



Banc Ceannais na hÉireann
Central Bank of Ireland

Eurosystem

Forward-looking assessments of banking resilience: the Central Bank's framework for the Irish retail banking system **November 2020**



Contents

- 1 Introduction.....3
- 2 Macroeconomic scenario and horizon4
- 3 Model overview.....6
- 4 Asset volumes7
- 5 Credit losses.....9
- 6 Pre-impairment profitability 14
- 7 Risk Weighted Asset (RWA) evolution 16
- 8 Key results..... 16
- 9 Conclusion..... 18
- Bibliography..... 19

1 Introduction

The COVID-19 crisis represents an exceptional economic shock, both globally and domestically. It is very different in nature to the financial crisis of 2008, with the financial system responding to, rather than being the source of, the shock. The policy response to the pandemic has also been unprecedented, with an exceptionally accommodative policy stance taken across monetary, fiscal, macroprudential and microprudential authorities. This policy response aims to cushion the impact of the shock on households and businesses and support the economic recovery. However, the full transmission of the shock to the economy and financial system will take time and depends on the path of the pandemic itself, interacting with other risks, such as Brexit.

Banking sector resilience has improved significantly in recent years, with banks being better capitalised in early 2020 than they were before the global financial crisis over a decade ago. However, given the widespread nature of the pandemic, asset quality deterioration is expected in the coming years. The banking system has granted short-term payment breaks in response to the liquidity shock facing firms and households, but it is likely that some of these customers will not return to full capital and interest payments, leading to bank losses and associated capital depletion. In addition, the weaker macroeconomic environment accompanied by lower for longer interest rates poses risks to underlying income generation for banks, given that it is likely to be associated with lower credit demand.

In that context, a quantitative, forward-looking assessment of the capital position of the banking system is a key part of the analytical toolkit that can inform the Central Bank's judgments around financial stability. As a result, the Central Bank has produced projections of the capital position of the banking system under different macroeconomic scenarios over the 2020-2022 horizon. Key results and judgments are reported in the *Financial Stability Review 2020:2*. This document provides further methodological detail around the analytical approach to deriving projections of system-wide capital ratios for the different macroeconomic scenarios.

Objective of the analysis

Banks are at the core of the financial system, providing a range of critical services to households and businesses. As a result, reaching a judgment around the resilience of the banking system is at the core of the Central Bank's financial stability mandate. A quantitative, forward-looking assessment of the capital position of the banking system is an essential part of the analytical toolkit that can inform that judgment.

The aim of the analysis toolkit described in this document is to derive projections of the capital position of the retail banking system under different macroeconomic scenarios. A rich literature has identified banks' capital constraints as a key driver of changing lending appetite: as banks suffer losses and their capital is eroded, they are more likely to tighten lending conditions, lower quantities lent, restrict new lending to more creditworthy borrowers, and raise interest rates on new loans. Recent work from the ECB ([Budnik et al., 2020](#)) has shown how these dynamics can influence the economy during periods of stress where the banking sector is affected, while also summarising much of the previous literature.¹ The avoidance of such "credit crunch" dynamics, where lending is disproportionately curtailed during an economic downturn and thereby amplifying the shock, is one of the cornerstones of macroprudential policy and more generally the prudential framework that has been built up as a response to the global financial crisis.

¹ [Gerali et al. \(2010\)](#) show in an estimated model of the euro area that capital shocks result in the banking sector can have important adverse economic effects through credit supply channels. [Khawaja and Mian \(2008\)](#) show how banks respond to negative shocks to their liquidity positions by reducing lending supply. [Santos and Winton \(2008\)](#) show that during recessions, banks charge their customers higher lending spreads. [Gambarcorta and Mistrulli \(2004\)](#) show that banks with weaker capital positions are more likely to curtail lending in response to monetary policy and economic shocks. For research showing that a tightening of capital requirements leads to lower credit supply, see both [Aiyar, Calomiris and Wieladek \(2014\)](#) and [Aiyar, Calomiris and Wieladek \(2016\)](#).

The focus of the assessment framework described here is on the capacity of the retail banking system *in aggregate* to absorb, rather than amplify, shocks. In this sense, the assessment forms part of the Central Bank's macro-financial toolkit, to inform its financial stability and macroprudential judgments. The supervision of individual banks is a separate competency, requiring separate tools, and not the aim of the assessment toolkit outlined in this paper.

Scope of institutions and exposures

The analysis focuses on the segment of the Irish financial system that provides core banking services to Irish households and businesses, covering the five main retail banks.² All exposures, regardless of geographic location, held by those institutions, are included in the exercise. As a result, Common Equity Tier 1 (CET1) and total capital ratios reported as outputs of the exercise relate to the full, aggregated balance sheet of the retail banking system.

Comparison to other exercises

The European Banking Authority (EBA) is mandated to conduct a stress test of systemically important European banks and currently does so every second year. The Single Supervisory Mechanism (SSM) also carried out a Vulnerability Assessment in the context of COVID-19 and [published](#) the aggregate results in July 2020.

There are a number of differences between these various exercises. These include the ultimate objective of the analysis, the scenarios being considered, the scope of institutions covered and the methodologies used to produce projections. The results of the Central Bank's analysis are therefore not directly comparable to other exercises. The Central Bank's 2020 assessment published in this document will provide the Central Bank with a range of analytical insights to inform financial stability and macroprudential policy judgments, beyond those available from other exercises. Further, the in-house capability embedded in the toolkit described in this document allows the Central Bank to flexibly assess the potential impact of new features of the macro-financial environment as they arise. Table 1 describes some of the key features of relevant exercises assessing banking sector resilience.

Table 1: Key features of recent assessments of bank resilience in Europe

Exercise	Aggregation	Scope	Balance Sheet	Details Published
Central Bank of Ireland 2020 assessment	System-wide	AIB, BOI, PTSB, KBC, UBI.	Dynamic ³	System-level results for Irish retail banking system
SSM 2020 Vulnerability Assessment	System-wide	86 banks supervised by SSM	Static	Aggregate results for euro area; distribution of results across the full sample of banks
EU-wide stress tests (European Banking Authority)	Individual banks	AIB, BOI (PTSB included in 2014 exercise).	Static	Bank-level results

2 Macroeconomic scenario and horizon

Projections of the capital position of the banking system are produced conditional on two macroeconomic scenarios, a baseline and adverse, over a three-year horizon from 2020 to 2022.

² Allied Irish Banks, plc; The Governor and Company of the Bank of Ireland/Bank of Ireland Mortgage Bank; Permanent TSB plc.; KBC Bank Ireland plc.; Ulster Bank Limited/Ulster Bank Ireland DAC. The institutions are referred to as AIB, BOI, PTSB, KBC and UB, respectively in the document.

³ The gross loan balances are modelled to evolve with the scenario.

