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IFRS 9 – Credit Modelling and Implementation

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Introductions – With you today

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Agenda

1. Expected Credit Loss (ECL) Modelling Concepts
   a) Expected Credit Loss Modelling
   b) Introduction to two possible approaches
   c) Expected Life

2. Key Impacts on Processes, Data, Systems and Implementation Plans
   a) Implementation Impacts
   b) System Vendors
   c) Implementation Planning

3. Questions

Expected Credit Loss (ECL) Modelling Concepts

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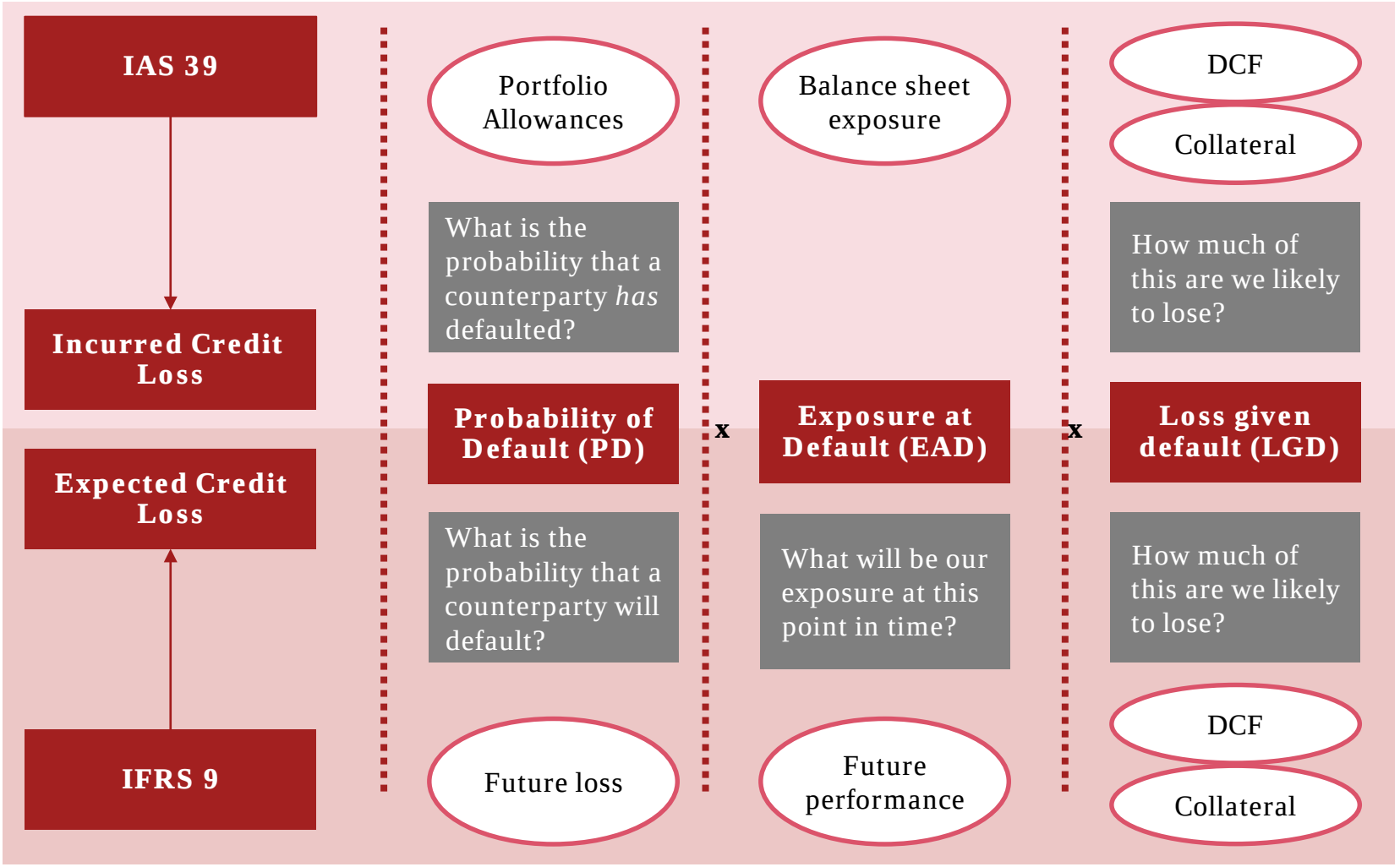
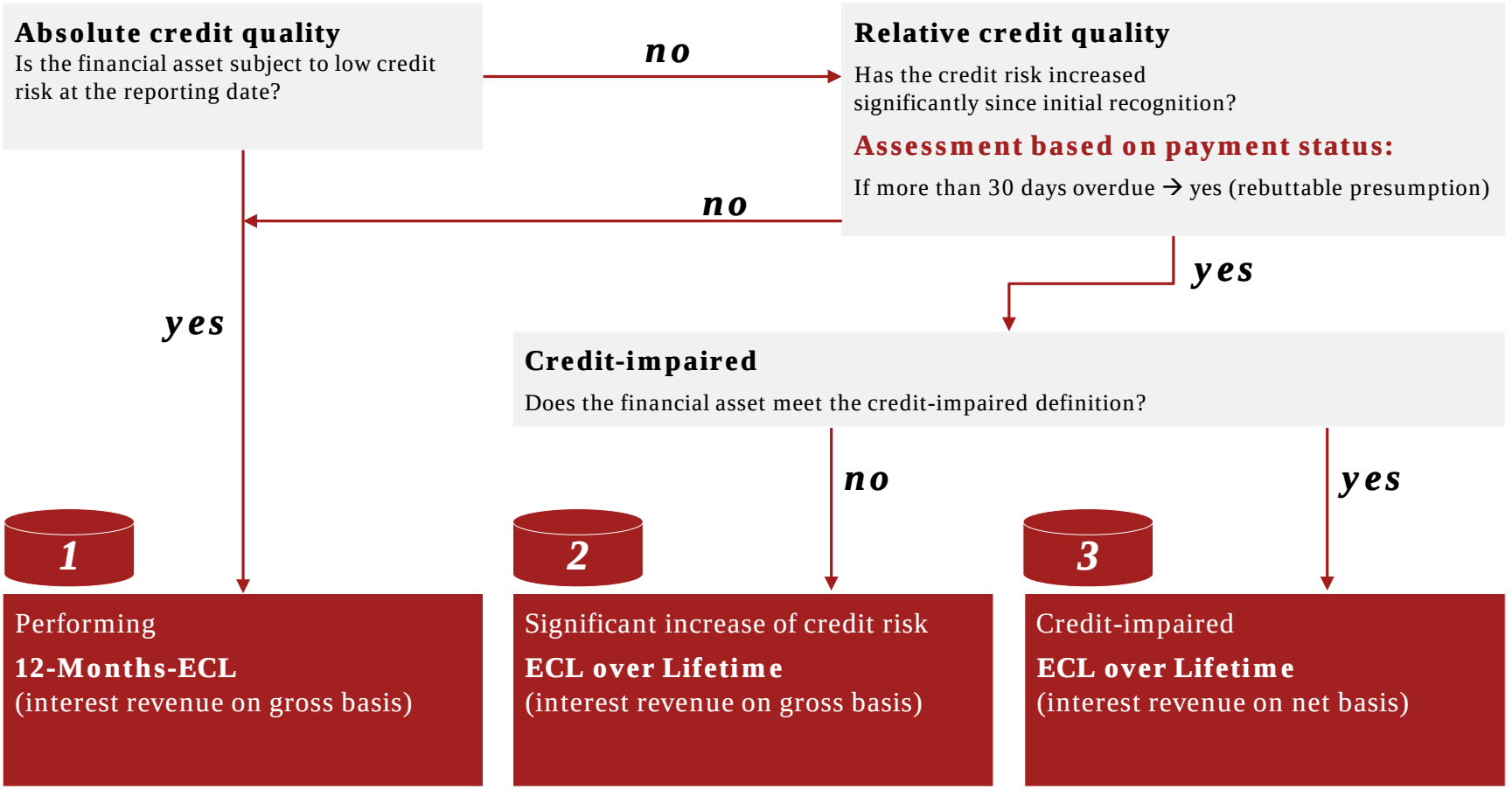
IAS 39 vs IFRS 9: Incurred vs. expected credit loss



