Assessing the Implications of IFRS 9 on Financial Stability using Bank Stress Tests

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Abstract

IFRS 9 substantially affected the financial sector by profoundly changing the impairment methodology for credit losses. This paper analyzes the implications of the change from IAS 39 to IFRS 9 in the context of financial stability. In doing so, we shed light on two effects. First, the "cliff-effect", which refers to sudden increases in impairments. It occurred under IAS 39, as credit losses were only recognized once they occurred. As a result, impairments often came late and abruptly. IFRS 9 was designed to mitigate this issue by applying a staging approach, which gradually recognizes losses over the lifetime of the loan. This benefit, however, comes at the cost of "front-loading" impairments, which is the second effect we investigate. The earlier recognition of losses may adversely impact bank resilience by lowering capital levels. It remains to be seen, whether the conjunction of both effects constitutes a net benefit for the financial sector. We empirically investigate this question using the European bank stress test from 2014 to 2018. It is a natural experiment, in which all banks are subject to the same regulations and exogenous shocks. This characteristic allows us to control for otherwise immeasurable effects and to reveal the true implications of the ECL model in light of the "cliff-effect" as well as the "front-loading" effect. Furthermore, the calculation of a baseline and an adverse scenario allows us to investigate the vigorousness of procyclicality under IFRS 9 compared to IAS 39.

JEL Classification: E58, G21, G28
Keywords: Bank Stress Test, CET1, Financial Stability, IAS 39, Impairments, IFRS 9

1 Introduction

In retrospect of the subprime crisis fundamental flaws in the incurred loss accounting of IAS 39 became evident (Schmidt et al. (2015); Gebhardt (2016); Hashim et al. (2016)). Particularly criticized for its late and incomplete recognition of impairments ("too little, too late"), regulators around the globe have pushed for a new standard (G20 (2009); Hoogervorst (2014); BCBS (2015b)). Responding to this criticism, the IASB urged a comprehensive revision of the accounting standard for financial instruments, resulting in the release of IFRS 9 (BCBS (2015a)). It constitutes a paradigm shift in the calculation of impairments for financial institutions by recognizing deteriorating credit quality in an expected credit loss (ECL) instead of incurred loss model. Where losses were previously only realized when they had occurred, IFRS 9 introduced a forward looking staging model, which gradually realizes them over the lifetime of the loan (IFRS 9.5.5.). This adjustment is intended to lessen the severity of sudden jumps in losses ("cliff-effect"), whose alleviation furthermore reduces procyclicality. In line with the FSF (2008) we understand procyclical effects as mutually reinforcing feedback mechanisms, which amplify the severity of financial turmoil. However, one consequence of the earlier recognition of impairments is a significant "front-loading" of credit losses. It is expected to reduce the earnings banks can retain. Because retained earnings are a key component of Common Equity Tier 1 (CET1), banks' equity base is similarly expected to decrease. An impact study by the European Banking Authority (EBA) estimated an additional need for capital of approximately 45 basis points of CET1 on average (EBA (2017)). Another issue was raised by Abad and Suarez (2017), who analyze a portfolio of European corporate loans. They find that the impact of IFRS 9 will be most pronounced during an economic downturn, questioning the idea of reducing procyclicality.

While these findings may seem negligible at first, they raise the question whether the advantages or disadvantages of IFRS 9 will prevail. Furthermore, they entail profound consequences for the assessment of bank stability as CET1 is a viable indicator of bank resilience. Should IFRS 9 reduce CET1, this decline would suggest deteriorating bank stability. However, this observation would only be due to a change in the accounting system, which should not influence bank resilience all else being equal. In light of this conflict we look at bank stress test results to investigate how the introduction of IFRS 9 influences financial stability. The stress test results provide a first and unique opportunity to investigate this research question. Moreover, they are beneficial for our identification strategy for three reasons in particular. First, they provide two macroeconomic scenarios, which allows us to assess the severity of the methodological changes. Comparing both scenarios further allows us to infer on the theorized reduction of procyclicality. Second, the assumptions of a static balance sheet and model stock isolate the effect we want to measure. Third, they provide sufficiently granular data to address our research question in detail. In doing so, we set ourselves apart from Abad and Suarez (2017) who can only analyze a portfolio of European corporate loans in a model-based setting.

Our approach to the problem necessitates the unification of two strands of literature: financial accounting in the context of capital adequacy and stress testing. Notable contributions are made by Oros (2015) and Novotny-Farkas (2016), who investigate the interaction between the novel impairment model and capital requirements under Basel III. Despite a manifold growth of the literature on stress testing, it is yet to discuss the intersection this paper identifies. Two major branches of the literature on stress testing can be discussed. One concerns stress testing as an essential part of the Basel framework (Foglia (2009)) and discusses the development of alternative approaches (Hanson et al. (2011); Acharya et al. (2014); Schuermann (2014)) or methodological improvements (Borio et al. (2012)). Another branch empirically assesses the impact of stress tests on banks as measured by equity or CDS spreads (Flannery et al. (2015); Ahnert et al. (2018)).

Despite valuable contributions from the literature, our research question remains unanswered at large. Given the implications of financial stability for the economy it seems appropriate to fill this research gap. Our study contributes to doing so by deepening the general understanding of the impairment requirements of IAS 39 and its successor IFRS 9. In doing so, the paper clarifies the main changes between both standards before transitioning to a discussion of how those changes affect the EBA stress test. Second, we contribute to evaluating the impact of IFRS 9 on banks and bank stress test results. By building on an in-depth analysis of the EBA stress test exercises from 2014 to 2018, we provide new insights on the severity of the "cliff-effect" in conjunction with "front-loading". Our findings help understand the interrelations between accounting and stress testing, and provide valuable insights to critically assess possible deviations in the reporting of bank resilience. Furthermore, we shed light on the envisaged reduction of procyclicality and contribute to the discussion of regulatory buffers against them, as called for under Pillar 1 of Basel III.

The remainder of the paper is structured as follows. Section 2 provides an overview of the conceptual differences between IAS 39 and IFRS 9, and disentangles their interrelation with regulatory stress testing as conducted by the EBA. In line with it we devise hypotheses concerning the effects of IFRS 9 and elaborate on the intended tests in Section 3. We present the analyzed dataset in Section 4 and show the results in the following fifth section. Section 6 verifies our results by means of robustness tests. We conclude this paper in Section 7 and give an outlook on future research.

2 Theoretical Background

2.1 Differences between IAS 39 and IFRS 9

The former IAS 39 impairment model only permitted the recognition of incurred losses as of the balance sheet date. Accordingly, impairment losses were incurred if there was objective evidence of an impairment as a result of a past event that succeeded the initial recognition of an asset (a "loss event") (IAS 39.58 f.). This thinking delayed the recognition of so called "day-1-losses", that is losses, which occurred immediately after origination, yet were only realized as of the balance sheet date (IAS 39.AG92, IAS 39.E.4.2).

The latest financial crisis, however, drew attention to this undue timely discrepancy between the loss event and its recognition (Schmidt et al. (2015); Gebhardt (2016); Hashim et al. (2016)). Moreover, the backward-looking nature of the impairment model was criticized for potentially aggravating the crisis situation (Marton and Runesson (2017)). Amongst others, the G20 raised concerns that loan loss provisioning of credit losses under the incurred loss method of IAS 39 was achieving "too little, too late" (G20 (2009); Hoogervorst (2014); BCBS (2015b)). The inherent risks of the underlying assets were not appropriately reflected (ESRB (2017)). Responding to this criticism, the IASB urged a comprehensive revision of the accounting standard for financial instruments, resulting in the release of IFRS 9 (BCBS (2015a)).

With the new impairment methodology of IFRS 9 the IASB introduced a forward looking expected credit loss model (IFRS 9.5.5.), requiring a more timely recognition of impairments (Landini et al. (2018)). This change was supposed to counteract the weakness of delayed credit loss recognition under IAS 39 (IFRS 9.BC.IN.2). As a consequence, the requirement of an incurred loss event as a trigger for the recognition of credit losses was removed (Gebhardt (2016); Novotny-Farkas (2016)). Rather, IFRS 9 is predicated on an immediate recognition of ECL directly from a financial instrument's initial recognition (IFRS 9.5.5). ECL are defined as probability-weighted estimates of credit losses (i.e., the present value of cash shortfalls) (IFRS 9.5.5.17). They are calculated as the present value of the difference between all contractual cash flows that are due to an entity in accordance with the contractual terms of a financial instrument and all the cash flows that the entity expects to receive (i.e., all cash shortfalls), discounted at the original effective interest rate (IFRS 9 Appendix A; IFRS 9.B5.5.28-29; Hashim et al. (2016)).