The scenarios draw from the projections published on 6 October in the Central Bank's Quarterly Bulletin (QB).⁴ The adverse scenario is consistent with the analysis presented in Box E of the QB and the Central Bank's judgments around the main risks facing the financial system that are outlined in the FSR. In particular, the adverse scenario is consistent with a second wave of the virus requiring more widespread and stricter public health restrictions than assumed in the baseline. Table 2 reports the path of the headline macro-financial variables of interest for the resilience assessment in both scenarios.

Table 2: Irish macro-financial variables used in the assessment

	Baseline			Adverse		
	2020	2021	2022	2020	2021	2022
Real Underlying Domestic Demand	-7.1	1.6	4.8	-8.5	-1.3	3.7
Unemployment rate*	16.7	9.3	7.5	19.1	13.5	10.1
Residential real estate prices	-0.4	-5.2	-0.3	-1.9	-13.7	-5.4
Commercial real estate prices	-4.9	-9.1	-2.6	-5.9	-16	-3.9

Source: Central Bank of Ireland

Notes: Residential and Commercial property price shocks were calibrated to be consistent with the paths for the other macro-economic variables published in the QB. * The unemployment rate in 2020 and 2021 is the COVID-adjusted rate, which includes recipients of the Pandemic Unemployment Payment as well as those who are unemployed according to the standard International Labour Organisation definition.

Both scenarios assume that the EU and the UK will move to trading on WTO terms from 1 January 2021. The primary difference between the baseline and adverse scenarios lies in the degree of global and domestic pandemic-related disruption during 2021. In the adverse scenario a prolonged period of disruption similar to what was experienced in Spring and early Summer 2020 is assumed to persist through most of 2021. These enhanced and stringent containment measures are assumed to be in place not just in Ireland, but also in key trading partners. Added to these real economic shocks, the adverse scenario also includes a range of financial shocks consistent with (1) higher risk premia passing through to interest rates and (2) tighter credit conditions on mortgages and other loans to households and businesses impacting on the volume of credit. These last shocks in particular are consistent with the risk of a restriction in credit supply relative to demand, where the actions of the banking sector are assumed to amplify the economic shock of COVID-19.

Known government support policies, to the expiry dates publicly known in October 2020, are considered in the macroeconomic modelling used to inform the baseline and adverse scenario paths. The effects of wage and income support schemes generally operate in these models through increased consumption, while the effect of policy support to SMEs operate through improved business investment.

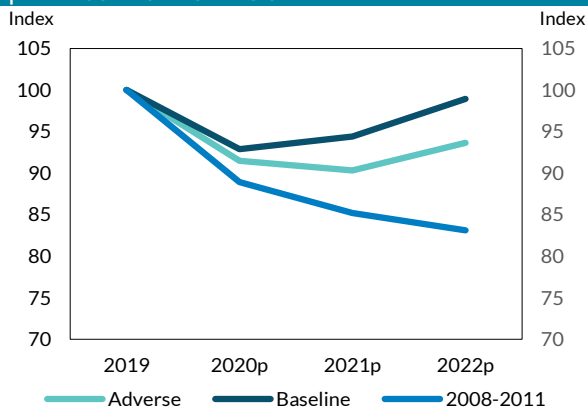
Providing context for the magnitude of these scenarios, Figures 1A and 1B describe the evolution of Underlying Domestic Demand and the unemployment rate in the current scenarios in comparison to the onset of the last crisis. The speed of the downturn and the starting position vulnerabilities are significantly different to those experienced in the period from 2008. This results in the gradual return of economic activity levels and reduction in the unemployment rate in the current scenario horizons, whereas the recovery was much more protracted in the case of the last crisis. Amongst the key vulnerabilities not present in the current situation is a credit-fuelled real

⁴ See [Quarterly Bulletin No.4 2020](#) for more detail on the main factors underpinning the baseline projection in particular.

estate boom and other large starting macro-economic imbalances. This is also reflected in the paths for real estate prices in the current scenarios relative to the declines experienced during the depths of the crisis from the late-2000's (Fig 1C).

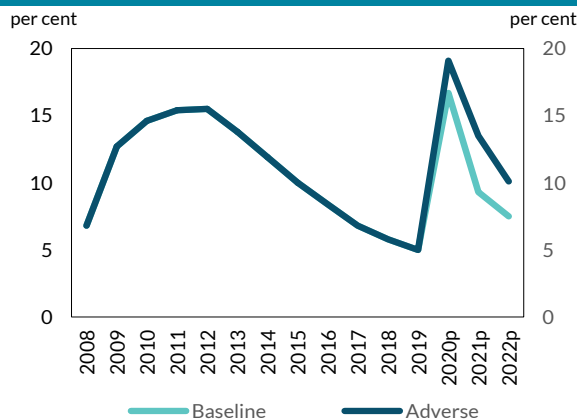
Figure 1: Key macroeconomic variables in Baseline and Adverse scenarios, relative to previous crisis.

Fig 1A: Scenario UDD 2019-2022 in comparison to previous financial crisis



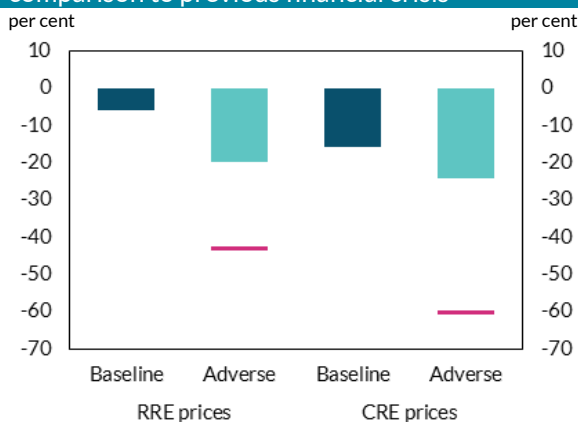
Source: Central Bank of Ireland
Notes: UDD is underlying domestic demand.

Fig 1B: Unemployment rate



Source: CSO and Central Bank of Ireland
Notes: ILO unemployment rate 2008-2019 and 2022. COVID-19 adjusted unemployment rate in 2020 and 2021.

Fig 1C: Scenario Real Estate Price Changes 2019-2022 in comparison to previous financial crisis



