Oracle Financial Services Loan Loss Forecasting and Provisioning

User Guide

Release 1.5.1.0.0

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Preface

Intended Audience

Welcome to Release 1.5.1.0.0 of the Oracle Financial Services Loan Loss Forecasting & Provisioning (LLF&P) User Guide.

This guide is intended for:

- Technical Analyst: This user ensures that the data is populated in the relevant tables as per the specifications, executes, schedules and monitors the execution of Runs as batches.
- Business Analyst: This user reviews the functional requirements and information sources, like reports.
- Data Analyst: This user would be involved with cleaning, validation and importing of data into the OFSAA Download Specification Format.
- Administrator: The Administrator maintains user accounts and roles, archives data, loads data feeds, and so on. The administrator would control the access rights of users.

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Structure

1. Introduction
2. Understanding Provision Calculation methods
3. Understanding the LLF&P Application
4. Preparing for Execution
5. Execution
6. Loan Loss and Forecasting & Provisioning Reports
7. Resolution of LLF&P Implementation Issues

Annexure

Related Information Sources

- Oracle Financial Services Loan Loss Forecasting and Provisioning Release 1.5.1.0.0, has been referred to as LLF&P in this User Guide.

1. Introduction

International Financial Reporting Standards (IFRS) guidelines have set out new requirements on classification and measurement of financial assets and liabilities. It specifies two approaches for the measurement of assets namely *Amortized Cost* and *Fair Value* approach. The scope of Oracle Financial Services Loan Loss Forecasting and Provisioning is to focus only on the amortized cost approach.

Oracle Financial Services Loan Loss Provisioning and Forecasting (LLF&P) is designed to aid institutions in calculating the provision or allowance for exposures as per IAS39 and IFRS 9. Proposed guidelines want institutions to estimate the future loss and make provisions accordingly. Thus, the LLF&P Application calculates expected loss as well as incurred loss.

A *Run* in the LLF&P Application specifies the approach (Expected Loss or Incurred Loss) to be used to calculate Loan Loss Provisioning. Broadly these approaches (Expected loss and Incurred loss) are further classified depending upon the product type and impairment status of the account. The following out of the box Runs are configured in this application:

- Expected Loss (EL) Run
- Incurred Loss (IL) Run
- EL Run OBP(Oracle Banking Platform) Interface (This is similar to EL Run in terms of functionality, except that, it uses underlying tables compatible with OBP interface. Further details are mentioned later in this guide.)

1.1. Scope of the Application

The International Financial Reporting Standards (IFRS) has set standards for calculating loan losses and its subsequent provisioning. . IFRS 9 is being discussed and issued in 3 phases.

- IFRS 9 (Phase I): Classification and Measurement.

  For more information, refer Financial Instruments: Classification and Measurement, published in July 2009.

- IFRS 9 (Phase 2) Impairment Methodology.

  For more information, refer exposure draft, Financial Instruments: Amortized Cost and Impairment, published in November 2009

- IFRS 9: Phase 3: Hedge Accounting.

  For more information on the details on the criteria to classify the asset as either value using amortized cost or fair value, refer to Appendix B (Section 4.1 and 4.26) of the Phase 1 document.

Oracle Financial Services Loan Loss Provisioning and Forecasting Release 1.5.1.0.0, caters to the IFRS 9: Phase II standards which expects institutions to classify the exposures in its banking and trading book into those valued, using the fair value concept and those valued using amortized cost.

Other regulations which an institution needs to follow as a pre-requisite to using the LLF&P Application are as follows:

- IFRS 9: Phase I- Classification & measurement
- IAS 39
- Other local accounting regulations as applicable

2. Understanding Provision Calculation methods

This chapter gives a better understanding of the various methods applied by the LLF&P application.

An Expected Loss approach applies the following methods:

- Cash Flow Based Method
- Provision Matrix Method
- Recovery Rate Method
- Collateral Value Based Method

An Incurred Loss approach applies the following methods:

- Cash Flow Based Method
- Provision Matrix Method
- Recovery Rate Method

Both Expected Loss and Incurred Loss runs have a few activities in common which are as follows:

1. Load the data as per data download requirements.
2. Assign the relevant provision calculation method.
3. Setting Charge-off materiality
4. Decide whether a collective assessment or an individual assessment is to be made.

Assign or reclassify a few aspects as follows:

- Map the external rating grades to internal credit grades for transition matrices.

  Note: Only one external rating from a rating source can be mapped to only one internal rating.

- Map the Bank Customer type to Basel Customer type, used for reporting only.
- Map the Bank Product type to Basel Product type, used for reporting only.
- Map the Bank Asset class to Basel Asset type, used for reporting only.

2.1. Cash Flow Based Method

This method mainly involves projecting cash flows using the asset contract definition. This method is applied on the financial assets for which cash flows can be generated, which includes loans and Held-to-Maturity (HTM) securities. In addition, assets for which cash flows are projected using behavior assumptions can also be included. However, this method is not applicable for impaired assets as it does not generate cash flows. This is a single name given to the method applicable for non-impaired cash flow based products under Expected Loss and Incurred Loss approach.

For Expected Loss approach, time horizon for which the cash flow method is applied is till the maturity of assets. For Incurred Loss approach (Forward Exposure Method - IBNR), time horizon for which the cash flow method is applied till the emergence period.

NOTE: Cash Flow Data Generation Alternative 1

Collective Assessment: The purpose of using collective method is to gain operational efficiency to generate cash flow (saving time required for calculation) and in cases where detailed information is not available. For internal CFE, account information, including cash-flow is expected to be available at individual level.

Oracle CFE: In cases where the Oracle Cash Flow Engine is used, the LLF&P application needs IRR of the contractual cash flows as a download. This will be required for the computation of EIS.

NOTE: Cash Flow Data Generation Alternative 2

When cash flows are provided as a download, FIC MIS DATE in STG ACCOUNT CASH FLOW is an important field to be considered. For EIR or EIS calculations, cash flows as of Account Start Date are required, and for provision calculations cash flows as per Current Date or FIC MIS DATE is provided. In the first instance, FIC MIS DATE in STG ACCOUNT CASH FLOW must be as per Account Start Date and in second case it should be normal FIC MIS DATE.

The steps to be followed for Cash Flow Based Method for both the Expected Loss and Incurred Loss approaches are detailed as follows:

2.1.1. Cash Flow Based Method - Expected Loss Approach

The features of this approach are the use of Effective Interest Rate (EIR) and Effective Initial Spread (EIS). The procedure to compute this method is as follows:

Transition matrix is assigned to each and every applicable account, exposure, or cohort (that is, group of accounts/exposures).

Cash Flow Engine (CFE) calculates the cash flows for each concerned exposure till its maturity.

The LLF&P Application requires Cash Flows for two purposes as follows:

- Calculation of provision
- Calculation of EIR or EIS.

Cash flows are generated as of account start date for the EIR or EIS calculations, whereas Cash flows are generated as of current date in case of provision calculation. If collective assessment has been selected, the cash flows are generated for cohort instead of each account. Every cohort is treated as single exposure from a cash flow perspective.

Note: Carrying amount is stored in carrying cost column, for processing and reporting purpose (N_CARRYING_COST_NCY).

For more information on the concept of collective assessment, see Collective Assessment section.

Projected cash flow is then converted to expected cash flow by multiplying with the expected cash flow rate.

The Loss Rate and Expected cash Flow are calculated as follows:

Loss Rate = Default Probability Applicable as of Cash Flow Date * LGD at Account Level

Expected Cash Flow Rate = 1 – Loss Rate

Expected Cash Flow = Projected Cash Flow * Expected Cash Flow Rate.

Expected cash flows are then discounted to the current date using EIR or EIS.

For Fixed Rate Instrument, Discount Rate = EIR

For Variable Rate Instrument, Discount Rate = Variable Rate Applicable for Cash Flow Date + EIS

Sum of these cash flows at account or cohort level is known as amortized cost.

Allowance as of date = Carrying amount – Amortized cost

If charge- off is material, **Provision as of date = Allowance as of Previous date - (Allowance as of current date – Net Charge off)** else, it is difference between two previous period allowances.

2.1.2. Cash Flow Based Method - Incurred Loss Approach

The procedure to compute this method is as follows:

1. Assign the following to each and every applicable account, exposure, or cohort. You can also provide a download at the required granularity:
   - Transition Matrix
   - Emergence period
   - Risk Free Rate
2. Cash Flow Engine calculates the cash flows for each concerned exposure till the maturity.

Note: If you have selected a collective assessment, the cash flows are generated for cohort instead of each account. Every cohort is treated as a single exposure from a cash flow perspective.

3. Projected Cash Flows are converted to Expected Loss using loss rate and Loss Given Default (LGD).

   The Loss Rate and Expected Loss Amount are calculated as follows:

   Loss Rate = Default Probability Applicable as of Cash Flow Date * LGD at Account Level

   Exposure at Default = Principle Outstanding as of each Cash Flow Date excluding Principle Payment as of said Cash Flow Date.

   Expected Loss Amount = Exposure at Default * Loss Rate
4. Expected loss amount is calculated up to the emergence period.
5. Expected cash flows are discounted to the current date using Risk Free rate assigned.

   Allowance as of Date = Sum of Expected Loss Amount at Account Level.

   If charge-off is material, **Provision as of Date = Allowance as of Previous Date - (Allowance as of Current Date – Net Charge off)** else, it's the difference between two previous period allowances.

2.1.3. Calculation of EIR and EIS

EIR and EIS are calculated for CFE based methods. Here, cash flows are calculated till maturity covering the entire life span.

EIR is the yield to maturity calculation for expected cash flows. This is calculated for fixed

interest rate contracts. Calculation of expected cash flows will be detailed in further sections.

EIS is calculated as follows. This is calculated for variable interest rate contracts:

Effective Initial Spread =
Initial Contracted spread – (**IRR Contractual Cash Flows – IRR probability weighted cash flows**)

Internal Rate of Return (IRR) is yield to maturity calculation for contracted cash flows.

The calculation of EIS and EIR are explained in the following document:

EIR and EIS Calculations.xlsx

You can decide the accounts for which EIR or EIS is required to be calculated. There can be various reasons for which EIR or EIS needs to be calculated or re-calculated, namely, new accounts, and change in important contract terms, and so on. However, except on the first day of implementation, percentage of new accounts for which EIR or EIS is to be calculated is expected to be small.

Thus, EIR or EIS can be re-calculated based on your instructions taken as input during the data download stage. The re-calculated EIR or EIS would exist along with pre-determined values but with a new 'as of date' and status as active. The LLF&P application considers the EIR or EIS with status as active and those with the latest as of date for further computation of loan loss provision.

Note: Upon recalculating EIR or EIS, the loan loss provision for the current period would be close to NIL.

2.1.4. Collective Assessment

Collective assessment is combining the exposures with similar characteristics, resulting in a single exposure known as a cohort. Hence, collective assessment is referred to as *Cohort Formation* in the LLF&P application. Cohort is strongly linked to the Oracle Cash Flow Engine (CFE). It uses all the mandatory cash flow calculation parameters as the basis of Cohort formation. Charged off / written off and impaired accounts are not allowed to use collective assessment.

Charged off accounts may require higher provisioning than that for non-charged off accounts. To maintain homogeneity of accounts within cohort, these accounts are not part of collective assessment.

The purpose of using collective method is to gain operational efficiency (saving time required for calculation) and in cases where detailed information is not available. Collective assessment helps reduce the time required for calculation with minimal loss in accuracy. However, at the bank level, where prudent provisioning is required, differences between collective assessment and individual assessment turns out to be trivial. If one calculates the provision at individual account level and then compares the same with the provision allocated to the individual account from cohort, then this will create a difference.

NOTE: Collective Assessment Allowance

The criteria for cohort formation are a key decision to be made by you. You can choose all the available parameters as the criteria. This will make lots of cohorts giving some sense of enhanced accuracy. However, operational efficiency achieved would be minimal. On the other hand, one can choose only a few required parameters. This will create fewer cohorts thereby increasing operational efficiencies. However, it also creates an impression of being less accurate.

Often comparison is made between two allowance numbers:

a. Calculated when exposure is treated as an individual asset.

b. Calculated when it is part of a cohort.

There are various factors affecting these calculations namely, criteria used for cohort formation and the allocation factor itself. Depending on these two numbers, the collective assessment allowance will either be close or depart. It is suggested that a comparison should be made between similar components. Hence, sum of allowance for a group of exposures when they are treated as individual exposures should be compared with allowance at cohort level assuming the composition is the same in both the cases. It is this comparison which should drive the decision for cohort formation criterion and allocation factor.

2.2. Provision Matrix Method

This mainly involves the usage of direct provision rates instead of cash flow projection. This is applied on the financial assets mapped to Provision Matrix based methods. There is no constraint to the application of this method. This method is common for both impaired and non-impaired exposures.

Note: It is assumed that in case of an impaired status a higher rate of provisioning is to be applied. This can be achieved by adding impairment status as one of the dimensions while applying the Provision Matrix method.

The following steps are required to be completed to use the Provision Matrix method:

1. Assign the provision matrix to each and every account, exposure or cohort. These provision matrices are either based on credit rating or delinquency bands or both.
2. Apply provision rate to each exposure, depending on the credit rating and/or delinquency band, from an assigned provision matrix.

Provision Matrix Assignment Rule is used for mapping provision Matrix. The parameters required for provision matrix assignment are source hierarchies in the Rule. Applicable provision rate from Provision Matrix is assigned to an account based on its rating or delinquency band using **Provision Rate Assignment** Rule. Amortized cost is calculated using provision rate as

Amortized cost = Carrying amount * (1 -Provision rate).

Allowance is calculated as difference between carrying amount and amortized cost.

2.3. Recovery Rate Method

In case of impaired accounts, a formula based approach is used, wherein the LLF&P application uses average recovery period and IRR of an account to calculate the provision.

$$\textbf{Amortised Cost of Impaired Asset} = (\boldsymbol{Carrying\ cost\ at\ Impairment} * (\mathbf{100}\% - \boldsymbol{LGD}))/(\mathbf{1} + \boldsymbol{r})^{\boldsymbol{t}})$$

- Carrying amount, (Carrying amount at impairment)
- LGD (Loss given Default)
- 'r' (Original Effective interest rate given as a download, that is, IRR of contractual cash flows).
- 't' average time to recovery

2.4.Collateral Value Based Method

Collateral Value Based (CVB) Method is used to calculate allowance for Mortgage products or other retail products only. In the Collateral Value Based Method, shortfall between the collateral value and carrying amount (with expected recovery cost) of an exposure is calculated. Allowance is calculated based on shortfall amount subject to shortfall threshold.

Collateral is assumed to be allocated at 100% mitigate an exposure which means the full value of collateral is available for the account it is mapped to. Hence, if collateral is shared across accounts of different product type, then the all associated accounts should be excluded from provision calculation processing. For non-retail customers or for customers having accounts not passed through CVB methods, it is assumed that same customer will not have same product type if the customer is shared across legal entity..

2.4.1. Allowance Calculation

To arrive at allowance amount, CVB Method requires calculating shortfall of collateral amount to cover carrying amount and expected recovery cost. Allowance is calculated only if shortfall is a positive value.

Shortfall is calculated as follows:

$$\boldsymbol{Shortfall} = -[\boldsymbol{Collateral\ Value} - (\boldsymbol{Carrying\ Cost} + \boldsymbol{Expected\ Recovery\ Cost})]$$

Expected recovery costs and carrying amounts are provided as input data at account level granularity. Collateral value is also provided as input data at a collateral-level granularity. Since CVB Method is to be applied on home loan and for retail customers, it is assumed that collateral amount, expected recovery cost and carrying amount will be in same currency that is the natural currency of the account.

