CURRENT EXPECTED CREDIT LOSSES (CECL)

BENCHMARKING SURVEY

INTRODUCTION – EXEC SUMMARY

- **Surveying industry readiness for CECL**

We are pleased to present the results of our CECL survey, which assesses U.S. banks' readiness as of October 2018 to implement the new current expected credit loss (CECL) accounting standard issued by the Financial Accounting Standards Board (FASB) under Accounting Standard Update (ASU) 2016-132.

Accenture, Global Credit Data (GCD), and the Institute of International Finance (IIF) partnered to conduct this survey to provide insights into the challenges faced by the banks across data management, model development and technology/implementation. We also sought to identify emerging trends as lenders move towards CECL compliance. Twenty-six banks participated in the survey representing over three quarters of the U.S. lending market.

This paper outlines the survey results across all participating banks and provides insight into readiness, modeling, and implementation choices of financial services institutions on CECL.

We hope that the insights gained from the survey results will assist banks in understanding the variety of choices to be made in CECL implementation and where they stand in relation to their peers.

- **CECL modeling methodologies depend on asset classes, implementation and validation are in process**

Complying with the new standard will require changes across numerous facets of a bank's operations, including finance, IT, risk, and the business units. Equally significant will be the financial impacts on impairment estimates, capital ratios, and the volatility of profit and loss.

At the time of survey (18 months before the dead line) most of institutions are well engaged in defining their methodologies and developing their models, though they are in adjustment and calibration testing phase. A minority still must progress a lot and may face delays. Very few went through final implementation and validation.

Models' frameworks contemplated or developed by institutions are diverse, as they are adapted to the different risk dynamics of the various portfolio segments.

- **The distinction wholesale/retail dictates differences in methodologies and model architectures**

When available, EL models leverage the existing stress test CCAR/DFAST frameworks segments and data, or the AIRB models.

Retail portfolio are mostly segmented by products types and EL is directly modeled following either a PD-LGD approach or a charge-off approach. In wholesale portfolios EL calculation follows the stress test segmentation (along geographies, industries, etc.), and each EL components are modeled separately: PD, LGD, EAD. Most institutions use PIT PD, PIT LGD and PIT EAD models, and most include forward looking features (a minority don't include forward looking features). Interesting to note that PIT PD models are mostly internally developed, with very few use of vendor models.

LGD PIT models very frequently leverage existing AIRB models, descaling the margins of conservatism, and adding forward looking features, often by fitting directly macro-economic variables (MEV) directly into the loss model components. It must be noted that EAD models are mostly specific and can rarely be based on preexisting EAD models developed for STT or capital.

- **Models target mostly short-term projection, and mean-revert for long-term, pending adjustments**

EL forecasts are mostly short-term horizons (up to 3 years), with models' architecture and calibration generally tuned to be EL-long-term-average-reverting above the 5 years' time limit. The methodologies are mostly quantitative or hybrid. Very small minority of models are based on qualitative methods.

There is not yet a strong pattern for model adjustments or overlay to account for model limitations toward extreme volatile scenarios and non-linear risks. Most of institutions seem to not have tackle the issue yet (at the time of survey).

- **Next study will test participants' models on a benchmark portfolio**

Phase 2 of the CECL benchmarking will focus on comparing the actual results of participants' CECL implementation to other banks using a benchmark portfolio. It will provide an even better gauge of the effect of different implementation choices.

- **Customize your benchmark study**

In addition to this report, participating banks receive an anonymized copy of the complete results in EXCEL format, so they can conduct their own analysis. We hope to share any insights participants discover after analyzing the data.

Participating Banks*

- Bank of America
- Bank of Nova Scotia
- BB&T
- BMO
- Citigroup
- Citizens Bank
- Comerica Bank
- Credit Suisse
- Deutsche Bank
- Fifth Third Bank
- Goldman Sachs
- HSBC
- JP Morgan Chase & Co.
- Keybank
- Morgan Stanley
- M&T Bank
- MUFG Union Bank
- Peoples United Financial, Inc.
- PNC Bank
- Regions Bank
- State Street
- SunTrust Bank
- Synchrony
- U.S. Bank
- BOKF NA
- Zions Bancorporation

FIGURES SUMMARY

As detailed in this report, the survey covered a wide range of CECL modelling choices, including lifetime expected credit loss, point in time (PiT) probability of default, loss given default and exposure at default modelling. Aside from parameter choices there were also questions on model execution, including technology/platform and data requirements.

Overall, the results show progress towards CECL implementation choices but less progress in actual implementation. With 18 months to go, most banks are focused on gap analysis, developing models, and adjusting existing models. The 2019 test runs, and parallel runs, will require many banks to accelerate their efforts if they are to meet their implementation goals. We saw a similar situation at this point with the implementation of IFRS 9 where increased efforts (spurred by regulatory concerns) were required to complete implementation. Even now, some IFRS 9 banks are struggling with more complicated issues such as aggregation & validation.
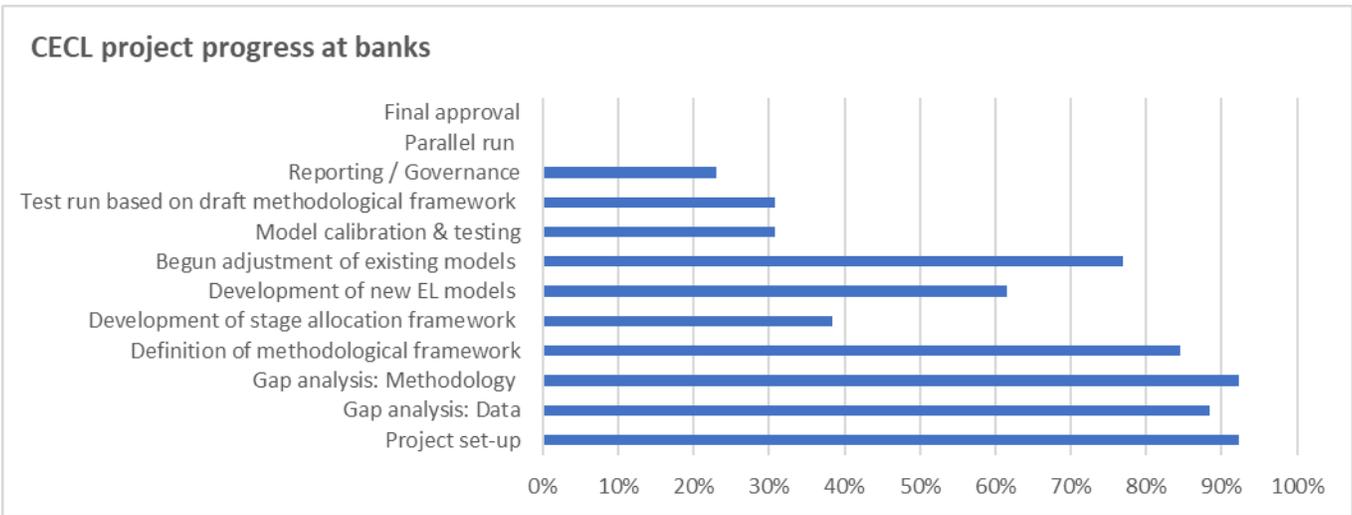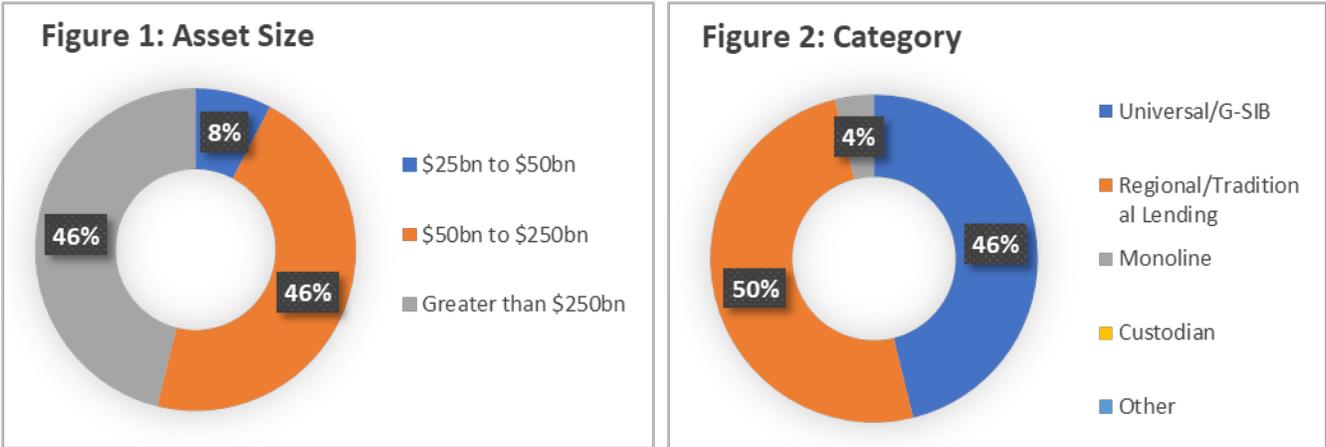

