (Beatty & Liao, 2014). The intuition behind capital management is that bank managers want to avoid the costs imposed by regulators on banks with too low regulatory capital, giving bank managers incentives to artificially inflate regulatory capital (see e.g. Moyer, 1990; Beatty et al., 1995). While some earlier studies include investigations of real capital management (Collins, Shackelford, & Wahlen, 1995; Beatty et al., 1995), most studies have focused on accruals-based capital management using LLPs (see e.g. Moyer 1990; Collins et al., 1995; Beatty et al., 1995; Kim & Kross, 1998; Ahmed et al., 1999; Anandarajan et al., 2003; 2007; Curcio & Hasan, 2015). The focus on LLPs, in both research on earnings management and capital management in banks, is due to its discretionary nature, frequency and size which makes it an ideal accrual to be used by managers to smooth income or inflate regulatory capital (Bushman, 2014; Beatty & Liao, 2014).

The aim of this thesis is to investigate capital management using LLPs during the transition to IFRS 9. In the following section, previous studies providing evidence on capital management behaviour in banks will be reviewed. Due to the change in nature of the relationship between LLPs and regulatory capital after the introduction of the first Basel Accord, the following section is subdivided into three parts covering the pre-Basel period, the transition period and the post-Basel period.

2.2. Evidence on Capital Management in Banks

2.2.1. Pre-Basel Evidence

In an early study on the relationship between accounting accruals, transactions and regulatory capital in U.S. commercial banks, Moyer (1990) investigates whether the levels of LLPs, loan charge-offs and realizations of investment securities were impacted by banks' level of regulatory capital. Moyer (1990) finds that the relation between regulatory capital and LLPs is significantly negative for banks between years 1981-1986, indicating that low capital banks inflate LLPs. Prior to the implementation of the first Basel Accord[8], increasing LLPs had a singularly positive impact on regulatory capital, why low capital banks had an incentive to increase LLPs to boost regulatory capital. Specifically, a one currency unit (CU) increase in LLPs would decrease accounting equity by one CU times one less the corporate tax rate, with the whole one CU increase of LLPs subsequently added back to regulatory capital, resulting in a net increase of regulatory capital of one CU times the tax rate (Moyer, 1990; Kim & Kross, 1998; Ahmed et al., 1999). This implies that capital increases with LLPs, which stands in contrast to the relation between LLPs, accounting earnings and equity. The evidence from Moyer (1990) indicate that low capital banks prioritize to increase regulatory capital, even at the expense of accounting earnings.

[8] First published in 1988 (BCBS, 1988), implemented in the U.S. years 1990-1992 (Ahmed et al., 1999).

Beatty et al. (1995) further investigate the trade-off bank managers face between earnings, capital and tax management incentives. The authors find evidence that LLPs, loan charge-offs and issuance of securities are influenced by regulatory capital levels on a sample of large U.S. banks between years 1985-1989. Beatty et al. (1995) interpret their results as bank managers use of accruals and financing discretion to avoid costs associated with deviating from regulatory capital targets. Specifically, the authors find a negative relation between regulatory capital levels and LLPs and conclude that capital management is prioritized, consistent with Moyer (1990).

In a contemporary study, Collins et al. (1995) try to ascertain how changing levels of earnings and capital management incentives affect U.S. commercial banks' use of different capital raising options. The authors hypothesise that bank managers will be more inclined to engage in capital management using LLPs when other means of raising capital are costly. Collins et al. (1995) find a significantly positive relation between regulatory capital and LLPs, in contrast to the negative relation documented by Moyer (1990) and Beatty et al. (1995), contradicting the notion that LLPs are used to inflate regulatory capital. However, the authors do find strong evidence that banks engage in capital management behaviour using other capital raising options. Collins et al. (1995) and Beatty et al. (1995) attribute their diverging result to model specification differences, discussing whether their own model better capture the trade-off bank managers face between increasing earnings or capital using LLPs.

Some studies also provide evidence on real capital management. Scholes, Wilson, & Wolfson (1990) investigate U.S. commercial banks' tax reduction incentives to trigger voluntary realizations of security gains. The authors find that banks with low capital realize gains on securities in order to replenish capital ratios, even in the face of baring substantially increased tax costs. Scholes et al. (1990) interpret their findings as strong evidence in favour of bank managers' propensity to engage in capital management, even at the expense of increased taxes.

In sum, studies on capital management in the pre-Basel setting provide evidence that bank managers engage in real and accruals-based capital management. Following strong incentives for banks to boost LLPs to increase regulatory capital in the prevailing regulatory regime, Moyer (1990) and Beatty et al. (1995) find consistent evidence, which is contrasted by the opposing findings of Collins et al. (1995). Following the results of Moyer (1990) and Beatty et al. (1995), the negative relationship between LLPs and regulatory capital, indicating capital management, has become known as the *capital management hypothesis* (Ahmed et al., 1999).

2.2.2. Pre- and Post-Basel Comparative Evidence

The first Basel Accord introduced a new definition of regulatory capital (BCBS, 1988; BCBS, 2011). Specifically, after the introduction of Basel I, LLPs are no longer added back to core Tier 1 capital. Instead, LLPs are added back to supplementary Tier 2 capital up to a certain threshold of risk-weighted assets (RWA). Using a similar example as in 2.2.1, this means that a one CU increase in LLPs reduce Tier 1 capital by the after-tax amount via accounting equity. The pre-tax amount is subsequently added back to Tier 2 capital, resulting in Total capital being increased by the net tax-shield amount. As banks face regulatory thresholds on both Tier 1 and Total capital, the incentive to inflate LLPs to boost regulatory capital after the introduction of

Basel is more unclear than in the pre-Basel period (Beatty & Liao, 2014). Exploiting the more ambiguous relationship between LLPs, Tier 1, Tier 2 and Total capital after the introduction of the first Basel Accord, a number of papers try to use the shift in the relation between regulatory capital and LLPs to validate claims of capital management.

Kim and Kross (1998) uses the introduction of the first Basel Accord to find evidence of capital management in the pre-Basel period. The study separates the sample banks into *high capital* and *low capital* banks based on their Tier 1 capital ratios, hypothesizing that low capital banks held stronger incentives to inflate LLPs in order to boost capital in the pre-Basel period. The authors find that low capital banks significantly reduced their LLPs in the years immediately following the introduction of the Basel framework, while the same pattern is not found for high capital banks. Kim and Kross (1998) interpret the deflation of LLPs in the post-Basel period as evidence that low capital banks had engaged in capital management by inflating LLPs before the introduction of the Basel framework. Kim and Kross (1998) conclude that regulators should consider the incentive effects of regulation on accounting decisions and managerial behaviour.

In a well-cited study, Ahmed et al. (1999) conduct a pre- and post-Basel comparative study on U.S. banks, focusing explicitly on the relationship between regulatory capital and LLPs. The authors find that banks exhibit a significantly less negative relationship between regulatory capital and LLPs in the post-Basel period, compared to the pre-Basel period. Ahmed et al (1999) attribute the change to the reduced incentive to inflate LLPs to manage capital after the introduction of the first Basel Accord. However, the authors find that the general relationship between regulatory capital and LLPs is significantly negative even in the post-Basel period, indicating that banks still inflate LLPs at low capital levels in accordance with the capital management hypothesis. In addition, the authors find that banks with different incentives to manage capital in the post-Basel regime will behave differently. Specifically, they find that the relation between regulatory capital and LLPs is less negative for banks with LLP reserves in excess of 1.25% of risk-weighted assets[9] in the post-Basel period. The authors attribute this to the reduced incentives these banks face to inflate capital under the Basel Accords.

Extending the previous pre/post-Basel comparative literature focusing on U.S. data, Anandarajan et al. (2003; 2007) employ a similar method to that of Ahmed et al. (1999) on Spanish (Anandarajan et al., 2003) and Australian (Anandarajan et al., 2007) samples of banks. Anandarajan et al., (2003) find that Spanish banks engaged in capital management in the pre-Basel period, but find no evidence of capital management in the post-Basel period, attributing the change to the especially strict interpretation of the first Basel Accord by the Spanish regulatory authority[10]. However, similar to Ahmed et al. (1999), Anandarajan et al. (2007) find a significantly negative coefficient between LLPs and regulatory capital in both the pre- and

[9] Under the Basel Accords, banks are generally allowed to add back LLPs to Tier 2 capital up to a threshold of 1.25% of risk-weighted assets (BCBS, 2011).

[10] Note that the local regulatory authority in Spain did not allow LLPs to be added back as Tier 2 capital under the first Basel Accord, completely removing the incentive to inflate LLPs to boost regulatory capital. Thus, the lack of capital management in the post-Basel period in Spanish banks may be interpreted as corroborative evidence of the capital management in other geographical areas (Anandarajan et al., 2003; Pérez, Salas-Fumás, & Saurina, 2007).

post-Basel periods for Australian banks, noting that the introduction did not seem to reduce capital management behaviour.

The findings from the above studies comparing capital management behaviour before and after the introduction of the first Basel Accord generally find that capital management using LLPs has been reduced following the introduction of the new regulation. However, the results of some studies (Ahmed et al., 1999; Anandarajan et al., 2007) find evidence of capital management behaviour still being present in the post-Basel period, indicating that the new regulation do not fully remove the incentive to inflate LLPs to boost regulatory capital.

2.2.3. Post-Basel Evidence

Studies focusing exclusively on the post-Basel period generally find weaker evidence of capital management. Shrieves and Dahl (2003) explore capital management in Tier 1 capital constrained Japanese banks in a post-Basel setting during the years 1989-1996. For their sample of low capital banks, the authors find evidence that these banks deflate LLPs to reduce the negative impact on Tier 1 capital. The same behaviour is not found among Japanese banks that hold sufficient Tier 1 capital, where a negative relation between regulatory capital and LLPs is found, in-line with previous research (Ahmed et al., 1999; Anandarajan et al., 2007). Shrieves and Dahl (2003) attribute the difference in behaviour to the incentive for Tier 1 capital constrained banks to reduce LLPs to avoid further deterioration of Tier 1 capital, interpreting it as evidence of capital or earnings management[11].

Also focusing on low Tier 1 capital banks in a post-Basel setting, Bouvatier and Lepetit (2008) conduct the first study of capital management on a sample of European banks in years 1992-2004. Using a similar method as Shrieves and Dahl (2003), the authors find corroborating evidence that Tier 1 capital constrained European banks deflate LLPs to reduce the negative impact on Tier 1 capital, indicating capital management. Following the method of Bouvatier and Lepetit (2008), Curcio and Hasan (2015) find conflicting evidence in a study comparing Eurozone and non-Eurozone banks during time periods 1996-2006 and 2007-2010. For both time periods the authors find that even Tier 1 capital constrained banks in the Eurozone seem to inflate LLPs, contradicting the results of Shrieves and Dahl (2003) and Bouvatier and Lepetit (2008). Further, Curcio and Hasan (2015) find that non-Eurozone Tier 1 capital constrained banks deflate LLPs in-line with previous research during the period 1996-2006, but find no such relation during the years 2007-2010 covering the financial crisis.

In a study closely related to this thesis, Leventis et al. (2011) investigate whether the mandatory implementation of IFRS in the European Union impacted banks' use of LLPs to manage earnings and capital in a post-Basel setting. The authors hypothesize that the introduction of a uniform provisioning model would reduce managers' ability to manage earnings and capital using LLPs. Thus, the study focuses on the changed opportunity to manage capital, rather than a change in incentives to do so. The authors find that the relation between regulatory capital and LLPs is negative, however insignificant, both before and after the mandatory adoption of IFRS. Thus, the results show no strong support for the capital management hypothesis.

[11] Deflating LLPs lead to both increased earnings and reduced deterioration of Tier 1 capital under the Basel Accords.

However, the authors note that the negative relation between LLPs and regulatory capital is increasingly negative after the implementation of IFRS, contradicting their hypothesis that the introduction of IFRS would reduce capital management behaviour.

In sum studies in the post-Basel setting find conflicting evidence of capital management. Studies focusing on European samples are no exception: Leventis et al. (2011) find an insignificant but increasingly negative relationship between regulatory capital and LLPs for European banks. Bouvatier and Lepetit (2008) find an oppositely positive relationship for Tier 1 capital constrained European banks, while Curcio and Hasan (2015) find that even Tier 1 capital constrained banks in the Eurozone exhibit a negative, however insignificant, relationship between regulatory capital and LLPs.

2.3. Hypotheses

This thesis' research question concerns if LLPs are used to manage regulatory capital in European banks during the transition to IFRS 9. A branch of previous research has utilized changes in regulation when investigating the existence of capital management. By investigating the same sample of banks before and after the change, these studies try to corroborate the existence of capital management by comparing the capital management behaviour between the control and treatment groups (see e.g. Ahmed et al., 1999). Some studies focus on changes in bank managers' incentives to manage capital by investigating changes in capital adequacy regulation (Kim & Kross, 1998; Ahmed et al., 1999; Anandarajan et al., 2007), while others focus on changes in bank managers' discretion over LLPs and capability to manage capital by investigating changes in accounting regulation (Leventis et al., 2011).

This study focuses on the transition from IAS 39 to IFRS 9, which entails both changes in bank managers' discretion over LLPs and incentive to manage capital using LLPs (Bushman & Williams, 2012; Novotny-Farkas, 2016; Krüger et al., 2018). Hypotheses concerning each aspect will be developed.

This study adopts the methodology established by Ahmed et al. (1999) and consequently used by Anandarajan et al. (2003; 2007) and Leventis et al. (2011) (see section 3.2). Generally, studies in the pre-Basel setting agree on a negative relationship between LLPs and regulatory capital as an indication of capital management (Moyer, 1990; Beatty et al., 1995; Kim & Kross, 1998; Ahmed et al., 1999). However, in the post-Basel era, the incentives to boost regulatory capital by inflating LLPs are double edged (BCBS, 2011). Still, several studies find that a general, negative relationship between LLPs and regulatory capital is indicative of capital management also in the post-Basel setting by emphasising banks' incentives to inflate LLPs to boost regulatory capital when not constrained by Tier 1 capital (Ahmed et al., 1999; Anandarajan et al., 2003; 2007, Leventis et al., 2011). Following this previous literature, this thesis shares the view that a negative relationship between regulatory capital and LLPs is indicative of capital management.

Increased Discretion

The ECL model introduced with IFRS 9 increases bank managers' discretion over LLPs (Cohen & Edwards Jr., 2017 and section 1.1) thus also making the effect of the transition to IFRS 9 on the reserve of LLPs subject to increased managerial discretion. Managerial discretion over LLPs is considered a key enabler of capital management practices (Bushman & Williams, 2012; Leventis et al., 2011; Beatty & Liao, 2014; Bushman, 2014). Generally, the effect of the transition to the ECL model is considered to have significant impact on accounting equity and regulatory capital, resulting in an opportunity to manage capital at the transition (BCBS, 2017; Krüger et al., 2018; EBA, 2018).