Based on number of collaterals for an account there will be following possible scenarios; and hence potentially varied formula to calculate shortfall:

Scenario ID	Description	Shortfall Calculation Formula
1	1 Account : 1 Collateral	$Shortfall = -[Collateral\ Value - (Carrying\ Cost + Expected\ Recovery\ Cost)]$
2	1 Account : N Collaterals	$Shortfall = -[\sum Collateral\ Value - (Carrying\ Cost + Expected\ Recovery\ Cost)]$

In addition to the above, there could be a case where one customer is holding multiple accounts to be treated by CVB Method. In such case, shortfall needs to be necessarily calculated at product type level for each customer and then allowance has to be allocated back to account level using waterfall approach as explained in Allowance Calculation – Multiple Accounts section. Based on

number of accounts for a customer, there will be following possible scenarios; and hence potentially varied formula to calculate shortfall.

Scenario ID	Description	Shortfall Calculation Formula
1	1 Customer : 1 Account	$Shortfall = -[\sum Collateral\ Value - (Carrying\ Cost + Expected\ Recovery\ Cost)]$
2	1 Customer : N Accounts	$Shortfall = -[\sum Collateral\ Value - \left(\sum Carrying\ Cost + \sum Expected\ Recovery\ Cost\right)]$

Allowance Calculation – Single Account

For a single customer and single account scenario, allowance amount is calculated from shortfall amount as follows:

$$Allowance = Shortfall\ ;if\ Shortfall > Threshold\ amount$$

or

$$Allowance = 0\ ;if\ Shortfall \leq Threshold\ amount$$

Threshold amount is assigned by computing a Rule at Legal Entity, Product type and Reporting Currency level.

Allowance Calculation – Multiple Accounts

If one customer is holding multiple accounts, then the shortfall is calculated at product type and customer level as follows:

$$Shortfall = -[\sum Collateral\ Value - \left(\sum Carrying\ Cost + \sum Expected\ Recovery\ Cost\right)]$$

Shortfall amount thus calculated will undergo threshold check at product type and customer level.

$$Eligible\ Shortfall = Shortfall\ ;if\ Shortfall > Threshold\ amount$$

or

$$Eligible\ shortfall = 0\ ;if\ Shortfall \leq Threshold\ amount$$

Threshold amount is a semi-static download amount at Legal Entity, Product type and Reporting Currency level. Allowance amount is derived at account level from the eligible shortfall amount using the waterfall approach. In this approach, the shortfall amount is first used to cover the account with the maximum carrying amount, and then the account with the second highest carrying amount is covered and so on, till the shortfall amount is exhausted. The waterfall approach is explained with an example in the attached worksheet.

Example.xlsx

2.5.Allowance Threshold

Threshold is checked against the sum of allowance across accounts for a customer and product type combination. Since the product type is one of the source hierarchies it is assumed that the underlying accounts would have undergone same provision calculation method.

Eligible Allowance amount for the underlying accounts can be considered as 0 if sum total of the allowance of its account-set, at which threshold was checked, is less than or equal to the given threshold.

Eligible Allowance is the same as the allowance if sum total of allowance of its account-set, at which threshold was checked, is greater than the given threshold.

Threshold amount is assigned through rule at Legal Entity, Product type and Reporting Currency level.

2.6.Provision Amount Calculation

Provision is calculated as a difference between allowance of current period and allowance of previous period.

The provision calculation is based on **f_Chargeoff_Materiality_Flag**.

If the flag is "**Y**", then, the formula is:

Provision at time (t) =Allowance at time (t) - (Allowance at time (t-1)-Net Charge off)

And if the flag is "**N**", then The formula is:

Provision at time (t) =Allowance at time (t) - Allowance at time (t-1)

Provision is calculated using **Provision Calculation** rule.

2.7.Other Important Calculation: Transition Matrix

Transition Matrix is the probability of an exposure or a customer moving from one credit grade to another over a defined period of time. Grades can be defined as:

Credit rating: For example AAA, AA.

Or

Delinquency bands: For example 0-30 Days, 31-60 days.

Transition matrix is used in the following steps:

1. Calculating a set of Historical Transition Matrices.
2. In Predicted Transition Matrix, use Poisson process to convert these probabilities to a suitable frequency.

2.7.1. Historical Transition Matrices

Keeping an eye on the set of exposures where these transition matrices are used, different granularities of data are used to generate different historical transition matrices. They represent the institution's experience.

Probability of Transition =
Count of Transition between two grades /Total Transition from a source grade.

In this calculation:

- The sum of all transitions is one, thus maintaining unity constraint,
- New and closed accounts are excluded.

NOTE:

New accounts are those which are not available in the last data point whereas they are available in the current data point. The concept of closed account is the exact opposite of new account.

Denominator is the base of the previous period. This means either the total number of accounts or the sum of carrying amount is used as the **denominator** which belongs to the previous period. At every instance, transition matrix from one period to another is calculated. For multi-period transition matrix, one needs to execute multiple times.

Once the institution has this set ready, it needs to predict or forecast the transition matrix for future years. These predicted transition matrices are used in the LLF&P application.

For example: Assume internal rating is from AAA to D (in the order of credit rank with AAA as most sound and D as rating for defaulted assets). If you keep the rating D as impaired state rating then the transition probability from AAA to D will be considered as probability of impairment for exposure having AAA rating. If you keep a rating better than D, say C+, as impaired state rating then all the ratings from C+ to D (both rating inclusive), in the order of credit rank, will be considered as impaired state rating. The transition probabilities from AAA+ to C+ and to all other rating between C+ and D (C, C-) will be aggregated and considered as probability of impairment for exposure having AAA rating.

2.7.2. Poisson Calculations

Poisson calculations are used to convert the probability from one frequency to another. For example: if the Transition Matrix frequency is annually and we are interested in monthly probabilities, then we look for Poisson calculations.

In these calculations, per period loss rate, which is credit grade specific, is the most important for calculations. Every grade calculation differs depending on the probability of default. The per period loss rate is computed through the following steps:

1. Calculate the **Poisson Parameter (φ)** for the Poisson Process of converting the Poisson parameter to the lower granularity based on the inputs of time (Monthly, Quarterly, Semi-annually or Annually), using the below formula for each credit grade:
   - **Formulae used: 1-Exp(-φ t) = t-year cumulative probability**
   - **All other parameters apart from 'Poisson Parameter' (φ) are input. Thus we solve this for φ. (The value for 'Poisson Parameter' should be stored)**
2. Calculation is performed at a Monthly level which will be the default option provided in the LLF&P Application. The output is a cumulative probability at a given frequency.
3. Cumulative probabilities are then adjusted for LGD.
4. Adjusted cumulative probabilities are used to calculate per period loss rate.
   - **Per Period Loss rate for period(t) = Cumulative Prob. for Period (t) - Cumulative Prob. for Period (t -1)**
5. Then, conversion to cumulative probability across years takes place; where:

- **Cumulative Loss rate for period(t) across TM period = Cumulative Prob. for Period (t-1) + Cumulative Prob. for Period (t)**

6. Expected Cash Flow rate at period (t) = 1 - Cumulative Loss rate for period(t)

3. Understanding the LLF&P Application

The main objective of this chapter is for you to get familiarized with the various functions of Oracle Financial Services Loan Loss Forecasting and Provisioning, through the process flow. The logical order, in which the LLF&P application functionalities are executed, will help in understanding, executing, and maintaining data in the LLF&P Application.

LLF&P Business Processes are majorly classified into the following:

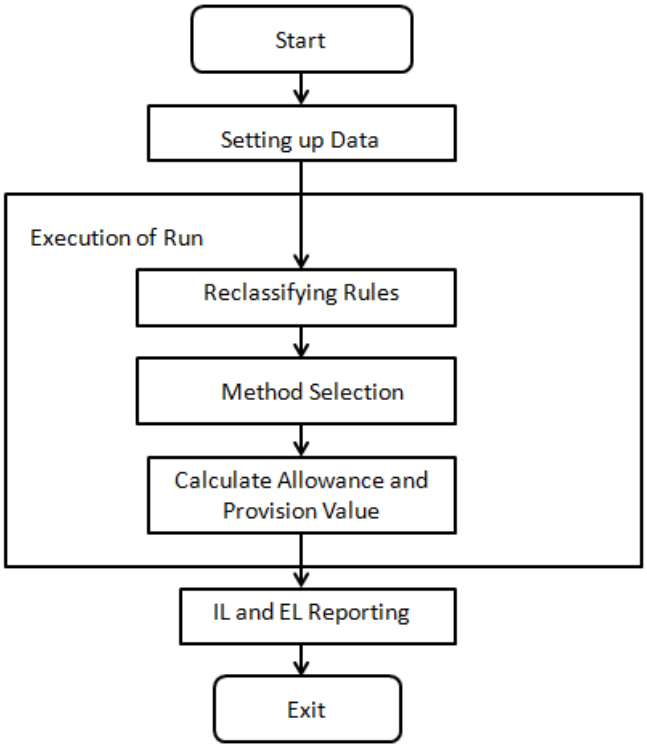
- Provision Calculation
- Loss Forecasting

3.1. Provision Calculation

Two types of approaches that are used to calculate provision which are as follows:

- Incurred Loss (IL) Approach
- Expected Loss (EL) Approach

Each approach is a separate Run in the LLF&P application. *For more information on executing a Run, refer to chapter 5-Execution.* A high level process flow to calculate provision is as follows:



The Expected Loss Run applies any one of the following methods:

- Cash flow based Method
- Provision Matrix Method
- Recovery Rate Method
- Collateral Value Based (CVB) method

The Incurred Loss Run applies any one of the following methods:

- Cash flow Based Method
- Provision Matrix Method
- Recovery Rate Method

NOTE: Provision Calculation method is expected to be changed.

3.1.1. Expected Loss (EL) Approach

EL Approach consists of the following major business processes:

1. Basic Procedure
2. Expected Loss Method
3. Provision Matrix Method
4. Recovery Rate Method
5. Collateral Value Based (CVB) Method
6. Net Charge Off Calculation
7. Provision Calculation
8. Currency Conversion

Basic Procedure

The basic procedure is as follows:

1. Load the setup data and Run data as mentioned in chapter 4 "Preparing for Execution".
2. Basel reclassification Rule is used to map the bank's customer type and product type to Basel Customer Type and Basel Product Type respectively. It is used for reporting purposes. This is done using the following reclassification Rules:
   - Basel Customer Type Re-classification
   - Basel Product Type Re-classification
   - Basel Asset Class Re-classification
3. Methodology is selected based on following source hierarchies:
   - Product Type
   - Account Status (Indicates Accrual Status, Write Off Indicator, Closed Account Indicator and other statuses)
   - Days Past Due (DPD) band
   - Customer Status (Indicates Bankruptcy Indicator and Fraud Indicator)
   - Account Based Provisioning Approach Indicator (Preferential method assignment indicator)

- Carrying Amount Band
- Cash Flow Approved Indicator
- Customer Type
- Impairment status

    a. Cash Flow Based Expected Loss (EL) method is mapped using the Rule **Provision Calculation Methodology Selection - EL Run.** For Non-retail customers, this method can be used.

    b. Provision Matrix method is mapped using the rule Provision Calculation Methodology Selection - IL Run for the following Source:

    (Non-Impaired Asset AND Customer Type AND Product) OR (Impaired Asset AND High Net Worth Individual AND Credit Cards) OR (Impaired Asset AND Corporate - Small AND Overdraft) OR (Impaired Asset AND Corporate - Medium AND Overdraft) OR (Impaired Asset AND Corporate - Large AND Cash Credit)

Method Override – Assume a customer has many accounts. If any one account is treated by CVB method then, all the other accounts should be treated by CVB method. It is assumed that same customer will not have same product type if shared across legal entity. Among all the accounts mapped to CVB method, if the collateral is shared across accounts of different product types, then the associated accounts will be excluded from provision calculation processing.

Note: Provision calculation Method selection rule is expected to be customized based on client's data and requirement. Further, Method override process may override the method, assigned by the rule, to ensure that all accounts of the customer, under same product type, are assigned CVB method to if one of the account is assigned to CVB Method.

4. Setting Charge-off materiality: If gross charge-off is greater than the charge-off materiality threshold then its net charge-off is adjusted from the calculated provision amount. In the pre-configured Run, charge-off materiality threshold amount is 500. This is done using **Charge-off Materiality Assignment** rule. Charge-off materiality is also used to identify accounts for collective assessment treatment. Materially charged-off accounts are not considered for collective assessment.

Cash Flow Based - Expected Loss Method

The process for computing Expected Loss Method is as follows:

1. Using **Collective Assessment Assignment** Rule, accounts are classified to be treated collectively. All retail customers having non-impaired accounts are assessed collectively to calculate provision.
2. Populate contractual cash flow from the stage table for each account using the T2T rule **CONTRACTUAL_CASH_FLOW_POPULATION**. This includes populating the principal component and the interest component for each cash flow date.
3. **CFE_CONTRACTUAL_CASH_FLOWS**: This T2T is used if Oracle Asset Liability Management (ALM) and LLF&P is installed together and the current cash flow is generated using Oracle Asset Liability Management (ALM) and if you want to reuse cash flows of Oracle Asset Liability Management (ALM). AS OF DATE is FIC_MIS_DATE for LLF&P to generate cash flows as on FIC_MIS_DATE. Also, the ALM process ID should be updated in the LLF&P T2T.
4. Amortized cost using EL approach is calculated when the Expected Interest Rate (EIR) and Expected Interest Spread (EIS) are as of account start date. If it is not provided as a download,

then the application calculates the same. EIR or EIS calculation indicator needs to be updated to indicate that EIR and EIS need to be calculated. This flag is updated by task **EIR_EIS_Flag_Update** – which updates the flag to **A**.

5. To calculate EIR or EIS as of account origination date, LLF&P needs cash flow from account origination and expected cash flow after considering the cumulative loss rate. If cash flow is a download as of account start date it needs to be populated using **ACCT_ORIGINATION_CASH_FLOWS** DT. Cumulative loss rate is calculated with the help of the transition matrix as described in the following steps:

NOTE:

If you want to calculate EIR or EIS, then the transition matrix provided for EIR or EIS calculation should be valid as of account origination date, that is, account origination date should be in between record start date and record end date of the transition matrix assigned.

6. Assign Transition Matrix: Transition matrix is assigned based on following parameters:
   - Customer Type
   - Currency
   - Product

This is done using **Transition Matrix Assignment** Rule. Accordingly, rating and delinquency based transition matrix data is populated for Poisson processing. This is done using T2T **RATING_TRANSITION_MATRIX_POPULATION** and **DPD_TRANSITION_MATRIX_POPULATION**.

7. Each rating scale or delinquency band scale has a default grade state, which indentifies defaulted accounts. Allowance amount is a function of transition probability to default or impairment. To calculate allowance, you may keep impaired state the same as default grade scale or assign some other impaired state depending on the credit policy or outlook.

   To enable this, you need to assign impaired state rating (absorbing state) for the transition matrix. This is done using the same source hierarchies that are used for Transition Matrix assignment. Transition probability for credit rating grade of impaired state rating and below will be accumulated and considered as Lamda calculation for Poisson process.

8. Similarly, assign impaired state delinquency band.

9. Poisson process is executed to arrive at monthly transition probability. It is done using **Cumlt_Impaired_Prob_Calc** DT. You can change monthly to quarterly/yearly by setting it up in Reveleus_Parameter_Master table by changing LLF&PBUCKETLENGTH.

NOTE:

Frequency period of the input transition matrix should be greater than that of bucket length.

For example: Input transition matrix cannot be monthly and LLF&PBUCKETLENGTH as Quarterly. In this case, all transition matrices should have frequency period as at least quarterly or more.