Estimations of ECL shall consider all relevant information, including historical data, current conditions as well as supportable forecasts of future events and macroeconomic conditions (IFRS 9.5.5.17). Thus, IFRS 9 significantly extends the information set required to determine credit losses. The scope of the IFRS 9 impairment model includes financial assets measured at amortized cost (FVAC) or fair value through other comprehensive income (FVOCI). Moreover the ECL model is applied to lease receivables, trade receivables or contract assets as well as all loan commitments and financial guarantee contracts that are not measured at fair value through profit or loss (FVPL) (IFRS 9, 4.1.2, 4.1.2a, 5.5.1, 5.5.2, BC5.118).

A key element of the IFRS 9 impairment model is the so-called three stages approach, which categorizes financial instruments according to their credit quality (i.e. 'Stage 1', 'Stage 2' and 'Stage 3'). It lessens the severity of the "cliff-effect" by gradually recognizing losses over the lifetime of the loan and thus reduces procyclical effects. The assignment to the stages depends on the change in credit risk since initial recognition (IASB (2013, 2014b)), and prescribes which methodology is to be applied for calculating the ECL.

Stage 1 includes financial assets, that were not subject to a significant increase in credit risk since initial recognition or exhibit a low credit risk as of the reporting date (IFRS 9.5.5.5). Their loss allowance is recognized as the 12-month ECL, which is defined as the share of the lifetime expected credit losses resulting from default events which are possible within 12 months after the reporting date (IFRS 9 Appendix A). Interest revenue is calculated based on the gross carrying amount of the asset, that is without deduction of the loss allowance (IFRS 9.B5.5.43).

Stage 2 includes financial assets which exhibit a significant increase in credit risk since initial recognition. In this stage, the lifetime ECL has to be recognized (IASB (2014a); IFRS 9.5.5.3-4). It is defined as the expected credit loss that results from all possible default events over the expected life of the financial instrument (IFRS 9 Appendix A). The calculation of interest revenue remains the same as for Stage 1 (IASB (2014b); IFRS 9.5.5.3-4). At each reporting date, the reporting entities are required to evaluate whether a potentially significant increase in credit risk has occurred (IFRS 9.5.5.9). Beside the "rebuttable presumption that the credit risk on a financial asset has increased significantly since initial recognition when contractual payments are more than 30 days past due" (IFRS 9.5.5.11), the IASB provides a list of information that may be used for the assessment of a significant credit risk deterioration (IFRS 9.B5.5.17). In addition to that, the standard setter grants a "low credit risk exemption", which excludes financial assets from the continuous credit-risk assessment and allows them to remain in Stage 1, as long as they exhibit a low credit risk (IFRS 9.5.5.10). An investment grade rating by a major rating agency may serve as such an indicator (IFRS 9.B5.5.22 ff.; IFRS 9.BC5.188 f.).

In case of a further increase in credit risk up to the status of non-performing or credit-impaired assets, the respective financial instrument must be allocated to Stage 3 (IASB (2014a)). The criteria for a financial asset to be considered as such are listed in Appendix A of IFRS 9, and largely match the objective evidences of a loss event according to the former IAS 39.59. As in Stage 2 loan loss allowances cover the lifetime ECL. Interest revenue is calculated based on the net carrying amount of the asset, which is the gross carrying amount less loan loss allowance (IFRS 9.5.4.1). ECL recognized in Stage 3 will likely be larger compared to Stage 2, reflecting the default position of the underlying assets. Table (1) provides a short overview over key implications of the three stages. A more detailed description can be found in Hartmann-Wendels et al. (2019).

	Stage 1	**Stage 2**	**Stage 3**
Classification	performing	under-performing	non-performing
Expected Loss	12 months	lifetime	lifetime
Interest Rate Calculation	gross book value	gross book value	net book value

Table 1: Stages according to IFRS 9.

This new impairment model appears to be a major concern for the banking industry as the initial set-up costs as well as the adjustments to loss allowances are expected to increase compared to the former IAS 39 model. Since they are recognized through the P&L of the reporting entity (IFRS 9.5.5.8) banks' ability to retain earnings is impeded (Deloitte (2013); Reitgruber et al. (2015); EBA (2016)). This interrelation negatively influences regulatory capital levels in banks (Hashim et al. (2015); Gebhardt (2016); Novotny-Farkas (2016)). Empirical evidence suggests that banks may counteract this pressure by asset sales, intending to strengthen capital levels (Abad and Suarez (2017); ESRB (2017); Sánchez Serrano (2018)). However, doing so during a crisis would further depress asset prices and thus exacerbate the economic downturn. While the ECL model does mitigate procyclicality from the "cliff-effect", it does not full resolve the issue. The transfer from Stage 1 to Stage 2 and the associated transition from the 12 month to the lifetime ECL still constitute an abrupt increase in loan loss allowances (Hashim et al. (2016); EBA (2016); Novotny-Farkas (2016)). In conjunction with the threat of downwards spirals in asset prices it necessitates the presence of countercyclical capital buffers as required under Pillar 1 of Basel III (EBA (2017); ESRB (2017)). Namely, the capital conservation buffer (CCB), and countercyclical capital buffer (CCyB) are intended to provide a backstop against this cascade.

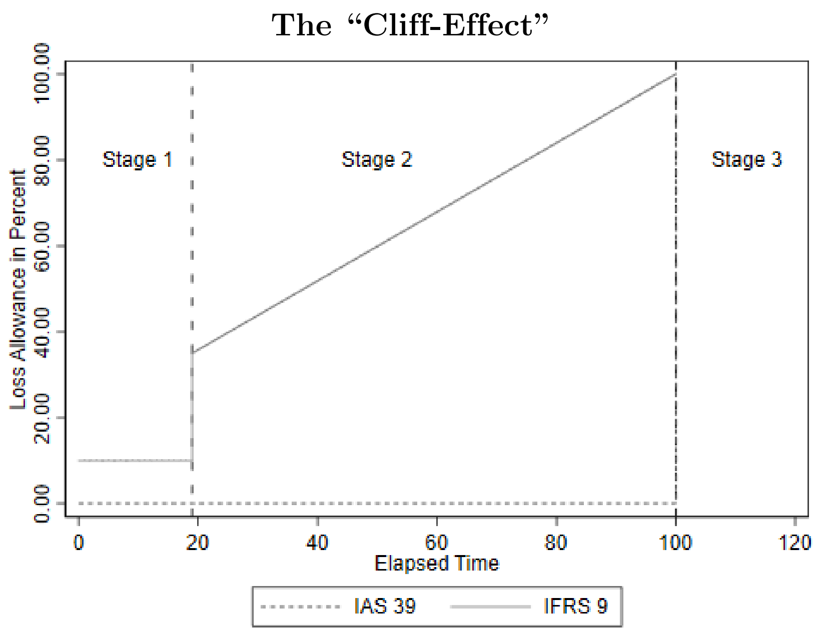

Figure 1: Illustration of the "cliff-effect" in conjunction with "front-loading".

While the discussed “too little, too late” (G20 (2009); Hoogervorst (2014); BCBS (2015b)) problematic of IAS 39 has been addressed by the expected loss model, not all issues of IAS 39 have been fully resolved. Another short-coming that was identified concerns the critique that the back-looking approach may have amplified the subprime crisis (Schmidt et al. (2015); Gebhardt (2016); Hashim et al. (2016)). Thus, it is worth mentioning, that the IASB relies on point in time (PIT) estimates for the probability of default (PD) (PwC (2014); IFRS 9 BC 5.282). Unlike the through the cycle (TTC) estimates of the internal ratings based approach (IRB) under Basel III (CRR (2013)), the PIT approach only considers one instead of multiple points in time. Hence, it fails to neutralize cyclical amplifications. In times of crisis, this point may be inflated, whereas the opposite may be true during economic expansion. As a result, this characteristic has the potential to act procyclical, which is especially problematic as the PD influences the assignment to the three stages of IFRS 9 (Novotny-Farkas (2016); Vaněk et al. (2017)). Figure (2) illustrates the differences between the two approaches and raises the question whether IFRS 9 has gone far enough to solve the procyclical effects of IAS 39.