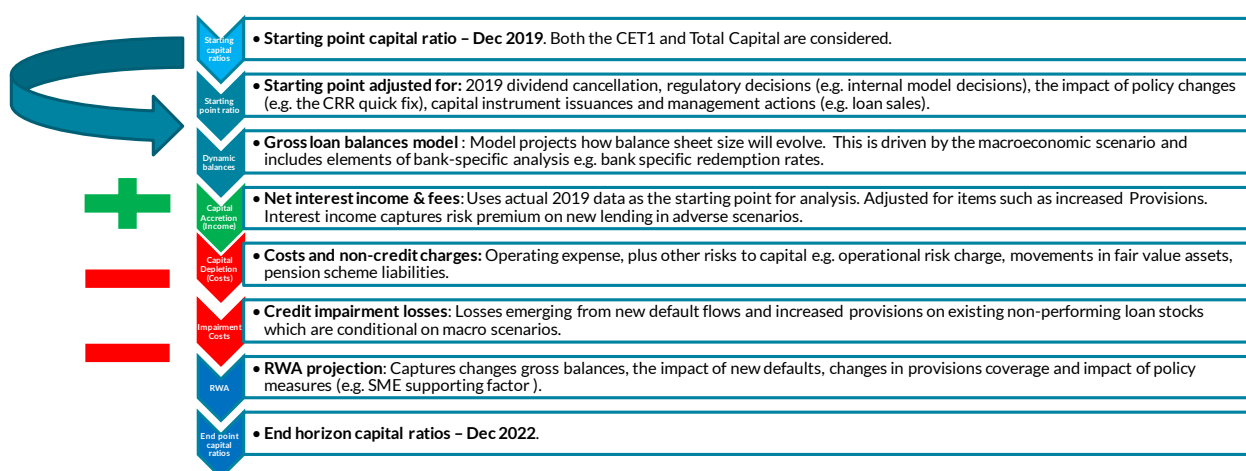
Source: CSO, MCSI and Central Bank of Ireland
Notes: RRE and CRE are residential and commercial real estate, respectively. Cumulative change (in annual average values) between 2019 and 2022. Pink markers indicate the maximum change over a similar period during the financial crisis from 2008.

3 Model overview

The projections involve the simulation of banks' balance sheets under the macroeconomic scenarios. December 2019 regulatory data on balance sheet items are taken as a starting point. These are adjusted to account for all known changes to a subset of key variables in the intervening period to October 2020, including the effect of the 2019 dividend cancellation, issuance of capital instruments, loan sales or securitisations, changes in Risk Weighted Assets (RWA), and changes

stemming from the ‘CRR quick fix’.⁵ The steps undertaken thereafter are summarised in Figure 2, with each step described in detail in the rest of this paper.

Figure 2: Schematic of the Central Bank’s capital assessment model



4 Asset volumes

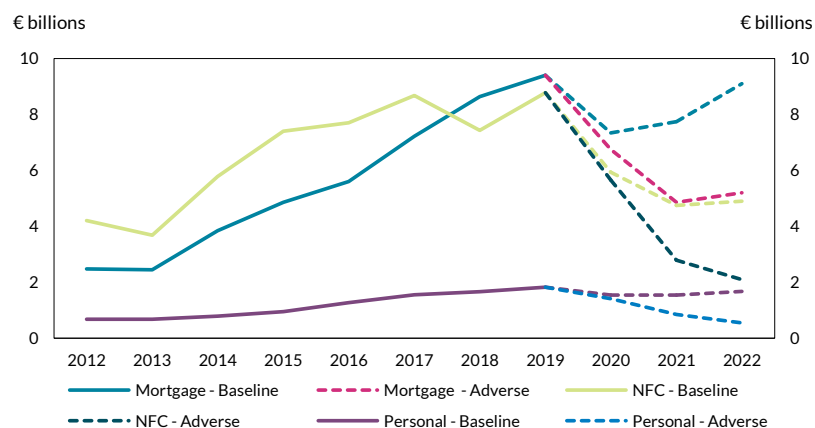
The stock of outstanding loans does not stay static during the scenario horizon. The change in gross loan balances over the scenario horizon is anchored in estimates of aggregate credit from the Central Bank’s Core Structural Macroeconomic ([COSMO](#)) model. The projected paths for gross loan balances, therefore, incorporate the key economic factors that affect the demand and supply of credit as reflected in the scenario calibrations. For example, everything else equal, the shock to economic activity from the COVID-19 shock would be expected to lead to lower demand for certain types of credit.

For the purposes of mapping these aggregate credit projections to the bank capital projections, in particular the calculation of net interest income, it is necessary to also consider the underlying factors that drive these gross loan balances. These factors include – among others – the projected path of gross new lending and the rate of redemptions on outstanding loans. The final path for these components in the current analysis combines input from satellite models, granular regulatory and company data and expert judgment.

The projections of gross new lending incorporate analysis of actual trends observed up to Q2 2020 and the initial impact of COVID-19 on credit markets. Future paths were estimated consistent with the baseline and adverse scenarios until 2022. New lending projections for Ireland relative to recent historical experience are reported in Figure 3. The baseline projections (which also include a no-deal Brexit) incorporate a gradual recovery in lending to households in 2021 and 2022 from the lows observed in 2020, but lending to companies remains more subdued given the path of the economy. Previous experience of sharp corporate deleveraging as a response to the last crisis is an influencing factor in these sensitivities. The projections in the adverse scenario assume bigger falls in gross new lending to both companies and households, consistent with bigger shocks to both credit demand and supply.

⁵ <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32020R0873&from=EN>. The “CRR quick fix” legislation has been intended to help credit institutions to mitigate the impact of the COVID-19 outbreak and to provide incentives for banks to continue lending to business and consumers

Figure 3: Irish new lending projections over the scenario horizon since 2012



Source: Central Bank of Ireland

Redemptions are assumed to respond less to the changed macroeconomic conditions than new-lending given the contractual repayment element. Reduced market activity, the possibility of repayment difficulties and payment break take-up will all lower redemptions. Offsetting this, particularly during the early phases of the pandemic, were drawdowns of committed facilities by some NFCs. Further, there is a possibility that some of the accumulated deposits of households and businesses could be used to repay debt at a faster rate than in the past. Granular regulatory data was used to estimate contractual repayments, adjusted for payment breaks in 2020. Early repayment or prepayments were estimated, with reference to both statistical data and other sources of public or regulatory information.

The overall effect of all of the above factors culminates in model projections for total gross loan balances in Ireland under each scenario, reported in Table 3. The stock of Irish gross loans is projected to fall by 10.2 per cent over the adverse scenario horizon, compared to 4.3 per cent in the baseline.

Table 3: changes in gross loan book balances over the scenario horizon, Irish portfolios

€bn	Est 2019	Baseline				Adverse			
		FY20	FY21	FY22	FY22-FY19	FY20	FY21	FY22	FY22-FY19
Household	102.0	101.3	100.3	100.8	-1.2	100.8	98.1	96.2	-5.8
Mortgage	94.4	94.3	93.9	94.7	0.3	93.9	91.9	90.8	-3.6
Consumer	7.5	7.0	6.5	6.0	-1.5	6.9	6.2	5.4	-2.2
NFC	34.1	33.0	30.5	29.4	-4.7	32.9	29.2	26.0	-8.1
NFC non-CRE	20.9	20.4	19.0	18.6	-2.2	20.4	18.1	16.0	-4.8
CRE	13.3	12.6	11.5	10.8	-2.5	12.5	11.1	9.9	-3.3
Total	136.1	134.3	130.9	130.2	-5.9	133.6	127.3	122.2	-13.9
Year on year growth									
Household		-0.7%	-0.9%	0.5%	-1.1%	-1.2%	-2.6%	-1.9%	-5.6%
Mortgage		-0.2%	-0.4%	0.9%	0.3%	-0.6%	-2.0%	-1.2%	-3.8%
Consumer		-6.9%	-7.7%	-6.5%	-19.6%	-8.3%	-10.3%	-13.1%	-28.6%
NFC		-3.3%	-7.5%	-3.8%	-13.9%	-3.6%	-11.2%	-11.0%	-23.8%
NFC non-CRE		-2.1%	-6.9%	-2.0%	-10.7%	-2.3%	-11.4%	-11.1%	-23.1%
CRE		-5.1%	-8.4%	-6.7%	-18.8%	-5.7%	-10.9%	-10.8%	-25.0%
Total		-1.3%	-2.5%	-0.5%	-4.3%	-1.8%	-4.7%	-4.0%	-10.2%

Source: Central Bank of Ireland, gross loans module of banking resilience assessment

5 Credit losses

Credit loss projections are estimated across key portfolio segments based on the estimation of Probability of Default (PD) and Loss Given Default (LGD). Credit losses are modelled on a forward-looking 3-year basis conditioned on the scenarios. Exposure sizes are determined with reference to the gross loan balances model described above.