10. Accounts to be assessed and treated collectively are identified based on their credit rating, delinquency band, customer type, start date, interest rate, cash flow pattern, and other such characteristics that can affect allowance amount. Cohort is formed according to such data. **Cohort_Identification** DT is used to achieve this.

11. After identifying such cohorts, data pertaining to accounts forming a cohort is aggregated for collective treatment. This is done using T2T rule **COHORT_DATA_POPULATION**.

12. Loss Given Default is calculated at cohort level with relative weight of carrying amount of the account in the cohort. Weighted average LGD for Collective Assessment rule is used for this.

13. For an account or at a cohort level (if account is part of cohort) following steps are performed to calculate allowance:
    a. Pre cash flow validation- This is to validate input data to CFE. All errors are logged in **FIC_DTDQ_MESSAGE_LOG** with value of the column **V_MAIN_PROG_NAME** as **FN_DT_PRE_CF_VALIDATIONS**. All values need to be picked up for the current batch.
    b. Generate cash flow and calculate principal and interest component of the cash flow amount. Errors thrown by CFE are logged in FSI_OPS_ERROR_DETAILS.
    c. Periodic Cumulative Loss Rate is calculated by multiplying LGD with cumulative impaired transition probability using a Rule.
    d. Expected cash flow rate is derived from cumulative loss rate using a Rule.
    e. Expected cash flow amount is calculated using cash flow amount and expected cash flow rate (calculated earlier).
    f. EIR_EIS_Calculation- EIR and EIS values are considered in the following order. First, the application checks for EIR / EIS value in stage table values. If EIR/EIS value is present in the stage table, then the application checks in the Account Inception table. If not present in the Account Inception table, then the LLF&P application calculates by itself. While calculating, records having erroneous data are skipped. Errors during processing are logged in FSI_OPS_ERROR_DETAILS. Also, account start date is mandatory for EIR EIS calculation
    g. EIR EIS is calculated at account level and not at cohort level.
    h. Table is updated with calculated EIR and EIS as on account start date. This is done using Upd_Inception_Rates.
    i. EIR is aggregated at cohort level with relative weight of carrying amount of the account in the cohort. Weighted Average EIR for Collective Assessment Rule is used for this.
    j. EIS is aggregated at cohort level with relative weight of carrying amount of the account in the cohort. Weighted Average EIS for Collective Assessment Rule is used for this.
    k. EIR or EIS value is updated in the cash flow table. This is done using EIR_EIS_Update DT.
    l. Benchmark interest rate is populated till the highest maturity for all distinct benchmark curves mapped to accounts and risk free rate for all distinct currencies.
    m. Benchmark rate is interpolated and updated. If benchmark rate is not available for the specified period then it is interpolated using either linear, cubic, and quadratic interpolation method as selected in Run execution parameters.
    n. Discounted rate used in the EL method for discounting future cash flows is EIR as on inception for fixed interest rate assets and EIS as on account origination added to benchmark rate for variable rate assets. This is assigned using the Rule Periodic Discount Rate calculation.
    o. Calculate discounting factor using discounting rate assigned as above. This is done using Periodic Discount Factor Calculation rule.
    p. Present value of expected cash flow is calculated by multiplying cash flow with discounting factor. Expected Cash Flow Present Value Calculation Rule does this task.
14. Amortized cost of an account is calculated as sum of present value of expected cash flow of the account. Amortized cost calculation for individual assessment rule is used for this.
15. Amortized cost of a cohort is calculated as sum of present value of expected cash flow from the cohort. Amortized cost calculation for collective assessment rule is used for this.

16. Net charge-off is calculated using Net Charge off Calculation Rule that subtracts cumulative recovery from gross charge-off. This is done for all product types.
17. Net charge-off rate is calculated from net charge-off as proportion of carrying amount. Net Charge-off Rate Calculation Rule is used for this.
18. Allowance is calculated as difference between carrying amount and amortized cost. Allowance calculation using Amortized Cost - Individual Assessment rule is used for this.
19. For collectively assessed exposure allowance is calculated at cohort level as difference between carrying amount and amortized cost of the cohort. This is done using the allowance calculation using Amortized Cost - Collective Assessment
20. In Collective assessment, amortized cost, and allowance is calculated at cohort level and then apportioned to account level as per allocation factor.
    - Allocation factor is calculated as per proportion of carrying amount of an account in the cohort. This is done using **Allowance Allocation Factor Calculation** Rule.
    - To allocate cohort level amortized cost back to the account level as per allocation factor **Collectively Assessed Exposure Amortized Cost Calculation** Rule is used.
    - To allocate cohort level allowance back as per allocation factor **Collectively Assessed Exposure Allowance Allocation** Rule is used.
21. Allowance is capped to carrying amount using **Reporting Allowance Calculation** Rule which takes maximum and minimum of carrying amount and calculated allowance. Allowance amount threshold check, is applicable for all the methods in EL run.
    - Threshold is checked against sum of allowance across accounts for a customer and product type combination. Product type is one of the source hierarchies in method selection. Ensure that underlying accounts have undergone the same provision calculation method.
    - Eligible Allowance amount for the underlying accounts is considered as 0 if the sum total of allowance of its account-set, at which threshold was checked, is less than or equal to the given threshold.
    - Eligible Allowance is same as the allowance, if sum total of allowance of its account-set, at which threshold was checked, is greater than the given threshold.
    - Threshold amount is assigned through rule at Legal Entity, Product type and Reporting Currency level.

Provision Matrix Method

All exposures under Provision Matrix method will be individually assessed. Collective Assessment approach is not applicable for Provision Matrix method. Provision rate may vary based on rating and delinquency days across various counterparties, products, or impairment statuses. Hence, Provision Matrix is assigned based on the following parameters:

- Impairment Status
- Customer Type
- Product.

Provision Matrix Assignment Rule is used for mapping provision Matrix. The parameters required for provision matrix assignment are source hierarchies in the Rule. Applicable provision rate from Provision Matrix is assigned to an account based on its rating or delinquency band using **Provision Rate Assignment** Rule. Amortized cost is calculated using provision rate as

Amortized cost = Carrying amount * (1 -Provision rate).

Allowance is calculated as difference between carrying amount and amortized cost.

NOTE: Each method calculates allowance amount as of FIC_MIS _Date.

Recovery Rate Method

Based on method selection criteria, that is, which has the impairment status as **Y** across products and customers, Recovery rate method is followed. Recovery rate method requires discounting of recovery amount till average recovery period based on type of interest rate. Recovery amount at the time of recovery are discounted using IRR for fixed interest rate assets. For variable interest rate assets, discount rate is original contractual spread added to interpolated benchmark rates. This is done using type 3 rule **Discount Factor Calculation**.

NOTE: Average Recovery period can be given in number of days, months or years.

Amortized cost for Recovery Rate method is the product of carrying amount, recovery rate (1-LGD) and discounting factor. It is calculated using **Amortized Cost Calculation - Impaired Assets**. Allowance is calculated as difference between carrying amount and amortized cost.

Collateral Value Based (CVB) Method

Collateral Value Based (CVB) Method is used for retail customer of mortgage portfolio. CVB Method is expected to be used to calculate allowance for retail assets. The CVB method is calculated as follows:

1. If the provision calculation method is CVB, then the following is computed:
    - Collateral Value for each collateral
    - Carrying amount and Recovery cost at the account level
    - Account to collateral mapping
2. The Carrying Amount, Recovery Cost, and Collateral Value are converted to Reporting Currency.
3. The Shortfall (RCY) at customer and product type level is calculated as follows:

    Shortfall = [∑Collateral value – (∑Carrying amount + ∑Recovery costs)]
4. If Shortfall > Threshold, an account with the same customer and product type and which has the highest carrying amount to which shortfall is not allocated is considered.

    Account level EoP Allowance (RCY) = Minimum (balance eligible shortfall, carrying amount)
5. If the customer does not have another account with the same product type, then the account level EoP Allowance is converted to the natural currency.

    Eligible Allowance = Min (EoP Allowance, Carrying amount) in NCY.
6. Provision is then calculated and converted eligible allowance and Provision Value to Reporting Currency.

Net- Charge off Calculation

Net charge-off is calculated using Net Charge off Calculation Rule that subtracts cumulative recovery from gross charge-off. This is done for all product types. Net charge-off rate is calculated from net charge-off as proportion of carrying amount. Net Charge-off Rate Calculation Rule is used for this.

Provision Amount Calculation

Provision is calculated as a difference between allowance of current period and allowance of previous period. The provision calculation is based on **f_Chargeoff_Materiality_Flag**.

If the flag is "Y", then the provision calculation formula will be = Allowance (t) – (Allowance(t-1)-Netchargeoff).

If the flag is "N", the provision calculation formula will be = Allowance (t) – Allowance (t-1). Provision is calculated using **Provision Calculation** rule.

Currency Conversion

Allowance, Provision and other reporting measures are converted to reporting currency using **Key_Measure_RCY_Conv** task. Please note that exchange rate will be applied as defined in **STG_FORWARD_EXCHG_RATES** table for the respective MIS date or earliest rate available till previous five days of the pre-defined source. Source of currency conversion rate should be given at Legal Entity level in V_ATTRIBUTE_ASSIGN_VALUE column of STG_LEGAL_ENTITY_ATTR_INTF table with corresponding parameter in V_ATTRIBUTE_VARCHAR_LABEL as "FX_SRC". Cohort level provision is updated for reporting purpose using **Cohort_Provision** DT.

3.1.2. Incurred Loss (IL) Approach

IL Approach consists of the following major business processes:

- Basic Procedure
- Forward Exposure Method
- Provision Matrix Method
- Recovery Rate Method
- Net Charge Off Calculation
- Provision Calculation
- Currency Conversion

Basic Procedure

The basic procedure is as follows:

1. Load the setup data and run data as mentioned in chapter 4 "Preparing for Execution".
2. Basel reclassification rule is used to map Bank's customer type and product type to Basel Customer Type and Basel Product Type respectively. It is used for reporting purpose. This is done using the following reclassification rules:
    - Basel Customer Type Re-classification
    - Basel Product Type Re-classification
    - Basel Asset Class Re-classification
3. Methodology is selected based on following source hierarchies:
    - Product Type
    - Customer Type
    - Impairment status

Forward exposure method is mapped using the rule **Provision Calculation Methodology Selection - IL** Run to the following Source:

(Non-Impaired Asset AND Insurance companies AND Product) OR (Non-Impaired Asset AND Corporate - Small AND Product) OR (Non-Impaired Asset AND Corporate - Medium AND Product) OR (Non-Impaired Asset AND Corporate - Large AND Product) OR (Non-Impaired Asset AND Banks AND Product)

4. Setting Charge-off materiality: If Gross charge-off is greater than the charge-off materiality threshold then its net charge-off is adjusted from the calculated provision amount. In the pre-configured run, charge-off materiality threshold amount is 500. This is done using **Charge-off Materiality Assignment** rule. Charge-off materiality is also used to identify accounts for collective assessment treatment. Materially charged-off accounts are not considered for collective assessment.

Cash Flow Based Forward Exposure Method

The process for computing Forward Exposure Method is as follows:

1. Classify the accounts to be treated collectively using **Collective Assessment Assignment** Rule:
   - To improve the overall efficiency of the process to generate cash flows using Oracle Cash Flow Engine (CFE)
   - Accounts having similar characteristics are grouped together to form a cohort.

   Typically, all retail customers having non-impaired accounts can be assessed collectively to calculate provision.
2. Populate contractual cash flows for each account to be treated under Forward Exposure Method using T2T rule. This includes populating principal component and interest component for each cash flow date.
3. Assign Transition Matrix: Transition matrix is assigned based on the following parameters:
   - Customer Type
   - Currency
   - Product

   Accordingly, rating, and delinquency based transition matrix data is populated for Poisson processing. This is done using the T2T **RATING_TRANSITION_MATRIX_POPULATION** and **DPD_TRANSITION_MATRIX_POPULATION**.
4. Each rating scale or delinquency band scale has a default grade state, which indicates defaulted accounts. Allowance amount is a function of transition probability to default or impairment. To calculate allowance, you may keep the impaired state the same as default grade scale or assign some other impaired state depending on the credit policy or outlook.
5. Transition probability for credit rating grade of impaired state rating and below will be accumulated and considered for Lamda calculation for Poisson process .It is done using **Cumlt_Impaired_Prob_Calc** DT.
6. Similarly, assign impaired state delinquency band.
7. Poisson process is executed to arrive at a monthly transition probability. You can change Monthly to Quarterly or Yearly by setting it up in the Reveleus_Parameter_Master Table by changing LLF&PBUCKETLENGTH.

NOTE: Frequency period of the input transition matrix should be greater than that of bucket length. For example: input transition matrix cannot be Monthly and LLF&PBUCKETLENGTH be

Quarterly. In this case, all transition matrices should have a frequency period of at least quarterly and more.

8. Accounts to be assessed and treated collectively are identified based on their credit rating, delinquency band, customer type, start date, interest rate, cash flow pattern and other such characteristics that can affect cash flow amount. Cohort is formed according to such data. **Cohort_Identification** DT is used to achieve this.
9. After identifying such cohorts, data pertaining to accounts forming a cohort is aggregated for collective treatment. This is done using T2T rule **COHORT_DATA_POPULATION**.

   Following parameters are calculated at cohort level with relative weight of carrying amount of the account in the cohort:

   - Emergence Period
   - LGD
   - CCF

   For an account or at a cohort level (if account is part of cohort) following steps are performed to calculate allowance:

1. Pre cash flow validation- This is to validate input data to CFE. All errors are logged in **FIC_DTDQ_MESSAGE_LOG** with value of the column **V_MAIN_PROG_NAME** as **FN_DT_PRE_CF_VALIDATIONS**. All values need to be picked up for the current batch.
2. Generate cash flow and calculate principal and interest component of cash flow amount. Errors thrown by CFE are logged in **FSI_OPS_ERROR_DETAILS**.
3. Periodic Cumulative Loss Rate is calculated by multiplying LGD with cumulative impaired transition probability using a rule.
4. Expected cash flow rate is derived from cumulative loss rate using a rule.
5. Expected cash flow amount is calculated using cash flow amount and expected cash flow rate calculated earlier.
6. Benchmark interest rate is populated till highest maturity for all distinct benchmark curves mapped to accounts and risk free rate for all distinct currencies. Interpolate benchmark rate and update interpolated benchmark rate. If benchmark rate is not available for the specified period then it is interpolated using either linear, cubic and quadratic interpolation method as selected in the Run execution parameter
7. Calculate Exposure at Default for revolving and non-revolving exposure: Value in *Revolving Exposure Indicator* will determine the nature of exposure.
   a. For Non-revolving Lines it is done using a DT **EAD_Non_Revolving_Lines**. It updates EAD for non-revolving exposures and undrawn amount for revolving exposure.
   b. For revolving lines, it is done using a type 3 rule – **Exposure at Default Calculation - Revolving Lines**. It is calculated as Principal Run-off + (Undrawn Amount * Credit Conversion Factor).
8. Expected loss amount is calculated up to the emergence period: Expected Loss is the product of Exposure at Default and Periodic Cumulative Loss rate. It is calculated by a type 3 rule - **Expected Loss Calculation**.
9. Discounting rate used in Forward Exposure Method for discounting future cash flow is risk free rate: This is assigned using a rule **Periodic Discount Rate Calculation**.
10. Calculate discounting factor using risk free rate: This is done using **Periodic Discount Factor Calculation** rule.