Estimation Methodologies

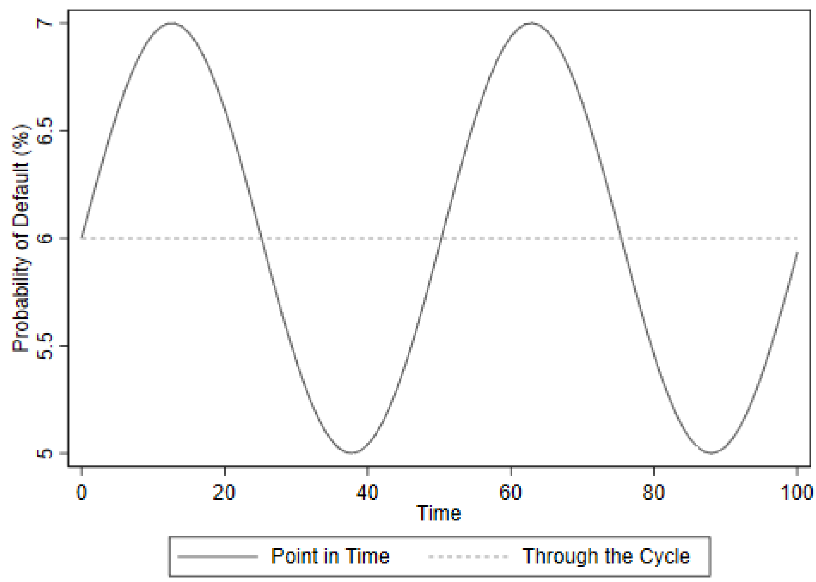

Figure 2: Illustration of the differences between through the cycle (TTC) and point in time (PIT) estimation.

Taken together, IFRS 9 has reduced the "cliff-effect" by introducing a forward looking staging model. Doing so has reduced jumps in impairments, which may have procyclically enforced economic downturns. However, it may not have gone far enough in addressing the issue of procyclicality, as IFRS 9 still employs PIT instead of TTC estimators. One way of addressing this issue is through designated capital buffers. Namely, the capital conservation buffer (CCB) and countercyclical buffer (CCyB) were designed with this intent. They amount to up to 2.5 % of the bank's RWA. Special attention should be drawn to the CCyB, whose required subscribed capital is at the discretion of national competence authorities. Out of 28 reporting countries, only four enforce requirements above 0.0 % (BIS (2018); ESRB (2019)). Their adequacy in times of crises may thus be critically questioned. Another benefit of IFRS 9 concerns the more timely recognition of losses due to the ECL model. Theses advantages though came at the cost of "front-loading" credit losses. Section 3 will shed further lights on these effects and empirically assess, whether the net benefit of IFRS 9 is positive.

2.2 Introduction to Stress Testing

Stress tests are forward-looking assessments of a banks' capitalization (i.e. microprudential stress test) or the stability of the financial system as a whole (i.e. macroprudential stress test) under simulated adverse economic conditions (Hanson et al. (2011); Borio et al. (2012); Acharya et al. (2014); KPMG (2016); Ahnert et al. (2018); Riebl and Gutierrez (2018)). One of their major objectives is to assert bank solvency (Acharya et al. (2014); Schuermann (2014)), after the financial crisis had revealed severe (qualitative and quantitative) shortcomings in this regard (Ahnert et al. (2018)). Moreover, they facilitate supervisors to assess, whether banks comply with their regulatory capital requirements and are one tool, which European supervisors employ as part of the second pillar Supervisory Review and Evaluation Process (SREP) (BIS (2006); Paisley (2017); Ahnert et al. (2018); Riebl and Gutierrez (2018)). Additionally, regulators can test key risks such as credit, market, and liquidity risks under predefined stress scenarios to identify potential needs for capital of individual banks or to assess systemic risks, which may compromise the financial systems' stability (Ahnert et al. (2018)). Ultimately, the final disclosure of regulatory stress testing intents to improve market discipline of financial institutions and alongside increases transparency to the market (de la Lastra and Ramón (2012); Acharya et al. (2014); EBA (2018b,a)).

The first European regulatory stress test exercises were launched in 2009 and 2010 by the Committee of European Banking Supervisors (CEBS). From 2011 onwards, its successor, the EBA, conducted further exercises in the year 2011, and biennially from 2014 forth. Initially, the EBA's stress tests of 2011 and 2014 included capital hurdle rates to assess a bank's passing or failing of the test to consider further recapitalization actions in case of a failure (Riebl and Gutierrez (2018)). In the 2016 exercise, this "pass or fail threshold" was abolished. Instead, the results henceforth served as an input to the SREP (EBA (2018a,b); Riebl and Gutierrez (2018)). The effects of the stress test scenarios on banks' capital are reported in terms of the capital ratios required by Basel III (Acharya et al. (2014); EBA (2018b)). One focal item is CET1 capital, which lies at the intersection of financial accounting which this paper discusses.

Overall, the stress test coordinated by the EBA is a comprehensive exercise undertaken in close cooperation with national and EU authorities to assess the resilience of EU banks to severe market developments (de la Lastra and Ramón (2012); EBA (2018a,b); ESRB (2018)). It is conducted as a constrained bottom-up exercise at the highest level of consolidation (i.e. group level) to assess the resilience of the largest EU banks to a (simulated) common macroeconomic baseline as well as adverse scenario over a period of three years. Unlike the stress tests of the Federal Reserve, there is no severely adverse scenario. The EBA is responsible for the development of a common methodology, which all banks have to adhere. Furthermore, it collects the final data and disseminates it to the public to foster transparency. In devising the methodology, it is aided by the Directorate General for Economic and Financial Affairs of the European Commission, which provides the baseline scenario, respectively the European Systemic Risk Board (ESRB), which is responsible for developing the adverse macroeconomic scenarios (EBA (2018b)). The scenarios for Norwegian banks are developed by the local central bank (Norges Bank) in conjunction with the Financial Supervisory Authority of Norway (Finanstilsynet).

In November 2017 the EBA published its final methodology for the current 2018 stress test, which was launched in conjunction with the release of the macroeconomic scenarios on 31^{st} January 2018. As in previous iterations, the bottom-up exercise is subject to strict constraints. The methodological note specifies to conduct the stress test on a static balance sheet. This simplifying assumption mandates a replacement of assets and liabilities that mature during the exercises' time horizon "with similar financial instruments in terms of type, currency, credit quality at date of maturity, and original maturity as at the start of the exercise". In relation to the static balance sheet assumption, the EBA stress test interdicts the incorporation of anticipated capital increases by means of raises or conversions (EBA (2018a,b)). Doing so constitutes a noteworthy difference compared to other stress tests, as for example from the Bank of England, which allows capital actions (BOE (2016)). In order to gain a higher degree of transparency and comparability among banks, it is moreover assumed that participating banks maintain the same business mix and model throughout the time horizon (Riebl and Gutierrez (2018)). Ultimately, banks are subject to a model stock and can only use the internal models they have devised at the beginning of the simulation.

For the estimation of the capital and P&L impact, the credit risk stress testing framework covers only amortized cost positions and explicitly excludes FVOCI and FVPL positions from the estimation of credit risk losses (Riebl and Gutierrez (2018); EBA (2018a)). Especially the new impairment model of IFRS 9 implicated profound adjustments to the stress test credit risk methodology. These adjustments, which partly diverge from IFRS 9 requirements, largely concern the single scenario assumption and perfect foresight as well as the stage definitions and transfer specifications.

Under the single scenario assumption, the EBA requires banks to assume one scenario for the ECL calculation (i.e. the baseline and the adverse macroeconomic scenario), instead of multiple probability-weighted cases (IFRS 9.5.5.17 (a)). The perfect foresight approach limits asset migration between the three stages of IFRS 9. In line with it, banks assume to know the precise development of the macroeconomic scenarios when calculating the lifetime ECL. Thus, the ECL of initial Stage 2 and Stage 3 exposures at inception does not change over the course of the simulation. Moreover, it implies that all loan loss provisions for Stage 2 and Stage 3 exposures are accrued in 2018. Provisions in the following years will only be due to stage migration. While the bidirectional transfer between Stages 1 and 2 is allowed, cures from Stage 3 are prohibited (EBA (2018a)). As under IFRS 9.5.5.5, financial instruments whose credit risk has not increased significantly since initial recognition are allocated to Stage 1. In line with IFRS 9, the criterion of a significant increase in credit risk (SICR) serves as a transfer criterion to Stage 2. The methodological note clarifies that the same classification criteria may be used as under the IFRS 9 model. Furthermore, the EBA defined an additional SICR-trigger which transfers exposures with a threefold increase over their initial lifetime PD to Stage 2. The low-credit risk exemption may be applied, however, the EBA specification diverges from IFRS 9 requirements as the threshold is independent of a credit-rating but instead defined as a PD of less than 0.3 %. Finally, exposures are allocated to Stage 3, if their credit quality decreases further to the point that it is either considered to be credit-impaired as defined under IFRS 9, defaulted as per Article 178 of the CRR or classified as non-performing as per EBA Implementing Technical Standard. Banks are permitted to apply their own internal accounting practices and definitions as long as they yield more conservative results (EBA (2018a); Riebl and Gutierrez (2018)).