The first hypothesis aims to test if the general relationship between regulatory capital and the increase in LLP reserves during the transition to IFRS 9 indicates capital management, as defined by the capital management hypothesis (Ahmed et al., 1999).

H1: *There is a negative relationship between regulatory capital and the first-day change in loan loss reserves in European banks at the transition to IFRS 9.*

Strong Incentive

Banks with a strong incentive to manage capital will be more likely to seize the opportunity provided by the increased discretion under the ECL model, especially as the effect of the transition does not affect earnings (Ahmed et al., 1999). In the post-Basel setting, banks with an LLP reserve below 1.25% of risk-weighted assets generally receive a positive effect on regulatory capital by inflating LLPs and thus have a strong incentive to increase LLPs to boost Total capital (BCBS, 2011). In accordance with earlier studies (Ahmed et al., 1999; Anandarajan et al., 2003; 2007) these banks are hypothesised to show a significantly stronger negative relationship between regulatory capital and LLPs than other banks, which face weaker incentives to manage capital at the transition to IFRS 9.

H2: *European banks with an LLP reserve < 1.25% of risk-weighted assets show a significantly stronger negative relationship between regulatory capital and the first-day change in loan loss reserves due to the transition to IFRS 9 than those with an LLP stock > 1.25% of risk-weighted assets.*

Weak Incentive

To reduce the impact of the transition to IFRS 9 on regulatory capital the BCBS introduced the IFRS 9 Transitional Arrangements (BCBS, 2017). The adoption of Transitional Arrangements is voluntary at a bank level and allow banks to effectively eliminate the initial impact of the change in LLP reserves due to the transition to IFRS 9 on regulatory capital (EU 2017/2395; CRR 473a). Thus, adopting the Transitional Arrangements removes the incentive for banks to manage capital during the transition to IFRS 9. Several studies have utilized regulatory change which reduce incentives to manage capital, to corroborate the existence of capital management before the change (Kim & Kross, 1998; Ahmed et al., 1999; Anandarajan et al., 2007). Following this methodology, if banks under the Transitional Arrangements exhibit a significantly weaker negative relationship, it indicates that an existing negative relationship

between regulatory capital and LLPs is driven by capital management incentives (Ahmed et al., 1999; Anandarajan et al., 2003; 2007). Hence, if the behaviour disappears along with the incentives, it is likely that the previous behaviour has been driven by incentives to manage capital.

H3: *European banks applying the IFRS 9 Transitional Arrangements show a significantly weaker negative relationship between regulatory capital and the first-day change in loan loss reserves due to the transition to IFRS 9 than those who are not applying the Transitional Arrangements.*

Lack of Evidence in Preceding Period

Following the relatively few studies on European samples, finding conflicting evidence examining capital management, an additional test of capital management behaviour in the period leading up to the implementation of IFRS 9 is proposed (Anandarajan et al., 2003; Bouvatier & Lepetit, 2008; Leventis et al., 2011; Curcio & Hasan, 2015). The additional test would contribute to answering the research question by allowing a comparison of LLP behaviour before and during the transition to IFRS 9, in-line with previous research on regulatory change (Ahmed et al., 1999; Anandarajan et al., 2003; 2007; Leventis et al., 2011). A fourth hypothesis is developed to establish the relationship between regulatory capital and LLPs among listed European banks in the period leading up to the introduction to IFRS 9. The hypothesis covers the years 2013-2017, i.e. the period after the financial crisis leading up to the introduction of IFRS 9, under which banks operated under a consistent regulatory regime, and where no research has been performed on a European sample of banks (Bouvatier & Lepetit, 2008; Leventis et al., 2011; Curcio & Hasan, 2015).

The fourth hypothesis aims to establish if capital management practices are present in European banks in the years 2013-2017, leading up to the introduction of IFRS 9. The previous findings of a negative, however insignificant, relationship between LLPs and regulatory capital (Anandarajan et al., 2003; Leventis et al., 2011; Curcio & Hasan, 2015) combined with the increased regulatory pressure from Basel III (BCBS, 2011) underpins the following hypothesis:

H4: *There is a negative relationship between regulatory capital and loan loss provisions in European banks in the period 2013-2017.*

3. Research Design and Methodology

The research question of this thesis concerns the relationship between regulatory capital and LLPs at the transition to IFRS 9. To examine such a relationship, a quantitative method which aims to identify the correlational association between the variables of interest is preferred. Due to the conflicting results of previous research on capital management (see e.g. Beatty & Liao, 2014), a two-stage approach containing the investigation of one longitudinal sample and one cross-sectional sample is employed. The scope and collection of the sample used to test the hypotheses are presented in the first section, with a discussion of the models and variables used to test the hypotheses following in the second section.

3.1. Data Collection and Sample Selection

3.1.1. Scope and Data Sources

The scope of the research question is to investigate if capital management behaviour can be found during the transition to IFRS 9. As the research question covers the transition to IFRS 9, the scope of the study is limited to listed banks in EU/EEA countries compliant with EC 1606/2002[12]. Limiting the scope this way, ensures that banks in the sample are compliant with IFRS. In addition, banks which have their securities listed on a regulated market are obliged to adopt IFRS with requirements of transparency and availability of data (IASB, 2017). The limitation to banks in EU/EEA countries is further motivated by the similarity of regulatory regime, as the local regulatory authorities are all members of the European Banking Authority (EBA, 2019) and compliant with Basel III (EU 2013/36).

All four defined hypotheses have the same scope concerning the research objects and geography but differ in time-dimension. While H4 is investigated using longitudinal data to establish and observe the relationship between regulatory capital and LLPs over time, H1-H3 aims to look at the transition to IFRS 9 at one point in time, why cross-sectional data is used. To investigate H4, financial data from listed European banks between the years 2013 and 2017 is used. As the hypothesis aims to establish the relationship for European banks in the period leading up to the implementation of IFRS 9, the sample is limited to the five years preceding the implementation of IFRS 9 to avoid years severely affected by the financial and European sovereign debt crises (see section 1.1 for further motivation). To investigate H1-H3, financial data from European banks at year end 2017 is used as well as data on the impact of the transition to IFRS 9 disclosed in financial reports by banks.

Financial data is collected from Thomson Reuters EIKON (EIKON), a database containing firm financial data. In addition, macroeconomic data used to test H4 is collected from the official Eurostat database. As data on the impact from the transition to IFRS 9 is not available in EIKON, hand collection of certain variables related to H1-H3 is performed. These data points are: 1) the change in LLP reserves due to the transition to IFRS 9, 2) the adoption of the IFRS 9 Transitional Arrangements, which are recovered from annual reports, interim reports or separate IFRS 9 Transition reports when those are available. After extraction, several gaps

[12] Referred to as *European Banks* in this thesis.

in the original data from the EIKON database concerning non-performing loans (NPLs), total loans and Total capital are discovered, which are also hand collected from annual reports to increase the total cross-sectional sample size.

3.1.2. Sample Selection and Data Quality

From EIKON, an initial sample of 371 active, listed banks was extracted. The initial search was conducted using Thomson Reuters Business Classification (TRBC) codes 551010 and 551020[13] resulting in 1138 listed companies in Europe. Limiting the result to companies registered in EU/EEA countries, the total sample was reduced by 207. Excluding holding companies under the non-banking TBRC codes 55102020, 55102030 and 55102050[14] reduced the sample by an additional 456 companies, leaving 475 listed European banks. Lastly, 104 banks were removed as they had no 2017 reported financial data, leaving a final sample of 371 active, listed banks in Europe extracted from the EIKON database.

From the final EIKON sample, a number of additional adjustments were made during the hand-collection of data on the IFRS 9 transition. An additional 88 non-bank companies were removed from the sample[15], 98 banks were removed due to only providing non-English financial reports, 6 non-commercial banks were removed, and 5 banks were removed as they did not disclose the relevant IFRS 9 information. After the collection of IFRS 9 data, the final sample of banks is 174 which is used to test H1-H3.

Table 3. Cross-sectional sample selection

Criteria	Adjustment	No. Banks
Initial scope		*1138*
EC 1606/2002 compliant countries	*207*	*931*
Non-banking TBRC codes	*456*	*475*
No reported 2017 fin. data	*104*	*371*
Initial Sample from EIKON		***371***
Additional non-banks	*88*	*283*
Non-English fin. reports	*98*	*185*
Non-commercial banks	*6*	*179*
Incomplete IFRS 9 disclosure	*5*	*174*
Final no. banks and observations for H1, H2 and H3		***174***

After obtaining a complete set of European banks with reported IFRS 9 data for testing H1-H3, the same banks were used to acquire the longitudinal sample for testing H4. This sample selection methodology was utilized to increase the comparability between the samples. The EIKON database was used to extract the additional years of financial data, 2013-2017, needed

[13] 551010 "Banking Services and 551020 "Investment Banking Services".

[14] 55102020 "Investment Management and Fund Operators", 55102030 "Diversified Investment Services" and 55102050 "Financial & Commodity Market Operators".

[15] The removed companies were non-banking companies under TRBC codes 55101030 "Consumer Lending" and 55102010 "Investment Banking & Brokerage Services".

for testing H4. Due to lack of complete financial data available for the years 2013-2017, 59 banks were removed from the sample with regards to the test for H4, reducing the maximum amount of observations from 870 to 575. In addition, observations with gaps in the financial data for NPLs were removed, reducing the total number of observations by 164. This results in an unbalanced panel of data consisting of 115 banks and 411 observations used to test H4.

Table 4. Panel data sample selection

Criteria	2013	2014	2015	2016	2017	Total
Maximum no. obervations from bank sample	*174*	*174*	*174*	*174*	*174*	***870***
Banks with incomplete data removed	*59*	*59*	*59*	*59*	*59*	
Additional gapping observations removed	*50*	*36*	*23*	*23*	*32*	
No. observations for H4	***65***	***79***	***92***	***92***	***83***	***411***

In order to ensure data quality and consistency, a number of data quality adjustments were considered. The data sample used to test H1-H3 was, due to the element of hand collection, automatically ensured to include no gaps or discrepancies. To further assure the quality of the data collected from the EIKON database to test H4, 35 data points were randomly selected out from the samples and double checked with reported numbers in the financial reports of the banks. Only a few small deviations were found, which could be attributed to small differences in exchange rates used to translate financial data from the reporting currency to EUR.

The distribution of listed European banks across countries is presented in Appendix A. As shown in the Appendix, the samples are unevenly distributed geographically, with Danish, Italian, Norwegian, Polish and UK banks comprising circa 50% of all banks included in both samples. To account for the skewed sample, macroeconomic variables (see section 3.3.3) and country fixed-effects (see section 4.3.1) are considered in the models used to test H1-H4. Further limitations imposed by the skewed sample are discussed in section 5.2.

3.2. Research Design

3.2.1. Research Methods Utilizing Regulatory Change

As discussed previously, a strain of capital management literature has utilized changes in regulation which alter bank managers' capability or incentive to manage capital using LLPs (Beatty & Liao, 2014). By investigating the same sample of banks before and after a regulatory change, or a contemporary subsample of banks that are affected by the change, these studies create a control group to investigate whether banks' provisioning behaviour changes in accordance with the altered capability or incentive to manage capital (Beatty & Liao, 2014). In the first comparative study regarding capital management, Kim and Kross (1998) focus on low-capital banks which have regulatory capital ratios close to the minimum. By introducing a dummy variable representing the regulatory change, the authors are able to ascertain if the change had an effect on the general level of LLPs. However, most of the later studies instead adopt a method introduced by Ahmed et al. (1999) (Anandarajan et al., 2003; 2007; Leventis et al., 2011) which investigates the impact of the regulatory change on the *relationship* between regulatory capital and LLPs, rather than the effect of regulation on the general level of LLPs. The method introduces an interaction variable between regulatory capital and a dummy

variable representing the control group (i.e. before/after the regulatory change). The coefficient on the interaction variable is interpreted as the difference in behaviour between the two groups with regards to the specific relationship between regulatory capital and LLPs (Ahmed et al., 1999). By finding a significant coefficient on the interaction variable, the authors infer that the relationship between regulatory capital and LLPs is significantly different in the two groups, likely to be driven by the regulatory change (Ahmed et al., 1999; Anandarajan et al., 2003; 2007; Leventis et al., 2011; Beatty & Liao, 2014).

To investigate H1-H3 regarding the transition to IFRS 9, the method introduced by Ahmed et al. (1999) is adopted to directly ascertain if the relationship between regulatory capital and LLPs is altered by different incentives to manage regulatory capital. Important to note is that Ahmed et al. (1999) do not include the dummy variable representing the control group independently in their model, thus not allowing the intercept to vary with regards to the two groups (Ahmed et al., 1999). However, later studies utilizing the method introduced by Ahmed et al. (1999) have included the dummy variable in all regressions (Anandarajan et al., 2003; 2007; Leventis et al., 2011). Following the refinement of this method, this study also includes the main effect dummy variable together with the interaction variable.

3.2.2. Control Group Concerns

The popularity of utilizing regulatory changes in capital management research stems from the difficulty of finding reliable control groups to confirm capital management (Beatty & Liao, 2014). Generally, studies that utilize regulatory changes attribute an observed difference in the relationship between regulatory capital and LLPs to the regulatory change, solely relying on control variables to remove any confounding effects (Beatty & Liao, 2014). This interpretation has been subject to some criticism in later research as there is no proof that the observed difference would not have happened without the regulatory change (Beatty & Liao, 2014). Some studies also utilize regulatory changes that only apply to a subset of the group or where early adoption is voluntary (see e.g. Leventis et al., 2011). Utilizing regulatory change with voluntary adoption creates a self-selection bias which must be addressed (Beatty & Liao, 2014). In addition, regulatory change itself may not be fully exogenous, as many times regulatory change come as a reaction to bank behaviour (BCBS, 2009; Beatty & Liao, 2014).

Similar weaknesses are also present in this study, especially with regards to the test of H3 regarding the IFRS 9 Transitional Arrangements. First, the adoption of IFRS 9 Transitional Arrangements, which neutralize the impact of the transition on regulatory capital, is voluntary for all banks. The EBA has concluded that three factors seem to have influenced banks' decision to adopt the Transitional Arrangements during the transition: 1) the size of the impact from the transition to IFRS 9, where banks facing a larger impact to a greater extent adopt the Transitional Arrangements; 2) bank size, where larger banks to a lesser extent adopt the Transitional Arrangements; and 3) the guidance provided by local regulatory authorities which in some cases have endorsed adoption of the Transitional Arrangements (EBA, 2018). This non-random assignment of the control group imposes a self-selection bias in the test for H3. Several approaches may be employed to increase the statistical inference that can be drawn from a non-random control group, such as Regression discontinuity design (RDD), Difference in differences (DID) or matching approaches. However, in this case, a RDD approach is not

feasible since there is no strict assignment rule in the case of the IFRS 9 Transitional Arrangements, a DID approach is not feasible since data on the transition is cross-sectional and a matching approach is unwanted due to the limited sample of banks affected by the transition to IFRS 9 (Lee, 2016). Instead, due to the presence of self-selection bias in the test for H3, the hypothesis does not rely strongly on causal inference regarding the selection of the IFRS 9 Transitional Arrangements. Thus, from the test of the hypothesis, only inferences regarding the relationship between regulatory capital and the impact of IFRS 9 can be drawn. In the light of this and the limitations of previous capital management research, the limitations of the control group with regards to H3 is deemed acceptable.