Two empirical credit risk modelling frameworks are available at the Central Bank of Ireland. The first is a set of portfolio-level models, in which total loan exposures are segmented into a number of sub-portfolios by loan type and by geography. The second empirical framework for credit losses is a more granular approach, which consists of a suite of loan loss forecasting (LLF) models calibrated using loan level data. In addition to these, a range of inputs were used to inform judgments around the ultimate impact of the scenarios on credit losses (including the effect of government supports, the impact of the changing composition of credit portfolios over time and comparisons of credit losses to history).

Portfolio-level credit modelling

The segmentation of portfolios is informed by the nature of the borrower, risk management practices, collateralisation, as well as differing risk performance over time (default rates). For example, in the mortgage book, the analysis segments between PDH and BTL mortgages, while corporate, SME, CRE and leveraged finance exposures are all treated separately within the commercial lending book.

The portfolio-level Probabilities of Default (PDs) are based on historical relationships between default flows and a range of macroeconomic drivers, such as unemployment, domestic demand or property prices. Table 4 reports the primary macroeconomic drivers used in each portfolio model. Historic time series for PD model estimation typically run from 2007 to 2019 in these portfolio-level models.⁶

Table 4: Approaches to portfolio-level credit risk modelling by asset class

Portfolio	Key macroeconomic variables used in PD estimation	Approach to LGD Methodology
Mortgages	Unemployment Rate, Residential Property Price Index	Structural collateral based model
Consumer Lending	Unemployment Rate, Underlying Domestic Demand	Calibrated based on historical data
Corporate	Unemployment Rate, Underlying Domestic Demand, UK GDP	Calibrated based on historical data
SME	Unemployment Rate, Underlying Domestic Demand, UK GDP	Calibrated based on historical data
CRE	Unemployment Rate, Commercial Property Price Index	Structural collateral based model

Loss Given Default (LGD) is modelled separately for each portfolio for new defaults and for the existing defaulted stock (i.e. the change in current provision coverage arising from the impact of the scenario) and is also summarised in Table 4. For mortgage and Commercial Real Estate portfolios, the LGDs are modelled taking into account the current Loan-to-Value profile of the respective portfolios, which is then adjusted in line with the property price assumptions in the scenario.

⁶ The approach focusses on forecasting flows into default, without explicit modelling flows of performing loans between Stage 1 and Stage 2 of the IFRS 9 accounting regime. Due to the expiry of IFRS 9-realted capital relief due to the “CRR Quick Fix” in 2021, the modelling team has estimated an impairment from Stage 2 assets in 2022 under each scenario.

Additional assumptions regarding projected cure rates and workout strategies are also applied, including particular features specific to collateral repossession processes in Ireland. Corporate, SME and Consumer LGDs were calibrated based on the scenarios and utilising historic provision coverage ratio (PCR) data over the previous twelve years on respective portfolios.

Loan-level credit risk modelling

The second empirical framework for credit losses is a more granular forecasting approach, which consists of a suite of loan loss forecasting (LLF) models calibrated on and using loan by loan level data. The LLF provides the key quantitative benchmark for comparing credit loss outputs of the portfolio-level models for each portfolio.

The development of the LLF models was made possible due to the collection of loan-by-loan level data from the domestic banks under the Financial Measures Programme (2011). This granular data provides detailed borrower, loan and collateral information that are used as key inputs to the models. The other key inputs are the macroeconomic variables that explain loan losses. The LLF allows a combination of loan-level and macroeconomic information to drive default prediction in the same forecasting exercise.

The original versions of the models were externally validated (in June 2013) to ensure that the models were fit for purpose and met industry best standards. The models have since been updated to account for the latest data as well as for regulatory and accounting changes such as the transition to IFRS9 expected credit loss modelling from 1 January 2018.⁷ LLF models calculate losses as the product of Probability of Default (PD), Loss Given Default (LGD), and the size of balances at each scenario year-end, with separate modelling methodologies for each of these individual components. The overall method for combining these features is described in detail in Gaffney et al. (2014a and 2014b)

- PD models: estimated for each asset class using historical loan-by-loan data. The PD models provide estimates of the probability of transition into and out of loan default.⁸ The Republic of Ireland (ROI) and UK residential models are detailed in Kelly and O'Malley (2016) and McCann (2014), respectively.
- LGD module: where collateral is based on property, the LGD module utilises the property price macroeconomic scenario to roll forward property values to calculate a loan-level Loss Given Liquidation. These are combined with outstanding balances and time to repossession, liquidation haircut, cure rate and legal expense assumptions to arrive at an amount recovered by the lender. In cases where loans are unsecured or secured on factors other than property, a range of floor and ceiling assumptions informed by historic and international experience are used.
- Outstanding balances: a "flow tree" approach where each loan begins at T=0 in its true state and has a probabilistic component that moves into and out of default at each T, as a function of the loans' covariate values, the macro scenario, and the PD parameters. This allows PDs beyond the first year of the scenario to be applied only to the component of the loan that is

⁷ The new IFRS 9 impairment model requires impairment allowances for all exposures from the time a loan is originated, based on the deterioration of credit risk since initial recognition. If the credit risk has not increased significantly (Stage 1), IFRS 9 requires allowances based on 12 month expected losses. If the credit risk has increased significantly (Stage 2) and if the loan is 'credit impaired' (Stage 3), the standard requires allowances based on lifetime expected losses.

⁸ Current default definitions incorporate both 90 days past due and Unlikely to Pay indicators. Historical default flows, on which PDs are estimated, were generated utilising historically available indicators to as closely approximate current default definition as possible.

modelled to remain performing. Overall portfolio-level exposures for capital assessment are adjusted to move in line with the gross loans methodology explained above.

Bringing together all inputs to arrive at credit loss estimation

Employing a suite of models means that – for each scenario – there are a range of quantitative projections available around potential credit losses. This reflects the fundamental uncertainty around any forecasting exercise. In the face of such uncertainty, using a suite of models reduces the risk of excessive reliance on any single quantitative approach.