Background: Stage migration

The three stages – Decision tree



Measuring expected credit losses under IFRS 9

An entity shall measure expected credit losses of a financial instrument in a way that reflects:

(a) an **unbiased and probability-weighted** amount that is determined by evaluating a **range of possible outcomes**;

(b) the **time value** of money; and

(c) reasonable and supportable information that is available without undue cost or effort at the reporting date about **past events, current conditions and forecasts of future economic conditions**. [IFRS 9.5.5.17]

Expected credit losses are the weighted average of credit losses with the respective risks of a default occurring as the weights. Credit losses are the difference between all contractual cash flows that are due to an entity in accordance with the contract and all the cash flows that the entity expects to receive (i.e. all cash shortfalls), discounted at the original effective interest rate (or credit-adjusted effective interest rate for purchased or originated credit-impaired financial assets).

How can credit losses be estimated?

Approach 1

Cash flow / parameter estimation

- Estimate parameters individual – e.g. PD, LGD and exposure
- Build out lifetime parameter estimates for Stage 2 assets
- Can be collective or individual assessment

$$\sum_{t=1}^{T} \frac{PD_t * SR_{t-1} * LGD_t * EAD_t}{(1+r)^t}$$

Approach 2

Transition matrix w/ overlay

- Simplified approach, but complexities in adjusting to forward-looking estimate
- Overlays permitted, but expect regulatory requirements to include quantitative basis for overlay (e.g. cannot be simply expert judgment)

Typical Credit Loss Modeling Approaches

*There are a range of credit risk modelling approaches **currently** used in industry, each with different strengths and limitations, and any of which could be leveraged in an IFRS framework*

Top Down Loss Model	Vintage Loss Models	Roll Rate or Transition Rate Models	Loan Level Default and Severity Models
Model Characteristics			
• Simple historical charge-off rate (gross or net charge-offs divided by outstanding exposure or commitments) • Look-back period may vary depending on robustness of observations and modelling objective • May utilize regression of charge-off rates to macroeconomic variables for certain business uses	• Cumulative estimate of defaults or losses from the origination date over the life of the loan • Baseline curve reflects average of many historical vintages • Scaling mechanisms applied for any segment experiencing above or below average losses • Estimate over forecast horizon developed by splicing remaining cumulative loss expectations together	• Estimates migration from an existing delinquency/rating state to another delinquency/rating state, or directly to default • Can be simple ratio-based rolls (consumer) or rating to default (commercial) – or - more dynamic flow models (consumer) or full rating transitions • May incorporate macroeconomic regression of delinquency rolls or rating transitions (i.e., conditional forecasts) • Typically incorporates separate severity/LGD model	• Predict default probability and/or loss severity as a function of loan level characteristic data • Loan level inputs can be tied to macroeconomic forecasts (easier with consumer, more difficult with commercial) • Often the approach used by vendor models calibrated to pooled data sets

Typical Credit Loss Modeling Approaches

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Top Down Loss Model	Vintage Loss Models	Roll Rate or Transition Rate Models	Loan Level Default and Severity Models
Model Considerations			
• Typically seen at smaller financial institutions lacking sophisticated modelling skills or sufficient defaults or losses • Lags fundamental drivers of changing credit risk, and even delinquency trends • Assumes current portfolio underwriting and mix is consistent with historical characteristics/mix • Loss rates reflective of principal plus accrued but uncollected interest	• Primarily used for consumer portfolios • Long history of data required • Inherent (implicit) prepayment patterns • Can be less accurate over shorter forecasting horizons • Difficult to implement macroeconomic correlation framework • Typically reflective of principal or principle plus accrued but uncollected interest	• Relatively robust and transparent • Can be data intensive depending on approach • More responsive to trends but still lags underlying drivers (i.e., borrower characteristics) • May lose accuracy over longer-term unless conditional rolls/migration is used • Relatively easy to run with and without new origination projections • Typically reflective of principal plus accrued but uncollected interest	• More sophisticated complex modeling concepts • Incorporates loan specific drivers helping to minimize lag • Increased segmentation inherent in models • Much more data intensive – fewer companies with sufficient internal data • More difficult to incorporate new origination projections for portfolio modelling • Depending on construct may be more or less accurate over short/long term

Considerations in selecting approach

- Expect both approaches to be permitted
- Complexity w/ Approach 2 (e.g. instrument level stage migration w/ portfolio level ECL estimation)
- Approach 2 not as technically pure

As a result of the above, ***Approach 1 is the preferred approach****, but* ***Approach 2 may be more operationally feasible*** *for smaller credit unions*

What does provisioning under IAS 39 currently look like?

A practical example...

- Assume a 3 year loan with $100 value and 10% interest rate, paid annually. The following illustrates 12 month and lifetime ECL calculations

Year	1	2	3
Balance outstanding	$110	$110	$110
Credit loss event?	No	No	Yes
Provision*			-$30
Net balance outstanding	$110	$110	$80

Note: Under IAS 39's incurred loss approach, a provision is only accrued when there is a credit loss event

How can ECLs be measured under Approach 1?

A practical example...