In the following sections, the models used to test for capital management before and at the transition to IFRS 9 will be discussed. First, the model used to investigate H4 regarding capital management during the period before the transition to IFRS 9 will be developed. Capital management at the transition to IFRS 9 is considered a special case of capital management, thus the model testing for this will have its starting point in the model used to test for capital management during the ordinary course of business. As a consequence, the models used to test for H1-H3 regarding capital management at the transition to IFRS 9 will be developed in the subsequent section.

3.3. Model Testing for Capital Management before the Transition to IFRS 9

Regression model (1) is used to test for capital management in the period before the transition to IFRS 9 and is shown as *equation 1*.

$$LLP_{it} = \beta_0 + \beta_1 T1CAP_{it} + \beta_2 EBTP_{it} + \beta_3 TA_{it} + \beta_4 NPL_{it} + \beta_5 \Delta NPL_{it} + \beta_6 \Delta TA_{it} + \beta_7 \Delta GDP_{jt} + \beta_8 \Delta UNEMP_{jt} + \beta_9 \Delta HPI_{jt} + FE_{COUNTRY} + FE_{YEAR} + \varepsilon \quad \textbf{(1)}$$

$$\textbf{H}_0\textbf{:}\ \beta_1 = 0 \qquad \textbf{H}_1\textbf{:}\ \beta_1 < 0$$

Where:
LLP_{it} = The ratio of loan loss provisions to opening balance total assets
$T1CAP_{it}$ = The ratio of opening balance Tier 1 capital to the minimum requirement of 6%
$EBTP_{it}$ = The ratio of earnings before taxes and LLPs to opening balance total assets
TA_{it} = The natural logarithm of total assets
NPL_{it} = The ratio of non-performing loans to total assets
ΔNPL_{it} = The change in non-performing loans deflated by opening balance total assets
ΔTA_{it} = The change in total assets deflated by opening balance total assets
ΔGDP_{jt} = The annual change in nominal GDP for country j
$\Delta UNEMP_{jt}$ = The annual change in the unemployment rate for country j
ΔHPI_{jt} = The annual change in the house price index for country j
$FE_{COUNTRY}$ and FE_{YEAR} represent country and year fixed-effects included as dummy variables

The dependent variable *LLP* is the ratio of the period's LLP expense to opening balance total assets (Kim & Kross, 1998; Ahmed et al., 1999; Anandarajan et al., 2003; 2007; Bouvatier & Lepetit, 2008; Leventis et al., 2011; Curcio & Hasan, 2015). The explanatory variable *T1CAP*

is defined as the ratio of Tier 1 capital to the minimum Tier 1 capital required by regulators[16] in accordance with Beatty et al. (1995), Ahmed et al. (1999), Anandarajan et al. (2003; 2007) and Leventis et al. (2011). The predicted sign of the coefficient on *T1CAP* is negative in accordance with the capital management hypothesis (Beatty et al., 1995; Ahmed et al., 1999; Anandarajan et al., 2003; 2007; Leventis et al., 2011). The expected coefficients on the control variables *TA* and ΔTA are non-directional as previous research has found both positive and negative coefficients with respect to size (Ahmed et al., 1999; Leventis et al., 2011; Beatty & Liao, 2014). For the control variables *NPL* and ΔNPL, the coefficients are expected to be positive as increased riskiness in the loan portfolio should entail larger provisions (Beatty & Liao, 2014). If the control variable for earnings management, *EBTP*, is positive it is an indication of earnings management behaviour (Ahmed et al., 1999; Anandarajan et al., 2003; 2007; Leventis et al., 2011). The coefficients on the macroeconomic controls ΔGDP and ΔHPI are expected to have a negative sign, as improvements in the macroeconomic conditions should entail a lower need for provisions (Beatty & Liao, 2014). Lastly, the coefficient on the macroeconomic control variable $\Delta UNEMP$ is expected to be positive following the same motivation (Beatty & Liao, 2014).

3.3.1. Measure of Regulatory Capital

The use of Tier 1 capital as a measure of regulatory capital follows most previous studies on capital management (Ahmed et al., 1999; Anandarajan et al., 2003; 2007; Shrieves & Dahl, 2003; Leventis et al., 2011). However, some later studies on capital management have utilized Total capital as a measure of regulatory capital (Bouvatier & Lepetit, 2008; Curcio & Hasan, 2015). However, both of these studies cite lack of data availability as the reason for using Total capital over Tier 1 capital (Bouvatier & Lepetit, 2008; Curcio & Hasan, 2015). Following the above motivation, this study will use Tier 1 capital as its main measure of regulatory capital, but to test the robustness of any results found, tests will also be conducted with Total capital as an alternative measure of regulatory capital. Some previous studies adjust the measure of regulatory capital for LLP reserves. Two reasons are found for this adjustment in previous literature: 1) to avoid endogeneity concerns for the explanatory variable when the model also includes total LLP reserves as an independent variable (Beatty et al., 1995); 2) to ensure comparability of regulatory capital measures in the pre- and post-Basel period for studies comparing capital management across the two regulatory regimes (Ahmed et al., 1999; Anandarajan et al., 2003; 2007). None of the listed reasons apply to this study, why the measure for regulatory capital will not be adjusted for LLP reserves. In addition, this study will use the opening balance of regulatory capital to avoid endogeneity with the dependent variable in the test for H4[17]. This is motivated by the fact that opening balance levels of regulatory capital contains the information actually available to bank managers during the year.

3.3.2. Controlling for Non-Discretionary Loan Loss Provisions

To manage regulatory capital using LLPs, provisioning behaviour must be at least partially under management's discretion (Beatty & Liao, 2014). To better ascertain if bank managers

[16] Under Basel III, the minimum required Tier 1 capital ratio is 6% (BCBS, 2011), meaning that the variable is defined as the Tier 1 capital ratio divided by 6%.

[17] In the tests for H1-H3, the 2017 closing balance Tier 1 capital will be used as it is naturally exogenous to the impact of the transition to IFRS 9.

use such discretion over accounting accruals to manage capital, capital management research try to separate the discretionary and non-discretionary LLPs by introducing variables designed to control for the non-discretionary part of LLPs (Beatty & Liao, 2014). By controlling for the non-discretionary component of LLPs, only the relation with the discretionary part of LLPs is captured by the coefficient on the main explanatory variable (Beatty & Liao, 2014). In contrast to research on accruals management in non-banks, where a small number of generally accepted discretionary accruals models are used, capital management literature focusing on LLPs employ a wide variety of models showing no general consensus on how to estimate discretionary LLPs (see e.g. Beatty et al., 1995; Ahmed et al., 1999; Anandarajan et al., 2003; 2007; Leventis et al., 2011; Beatty & Liao, 2014).

To address the lack of general consensus regarding discretionary LLP modelling, Beatty and Liao (2014) perform an analysis of nine discretionary LLP models employed by previous research on earnings and capital management in banks. The authors divide the models into four classes, with the first class representing a baseline model, and the other three classes defined as the baseline model with one or two additional variables added. The baseline model includes bank size as measured by total assets, the change in the total loans for the period, the change in total NPLs for the period, the one and two period lagged change in NPLs and one period forward looking change in NPL. Change in NPLs are included as an increase/decrease in defaulted loans should lead to increased/decreased LLPs, size is included as banks of different sizes face different levels of regulatory scrutiny and change in total loans is included as LLPs may become higher when banks extend credit to more clients with doubtful credit scores (Beatty & Liao, 2014). The other model classes include either the total reserve of LLPs, loan charge-offs or both variables to control for additional non-discretionary parts of LLPs. Additionally, all tested models include GDP growth, the return on the Case-Shiller Real Estate Index and the change in unemployment to control for the macro environment. By regressing the residuals from the models on restatements/comment letters issued by banks with regards to LLPs, Beatty and Liao (2014) find that the residual from the baseline model has the strongest predicting power for occurrences of discretionary LLP management (Beatty & Liao, 2014). This indicates that the baseline model performs better than other model classes in controlling for the non-discretionary part of LLPs that cannot be used for accruals management (Beatty & Liao, 2014).

This study will adopt a model similar to the baseline model proposed by Beatty and Liao (2014) to control for the non-discretionary LLPs in the regression model used to test for capital management in the period before the transition to IFRS 9 (equation 1). Due to the relatively short time-series of data, one and two-period lagged changes in NPLs will be replaced with opening balance total NPLs. This is similar to models used by Beatty et al. (1995), Collins et al. (1995) and Kim and Kross (1998). In addition, granted that the correlation between the change and total NPLs is at acceptable levels, Beatty and Liao (2014) considers it a good alternative. In addition, one-period forward changes in NPL is excluded from the model. Beatty and Liao (2014) motivate the inclusion of the forward-period change with the fact that some banks may use forward looking information when determining LLPs. Under IAS 39 and the ILM, provisions are only allowed to be recorded after a triggering event has occurred, why the inclusion of forward-looking variables to determine non-discretionary provisions becomes irrelevant in the test for H4.

3.3.3. Additional Control Variables

Due to the trade-off between earnings and regulatory capital management using LLPs, previous research has simultaneously controlled for earnings management in models testing for capital management (see e.g. Beatty et al., 1995; Ahmed et al., 1999; Anandarajan et al., 2003; 2007; Leventis et al., 2011; Beatty & Liao, 2014). Following previous studies, this study will control for earnings management by including earnings before taxes and LLPs deflated by total assets. In addition to controlling for non-discretionary LLPs, the baseline model proposed by Beatty and Liao (2014) includes macroeconomic control variables for the change in GDP, unemployment rate and house price. This study follows their recommendation and includes macroeconomic variables to control for changes in general economic conditions across countries.

3.4. Models Testing for Capital Management at the Transition to IFRS 9

Below, the models used to test for capital management at the transition to IFRS 9 are developed. First, a motivation of the general model used to test for H1 is conducted, with a subsequent motivation of the interaction variables used to test for H2 and H3. Regression model (2) is used to test for capital management at the transition to IFRS 9 in H1 and is shown in *equation 2*.

$$IFRS9_i = \beta_0 + \beta_1 T1CAP_i + \beta_2 TA_i + \beta_3 NPL_i + \beta_4 GL_i + \beta_5 LLP_i + \beta_6 RWA_i + \beta_7 Trans_i + \varepsilon \quad \textbf{(2)}$$

$$\textbf{H}_0\textbf{:}\ \beta_1 = 0 \qquad \textbf{H}_1\textbf{:}\ \beta_1 < 0$$

Where:
$IFRS9_i$ = The increase in the LLP reserve from adopting IFRS 9 deflated by total assets
$T1CAP_i$ = The ratio of 2017 Tier 1 capital to the minimum requirement of 6%
TA_i = The natural logarithm of total assets
NPL_i = The ratio of non-performing loans to total assets
GL_i = The ratio of total loans to total assets
LLP_i = The ratio of loan loss provisions to opening balance total assets
RWA_i = Dummy variable equal to 1 when banks have an LLP reserve < 1.25% of risk-weighted assets
$Trans_i$ = Dummy variable equal to 1 when banks have adopted the IFRS 9 Transitional Arrangements

The dependent variable *IFRS9* represents the one-time change in total LLP reserves due to the transition to IFRS 9 deflated by total assets. The specification of the explanatory variable *T1CAP* follows the above motivation in 3.3.1 and is defined as the 2017 closing balance ratio of Tier 1 capital to the minimum requirement. The coefficient on the explanatory variable *T1CAP* is expected to be negative if capital management is present at the transition to IFRS 9 according to the capital management hypothesis. The control variables for *NPL* and *TA* are expected to follow the same predicted signs as motivated in section 3.3.2. With regards to the new control variables, *GL* and *LLP*, the coefficients on both variables are expected to be positive according to the results of Krüger et al. (2018) and EBA (2018). The coefficients on

the dummy variables *RWA* and *Trans*, representing two sub-samples of banks with increased/decreased incentive to manage capital, are expected to have a negative and positive sign respectively, following the results of EBA's (2018) impact assessment.

3.4.1. Controlling for the Non-Discretionary Impact of the Transition to IFRS 9

In the model testing for capital management at the transition to IFRS 9, a slightly altered approach is warranted as the non-discretionary drivers of the impact of the transition to IFRS 9 are slightly different from those of regular LLP expenses (Novotny-Farkas, 2016; Krüger et al., 2018; EBA, 2018). The impact on the LLP reserve from the transition to IFRS 9 stems from the introduction of the ECL model, which replaces the previous ILM. The impact will generally be an increase in total LLP reserves, driven by new LLPs on loans classified as stage 1 and 2 (EBA, 2018). Provisions on loans classified as stage 3 largely correspond to loans which were already fully provisioned for under IAS 39 and the ILM (EBA, 2018). In addition, the relative amount of loans classified in stage 2 rather than in stage 1 will determine the impact, as loans in stage 1 only require provisions for 12-month expected credit losses while stage 2 loans require provisions for lifetime expected credit losses. The reclassification from stage 1 to stage 2 is determined by SICR, which has been criticised for giving banks increased discretion over LLPs under IFRS 9 (see section 1.2.1; Novotny-Farkas, 2016; Krüger et al., 2018).

To control for the non-discretionary increase in the LLP reserve from the transition, four variables are suggested based on the results from EBA's IFRS 9 impact assessment (EBA, 2018), research on the ECL model (Novotny-Farkas, 2016; Krüger et al., 2018) and previous research on capital management (Beatty & Liao, 2014): 1) The total reserve of NPLs indicate the riskiness of the loan portfolio, a bank with a risky loan portfolio should have a relatively larger percentage of loans classified as stage 2 with a greater impact from IFRS 9 as a consequence (Krüger et al., 2018; EBA, 2018). The use of NPLs as an indicator of risk is also in-line with the baseline model proposed by Beatty and Liao (2014); 2) the ratio of total loans to total assets, which indicate how lending oriented a bank's business model is. A bank with loans as a relatively large part of assets should expect a larger impact from the transition to IFRS 9, as provisions for expected credit losses are to be recorded on all loans (EBA, 2018); 3) Bank size as determined by total assets. Beatty and Liao (2014) argue that banks of different sizes face different levels of regulatory scrutiny and evidence from EBA has shown that smaller banks generally experience a larger impact from the transition to IFRS 9 (Beatty & Liao, 2014; EBA, 2018); 4) One period lagged LLP expense which captures the trend in the bank's credit risk. Banks with a deteriorating credit quality are more likely to classify a larger part of total loans in stage 2, leading to a larger increase in LLP reserves from the transition to IFRS 9 (EBA, 2018). To control for the non-discretionary increase in LLPs due to the transition to IFRS 9, the above control variables are included in the models presented in equations 2-5.