The survey results indicate these key findings:

- **R&S horizon forecast length:** For 38% of the banks, the forecast period is 2-3 years. However, 27% of banks only forecast the next 1-2 years which is less than the CCAR forecast period of nine quarters. Most of these banks (88%) tend to be medium sized banks with total assets between $50bn and $250bn.
- **Scenarios used in CECL modelling:** 30% of the participating banks create special scenarios for CECL purposes. They don't re-use scenarios from other processes such as budgeting or stress testing. For sources of macroeconomic scenarios, banks mostly rely on internal economics or on the published forecasts of professional firms and the government. Generally, the bigger the bank, the more they rely on internal forecasts.
- **Differing probabilities in scenarios:** Assigning different probabilities to a scenario is challenging. Almost 27% of the banks are assigning asymmetric probability for upside and downside probability and do not differentiate the probabilities by different regions / countries. Only 8% of the banks are assigning asymmetric probabilities to scenarios with different probabilities assigned to different regions/countries.

21% of the banks have not yet decided on whether to assign different probabilities to different regions/countries.

- **Qualitative overlay:** More than 60% of the banks have not yet made any decision on how to model the qualitative overlay. Qualitative overlay is one of the last elements to model for many banks.
- **PD modelling:** 40% of the banks are building separate PiT PD models and only 15% of the banks are using the TTC PD models as a starting point. This methodology differs from our work on IFRS 9 in Europe where many banks use their TTC-based capital models as a base for their PD modelling. In the US banks are more familiar with PiT modeling from stress testing.
- **LGD modelling:** A large number of banks (55%) are using actual loss data for their modelling using the original cash flows.

FIGURES DETAILS AND ANALYSIS

We conducted an online survey of executives across top US banks to assess how banks are preparing for CECL implementation and its potential impacts. The banks surveyed covered a diverse range of institutions, spanning different volumes of total assets (Figure 1) and different bank categories (Figure 2):

Figure 1: Asset Size
- $25bn to $50bn — 8%
- $50bn to $250bn — 46%
- Greater than $250bn — 46%

Figure 2: Category
- Universal/G-SIB — 46%
- Regional/Traditional Lending — 50%
- Monoline — 4%
- Custodian
- Other

The survey was organized around the various steps in the expected loss modelling process and covers both retail and non-retail portfolios.

It covers the following topics:

1. Introduction
2. Scenarios & forward-looking information
3. Modelling lifetime expected loss (general questions)
4. Segmentation
5. 1-year and multi-year PD
6. Lifetime LGD
7. Lifetime EAD
8. Definition of "lifetime"
9. Dealing with specific portfolios

With member banks still in "project mode", it is not surprising that they answered "We have not decided yet" to some of the detailed methodological questions in this survey.

Forward-looking scenarios

39% of the banks use two to four forward-looking scenarios for modelling expected losses under CECL. More than 15% of the banks have not yet decided on the number of scenarios. Banks are mostly relying on internal economists (50%) or professional / government-published forecasts as sources of macroeconomic scenarios (42%

of the cases). It appears that the bigger the bank, the more it relies on internal forecasts. Also, 20% of the banks use the same scenarios for CECL modelling as they do in the budgeting process and 15% of banks use the same scenarios for CECL modelling as use in internal stress testing (base case), while more than 30% of the banks create special scenarios for CECL impairment modeling. GDP, unemployment, interest rates, housing prices, and commercial property rents are the main macroeconomic indicators used in each scenario.
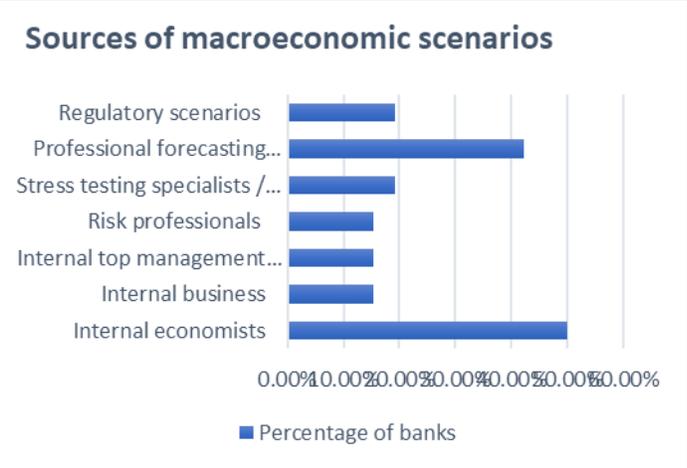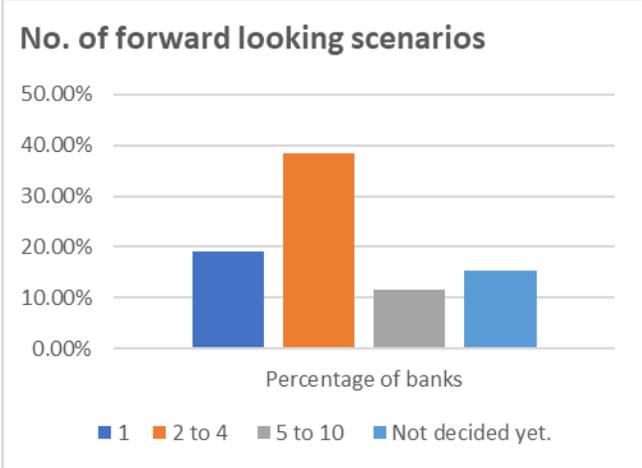
When asked about the R&S horizon forecast length and forecast modelling, 38% of the surveyed banks report their forecast period length to be 2-3 years. Notably, several banks (27%) only forecast the next 1-2 years. Of these banks, 88% are medium sized banks with total assets between $50bn and $250bn and they belong to the regional/traditional lending category.