- Assume a 3 year loan with $100 value and 10% interest rate, paid annually. The following illustrates 12 month and lifetime ECL calculations

Calculation of 12 Month and lifetime ECL at beginning of Year 1 - with discounting					
Year	**1**	**2**	**3**	**ECL**	
PD	0.10%	0.15%	0.20%		A
Cumulative PD	0.10%	0.25%	0.45%		
Probability of survival (end of year)	99.90%	99.75%	99.55%		
Probability of prior year survival	100.00%	99.90%	99.75%		B
LGD	50%	50%	50%		C
Effective interest rate	10%	10%	10%		
Discount factor	91%	83%	75%		D
Balance outstanding, end of year	110	110	110		E
12 Month ECL	0.0550			**0.0550**	F = A x C x E
Period credit loss	0.0550	0.0824	0.1097	0.2471	G = A x B x C x E
PV of period credit loss & Lifetime ECL	0.0550	0.0681	0.0824	**0.2056**	H = G x D

Parameters – PD, LGD, EAD

Probability of Default (PD)	Loss Given Default (LGD)	Exposure At Default (EAD)
IFRS 9 requires PDs to be: • Lifetime (for Stage 2) • Forward-looking • Point in time	**IFRS 9 requires LGDs to be:** • Lifetime (for Stage 2) • Best estimate (e.g. no downturn bias, regulatory floors, collateral limits, etc.) • Forward looking • Include direct costs only	**IFRS 9 requires EADs to be:** • Point in time expected credit exposure • Best estimate for drawn and undrawn amounts
Sample Approaches for Retail Loans and Mortgages: • Credit Bureau Score • Internal Behavior Score • Roll Rates	**Sample approach:** • Leverage Moody's analytics and adjust for items noted above • Use historical average and overlay direct costs.	**Sample approach:** • Review historical utilization / outstanding balance to estimate future exposures • Use credit conversation factors for revolving facilities
Sample approach for small business and commercial loans: • Moody's / S&P's Credit Ratings	**Considerations:** • Only include direct costs to sell • Only include credit enhancements that are part of the contractual term • Determine whether separate asset can be recognized if not part of the contractual terms	**Considerations:** • Need to incorporate behavioural elements (i.e. draw downs, undrawn amounts, prepayments, amortization, etc) • 12 month ECLs based on 12 month PD x lifetime cash shortfalls

How can ECLs be measured under Approach 2?

Leverage existing roll rate models / transition matrix analysis with overlays

- Incorporate forward looking information sourced from Bank of Canada, Moody's, Statistics Canada, etc.
  - It may be helpful to perform regression analysis on macroeconomic variables (i.e. HPI, unemployment rates, interest rates, etc) to determine if there is a correlation with default patterns
- Utilize other historical information to supplement the rationale for the overlay
  - For retail: Utilization changes over time, cash advance activity, separation of spousal bank accounts, termination of payroll payments, etc.
  - For commercial and small business: Underperforming segments released within the last quarter financial statements, debt covenants breached, etc.

How many years of these parameters will I need for my cash flow projections?

What is the expected life of an instrument in scope under IFRS 9?

- 'Expected life' is not defined, but implied based on period over which cash flows arise
  - In other words, figure out the period over which you must forecast cash flows / shortfalls, and the 'expected life' may be implied as a shorter period
- As a starting point, must calculate cash flows over:
  - Maximum contractual period during which exposed to credit risk
    - Including substantive extension options (i.e. unilaterally exercisable by the borrower); none noted per preliminary discussions

How many years of these parameters will I need for my cash flow projections?

How is expected life determined?

- For commitments with both loan and undrawn portion, credit risk may not really be limited to the contractual period (e.g. term or contractual notice period) because credit risk reflexes not sufficient to limit to the contractual period
- For those determined in scope, need to assess (realistic) period of credit risk exposure, based on
  - period exposed to credit risk on similar financial instruments
  - length for defaults to occur on similar financial instruments
  - expected credit risk management actions given significant increase in credit risk, such as the reduction or removal of undrawn limits.
    - Will require comprehensive analysis of credit risk activities and what the organization has done in the past

Key Impacts on Processes, Data, Systems and Implementation Plans

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Implementation Impacts on Data and Systems

- IFRS 9 will cut across functional responsibilities and in-flight programs, thus increasing the need for planning and communication
- IFRS 9 will require building new – or leveraging existing – processes and systems for estimating forward looking ECLs and related parameters
- IFRS 9 will require new data attributes for classification and calculation. These new data attributes will need to be captured consistently and with good quality