3.4.2. Additional Control Variables

In contrast to previous research, the models testing for capital management at the transition to IFRS 9 will not control for earnings management. The impact from the transition to IFRS 9 is recorded directly in 2018 opening balance equity, thus not affecting earnings (IASB, 2017), why direct earnings manipulation captured by including an earnings variable is not possible

(Ahmed et al., 1999)[18]. In addition, the impact assessment conducted by the EBA (2018) do not suggest that the inclusion of any macroeconomic variables would capture any additional non-discretionary increase of LLP reserves from the transition to IFRS 9, why no such variables are included in the model testing for capital management in this setting.

Both dummy variables representing the sub-samples used to test H2 and H3 respectively are included in all models testing for capital management at the transition to IFRS 9. The dummy variable *Trans*, representing banks which have adopted the IFRS 9 Transitional Arrangements, is expected to have an impact on the day-one change in LLP reserves from the transition to IFRS 9 following the results for EBA (2018). In addition, the dummy variable *RWA*, representing banks with a total LLP reserve below 1.25% of risk-weighted assets[19], is included following the same results (EBA, 2018).

3.4.3. Interaction Variables Testing for Varying Capital Management Incentives

To test for H2 and H3 regarding different capital management behaviour in sub-sample groups at the transition to IFRS 9, interaction variables are added to the model presented above in section 3.4. *Equation 3* presents regression model (3) with the added interaction variable *T1CAP_RWA* used to test for H2 and *equation 4* presents regression model (4) with the added interaction variable *T1CAP_Trans* used to test for H3.

$$IFRS9_i = \beta_0 + \beta_1 T1CAP_i + \beta_2 TA_i + \beta_3 NPL_i + \beta_4 GL_i + \beta_5 LLP_i + \beta_6 RWA_i + \beta_7 T1CAP\_RWA_i + \beta_8 Trans_i + \varepsilon \quad \textbf{(3)}$$

$$\textbf{H}_0\textbf{:}\ \beta_7 = 0 \qquad \textbf{H}_1\textbf{:}\ \beta_7 < 0$$

Where:
$\boldsymbol{T1CAP\_RWA_i}$ = Interaction variable between explanatory variable $T1CAP_i$ and dummy variable RWA_i

The dummy variable *RWA* is equal to 1 for banks with a strong incentive to manage capital by inflating LLPs. Following H2, the coefficient on the interaction variable *T1CAP_RWA* is predicted to be negative, indicating that banks with a strong incentive to manage capital by inflating LLPs will show a *significantly more negative* relationship between regulatory capital and the impact from the transition to IFRS 9 than other banks (Ahmed et al., 1999; Anandarajan et al., 2003; 2007; Leventis et al., 2011).

[18] However, there may be a possibility to manipulate future earnings using the transition to IFRS 9. This could be done by inflating the impact on LLP reserves from the transition, reversing LLPs in the following periods to increase earnings. As this study is conducted in close approximation to the introduction to IFRS 9, sufficient data to capture such earnings management behaviour is not available at the time of writing this thesis. This is further discussed as an opportunity for future research is section 6.

[19] The authors note that the inclusion of dummy variable *RWA*, which is based on LLP reserves, in the models testing for capital management at the transition to IFRS 9 might expose the explanatory variable to endogeneity concerns as discussed in section 3.3.1. To ensure that the obtained results are not driven by this, a robustness test is conducted where the explanatory variable *T1CAP* is adjusted for total LLP reserves. The results (untabulated) from this test do not change any of the conclusions regarding H1-H3 and are available from the authors upon request.

$$IFRS9_i = \beta_0 + \beta_1 T1CAP_i + \beta_2 TA_i + \beta_3 NPL_i + \beta_4 GL_i + \beta_5 LLP_i + \beta_6 RWA_i + \beta_7 Trans_i + \beta_8 T1CAP\_Trans_i + \varepsilon \quad \textbf{(4)}$$

H₀: $\beta_8 = 0$ **H₁:** $\beta_8 > 0$

Where:
T1CAP_Trans$_i$ = Interaction variable between explanatory variable $T1CAP_i$ and dummy variable $Trans_i$

The dummy variable *Trans* is equal to 1 for banks with a weak incentive to manage capital by inflating LLPs. Following H3, the coefficient on the interaction variable *T1CAP_Trans* is predicted to be positive, indicating that banks with a weak incentive to manage capital by inflating LLPs will show a *significantly less negative* relationship between regulatory capital and the impact from the transition to IFRS 9 than other banks (Ahmed et al., 1999; Anandarajan et al., 2003; 2007; Leventis et al., 2011).

In addition, a final model including both interaction variables will be run to ascertain the robustness of any results found using regression models (3) or (4) (Ahmed et al., 1999). The final model is presented in *equation 5* below.

$$IFRS9_i = \beta_0 + \beta_1 T1CAP_i + \beta_2 TA_i + \beta_3 NPL_i + \beta_4 GL_i + \beta_5 LLP_i + \beta_6 RWA_i + \beta_7 T1CAP\_RWA_i + \beta_8 Trans_i + \beta_9 T1CAP\_Trans_i + \varepsilon \quad \textbf{(5)}$$

4. Results

The next section will be opened with a presentation of descriptive statistics for the samples used to investigate the defined hypotheses. Following this, results from the main tests are presented. The section will start with the results from regression model (1), testing for capital management in the period before the introduction of IFRS 9, followed by results from models (2)-(5) testing for capital management at the transition to IFRS 9. The section will end with a discussion of the sensitivity and robustness of the presented results.

4.1. Descriptive Statistics

4.1.1. Variable Descriptives

Table 5. Descriptive statistics for the panel data sample covering years 2013-2017

Variables	Mean	St.Dev.	Q1	Median	Q3	Min	Max
(1) LLP	0.0068	0.0114	0.0008	0.0030	0.0083	-0.0016	0.1590
(2) T1CAP	2.4468	0.7372	2.0133	2.3533	2.7500	0.9333	8.4798
(3) EBTP	0.0152	0.0131	0.0078	0.0130	0.0185	-0.0286	0.1128
(4) TA	10.3441	2.1249	8.8875	10.0575	11.8433	4.8069	14.6305
(5) NPL	0.0634	0.1003	0.0074	0.0280	0.0717	0.0003	0.7372
(6) ΔNPL	0.0013	0.0382	-0.0040	-0.0007	0.0031	-0.3653	0.2398
(7) ΔTA	0.0349	0.1582	-0.0462	0.0095	0.0792	-0.3759	1.0710
(8) ΔGDP	0.0215	0.0260	0.0109	0.0192	0.0305	-0.0324	0.2556
(9) ΔUNEMP	-0.0051	0.0092	-0.0110	-0.0050	0.0010	-0.0270	0.0300
(10) ΔHPI	0.0307	0.0430	0.0040	0.0380	0.0600	-0.0910	0.1650

Table 5. presents descriptive statistics for the sample used to test for capital management before the introduction of IFRS 9. The sample consists of panel data covering 115 banks years 2013-2017. *LLP* is the ratio of loan loss provisions to opening balance total assets. *T1CAP* is the ratio of opening balance Tier 1 capital to the minimum requirement. *EBTP* is the ratio of earnings before taxes and loan loss provisions to opening balance total assets. *TA* is the natural logarithm of total assets. *NPL* is the ratio of non-performing loans to total assets. *ΔNPL* is the change in non-performing loans deflated by opening balance total assets. *ΔTA* is the change in total assets deflated by opening balance total assets. *ΔGDP* is the change in nominal GDP. *ΔUNEMP* is the change in unemployment rate. *ΔHPI* is the change in the house price index.

The dependent variable *LLP* shows that LLP expenses are on average 0.7% of lagged total assets with a standard deviation of 1.1%. The largest net reversal of LLPs is 0.16%, while the largest LLP expense has a significant magnitude of 15.9% of lagged total assets, indicating that the distribution of LLP expenses is positively skewed. This is further supported by the difference between mean and median values for *LLP*, where the median at 0.3% is smaller than the average at 0.7%.

By comparison, the earnings variable *EBTP* shows that earnings before LLPs are on average 1.5% of lagged total assets, indicating that LLP expenses have a large impact on earnings by amounting to almost half of the average EBTP for the sample. However, the median *EBTP* is at 1.3%, showing only a small difference from the mean, in contrast to the larger difference observed in *LLP*. The comparison between the medians and the means show that LLPs have a large impact on earnings only for some extreme observations in the sample.

The explanatory variable *T1CAP* has a mean of 2.45 and a median of 2.35, indicating that the banks in the sample generally are well capitalized with Tier 1 capital over two times the minimum required level of 6%. In addition, observations in the lowest quartile range between 0.93 to 2.01, indicating that very few banks in the sample hold Tier 1 capital below the absolute minimum required by the regulator. This shows that banks in the sample are generally not constrained by their Tier 1 capital.

The variable *NPL*, which captures the level of non-performing loans, shows that banks on average have NPLs equal to 6.3% of their asset base. However, the standard deviation is quite large at 10% and extreme observations are evident since the minimum value is 0.003% and the maximum value is 73.7%. Other control variables ΔTA and ΔNPL show that banks on average grew their asset base by 3% between years 2013-2017, while NPLs only grew at a pace of 0.1%, indicating that banks in the sample generally reduced their relative share of NPLs during the period. The macroeconomic variables ΔGDP, $\Delta UNEMP$ and ΔHPI show that the economic climate was generally positive for the sample, with an average GDP growth of 2.1%, an average reduction in unemployment rate by 0.5% and a growth in house prices by 3%.

Table 6. Descriptive statistics for the cross-sectional sample at the transition to IFRS 9

Variables	Mean	St.Dev	Q1	Median	Q3	Min	Max
(1) IFRS9	0.0039	0.0091	0.0004	0.0015	0.0048	-0.0490	0.0803
(2) T1CAP	2.7601	0.7309	2.3283	2.6500	3.0040	1.5933	7.8750
(3) TA	9.7058	2.2429	7.9680	9.5582	11.1751	5.0407	14.5585
(4) NPL	0.0548	0.0853	0.0064	0.0256	0.0608	0.0000	0.4820
(5) GL	0.6578	0.1704	0.5745	0.6833	0.7862	0.0216	0.9392
(6) LLP	0.0056	0.0208	0.0002	0.0014	0.0045	-0.0156	0.2124

Table 6. presents the descriptive statistics used to investigate capital management at the transition to IFRS 9. The data is cross-sectional at the date of the transition to IFRS 9 and consists of a sample of 174 banks. *IFRS9* is the increase in the LLP reserve from adopting IFRS 9 deflated by total assets. *T1CAP* is the ratio of 2017 Tier 1 capital to the minimum requirement. *TA* is the natural logarithm of total assets. *NPL* is non-performing loans deflated by total assets. *GL* is the ratio of total loans to total assets. *LLP* is the loan loss provisions expense deflated by total assets.

Table 6 shows descriptive statistics for the cross-sectional sample used to test for capital management at the transition to IFRS 9. On average, the dependent variable *IFRS9*, showing the increase in LLP reserves due to the implementation of IFRS 9, is 0.39% of total assets. The minimum observation of negative 4.9% indicates that some banks experience a large reduction of LLP reserves, and a maximum observation of 8.0% show that some banks experience a large increase in LLP reserves due to the introduction of IFRS 9. The standard deviation of *IFRS9* is relatively large at 0.91% and the median is lower than the mean at 0.15% indicating that the distribution for *IFRS9* is positively skewed, similar to the variable *LLP* in Table 5.

With regards to the explanatory variable *T1CAP*, the average of 2.76 shows that banks are on average slightly better capitalized than in the sample covering years 2013-2017. This is further indicated by the minimum observation, which is 1.59 for the cross-sectional sample, meaning that no bank in this sample has Tier 1 capital below the absolute minimum required level of 6%.

Focusing on the control variables, both *NPL* and *LLP* show values that are on par with those in the panel data sample. The control variable *GL* show that banks in the sample generally run a lending heavy business model, where total loans are on average 65% of total assets.

4.1.2. Pearson's Correlations

Table 7. Pearson's correlations from the panel data sample covering years 2013-2017

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
(1) LLP	1									
(2) T1CAP	-0.199***	1								
(3) EBTP	0.225***	0.076	1							
(4) TA	-0.147***	-0.097**	-0.399***	1						
(5) NPL	0.621***	-0.168***	0.105**	-0.032	1					
(6) ∆NPL	0.106**	-0.094*	0.134***	-0.0417	0.0996**	1				
(7) ∆TA	0.031	0.085*	0.481***	-0.1792**	-0.0247	0.1837***	1			
(8) ∆GDP	-0.125**	0.089*	0.040	0.0190	-0.0309	-0.1638**	0.0226	1		
(9) ∆UNEMP	-0.117**	-0.072	-0.036	-0.1411**	-0.2082**	0.2201**	-0.0319	-0.5103**	1	
(10) ∆HPI	-0.313***	0.283***	0.020	-0.0633	-0.3735**	-0.1294**	0.0578	0.4730***	-0.2590**	1

Table 7. presents Pearson's correlations for the variables used to test for capital management before the introduction of IFRS 9. The sample consists of panel data covering 115 banks years 2013-2017. *LLP* is the ratio of loan loss provisions to opening balance total assets. *T1CAP* is the ratio of opening balance Tier 1 capital to the minimum requirement. *EBTP* is the ratio of earnings before taxes and loan loss provisions to opening balance total assets. *TA* is the natural logarithm of total assets. *NPL* is the ratio of non-performing loans to total assets. *ΔNPL* is the change in non-performing loans deflated by opening balance total assets. *ΔTA* is the change in total assets deflated by opening balance total assets. *ΔGDP* is the change in nominal GDP. *ΔUNEMP* is the change in unemployment rate. *ΔHPI* is the change in the house price index. The notation *, ** and *** represents significance at the 0.10-, 0.05- and 0.01-levels respectively.

Table 7 shows Pearson's correlations between variables used in regression model (1) to investigate capital management in the period before the transition to IFRS 9. Generally, the independent variables exhibit significant correlations with the dependent variable following their predicted signs. Especially, the explanatory variable *T1CAP* exhibits a negative 0.2 correlation significant at the 0.01-level, indicating that the relationship between the variables seem to follow the negative relationship developed in H4. The unpredicted control variable *TA*, which controls for bank size, exhibits a significantly negative correlation with the dependant variable. In addition, the control variables *EBTP*, *NPL* and Δ*NPL* all follow their predicted signs and are significantly correlated with the dependent variable *LLP*. The control variable Δ*TA*, controlling for growth, exhibits a small positive correlation with the dependent variable which is not significant at conventional levels.