11. Present value of Expected Loss is calculated by discounting each cash flow with the discounting rate. This is done by multiplying cash flow with discounting factor. **Loss Amount Present Value Calculation** rule does this task.
12. Allowance as of date is calculated as sum of Present value of Expected Loss Amount at account level. This is done using a type 3 rule allowance calculation using **Forward Expected Loss - Individual Assessment**.
13. For collectively assessed exposure allowance is calculated at cohort level and then apportioned to account level as per allocation factor.
    a. Allowance is calculated at a cohort level as sum of Present value of Expected Loss Amount. This is done using type 3 rule **Allowance calculation using Forward Expected Loss - Collective Assessment**.
    b. Allocation factor is calculated as per proportion of carrying amount of an account in the cohort. This is done using **Allowance Allocation Factor Calculation** rule.
    c. To allocate cohort level allowance back as per allocation factor **Collectively Assessed Exposure Allowance Allocation** rule is used.
14. Allowance is capped to carrying amount using **Reporting Allowance Calculation** rule which takes maximum minimum of carrying amount and calculated allowance.

NOTE: Each method calculates allowance amount as of FIC_MIS _Date

Provision Matrix Method

Refer to Provision Matrix method explained in EL Approach.

Recovery Rate Method

Refer to Recovery Rate Method explained in EL Approach.

Net- Charge off Calculation

Refer to Net-Charge off Calculation explained in EL Approach

Provision Amount Calculation

Refer to Provision Calculation explained in EL Approach

Currency Conversion

Refer to Currency Conversion explained in EL Approach

3.2. Loss Forecasting

Apart from calculating the provision (by EL and IL approach), Oracle Financial Services Loan Loss Forecasting and Provisioning, forecasts the losses by using *ratings* or *days-past-due* matrices based on the *number of customers* or *total amount of exposures* across *product types*. Loss forecast component doesn't report the losses for the future period; instead it predicts the status of the exposure count or exposure amount.

For example: For the current period if the total exposure count at a given product type is 3000 and the forecasted PD for period 1 is 10%, then the loss forecasted value would be 300, than 2700.

The user input matrices would differ in their frequency ranging from a month to one year. The forecasted period is based on the least available frequency to: five (5) periods in case of *rating based* and twenty four (24) periods in case of days-past-due (DPD) based. Loss forecasting

procedure is computed as follows:

1. **Determination of Min Frequency**: Minimum frequency period of the matrices for both *rating* based and *days-past-due* based is used as an input for Poisson process, to bring down all the other matrices to the common platform of frequency.

   For example: For a given set of exposures if the matrix frequency period ranges from Monthly, Quarterly, Half-yearly to Yearly, the minimum frequency period of all the matrices available (monthly) will be used as a base frequency for the other matrices to undergo Poisson process. The forecasting is done for five (5) months in case of rating based and twenty four (24) months in case of DPD based (excluding current period).

2. **Loss forecast for Current Period**: For current period values, the LLF&P application will just populate the summation of the values on the given dimension. This will not need any matrix intervention. Normally, loss forecast is done on pre-determined dimensions like product type, product, asset class and so on. Hence, while reporting the current period; LLF&P will sum up the values across the selected dimensions for both *exposure count* and *exposure amount* level.

3. **Poisson Parameter**: The Poisson process is initiated after successful assignment of Individual exposures undergoing Expected Loss or Incurred Loss approach to transition matrix. The matrix is assigned based on predetermined dimensions (Customer type, product type and currency). All the matrices irrespective of the frequency applicability will undergo Poisson parameter.

   Poisson Parameter = 1-exp (-Φ) = λ; where Φ = the probability of default values for a given period.

4. **Calculation of Probability of Defaults**: The default values for the forecasted period (5 periods / 24 periods) are loaded by using time homogeneous and time-non-homogeneous matrices. For those matrices with variant frequency, the Poisson process of decomposition is used to trickle down the matrices to a common platform of frequency and then loaded for the respective periods.

5. **Customer count & Exposure amount**: LLF&P application supports the forecast based on the customer count and exposure amount. Under the given dimensions (Product type, Geography, and so on) the sum of exposures or amount of exposures are multiplied with the corresponding default values. For the second consecutive period, the output of the first period is multiplied with the corresponding default values and so on.

4. Preparing for Execution

The main objective of this chapter is for you to get familiarized with the various requirements of LLF&P before data execution.

This chapter is classified into the following:

- Data Requirements
- Important Metadata Definition

4.1. Data Requirements

The most important activity, to commence working on the LLF&P Application, is configuration of data into the application. Data can be divided into the following categories:

Master Data or Dimension Data: This set of data includes the following:

- Slowly Changing Dimension (*SCD*) data: It is a set of Dimension tables wherein data changes by a small amount regularly over a period of time. Following SCD tables are used in LLF&P:
  - stage customer type master
  - stage geography master
  - dim organization structure

NOTE: To work with OBP interface, dim_org_structure needs to be updated directly based on records in stg_legal_entity_master. Dim data population batch does not update dim_org_structure from stg_legal_entity_master.

  - stage industry master
  - stage IRCS
  - stage LOB master
  - stage market variables master
  - stage product master
  - stage mitigant master or stage collateral master

NOTE: For EL-OBP interface, collateral specific tables are used. For EL run, Mitigant related tables are used.

- Setup Data: Setup Data is a static data and does not change at regular intervals. List of setup data tables is provided in **Seeded Data Tables** sheet in the attached Download Specification. *For more information, refer to the Download Specification (DL Specs) document.*

Fact Data: Fact Data can be populated in either the Product Processors or Other Stage tables as follows:

- Product Processor: is an entity in the LLF&P Application which stores data from the Operational Systems of the Bank. This entity is created based on the various financial products that the bank caters to. Stage tables for Product Processors have been categorized as Exposures data of Product Processors. The Product Processor tables have been represented in the following tables:
  - stage cards
  - stage investments
  - stage loan contracts
  - stage over draft accounts

- Others: In addition to Product Processors, there are other stage tables which are used to store customer and account attributes as represented in the following tables:
  - stage customer details
  - stage customer master
  - stage issuer master

NOTE: Issuer data is also expected to be in customer master table for customer reclassification purpose and to get customer specific attribute in method selection rule.

  - stage party rating details
  - stage account cash flows
  - stage account inception rates
  - stage forward exchange rates
  - stage irc rate history
  - stage market variables
  - stage dpd transition matrix
  - stage provision matrix
  - stage rating transition matrix
  - stage mitigants or stg collaterals
  - stage account mitigant map or STG EXP MITIGANT MAPPINGS

NOTE: For EL-OBP interface, collateral specific tables are used. For EL run, Mitigant related tables are used.

NOTE:

- Transition Matrix should be complete, that is, all rating or delinquency bands should be there.
- Square Matrix, that is, source and destination rating or DPD band should be equal.
- Transition frequency unit should be consistent across time periods, that is, if it is yearly transition matrix given for 2 periods then it should be 2 yearly transition matrices. Any other combination, like, 1 year and 4 quarters and so on, is not valid
- Transition Matrix should be available for a continuous time period starting from period 1, that is, if transition matrix is available for 3 years then it should be for first three consecutive years. In case of external rating transition matrix, rating source and external to internal mapping is mandatory.

For more information on the list of columns and tables to be populated within each table, refer to the Download Specifications document.

After data population to stage and setup table, follow the Run Chart

4.2.Important Metadata Definition

Rating Re-classification:

It populates rating data and reclassifies external rating to internal rating. Data population is done

using T2T and reclassification is done using a Type 2 rule **External Rating to Internal Rating Re-classification**. Current Application supports only 1-1 mapping of External Rating to Internal Rating. This rule is expected to be reviewed and customized based on internal rating and mapping strategy of the bank.

NOTE: As each rating has its unique characteristics, it is required to map each external rating to a unique internal rating.

Market Data Population:

It populates Interest Rate data and Exchange Rate data using T2T **IRC_DATA_POPULATION** and **EXCHANGE_RATE_DATA_POPULATION** respectively. Runskey marked as -1 will the actual history data. For each run, data from -1 will be populated with execution runskey in the same table.

Approach Setting:

The Rules associated with this task are:

Provision Calculation Methodology Selection - EL Run

Provision Calculation Methodology Selection - IL Run

As mentioned earlier, Allowance can be calculated using Cash-Flow method or Provision Matrix Method. In case of Cash-flow based method, impaired assets needs to be treated based on recovery rate method whereas non-impaired can be treated with the projected cash flow and EIR or EIS in expected loss approach or with risk free rate in incurred loss approach.

Provision Matrix method assigns provision rate to an account based on rating or delinquency band as per mapping. To select the treatment, each account is mapped to an approach based on following criteria:

- Impairment Status
- Customer Type
- Product

This rule is expected to be reviewed and customized based on data and mapping strategy of the bank.

Transition Matrix Mapping:

The Rules associated with this task are:

Transition Matrix Assignment:

In EL approach, future cash flows need to be adjusted with the probability of transition to impaired state. Transition probability is calculated based on Predicted transition matrix and converted to suitable frequency using Poison process. Largely, Transition Probability may vary depending on the currency of exposure, product and customer type of the account. In the pre-configured run, transition matrix is mapped with following source hierarchy:

- Currency
- Customer Type
- Product

This rule is expected to be reviewed and customized based on data and mapping strategy of the bank.

Provision Matrix Mapping:

The Rules associated with this task are:

Provision Matrix Assignment

Accounts for which cash flow cannot be predicted, or not available, can be treated with provision matrix method wherein provision rate is assigned to an account based on its rating or delinquency days or both. If Provision Matrix given is only *rating-based* then delinquency band given at account level, if any, is ignored and vice-versa for *delinquency-based* matrix.

Provision rate for the accounts having same rating or delinquency band may vary across products, customer type or impairment status. Hence, Provision Matrix is mapped based on following criteria:

- Impairment Status
- Customer Type
- Product

This rule is expected to be reviewed and customized based on data and mapping strategy of the bank.

Basel Re-classification:

The Rules associated with this task are:

Basel Customer Type Re-classification

Basel Product Type Re-classification

Basel Asset Class Re-classification

For regulatory reporting and consolidation purpose, bank product and customer needs to be re-classified to Basel product type and Basel customer type respectively. Also, Basel customer type and Basel Product Type are reclassified to Basel Asset class for future purpose of regulatory capital calculation and reporting.

This rule is expected to be reviewed and customized based on data and mapping strategy of the bank.

Impaired State Identification:

The Rules associated with this task are:

Rating Impairment State Assignment

DPD Impairment State Assignment

To allocate probability of transition to impairment for an account, impairment state should be identified. Transition probability of rating identified as impaired state and below will be aggregated to be counted as impairment probability. Impaired state may vary depending on the various factors of an account.

In pre-configured rule, impaired state is identified based on the following:

- Currency
- Customer Type
- Product

This rule is expected to be reviewed and customized based on bank's strategy to identify the impaired / default state

Collective Assessment:

The Rules associated with this task are:

Collective Assessment Assignment Rule

Cohort_Identification DT

To improve overall process efficiency to generate cash flow, accounts having similar characteristics – typically small in value and large in volume accounts like retail accounts – are grouped together to form a cohort. Cash flow and allowance is then, calculated at cohort level. Amortized cost and allowance calculated at cohort level is allocated back to account level based on allocation factor of an account. Allocation factor is typically carrying amount of an account in the cohort.

Gross Charge-off Threshold:

The Rules associated with this task are:

Charge-off Materiality Assignment

This rule sets materiality flag based on for gross charge-off amount to be considered for Provision calculation.

5. Execution

The main objective of this chapter is for you to get familiarized with the data execution process.

This chapter is classified into the following:

- Data Quality Framework
- Run Management

5.1. Data Quality Framework

Data from stage table is checked for quality of data. Any erroneous data that is not processed and are reported in log file.

SCD is executed in following order:

1. DIMENSION_DATA_POPULATION
2. MARKET_DATA_POPULATION
3. ACCOUNT_DATA_POPULATION
4. MITAGANT_MAP_DATA_POPULATION
5. SEMI_STATIC_DATA_POPULATION

There is one base run each for EL and IL approach of LLF&P. Provision Matrix method and Recovery Rate method are part of both the Runs. In EL run, an account can be mapped to either of the EL, Provision Matrix or Recovery Rate method. Similarly, in IL run, an account can be mapped to either of IL, Provision Matrix or Recovery Rate method.

Output Table Population batch is used to populate provision amount to fct_llfp_output table for OBP-CSA interface to fetch the output data.

5.2. Run Management

The Run Management framework is a unique feature of the LLF&P which enables a business user - *without assistance from a technical analyst* - to easily define and execute a Run. The features of this framework are as follows:

- Displays all the Runs.
- Provides details of the Run.
- Parameters can be entered at the Run Level.
- The Existing Parameter values can be edited and there is an option to create and execute a batch.
- The Execution Summary page provides the selected Run Execution details, for each execution there is an option to check the following:
    - Parameters defined.
    - Copy option to copy the parameters of the execution selected.
    - Option to trigger batch

Refer to the following steps to navigate to the Run Management Screen:

1. Click **Risk Application** on the Left Hand Side (LHS) pane of the OFSAAI.
2. Click **Loan Loss Forecasting & Provisioning** under **Run Execution** to open **Run Management** screen.

3. Click **Run Management** on LHS pane to open **Run Management Summary** screen.

5.2.1. Run Management UI Icons

The following table aims to familiarize you with the common icons available in the Run Management UI:

Button Name	Icon	Description
Pagination Options		Helps in navigating from one page to another
View		Helps to view details of a particular Run
Run Default Parameters		Click this icon to allow you to update the Run Default Parameters
Run Execution Parameters		Click this icon to allow you to update the Run Execution Parameters
Add		Helps in adding a hierarchy
Run Execution Summary		Helps in viewing the Run Execution details
Copy		Click this icon to display the Run Execution Parameters window to modify or create a batch
Execute		Click to execute a Run

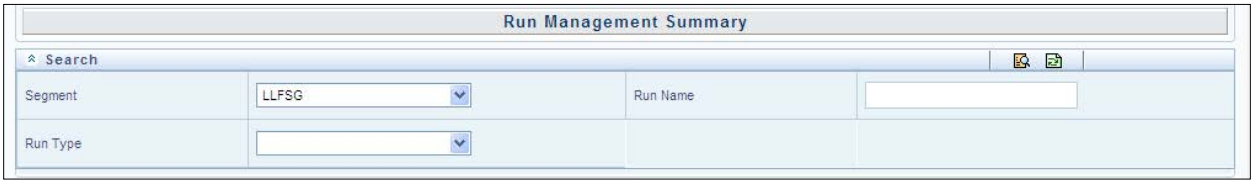
5.2.2. Displaying a Run

Run Management Summary

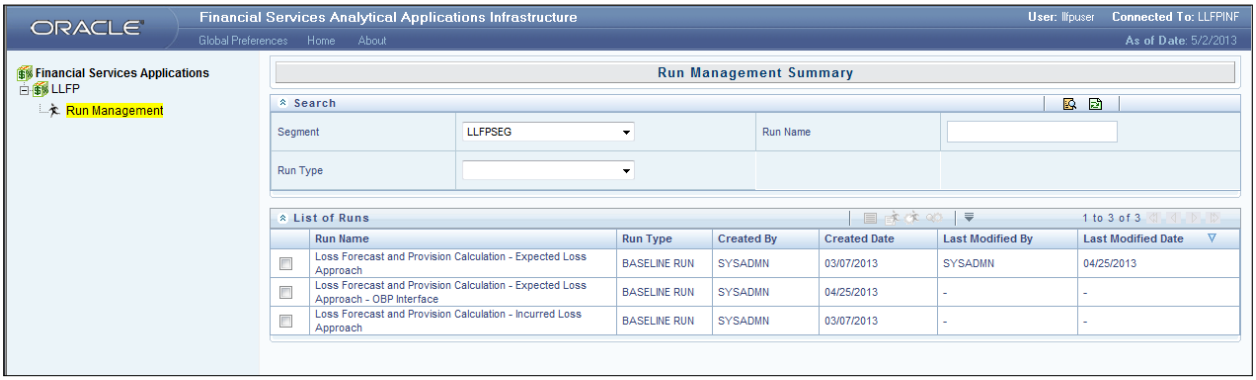
The Run management Summary screen displays the list of runs defined in the PR2, except the Immediate Execution Option **Yes** in the grid. It provides the following details of the run:

- Run name
- Run Type
- Created By
- Creation Date
- Last Modification By
- Last Modification Date

The Search Panel has a provision to search, based on **Segment**, **Run Name**, and **Run Type**.



