Wider Fields: IFRS 9 credit impairment modelling

Actuarial Insights Series
2016

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Presenter Backgrounds

Dickson Wong

- **Actuary** working in financial risk management: credit risk, market risk, stress testing, regulatory capital, model validation
- PwC Singapore (previously PwC Australia)

Nini Kung

- **Actuary** working in financial risk management: credit risk, stress testing, IAS 39 auditing, regulatory capital
- PwC Singapore (previously PwC South Africa)
Agenda

Overview of IFRS 9

Impairment modelling approaches

What’s Next

Challenges
Banking for Actuaries

The Banking Industry presents a large opportunity for actuaries

Credit Risk Modelling roles require similar modelling and programming skills

Actuaries are applying their skill set in different banking areas: Pricing, Treasury, Stress Testing

Introduction of IFRS 9 requires a significant increase in modelling skillset

New Basel requirements are providing more technical risk management and modelling opportunities

Introduction of the Banking specialist courses as part of the Part 3 education system

Focus on wider field presentations covering banking
The Need for Provisions

Banks issue loans to a variety of customers

A portion of the loans will default

Defaulted loans may incur a loss to be written off

Banks must hold provisions for these losses

Scorecard models

Score credit riskiness of customers

PD models

Predict default probability

LGD and EAD models

Predict final loss amount

Expected Credit Loss

ECL = PD \times LGD \times EAD

Requirements stipulated by Accounting Standards

IAS 39 (current)

IFRS 9 (2018)
Overview of IFRS 9

In response to the financial crisis:
- Existing IAS 39 considered “too little too late”
- Regulators developed a new principles-based Standards IFRS 9

IFRS 9 contains 3 parts:
- P1: Classification and measurement
  - P2: Impairment
  - P3: Hedge Accounting

Banks are facing challenges with P2: Impairment:
- Sufficient data
- Complexity Impairment calculation
- Interpretation of requirements
IFRS 9 P2 Impairments Stages

- **Stage 1**: 12 months expected credit losses
- **Stage 2**: Lifetime expected credit losses
- **Stage 3**: Lifetime expected credit losses

**Loan**

- **N (Performing)**
  - Significant deterioration in credit risk since initial recognition?
  - **Challenge**: Triggers

- **Y (Underperforming)**
  - **Challenge**: Lifetime ECL

- **Credit impaired**
  - **Challenge**: Forward-looking

**IFRS 9 Provision**

- **Forward-looking adjustments**
IFRS 9 ECL Model Components

**PD**
- Basel II 12 Month PD
- Life-time PD term structure
- IFRS 9 12 Month PD
- Life-time Definition
- 12 months Forward Looking Adjustment
- Lifetime Forward Looking Adjustment
- Lifetime Forward Looking PD
- Alignment Required
- Macroeconomic Model
- 12 months Forward Looking PD
- Lifetime Forward Looking PD
- IFRS 9 PD for all accounts

**EAD**
- Current balance and limit
- Amortisation profile
- 12 month / Lifetime FL Adjustment
- 12 month / Lifetime Forward Looking EAD
- IFRS 9 EAD for all accounts

**LGD**
- Current collateral value
- Forecast collateral values
- 12 month / Lifetime FL Adjustment
- 12 month / Lifetime Forward Looking LGD
- Current LGD
- IFRS 9 LGD for all accounts

Bucket 1 and Bucket 2 Definitions
**ECL model component - PD**

**Key Challenge: Lifetime PD Term Structure**

**Method 1: Cohort Analysis**

- Conditional for survival
- Kaplan-Meier estimate of hazard functions to remove potential biases in the data

\[
h(t, s + t, X) = \frac{f_{sX}(t)}{S_{sX}(t - 1)}
\]

- \(h(t, s + t, X)\) = default hazard of a customer \(t\) months after observation
- \(f_{sX}(t)\) = P(account defaults exactly \(t\) months after observation)
- \(S_{sX}(t)\) = P(default does not occur within the first \(t\) months)

**Considerations**

- Requires a long time series of data (loan lifetime; segmentation and a full economic cycle)
- Impacted by calendar based events (e.g. change in business policy)
- Develop lifetime PD given Stage 2
# ECL model component - PD

## Key Challenge: Lifetime PD Term Structure

### Method 2: Regression Modelling
- Relationship between historical PDs and behavioural factors
- Analyse statistical significance and business intuitiveness of factors

<table>
<thead>
<tr>
<th>Linear regression with logistic transform</th>
<th>Cox regression for survival function</th>
</tr>
</thead>
<tbody>
<tr>
<td>[ \ln \left( \frac{P_X}{1 - P_X} \right) = \beta_0 + \sum_{i=1}^{p} \beta_i X_i, ]</td>
<td>[ S_X(t) = e^{h_0(t)}e^{\sum_{j=1}^{p} \beta_j X_j} ]</td>
</tr>
</tbody>
</table>

Where
- \( P_X = P[D_X = 1] \) and \( D_X = \) \(
- \{ 0 \quad \text{if default does not occur} \)
- \{ 1 \quad \text{if default occurs} \) .

Where \( h_0(t) \) is the empirical hazard function, estimated non-parametrically. Under this model, the probability of default at outcome period \( t \) is given by:
- \( P_X(t) = 1 - S_X(t) \).