The three variables controlling for the macroeconomic environment all exhibit significant correlations with the dependent variable *LLP*. Both Δ*GDP* and Δ*HPI* follow their predicted signs. However, Δ*UNEMP*, controlling for the change in unemployment rate, exhibits a negative correlation with *LLP* in contrast to the predicted positive correlation.

Overall, while some independent variables exhibit significant correlations with other independent variables, the correlations are not excessively high and do not warrant the exclusion of one or more independent variables. The highest recorded correlation is positive 0.481 between *EBTP* and Δ*TA*, which is not surprising since high earnings lead to a growth in the asset base. Interestingly, *EBTP* and *TA* exhibit a negative correlation of 0.399, indicating that larger banks exhibit lower profitability before LLP expenses. In addition, the macroeconomic variables all exhibit significant correlations amongst each other, with the

highest correlation being negative 0.5144 between Δ*GPA* and Δ*UNEMP* which is not deemed excessive.

Table 8. Pearson's correlations for the cross-sectional sample at the transition to IFRS 9

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
(1) IFRS9	1							
(2) T1CAP	-0.111	1						
(3) TA	-0.088	-0.021	1					
(4) NPL	0.426***	-0.154**	-0.0491	1				
(5) GL	0.214***	0.233***	-0.249***	0.222***	1			
(6) LLP	0.495***	-0.060	-0.095	0.145*	0.102	1		
(7) RWA	-0.229***	0.181**	-0.116	-0.349***	0.096	-0.012	1	
(8) Trans	0.335***	-0.277***	0.051	0.330***	0.109	0.219***	-0.327***	1

Table 8. presents Pearson's correlations for the variables used to investigate capital management at the transition to IFRS 9. The data is cross-sectional at the date of the transition to IFRS 9 and consists of a sample of 174 banks. *IFRS9* is the increase in the LLP reserve from adopting IFRS 9 deflated by total assets. *T1CAP* is the ratio of 2017 Tier 1 capital to the minimum requirement. *TA* is the natural logarithm of total assets. *NPL* is non-performing loans deflated by total assets. *GL* is the ratio of total loans to total assets. *LLP* is the loan loss provisions expense deflated by total assets. *RWA* is a dummy variable equal to 1 when banks have an LLP reserve < 1.25% of risk-weighted assets. *Trans* is a dummy variable equal to 1 when banks have adopted IFRS 9 Transitional Arrangements. The notation *, ** and *** represents significance at the 0.10-, 0.05- and 0.01-levels respectively.

Pearson's correlations between variables included in the regression models used to test for capital management at the transition to IFRS 9 are displayed in Table 8. Generally, the correlations between the independent and dependent variables are weaker than found in regression model (1). Specifically, while the correlation between *T1CAP* and *IFRS9* follows the predicted sign with regards to H1, it is not significant at conventional levels. However, the additional control variables *NPL*, *GL* and *LLP* are all significantly correlated with *IFRS9* following their predicted signs. In addition, both dummy variables *RWA* and *Trans* exhibit correlations significant at the 0.01-level with the dependent variable. More specifically, *RWA* exhibits a negative correlation with the dependent variable following the prediction that banks with lower overall LLP reserves will see a smaller increase in LLP reserves following the introduction of IFRS 9. *Trans* exhibits a positive correlation supporting the findings of EBA (2018), that banks predicting a larger impact from the introduction of IFRS 9 will adopt the Transitional Arrangements.

With regards to the independent variables, some variables display significant correlations, however the general level of correlations between independent variables included in the models are not excessively high. *T1CAP* and *Trans* exhibit a significant negative correlation of 0.277, indicating that banks adopting the IFRS 9 Transitional Arrangements generally hold lower levels of regulatory capital. *NPL* exhibits significant correlation with both dummy variables. *NPL* and *RWA* exhibit a negative correlation of 0.349, signalling that banks with lower LLP reserves also exhibit lower levels of NPLs. *NPL* and *Trans* exhibit a positive correlation of 0.330, which indicates that banks adopting the IFRS 9 Transitional Arrangements oppositely exhibit higher levels of NPLs. In addition, *RWA* and *Trans* exhibit a significantly negative relationship of 0.327.

4.2. Results from Regression Models

Table 9. Test for H4

Dependent variable: LLP	(1)
Intercept	0.0224
(t-stat)	*(3.01)****
T1CAP	-0.0027
(t-stat)	*(-2.00)***
EBTP	0.0888
(t-stat)	*(1.53)*
TA	-0.0010
(t-stat)	*(-2.54)***
NPL	0.0398
(t-stat)	*(2.65)****
ΔNPL	0.0200
(t-stat)	*(0.60)*
ΔTA	0.0006
(t-stat)	*(0.23)*
ΔGDP	-0.0295
(t-stat)	*(-2.41)***
ΔUNEMP	-0.2094
(t-stat)	*(-1.58)*
ΔHPI	-0.0343
(t-stat)	*(-1.31)*
Country Fixed-Effects	Yes
Year Fixed-Effects	Yes
Adj. R-squared	0.5055
F-stat	12.33***
No. Observations	411
No. Banks	115

Table 10. Test for H1-H3

Dependent variable: IFRS9	(2)	(3)	(4)	(5)
Intercept	-0.0032	-0.0026	-0.0068	-0.0080
(t-stat)	*(-0.63)*	*(-0.48)*	*(-1.11)*	*(-1.10)*
T1CAP	0.0004	0.0002	0.0013	0.0016
(t-stat)	*(0.73)*	*(0.20)*	*(2.06)***	*(1.64)*
TA	-0.0001	-0.0001	-0.0001	0.0000
(t-stat)	*(-0.43)*	*(-0.45)*	*(-0.21)*	*(-0.15)*
NPL	0.0284	0.0281	0.0277	0.0278
(t-stat)	*(4.06)****	*(4.03)****	*(3.92)****	*(3.96)****
GL	0.0060	0.0061	0.0070	0.0070
(t-stat)	*(1.63)*	*(1.65)*	*(1.76)**	*(1.76)*
LLP	0.1816	0.1813	0.1827	0.1830
(t-stat)	*(1.26)*	*(1.25)*	*(1.28)*	*(1.28)*
RWA	-0.0023	-0.0044	-0.0025	-0.0008
(t-stat)	*(-1.73)**	*(-1.38)*	*(-1.82)**	*(-0.25)*
T1CAP_RWA		0.0007		-0.0006
(t-stat)		*(0.88)*		*(-0.74)*
Trans	0.0021	0.0021	0.0080	0.0089
(t-stat)	*(1.69)**	*(1.67)**	*(1.87)**	*(1.81)**
T1CAP_Trans			-0.0022	-0.0025
(t-stat)			*(-1.48)*	*(-1.50)*
Adj. R-squared	0.3822	0.3792	0.3849	0.3815
F-stat	14.21***	12.86***	12.67***	11.58***
No. Observations	174	174	174	174
No. Banks	174	174	174	174

Table 9. presents the results from regression model (1) used to test for capital management before the introduction of IFRS 9. The sample consists of panel data covering 115 banks years 2013-2017. *LLP* is the ratio of loan loss provisions to opening balance total assets. *T1CAP* is the ratio of opening balance Tier 1 capital to the minimum requirement. *EBTP* is the ratio of earnings before taxes and loan loss provisions to opening balance total assets. *TA* is the natural logarithm of total assets. *NPL* is the ratio of non-performing loans to total assets. *ΔNPL* is the change in non-performing loans deflated by opening balance total assets. *ΔTA* is the change in total assets deflated by opening balance total assets. *ΔGDP* is the change in nominal GDP. *ΔUNEMP* is the change in unemployment rate. *ΔHPI* is the change in the house price index. The notation *, ** and *** represents significance at the 0.10-, 0.05- and 0.01-levels respectively.

Table 10. presents the results from regression models (2)-(4) used to investigate capital management at the transition to IFRS 9. The data is cross-sectional at the date of the transition to IFRS 9 and consists of a sample of 174 banks. In addition, regression (5) presents an additional test including both interaction variables from regressions (3) and (4). *IFRS9* is the increase in the LLP reserve from adopting IFRS 9 deflated by total assets. *T1CAP* is the ratio of 2017 Tier 1 capital to the minimum requirement. *TA* is the natural logarithm of total assets. *NPL* is non-performing loans deflated by total assets. *GL* is the ratio of total loans to total assets. *LLP* is the loan loss provisions expense deflated by total assets. *RWA* is a dummy variable equal to 1 when banks have an LLP reserve < 1.25% of risk-weighted assets. *Trans* is a dummy variable equal to 1 when banks have adopted IFRS 9 Transitional Arrangements. *T1CAP_RWA*, is the interaction variable between T1CAP and RWA, included in regression model (3). *T1CAP_Trans*, the interaction between T1CAP and Trans is included in regression model (4). Both interaction variables are included in regression (5). The notation *, ** and *** represents significance at the 0.10, 0.05 and 0.01-levels respectively.

4.2.1. Test for Capital Management before the Transition to IFRS 9

Table 9 presents the results from regression model (1) investigating capital management in the period 2013-2017 before the transition to IFRS 9. The independent variable *T1CAP* has a negative coefficient which is significant at the 0.05-level, supporting H4 and determining a negative relationship between regulatory capital and LLPs in the 5-year period before the introduction of IFRS 9. The estimated coefficient of -0.0027 indicates that a 6% drop in Tier 1 capital ratio leads to an increase of LLP expenses by 0.27% of total assets, corresponding to a 40% increase from the mean value of LLPs as observed in Table 5. The results support the notion that banks in general engage in capital management in the post-Basel era in-line with some previous research (Ahmed et al., 1999; Anandarajan et al., 2007), but stands in contrast to later research which finds insufficient evidence of capital management in European banks (Anandarajan et al., 2003; Leventis et al., 2011; Curcio & Hasan, 2015).

The control variable *EBTP* has a positive coefficient, consistent with the existence of earnings management, but is not significant at conventional levels[20]. *TA*, controlling for size, has a significantly negative coefficient, indicating that larger banks take lower LLP expenses. In addition, the variable *NPL* controlling for credit risk in the portfolio, has a coefficient that follows the predicted sign and is significant at the 0.01-level. Both ΔTA and ΔNPL have positive coefficients but very weak t-statistics, showing no significant impact on the dependent variable *LLP*. Lastly, two out of three macro-variables lose their significance in the regression, with only ΔGDP retaining the predicted negative coefficient significant at the 0.05-level.

Regression model (1) displays a high adjusted R-squared of 0.51 when compared to previous research[21] (Ahmed et al., 1999; Anandarajan et al., 2003; 2007; Leventis et al., 2011) which report adjusted R-squareds in the range of 0.2-0.49. In this light, regression model (1) can be determined to hold high explanatory power. This is further confirmed by the model's F-statistic of 12.33, rejecting the null hypothesis that the model includes no significant independent variables.

In sum, the test supports H4, confirming a significant negative relation between regulatory capital and LLPs, which indicates that capital management was present in European banks between years 2013 and 2017 leading up to the introduction of IFRS 9.

4.2.2. Test for Capital Management at the Transition to IFRS 9

Table 10 reports the results from regressions model (2), (3) and (4), testing H1, H2 and H3 respectively, as well as results from model (5) including both interaction variables.

In regression (2) the independent variable *T1CAP* has a small, positive, coefficient which is statistically insignificant. This opposes the predicted sign for the variable as well as the observed correlation in the correlation matrix presented in Table 8. In addition, the estimated coefficient of 0.0004 on *T1CAP* appears to lack economic significance, as a 6% decrease in

[20] This coefficient becomes statistically significant in sensitivity tests shown in Appendix B and C, which indicates that earnings management behaviour is present in the sample (Ahmed et al., 1999).
[21] This may be due to the inclusion of country and time dummy variables, which naturally increase the R-squared of a model through the introduction of otherwise endogenous effects (Wooldridge, 2012).

Tier 1 capital ratio would only lead to a 0.04% increase in the impact from the transition to IFRS 9. Thus, the study finds no support for H1 stating that there is a negative relation between regulatory capital and the impact from the transition to IFRS 9, which would be interpreted as evidence of capital management.

In regression (2), both of the included dummy variables have coefficients significant at the 0.10-level. The coefficient for the dummy variable *RWA*, which is equal to 1 for banks with total LLP reserves < 1.25% of risk-weighted assets, is negative 0.0023. This follows the intuition that banks with overall lower LLP reserves will face a lower impact from the transition to IFRS 9. The coefficient on the dummy variable *Trans*, which is equal to 1 for banks which adopted the IFRS 9 Transitional Arrangements, is positive 0.0021. This indicates that banks who opted to use the Transitional Arrangements generally face a larger impact from the transition to IFRS 9, in line with the findings of EBA (2018).

In regression (3), the interaction variable *T1CAP_RWA* is included to test for H2. *T1CAP_RWA* is the interaction between variables *T1CAP* and *RWA*, and represents the difference in the relation between *T1CAP* and the dependent variable *IFRS9* for the two groups defined by the dummy variable *RWA*. The coefficient on *T1CAP_RWA* in regression (3) is positive 0.0007 and not statistically significant, thus opposing the predicted sign and showing no support for H2, stating that banks with a stronger incentive to manage capital will do so during the transition to IFRS 9. In the combined regression (5), the sign of the estimated coefficient changes to negative in accordance with the hypothesis, however still without being significant at conventional levels.

In regression (4) a similar test for H3 is reported. The interaction variable *T1CAP_Trans*, which is the interaction between variables *T1CAP* and *Trans*, represents the difference in the relation between the *T1CAP* and the dependent variable *IFRS9* for the two groups defined by the dummy variable *Trans*. The coefficient on *T1CAP_Trans* in regression (4) is negative 0.0022 but not significant at conventional levels. The sign on the coefficient contradicts H3, which states that banks facing a weaker incentive to manage capital will not do so during the transition to IFRS 9. In the combined regression (5), the point estimate of the coefficient on *T1CAP_Trans* remains negative at 0.0025 but its significance still remains below the 0.10-level. Interestingly, the authors note that the coefficient on *T1CAP* is positive and significant at the 0.05-level in regression (4). With the interaction variable included, the coefficient on *T1CAP* captures the relationship between regulatory capital and *IFRS9* for the group of banks which have not adopted the Transitional Arrangements. This positive coefficient contradicts the capital management hypothesis, however, its significance disappears altogether in the sensitivity tests presented in section 4.3 and reported in Appendix B and C. Thus, it can be concluded that this positive coefficient is driven by a few, extreme, observations.