Search Panel



Run Management Summary Screen

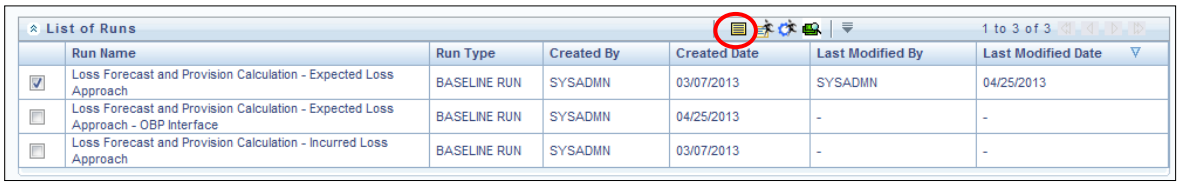
You can see the complete list of Runs with the help of pagination by navigating from one page to another by clicking the (Next) (Previous) icons. By clicking the (No Records) icon, you can provide the number of records to be displayed per page or on the bar. You can also sort the records to view it in convenient way.

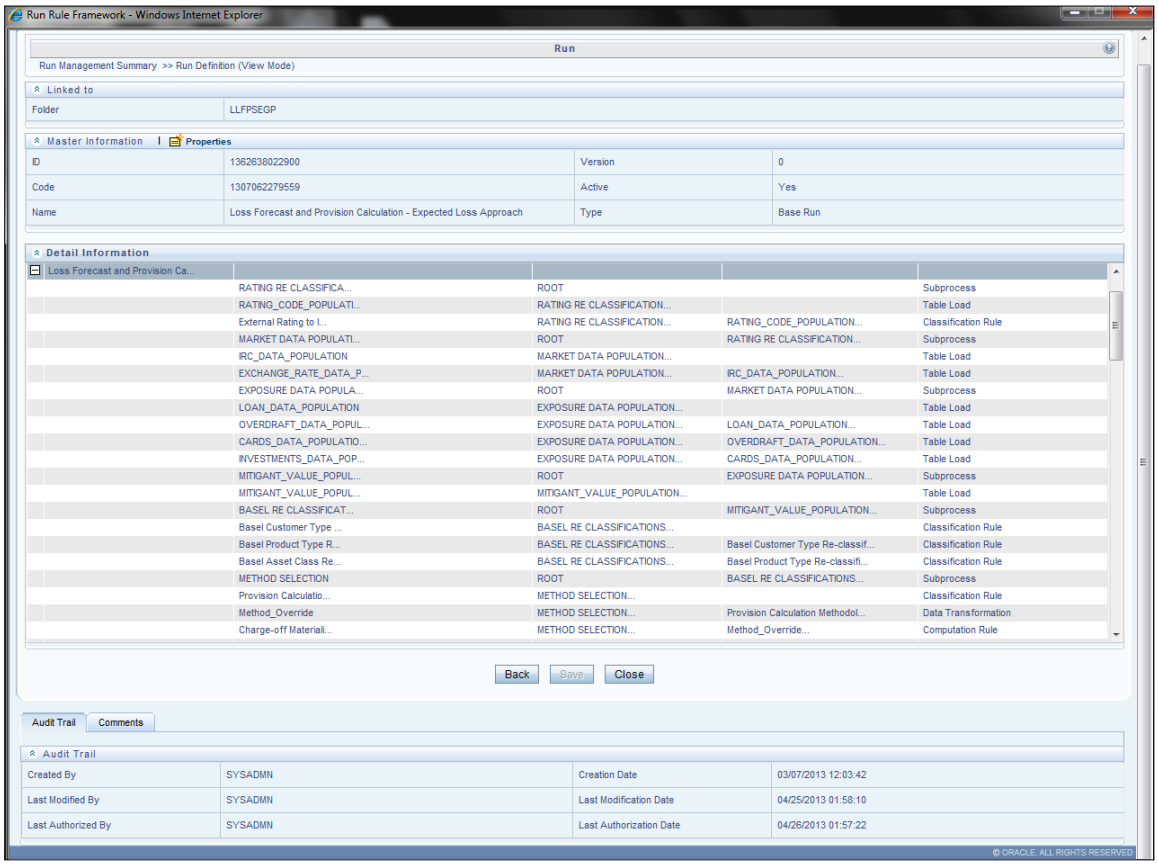
View a Run

You can view individual Run details at any given point. Ensure that the Modify Run Parameters role is mapped to the user profile. To view the existing Run details:

1. Select the checkbox adjacent to the required Run.
2. Click the **View** icon from the navigation bar.

The window displays the details of the Run and the details relating to the underlying processes and the rules if any.





View details

5.2.3. Modifying a Run

Run Parameters

Run Parameter window allows you to enter and save the Run level parameters. To input the run level parameters:

1. Select the checkbox adjacent to the required Run.
2. Click the icon from the navigation bar.

The Run Parameters window is displayed, where you can view and input Run level parameters related to the corresponding Run. You can add or modify the parameter values and store the same.

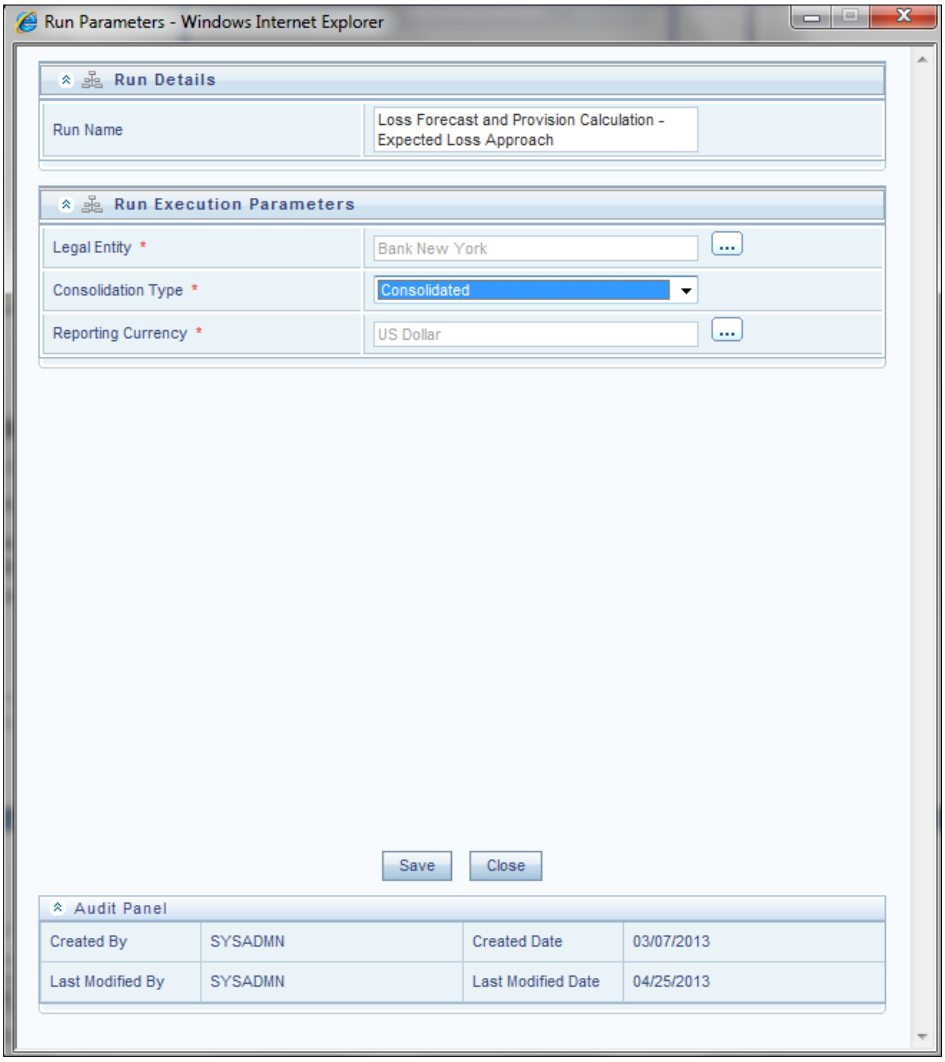
NOTE: To modify or view the parameters, the Modify Run Parameters role should be mapped to your user profile.

The following parameters are to be updated:

Field	Description
Legal Entity	The accounts of the selected legal entity and its child entity (depending on the consolidation type selected), is processed to calculate provision. Parent-child relationship between Legal Entity will be as defined in DIM_ORG_STRUCTURE table.
Consolidation Type	This field is read in conjunction with the **Legal Entity** field. It is a dropdown box and the value could be **Solo** or **Consolidated**. Select

Field	Description
	Solo if you want to process direct accounts of the legal entity and not that of its child entities. Select **Consolidated** if you want to process all the accounts under the legal entity and its child entities. In case of Consolidated, all intra-group exposures are excluded.
Reporting Currency	You can define reporting currency by selecting one in this field. Allowance threshold is based on reporting currency.

NOTE: The exchange rate is applied as defined in STG_FORWARD_EXCHG_RATES table for the respective MIS date or earliest rate available till previous five days of the pre-defined source.



Run Parameters Screen

Run Execution Parameters

In addition to the Run Default parameters, **Run Execution Parameter** window allows you to enter and save the Run execution parameters. By clicking the Save button, a batch with the entered Run execution parameters is created. The batch created can be executed by clicking

Execute button. To execute a Run, ensure that the *Execute Run* role is mapped to the user profile.

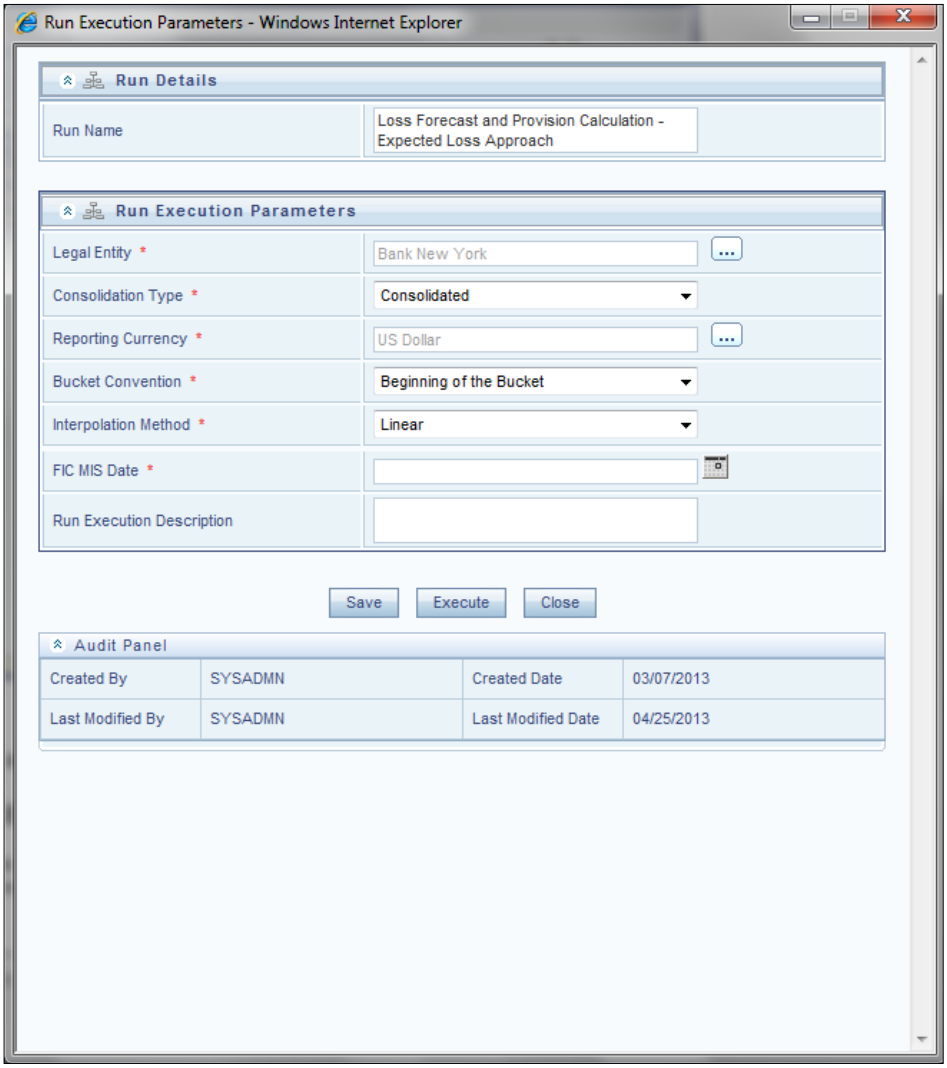
To input the Run execution parameters:

1. Select the checkbox adjacent to the required Run.
2. Click the icon from the navigation bar.

The following Run execution parameters are to be updated:

Field	Description
Legal Entity	Default Legal Entity set for the Run (as mentioned in Default Parameters for Run) can be changed for the specific execution. The accounts of the selected legal entity and its child entity (depending on the consolidation type selected) are processed to calculate provision. Parent-child relationship between legal entities will be as defined in DIM_ORG_STRUCTURE table.
Consolidation Type	Default Consolidation Type set for the Run (as mentioned in Default Parameters for Run) can be changed for the specific execution. This field is read in conjunction with **Legal Entity** field. It is a dropdown list and the value could be **Solo** or **Consolidated**. Select **Solo** if you want to process direct accounts of the Legal entity and not that of its child entities. Select **Consolidated** if you want to process all the accounts under the Legal Entity and its child entities. In case of Consolidated, all intra-group exposures are excluded.
Reporting Currency	You can define reporting currency by selecting one in this field. **NOTE:** Exchange rate will be applied as defined in **STG_FORWARD_EXCHG_RATE**S table for the respective MIS date or earliest rate available till previous five days of the pre-defined source. Default value displayed for Legal Entity, consolidation Type and Reporting Currency is as set in **Run Default Parameter**.
Bucket Conversion	For discounting purposes, the LLF&P application works on monthly bucketing. Here, month is representative of 30 days bucket. All the cash flows falling in a given bucket will be discounted by the same interest rate as selected in the Time Convention. Similarly, for variable rate cash flows spot rate is required to discount. You can select one of the three time conventions namely • Beginning of Bucket • Mid of Bucket • End of Bucket If you select **Beginning of Bucket**, it means benchmark interest rate as of first day of month will be used as the discount rate. Similarly *mid* means middle of month and *end* means end of month. The beginning, mid, and end are referred to bucket-period and not calendar month.
Interpolation Method	If the exact interest rate is not available for the period of cash flow, then the applicable needs to be calculated as by interpolating from the

Field	Description
	available interest rate. The method to be used for interpolation can be selected from this dropdown box. Methods available in pre-configured Run are • Linear • Quartic • Cubic Spline
FIC_MIS_DATE	Date as-on which data should be picked and processed. The date can be selected from the calendar (icon).
Run Execution Description	This is to describe a Run in detail. It is an optional parameter.



Run Execution Parameters Screen

5.2.4. Executing a Run

Run Execution Summary

To execute a Run:

1. Select the checkbox adjacent to the required Run.
2. Click the icon from the navigation bar.

The **Run Execution Summary** screen is displayed. The screen has two panels.