Approximately 46% of the banks use quantitative/ statistical techniques to model forecasts, while 42% of banks' forecasts are hybrid modeled and expert based, as indicated in the figures below.
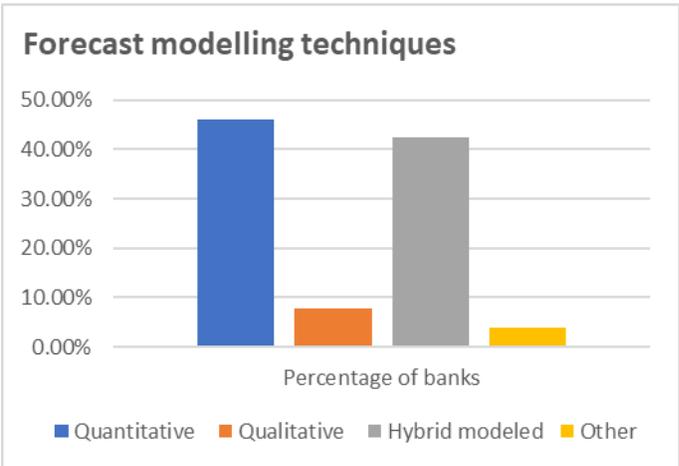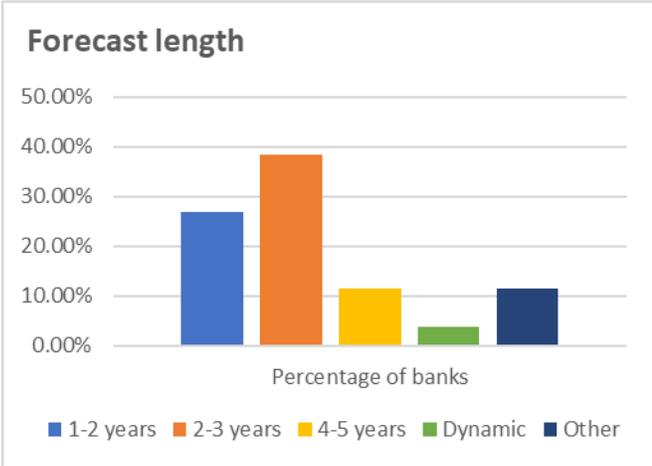
To account for non-linearity, 19% of banks plan to model an additional overlay, but an equal percentage of banks do not plan to model an additional overlay. More than 60% of the banks remain undecided about whether to create an overlay model. 34% of these banks are using multiple scenarios for modelling expected losses to deal with non-linearity. In addition, 12% of the banks re-calibrate their overlay every quarter, but the others haven't yet reached this point in their CECL modelling life-cycle.

One main argument in the discussion on the "optimal number" of scenarios is how to best consider a possible non-linear relationship between key components of ECL (PD, LGD or EaD) and the relevant economic parameter or credit cycle indicator. The possible non-linear relationship between the economic factor in the scenario (e.g. unemployment rate, GDP, credit cycle indicator, etc.) and the PD factor results in a convex PD probability distribution, where negative parameter/indicator outcomes have a much higher impact on the PD than positive parameter/indicator outcomes. For example, consider that for a portfolio the average default rate (ODF) per annum is measured at 1%, which is known to decrease to 0.8% p.a. during the most favorable economic conditions but increase to 5% during the least favorable times (negative parameter outcomes).

Majority of the banks would revert to long-term portfolio loss rate for those instruments where maturity is beyond the forecast period. And only a minority (8%) would use long-term macroeconomic averages as inputs into their models.

Modelling life-time expected losses

Respondents answered general questions about modelling lifetime expected losses. It was observed that the banks are using different modelling methods for different portfolios. Most of the banks are deploying PD/LGD - based on DFAST/CCAR and discount cash flow modelling methods for varied portfolios. It is worth noting that PD/LGD applications to loss and discounted cash flow approaches are not mutually exclusive; some banks are planning to deploy both approaches.

The methodologies and significant assumptions used in the calculation of the "expected loss" allowance varies depending on the loan portfolio (retail/wholesale) held by the bank. It can be seen that almost all the participating banks plan to model each individual component (PD, LGD, EAD) separately for wholesale/non-retail, while 15% of the banks plan to model/estimate expected loss on an overall basis for their retail portfolios. These are mostly medium sized banks with total assets between $50bn and $250bn that belong to the regional/traditional lending category. More than 69% of banks make all components (PD, LGD and EAD) PiT and forward-looking for their wholesale portfolios, while 8% of the banks make only PD PiT forward looking for their wholesale portfolios. 50% of the banks make all the components PiT and forward looking for their retail portfolios, while 8% make only PD PiT forward looking for their retail portfolios.
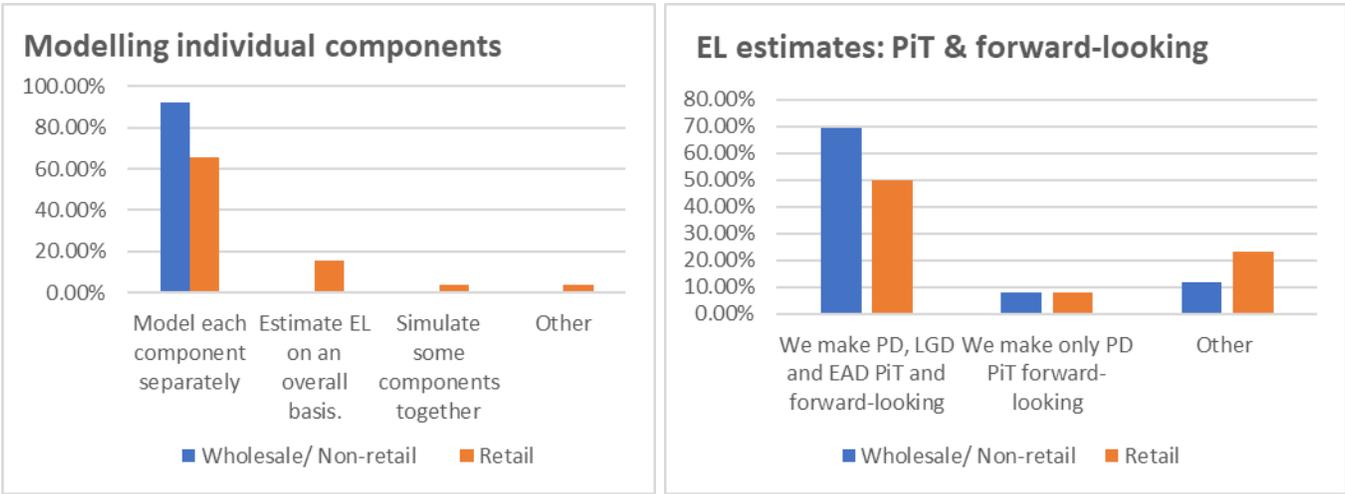
35% of the banks intend to build the life-time expected loss model on the same model/infrastructure used for stress testing while 46% of banks would be partly building on the same models i.e. some elements will be the same and some would be different. However, a minority (15%) responded that they will build new models / infrastructure given the different requirements.