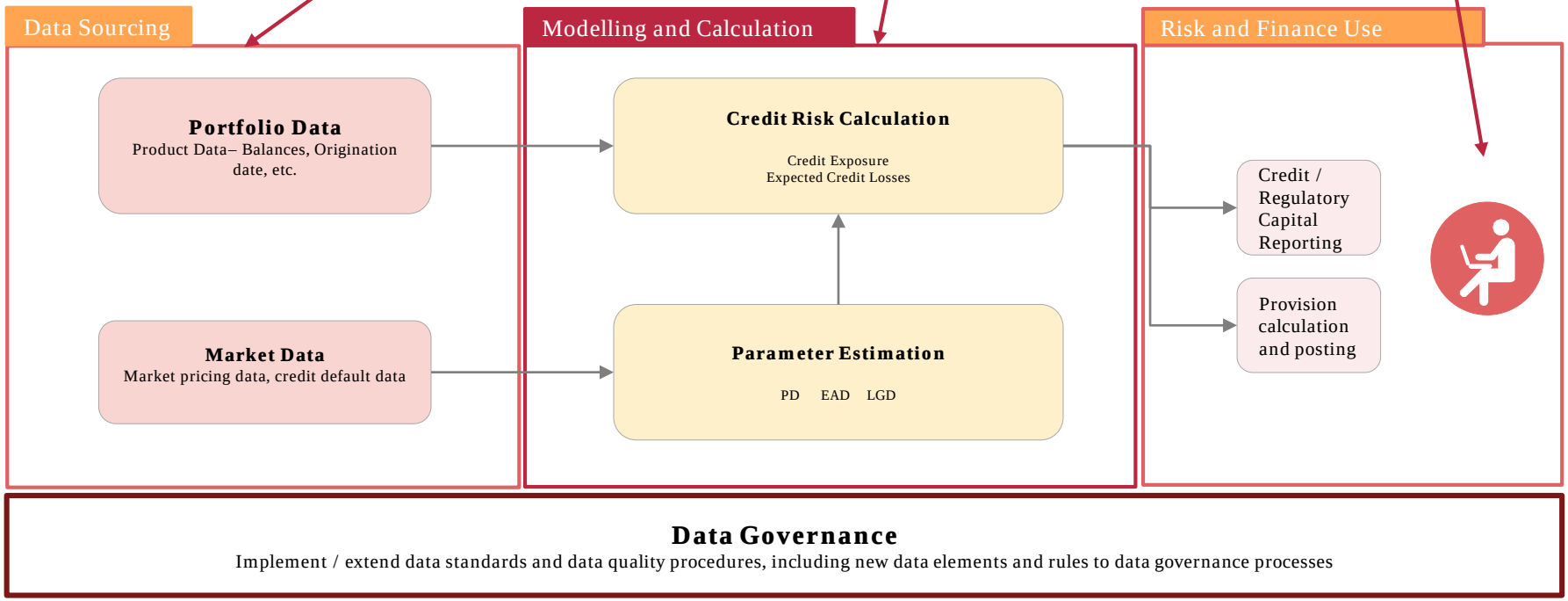
High Level ECL Impact on Technology and Data

No technology solution alone will 'implement IFRS 9' and create ECL compliant data. Tools are available to support workflow and calculations – or organizations can build their own.

- New disclosures and ownership of new models
- Controls to compare ECL calculation to regulatory capital and provisions

- Data elements to support classification and measurement

- Calculation for impairment and expected loss
- Parameter estimation



Considerations for System Selection and Update

We recommend a prudent deep dive into each organization's planned methodologies and current technologies to identify what incremental technology – or workarounds - should be pursued.

Life Cycle of Current Technology	Calculation Methodology	Financial Operations	Reporting
Is there a current gap? Is there technology approaching replacement?	**Is your approach customized and proprietary, requiring modelling technology?**	**Will you be integrating into an existing accounting solution?**	**How will you handle new reporting and disclosures?**
Consider solutions to address technology gaps based on the specification of the gaps. Leverage current technology and platforms if they remain in production	If your modelling approach is proprietary, you will need to consider analytical tools that allow you to create models.	Consider the IFRS 9 approaches offered by that vendor, but make sure to consider tools – and implementation time – for business rules and workflows.	In a packaged solution, reporting may be provided but you may need to create and report additional disclosures, depending on your methodology choices.