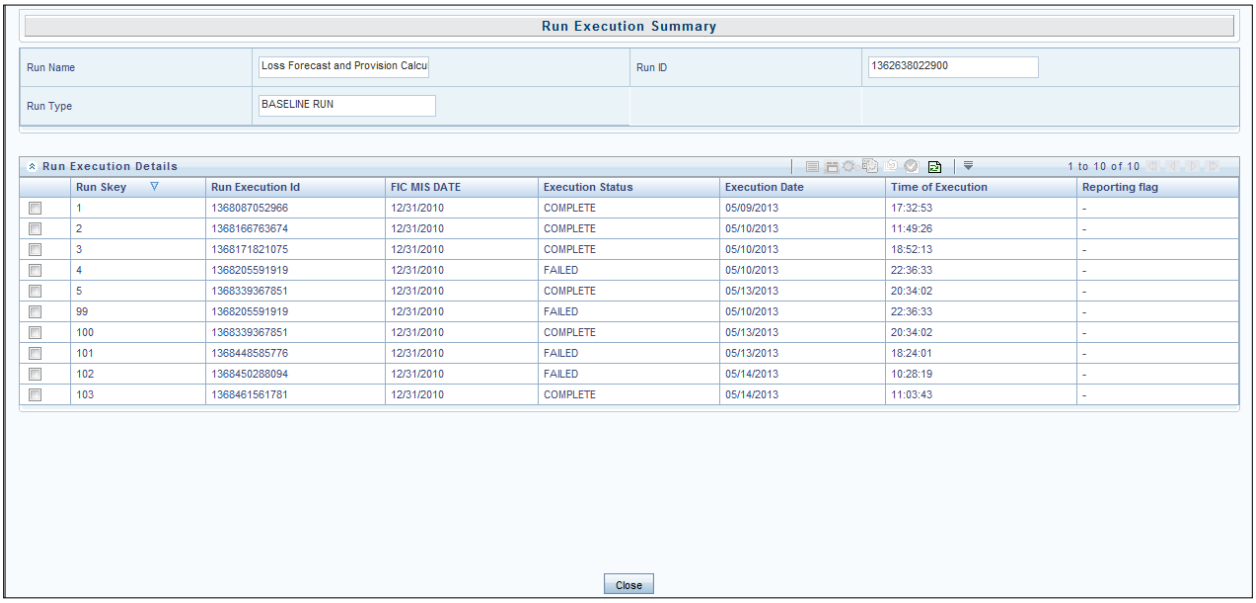
- Run Details
- Run Execution Details

The Run Details panel displays the following:

- Run Name
- Run Type
- Run ID

The Run Execution Details displays the following:

- Run Skey
- Run Execution Id
- FIC MIS DATE
- Execution Status
- Execution Date
- Time of Execution
- Reporting Flag

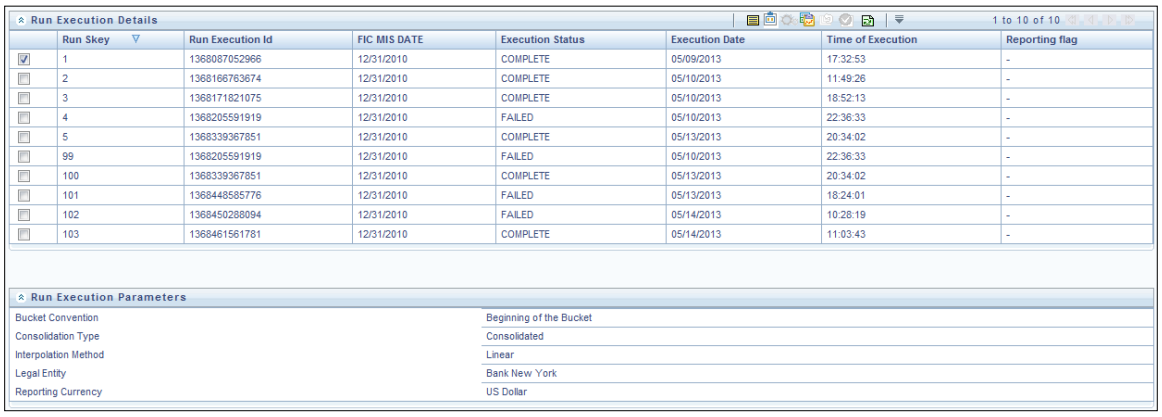


Run Execution Summary Screen

To View the Parameter details:

1. Select the checkbox adjacent to the required Run.
2. Click the icon from the navigation bar.

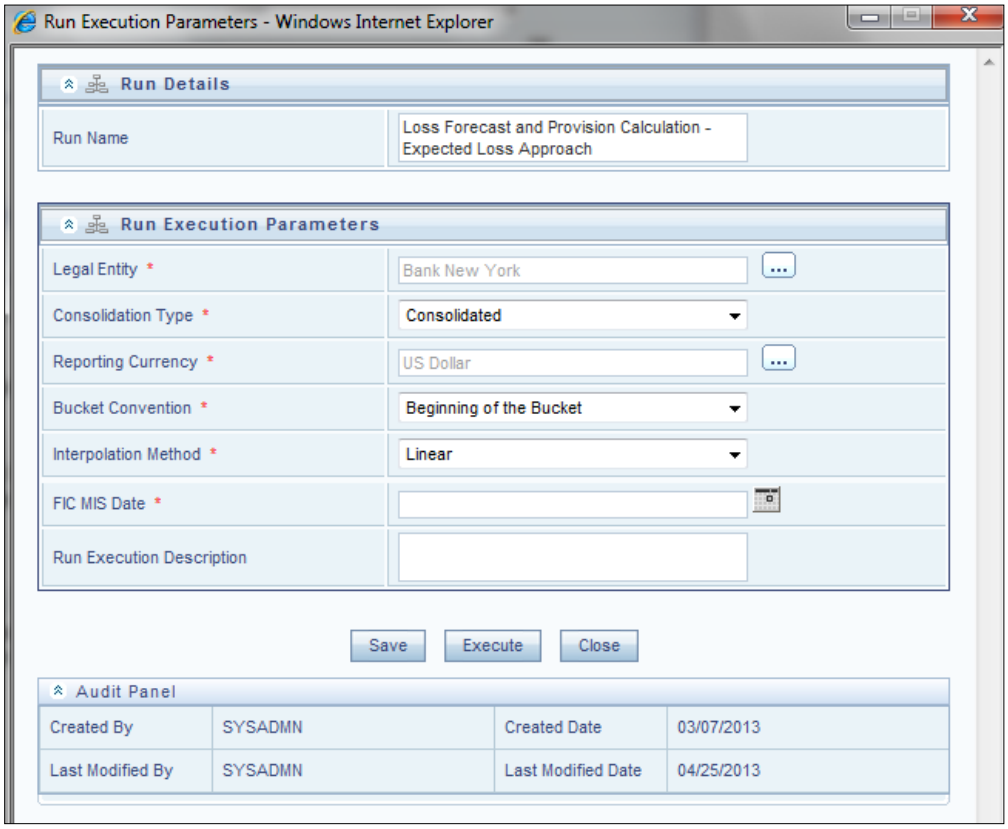
The parameter details are displayed.



To Copy the Parameter:

1. Select the checkbox adjacent to the required Run.
2. Click the icon from the navigation bar.

The **Run Execution Parameter** window appears. The parameters are populated as the selected execution and it can be modified or can create a batch and execute the same.

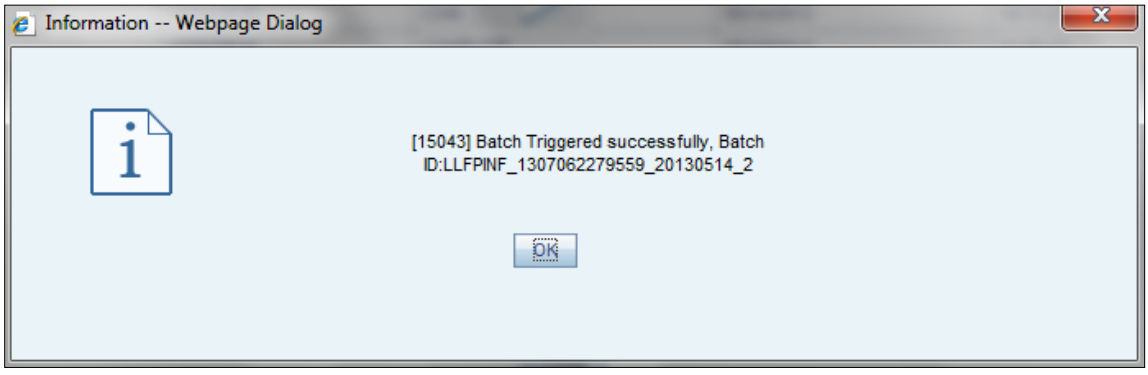


Run Execution Parameters

To Execute the Parameter:

1. Select the checkbox adjacent to the required Run.
2. Click the icon from the navigation bar.

The status of the triggered batch is displayed. In the execution summary screen multiple selections of the execution ids is available to trigger a batch.



Batch triggered dialog box

5.2.5. Database Design

Logical Data Model

Data model for Run Management consists of Run Management UI Tables and Rules Framework tables. Storage for Run Management is as follows:

The definition is stored in the Run Management UI tables. The data is later inserted into the PR2 batch group tables. Run Management UI tables are listed in the following tables:

Run Management Data Model.xlsx

Setup Tables

The following Setup tables are used in the Run Management framework is as follows:

- Run_Parameter_Details table:
  - V_SEGMENT_CODE: Stores the segment codes.
  - V_PARAM_ID: Stores the parameter id of the parameters used in the default parameter screen.
  - V_PARAM_DESC: Stores the description of the parameters.
  - V_PARAM_TYPE: Stores the information on the parameter type. The type can be HIER for Hierarchy, LIST for dropdown, TEXT for input, RADIO for radio button, CALENDAR for calendar.
  - F_IS_MANDATORY: Stores the information whether the parameter is mandatory or not.
  - N_DISPLAY_ORDER: Specifies the order in which the parameters need to appear in the screen.
  - F_IS_DEFAULT_PARAM: Specifies if the parameter is default or not.
  - F_NODE_SELECTION: Specifies if the hierarchy selection is single level or multi level.
  - V_RUN_TYPE: Specifies the type of run. BR for Baseline Run, SR for Simulation Run, ST for Stress Run.
  - F_IS_LEBASED: Specifies that the run is LE based.
- Run_Parameters_Lov Table:
  - V_SEGMENT_CODE: Stores the segment codes.
  - V_PARAM_ID: Stores the parameter id of the parameters used in the default parameter screen.
  - V_PARAM_VALUE_CODE: Stores the code of the list of values to be displayed.
  - V_PARAM_VALUE_DESC: Stores the description of the list of values to be displayed.
  - N_DISPLAY_ORDER: Specifies the order in which the parameters need to appear in the screen

- V_RUN_TYPE: Specifies the type of Run. BR for Baseline Run, SR for Simulation Run, ST for Stress Run.

5.2.6. Processed Data Maintenance Batch

The LLF&P application can reuse previously calculated EIR or EIS and cash flow values using Processed Data Maintenance Batch. This batch is an ICC batch and requires previous run skey as parameter from which data needs to be fetched for future use. Primarily, it performs following tasks:

- Inception Rates Maintenance: It makes EIR and EIS calculated by previous Run available for the subsequent Run. Run skey of the Run from which the value should be taken is given as property value of 'parameter list' in Task definition as '$RUNSK=*Run skey'*. This can be updated from Batch Maintenance.
- Stage Cash Flow Population: This task makes cash flow calculated by previous Run available for the subsequent Run. Run skey of the previous Run from which the value should be taken is given as property value of 'Data File Name' as - $RUNSK='*Run Skey'* . This can be updated from Batch Maintenance.

6. Loan Loss Forecasting & Provisioning Reports

LLF&P uses the Oracle Dashboard reporting tool for expected loss and incurred loss executables. The reports are in graphical and tabular form. The reports are generated by using the following filters:

- **Execution Date:** It refers to the FIC_MIS_DATE of the RUN executed
- **RUN Name**: This is the name of the Run. When selecting this filter, it should be noted that only those *Runs* falling under the *execution date* would be displayed in the drop down menu.
- **RUN Skey:** You are supposed to select the RUN skey corresponding to the Run. Like in case of Run name, the Run skey would also display only those Skey's corresponding to the execution date and Run name.

Oracle Business Intelligence has the following set of tabs classified for simpler user interface.

- Home Page
- Trend Analysis
- Transition Matrix
- Comparison Analysis
- Stress Test Reports
- Loss forecast

Apart from the above tabs some of the reports are allowed to drill down to a more granular detailing of the outputs. Stress reports and Loss forecast and some of baseline reports are provided with a drill down option.

6.1. Home page Reports

The objective of the Home Page reports is to provide a glimpse of the entire outputs starting from carrying amount information to the loss forecast. There are seven such classifications provided.

- **Tabular Reports**: The set of reports provide the details for parameters like allowance, impairment, transition matrices and loss forecast in tabular format. You have to click the individual reports to display the same in a new browser. You have to select the three filters mentioned above. Oracle business Intelligence provides the following Tabular Reports:
  - Allowance for Credit Losses – Basel Asset class
  - Allowance for Credit Losses – Product Type
  - Impaired Assets – Product Type
  - Impaired Assets – Basel Asset Classes
  - Impaired Assets - Line of Business
  - Trend Reports of Provision – Basel Asset Classes
  - Historical Transition Matrix
  - Effective Interest Rate Report
  - Charge off Rates – Product Type
  - Predicted Transition Matrix – Stress Scenario

- Charge off Report
- Loss Forecast – Retail Exposures
- Loss Forecast – Wholesale Exposure

Allowance for Credit Losses: The report is generated at a RUN level. Overall allowance value for the Run is displayed. It has an additional filter on period. Only when previous period data exists, both the current period and previous period details are made available in the report. If you do not have previous period data, only current period details are displayed.

Allowance for Credit Losses by Line of Business: The report displays allowance values across Lines of Business (LOB) level in a tabular format. You are supposed to select the period filter and click the **Apply** icon to see the previous period data. Also, you can opt for a more granular view by drilling down till account level. For each level of drill through, corresponding filters need to be selected separately.

Allowance at Product Type level*:* The report is viewed filtering LOB and Product type. This allows you to interpret the allowance amount at each product type level at LOB level.

Allowance at Product Level: The report is viewed filtering LOB, product type and product level. This allows you to interpret the allowance amount at each product level falling under a particular product type and Line of Business

Allowance at Account Level*:* The report is viewed filtering LOB, product type, product and Account level. This allows you to view the allowance at the most granular level of account.

Allowance Account Trend: This report allows you to interpret the allowance values at *Asset Class* Level. The list of Basel Asset Class is displayed in the drop down. You can select the Asset class and the period filters. There is no drill down reports provided in this report. The report is in graphical format.

Impaired Assets across Line of Business: The impaired asset report is displayed under two measures:

- *Allowance:* Graphical representation of Allowance at each line of business of those assets which are impaired.
- *Provision:* Graphical representation of Provision at each line of business of those assets which are impaired.

Charge of Rate by Line of Business: Charge off rate refers to the ratio of net charge off and carrying amount. The reports are displayed in graphical across LOB for a particular period.

Charge of Rate Trend: The trend displays five years or twelve months or twelve quarters based on the filter selected. The charge off rate is at the Run level unlike in 1.6 which is at Line of business level.

6.2. Trend Analysis

All the reports in this tab provide the historical trend in graphical form. Accordingly, the following set of reports is displayed:

Allowance Trend by Line of Business: The Allowance amount trend is displayed at each line of business level. The trend displays five years or twelve months or twelve quarters based on the filter selected.