Segmentation

Most of the banks surveyed use the same segmentation they use for stress testing/CCAR modelling. Some of the banks use a less granular level of regulatory capital/BASEL modelling for CECL and some use a more granular level of regulatory capital/ BASEL modelling and stress testing/CCAR modelling. Banks selected different levels of segmentation for both Retail as well as Non-Retail portfolios for modelling PD, LGD, and EAD under CECL. We also surveyed the levels of segmentation based on geography and industries for both Retail and Non-Retail portfolios. Most of the banks using geographic segmentation have used continent, country, and regional level segmentation. 38% of the banks have 5-10 segments for their Non-Retail/wholesale portfolios based on industries while close to 54% of the banks did not segment based on industries for their retail portfolios.
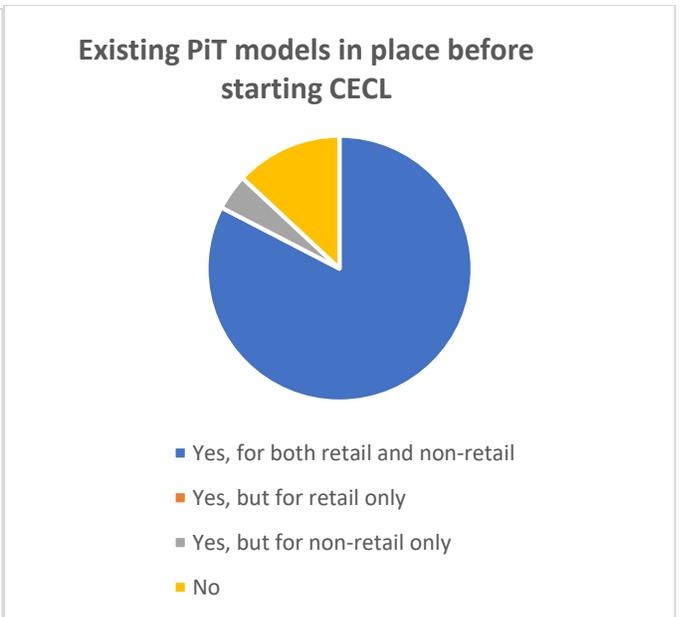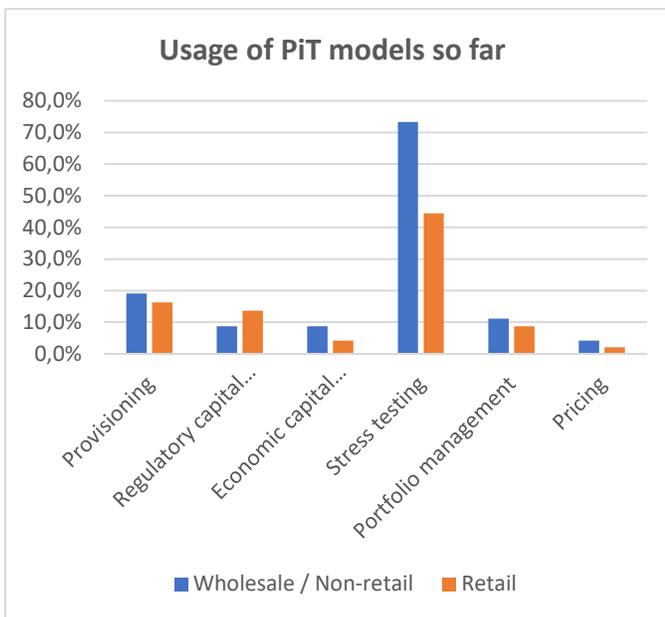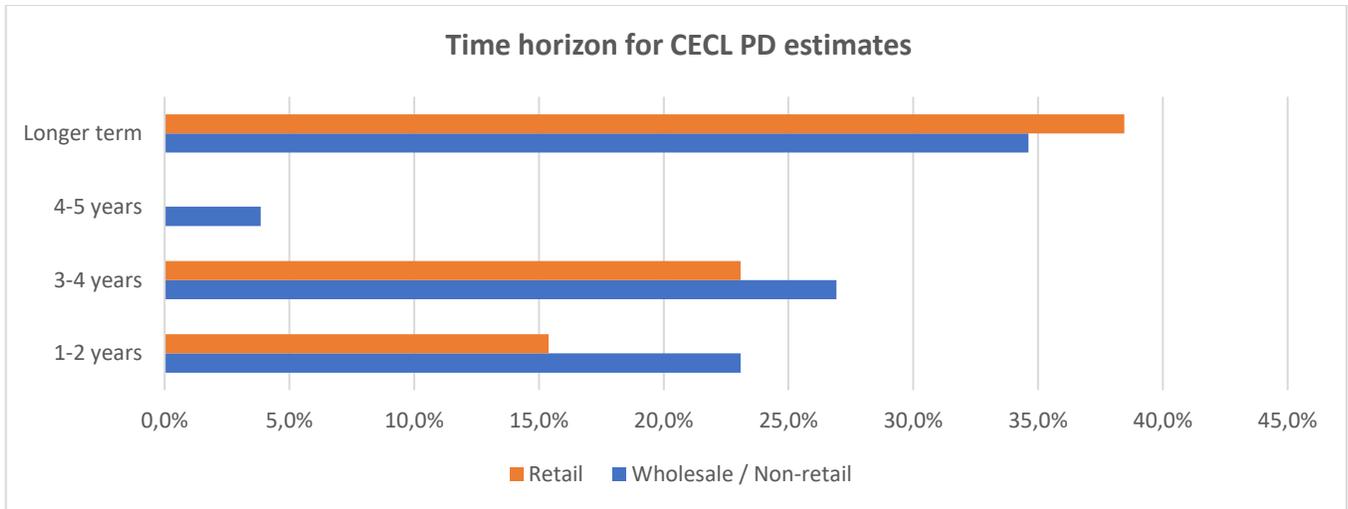
Segmentation for Non-Retail portfolios
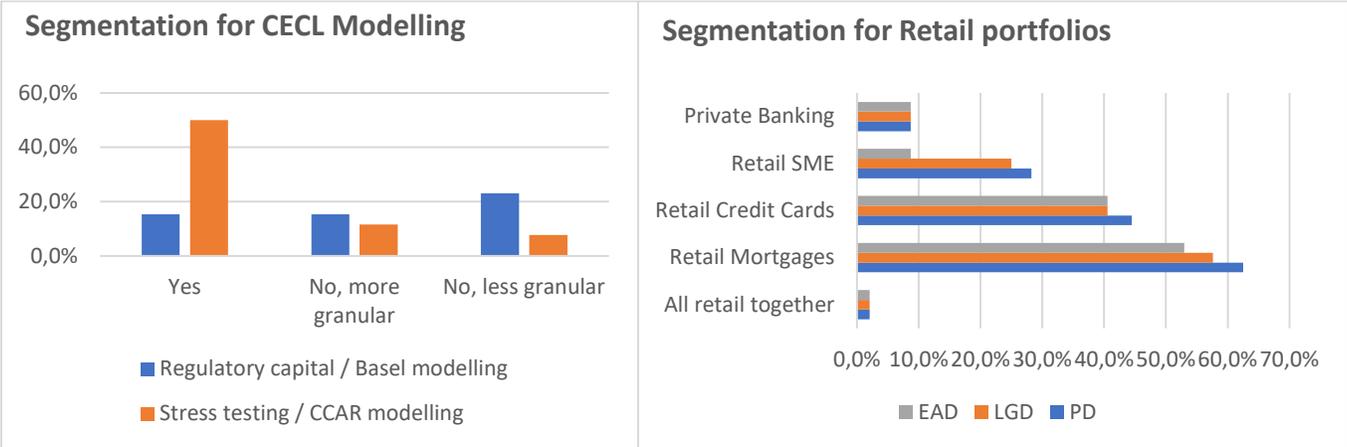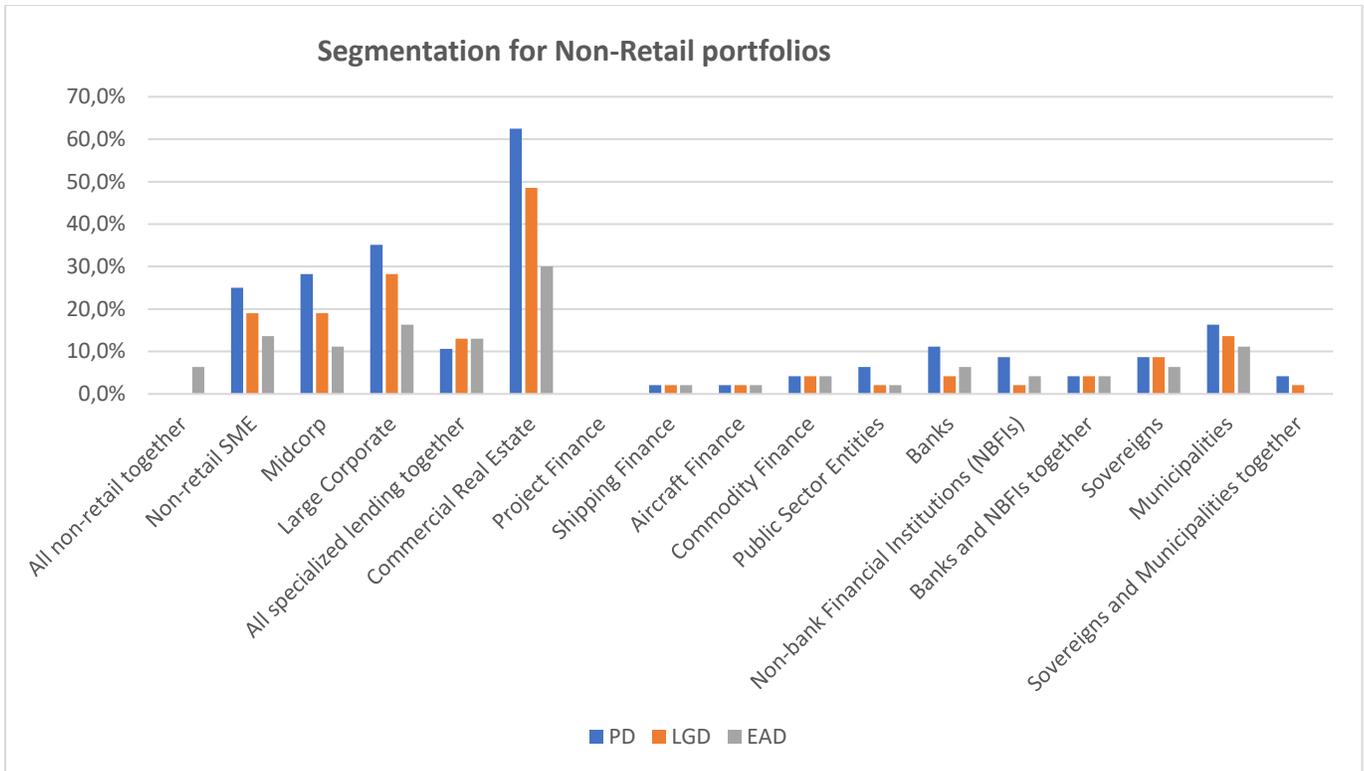
1-year and multi-year PD