3 Hypotheses and Evaluation Methodology

The previous chapter has covered the theoretical background of the two accounting standards extensively and clearly identified their differences. The introduction of gradual loss recognition under the three stages model of IFRS 9 is expected to reduce the "cliff-effect" at the cost of introducing a "front-loading" of losses. The conjunction of both effects has led us to derive the following hypotheses:

Hypothesis 1 *The gradual recognition of impairments under IFRS 9 should reduce the volatility of impairments (i.e. the "cliff-effect").*

We test this hypothesis by comparing the variance of impairments under IAS 39 and IFRS 9. If our hypothesis is correct, we expect variance heterogeneity as the variance under IFRS 9 will be lower than under IAS 39. At the same time, the "front-loading" component should reduce the potential of banks to retain earnings. Hence, their capital base as measured by CET1, cannot be strengthened by retained earnings. We thus posit:

Hypothesis 2 *The "front-loading" effect impedes banks' ability to increase capital levels by means of retaining capital.*

Furthermore, we want to investigate how the introduction of IFRS 9 has influenced the dynamics between impairments and CET1. We hypothesize, that the impact of impairments on CET1 capital should decrease due to the gradual recognition of losses.

Hypothesis 3 *The introduction of the IFRS 9 ECL model changes the impact of net impairments on retained earnings and thus CET1 in the baseline and adverse scenario.*

We test this hypothesis by calibrating an explanatory model of the flow in retained earnings as presented in Equation (1). In it, the subscript t denotes the time, whereas i and c denote the bank, respectively country. Since we are interested in explaining the differences of an observed bank over time, a fixed-effects model is appealing from an econometric perspective. Applying the Hausman test deems the usage of such a model appropriate. We thus follow the standard in the literature and proceed with the fixed-effects model. Standard errors are clustered on the bank-level in order to account for heteroskedasticity. We evaluate the equation four different times, for all combinations of IAS 39 and IFRS 9 and the baseline, respectively adverse scenario. We look at the estimated coefficients in order to validate our hypothesis.

$$\Delta RET_{it} = \alpha + \beta_1 RWA_{it} + \beta_2 NII_{it} + \beta_3 NNII_{it} + \beta_4 IMP_{it} + \beta_5 DIV_{it} + \gamma_1 HPI_{ct} + \gamma_2 CPI_{ct} + \gamma_3 UNEMP_{ct} + \gamma_4 GDP_{ct} + \epsilon_{it} \quad (1)$$

We incorporate multiple control variables in our model. The aggregate level of risk-weighted assets (RWA) is used as a proxy for bank size. Our rational is that smaller banks tend to be more exposed to credit risk, whereas larger banks are more susceptible to market risk. Hence, they might respond differently to the stress test scenarios. In order to account for the business model of the respective bank, we included net interest (NII), respectively non interest income (NNII). Banks with high net interest income should earn it from a large credit portfolio, which in turn would make the bank more susceptible for the theorized differences between IAS 39 and IFRS 9. In line with our research question we incorporate impairments (IMP) as a central part of our analysis. Given the impact of IFRS 9, we expect the influence of impairments on CET1 capital to be negative and growing, relative to IAS 39. Furthermore, we incorporate dividend payments (DIV) in our model. The rational is that dividends are paid from the net income, which represents the earnings net of taxes and impairments that might alternatively be allocated to the stock of retained earnings and thus CET1. RWA and NII correlate highly, as depicted in Table (3), and might thus hint at multicollinearity. However, both variables contribute towards explaining the observed dynamics. Discarding either of them might thus constitute an endogeneity problem due to an omitted variable. We thus proceeded with the initial model.

In addition, we include four variables from the macroeconomic scenario depicted by γ. The idea was to account for the different macroeconomic scenarios, as well as structural differences between the heterogeneous countries, in which the assessed banks operate. Furthermore, all of them influence repayment behavior and thus the likeliness of a loan to be classified as impaired. Especially rising unemployment should severely increase the probability of delinquency, respectively default and thus negatively influence CET1. Contrarily, a high level of GDP can be associated with a sound economic environment, in which late payments or the absence of payments occur seldom. As a result, CET1 should be high, when GDP is high. The same relationship can be attested for the House Price Index (HPI). When housing prices are high, default rates should be low, as consumers can easily refinance existing loans by borrowing against the high value of their real estate. The influence of Consumer Price Inflation (CPI) is ambiguous. Given that wages adjust in parallel to inflation, impairment rates should decrease because the debt payments on fixed interest loans become more affordable to the consumer. To the contrary, if wage growth cannot keep up with inflation, people have less available income to allocate to debt service. We thus refrain from making an a priori assumption about the possible influence of CPI. A comprehensive list of the variables can be found in Table (2) in the Appendix.

The proposed methodology benefits from the stress test framework. Under the static balance sheet assumption, exposures are fixed and replaced with comparable assets at maturity. Hence, there is no inference to control for. Likewise, the prohibition of changes to the business model and capital structure exclude immeasurable effects from the model. We control for the different macroeconomic scenarios by incorporating them in our estimation model. Our methodology is thus compliant with Appendix B5.5.17 (f) of IFRS 9, which stipulates, that the transition between the stages of IFRS 9 can be justified by the expectation of negative economic conditions. Moreover, the model stock assumption enables us to compare IFRS 9 models as of their inception, thus depleting the model of further biases. We thus argue that, ceteris paribus, deviations in the results should be attributable to the enactment of IFRS 9.

4 Dataset

Our dataset consists of the stress test results from 2014 to 2018 as provided by the EBA, respectively European Central Bank (ECB). We merge the results to form a joint dataset and obtain a panel of 43 banks for the initially mentioned time frame. The banks represent 15 different countries of which nine are Euro-denominated.

Our sample represents approximately 70 % of all exposures in the eurozone and can thus be considered representative. Two notable mergers occurred during the analyzed time. Banco Santander acquired Banco Popular Español, so that the latter was dropped from our panel. Moreover, Banco Popolare - Società Cooperativa and Banco Popolare di Milano merged. Although information for Banco Popolare are included in all three stress tests, we discontinued the time series, as Banco Popolare di Milano was not subject to previous iterations of the stress test and would thus bias the results. Because of overlapping time frames, we have two observations for the year 2016, which is included in the 2014 and 2016 stress test. After regressing the values on another, we found in untabulated results that the values were equal to a confidence level of 99.9 %. We thus kept the value from the 2014 stress test, in order to keep the time series intact for as long as possible. The dataset also contains information on transitory adjustments that might arise from the new accounting standards or other regulatory influences. We decided to not incorporate them in our model for two reasons. First, only a limited number of banks makes use of them. Second, if they are being used, they are so small that their influence on our results can be neglected.

Information on equity, RWA, and a plurality of performance metrics are provided with sufficient granularity to allow for a meaningful analysis of the changes that can be attributable to the implementation of IFRS 9. Because the stress test is calculated for a baseline and an adverse scenario, we have two observations in the time dimension on the bank-level. We address this issue by conducting our analyses individually for the respective scenarios.

The descriptive statistics for the baseline scenario are tabulated in Table (4), whereas the results for the adverse scenario can be found in Table (5). Both tables have been further disaggregated, with the upper panel showing IAS 39 and the lower panel depicting IFRS 9. We find CET1 and RWA to exhibit the skewness that can be expected ex ante from comparable datasets.

5 Results

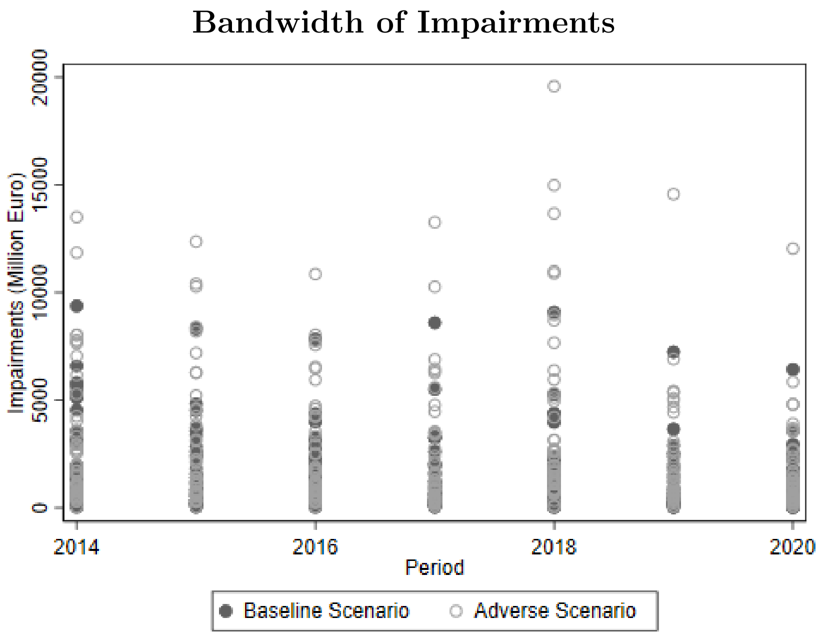

Figure 3: Visualization of impairments over the analyzed time frame.