Charge off Trend by Line of Business: The report summarizes the charge off trend at line of business level with three measures;

Gross charge off

Net Charge off

Recoveries

Allowance Trend by Product: Allowance amount trend is given at product level. The trend displays five years or twelve months or twelve quarters based on the filter selected.

Charge off Trend by Product: Charge off Trend is at product level selected in a filter. The trend displays five years or twelve months or twelve quarters based on the filter selected.

Charge off Rate Trend: The report is at Line of Business (LOB) Level. The trend displays five years or twelve months or twelve quarters based on the filter selected.

Charge off Rate Trend: The report is at product level. The trend displays five years or twelve months or twelve quarters based on the filter selected.

6.3. Transition Matrix

Transition matrix displays the square matrix individually for both retail and corporate separately along with historical and predicted Transition Matrix.

Historical Average Transition Matrix- Wholesale: You have to select the Transition Matrix name as a filter to display the matrix in the same browser. The reports are populated from fct_rating_transition_matrix. It is identified with N_PERIOD_APPLICABLE as -1.

Historical Average Transition Matrix- Retail: You have to select the Transition Matrix name and the product as a filter to display the matrix in the same browser. The reports are populated from and fct_dpd_transition_matrix. It is identified with N_PERIOD_APPLICABLE as -1.

Predicted Transition Matrix-Wholesale: You have to select the Transition Matrix name and the time period applicable as a filter to display the matrix in the same browser.

Predicted Transition Matrix-Retail: You have to select the Transition Matrix name, the product, and time applicable, as a filter to display the matrix in the same browser.

6.4. Comparison Analysis

The tab compares the provision amount between two runs or two periods based on your selection of comparison.

Provision Comparison across Business Lines: The filter used is the Run Identifier. Each identifier is the combination of Run Name and Run Skey. Upon selection of these filters you can compare the provision amount across business lines between two separate Runs in graphical form.

Provision Comparison: This is the comparison report of all the available Runs. The comparison is between Allowance - beginning of period, end of period, Provision, Carrying amount and Net charge off across the Runs.

6.5. Stress Test Reports

Stress reports would have the following filters:

- Scenario
- Stress Run
- Run Skey

Each stress Run would have multiple scenarios. Only those scenarios corresponding to the particular Run is displayed.

NOTE: Stress Test Reports are not a part of the ‘out of box’ product. However, if it Is created and executed on the LLF&P application, the complete report will be displayed.

Allowance for Credit Losses: Stress report for collective assignment and individual assignment

are done separately. The report is similar to that available in the baseline report in the home page.

Stressed Provisions Across Business Lines: The report displays the comparison of provision amount between the baseline Run and the stressed Run.

Charge off Rates: Charge off rate is similar to that of baseline Run displayed in the home page.

Stressed Impaired Assets Across Business Lines: The report summarizes the impaired assets across business line. The comparison is done between two measures which are carrying amount and Allowances.

Stressed Effective Interest Rate or Spread across Business Lines: The report summarizes the interest rates of all the active accounts. For fixed rate instruments weighted average, EIR is calculated and for variable rate instruments weighted average EIS is calculated.

Expected Loss % Across Business Lines: Expected loss is calculated as the percentage of allowance of individual business line to the corresponding carrying amount. The comparison is between baseline and stressed reports.

6.6. Loss Forecast

Loss forecast is an independent function of any Run. The filters used for these reports are Run Skey, Run Name, and Execution Date. Oracle Business Intelligence reports the following:

Loss Forecast for Wholesale Exposures: Based on the measure selected, the forecast period is provided for five periods excluding the current period. The reports are given at two measures:

Total customers

Total Exposure Value

The period selection is displayed at the top of the report.

Loss Forecast for Wholesale exposures by time period: The report gives the graphical representation of customer count and exposure value. Accordingly, the percentage report is also computed graphically.

Loss Forecast for Retail Exposures: Based on the measure selected, the forecast period is provided for five periods excluding the current period. The reports are given at two measures:

- Total customers
- Total Exposure Value

The period selection is displayed at the top of the report.

Loss Forecast for Retail exposures by time period: The report gives the graphical representation of customer count and exposure value. Accordingly the percentage report is also computed graphically.

7. Resolution of LLF&P Implementation Issues

Data related issues can be generally classified as **Initiation Date** (Date of initial application) and **Subsequent Day**, subsequent day being any day other than initiation date.

Initiation date of implementation is crucial from data perspective. Few notable ones are as below:

- **To calculate EIR or EIS, transition matrix and interest rates pertaining to the account start date is required.**
- **Old accounts may not have transition matrix as of account start date. However, interest rate data should be available, which is not a serious issue nowadays. Yet calculating EIR or EIS of these old accounts is an important decision to be made, mainly due to transition matrix.** *According to IFRS, in its draft on Amortized cost published in 2009, refer to the pages with Para 23 – 27. However, this is left to the interpretation of each entity.*

NOTE: ○Institutions are expected to make use of all the possible data available. This necessarily means that even if we have data not as of account start date but some reasonable date in history, it can be used. However, it is expected to use the same transition matrices pertaining to a given period for all the accounts having their account start date in the given period. This will enable benchmarking.

○In the LLF&P Application, you need to define a separate run named aptly. In this run, you can assign the appropriate transition matrix to the concerned exposures and define a run only till EIR or EIS calculations. Later post verification, you can post the same to the INCEPTION TABLE. Later in the provision calculation run, this can be used as an input for discount rate.

○Alternatively, you can provide the EIR or EIS as a download based on some assumptions like EIR is x% below IRR. This at times either underestimates or overestimates the risk. However, being approximate numbers, provision using these rates and actual rates should be compared to arrive at a logical decision which should be in compliance with regulatory requirements if any.

Annexure A: Understanding Key Terms and Concepts

- **Poisson Process and Exponential Distribution**

  The Poisson process is a counting process for the number of events that have occurred up to a particular time. It is at times called a jump process, as it jumps up to a higher state each time an event occurs. It is also a special case of a continuous Markov process.

  It has potential applications in the Financial Industry. For example: Total Credit default amounts consist usually of a sum of individual default amounts. The number of defaults is usually assumed to occur according to a Poisson process.

  The exponential distribution plays a very important role in Poisson process partly because the time between events or jumps follow an exponential distribution.

  Random variable X is said to have an exponential distribution if density has the form:

  $f_X(x) = e^{-x}$, for $x \geq 0$.

  - **Splitting of Poisson Processes**

  For Example: Times between births (in a family) follow an exponential distribution. The births are categorized by gender.

  For Example: Times between back pains follow an exponential distribution. However, the degree of pain may be categorized as per the required medication (which depends on the degree of pain).

  Consider a Poisson Process **fN(t);** where in addition to observing an event, the event can be classified as belonging to one of **r** possible categories.

  Define Ni(t) = no. of events of type i during (0; t] for i = 1; 2; : : : ; r)

  N(t) = N1(t) + N2(t) + … + Nr(t)

  This process is referred to as splitting the process.

  The LLF&P Application makes use of this property to arrive at **n-period probability** from a given Transition matrix. This method is used to calculate monthly probabilities from the annual transition matrices.

- **Marginal Transition Matrix Vs Cumulative Transition Matrix**

  Cumulative Transition Matrix refers to the cumulative, which includes transitions from previous years as well. Marginal Matrix refers to transitions that are incremental or only one unit of time at a time.

  Generally, Cumulative Transition Matrices are used when you are required to compute at the transition rates at the end of period n, whereas when you want to analyze incremental defaults, marginal transition matrices are used.

  In the LLF&P Application, if you want to calculate provision at exposure level for each time period like each year individually throughout the life time of the asset, then factors like discount rate for the same cash flow makes a considerable impact on the overall amortized cost, compared to discounting from chosen milestones like 3 year, 6 year and so on. This makes Marginal Transition Matrix a better choice over Cumulative Transition Matrix.

  Examples of Marginal Transition Matrices:

Year 1 - Transition Matrix							
From /To	**AAA**	**AA**	**A**	**BBB**	**BB**	**B**	**D**
AAA	88.53%	7.75%	0.47%	0.00%	0.00%	0.00%	3.25%
AA	0.60%	87.50%	7.33%	0.54%	0.06%	0.50%	3.47%

Year 1 - Transition Matrix							
A	0.40%	2.07%	87.21%	5.36%	0.39%	0.16%	4.41%
BBB	0.01%	0.17%	3.96%	84.13%	4.03%	0.72%	6.98%
BB	0.02%	0.05%	0.21%	5.32%	75.62%	7.15%	11.63%
B	0.00%	0.05%	0.16%	0.28%	5.92%	73.00%	20.59%
CCC/C	0.00%	0.00%	0.24%	0.36%	1.02%	11.74%	86.64%

Marginal Transition Matrix (Year 1)

Let us assume that we are using time homogeneous matrices, then the same matrix will be used **for year 2** also,

Year 2 - Transition Matrix							
From /To	**AAA**	**AA**	**A**	**BBB**	**BB**	**B**	**D**
AAA	88.53%	7.75%	0.47%	0.00%	0.00%	0.00%	3.25%
AA	0.60%	87.50%	7.33%	0.54%	0.06%	0.50%	3.47%
A	0.40%	2.07%	87.21%	5.36%	0.39%	0.16%	4.41%
BBB	0.01%	0.17%	3.96%	84.13%	4.03%	0.72%	6.98%
BB	0.02%	0.05%	0.21%	5.32%	75.62%	7.15%	11.63%
B	0.00%	0.05%	0.16%	0.28%	5.92%	73.00%	20.59%
CCC/C	0.00%	0.00%	0.24%	0.36%	1.02%	11.74%	86.64%

Marginal Transition Matrix (Year 2)

However, if it has been cumulative transition matrix, then we have for **up to year 2** transitions as,

Year 2 - Transition Matrix							
From /To	**AAA**	**AA**	**A**	**BBB**	**BB**	**B**	**D**
AAA	78.42%	13.65%	1.40%	0.08%	0.04%	0.42%	5.98%
AA	1.09%	76.76%	12.84%	1.34%	0.21%	1.23%	6.53%
A	0.72%	3.66%	76.43%	9.23%	0.91%	0.85%	8.20%
BBB	0.03%	0.38%	6.82%	71.23%	6.57%	2.25%	12.72%
BB	0.03%	0.10%	0.60%	8.57%	57.94%	12.03%	20.73%
B	0.00%	0.09%	0.33%	0.84%	9.02%	56.13%	33.59%
CCC/C	0.00%	0.01%	0.45%	0.71%	2.37%	18.82%	77.64%

Cumulative Transition Matrix (Year 2)

Annexure B: Things to Remember

- Basel Reclassification rule is for reporting purposes only and does not have any effect on method selection or calculation.
- LLF&P application expects one internal rating for only one external rating.
- Provision matrix method is assigned for specific condition and as default method for all, unless otherwise specified.
- In case cash flow is given as download, then all accounts are treated individually.
- Overnight rate (1 Day) is mandatory for Interest Rate Curve.
- Historical Average Transition Matrix reports are populated from fct_rating_transition_matrix (for wholesale) and fct_dpd_transition_matrix (for retail). It is identified with N_PERIOD_APPLICABLE as -1.
- Method override also checks for accounts having different product types but sharing same collateral. Such accounts are not assigned any provision calculation method and, hence, Provision amount is not calculated for it.
- For Poisson process**,** the desired frequency period should be less than the input matrix frequency period.
- To calculate proper coefficient, no consecutive interest rates in historical interest rate curve table should be precisely same.
- Maximum of 100 data points (interest rate points) can be given for interpolation coefficient calculation.
- LLFP does not handle partial allocation of mitigant value to an account, i.e. 100% of the mitigant value is considered to be associated with the account.
- Threshold can only be applied at product-type, Legal Entity and Currency level.
- Accounts with Negative balance or 0 as carrying amount will be forced to have an allowance of 0.
- Loss forecasting is done for five (5) periods in case of rating based and twenty four (24) periods for DPD based (excluding the current period); where a period is the minimum frequency period of the transition matrix mapped. For example: if there are 3 transition matrices (TM1, TM2 and TM3) mapped to various accounts in a run and frequency period of these transition matrices are TM1-quarterly, TM2-quarterly and TM3-yearly period, then forecasting is done for 5 quarters for rating based and 24 quarters for DPD based.

Annexure C: Frequently Asked Questions

1. Can LLF&P be used with other cash flow engines instead of Oracle CFE? If yes, then what is required be done?

   Oracle LLF&P can be used with other cash flow engines. LLF&P uses Oracle cash flow engine to generate contractual cash flow at account level and cash flow as of account start date to calculate EIR and EIS. If any external engine is used then cash flow generated by other engines need to be given as download in **stg_account_cash_flows** table in the format as specified in download specifications.

2. For a given transition matrix can the user define the impairment grade?

   The user can change the default grade by selecting a Target Hierarchy in Rating Impairment State Assignment or DPD Impairment State Assignment. However, impairment status should be at a transition matrix level and, hence, source hierarchy in this should be consistent with that of transition matrix selection.

3. Effective Initial Rate and Effective Initial spread provided by Oracle LLF&P are calculated as of which date?

   Effective Initial Rate and Effective Initial spread provided by Oracle LLF&P are calculated as of account start date.

4. What are the conditions when Effective Initial Rate and Effective Initial spread are recalculated in Oracle LLF&P?

   EIR and EIS values are considered in following order:

   - EIR or EIS value is in Stage Table value.
   - If EIR/EIS value is not there in Stage table then it checks in Account Inception Table
   - If not found there then application calculates by itself

5. How to select the approach for available products?

   Following rules are used to assign a method in EL and IL approach respectively: **Provision Calculation Methodology Selection - EL Run** and **Provision Calculation Methodology Selection - IL Run**. You can change this rule to select the approach based on the requirement.

6. How is collective assessment handled in Oracle LLF&P?

   Accounts that can be assessed and treated collectively are identified based on their credit rating, delinquency band, customer type, start date, interest rate, cash flow pattern and other such characteristics that can affect allowance amount. Cohort is formed according to such data. Allowance and provision amount is calculated for cohort and then allocated back to account level using carrying amount as allocation factor.

7. If we provide only rating based Provision Matrix then is it compulsory to provide rate for delinquency band as well?

   In case of 'rating-only' provision matrix, delinquency band is considered as missing (value 0) and delinquency band of the account is not considered for provision rate assignment.

8. Are there any conditions on Transition matrix data download in Oracle LLF&P?

   Transition Matrix should be:

   - Complete
   - Square
   - Transition frequency unit should be consistent across time periods.

- Transition Matrix should be available for continuous time period starting from period 1 In case of external rating transition matrix, rating source and external to internal mapping is mandatory. *For more information, refer to the DL Specs*.

9. Can cash flow be generated for revolving products?

   Yes, cash flow can be generated for revolving products using payment patterns. Following Pre- configured payment patterns are available:

Code	Description
5999	For payment pattern of Cards
6000	For payment pattern of Purchase Receivables
6001	For payment pattern of cash credit and overdraft

10. Can we download TM with different interval for example TM1 with 1year ,3 year, 5year and so on?

    No. Refer Question No. 10 for more details.

11. Does the user need to give cash flow download every time for same day execution?

    Yes. Cash flow needs to be in stage table for each run.

12. Can EL and IL approach be combined and executed?

    Yes. To combine EL and IL run, Provision Calculation Methodology Selection rule needs to be modified. Also, some rules which are specific to the approach need to be included for processing.

13. Can download TM with different frequency for example TM1 with 1 year, 6 month, 1 month and so on?

    No. To generate Lamda for Poisson process and subsequent usage, Transition Matrix needs to be of same frequency for all period. Please refer Q No 10 for more detail.

14. Can Charged off account be part of a collective assessment?

    No. Charged off / written off and impaired accounts are cannot be part of any cohort.

15. Is it feasible to compare individually calculated allowance and those which are allocated back to account level from collective assessment?