The survey provided an interesting insight into how banks are modelling their one-year and multi-year PD for CECL implementation. Most of the banks (73%) already had PiT PD models for both retail and non-retail portfolios before starting to work on CECL. For Retail and Non-Retail portfolios, most of the PiT models have been built for multiple purposes of provisioning, regulatory capital management, economic capital management, portfolio management, stress testing and pricing. However, majority of the banks have not yet decided if they plan to have different PiT models for the same portfolio for different purposes.

More than 92% of the banks would not consider using vendor models for the PD components of ECL. Most of the banks are using external or peer data for their PD models for CECL-- albeit for certain portfolios and not necessarily all of them. Almost 54% and 46% of the banks are building models from the same source data to ensure consistency between TTC and PiT PD estimated for their Wholesale/Non-retail and retail portfolios respectively.

Time horizon for CECL PD estimates

Usage of PiT models so far

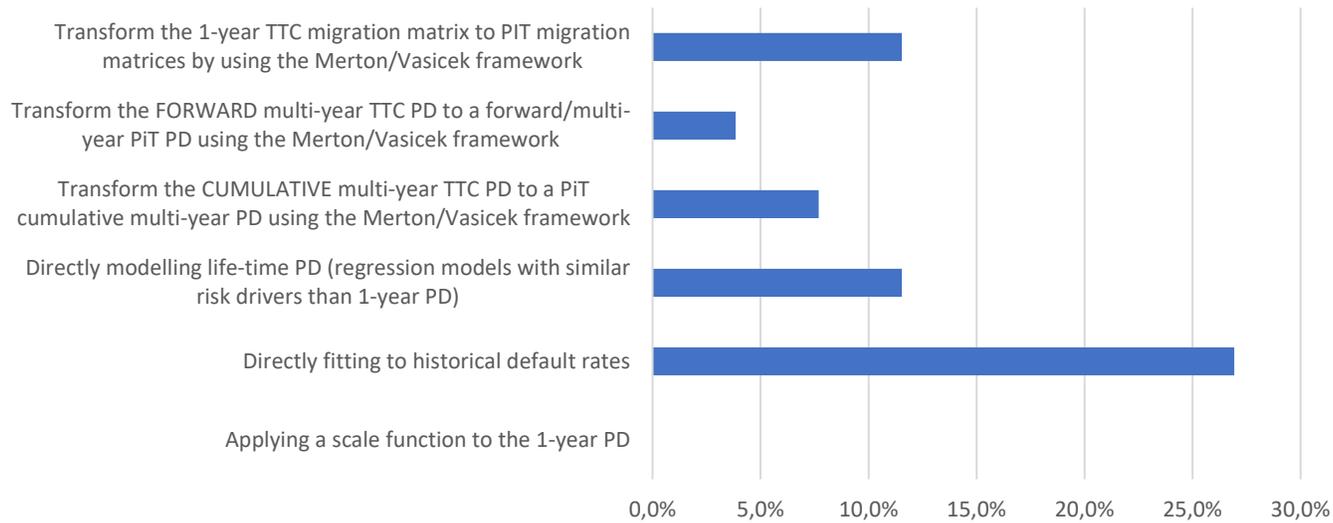Existing PiT models in place before starting CECL

Majority of the banks' PiT PD models take into consideration a time lag between macroeconomic conditions and default rates and the models differ between high-risk ratings/segments vs. low-risk ratings/segments.

There is no consensus among the banks regarding the ideal time horizon for the CECL PD estimates, with a majority choosing longer terms greater than 5 years for both Non-retail and retail portfolios. Also, almost half of the banks (46%) surveyed used convergence to portfolio average default rate to deal with the years after the forecast of the scenario ends until the end of maturity of the financial instrument.

There are varied approaches to how a bank computes multi-year PD for retail and non-retail portfolios. The CCAR experience differentiates the PD approaches taken in the U.S. compared to Europe. Both in Retail and Wholesale portfolios the most common approach for CECL is directly fitting macroeconomic variables to loss or default rates.

Multi-year PD estimates for Non-retail portfolios

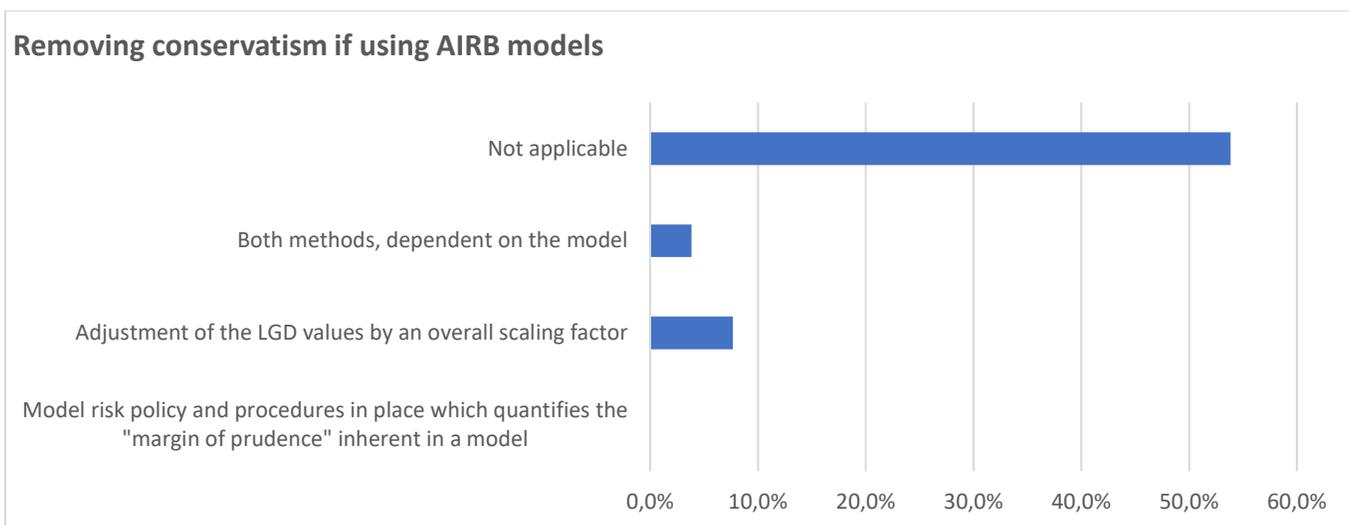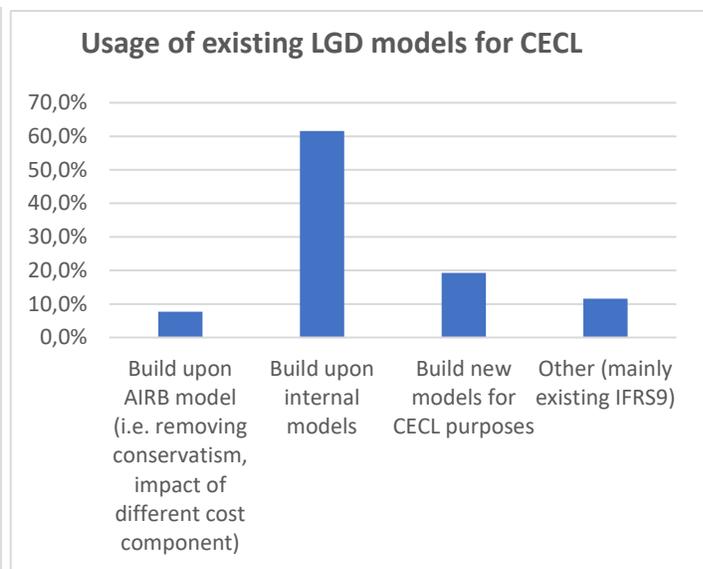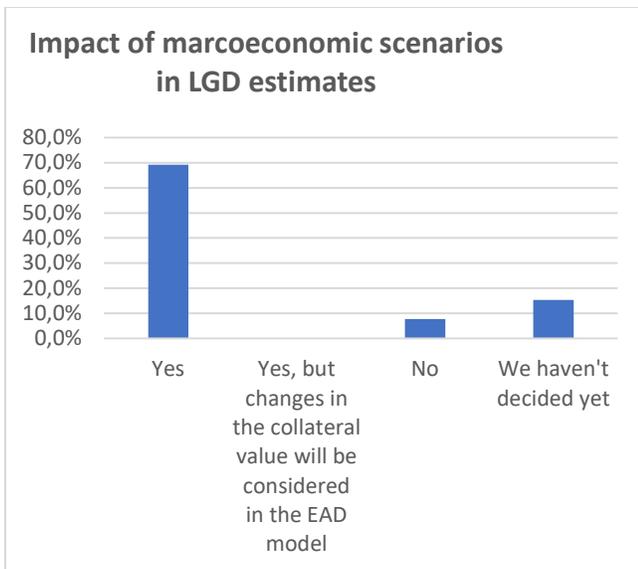Transform the 1-year TTC migration matrix to PIT migration matrices by using the Merton/Vasicek framework