Figure (3) depicts the bandwidth of impairments over the analyzed stress test horizon. Each dot represents the impairments of one bank under the given scenario and year. It is indicative of our first hypothesis, which posits that the volatility of impairments under IFRS 9 should be lower compared to IAS 39. Although, we see an initial spike with the enacting of IFRS 9 in 2018, the dispersion of impairments declines over the analyzed horizon. This observation would relate to the initial "front-loading" which is then attenuated by the gradual loss recognition under the ECL model. We proceed to empirically test our hypothesis by testing for variance homogeneity with Levene's test. Under our hypothesis, we expect the Null to be rejected, as the volatility of IAS 39 and IFRS 9 differ significantly, and thus constitute heterogeneous variances.

Table (6) about here

The table above shows the differences between the baseline (Panel A) and adverse (Panel B) scenario for all three periods during which IFRS 9 is applicable. Using Levene's test, we calculated a test statistic in column four and computed the probability of the test statistic under variance homogeneity in column five. As can be obtained from the results, the test statistic is always insignificant, so that the Null is rejected. Accordingly, we assume the variances to be statistically different. We find that IFRS 9 exhibits less volatility in the baseline scenario, and becomes even less volatile with increasing time. This observation is in line with our prediction, that the gradual loss recognition lessens the severity of the "cliff-effect". Likewise our expectation of "front-loading" is confirmed for the adverse scenario, which initially shows higher volatility under IFRS 9 compared to IAS 39. However, the longer the analyzed period, the smaller the difference. We thus generate substantiated evidence in favor of our first hypothesis and conclude that the introduction of IFRS 9 has achieved the objective of reducing the volatility of impairments.

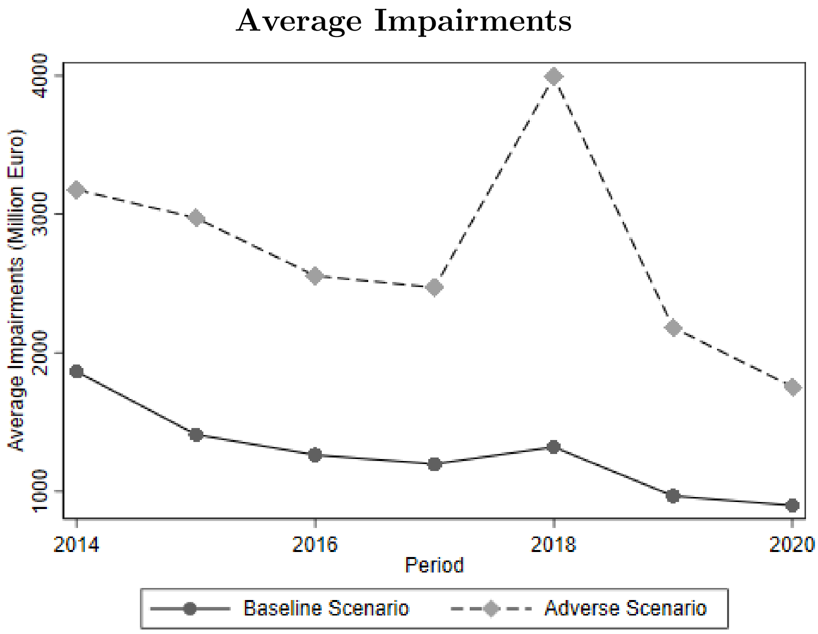

Figure 4: Evolution of the average height of Impairment.

Figure (4) yields graphic evidence of our second hypothesis. It shows that the introduction of IFRS 9 in 2018 has coincided with massive "front-loading" of exposures. While this observation may partially be explained by the perfect foresight approach from the stress test, it also shows that the immediate loss recognition yielded high initial impairments, yet smooths out with increasing time. We proceed to empirically test the severity of this distortion in line with our second hypothesis and depict the results in Table (7).

Table (7) about here

As can be inferred from the table above, the difference of average impairments is statistically significant between IAS 39 and IFRS 9 for both macroeconomic scenarios. For the baseline scenario, we find that banks are able to reverse impairments due to the positive macroeconomic scenario. In this context, IFRS 9 yields even stronger reversals compared to IAS 39. Under the adverse scenario, banks incur impairments. The difference between both accounting standards is extremely large at the beginning, yet declines with increasing time. This finding may be due to the discussed "front-loading" under the perfect foresight approach. In the initial year of the stress tests, all exposures are assigned to the correct stage of IFRS 9, and thus incur the total of their potential lifetime losses if they are in Stage 2 or above. While the initial costs are high, the staging approach of IFRS 9 eases the severity of losses over time.

Table (8) about here

According to our third hypothesis, the results of the regression are shown in Table (8). They are separated by the baseline and adverse scenario as well as the two accounting standards. Our findings regarding impairments are in line with our predictions. When comparing the baseline scenarios, we find that IFRS 9 has become more costly with regards to profitability. This effect can be explained by the theorized "front-loading". At the same time, the impact in the adverse scenario is reduced, which can be seen as evidence in favor of the mitigation of the "cliff-effect".

A surprising finding relates to dividend payments. They negatively influenced the potential to retain earnings under the baseline scenario, whereas the opposite is true for the adverse scenario. This observation contradicts economic theory, as it suggests that the more dividends are paid, the higher will be the contribution to retained earnings. However, only the residual between net income and dividends can be deferred to retained earnings. Our control variables are in line with expectations. Their coefficients appear large compared to the remaining variables as they are not in million Euro denominated, but percentages.

Taken together, we find strong evidence in favor of our first hypothesis. The volatility of impairments has been substantially reduced by IFRS 9 under the baseline scenario. While this relation is initially not true for the adverse scenario, it converges towards the intended goal with increasing time. In sum, the "cliff-effect" was thus weakened at the cost of the theorized "front-loading", which concerns our second hypothesis. We find that "front-loading" impedes banks' ability to retain earnings and is quite significant in the adverse scenario. We furthermore generated evidence that substantiated our third hypothesis. The baseline scenario reduces profitability under IFRS 9, whereas the opposite is true for the adverse scenario. Again, this observation is what would be expected under the posited model, due to the combination of both effects. Our findings are in line with those made by the EBA (2018b). As illustrated in Figure (5) banks are initially profitable in 2017, and then take a substantial hit from realizing expected losses in 2018. This, however, only constitutes "front-loading" of not yet realized losses, as can be inferred from the strong reduction in subsequent impairments until 2020.

Aggregate Impairments and their Impact on Profitability

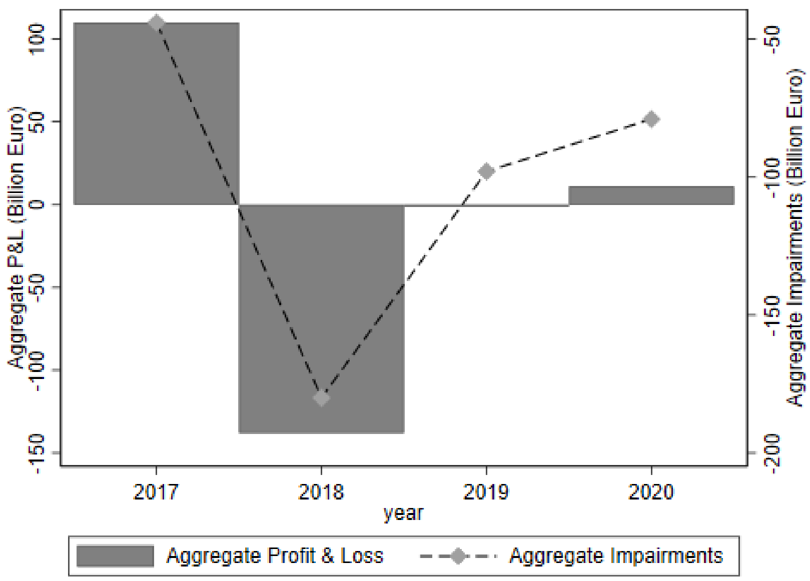

Figure 5: Aggregate Impairments not measured at Fair Value through P&L.

Moreover, we find that the impact of net interest income grows significantly under the adverse scenario of IFRS 9. We relate this increase to the methodology of IFRS 9, which stipulates that exposures in Stage 3 – which should be numerous in the adverse scenario – calculate interest payments differently (EBA (2018b)). While this procedure is identical to defaulted assets under IAS 39, interest recognition was previously ruled out by the methodological note of the stress test. Lastly, the forward looking nature of IFRS 9 has reduced the impact of impairments in the adverse scenario, and renders the initial discussion of TTC estimators obsolete.