Pre-packaged models and business rules can help accelerate your IFRS 9 implementation but be sure to consider:

- *Does the package provide modelling that matches your approach: for example, if you are using a cashflow modelling approach, does the package model cashflows by product the way you intend?*
- *How well does the package document the approaches and assumptions of the models, to provide you with model justification? Do you know and understand what the model is doing?*
- *How flexible are the parameters of the model? For example, the model may allow you to specify a threshold for a 'significant increase in credit risk' but does it allow you to link that threshold to your qualitative criteria?*

High Level Implementation Steps

What steps should you incorporate into your planning? How long should you target for implementation?

- What does standard require?
- What exists already?
- What gaps need to be addressed?
- Focus on accounting rules and credit assessment

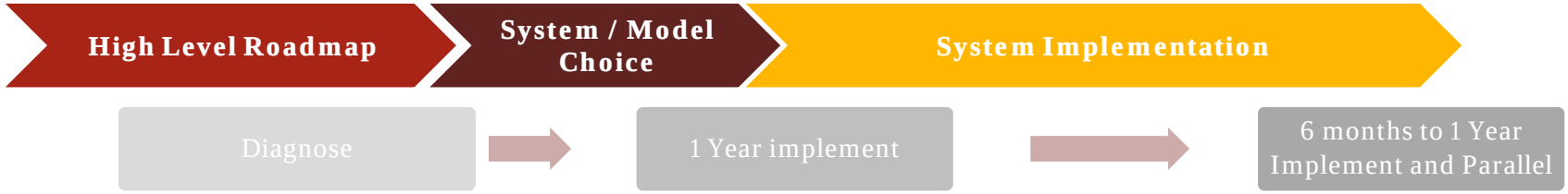
- Overall IFRS 9 methodology
- Classification and Measurement
- Product
- Credit Assessment
- Business Rules
- Hedging

- Pricing / Valuations
- PD
- LGD
- EAD
- Bucketing
- Interest Rates / Discounting
- Roll rate with overlay

- Product Mapping
- Credit State Mapping
- Instrument and Model Linkage

- Accelerators available from other practices (e.g. AML)

Once you understand your needs and methodology you can select a vendor – or build tools



Next Steps: Getting Started

It is important not to underestimate the operational work required to adopt IFRS 9

Take the time to plan

- A long-term project starts with short term actions: set 30- to 90- day action plans
- Early on, consider your product portfolio and your preferred approaches
- Consider what other groups you need involved – and bring them aboard
- Consider extra time for methodologies and models: even if you select a modelling and business rules package, you need to be able to justify and explain the approach and results.
- Be cautious when relying on shortcuts: shortcuts can speed progress, but we have observed large IFRS 9 programs which have needed significant rework when shortcuts did not work

Manage progress

- Track progress regularly - and address gaps when you fall behind
- Coordinate actively with other teams and include them in IFRS 9 decision-making

Remember that IFRS 9 requires significant operational and technology work

- Capture of new data, updates to systems and implementation of business rules are best automated, but technology teams need specifications and implementation time
- Similarly, to leverage other programs and work in progress, the IFRS 9 team must understand its requirements and understand the delivery plans for those teams

Questions

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Thank you for your time today

Appendix

Glossary of Terms

Term	Term Defined	Context
IAS 39	International Accounting Standard 39	An international accounting standard for financial instruments released by the International Accounting Standards Board (IASB). It was replaced in 2014 by IFRS 9, which becomes effective in 2018.
ECL	Expected credit losses	The concept of expected credit losses is required under IFRS 9
PD	Probability of default	PD is a parameter used in the calculation of expected losses.
EAD	Exposure at default	EAD is a parameter used in the calculation of expected losses.
LGD	Loss given default	LGD is a parameter used in the calculation of expected losses.
DCF	Discounted cash flows	DCF analysis uses cash flow projections and discounts them to arrive at a present value estimate.

Glossary of Terms

Term	Term Defined	Context
AML	Anti Money Laundering	AML refers to a set of procedures designed to stop the practice of generating income through illegal actions.
Roll rate	N/A	Roll rate analysis refers to the percentage of users who become increasingly delinquent on their accounts.
HPI	House Price Index	An index that measures the price of residential housing (specifically single-family properties) which is published quarterly by the Federal Housing Finance Agency (FHFA).
CMHC insurance	Canadian Mortgage and Housing Corporation insurance	CMHC insurance refers to the mandatory default insurance in Canada for down payments between 5% and 19.99%.
CVA	Credit Value Adjustment	CVA refers to the difference between the risk-free portfolio value and the true portfolio value that takes into account the possibility of a counterparty's default.