All model outputs were subjected to qualitative and quantitative review of banks' portfolios to challenge the appropriateness of the modelled estimates. Ultimate projections around credit losses were arrived at, taking into account a range of inputs. These included the portfolio-level and loan-level models discussed above; expert judgment and calibration based on review of large exposures and market intelligence; analysis of COVID-19-related payment break take-up rates; analysis on the impact of changed portfolio composition since the last crisis and analysis on the role of government supports in mitigating default.

Overlays and judgments are required in combining the range of inputs described above to arrive at credit loss projections. These judgments were informed by – among others – analysis on the relative strengths and weaknesses of different modelling approaches in the context of these specific scenarios; an assessment of the extent to which history may not be a good guide to the future given the nature of the scenarios or the composition of portfolios; and the weight attached to the effectiveness of government supports in mitigating financial stress.

Final modelled PD and LGD values for selected key ROI portfolios are outlined in Tables 5 and 6 below for a number of key portfolios.

Table 5 reports PDs over a three-year horizon in the baseline, adverse and the maximum comparative experience in the historic data since 2007. The adverse projection does not surpass the historic maximum for any of the ROI portfolios. While the income and employment shock is severe in the adverse scenario, the projected stress is shorter in duration in comparison to the prolonged nature of the last crisis, with economic recovery progressing by 2022. This, supported by the role of improved credit quality, direct government policy supports and the far lower risk of negative equity, informs the final PD estimates of 13 per cent, which are significantly below the historic crisis experience of 21 per cent. Figure 4 shows the full historic time series of annual ROI Mortgage PDs, with baseline and adverse projections reported.

Table 5: Probability of Default (3-Yr cumulative) by scenario and portfolio, with comparisons to historic experience. ROI portfolios only

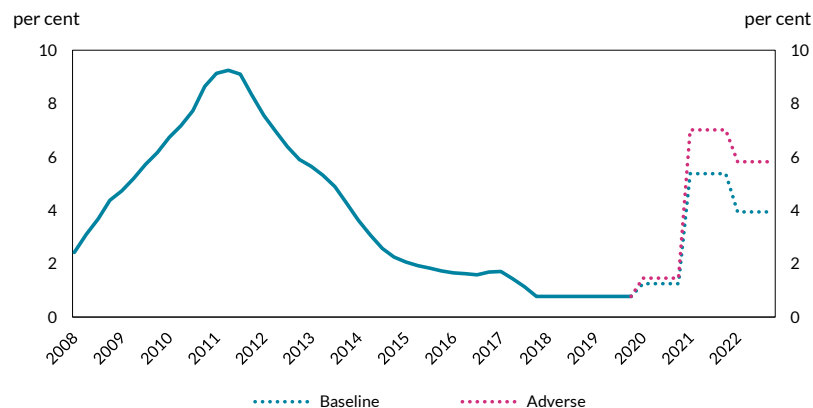
Scenario	ROI Mortgage	ROI SME / Corporate	ROI CRE
Base	10%	20%	27%
Adverse	13%	27%	37%
Estimated Historical Peak	21%	33%	58%

Source: Central Bank of Ireland

In the SME and Corporate portfolios, the nature of the pandemic, having such widespread effects on businesses' revenue-generating capacity, means that the adverse PD outcomes at 27 per cent are closer to the historic maximum of 33 per cent.

In CRE markets, the severity of the previous crisis experience is not projected to be repeated, despite uncertainty around the effect of the pandemic on demand for retail and office space. This relates to the shrinking size, lesser focus on Land and Development lending, and improvements in underwriting quality on Irish banks' CRE lending in recent years and the relatively smaller falls in CRE prices projected in the scenario relative to the last crisis, leading to less negative equity and risk amplification.

Figure 4: Irish mortgage defaults since 2008 and across the scenario horizon



Source: Central Bank of Ireland

Notes: One-year default flows reported (share of performing loans transitioning to default in each year)

Table 6 reports Loss Given Default (LGD). ROI Mortgage LGDs are projected to rise from 11 to 18 per cent between the baseline and adverse scenarios, respectively, with increases in SME, Corporate and CRE portfolios also observed. The modelling of less severe loss experience relative to historic provision coverage in mortgage and CRE markets primarily reflects the relatively less severe property price shock currently being forecast, even in the adverse scenario, compared to the last crisis.

Table 6: Loss Given Default for default flows by scenario and portfolio

Scenario	ROI Mortgage	ROI SME / Corporate	ROI CRE
Baseline	11%	40%	22%
Adverse	18%	45%	34%

Source: Central Bank of Ireland

Box 1 describes the factors that warranted adjustment to empirical model outputs in this assessment.

Box 1: Adjustments to credit loss projections for specific features of the current environment

The empirical models described in Section 5 use historic data in their estimation. There are a number of reasons why historical relationships between credit losses and macroeconomic outcomes may not hold into the future, especially in this scenario. First, there has been a significant change in risk appetite in Ireland, among both banks and borrowers, since the last crisis, with much lower levels of leverage and indebtedness in many asset classes at the onset of the pandemic. Second, the nature of the fiscal policy response to the pandemic further challenges the interpretation of such outputs, given that the fiscal measures taken to support households and firms during the pandemic have been unprecedented

and are assumed to remain in place consistent with the timetables announced by the government, in both base and adverse scenarios. Third, the very abrupt nature of this shock and its particular impact on certain sectors mean that this is a very different downturn to anything that we have observed in the past, with potential implications for the distribution of losses as well as their timing. Based on the above features, the Central Bank has considered overlay-based adjustments to results that come from directly-estimated empirical models.

Mortgage models and government pandemic-related income supports

The historic relationship between unemployment and mortgage default needs consideration. Given that Pandemic Unemployment Payment recipients receive between 1.5 and 1.8 times the payment that those entering unemployment would have received under Jobseeker's Benefit up to 2019, those losing employment during this crisis are less likely to default than those losing their jobs in the past, all other things equal. The model of O'Malley (2020) is used to motivate downward adjustments to model-estimated Probability of Default (PD). This model suggests that mortgage defaults are around one fifth lower than they would otherwise have been due directly to the size of PUP payments.

SME models and government pandemic-related fiscal supports

In the SME sector, policy interventions such as tax warehousing, direct grants and guaranteed credit are all likely to lower default rates relative to the past, for a given macroeconomic shock. The model of McCann and Yao (Mimeo, 2020), of which headline results are available in [Lambert et al. \(2020\)](#) suggests that the policy package announced by Government in 2020 can lower financial distress rates among SMEs by close to two fifths.

Historic changes to borrower indebtedness and risk profile

The Irish banks' loan portfolios had been changing over the decade preceding COVID-19. The experience of the previous crisis led to changes in credit risk appetite among banks, as well as a reduced demand for debt among many borrowers, particularly SMEs, evident in [SME survey responses](#) in recent years. In the CRE markets, Irish banks' new originations in recent years were less speculative than the lending predating the 2008 downturn. Furthermore, in the mortgage market, macroprudential mortgage measures have bolstered a more prudent underwriting appetite, ensuring that risk in new mortgage lending is lower than in the period preceding the previous crisis.