For all regression models reported in Table 10, the coefficients on the control variables *TA*, *NPL*, *GL* and *LLP* follow their predicted signs and the results reported from the test of H4 in Table 9. In contrast, only the coefficient for the control variable *NPL* is statistically significant at conventional levels, indicating that the model used to investigate H1-H3 does not fit the dependent variable as well as the model used to investigate H4. However, in the sensitivity tests performed in section 4.3, both *TA* and *LLP* gain strong statistical significance. Further,

regressions (2)-(5) report R-squareds hovering around 0.38, which is in-line with previous research (Ahmed et al., 1999; Anandarajan et al., 2003;2007; Leventis et al., 2011), but offers a drop from the R-squared of 0.51 reported for regression (1). For all regressions presented in Table 10, reported F-statistics reject the hypothesis that all coefficients are zero, confirming that the models hold explanatory value with regards to the dependent variable.

In sum, the results from regressions (2)-(5) show no support for H1, H2 and H3 regarding capital management at the transition to IFRS 9. The general relationship between regulatory capital and the impact of the transition to IFRS 9 is deemed, both statistically and economically, insignificant. In addition, no support for H2 and H3 is found, indicating that no evidence of capital management can neither be found when comparing the behaviour of banks with different incentives to manage capital at the transition to IFRS 9.

4.3. Sensitivity Analysis and Robustness Tests

To ensure that the results are not driven by specific variable definitions or extreme observations, a number of sensitivity tests are performed and described below.

To assess if there is any impact from extreme values or outliers on the results, reruns of regressions (1)-(5) is performed on winsorized and trimmed data (Wooldridge, 2012). Appendix B reports regressions (1)-(5) on samples which have been winsorized at percentiles 1 and 99. Appendix C reports regressions (1)-(5) on samples where observations outside percentiles 1 and 99 have been dropped. In both tests, while the level and significance of some variable coefficients change slightly, the results regarding H1-H4 do not change. Especially, the coefficient on *T1CAP* becomes strongly statistically significant at the 0.01-level in regression (1) running on winsorized and trimmed samples reported in Appendix B and C respectively. This indicates that extreme observations do not drive the results regarding H4, increasing the result's robustness.

To investigate whether the results are robust with regards to the specific definition of the explanatory variable, tests using an alternative definition are performed in accordance with previous research. The sensitivity test replaces the measure of the regulatory capital independent variable from Tier 1 capital to Total capital in regression models (2)-(5) in accordance with some previous studies (Ahmed et al., 1999; Anandarajan et al., 2003; 2007; Bouvatier & Lepetit, 2008; Curcio & Hasan, 2015)[22]. Due to the complex relation between LLPs, Tier 1 capital and Total capital, results may be driven by the measure of regulatory capital used in the regressions (Bouvatier & Lepetit, 2008; Curcio & Hasan, 2015). The results are reported in Appendix D which show that the results do not change depending on the adopted measure of regulatory capital.

To further corroborate our findings, a number of additional robustness tests are performed and described below to ensure the statistical integrity of the results.

[22] Due to lack of data, this test cannot be performed with regards to regression (1) testing for H4.

4.3.1. Fixed-Effects

While most previous capital management research have performed tests without considering fixed-effects (see e.g. Moyer, 1990; Beatty et al., 1995; Ahmed et al., 1999), some later studies have included time and/or country fixed-effects in their models (Anandarajan et al., 2007; Curcio & Hasan, 2015). The inclusion of country fixed-effects may be especially important when focusing on European data covering several countries, where country specific factors that are time-invariant might distort the results (Curcio & Hasan, 2015). To formally test if a fixed-effects model is preferred in this study, a Durbin-Wu-Hausman test for endogeneity is performed on the panel data sample used to investigate H4 in regression (1) and the cross-sectional sample used to investigate H1-H3 in regressions (2)-(5) (Wooldridge, 2010). The results presented in Appendix E reject the null-hypothesis indicating no difference between a fixed and random effects model for regression (1), indicating that country fixed-effects should be added (Wooldridge, 2010). For models (2)-(5) ran on cross-sectional data, the null hypothesis is not rejected for the base model used to test H1-H3 on cross-sectional data, why no dummy variables controlling for country fixed-effects are added to these models (Wooldridge, 2010)[23].

After adding country fixed-effects to regression (1), an additional F-test is performed to evaluate if time fixed-effects should be added, as it runs on panel data. Time fixed-effects capture endogenous effects that are constant across the sample of banks, but vary over time (Wooldridge, 2012). The F-test for time fixed-effects is reported in Appendix F. The null hypothesis that coefficients on all time dummy variables are equal to zero is rejected with a probability of 0.0734, indicating that time fixed-effects may be added to the model[24]. Following this, regression model (1) testing for H4 on a panel data sample includes dummy variables controlling for both country and time fixed-effects.

4.3.2. Multicollinearity

Multicollinearity exists when independent variables are highly correlated with each other, making it difficult to distinguish the contribution of each variable to the result (Wooldridge, 2012). To examine if multicollinearity is present among independent variables, two Pearson's correlation matrices is presented in section 4.1. Pearson's correlations for the two samples show no excessively high correlations between the independent variables included. As an additional test, Variance Inflation Factors (VIF) and tolerance levels for regressions (1)-(5) are checked (O'Brien, 2007) and presented in Appendix G. Generally, a critical value for VIF are debated, with some suggesting values above 10 as an indication of a collinearity issue (Wooldridge, 2012) while others consider a VIF above 4 worrisome (O'Brien, 2007). For regression (1), VIFs on all variables appear acceptable, except for the control variable ΔHPI which exhibits a notably high VIF of 7.23. Re-examining the correlation matrix in Table 7 shows that ΔHPI has significant correlations with several independent variables, however none of the significant

[23] To increase robustness, regression models (2)-(5) are also ran with country fixed-effects included. The results regarding H1-H3 do not change and the tests report lower adjusted R-squared and F-statistics, indicating that the inclusion of country fixed-effects would weaken the model fit (Wooldridge, 2012).

[24] Since the null hypothesis is not rejected at the 0.05-level, regression model (1) is also ran without time fixed-effects included. The results regarding H4 do not change and the test report lower adjusted R-squared and F-statistics, indicating that that the inclusion of time fixed-effects improves the model fit.

correlations appear excessively high. To confirm the robustness of regression (1) against potential collinearity, the model is re-estimated and ran without the variable Δ*HPI* included. The untabulated results show that the results regarding H4 are not driven by multicollinearity.

Appendix G also presents VIFs and tolerance levels for regression models (2)-(5) used to investigate H1-H3. Both VIFs and tolerance levels are at acceptable levels for all models and it can be concluded that the results are not driven by multicollinearity[25].

4.3.3. Heteroscedasticity

Heteroscedasticity is present when the variance of the error term of a regression model is non-constant. Heteroscedasticity can contribute to incorrect interpretations of the significance of the coefficients following the biased estimates of standard errors (Wooldridge, 2012). To test for heteroscedasticity in the error terms in regression models (1)-(5), a Breusch-Pagan test is performed (Wooldridge, 2012). The Breusch-Pagan test is preferred over the test proposed by White (1980) to preserve degrees of freedom in the relatively small samples used in regressions (1)-(5) (Wooldridge, 2012). The results of the Breusch-Pagan test are reported in Appendix H and shows that the null hypothesis of homoscedasticity is rejected for all regression models. To correct for the observed heteroscedasticity, robust standard errors are used in all regressions (Wooldridge, 2012).

4.3.4. Autocorrelation

Serial correlation is present when observations in time-series or panel data are inter-correlated over time (Wooldridge, 2010). As regression model (1) runs on panel data, a test proposed by Wooldridge (2010) is performed to test for serial correlation in panel data. The results are reported in Appendix I and shows that the null hypothesis of no serial correlation is rejected for regression model (1). According to Wooldridge (2010), serial correlation in panel data with a large number of cross-sectional panels spread over few time-periods is often considered arbitrary, requiring only small interventions. To correct for such serial correlation in panel data, Wooldridge (2010) suggests that standard errors should be clustered by firm. Following this, standard errors in regression (1) are clustered at a bank level to correct for the observed autocorrelation.

4.4. Summary

In sum, the study finds contradicting results regarding the prevalence of capital management before and during the transition to IFRS 9. In the test for H4, a significant negative relation between regulatory capital and LLPs is found, supporting the hypothesis. The significant negative relationship indicates that capital management behaviour was present among European banks in the years 2013-2017, contradicting some previous studies on European data which do not find evidence of capital management (Leventis et al., 2011; Curcio & Hasan, 2015). However, when testing for capital management at the transition to IFRS 9 in H1-H3, no support for any of the three hypotheses is found. Thus, the tests exhibit no support for capital

[25] The inclusion of interaction variables naturally inflates VIFs for the main effect variables due to construction. Notably, these high VIFs do not indicate multicollinearity issues (Wooldridge, 2012).

management at the transition to IFRS 9. The lack of evidence of capital management from regression models (2)-(5) contrasts the findings from regression model (1) concerning the preceding period, indicating that banks do not manage regulatory capital in the same way at the transition to IFRS 9 as they have in the preceding period.

5. Analysis

The following section contains a thorough discussion concerning the validity and reliability of the results presented above. In addition, several limitations of the generalizability of the results are addressed, before the concluding section which reviews the main contributions of the study and offers the authors' suggestions for future research.

5.1. Discussion of Findings

The purpose of this thesis is to investigate if capital management behaviour was present among European banks during the transition to IFRS 9. Previous studies have provided evidence that banks use LLPs to manage regulatory capital across different time-periods and geographies (Moyer, 1990; Beatty et al., 1995; Ahmed et al., 1999; Shrieves & Dahl, 2003; Anandarajan et al., 2003; 2007; Bouvatier & Lepetit, 2008; Curcio & Hasan, 2015). However, due to the ambiguous results of capital management research focusing on European samples (Anandarajan et al., 2003; Bouvatier & Lepetit, 2008; Leventis et al., 2011; Curcio & Hasan, 2015), an additional test of capital management in the years 2013-2017 is performed to determine if capital management is present among European banks in the ordinary course of business and allows for comparison with the results found at the transition to IFRS 9.

Overall, the findings regarding capital management in this study are contradictory. While capital management behaviour is found among European banks in the years 2013-2017, preceding the transition to IFRS 9, no capital management behaviour is found at the transition, even though ample opportunity exists (Novotny-Farkas, 2016; Krüger et al., 2018). This section begins with a discussion of the validity of the results found in regression (1), regarding capital management in the period before the introduction of IFRS 9, followed by a discussion contrasting the support for capital management found in regression (1) to the lack of support for capital management found in regressions (2)-(5) at the transition to IFRS 9.

The negative relationship between regulatory capital and LLPs found in regression (1) has traditionally been interpreted as proof of capital management behaviour in both pre- and post-Basel regimes according to the capital management hypothesis (see e.g. Ahmed et al., 1999; Anandarajan et al., 2007). The capital management hypothesis also provides the foundation for H4 in this study, which is supported by the negative relation found in regression (1). However, due to the complex relation between regulatory capital and LLPs in the post-Basel period, a negative relation may also be driven by conservatism, as suggested by Shrieves and Dahl (2003). In such a scenario, the negative relation is driven by banks with excessively high regulatory capital taking on additional provisions, not banks with low regulatory capital aiming to inflate their Total capital (Shrieves & Dahl, 2003). To confirm the interpretation of a negative relationship as capital management, a test according to the method proposed by

Shrieves and Dahl (2003), where the sample is subdivided into quartiles based on their level of T1CAP, is performed. Untabulated results of the test show that the negative relationship between regulatory capital and LLPs is stronger for low-capital banks[26] than high-capital banks[27], supporting the notion that the negative relationship found in regression model (1) is not driven by conservatism (Shrieves & Dahl, 2003).

While some earlier research on capital management in European banks have found a negative relationship between LLPs and regulatory capital, it has not been statistically significant (Leventis et al., 2011; Curcio & Hasan, 2015). Thus, while this study presents evidence of capital management between years 2013-2017 in regression (1), no similarly strong evidence of capital management has been found in preceding periods among European banks. The lack of previous evidence weakens the interpretation of the results found in regression (1) as capital management without a plausible reason for a change in behaviour towards more capital management among European banks. As this thesis focuses on a sample limited to the time period after the financial and European debt crises, a plausible reason can be the stress on capital ratios caused by the aforementioned crises and the additional pressure on European banks following the strong regulatory response (BCBS, 2009; BCBS, 2011). This may have caused banks to consider every last option to increase Total capital ratios, including the inflation of LLPs (Bushman & Landsman, 2010; Bushman & Williams, 2012).

Another plausible explanation may be differences in the regression models used to investigate capital management, especially in the specification of the explanatory variable and the included controls for non-discretionary LLPs, which have differed widely in previous research (see discussion in Beatty & Liao, 2014; Leventis et al., 2011; Curcio & Hasan, 2015). In section 4.3, robustness tests are performed with regards to alternative model specifications, to which the results are found robust. However, due to the large diversity in the models used to control for non-discretionary LLPs, it is not feasible to test all specifications that have been employed in previous research (Beatty & Liao, 2014).

Following the above discussion, the authors of this study deem the interpretation of the negative relation found in regression (1) as evidence of capital management reliable and valid.

The results from regressions (2)-(5) show a different picture from the one found in regression (1). Overall, this study finds no support for H1-H3 regarding capital management behaviour at the transition to IFRS 9, as opposed to the evidence found in the preceding period. The test for H1, which tests the general relationship between regulatory capital and the impact of the transition to IFRS 9, finds the relationship both statistically and economically insignificant, contrary to the hypothesis. The difference in the results from regression (1) and regression (2) may be interpreted in several ways. The most straightforward interpretation is that while banks manage regulatory capital continuously using LLPs, the one-time impact of the transition to IFRS 9 may not be sizable enough to warrant capital management behaviour. However, comparing the average increase of LLPs from the transition to IFRS 9, which equals 0.40% of total assets, to the average yearly LLP expense at 0.68% of total assets, this indicates that the

[26] Defined as banks with observations in the lowest quartile of the independent variable T1CAP.
[27] Defined as banks with observations in the highest quartile of the independent variable T1CAP.

impact of IFRS 9 on LLP reserves is on average comparable to an annual LLP expense. The evidence from regression (1) suggests that bank managers continuously use LLP expenses which are similar in size to the impact of the transition to IFRS 9 to manage capital. Following this, the authors find it unlikely that bank managers would completely ignore the possibility to manage capital using the one-time impact of IFRS 9 on LLP reserves purely based on its size. Instead, the lack of evidence to support H1 and a general relationship between regulatory capital and the IFRS 9 impact may be a result of the different incentives banks face to manage capital during the transition, as explored in regression (3) and (4) (Ahmed et al., 1999).