## Considerations
- Consider transforms of variables to ensure stationarity
- Different regression formats (linear regression with logistic transform preferred by most banks)
- Term structure developed through including a month on book variable
ECL model component - PD

Key Challenge: Lifetime PD Term Structure

Method 3: Transition matrices

<table>
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<th>AAA</th>
<th>BBB+</th>
<th>B-</th>
<th>CCC</th>
<th>D</th>
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<tbody>
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<td>0.0%</td>
<td>0.0%</td>
<td>0.1%</td>
<td>0.0%</td>
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<tr>
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<td>73.9%</td>
<td>0.0%</td>
<td>0.1%</td>
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<tr>
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<tr>
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<td>43.9%</td>
<td>26.4%</td>
</tr>
</tbody>
</table>

Source: S&P Average One-Year Transition Rates For Global Corporates By Rating Modifier (1981-2014) (%)

Considerations
- Extrapolation assumes a memoryless process
- Alternative method considered where cohort data is not available
ECL model component - EAD

Key Challenge: Lifetime EAD

Amortising products (e.g. term loans and mortgages)

Loan Repayment Pattern

- Prepayment
- Contractual repayment
- Expected Out. Balance
- Actual Out. Balance

Estimating prepayments

\[ \text{Prepayment rate}_t = \frac{\text{Prepayment}_t}{\text{Origination Balance}} \]

\[ \text{Prepayment rate}_t = \alpha + \sum_{i=1}^{n} \beta_i x_i + \sum_{j=1}^{m} \gamma_j y_j + \epsilon_i \]

- \( \beta_i \) = coefficient for macroeconomic variable
- \( x_i \) = macroeconomic variable
- \( \gamma_j \) = coefficient for loan level characteristic
- \( y_j \) = loan level characteristic

Considerations

- Loan level characteristics (product type, borrower income level, loan-to-value)
- Macroeconomic economic variables (interest rates, unemployment rates, GDP, inflation)
- Additional loan features such as refinancing
ECL model component - EAD

Key Challenge: Lifetime EAD

Revolving products (e.g. credit card, line of credit)

\[ \text{Utilisation Rate}_t = \frac{\text{Outstanding Amount}_t}{\text{Commitment Amount}_t} \]

Considerations
- Aggregation of data into homogenous risk groups
- Stability of development patterns and representativeness of historical experience
- Alternative methods such as developing regression models
ECL model component – Forward Looking

Key Challenge: Forward Looking

Leveraging Existing Stress Testing Process:

Current Stress Testing Process:
- Determine Stress Scenarios
- Economic Linkage Model
- Determine Stress Outcomes

Additional modification:
- Unbiased best estimate forecast
- Monte Carlo Simulation for MEV forecast
- Linkages for non-stress periods
- Linkages for areas not covered
- Sensitivity and back testing
- Overlay Framework

Considerations
- Lack of data required to build a statistical model
- Require multiple year of Macro-economic forecast
- Shift in mentality from stress testing to forward looking
ECL model component – Triggers

Key Challenge: Relative and Absolute Credit Quality

**Absolute credit quality**
Does the financial asset meet the definition of “low credit risk” at the reporting date?

- yes
- no

**Relative credit quality**
Has the credit risk increased significantly since initial recognition?
- If more than 30 days overdue - > yes (rebuttable presumption)
- Financial asset is below investment grade -> likely yes but significance of increase has to be determined

- yes
- no

**Credit-impaired**
Does the financial asset meet the credit-impaired definition (same definition as in IAS 39)?

- yes
- no

1. Performing >12-Months-EL (interest revenue on gross basis)
2. Deterioration of credit quality > EL over Lifetime (interest revenue on gross basis)
3. Credit-impaired > EL over Lifetime (interest revenue on net basis)
ECL model component – Triggers

Key Challenge: Definition of significant increase in credit risk

Quantitative Triggers:

Changes in credit ratings
• Drop in external credit ratings
• Drop in internal credit ratings

Changes in internal price indicators of credit risk
• Significant deterioration of loan to value ratio
• Breaches in financial covenants

Changes in external market indicators
• Drop in borrower’s bond prices
• Increase in credit default swap prices for borrower

Qualitative Triggers:

Changes in business, financial or economic conditions
• Industry downturn
• Increase in unemployment rates

Changes in operating results
• Actual or expected decline in revenues/margins
• Working capital deficiencies

Other qualitative inputs
• Trading suspension of listed shares on exchange
• Litigations likely to have material impact Profit warnings
Challenges to comply with IFRS 9

Banks face a number of challenges in meeting their desired level of IFRS 9 compliance

**IFRS 9 Requirements**
- Range of data requirements
- Sophisticated modelling expectations
- Expert judgement based decision
- Holistic governance process

**Challenges**
- Lack of data
- Expert Judgement
- Implementation
- Systems and processes
- Timelines
- Correct models
- Peoples and skills
- Uncertainty in expectation
- Interpretation of the Standard
- Cross-border exposure

**Desired level of compliance**
- Regulatory expectation
- Industry Practice
- Auditor expectation
- High quality implementation
Results from Latest Survey

There is still a significant amount of work to be done in APAC.

Understanding IFRS 9

Detailed Design

Model Development

Test / Implementation
Results from Latest Survey

The industry view currently varies on the best approach to adopt when it comes to incorporating forward looking in their models.

Approach to incorporate Forward Looking

- Bottom-up model driven enhancements to PD, LGD and EAD
- Bottom-up expert judgement based enhancements to PD, LGD and EAD
- Top-down quantitatively assessed overlay
- Top-down expert judgement overlay
- A combination of the above
- To be determined
Further Reading and Q&A

IFRS 9: Impairment, Global banking industry benchmark
Available on Request

IFRS 9: Expected Credit Losses