Vulnerabilities stemming from the last crisis

On the other hand, there are features specific to the current setting that may present additional risk. For example, a cohort of existing loans that were originated pre the last crisis have already been restructured.. These loans have been shown to have significantly higher risk than other performing loans ([Gaffney and McCann, 2018](#)), even in times of positive macroeconomic performance. All else equal, the presence of these loans in the mortgage portfolio will increase default risk.

Risks posed by the pandemic not captured in the historic data

Further, the specific effects of the pandemic on most-affected sectors of the SME and Corporate portfolios, and the risks of the changing nature of the use of commercial property, have the potential to create additional losses that would not be predicted when solely observing historic relationships. These include the effects of the pandemic on economic demand in certain sectors of SME and Corporate loan books. The reported falls in turnover for SMEs in some sectors are beyond precedent; for example, the majority of SMEs in the Accommodation and Food sector have reported falls of more than 75 per cent in their revenues relative to pre-pandemic norms throughout Q2 and Q3 2020. The effects on CRE (particularly in the office and retail sectors) are currently difficult to ascertain, but have the potential to be without precedent in their effects on the urban economic landscape, with knock-on effects for banks' loan asset quality.

In attempting to account for these effects, the Central Bank has made adjustments to default flow predictions for loans to enterprises in the sectors most directly affected by the pandemic. To account for the extreme nature of the shock being faced by these businesses, their loans are classified with default rates similar to those experienced by the highest-risk performing loans during the last cycle.

Timing of losses

Due to the exceptional economic shock caused by COVID-19, and the unprecedented policy response to the pandemic, the timing of the recognition of credit losses has been expertly applied. Given the

immediacy of the economic shock, and the timing impacts introduced by initiatives such as the issuance of generic moratoria, the use of traditional model based lags were deemed insufficient to capture the expected trajectory of default materialisation. As such a proportion of the losses which were estimated to occur in years 1 and 2 of the projection have been deferred to years 2 and 3.

6 Pre-impairment profitability

Pre-provision profitability takes account of the following factors, each outlined in turn in this section: Net interest income; fee and commission income; operating expenses; operational risk and market risk.

6.1 Net Interest Income

The starting position for net interest income is based on end-2019 net balances for interest earning assets and interest paying liabilities and implied Q4 2019 effective interest rates.

The main transmission channels through which the macroeconomic scenario impacts net interest income projections is through (i) the changes in gross balances; (ii) assumed changes in interest rates on new lending; and (iii) the rise in impairment provisions, on which the effective interest rate is not applied. The main variation between baseline and adverse scenarios arise from the difference in the net balances of the key interest earning assets – loans to customers. In addition, within the adverse scenario, a risk premium is applied to new household and customer lending from 2021, offsetting some of the impact of reduced balances. Finally, the cost of issuing new debt is assumed to be 200bps higher in the adverse scenario than in the baseline.

While the balances for customer loans are determined as outlined in section 4, balances relating to assets from other counterparties⁹, debt securities held, customer deposits and wholesale funding are generally set to remain at end-June 2020 levels. Redemption assumptions for these balances are determined with reference to contractual maturity data and new flows are set at levels to maintain balances at June 2020 levels. Other aspects incorporated include banks' participation in TLTRO; the impact of loan sales; and expected debt issuance¹⁰.

Foreign exchange rate and reference interest rate movements in the period to end June 2020 are reflected as relevant in volumes and interest rates and are assumed to stay at June 2020 levels for the remainder of the scenario. These assumptions remain the same in both the baseline and adverse. The rates on redeeming and new amounts are determined with reference to a variety of sources including regulatory data; publicly available statistical data; and market data. Rates on deposits with the ECB reflect ECB deposit tiering.¹¹

All foreign exchange and interest rate movements are estimated before the impact of hedging, although micro hedges will be implicitly reflected in end December 2019 effective interest rates. 2020 macro hedging effects are determined with reference to H1 2020 and remain constant in subsequent years in both base and adverse.

Taking all of the above into account, net interest margins (NIM) are projected in Figure 5. The gradual decline experienced since the recent peak of 2.23 per cent in 2017 are modelled to continue under both scenarios, with NIMs reaching 1.73 per cent in the baseline and 1.63 per cent in the adverse. The broad direction on NIMs is in line with analysis published in recent *Financial Stability Reviews* in 2019 and 2020 by the Central Bank of Ireland around the role of the low interest rate

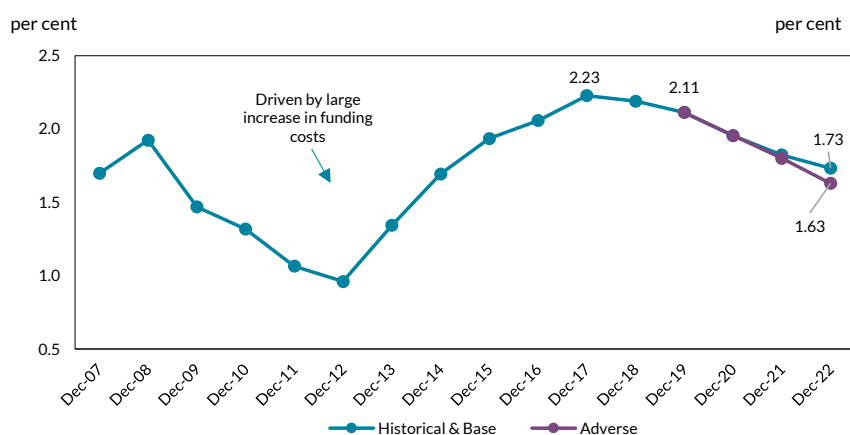
⁹ Loans to governments, credit institutions, other financial corporations and central banks.

¹⁰ These balances are not kept at June 2020 levels and reflect expected issuance to meet MREL requirements, including issuance year to date.

¹¹ <https://www.ecb.europa.eu/mopo/two-tier/html/index.en.html>

environment and a reliance on lending for income generation acting as drag on banks' capacity to generate pre-impairment profits from lending.

Figure 5: Net Interest Margins in a historic context



Source: Annual reports and S&P Global pre-2015 and regulatory data from 2015 onwards.
Notes: KBC excluded up to 2015 due to insufficient historic data.

6.2 Fee and commission income

Declines in Net Fee and Commission Income (NFCI) for 2020 are informed by banks' experience in 2020 H1 and expectations for the rest of the year. Given differing composition of NFCI across banks, the rate of decline varies. Adjustments have been made in the projections to reflect the effect of the macroeconomic impact on banks' capacity to generate such income in each scenario. This results in a greater decline in adverse that is on average 6 to 8 percentage points lower than in baseline (Table 7).

As payment based transactions comprise a significant portion of NFCI, consideration has also been given to changes in customer behaviour resulting from the pandemic, some of which are assumed to persist after the worst of COVID-19 has passed. In particular, many physical and cash based transactions have been replaced by card-based, contactless or online activity, much of which generates lower fees. Therefore, NFCI is not assumed to return to 2019 levels, in either baseline or adverse scenarios by 2022.