6 Robustness

Due to the research setting, it was not feasible to conduct some common robustness checks. We employ subsampling as part of our identification strategy in order to differentiate between the baseline and the adverse scenario. Therefore, a further disaggregation would only lead to inconclusive subsets with no meaningful data. Likewise, the limited sample size has depleted winsorization or truncation of meaning. To the contrary, the volatile observations under macroeconomic stress actually contain significant information for our research question in light of the "cliff-effect".

Another approach of testing the validity of our results stems from a choice that is given to banks with securitization positions. According to Article 36 (1) (k) of the CRR, they can either follow the standard approach discussed before, or they can calculate RWA equivalents of their impairments. This alternative is achieved by assigning a risk-weight of 1,250 % to impairments on selected securitization positions. Consequently, such banks would report a less severe impact on CET1, whereas RWA should grow in excess of what peers report. However, we fail to identify such an effect as banks have dramatically scaled down their securitization portfolios. Where the average outstanding volume at the begin of our sample was 7,657.01 in the baseline, respectively 10,028.15 in the adverse scenario, it has fallen by 67.07 % (67.36 %) to 2,521.64 (3,273.04). This exuberant reduction interferes with the effect we want to measure.

Nevertheless, we challenged the robustness of our model by replacing certain variables with alternative measures. Given the limited number of variables that are consistently reported over all iterations of the stress test, only two viable options stood out. First, we could have substituted the NII and NNII, which serve as proxy for the business model, by using the associated credit and market risk RWA. This approach though raises significant issues in light of multicollinearity with the size proxy, which is the aggregate level of RWA. This limitation left us with our second option, in which we substituted RWA by equity (EQT) as a proxy for bank size. Hence, Equation (1) was modified such that we obtained Equation (2), as depicted below:

$$\begin{aligned}\Delta RET_{it} = \alpha + \beta_1 EQT_{it} + \beta_2 NII_{it} + \beta_3 NNII_{it} + \beta_4 IMP_{it} + \beta_5 DIV_{it} + \\ \gamma_1 HPI_{ct} + \gamma_2 CPI_{ct} + \gamma_3 UNEMP_{ct} + \gamma_4 GDP_{ct} + \epsilon_{it}\end{aligned} \tag{2}$$

While we understand that equity can be a biased measure of size, we found a high correlation with risk-weighted assets, and are thus confident to have found a suitable alternative variable.

Table (9) about here

Table (9) depicts the results of Equation (2). We have substituted RWA with equity and find the results to be consistent with the initial model. Again, a strong amplification of NII can be attested in the adverse scenario of IFRS 9. We thus generate further evidence in favor of our explanation, which relates this observation to the methodological adjustments in Stage 3. The impact of impairments remains highly significant at the 99.9 % confidence level. However, we can no longer observe the intended reduction of volatility as indicated by the coefficient.

7 Conclusion

This paper sets out to investigate the financial stability implications of the new IFRS 9 impairment model. The shift from an incurred to an expected loss model entails profound changes for the banking sector in the calculation and recognition of impairments. Instead of realizing losses only when they occur, a more timely recognition is suggested by calculating expected credit losses. We investigate this impact, using a key component of CET1 capital, retained earnings. We argue that the introduction of the new accounting standard has yielded substantial changes to the calculation of impairments and hence financial stability.

We posited three main hypothesis in connection with the advent of IFRS 9. First, the gradual loss recognition through the ECL model should decrease the volatility of impairments. The "cliff-effect" of the incurred loss model of former IAS 39 represented a major source of procyclicality. It should be mitigated by the gradual loss recognition under IFRS 9, although a dampened version of the "cliff-effect" still persists in the shift from Stage 1 to Stage 2. However, it should be attenuated by the CCB and CCyB capital buffers. Second, initially impairments under IFRS 9 should be higher compared to IAS 39 due to the earlier recognition of impairment under the ECL approach and the resulting "front-loading" effect. Third, the impact impairments on retained earnings and, subsequently, on CET1, should be the strongest at the outset of the crisis. In the further course of the crisis, this impact should decrease.

In order to test our hypotheses, we draw on the empirical data of the latest European banking stress test results. The stress test results allow us to investigate the implications of the new ECL impairment model on bank resilience and financial stability based on the entire loan portfolios of major European banks. The specified stress scenario offers a first and unique opportunity to explore, how the impairment model affects banks' reported results in a crisis situation.

With regards to our first hypothesis, our analysis reveals that the "cliff-effect" of IAS 39 has been weakened under IFRS 9, which indicates the potential of the staging model to enhance financial stability of the banking sector in the future. We proceeded our investigation by assessing whether the reduction of the "cliff-effect" came at the theorized cost of "front-loading". Consistent with our second hypothesis, we find that impairments grow excessively at the beginning of the adverse scenario. However, the gap between the two accounting standards narrows as time progresses. The findings of our third hypothesis confirm the previous results. In comparison to IAS 39, IFRS 9 shows a stronger impact of impairment on retained earnings in the baseline scenario, which can be attributed to the "front-loading" effect of the new ECL model. In the adverse scenario, however, this impact relation reverses, showing a stronger impact under IAS 39, reconfirming our finding of a mitigated "cliff-effect" under IFRS 9.

Although, the results of the paper indicate that the introduction of IFRS 9 has successfully diminished the severity of the "cliff-effect", this goal was achieved at the cost of "front-loading" expected credit losses. While the timelier recognition of expected credit losses under the IFRS 9 approach may have positive effects on financial stability and bank resilience, not all issues of the preceding IAS 39 have been resolved.

The combination of stress test results and accounting requirements opens up a plurality of new research questions. Future research should for example try to assess how the differences between IAS 39 and IFRS 9 manifest under the standard and internal ratings based approach of the Basel accords. Due to data constraints we were unable to address this question. Repeating this study with future stress test results also seems to be an appropriate undertaking, given the relatively small size of our sample.

8 Appendix

Table 2: Used variables and their sources.

Variable	Description	Source
NI	Net Income	Item 993014[1], Item 1690715[2], Item 183615[3]
DIV	Dividends	Item 993017[1], Item 1690717[2], Item 183617[3]
ΔRET	Flow to Retained Earnings	Own Computation: Net Income - Dividend
RWA (Total)	Total Risk-weighted Assets	Item 993107[1], Item 1690607[2], Item 183507[3]
NII	Net Interest Income	Item 993001[1], Item 1690701[2], Item 183601[3]
NNII	Net Non Interest Income	Item 993002[1], Item 1690705[2], Item 183605[3]
IMP	Amortized Impairments	Item 993007[1], Item 1690710[2], Item 183610[3]
HPI	Housing Price Inflation	ESRB[4]
CPI	Consumer Price Inflation	ESRB[4]
UNEMP	Unemployment Rate	ESRB[4]
GDP	Gross Domestic Product	ESRB[4]

Note: (1) as obtained from the 2014 Stress Test Results website. (2) as obtained from the 2016 Stress Test Results website. (3) as obtained from the 2018 Stress Test Results website. (4) as obtained from the macroeconomic scenario diffused by the ESRB.

Table 3: Correlation Matrix of Regessand and Regressor

	ΔRET(EUR)	RWA(EUR)	NII(EUR)	NNII(EUR)	IMP(EUR)	DIV(EUR)	HPI(%)	CPI(%)	UNEMP(%)	GDP(%)	EQT(EUR)
ΔRET (EUR)	1.0000										
RWA (EUR)	0.0691	1.0000									
NII (EUR)	0.2000	0.9218	1.0000								
NNII (EUR)	0.1273	0.0901	0.1214	1.0000							
IMP (EUR)	-0.2713	0.7560	0.7912	-0.0275	1.0000						
DIV (EUR)	0.4575	0.5046	0.5923	0.3096	0.1623	1.0000					
HPI (%)	0.3885	-0.0498	0.0238	0.1376	-0.2549	0.2693	1.0000				
CPI (%)	0.1151	-0.0369	0.0257	0.0839	-0.1316	0.2088	0.5741	1.0000			
UNEMP (%)	0.0421	0.2399	0.3041	-0.0917	0.4344	0.0266	-0.1984	-0.3393	1.0000		
GDP (%)	0.2252	0.0236	0.0670	0.0258	-0.1271	0.2139	0.6971	0.4627	-0.0938	1.0000	
EQT (EUR)	0.1659	0.9527	0.9041	0.2419	0.6506	0.6293	0.0345	0.0716	0.1325	0.0670	1.0000

Note: The table above shows the variables used in in Equations (1) and (2). For the robustness check, we substituted RWA with EQT as an alternative proxy for bank size. The validity of this change is underlined by the high correlation between the two coefficients. Although both size proxies correlate highly with NII, we keep the variable in our model. In doing so we balanced the issue of potential multicollinearity against an omitted variable bias, which would have let to more troublesome endogeneity concerns. The correlations of the macroeconomic variables are in line with expectations. Higher GDP coincides with higher housing prices and less unemployment. The strongest negative relationship could be observed between inflation and unemployment. As theory predicts, higher inflation depresses employment.