Transform the FORWARD multi-year TTC PD to a forward/multi-year PiT PD using the Merton/Vasicek framework

Transform the CUMULATIVE multi-year TTC PD to a PiT cumulative multi-year PD using the Merton/Vasicek framework

Directly modelling life-time PD (regression models with similar risk drivers than 1-year PD)

Directly fitting to historical default rates

Applying a scale function to the 1-year PD

Multi-year PD estimates for Retail portfolios

Markov chain model

Default/loss ever approach

EMV (Exogenous, Maturation and Vintage) approach

Runoff triangles approach (vintage curve)

Hazard function approach

Merton/Vasicek framework

Directly modelling life-time PD (regression models with similar…

Directly fitting to historical default rates

Applying a scale function to the 1-year PD
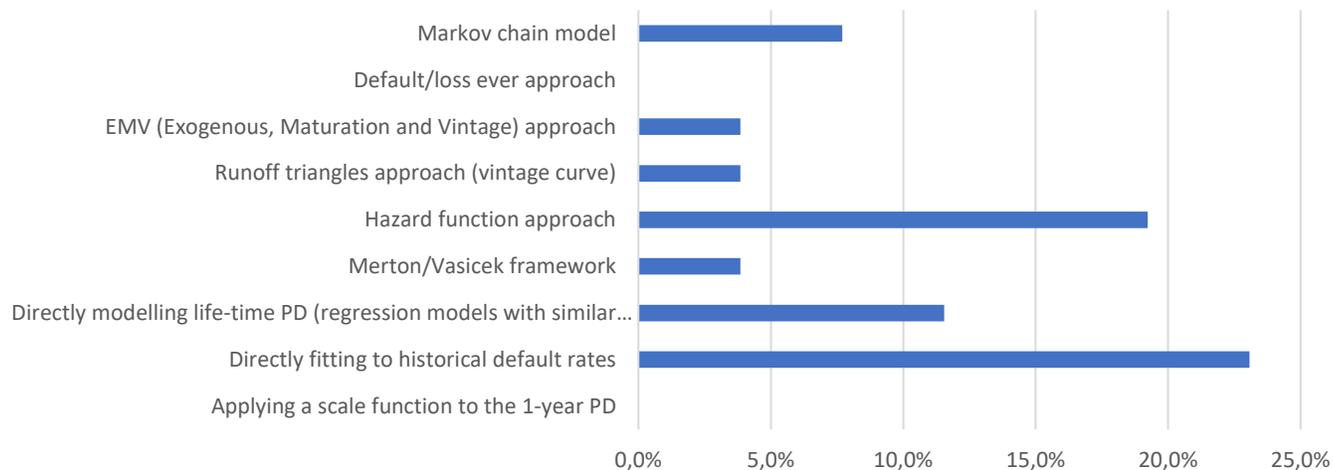
Modelling lifetime LGD

Most of the banks plan to build LGD models for CECL purposes based on existing internal models. While a small percentage of banks plan to build LGD models on AIRB/regulatory capital models, almost 19% of the banks plan to build new models for CECL purpose. Banks using AIRB/Regulatory capital models for CECL purpose, plan to remove the conservatism from the estimation by using either existing model risk policy and procedures that quantify the "margin of prudence" inherent in a model or by adjusting the LGD values by an overall scaling factor; depending on the model.
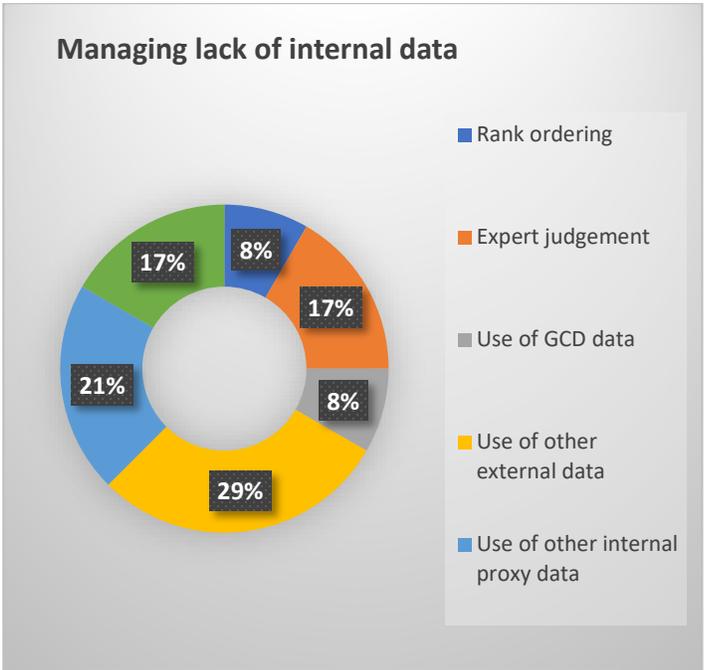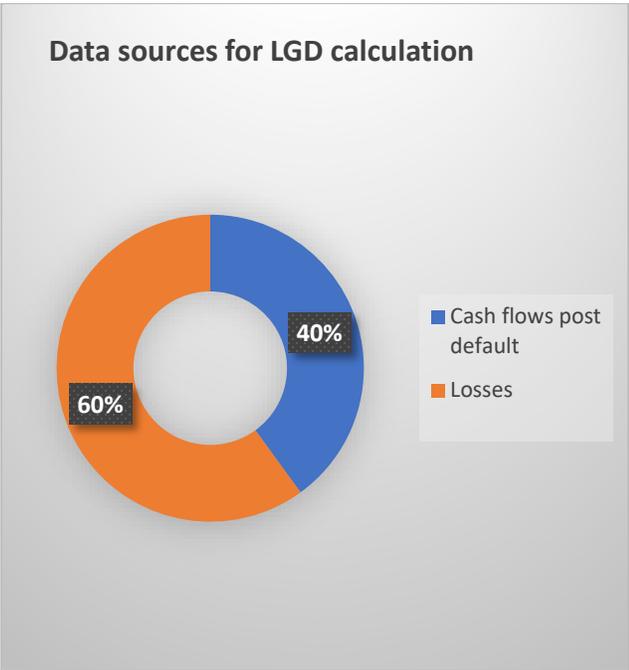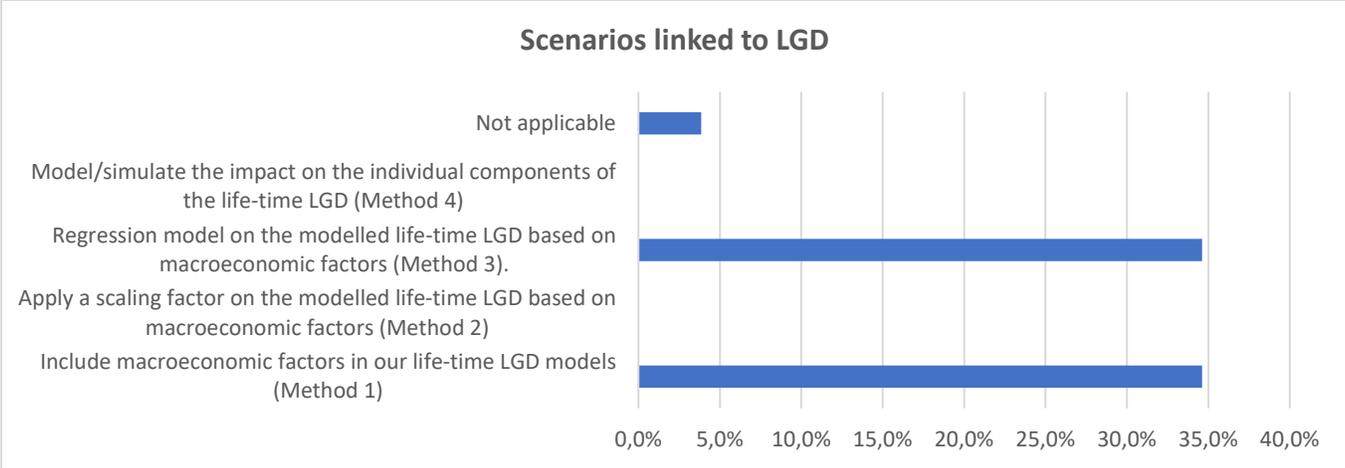
69% of the banks have either included or plan to include the impact of the forward-looking information, macroeconomic information/scenarios in the LGD estimates.