However, the results from regressions (3) and (4) do not find support for the hypotheses that banks with different incentives to manage capital during the transition behave differently (Ahmed et al., 1999). With regards to regression (3), the lack of evidence may in fact be driven by a relatively small impact of the transition to IFRS 9 for banks in the treatment group, as indicated by the negative coefficient on the dummy variable *RWA* in regression (2). The banks included in the treatment group defined by *RWA*, holding a total LLP reserve below 1.25% of risk-weighted assets, only face an impact on LLP reserves from the transition to IFRS 9 of 0.043% of total assets on average, indicating that the impact on these banks are about 1/10 of the average impact for the sample. With such a small impact, even if you have a strong underlying incentive to manage capital, the authors of this study conclude that it may not be worth the effort to manage regulatory capital.

With regards to the result of regression (4), the estimated coefficient is negative on the interaction variable *T1CAP_Trans*, as opposed to the predicted positive coefficient, thus finding no support for H3. While the estimated negative coefficient has a low statistical significance just below the 0.10-level, the point estimate is economically significant, stable in both regression (4) and (5), and it becomes necessary to comment on the opposing findings. H3 states that banks adopting Transitional Arrangements face lower incentives to manage capital according to the traditional capital management hypothesis (Ahmed et al., 1999), indicating a less negative relationship between regulatory capital and the IFRS 9 impact for these banks. While no evidence for this hypothesis is found, the exhibited negative relationship may potentially still be explained by accounting, capital or earnings management behaviour. Potentially, the negative coefficient may indicate that low capital banks under the Transitional Arrangements instead use the transition to IFRS 9 as an opportunity to take an excessively large impact on LLP reserves. The motivation behind such behaviour may be to artificially inflate reported accounting key numbers, such as coverage ratios, without impacting Tier 1 regulatory capital (Ahmed et al., 1999; Anandarajan et al., 2003; 2007). In addition, as the one-day impact of IFRS 9 is reported directly as a change in accounting equity, banks may take an excessively large LLP which is successively reversed during the following years to increase reported accounting earnings (Healy & Wahlen, 1999).

In sum, the results find support for H4 regarding capital management in the period preceding the introduction of IFRS 9, but find no support for H1-H3 regarding capital management at the transition to IFRS 9. Even though earlier research has found that the transition provides ample opportunity to engage in capital management through increased discretion (Novotny-Farkas, 2016; Krüger et al., 2018), bank managers have not utilized this opportunity. Potential explanations for the observed pattern are the limited size of the impact on LLP reserves from

the transition to IFRS 9 in banks with a strong incentive to manage capital, or alternative earnings management incentives for banks adopting the IFRS 9 Transitional Arrangements. While a more thorough investigation and confirmation of potential explanations for the differences are outside the scope of this thesis, the results do confirm that banks do not engage in capital management in a similar way during the transition to IFRS 9 as they previously have in their ordinary course of business.

5.2. Limitations

This thesis is subject to several limitations. As discussed above, the validity of the results depends on the interpretation of a negative correlation between regulatory capital and LLPs as capital management behaviour. While several measures have been taken to corroborate the results, and previous research has relied on similar inference (see e.g. Ahmed et al., 1999), there is still a chance that the negative correlation found in regression (1) may not stem from capital management behaviour. Previous studies have also focused on alternative motives for the level of LLPs, such as signalling theory, and hence investigated how the capital market interpret a certain level of LLPs (Beatty & Liao, 2014). Because IFRS 9 was implemented recently and due to the limited scope of this study, this thesis has not included the eventual signalling motives for choosing a certain level of LLPs.

The interaction between the accounting and regulatory framework is complex (BCBS, 2017). Especially, the impact of accounting provisions on bank regulatory capital depends on several factors, such as the adoption of a standardized or internal ratings-based risk model, or the classification on the provision as a general or specific provision (BCBS, 2011; EBA, 2017). The quantitative research method utilized in this thesis and previous capital management research cannot fully control for the complex relation between accounting provisions and regulatory capital, which may influence bank managers' propensity to use LLPs to manage capital (Beatty & Liao, 2014).

As discussed in section 3.2.2, capital management studies utilizing regulatory changes are subject to control group concerns, as pointed out by Beatty and Liao (2014). This study is no exception, as the choice to adopt the IFRS 9 Transitional Arrangements is voluntary, creating a strong self-selection bias in the test for H3. However, due to this self-selection bias, it is important to note that this study does not intend to infer a causal relationship between the adoption of the Transitional Arrangements and capital management behaviour under H3.

Regression models (1)-(5) utilize several variables to control for the non-discretionary part of LLPs. While the motivation for the choice of model is based on results of previous research which have investigated a large number of LLP-models (see Beatty & Liao, 2014 and sections 3.3.2 and 3.4.1 of this thesis), there is no guarantee that the models used in regressions (1)-(5) fully capture non-discretionary part of LLPs.

The two samples used in this study are limited by several factors. First, the banks used in regression (1) and regressions (2)-(5) differs slightly (see section 3.1), as necessary data for all

banks used to test H1-H3 was not available in the EIKON database for the years 2013-2017[28]. This reduces the comparability of the results found in regression (1) to the lack of evidence exhibited in regressions (2)-(5). Second, the sample is limited to listed banks in countries compliant with EC 1606/2002, ensuring that only IFRS compliant banks are included in the study. However, this may not be a representative sample for all IFRS compliant banks, imposing limitations to the generalizability of the results. In addition, the sample is limited to banks disclosing the effects of the transition to IFRS 9 in English, imposing an even more narrow limitation. Third, as a consequence of the required IFRS 9 disclosure, the sample of banks becomes heavily tilted towards some countries, imposing further limitations to the generalizability of the results. Another limitation concerning the sample is that the local supervisory authority of each country has the possibility to impose regulation that diverge slightly under the Basel Accords (BCBS, 2011). Even if the differences are not large between countries in practice, it can affect banks' LLP behaviour, hence affecting the results.

6. Concluding Remarks

On January 1, 2018 IFRS 9, the new accounting standard governing financial instruments were mandatorily adopted by all IFRS compliant entities (IASB, 2017). The new standard includes a drastically changed provisioning model which aims to allow more timely recognition of loan losses, following widespread critique of the previous model in the light of the last decade's financial and banking crises (BCBS, 2009; IASB, 2013). However, recent research has criticized the new ECL model for increasing bank managers' discretion over LLPs and noted its potential implications for financial stability (Bushman & Williams, 2012; Novotny-Farkas, 2016; Krüger et al., 2018).

A large literature has investigated the relationship between LLPs and regulatory capital, finding that LLPs are used to inflate regulatory capital to avoid the costs associated with breaching minimum thresholds set by the regulator (Moyer, 1990; Beatty et al., 1995; Kim & Kross, 1998; Ahmed et al., 1999; Shrieves & Dahl, 2003; Anandarajan et al., 2003; 2007; Bouvatier & Lepetit, 2008; Curcio & Hasan, 2015). A particular strain of research has successfully utilized regulatory shifts, which change the incentive or capability for bank managers to manipulate regulatory capital using LLPs, to investigate capital management (Kim & Kross, 1998; Ahmed et al., 1999; Anandarajan et al., 2003; 2007; Leventis et al., 2011).

Following this strain of previous capital management research, the aim of this thesis is to investigate whether LLPs were used to manage regulatory capital during the transition to IFRS 9 and answer the research question:

Were Loan Loss Provisions used to manage regulatory capital in European Banks during the transition to IFRS 9?

The study is conducted on two samples of listed European banks: one panel data sample covering the years 2013-2017 and one cross-sectional sample covering the transition to IFRS

[28] The alternative to the exclusion of banks would have been a more comprehensive hand-collection of data, which would have encumbered the thesis due to the limited time-frame.

9. The results show a statistically significant negative relationship between regulatory capital and LLPs, indicating that European banks were engaged in capital management using LLPs during the period 2013-2017. This contrast some later research on European banks, which has not found a significant negative relationship (Leventis et al., 2011; Curcio & Hasan, 2015). The difference in results compared to previous research may be attributed to the stronger regulatory pressure on European banks during years 2013-2017 or the utilized model specifications (BCBS, 2011; Leventis et al., 2011; Beatty & Liao, 2014; Curcio & Hasan, 2015).

In contrast, the results from the tests investigating the relation between LLPs and regulatory capital at the transition to IFRS 9 find no support of capital management. Even though later research has found that the introduction of the ECL model provides increased discretion over LLPs (Novotny-Farkas, 2016; Krüger et al., 2018), bank managers have not utilized this opportunity to manage regulatory capital. Potential explanations for the lack of evidence are the limited size of the impact on LLP reserves from the transition to IFRS 9 in banks with a strong incentive to manage capital, or alternative earnings management incentives for banks adopting the IFRS 9 Transitional Arrangements (Healy & Wahlen, 1999; BCBS, 2017; EBA, 2018). While a more thorough investigation and confirmation of potential explanations for the differences are outside the scope of this paper, the results do confirm that banks do not engage in capital management in a similar way during the transition to IFRS 9 as they previously have.

The results from this paper contributes to academic research on capital management in three distinct areas. First, this study is the first post-financial crisis study investigating the relation between LLPs and regulatory capital in European banks. Specifically, the results of this paper contrasts previous research on capital management among European banks from earlier periods (Leventis et al., 2011; Curcio & Hasan, 2015) by providing new evidence of capital management in the period 2013-2017. Second, this study is the first to investigate capital management during the transition IFRS 9 and the new ECL model, providing a first insight to how the new provisioning model might affect capital management behaviour. Third, by focusing on the transition to IFRS 9 and the implications of the IFRS 9 Transitional Arrangements, this study contributes to the specific strain of capital management research focusing on regulatory change which alter the incentives for bank managers to manage capital (Ahmed et al., 1999; Leventis et al., 2011).

In addition, the results from this study contribute with practical insights to regulators, standard setters and analysts alike. For standard setters, it is of great importance to understand if new accounting standards serve their intended purpose or allow for any adverse behaviour, such as capital management (BCBS, 2010). For regulators, the impact of new accounting standards on regulation needs to be understood to ascertain its effectiveness (ESRB, 2017). For analysts, the information contained in financial reports needs to reflect the reality of the underlying business to be useful (IASB, 2017). By investigating potential capital management behaviour using LLPs during the transition to IFRS 9, this thesis contributes with new findings and practical insights to all three.

The findings of this study provide ample starting points for future capital management research focusing on LLPs. Following comments by Beatty and Liao (2014), the authors of this study

notes that no cross-geographical, large-scale study of capital management using LLPs focusing on a post-Basel sample have been conducted to this date. Having access to such a study will be useful to understand how capital management behaviour has evolved over time and in different regions since the implementation of the Basel Accords.

While the results of this study find that banks do not engage in similar capital management behaviour during the transition to IFRS 9 as they have in the previous period, this does not rule out that LLPs will be used to manage regulatory capital in the ordinary course of business after IFRS 9 has been fully implemented. This provides an opportunity for future studies to investigate the impact of IFRS 9 and the ECL model on capital management behaviour over time. Such a study could also investigate if there are other reasons for eventual manipulation of LLPs, as signalling theory or managing of earnings (Beatty & Liao, 2014), something that has not been investigated in this thesis.

In addition, indicative results found with regards to H3 show that banks adopting the IFRS 9 Transitional Arrangements seem to behave differently with regards to LLPs than other banks during the transition to IFRS 9. Research following-up on these banks' provisioning behaviour post IFRS 9 implementation will be useful to fully understand the implications of the IFRS 9 Transitional Arrangements and any resulting adverse behaviour.

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Appendix

Appendix A.

The distribution of listed European banks across countries in the cross-sectional and panel data samples

Country	No. Banks cross-sectional sample (H1-H3)	No. Banks panel data sample (H4)
Austria	*5*	3
Belgium	*3*	2
Bulgaria	*2*	1
Croatia	*3*	1
Cyprus	*2*	2
Czech Republic	*2*	2
Denmark	*20*	12
Estonia	*1*	0
Finland	*4*	3
France	*4*	3
Germany	*8*	3
Greece	*5*	4
Hungary	*1*	1
Iceland	*2*	0
Ireland	*3*	3
Italy	*17*	13
Lithuania	*1*	1
Malta	*3*	1
Netherlands	*4*	3
Norway	*26*	22
Poland	*13*	12
Portugal	*1*	1
Romania	*3*	2
Slovakia	*2*	2
Slovenia	*2*	0
Spain	*8*	7
Sweden	*8*	3
United Kingdom	*21*	8
Total	**174**	**115**
No. Banks under IFRS 9 Transitional Arrangements	89	
No. Banks not under IFRS 9 Transitional Arrangements	85	
No. Banks with LLP reserves < 1.25% of risk-weighted assets	46	
No. Banks with LLP reserves > 1.25% of risk-weighted assets	128	

Appendix B.

Regressions (1)-(5) on samples which have been winsorized at percentiles 1/99

Dependent variable: LLP	(1)
Intercept	0.0168
(t-stat)	*(3.70)***
T1CAP	-0.0029
(t-stat)	*(-2.93)***
EBTP	0.1719
(t-stat)	*(2.80)***
TA	-0.0006
(t-stat)	*(-2.54)***
NPL	0.0287
(t-stat)	*(1.66)**
ΔNPL	-0.0123
(t-stat)	*(-1.06)*
ΔTA	0.0007
(t-stat)	*(0.27)*
ΔGDP	-0.0958
(t-stat)	*(-2.22)***
ΔUNEMP	-0.1451
(t-stat)	*(-2.12)***
ΔHPI	-0.0077
(t-stat)	*(-0.59)*
Country Fixed-Effects	Yes
Year Fixed-Effects	Yes
Adj. R-squared	0.6435
F-stat	21.01***
No. Observations	411
No. Banks	115

Dependent variable: IFRS9	(2)	(3)	(4)	(5)
Intercept	0.0014	0.0017	-0.0006	-0.0005
(t-stat)	*(0.43)*	*(0.51)*	*(-0.21)*	*(-0.15)*
T1CAP	0.0002	0.0000	0.0007	0.0006
(t-stat)	*(0.30)*	*(0.06)*	*(1.87)*	*(1.33)*
TA	-0.0003	-0.0003	-0.0003	-0.0003
(t-stat)	*(-1.98)***	*(-2.00)***	*(-1.67)*	*(-1.65)*
NPL	0.0319	0.0317	0.0316	0.0316
(t-stat)	*(4.88)****	*(4.83)****	*(4.83)****	*(4.80)****
GL	0.0029	0.0031	0.0034	0.0034
(t-stat)	*(1.33)*	*(1.41)*	*(1.55)*	*(1.55)*
LLP	0.0959	0.0957	0.0964	0.0963
(t-stat)	*(1.95)**	*(1.95)**	*(1.99)***	*(1.98)***
RWA	-0.0019	-0.0033	-0.0020	-0.0023
(t-stat)	*(-2.83)****	*(-1.93)**	*(-2.95)****	*(-1.53)*
T1CAP_RWA		0.0005		0.0001
(t-stat)		*(0.93)*		*(0.28)*
Trans	0.0019	0.0019	0.0049	0.0047
(t-stat)	*(2.98)****	*(2.97)****	*(1.39)*	*(1.31)*
T1CAP_Trans			-0.0011	-0.0010
(t-stat)			*(-0.84)*	*(-0.78)*
Adj. R-squared	0.5214	0.5194	0.5218	0.519
F-stat	21.41***	20.06***	19.11***	19.00***
No. Observations	174	174	174	174
No. Banks	174	174	174	174

Appendix B1. presents the results from regression model (1) used to test for capital management before the introduction of IFRS 9. The sample consists of panel data covering 115 banks years 2013-2017. *LLP* is the ratio of loan loss provisions to opening balance total assets. *T1CAP* is the ratio of opening balance Tier 1 capital to the minimum requirement. *EBTP* is the ratio of earnings before taxes and loan loss provisions to opening balance total assets. *TA* is the natural logarithm of total assets. *NPL* is the ratio of non-performing loans to total assets. *ΔNPL* is the change in non-performing loans deflated by opening balance total assets. *ΔTA* is the change in total assets deflated by opening balance total assets. *ΔGDP* is the change in nominal GDP. *ΔUNEMP* is the change in unemployment rate. *ΔHPI* is the change in the house price index. The notation *, ** and *** represents significance at the 0.10-, 0.05- and 0.01-levels respectively.