Table 4: Descriptive Statistics of the Baseline Scenario.

	Panel A: IAS 39					
	Obs.	*Min.*	$Q_{0.25}$	$Q_{0.50}$	$Q_{0.75}$	*Max.*
ΔRET	172	-3,292.55	122.71	452.12	1,139.27	5,572.93
RWA (Total)	172	12,162.64	54,565.99	101,062.00	342,219.60	1,029,929.00
NII	172	192.11	1.637.42	3.453.88	10.748.06	32.525.96
NNII	172	-13,226.06	-4,203.83	-1,106.41	-72.07	19,233.21
IMP	172	-10,434.67	-1,953.17	-794.40	-282.22	-28.77
DIV	172	0.00	21.12	271.20	846.58	5,253.26
HPI	172	-4.30	1.50	4.00	5.60	8.70
CPI	172	0.30	1.15	1.40	1.70	2.80
UNEMP	172	3.80	5.50	7.40	10.40	25.70
GDP	172	0.20	1.50	1.85	2.40	4.50

	Panel B: IFRS 9					
	Obs.	*Min.*	$Q_{0.25}$	$Q_{0.50}$	$Q_{0.75}$	*Max.*
ΔRET	129	-200.76	125.57	446.50	1,723.86	6,939.81
RWA (Total)	129	11,828.83	51,087.59	101,427.40	312,261.80	763,275.40
NII	129	396.81	1,608.88	3,488.93	9,883.59	36,584.17
NNII	129	23.15	650.67	2,058.60	6,158.46	17,949.45
IMP	129	-126.94	70.42	228.90	1,061.08	5,711.68
DIV	129	0.00	118.55	410.50	1,018.48	5,305.09
HPI	129	-1.60	2.90	3.80	4.80	12.60
CPI	129	0.70	1.40	1.70	2.00	2.90
UNEMP	129	2.90	3.90	5.00	8.80	14.80
GDP	129	1.30	1.60	1.70	2.30	4.30

Note: The table above depicts the descriptive statistics of IAS 39 (Panel A) and IFRS 9 (Panel B) in the baseline scenario. The results show the typical skewness in bank size as measured by income (NII and NNII) and risk (RWA). Risk exposure under IFRS 9 appears lower, however, this observation has to be attributed to a general trend in the banking sector, which has seen banks reduce their appetite for risk significantly over the last years.

Table 5: Descriptive Statistics of the Adverse Scenario.

	Panel A: IAS 39					
	Obs.	*Min.*	$Q_{0.25}$	$Q_{0.50}$	$Q_{0.75}$	*Max.*
ΔRET	172	-10,200.31	-855.13	-213.05	76.93	3,789.72
RWA (Total)	172	13,194.16	60,184.82	107,089.90	366,474.40	1,144,861.00
NII	172	104.80	1,405.90	2,905.12	9,806.20	29,696.25
NNII	172	-14,793.92	-4,530.32	-1,206.17	-74.71	18,174.91
IMP	172	-15,900.88	-3,930.53	-1,562.34	-638.77	-41.82
DIV	172	0.00	0.00	0.00	92.10	2,818.39
HPI	172	-19.20	-9.90	-5.50	-3.50	9.20
CPI	172	-3.90	-0.50	0.35	0.90	2.40
UNEMP	172	4.60	7.20	9.50	11.10	26.80
GDP	172	-4.10	-1.60	-1.10	-0.70	0.90

	Panel B: IFRS 9					
	Obs.	*Min.*	$Q_{0.25}$	$Q_{0.50}$	$Q_{0.75}$	*Max.*
ΔRET	129	-22,906.98	-1,026.36	-218.45	31.45	1,597.28
RWA (Total)	129	12,595.08	53,246.21	108,921.00	327,332.00	906,287.70
NII	129	275.82	1,541.80	3,094.85	9,077.79	34,065.50
NNII	129	-946.48	418.51	1.655.98	3,850.25	13,459.02
IMP	129	-11,615.97	-12.60	72.97	343.46	3,975.26
DIV	129	0.00	0.00	0.00	56.96	4,161.93
HPI	129	-31.10	-11.60	-7.20	-2.40	10.00
CPI	129	-1.80	0.10	0.40	1.10	2.70
UNEMP	129	3.80	6.10	8.10	10.20	15.90
GDP	129	-31.00	-2.20	-1.20	0.00	1.90

Note: The table above shows the descriptive statistics of IAS 39 (Panel A) and IFRS 9 (Panel B) in the adverse scenario. We can reinstate the description from Table (4), with an exception for the macroeconomic variables. As suggested by the scenario name, the aptitude of the minima and maxima has grown. This observations is especially true for the GDP which sees severe declines under the adverse scenario.

Table 6: Comparison of Standard Deviations

Panel A: Baseline

	IAS 39	IFRS 9	Difference	Prob.
2018	1,929.96	1,751.49	0.8015	0.3717
2018 – 2019	1,929.96	1,555.90	3.4738	0.0635
2018 – 2020	1,929.96	1,449.13	7.0906	0.0082

Panel B: Adverse

	IAS 39	IFRS 9	Difference	Prob.
2018	3,178.28	4,436.15	5.7790	0.0171
2018 – 2019	3,178.28	3,746.46	0.6126	0.4345
2018 – 2020	3,178.28	3,356.01	0.2428	0.6226

Note: The table above compares the standard deviations of impairments under the two accounting standards. The first column depicts the length of the analyzed forecasting horizon, relative to IAS 39. Columns two and three show the standard deviations of IAS 39, respectively IFRS 9. We statistically investigate this hypothesis by comparing Levene's test statistic and reporting the confidence level in the four column. Column five shows the probability of computing the value of the test statistic, if the hypothesis of variance homogeneity is true. We find that the variance is different for all instances. The gap widens under the baseline scenario, whereas it narrows under the adverse scenario. This observation is in line with our hypothesis. The gradual recognition of losses under the ECL model lessens the severity of the "cliff-effect", whereas "front-loading" seems to be more dominant in the adverse scenario, and initially superimposes the decline in volatility.

Table 7: Comparison of Average Impairments

	Panel A: Baseline			
	IAS 39	IFRS 9	Difference	Prob.
2018	875.75	1,098.74	222.99	0.3339
2018 – 2019	875.75	1,152.73	276.98	0.1285
2018 – 2020	875.75	1,164.58	288.82	0.0755

	Panel B: Adverse			
	IAS 39	IFRS 9	Difference	Prob.
2018	-512.30	-3,087.57	-2,570.27	0.0000
2018 – 2019	-512.30	-1,617.75	-1,100.48	0.0003
2018 – 2020	-512.30	-1,084.63	-567.33	0.0258

Note: The table above shows the mean absolute value of impairments. We find that the baseline scenario is quite optimistic, as it allows banks to realize reversals on their impairments. Surprisingly, this effect is more pronounced for IFRS 9 than IAS 39. In the adverse scenario, the average bank sustains high levels of impairments. The effect is especially strong for the first year of the horizon, which can be attributed to the discussed "front-loading". However, the longer the assessed period, the less severe the effect. This observation can be related to the gradual loss recognition, which eases the severity of initial losses over time.

Table 8: Comparison of the Accounting Standards with y = ΔRET

	IAS 39		**IFRS 9**	
	Baseline	Adverse	Baseline	Adverse
RWA (Total) (EUR)	-0.0183***	-0.0059	0.0134	0.0713
NII (EUR)	0.3292*	0.4049**	0.5460***	1.9353***
NNII (EUR)	0.0021	-0.0017	0.2516	0.7929***
IMP (EUR)	-0.4470*	-1.0474***	-0.4867***	-0.9618***
DIV (EUR)	-0.1555	0.2425	-0.4854***	1.5364***
HPI (%)	22.7454	15.1839	0.4531	3.2235
CPI (%)	-150.1400	-3.2947	59.0743	-302.6726*
UNEMP (%)	-53.9886	-87.4347	34.4344	-211.2467
GDP (%)	-4.9995	-146.7284	-16.2950	-7.9094
Cluster	Bank	Bank	Bank	Bank
N	172	172	129	129
R^2_{within}	0.5131	0.6156	0.8666	0.9078
$R^2_{between}$	0.4059	0.1810	0.6977	0.5071
$R^2_{overall}$	0.2803	0.2266	0.6940	0.0800

Note: The table above depicts our initial model. We regress the shown variables on the potential of a bank to retain earnings. We control for bank size by RWA and proxy the business model by means of the bank's income streams (NII and NNII). Impairments (IMP) is the variable of interest, whereas dividends (DIV) is a residual in the model. The last four variables control for the macroeconomic scenario of the respective stress tests. They are significantly larger in terms of their coefficients as they are measured in percent, whereas the remaining variables are in million Euro. We find our hypothesis from Section (3) to be confirmed. The influence of NII has grown significantly under the adverse scenario if IFRS 9, which can be explained by the methodological adjustment to exposures in Stage 3. The baseline scenario became more expensive due to "front-loading", whereas the "cliff-effect" in the adverse scenario has been mitigated. Significance is denoted at the 5 %, 1 %, and 0.1 % level.