Impact of marcoeconomic scenarios in LGD estimates

Usage of existing LGD models for CECL

Removing conservatism if using AIRB models

For all the banks that are including macroeconomic scenarios in the LGD estimates, the scenarios are getting linked to the LGD by: -

- Including macroeconomic factors in their life-time LGD models (Method 1)
- Applying a scaling factor on the modelled life-time LGD based on macroeconomic factors (Method 2)
- Using a regression model on the modelled life-time LGD based on macroeconomic factors (Method 3)
- Modelling/simulating the impact on the individual components of the life-time LGD (Method 4)

In modelling LGD over the life of the loan, most of the banks do not use a "term structure" of LGD over the life of the loan. Rather they use a flat/average LGD over the life of the loan. Some banks also factored in macroeconomic conditions while modelling the term.

Scenarios linked to LGD

Not applicable	~4%
Model/simulate the impact on the individual components of the life-time LGD (Method 4)	
Regression model on the modelled life-time LGD based on macroeconomic factors (Method 3).	~34.5%
Apply a scaling factor on the modelled life-time LGD based on macroeconomic factors (Method 2)	
Include macroeconomic factors in our life-time LGD models (Method 1)	~34.5%

0,0% 5,0% 10,0% 15,0% 20,0% 25,0% 30,0% 35,0% 40,0%

Data sources for LGD calculation

- Cash flows post default — 40%
- Losses — 60%

Managing lack of internal data

- Rank ordering — 8%
- Expert judgement — 17%
- Use of GCD data — 8%
- Use of other external data — 29%
- Use of other internal proxy data — 21%
- (Green) — 17%

Most of the banks have been using losses data for their LGD calculation and are primarily compensating for the lack of internal data using external data or internal proxy data or a combination of all the above methods.

Modelling lifetime EAD

With respect to estimation, more than 65% of the banks estimate components like amortizing amount, prepays and paydown of balances. Most of the banks have specific EAD models under CECL for term products and revolving products. 25% banks have built or plan to build EAD models for CECL purposes based on their internal models, 20% banks plan to build new models for CECL purposes. 10% of banks use CCAR and IFRS models each. In case of revolvers, majority of banks uses Cap/Floor techniques to deal with the phenomenon of pay-downs of

credit in CCF/UAD estimation that may lead to outlier estimates. Forward looking, macroeconomic scenarios in EAD models are represented by following:
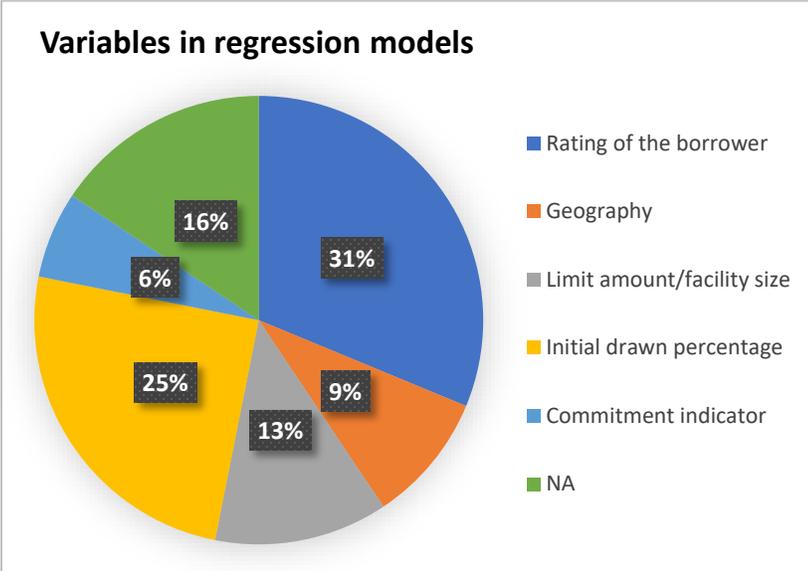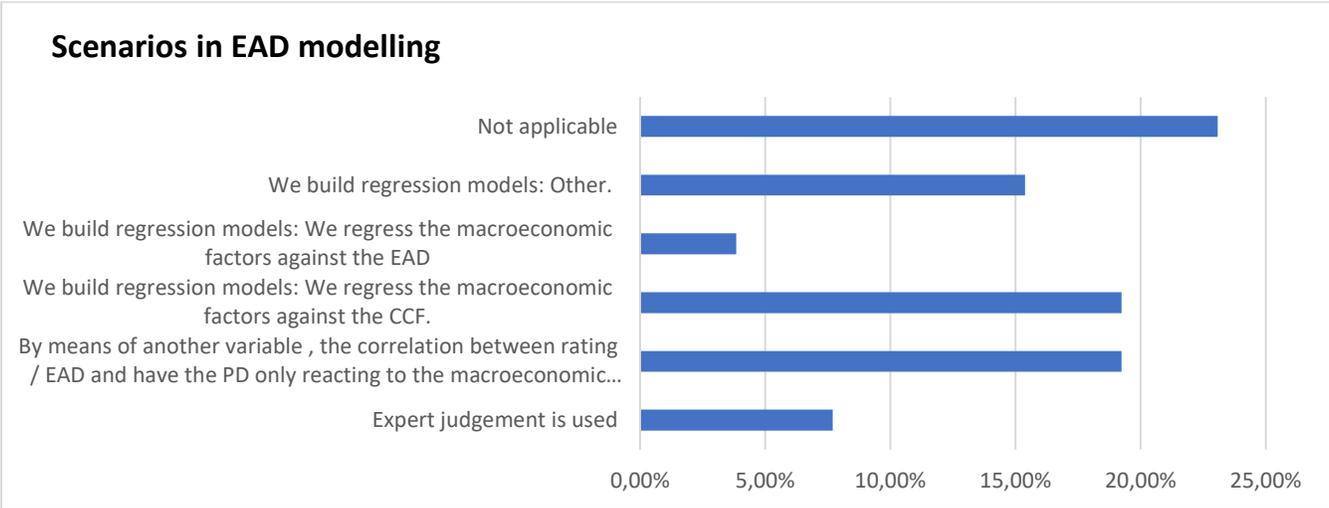
From the graph depicted above, 40% of the banks use regression models. Most banks use borrower rating and initial draw in their regression analysis.

