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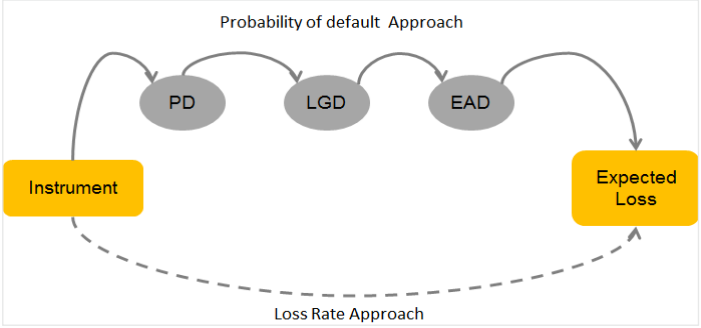
Impairment Modelling

The new standard on financial instruments accounting – IFRS 9 has significantly transformed banks' existing impairment assessment to address concerns about "too little, too late" provisioning for loan losses. In our previous blog i.e. "Stage Assessment – Devil is in the detail" we discussed how lifetime PDs are used for stage assessment of instruments, apart from other nuances of assessing significant deterioration of credit quality. Entities are required to recognise an allowance for either 12-month or lifetime Expected Credit Losses (ECLs), depending on whether there has been a significant increase in credit risk since initial recognition. This significant increase in credit risk needs to be measured ideally at instrument level. However, in some cases, especially for retail assets, this determination might be difficult to achieve and this assessment may be done at a collective level, wherein the deterioration in asset quality needs to be checked for at a portfolio level or a sub-portfolio level. It would be pertinent to note that this is relevant for Stage 2. For Stage 3 classification, since it is nearly the same as incurred loss approach, this determination would continue to be on individual assets. Consequently, for collective assessment, where it has been determined that there has been a deterioration in asset quality (on a forward looking basis), the lifetime ECLs need to be computed for that section of the portfolio. Banks may use segmentation schemes to identify slivers of portfolio that are deemed to have deteriorated, and examples of such segmentation schema include instrument type, collateral types, risk scores etc.



The measurement of lifetime expected loss can be done by either a Loss rate method or an approach that uses Probability of Default (PD) and Loss Given Default (LGD) estimates. The loss rate approach looks at historical losses suffered and uses the same to estimate forward looking losses. While the loss rate

approach looks deceptively easy to implement, and at first glance it seems as if lifetime PDs and LGDs may not be needed for this approach; the truth is that while for ECL computation PDs may not be needed, to determine significant deterioration in credit quality, lifetime PDs are still very useful. The article walks through a few numerical examples of methodologies using the Loss rate approaches as well as the PD-LGD approach.

Before we talk about different modeling methodologies in loss forecasting, it is important to understand how the loss ratio is calculated. The loss rate can either be calculated at an instrument level or at a cohort level. The table below represents historical balance, charge-offs and recovery information of a portfolio across different months. Most institutions use either the traditional historical loss rate analysis or the migration analysis for the actual loss rate calculation.

Historical Data

Month	Total Outstanding Balance	Number of Loans	Charge-offs	Recoveries
July-14	$177,627,234	467	$0	$0
June-14	$177,627,234	467	$0	$0
May-14	$177,627,234	467	$0	$0
April-14	$201,589,794	530	$0	$0
March-14	$201,589,794	530	$0	$0
February-14	$201,589,794	530	$0	$0
January-14	$201,589,794	530	$0	$0
December-13	$201,589,794	530	$0	$0
November-13	$201,589,794	530	$0	$0
October-13	$201,589,794	530	$6,300	$3,611
September-13	$155,946,822	410	$0	$0
August-13	$155,946,822	410	$43,098	$32,001
July-13	$155,946,822	410	$23,000	$0
June-13	$163,553,984	430	$0	$0
May-13	$171,161,146	450	$0	$5,629
April-13	$186,375,470	490	$45,000	$8,754
March-13	$186,375,470	490	$3,000	$0
February-13	$186,375,470	490	$3,425	$4,930

Traditional Historical Loss Rates
Loss ratio =
(Charge-offs – Recoveries) /
Average Outstanding Balance