Table 7: Net fee and commission income relative to starting point

	Base 2020	2021	2022	Adverse 2020	2021	2022
% of 2019	84%	88%	92%	76%	82%	88%

6.3 Operating expense and operational risk

Operating expenses are also based on H1 2020 costs, but with certain 'one-off' items stripped out for projection in future years. The projections do not incorporate recent announcements around cost cutting programmes. Operational risk losses are estimated separately to operating expenses. The methodology uses data from the last five years of loss history.

6.4 Market risks

Another channel through which bank capital can be eroded is the crystallisation of market-related risks. Some of the more significant contributors to market-risk driven losses are: (i) revaluations of

non-trading book positions which are not valued at amortised cost; and (ii) revaluations of defined benefit pension scheme assets and liabilities.

To assess the effect of such risks on bank capital a set of market risk-factor shocks were calibrated for the 'baseline' and 'adverse' scenarios. In particular shocks were calibrated for: interest rates, exchange rates, bond prices, credit spreads, equities and commodities. These shocks complement the macro scenarios and are designed to test the potential for losses stemming from financial market volatility. For example, in this analysis, shocks to various sovereign spreads range from 15bp to 150bps in base and 30bp to 300bp in adverse - with the Irish sovereign spread shock being 75bp and 175bp respectively. As the timing of these market shocks is uncertain they are assumed to persist for the horizon of the analysis.

The market shocks are used in conjunction with risk factor sensitivities to compute the impact on capital. For assessing changes to pension scheme obligations, shocks to both assets and liabilities are evaluated. Relevant regulatory rules have also been considered.¹²

7 Risk Weighted Asset (RWA) evolution

Risk-Weighted Assets (RWA) are a key component in assessing the capital adequacy of a firm, as key regulatory capital ratios are expressed as a percentage of RWA, rather than total assets. Credit risk is the most material component of RWA in the Irish retail banks, contributing 90 per cent of total RWAs. In projecting movements in this component of RWA over the scenario horizon, a number of general and scenario-specific factors were considered. These include projected balance sheet movements, projected provision coverage levels and projected default flows. Furthermore, the mix of application of internal models (either advanced or foundation) or the standardised approach as well as the asset types to which those approaches are applied, were incorporated in the analysis.

The analysis also explicitly takes into account how responsive banks' own internal models are to changes in the economic cycle – which is driven by the scenarios. In addition, consideration was given to a number of other factors, including: the Irish government's COVID-19 Credit Guarantee Scheme introduced in response to the pandemic; the introduction of supportive regulatory measures such as the extended use of the SME supporting factor announced as part of the CRR 'quick fix', which came into effect in June 2020 and the impact on RWA of any loan sales or securitisations or other upcoming regulatory changes announced and implemented by Irish banks in 2020.

Assessing the impact of the scenarios on RWAs, as at the end of 2022, RWAs are projected to remain at approximately the same level as in 2019 in the baseline scenario, and decreases just under 8% in the adverse scenario. The RWA movements factor in bank specificities including the level of model use in each firm, as well as features of the scenarios themselves such as projected movements in overall balance sheet size.

8 Key results

The key results of any assessment of banking sector resilience are capital depletion levels, and the relative importance of the underlying factors described in section 3 to 7 above.

Figure 6 reports CET1 depletion across the baseline and adverse scenarios, presented in "waterfall" style to highlight the contribution of key underlying factors. The baseline scenario leads to a system-wide CET1 ratio of 12.6 per cent. This compares to Total SREP Capital Requirements (TSCR) – on an equivalent basis in terms of the definition of capital – that average 6 per cent across

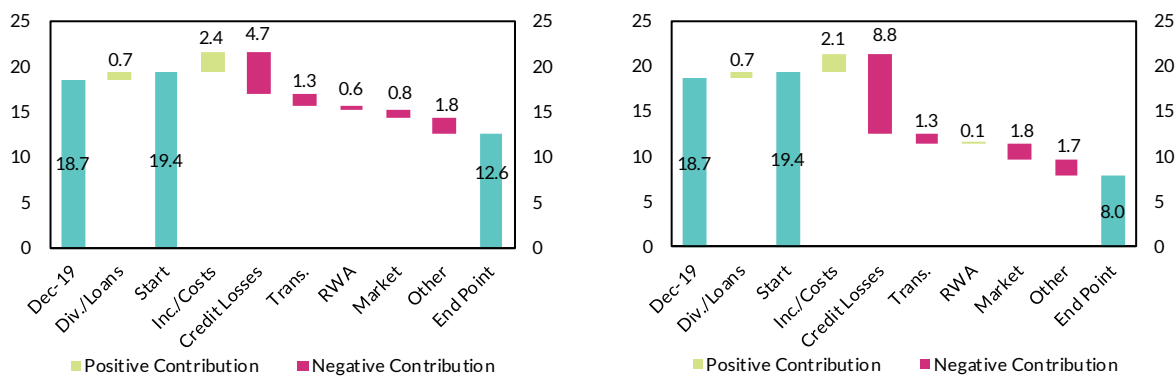
¹² This includes application of the 'prudential filter' which reduces the capital impact for unrealised gains and losses on holdings of Sovereign securities. The filter is applied as follows: (100% from 1 Jan 2020 to 31 Dec 2020, 70% from 1 Jan 2021 to 31 Dec 2021 and 40% from 1 Jan 2022 to 31 Dec 2022).

the institutions. The impact of the adverse scenario is much more significant, with the system-wide transitional CET1 capital ratio projected to fall to 8 per cent over the course of the scenario horizon

The magnitude of credit losses is the key driver of overall capital developments, reflecting the importance of lending in Irish banks' total asset base. Impairments contribute 4.7 and 8.8 percentage points to baseline and adverse capital depletion, respectively. The mitigating effect of income generation (net of expenses) is to contribute 2.4 and 2.1 percentage points to system-wide CET1 capital across the two scenarios. Market risk shocks are also important, contributing 0.8 and 1.8 percentage points to CET1 depletion across the scenarios, respectively.

Part of the fall in the system-wide capital ratio stems from factors that are expected to happen, irrespective of the precise shock or scenario. For example, the projections incorporate the impact of factors such as the phase-in arrangement for the definition of regulatory capital or changes in RWAs and provisions reflecting the way in which risk is measured. Together, these account for between 3 and 4 percentage of the fall in the CET1 ratios in the two scenarios.