Almost 50% of the banks have not decided on treating potential countercyclicality in EAD estimates. 25% of the banks always limit the CCF/Utilization to 1 and never include interest due. 35% of the banks haven't decided yet. The lack of internal data for some products is managed mostly by expert judgement or by using other internal proxy data. CECL does not allow reserves for unfunded commitments that are unconditionally cancellable as in credit cards.
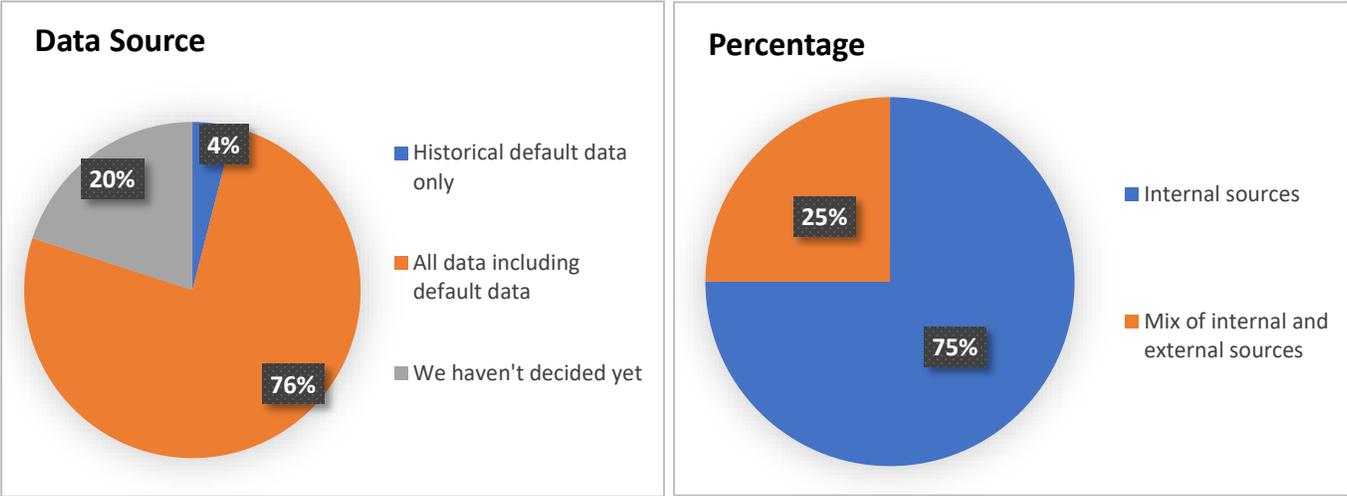

In such cases, 40% of the banks leave unfunded part completely and 20% of banks calculate it quantitatively using EAD types of models

Lifetime Period/ Period of Exposure

This section provides insight about lifetime/period of exposure for retail and non-retail portfolios. 40% of participants mentioned that all their non-retail portfolios had products with a stipulated contracted end date. 50% of the banks had few products without contract end dates. Some of these products were credit cards, overdraft protection, demand loans, revolving products, evergreen lines of credit etc. For those products without a contractual date, 40% of the banks had not decided how to estimate behavioral life. 40% of the banks had their own methodology to estimate it. Almost 45% of banks considers pre-payments in estimating the life time of a product either implicitly or explicitly. Exact modeling depends on the type of portfolio/product. With respect to
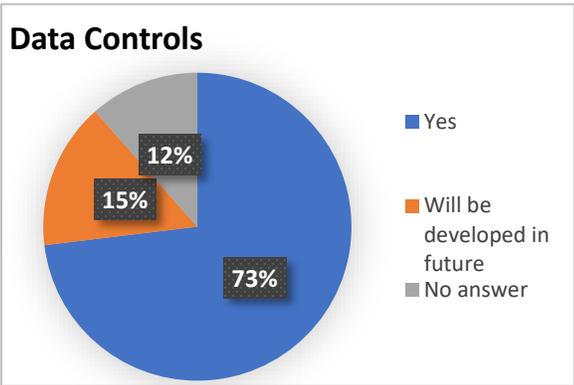
partial pre-payments, half of the banks had no facility to avail it. 35% of the banks allowed partial pre-payments. Various techniques were employed for estimating these partial pre-payments. These include, hazard approach. expert judgement, historical cohort payment behavior, loan amortization, EAD model estimates and aging of loans.

With respect to retail products, 25% of the banks were undecided on life time estimation. The rest had their own process to estimate it. Details the data sources used for estimation is given below.

Data Source

- Historical default data only — 4%
- All data including default data — 76%
- We haven't decided yet — 20%

Percentage

- Internal sources — 75%
- Mix of internal and external sources — 25%

Model execution platform / technology and data

This section deals with the platform that is used for modelling CECL. It appears that banks have chosen a variety of approaches but with some commonality in specific areas. 40% of participants plan to use a single *model execution* platform for CCAR/CECL and other loss forecasting processes, while 50% will use a separate platform. 55% banks expect to use existing CCAR/other model execution platform for CECL and have a separate tool for *aggregation/reporting* for CECL. 45% banks use internally developed execution platforms for orchestrating the CECL processes and reporting, rest use SAS ECL, Primatics and Oracle. The data platform being leveraged by most of the banks (75%) is Risk data warehouse. 55% banks expect their model execution and reporting platform solution to be on Premise, 10% expect it to be on Cloud, rest expect it to be software as a service and not on cloud.

Data Controls

- Yes — 73%
- Will be developed in future — 15%
- No answer — 12%

In terms of data controls, 75% of banks had a preferred governance solution.

70% - 75% of bank had their IT assessment with respect to infrastructure required for building CECL models and scale up for CECL production. 55% of banks have also plans for alternative solution options for CECL implementation

Immaterial/difficult to model Portfolios

For exposures where PiT PD, LGD and EAD cannot be modelled and estimated, 53% of banks use modelled parameters as proxies with high-level justification to calculate the expected loss. In addition, 84% of banks have immaterial portfolios where they just use loss rates or a proxy rather than develop PIT models for PD, LGD, EAD. 65% of participants have automated systems to track period over period reserve volatility.

Please see the comments section on the complete survey(EXCEL) for example of these types of portfolios.

Conclusion

The implementation of the CECL requires a complex set of choices for the banking industry. Models, parameters, data sources, systems architecture, and economic scenarios must all be combined to produce timely and frequent ECL projections. In the next several months, banks will have to put these efforts into production to create results that can be reviewed for reasonableness, stability, and accuracy. The results of our survey suggest that many banks have decided how to approach many of these choices, but a significant minority has fallen behind. Moreover, several banks started our survey, but were unable to complete it because they had not progressed far enough in their implementation to answer the questions.

Survey responses indicate a difference in choices among several dimensions. Scenario generation, length and the number of scenarios, differences in segmentation, and PD, LGD, EAD modeling choice differences will certainly drive variation in banks' ECL calculations.

GCD's earlier study of IFRS9 implementation highlights another benefit of moving into parallel production mode earlier. Once systems are ready, banks can participate in running a benchmark portfolio to compare results against their peers. This study can provide insight into different approaches used by banks and help pinpoint areas that produce the largest differences in estimates. It can also alert regulators and auditors to possible variances, which may encourage them to provide more guidance/standardization in approaches.

Once CECL is implemented, the work cannot stop. Validation and back testing will have to continue ensure that models stay robust and accurate. Unlike capital and stress testing, extra conservatism will not be a cure for uncertainty. CECL accounting models must be accurate, which places extra emphasis on data quality, collection, and availability.

Finally, concerns have been raised regarding the potential procyclicality of CECL. How a bank behaves during a downturn can have as much impact on estimates as a model or parameter choice. We hope to discuss this complex issue with member banks in the next several months.