Appl Qtr	DPD Buckets							
	Current	0-30	30-59	60-89	90-119	>120	Net Charge-offs	% of Total
2001Q4	978	12,180	27,081	0	14,688	20,737	7,566	10.0%
2002Q1	60,970	0	66,898	10,860	242,487	40,270	50,578	12.0%
2002Q2	0	23,797	18,787	106,943	11,695	0	25,796	16.0%
2002Q3	17,424	72,624	208,911	34,837	428,845	38,076	152,136	19.0%
2002Q4	1,282	55,080	161,525	191,960	312,760	79,139	104,227	13.0%
2003Q1	116	12,449	(664)	3,673	0	45,182	0	0.0%
2003Q2	312,367	61,222	206,760	147,602	66,683	67,938	103,509	12.0%
2003Q3	17,735	27,944	78,931	117,059	0	0	0	0.0%
2003Q4	16,383	4,058	91,857	0	0	0	20,213	18.0%
2004Q1	0	11,036	33,757	0	0		0	0.0%
2004Q2	23,837	0	0	0			0	0.0%
2004Q3	40,859	0	0				0	0.0%

$7,566 of net-charge-offs are experienced against total balance of $75,664 as of 2001Q4, giving us 10% loss rate through the migration analysis.

There are several modeling practices for loss forecasting across industries. Let's discuss some of the well-known forecasting techniques, Such as Roll rate models, Vintage loss models, Provision Matrix method, Expected loss models and Discounted Cash-flow method. Roll Rate Models, Vintage Loss Models as well as Provision Matrix method directly predict loss amount / loss ratio, whereas the Expected Loss Models predict losses by using PD as one of the components of loss prediction. The Discounted Cash-flow method predicts loss amounts as well, but it is ideal for individual assessment of losses.

Roll Rate Models:

The roll rate model is the most commonly used modeling practice for loss forecasting and is done at a portfolio level instead of account level. The entire portfolio balance is segmented across various buckets e.g. Current, 1- 30 DPD, 31-60 DPD, 61-90 DPD, 91-120 DPD. using current balance. Roll rate technique is a forecast in which the flow of outstanding amounts from one level of delinquency (lower) to another (higher) is applied to the current portfolio outstanding mix. This technique follows the flow from 'Current' through all the delinquency buckets to 'charge-off'. Once historical net roll rates by bucket have been calculated, their patterns over time are examined and future roll rates are estimated. The losses are determined as a product of flow rates from the bucket to the final bucket of 180+. This technique is widely used to forecast the next 12 to 24 months losses at the portfolio level.

Balance

	January	February
Current	100000	105000
1-30	3000	3500
31-60	500	600
61-90	280	300
91-120	200	210
121-150	140	160
151-180	130	135
181 new	120	128
180+	3000	3120

Roll Rate

	January	February
Current	-	-
1-30	-	3.50%
31-60	-	20.00%
61-90	-	60.00%
91-120	-	75.00%
121-150	-	80.00%
151-180	-	96.43%
181 new	-	98.46%
180+	-	-

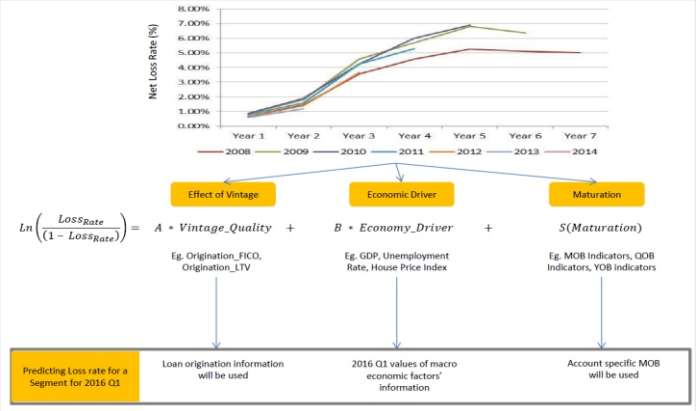
Loss Rate

	January	February
Current	-	0.24%
1-30	-	6.84%
31-60	-	34.18%
61-90	-	56.97%
91-120	-	75.96%
121-150	-	94.95%
151-180	-	98.46%
180+	-	100.00%