Appendix B2. presents the results from regression models (2)-(4) used to investigate capital management at the transition to IFRS 9. The data is cross-sectional at the date of the transition to IFRS 9 and consists of a sample of 174 banks. In addition, regression (5) presents an additional test including both interaction variables from regressions (3) and (4). *IFRS9* is the increase in the LLP reserve from adopting IFRS 9 deflated by total assets. *T1CAP* is the ratio of 2017 Tier 1 capital to the minimum requirement. *TA* is the natural logarithm of total assets. *NPL* is non-performing loans deflated by total assets. *GL* is the ratio of total loans to total assets. *LLP* is the loan loss provisions expense deflated by total assets. *RWA* is a dummy variable equal to 1 when banks have an LLP reserve < 1.25% of risk-weighted assets. *Trans* is a dummy variable equal to 1 when banks have adopted IFRS 9 Transitional Arrangements. *T1CAP_RWA*, is the interaction variable between T1CAP and RWA, included in regression model (3). *T1CAP_Trans*, the interaction between T1CAP and Trans is included in regression model (4). Both interaction variables are included in regression (5). The notation *, ** and *** represents significance at the 0.10, 0.05 and 0.01-levels respectively

Appendix C.

Regressions (1)-(5) on samples where observations outside percentiles 1/99 have been dropped

Dependent variable: LLP	(1)
Intercept	0.0157
(t-stat)	*(3.55)***
T1CAP	-0.0030
(t-stat)	*(-2.59)***
EBTP	0.1482
(t-stat)	*(2.49)***
TA	-0.0005
(t-stat)	*(-1.69)**
NPL	0.0201
(t-stat)	*(1.21)*
ΔNPL	-0.0031
(t-stat)	*(-0.32)*
ΔTA	0.0004
(t-stat)	*(0.16)*
ΔGDP	-0.0194
(t-stat)	*(-2.46)***
ΔUNEMP	-0.0690
(t-stat)	*(-1.46)*
ΔHPI	-0.0224
(t-stat)	*(-1.85)**
Country Fixed-Effects	Yes
Year Fixed-Effects	Yes
Adj. R-squared	0.6344
F-stat	19.53***
No. Observations	396
No. Banks	113

Dependent variable: IFRS9	(2)	(3)	(4)	(5)
Intercept	0.0045	0.0050	0.0031	0.0035
(t-stat)	*(1.55)*	*(1.55)*	*(1.04)*	*(1.02)*
T1CAP	0.0001	0.0000	0.0005	0.0004
(t-stat)	*(-0.12)*	*(-0.09)*	*(1.04)*	*(0.64)*
TA	-0.0004	-0.0004	-0.0004	-0.0004
(t-stat)	*(-3.04)****	*(-3.04)****	*(-2.89)****	*(-2.81)****
NPL	0.0203	0.0202	0.0200	0.0199
(t-stat)	*(3.28)****	*(3.24)****	*(3.21)****	*(3.19)****
GL	-0.0004	-0.0005	-0.0001	-0.0002
(t-stat)	*(-0.20)*	*(-0.26)*	*(-0.03)*	*(-0.08)*
LLP	0.4579	0.4578	0.4587	0.4586
(t-stat)	*(4.79)****	*(4.76)****	*(4.71)****	*(4.69)****
RWA	-0.0011	-0.0031	-0.0012	-0.0023
(t-stat)	*(-2.46)***	*(-1.41)*	*(-2.61)****	*(-1.07)*
T1CAP_RWA		0.0007		0.0004
(t-stat)		*(0.94)*		*(0.55)*
Trans	0.0012	0.0012	0.0034	0.0032
(t-stat)	*(2.48)***	*(2.47)***	*(1.37)*	*(1.27)*
T1CAP_Trans			-0.0008	-0.0007
(t-stat)			*(-0.92)*	*(-0.80)*
Adj. R-squared	0.6686	0.6671	0.6682	0.6662
F-stat	24.41***	21.71***	21.89***	19.86***
No. Observations	158	158	158	158
No. Banks	158	158	158	158

Appendix C1. presents the results from regression model (1) used to test for capital management before the introduction of IFRS 9. The sample consists of panel data covering 115 banks years 2013-2017. *LLP* is the ratio of loan loss provisions to opening balance total assets. *T1CAP* is the ratio of opening balance Tier 1 capital to the minimum requirement. *EBTP* is the ratio of earnings before taxes and loan loss provisions to opening balance total assets. *TA* is the natural logarithm of total assets. *NPL* is the ratio of non-performing loans to total assets. *ΔNPL* is the change in non-performing loans deflated by opening balance total assets. *ΔTA* is the change in total assets deflated by opening balance total assets. *ΔGDP* is the change in nominal GDP. *ΔUNEMP* is the change in unemployment rate. *ΔHPI* is the change in the house price index. The notation *, ** and *** represents significance at the 0.10-, 0.05- and 0.01-levels respectively.

Appendix C2. presents the results from regression models (2)-(4) used to investigate capital management at the transition to IFRS 9. The data is cross-sectional at the date of the transition to IFRS 9 and consists of a sample of 174 banks. In addition, regression (5) presents an additional test including both interaction variables from regressions (3) and (4). *IFRS9* is the increase in the LLP reserve from adopting IFRS 9 deflated by total assets. *T1CAP* is the ratio of 2017 Tier 1 capital to the minimum requirement. *TA* is the natural logarithm of total assets. *NPL* is non-performing loans deflated by total assets. *GL* is the ratio of total loans to total assets. *LLP* is the loan loss provisions expense deflated by total assets. *RWA* is a dummy variable equal to 1 when banks have an LLP reserve < 1.25% of risk-weighted assets. *Trans* is a dummy variable equal to 1 when banks have adopted IFRS 9 Transitional Arrangements. *T1CAP_RWA*, is the interaction variable between T1CAP and RWA, included in regression model (3). *T1CAP_Trans*, the interaction between T1CAP and Trans is included in regression model (4). Both interaction variables are included in regression (5). The notation *, ** and *** represents significance at the 0.10, 0.05 and 0.01-levels respectively.

Appendix D.

Regressions (2)-(5) with Total capital as the measure of regulatory capital

Dependent variable: IFRS9	(2)	(3)	(4)	(5)
Intercept	-0.0017	-0.0005	-0.0066	-0.0072
(t-stat)	*(-0.38)*	*-(0.12)*	*(-1.12)*	*(-1.06)*
TOTCAP	0.0000	-0.0006	0.0015	0.0018
(t-stat)	*(-0.01)*	*(-0.66)*	*(2.15)***	*(1.57)*
TA	-0.0001	-0.0001	-0.0001	-0.0001
(t-stat)	*(-0.47)*	*(-0.47)*	*(-0.23)*	*(-0.21)*
NPL	0.0284	0.0275	0.0265	0.0265
(t-stat)	*(4.09)****	*(3.97)****	*(3.75)****	*(3.19)****
GL	0.0055	0.0059	0.0067	0.0067
(t-stat)	*(1.60)*	*(1.64)*	*(1.77)**	*(1.76)**
LLP	0.1816	0.1812	0.1809	0.1810
(t-stat)	*(1.26)*	*(1.26)*	*(1.27)*	*(1.27)*
RWA	-0.0022	-0.0062	-0.0024	-0.0015
(t-stat)	*(-1.67)**	*(-1.68)**	*(-1.79)**	*(-0.43)*
TOTCAP_RWA		0.0016		-0.0004
(t-stat)		*(1.44)*		*(-0.37)*
Trans	0.0020	0.0020	0.0095	0.0100
(t-stat)	*(1.62)**	*(1.58)*	*(2.25)***	*(2.10)***
TOTCAP_Trans			-0.0033	-0.0035
(t-stat)			*(-1.94)**	*(-1.87)**
Adj. R-squared	0.3812	0.3798	0.3871	0.3835
F-stat	14.13***	12.85***	12.73***	11.74***
No. Observations	174	174	174	174
No. Banks	174	174	174	174

Appendix D. presents the results from regression models (2)-(4) used to investigate capital management at the transition to IFRS 9. The data is cross-sectional at the date of the transition to IFRS 9 and consists of a sample of 174 banks. In addition, regression (5) presents an additional test including both interaction variables from regressions (3) and (4). *IFRS9* is the increase in the LLP reserve from adopting IFRS 9 deflated by total assets. *TOTCAP* is the ratio of 2017 Total capital to the minimum requirement (8% under Basel III). *TA* is the natural logarithm of total assets. *NPL* is non-performing loans deflated by total assets. *GL* is the ratio of total loans to total assets. *LLP* is the loan loss provisions expense deflated by total assets. *RWA* is a dummy variable equal to 1 when banks have an LLP reserve < 1.25% of risk-weighted assets. *Trans* is a dummy variable equal to 1 when banks have adopted IFRS 9 Transitional Arrangements. *T1CAP_RWA*, is the interaction variable between T1CAP and RWA, included in regression model (3). *T1CAP_Trans*, the interaction between T1CAP and Trans is included in regression model (4). Both interaction variables are included in regression (5). The notation *, ** and *** represents significance at the 0.10, 0.05 and 0.01-levels respectively.

Appendix E.

Durbin-Wu-Hausman test for endogeneity is performed on the panel data sample used to investigate H4 and the cross-sectional sample used to investigate H1-H3

Durbin-Wu-Hausman Test – Model (1)				
	Coefficients			
	fe	re	Diff.	S.E.
T1CAP	*-0.0030*	*-0.0016*	*-0.0013*	*0.0004*
EBTP	*0.0919*	*0.1353*	*-0.0434*	*0.0105*
TA	*-0.0010*	*-0.0005*	*-0.0005*	*0.0002*
NPL	*0.0391*	*0.0607*	*-0.0216*	*0.0055*
ΔNPL	*0.0215*	*0.0064*	*0.0151*	*0.0014*
ΔTA	*0.0000*	*-0.0029*	*0.0029*	.
ΔGDP	*-0.0218*	*-0.0564*	*0.0346*	*0.0155*
ΔUNEMP	*-0.1704*	*-0.1340*	*-0.0365*	*0.0536*
ΔHPI	*-0.0458*	*-0.0147*	*-0.0312*	*0.0162*
	Test Stat.	54.4900		
	p-value	0.0000		

Durbin-Wu-Hausman Test – Model (2)				
	Coefficients			
	fe	re	Diff.	S.E.
T1CAP	0.0004	0.0004	0.0000	0.0005
TA	-0.0002	-0.0001	-0.0001	0.0003
NPL	0.0216	0.0284	-0.0068	0.0112
GL	0.0060	0.0060	0.0001	0.0033
LLP	0.1757	0.1816	-0.0059	0.0128
RWA	-0.0035	-0.0023	-0.0012	0.0014
Trans	0.0028	0.0021	0.0007	0.0011
	Test Stat.	*2.20*		
	p-value	*0.9477*		

Appendix F.

F-test for time fixed-effects to be included in regression (1) testing H4 on panel data

F-test	
(1) 2014.Year = 0	
(2) 2015.Year = 0	
(3) 2015.Year = 0	
(4) 2016.Year = 0	
Test Stat.	*2.2000*
p-value	*0.0734*

Multicolinearity	(1)	
	VIF	Tolerance
T1CAP	1.84	0.5446
EBTP	1.88	0.5322
TA	2.39	0.4180
NPL	3.52	0.2840
ΔNPL	1.33	0.7504
ΔTA	1.48	0.6752
ΔGDP	1.53	0.6538
ΔUNEMP	3.95	0.2532
ΔHPI	7.23	0.1384

Appendix G.

Variance Inflation Factors (VIF) and tolerance levels for regression models (1)-(5)

Multicolinearity	(2)		(3)		(4)		(5)	
	VIF	Tolerance	VIF	Tolerance	VIF	Tolerance	VIF	Tolerance
T1CAP	1.16	0.8629	1.77	0.5655	1.94	0.5161	4.18	0.2391
TA	1.09	0.9154	1.10	0.9128	1.12	0.8957	1.14	0.8738
NPL	1.30	0.7688	1.31	0.7629	1.31	0.7647	1.31	0.7622
GL	1.23	0.8141	1.24	0.8050	1.29	0.7752	1.29	0.7750
LLP	1.08	0.9293	1.08	0.9290	1.08	0.9284	1.08	0.9268
RWA	1.30	0.7712	15.40	0.0649	1.31	0.7645	20.67	0.0484
T1_RWA			16.34	0.0612			23.13	0.0432
Trans	1.31	0.7661	1.31	0.7656	18.16	0.0551	25.36	0.0394
T1_Trans					16.98	0.0589	24.05	0.0416

Appendix H.

Breusch-Pagan test for heteroscedasticity for regression models (1)-(5)

Model	(1)		(2)		(3)	
Breuch-Pagan Test	Test stat.	p-value	Test stat.	p-value	Test stat.	p-value
	2385.0300	0.0000	547.0700	0.0000	543.7300	0.0000
Model	**(4)**		**(5)**			
Breuch-Pagan Test	Test stat.	p-value	Test stat.	p-value		
	515.5700	0.0000	513.7200	0.0000		

Appendix I.

Wooldridge test for serial correlation in panel data

Wooldridge test for Autocorrelation in Panel Data	
H0: no first-order autocorrelation	
F(1 , 83)	*32.4050*
p-value	*0.0000*