Table 9: Comparison of the Accounting Standards with y = ΔRET

	IAS 39		IFRS 9	
	Baseline	Adverse	Baseline	Adverse
EQT (EUR)	-0.0154	-0.0068	-0.0179	-0.3030
NII (EUR)	0.2444	0.4115***	0.5609***	1.5908***
NNII (EUR)	0.0166	0.0021	0.3419	0.8217***
IMP (EUR)	-0.7250***	-1.0873***	-0.5550***	-1.1235***
DIV (EUR)	-0.3274	0.2460	-0.5843***	0.5794
HPI (%)	-13.1997	14.9979	-0.5461	-17.1744
CPI (%)	-91.0862	9.1078	57.7681	-1.3833
UNEMP (%)	-72.7793	-71.5608	29.1238	-46.3893
GDP (%)	-86.5708	-114.8350	-30.4630	-5.2463
Cluster	Bank	Bank	Bank	Bank
N	172	172	129	129
R^2_{within}	0.3623	0.6107	0.8595	0.9112
$R^2_{between}$	0.0289	0.2074	0.6944	0.0012
$R^2_{overall}$	0.0003	0.3040	0.6924	0.1958

Note: This table depicts the robustness check conducted for the results of our third hypothesis. The findings made for Table (8) can be reinstated at large. However, the attested impact of impairments (IMP) has faded in this specification. Nevertheless, the influence of net interest income (NII) has grown in light of the discussed methodological changes to Stage 3 exposures. Significance is denoted at the 5 %, 1 %, and 0.1 % level.

References

Abad, J. and Suarez, J. (2017). Assessing the Cyclical Implications of IFRS 9 – A Recursive Model. *ESRB Occasional Paper Series*.

Acharya, V., Engle, R., and Pierret, D. (2014). Testing Macroprudential Stress Tests: The Risk of Regulatory Risk Weights. *Journal of Monetary Economics*, 65:36–53.

Ahnert, L., Vogt, P., Vonhoff, V., and Weigert, F. (2018). The Impact of Regulatory Stress Testing on Bank's Equity and CDS Performance.

BCBS (2015a). Consultative Documentation – Guidance on Accounting for expected Credit Losses.

BCBS (2015b). Discussion Paper – Regulatory Treatment of Accounting Provisions.

BIS (2006). Supervisory Review Process and Market Discipline-Part 3: The Second Pillar-Supervisory Review Process.

BIS (2018). Countercyclical capital buffer (CCyB). `https://www.bis.org/bcbs/ccyb/`.

BOE (2016). Stress Testing the UK Banking System: 2016 Guidance for participating Banks and Building Societies.

Borio, C., Drehmann, M., and Tsatsaronis, K. (2012). Stress-testing Macro Stress Testing: does it live up to Expectations? BIS Working Papers 369, Bank for International Settlements.

de la Lastra, M. and Ramón, J. (2012). 2011 EBA Stress Testing in Europe.

Deloitte (2013). Going up? The Impact of Impairment Proposals on Regulatory Capital.

EBA (2016). Report on results from EBA impact assessment of IFRS.

EBA (2017). EBA Report on result from the second EBA impact assessment of IFRS 9.

EBA (2018a). 2018 EU-Wide Stress Test, European Banking Authority (EBA).

EBA (2018b). 2018 EU-wide stress test: Frequently Asked Questions, European Banking Authority (EBA).

ESRB (2017). Financial Stability Implications of IFRS 9.

ESRB (2018). Adverse macro-financial scenario for the 2018 EU-wide banking sector stress test, European System of Financial Supervision.

ESRB (2019). Announced CCyB Rates. https://www.esrb.europa.eu/national_policy/ccb/all_rates/html/index.en.html.

Financial Stability Forum (2008). Report of the Financial Stability Forum on Enhancing Market and Institutional Resilience.

Flannery, M., Hirtle, B., and Kovner, A. (2015). Evaluating the Information in the Federal Reserve Stress Tests. Technical report.

Foglia, A. (2009). Stress Testing Credit Risk: A Survey of Authorities' Approaches. *International Journal of Central Banking*, 5(3):9–45.

G20 (2009). Declaration on Strengthening the Financial System – London Summit. Declaration.

Gebhardt, G. (2016). Impairments of Greek Government Bonds under IAS 39 and IFRS 9: A Case Study. *Accounting in Europe*, 13(2):169–196.

Hanson, S. G., Kashyap, A. K., and Stein, J. C. (2011). A macroprudential approach to financial regulation. *Journal of Economic Perspectives*, 25(1):3–28.

Hartmann-Wendels, T., Pfingsten, A., and Weber, M. (2019). *Bankbetriebslehre*. Springer, 7 edition.

Hashim, N., Li, W., and O'Hanlon, J. (2016). Expected-loss-based accounting for Impairment of Financial Instruments: The FASB and IASB proposals 2009 – 2016. *Accounting in Europe*, 13(2):229–267.

Hashim, N., O'Hanlon, J., and Li, W. (2015). Expected-loss-based accounting for the Impairment of Financial Instruments: The FASB and IASB IFRS 9 Approaches.

Hoogervorst, H. (2014). Closing the Accounting Chapter of the Financial Crisis.

IASB (2013). Exposure Draft - Snapshot: Financial Instruments: Expected Credit Losses.

IASB (2014a). IFRS 9 Financial Instruments.

IASB (2014b). IFRS 9 Financial Instruments – Project Summary.

KPMG (2016). Stress Testing: A Benchmark Analysis of systemically important Financial Institutions.

Landini, S., Uberti, M., and Casellina, S. (2018). Credit Risk Migration Rates Modeling as open Systems: A micro-simulation Approach. *Communications in nonlinear Science & Numerical Simulation*, 58:147–166.

Marton, J. and Runesson, E. (2017). The predictive Ability of Loan Loss Provisions in Banks – Effects of Accounting Standards, Enforcement and Incentives. *The British Accounting Review*, 49(2):162–180.

Novotny-Farkas, Z. (2016). The Interaction of the IFRS 9 Expected Loss Approach with supervisory Rules and Implications for Financial Stability. *Accounting in Europe*, 13(2):197–227.

Oros, O. E. (2015). Expected Credit Losses - IFRS 9 and Basel III moving towards Convergence? *Ovidius University Annals, Economic Sciences Series*, (1):872–876.

Paisley, J. (2017). Stress Testing: Where next? *Journal of Risk Management in Financial Institutions*, 10(3):224–237.

PwC (2014). IFRS 9 – Expected Credit Losses.

Reitgruber, W. et al. (2015). Methodological Thoughts on Expected Loss Estimates for IFRS 9 impairment: Hidden Reserves, Cyclical Loss Predictions and LGD Backtesting. Technical report.

Riebl, L. and Gutierrez, P. (2018). A Review of Stress Test Methodology. *Journal of Securities Operations & Custody*, 10(3):254–267.

Sánchez Serrano, A. (2018). Financial Stability Consequences of the Expected Credit Loss Model in IFRS 9. *Revista de Estabilidad Financiera*, 34:83–99.

Schmidt, A., Barekzai, O., and Hüttermann, K. (2015). Lieber ungefähr richtig, als genau falsch: die Neuregelungen des IFRS 9 zur Wertminderung finanzieller Vermögenswerte. *KoR: internationale und kapitalmarktorientierte Rechnungslegung IFRS*, 15(7/8, (7/8)):344–356.

Schuermann, T. (2014). Stress Testing Banks. *International Journal of Forecasting*, 30(3):717–728.

Vaněk, T., Hampel, D., et al. (2017). The Probability of Default Under IFRS 9: Multi-period Estimation and Macroeconomic Forecast. *Acta Universitatis Agriculturae et Silviculturae Mendelianae Brunensis*, 65(2):759–776.