Figure 6: CET1 capital depletion results for baseline and adverse scenarios, Central Bank of Ireland 2020 resilience assessment

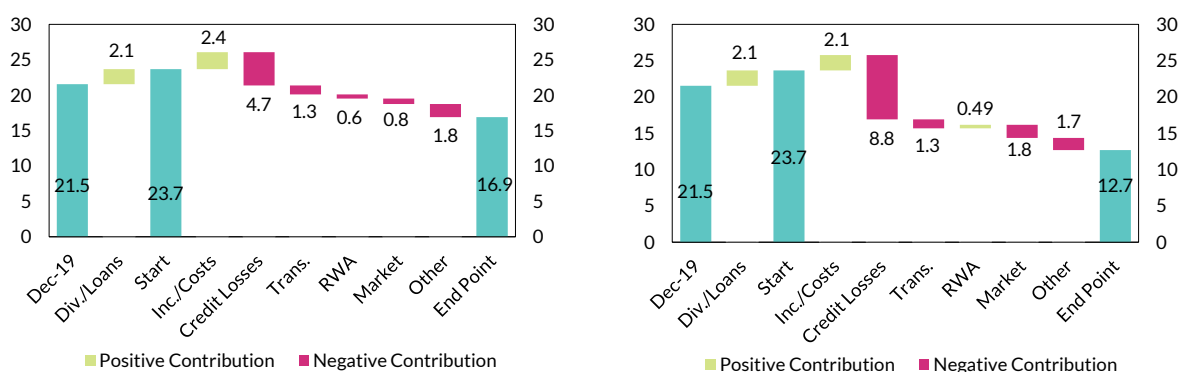


Source: Central Bank of Ireland

Notes: CET1 ratios over the scenario horizon. Green bars imply a positive contribution to the capital ratio, while red bars imply a negative contribution. Opening CET1 ratio reported on a transitional basis. Five retail banks included in resilience assessment. The starting point includes the impact of dividend reversals, loan sales and securitisations ("Div./Loans"). "Inc./Costs" refers to differential between income and costs. "Trans." refers to the impact of Capital Requirements Directive transitional effects e.g. Deferred Tax Assets and IFRS 9. "RWA" refers to changes in risk weighted assets. "Market" refers to market risk losses. "Other" captures the impact of a number of items including: the operational risk charge; the non-deduction of certain software assets as outlined in the CRR quick fix and non-scenario related factors affecting the provision on legacy non-performing loans.

Figure 7 reports the assessment results in terms of Total Capital, rather than CET1 capital. The Central Bank has carried out a dual assessment using both definitions, as regulatory thresholds in both definitions are relevant when considering the resilience of the system to shocks. In the baseline scenario, Total Capital falls to 16.9 per cent, relative to a TSCR of 10.8 per cent on average across the system. The impact of the adverse scenario is again more severe, with Total Capital ratios falling to 12.7 per cent.

Figure 7: Total Capital depletion results for baseline and adverse scenarios, Central Bank of Ireland 2020 resilience assessment



Source: Central Bank of Ireland

Notes: Total Capital ratios over the scenario horizon. Green bars imply a positive contribution to the capital ratio, while red bars imply a negative contribution. Opening Total Capital ratio reported on a transitional basis. Five retail banks included in resilience assessment. The starting point includes the impact of dividend reversals, loan sales and securitisations ("Div./Loans"). "Inc./Costs" refers to differential between income and costs. "Trans." refers to the impact of Capital Requirements Directive transitional effects e.g. Deferred Tax Assets and IFRS 9. "RWA" refers to changes in risk weighted assets. "Market" refers to market risk losses. "Other" captures the impact of a number of items including: the operational risk charge; the non-deduction of certain software assets as outlined in the CRR quick fix and non-scenario related factors affecting the provision on legacy non-performing loans.

9 Conclusion

This paper has presented the Central Bank of Ireland's toolkit for assessing the resilience of the retail banking system in Ireland. Key results of the 2020 resilience assessment have been included in the paper. The exercise does not incorporate the range of possible actions that banks may take in response to shocks to their balance sheets such as those modelled. Rather, the aim of the exercise is to assess the capacity of available capital buffers to absorb shocks relating to known future developments and modelled sensitivities to macroeconomic developments.

The modelling capacity underlying these results has been under development for a number of years, with previous iterations used in a range of assessments since the last crisis. The toolkit described in this document will be used on an ongoing basis by the Central Bank to inform its financial stability and macroprudential policy judgments.

Bibliography

Aiyar, S., Calomiris, C.W. and Wieladek, T., 2014. Does macro-prudential regulation leak? Evidence from a UK policy experiment. *Journal of Money, Credit and Banking*, 46(s1), pp.181-214.

Aiyar, S., Calomiris, C.W. and Wieladek, T., 2016. How does credit supply respond to monetary policy and bank minimum capital requirements?. *European Economic Review*, 82, pp.142-165.

Bergin, A., Conroy, N., Garcia Rodriguez, A., Holland, D., McInerney, N., Morgenroth, E. and D. Smith., 2017. COSMO: A new COre Structural MOdel for Ireland, ESRI, Feb 2017. Working Paper No. 553, Economic and Social Research Institute.

Budnik, K. B., et al., 2020. Banking euro area stress test model. European Central Bank Working Paper 2469.

Central Bank of Ireland. Quarterly Bulletin 4, Central Bank of Ireland, October 2020. <https://www.centralbank.ie/publication/quarterly-bulletins/quarterly-bulletin-q4-2020>

European Central Bank. COVID-19 Vulnerability Analysis Results Overview, ECB, 28 July 2020. https://www.bankingsupervision.europa.eu/press/pr/date/2020/html/ssm.pr200728_annex~d36d893ca2.en.pdf

Gaffney, E., Kelly, R. and McCann, F., 2014a. A transitions-based framework for estimating expected credit losses. Research Technical Paper 16RT14, Central Bank of Ireland.

Gaffney, E., Kelly, R., McCann, F. and Lyons, P., 2014b. Loan loss forecasting: a methodological overview (No. 13/EL/14). Central Bank of Ireland.

Gaffney, E. and McCann, F., 2019. The cyclical in SICR: mortgage modelling under IFRS 9 (No. 92). European Systemic Risk Board.

Gambacorta, L. and Mistrulli, P.E., 2004. Does bank capital affect lending behavior? *Journal of Financial intermediation*, 13(4), pp.436-457.

Gerali, A., Neri, S., Sessa, L. and F. M. Signoretti, 2010. Credit and banking in a DSGE model of the euro area. *Journal of Money, Credit and Banking*, 42 (1), pp.107-142.

Kelly, R. and O'Malley, T., 2016. The good, the bad and the impaired: A credit risk model of the Irish mortgage market. *Journal of Financial Stability*, 22, pp.1-9.

Khwaja, A.S., and A. Mian, 2008. Tracing the impact of bank liquidity shocks: Evidence from an emerging market. *American Economic Review* 98.4 (2008): 1413-42.

McCann, F., 2014. Modelling default transitions in the UK mortgage market. Research Technical Papers, 18RT14. Central Bank of Ireland.

Santos, J.A. and A. Winton, 2008. Bank loans, bonds, and information monopolies across the business cycle. *The Journal of Finance*, 63(3), pp.1315-1359.

T: +353 (0)1 224 6000

www.centralbank.ie

publications@centralbank.ie

Bosca PO 559, Baile Átha Cliath 1, Éire
PO Box 559, Dublin 1, Ireland



Banc Ceannais na hÉireann
Central Bank of Ireland

Eurosystem