Loss Rate (Current)-
3.50% * 20% * 60% *75% * 80% * 96.43 * 98.46% = 0.24%

Gross losses can be calculated by applying these Loss rates on the outstanding balances, which gives us a figure of $240 ($100,000 * 0.24%). To calculate Net provisions, one needs to take into account Recovery rates, Accounts that go into loss status (180+ dpd), that can be partly (or fully) recovered in the future as an outcome of internal collections or debt sales. Banks predominantly calculate and forecast recovery rates using Recovery curves, representing recoveries post charge-off (180+ in our example) across different charge-off vintages. Let us assume the recovery rate is 50%, in which case the Gross provision is $120 ($240 * 50%).

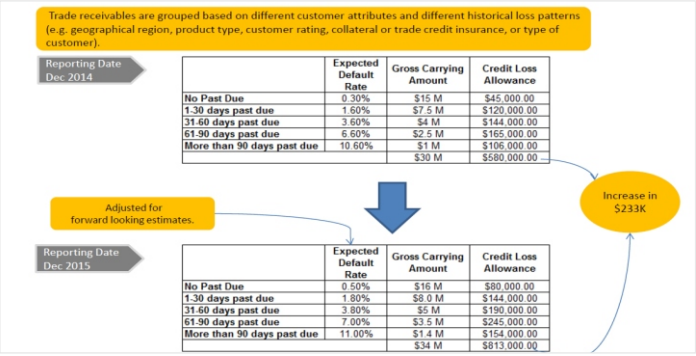
The roll rate methodology is particularly suited for retail portfolios, however the methodology makes assumptions about prepayment patterns. Also, Lifetime PDs may still be needed to be calculated separately for Stage assessment.



Vintage Loss Models:

The vintage loss model is another widely used loss forecasting modeling technique. Under this approach, the portfolio is segmented by various origination vintages instead of delinquency buckets. As a part of the modeling practice, the loss rate can be tracked over time through full lifecycle for each of the vintages.

The Vintage Loss model has twofold benefits. By incorporating maturation effect, the loss trend can be forecast for a longer term. Secondly, the model takes into account the economic factors to incorporate the current and future market movements. Like the roll rate methodology, the vintage loss methodology is again suited for retail portfolios. Again, Lifetime PDs may still need to be calculated separately for Stage assessment unless other expedients are used.



Provision Matrix Method:

Similar to roll rate models, Provision Matrix is a delinquency based model used for estimating bad debt reserves for short term trade receivables. Many entities estimate credit losses using a provision matrix where trade receivables are grouped based on different customer attributes and different historical loss patterns (e.g. geographical region, product type, customer rating, collateral or trade credit insurance, or type of customer). Under IFRS 9, entities need to update their historical provision rates with current and forward looking macro-economic factors.

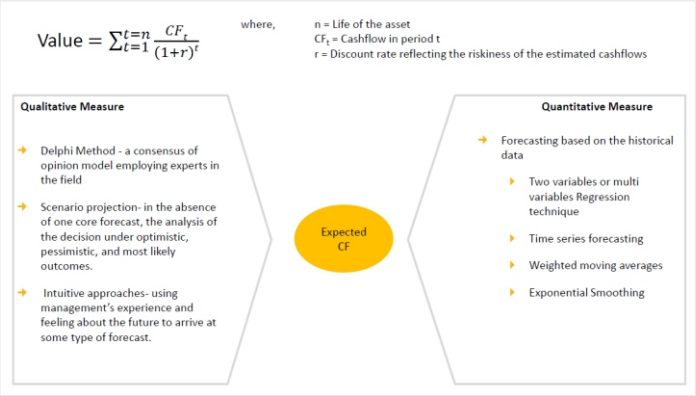
Expected Loss Models:

Significantly different from roll rate models and vintage loss curves, Expected Loss (EL) estimation is a modern modeling practice, in line with BASEL framework, developed on the basis of 3 risk parameters, namely Probability of Default (PD), Exposure At Default (EAD), and Loss Given Default (LGD) by incorporating loan-specific characteristics.