    Accounts having similar behaviour and potential cash flow are combined to generate cash flow more efficiently. These are typically large-in-volume accounts like retail exposures. Considering carrying amount as weight for individual allocation, allowance may be compared with individual treatment. If allocation factor is other than Carrying amount then there will be some difference.

16. Why recoveries are not part of collective assessment assignment?

    Recovery pattern and impact on cash flow parameters may not be same. To maintain homogeneity of accounts within cohort these accounts are not part of collective assessment.

17. Can we download TM with non-continuous time period? For example: TM1 with applicable period 1, 3, 5 years and so on.

    No. Refer Question No. 10 for more details.

18. Are EIR and EIS calculated collectively or individually?

    EIR EIS is calculated at account level and not at cohort level. Then, it is allocated back to account level using carrying amount of the account in the cohort as allocation factor.

19. Can a Run be without collective assessment?

Yes. Collective assessment is done to efficiently generate cash flow for identical accounts.

20. Can Provision Matrix be based on External Ratings?

    No. User can map external rating to internal rating at account level and then internal rating based provision matrix can be mapped to it.

21. Which Transition Matrix is used for Loss Forecasting?

    Transition Matrix mapped to the accounts is used for Loss Forecasting. Also, same matrix is used for Provision calculation in Cash flow based approach.

22. Is account mapped with PMM/RRM considered for loss forecasting computation?

    Yes, all accounts mapped with Transition Matrix are considered for Loss Forecasting, irrespective of approach mapped.

23. Does LLF&P compute the EIR/EIS for impaired state accounts?

    No, LLF&P does not calculate EIR/EIS for accounts mapped to Recovery Rate Methodology and Provision Matrix Methodology. EIR / EIS are calculated only for the accounts mapped to Expected Loss Methodology - Cash Flow Based.

24. Can user use the calculated EIR/EIS in the future execution runs?

    Yes, it can be used for future execution by maintaining in Account Inception Table. Calculated EIR/EIS can be posted in FSI_ACCOUNT_INCEPTION_RATES using batch name PROCESSED_DATA_MAINTENANCE and Task Name Processed Data Maintenance.

25. Is overnight rate (1 Day) mandatory for Interest Rate Curve?

    Yes.

26. Is Risk free IRC mandatory for IL Run?

    Yes. Discounting of cash flow till average recovery period is done using risk free rate.

27. Can you use the cash flows to generate in EL to IL Run?

    The generated cash flows can be re-used by populating those values back to the stage table. Then it will be considered as a download and would not be recalculated. Batch Name is PROCESSED_DATA_MAINTENANCE and Task Name Stage Cash Flow Population.

28. In which currency charge-off amount threshold is denominated?

    Charge-off amount threshold is in account's Natural Currency. User has the flexibility to set the threshold currency wise also by selecting currency as source hierarchy in the rule.

29. Can user give average recovery period for monthly, quarterly or yearly period?

    Average recovery period can be in Days, Months or Years.

30. Can user give emergence period for monthly, quarterly or yearly period?

    Emergence period can be in Days, Months or Years.

31. Why charge-off materiality flag is calculated based on Gross charge-off and not based on net charge-off which would consider recoveries as well?

    Charge off materiality flag helps in deciding whether particular exposure to be considered as charged off (instance of default) or not. Whereas, whether recoveries are done or not does not impact this decision, it helps to arrive at actual LGD.

32. Does LLF &P calculate carrying amount based on amount of principal outstanding, write off, interest and other such component that could potentially form *carrying amount*?

While we take these individual components as download, it is left to the user to arrive at carrying amount based on their accounting requirement. Presently, carrying amount is EOP Balance.

33. Can collective assessment be used when cash flow for all accounts is provided as download?

    No. If cash flow is given as download then corresponding account is treated individually.

34. Can the application calculate EIR / EIS if cash flow is provided as a download?

    Yes. EIR / EIS can be calculated with downloaded cash flow and Transition matrix valid as on account origination date.

Annexure D: Cash Flow Dictionary

Cash flow processing is executed from Oracle Financial Services Cash Flow Engine (CFE). This processing accesses specific fields from instrument tables to perform cash flow calculations.

In order for OFSA cash flow processing to generate appropriate results, the data within the accessed instrument tables must be appropriate and consistent. The OFSA cash flow edits function provides a measure of validation for this data. However, the cash flow edits function cannot ensure that the input data from the instrument tables is correct and faithfully reflects reality. Therefore, this chapter contains detailed information necessary for correct data population, including field definitions, formulas used in the cash flow process calculations, and recommended default values for the cash flow processing fields.

Unless otherwise stated, when calculations refer to frequency or term fields in this chapter, the implication is that both the frequency (or term) and its associated multiplier fields are used. For example: if N_INTEREST_FREQ is used in a formula, it refers to N_INTEREST_FREQ and V_INTEREST_FREQ_UNIT to determine the true payment frequency. The cash flow processing columns have been explained in detail in the following document:

Oracle Financial Services Cash Flow D

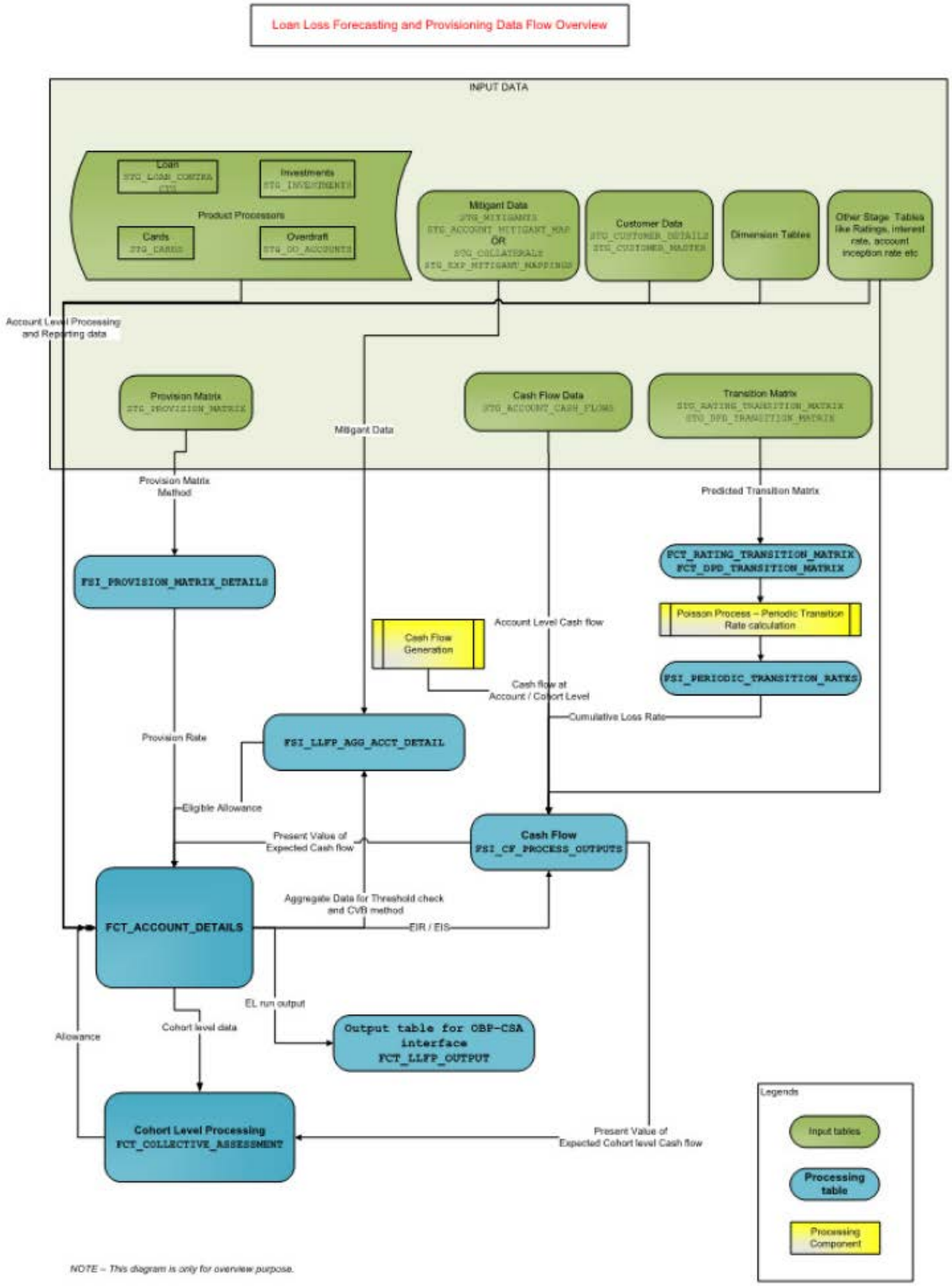
Annexure E: Product Type Mapping

Each product in STG_PRODUCT_MASTER should be mapped to one of the Product Type as mentioned in the following document. Also, each product type should be mapped to product sub category, product category and product group as mentioned therein.

Product Types and Categories.xlsx

Annexure F: Data Flow

The LLF&P Application data flow is represented in the following diagram:



Annexure G: GENERATING DOWNLOAD SPECIFICATIONS

Data Model Oracle Financial Services Loan Loss Forecasting and Provisioning, Release 1.5.1.0.0 for is available on customer request as an ERwin file.

Download Specifications can be extracted from this model. Refer the whitepaper present in OTN for more details.

Acronyms and Glossary Terms

Allowance:	Allowance is an amount set aside for adequacy to absorb the potential credit losses in a Bank's portfolio of loans, HTM securities or other assets.
Allowance account	When financial assets are impaired by credit losses and the entity records the impairment in a separate account (For example: an allowance account used to record individual impairments or a similar account used to record a collective impairment of assets) rather than directly reducing the carrying amount of the asset, it shall disclose a reconciliation of changes in that account during the period for each class of financial assets (IFRS 7 PARA 16)
Amortized cost:	Present value of the expected cash flows over the remaining life of the financial asset or a pool of assets, discounted using the original effective interest rate.
Benchmark interest rate:	A rate used as a yardstick for measuring or setting other interest rates; for example LIBOR
Carrying Cost:	Carrying Cost of an asset is its value stated (carried) in the books of accounts on a measurement date. Also called Current Carrying Cost
Cash flow engine:	This is an OFSAA Specific terminology. Cash Flow Engine is a component used in the Oracle ALM application.
Cash Flow Method:	This implies to calculate amortized cost of underlying asset the LLF&P Application will project cash flows. It typically includes Loans and Held-to-Maturity securities (HTM Securities).This is OFSAA specific term.
CFE	Cash Flow Engine
Charge off:	Process of removing uncollectible loans or closed accounts or other assets from the Balance Sheet.
Contractual cash flow:	This conveys that cash flows are generated using terms and conditions as specified in the contract. This is contrasted against the expected cash flows where cash flows are multiplied by probability which is not part of the contract.
Credit Conversion Factor:	This term is generally referred from Basel accord by BIS. The credit risk exposure attached to off-balance sheet items is calculated by multiplying the face amount of each of the off-balance sheet items by the credit conversion factor. Thus, this serves as numerical factor for conversion.
Effective interest rate	The Effective Interest Rate (EIR) is the rate that exactly discounts estimated future cash flows to the net carrying amount of the financial instrument through the life of an asset. In context of IFRS 9, this means rate that exactly discounts probability weighted future cash flows to the net carrying amount of the financial instrument through the life of an asset.
EL Approach	Expected Loss Approach
Emergence Period:	The emergence period is typically defined as the time it takes from the date a loss event occurred to the date the entity identifies it has occurred.
Expected Cash Flows:	Contractual cash flows adjusted for expected credit losses. This involves reduction of future cash flow by the percentage of expected credit losses.
Expected Loss Approach	The expected loss model requires an entity to make an ongoing assessment of expected credit losses, which may require earlier recognition of credit losses.
Recovery Cost	It represents cost of recovery to recover the outstanding amount of the account, in case of default.

Fair Value:	As defined by IASB, it is the amount for which an asset can be exchanged or a liability is settled, between knowledgeable, willing parties in an arm's length transaction.
Fic_MIS DATE:	This is OFSS specific terminology meaning current date or date stamp for which data belongs to which is also referred to as current date.
Fixed interest rate:	A loan or other financial asset with an interest rate that will remain at a constant rate for the entire life. (Maturity)
Gain and Loss	A gain or loss on a financial asset that is measured at amortized cost and is not part of a hedging relationship (see paragraphs 89–102 of IAS 39) shall be recognized in profit or loss when the financial asset is derecognized, impaired or reclassified in accordance with paragraph 5.3.2, and through the amortization process (IFRS 9 Phase1, PARA 5.4.2)
Held for trading:	A financial asset or financial liability is held for trading if: i) It is acquired or incurred principally for the purpose of selling or repurchasing it in the near term ii) on initial recognition it is part of a portfolio of identified financial instruments that are managed together and for which there is evidence of a recent actual pattern of short-term profit-taking; or iii) It is a derivative (except for a derivative that is a financial guarantee contract or a designated and effective hedging instrument).
Held-to-Maturity securities (HTM):	Security that a company intends to hold until its date of Maturity.
HTM	Held to Maturity
Incurred But Not Reported (IBNR):	The losses pertaining to exposures that have not been reported as such by the obligor.
IL Approach	Incurred Loss Approach
Impaired Asset:	An asset which is carried at more than its recoverable amount if its carrying amount exceeds the amount to be recovered through use or sale of the asset (Ref: IAS 36). However for the scope of this application impaired status is downloading.
Impairment Loss	Impairment loss is the difference between the carrying amount of the financial asset before the change in estimate and the present value of the expected cash flows of that asset after including the change in estimate, that is, difference between carrying amount before change and amortized cost estimated after factoring the change
Inception / Initial Recognition:	This is the date from which IFRS 9 is applicable for a given bank. IFRS 9 tells us that on this date, the entity shall recognize the asset to be valued either as a fair value or amortized cost. For amortized cost this is the date on which EIR will be calculated. In case of applicable loans and bonds on this date Effective interest rate is calculated. Hence expected loss on this date will be zero. (IFRS 9 Phase 1)
Incurred loss Approach:	Under IAS 39, an entity accounts for credit losses in financial assets only if a loss event has occurred without considering the effects of future expected losses.
Initiation Data:	This is an OFSS specific term. This means EIR or EIS of required exposures calculated as of initiation date are available for all future dates. This includes IRR of contractual cash flows as well. This data is available across the runs and for all future references. Suggestion has been received to change the same which will be done in the subsequent revision. Post first day of implementation, the LLF&P application will calculate EIR/EIS/IRR and store the same as part of initiation data,
LLF&P	Loan Loss forecasting and Provisioning
OBP(Oracle Banking Platform)	This is similar to EL Run in terms of functionality, except that, it uses underlying tables compatible with OBP interface.

Period Applicable:	This is the period for which Transition matrix is applicable.
PM	Provision Matrix
Provision Amount:	An expense set aside as an incremental allowance (Allowance = Loan loss Reserve) for bad loans over and above previous year allowance.
Provision Method:	This implies that to calculate amortized cost of an underlying asset the LLF&P Application will use provision rates and cash flows will not be generated for the same. The method is common for both impaired and non-impaired status of the 'Receivable type of assets'. This is an OFSS specific term.
TM	Transition Matrix
Transaction costs	They are incremental costs that are directly attributable to the acquisition, issue or disposal of a financial asset or financial liability (see Appendix a paragraph AG13). An incremental cost is one that would not have been incurred if the entity had not acquired, issued or disposed of the financial instrument (IAS 39, PARA 9)
Variable interest rate:	An interest rate that changes according to the underlying or Benchmark interest rate index like Treasuries or LIBOR rates

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