For both wholesale and retail portfolios, each of the three risk factors are modeled separately to capture the account / cohort specific behavior. Survival model can also be used for directly predicting “Time to Default” for a loan. The customers are segmented across homogeneous groups based on origination variables, such that the historical bad rates across time for each of the groups never intersect each other. For each of these groups, average PD, LGD and EAD is used to calculate Expected Loss.

Discount Cash Flow Method:

Discount Cash Flow (DCF) analysis revolves around the concept of the time value of money. All future cash flows are estimated and discounted by using appropriate effective interest rate to arrive at their Present Values (PVs). This is ideal for the individual loss estimation of instruments falling under Stage 3.



A comparative analysis across the methodologies is shown below

Roll Rate Models	Vintage Loss Models	Provision Matrix Model	Expected Loss Model	Discount Cash Flow Method
Model Characteristics				
• Segments are created based on Delinquency or PD bands • Determines flow of instruments or loss across Transition Matrix • May be augmented with vendor data • Relatively robust and transparent • Predicts loss rate account migration and recovery analysis • Frequently used for short-term loss forecasting	• Losses are estimated using multistep process • Separates estimation of vintage effect, economic effect and maturation effect • Tend to use primarily for consumer portfolios • Used for Long term loss forecasting	• Based on historical data and judgment • Done at a homogenous segment level • Directly predicts loss ratio or loss amount • Typically used for the short term trade receivables	• Predict default probability or loss severity by using loan specific characteristics and macroeconomic inputs • Often used to calibrate vendor models • Involves complex modeling concepts • Data intensive • Use of Survival model to predict Time to default	Individual assessment of instruments Required business and individual customer level knowledge Future cash flows are discounted by the EIR(effective interest rate)
IFRS 9 prerequisites				
• Longer Time Series data required • Assumptions on pre-prepayment patterns • Linking roll rate rates with macro-economic drivers to incorporate forward looking scenarios in the loss estimates • Separate estimation of Lifetime PD • Assumptions on effective maturity at portfolio or segment level	• Longer Time Series data required • Assumptions on pre-prepayment patterns • Separate estimation of Lifetime PD	• Need to develop models to incorporate macro-economic variable for forward looking scenarios • Assumptions on pre-prepayment patterns • Separate estimation of Lifetime PD • Assumptions on effective maturity at portfolio or segment level	• Need to make the maturity adjustment if Survival model is not used • Assumptions on pre-prepayment patterns • Assumptions on lifetime maturity	• Quantitative measures for loss forecasting by integrating macro-economic drivers • Assumptions on pre-prepayment patterns • Assumptions on lifetime maturity
Limitations				
• Does not consider loan specific information • Heavy assumptions for long term estimations	• Does not consider loan specific information	• Does not consider loan specific information • Heavy on assumptions	• Heavy on data requirements	• Difficult to implement for large number of instruments in the banking book
Portfolio Suitability				
• Retail Assets	• Retail Assets	• Trade Receivables, Contract assets	• Corporate and Retail	• Corporate

Irrespective of the choice of methodologies, according to IFRS 9, the estimation of losses should incorporate not only past due information but also all relevant current as well as future credit information, including forward-looking macroeconomic outlook. The Expected Loss methodology, which involves separate estimates of PD and LGD is perhaps the best and one of the most popular choices, the advantages of the approach being:

- The instrument level modeling provides a more granular risk profiling for each individual instruments / homogeneous pool of instruments
- Each risk parameter is independently driven by a separate set of economic factors, allowing a more dynamic view of economic impacts
- The modeling methodology is in line with statistical techniques prevailing in the consumer lending arena and intuitively adoptable by most model developers
- The lifetime PD that includes forward looking macro-economic scenarios which can directly be used for the assessment of significant increase in credit risk

That being said, it does have requirements of large amounts of data, not to mention validation and other model governance/ maintenance requirements of the upstream PD and LGD models. IFRS 9, being a principle based guideline, does not prescribe specific methodologies for lifetime expected loss estimation, and there is no single methodology that can suit all portfolios. The choice of methodology should be an informed one based on the availability of data as well as materiality of the portfolio, and such decisions should ideally be documented in a 'Target Operating Model' design document. In our next blog, we will discuss the Target Operating model and the role of the statutory auditor in the same.