

Oracle Financial Services Loan Loss Forecasting and Provisioning

User Guide

Release 8.0.0.0.0

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ORACLE[®]
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Preface

Intended Audience

Welcome to Release 8.0.0.0.0 of the Oracle Financial Services Loan Loss Forecasting and Provisioning (OFS LLFP) 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 8.0.0.0.0, has been referred to as LLF&P in this User Guide.

1. Introduction

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 future losses and make provisions accordingly. Thus, the LLF&P Application calculates expected loss as well as incurred loss.

International Financial Reporting Standards (IFRS) guidelines have set out new requirements on the classification and measurement of financial assets and liabilities. It specifies two approaches for the measurement of assets namely *Amortized Cost* and *Fair Value* approach.

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 to Financial Instruments: Classification and Measurement, published in July 2009.

- IFRS 9 (Phase II) Impairment Methodology.

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

- IFRS 9: Phase III: 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 expect institutions to classify the exposures in its banking and trading book into 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 follows the below 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.

Assigns or reclassifies 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 to the financial assets for which cash flows can be generated, which includes loans and Held-to-Maturity securities. Also, assets for which cash flows are projected using behavior assumptions can 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 the Expected Loss and Incurred Loss approach.

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

NOTE: Cash Flow Data Generation Alternative 1

Collective Assessment: The purpose of using a 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 the 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 is 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 the 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:

The transition matrix is assigned to every applicable account, exposure, or cohort (that is, a group of accounts/exposures).

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

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

For more information on the concept of collective assessment, see the [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

The sum of these cash flows at the 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 the Previous date - (Allowance as of current date – Net Charge off)** else, it is different 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 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 the 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. The expected loss amount is calculated up to the emergence period.
5. Expected cash flows are discounted to the current date using the 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 the 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 until maturity covers the entire life span.

EIR is the yield to maturity calculation for expected cash flows. This is calculated for fixed interest rate contracts. The calculation of expected cash flows will be detailed in further sections.

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

$$\text{Effective Initial Spread} = \text{Initial Contracted spread} - (\text{IRR Contractual Cash Flows} - \text{IRR probability weighted cash flows})$$

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](#).

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 changes in important contract terms, and so on. However, except on the first day of implementation, the 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 the 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. The 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 the cohort, these accounts are not part of the collective assessment.

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

Various factors are 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, the sum of allowance for a group of exposures when they are treated as individual exposures should be compared with allowance at the cohort level assuming the composition is the same in both the cases. It is this comparison that 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 to 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 every account, exposure, or cohort. These provision matrices are either based on credit rating or delinquency bands or both.
2. Apply the 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 the **Provision Rate Assignment Rule**. Amortized cost is calculated using the provision rate as

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

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

2.3. *Recovery Rate Method*

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

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

- Carrying amount, (Carrying amount at impairment)
- LGD (Loss Given Default)
- 'r' (Original Effective interest rate is 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 the allowance for Mortgage products or other retail products only. In the Collateral Value Based Method, the shortfall between the collateral value and carrying amount (with expected recovery cost) of exposure is calculated. Allowance is calculated based on the shortfall amount subject to the shortfall threshold.

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

2.4.1. Allowance Calculation

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

The shortfall is calculated as follows:

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

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 the collateral amount, expected recovery cost, and carrying amount will be in the same currency that is the natural currency of the account.

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

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

In addition to the above, there could be a case where one customer is holding multiple accounts to be treated by the CVB Method. In such a 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 the waterfall approach as explained in the [Allowance Calculation – Multiple Accounts](#)

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

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

Allowance Calculation – Single Account

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

$$\text{Allowance} = \text{Shortfall} ; \text{if } \text{Shortfall} > \text{Threshold amount}$$

or

$$\text{Allowance} = 0 ; \text{if } \text{Shortfall} \leq \text{Threshold amount}$$

The 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:

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

The shortfall amount thus calculated will undergo a threshold check at product type and customer level.

$$\text{Eligible Shortfall} = \text{Shortfall} ; \text{if } \text{Shortfall} > \text{Threshold amount}$$

or

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

The threshold amount is a semi-static download amount at Legal Entity, Product type, and Reporting Currency level. The allowance amount is derived at the 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 worksheet available in the following OTN Documentation Library location: [Example](#).

2.5. Allowance Threshold

The 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 the same provision calculation method.

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

The 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 the allowance of the current period and allowance of the previous period.

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

If the flag is “Y”, then, the formula is:

The provision at the time (t) = Allowance at the time (t) - (Allowance at the time (t-1) - Net Charge off)

And if the flag is “N”, then The formula is:

The provision at the time (t) = Allowance at the time (t) - Allowance at the time (t-1)

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

2.7. Other Important Calculation: Transition Matrix

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

Credit rating: For example AAA, AA.

Or

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

The transition matrix is used in the following steps:

1. Calculating a set of Historical Transition Matrices.
2. In the Predicted Transition Matrix, use the 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 a closed account is the exact opposite of a new account.

The 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, the transition matrix from one period to another is calculated. For a multi-period transition matrix, one needs to execute multiple times.

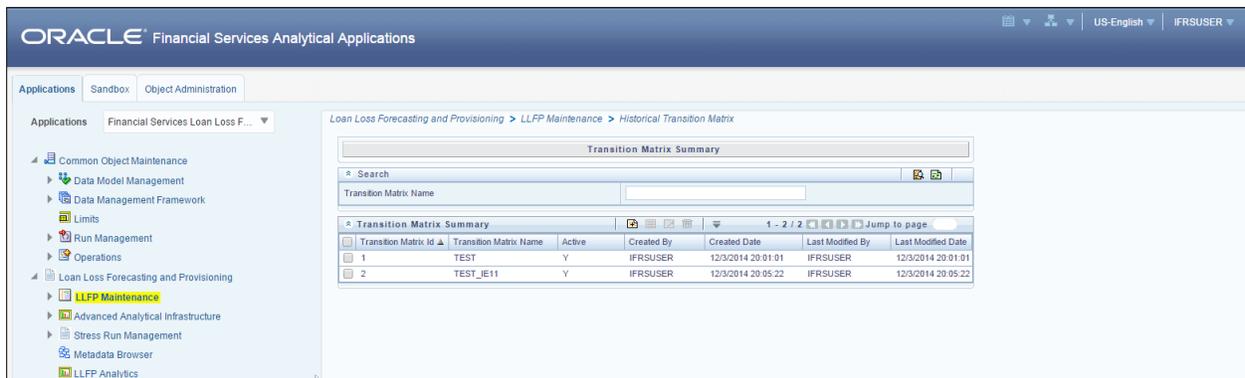
Once the institution has this set ready, it needs to predict or forecast the transition matrix for future years. These predicted transition matrices are used in the LLF&P application.

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

Defining an HTM

To define an HTM, follow the below procedure:

1. Select the Historical Transition matrix Definition option from the LHS. The Transition Matrix Summary page appears.



2. Click the Add  icon. The Transition Matrix Definition screen comes up.
3. The fields that are displayed are explained as tabulated.

Fields	Description
Fields marked in red asterisk(*) are mandatory	
Transition Matrix Name	Enter a Transition Matrix name

Fields	Description
Fields marked in red asterisk(*) are mandatory	
Transition Matrix Description	Enter a description for the Transition matrix
Data Set	Select the option by clicking the browse button. The 2 options are available. <ul style="list-style-type: none"> Corporate HTM Retail HTM
State Space	Click the browse button and select the child nodes from the available Hierarchies listed.
Transition Basis	Select the members from the list. Corporate only one member and Retail has 3
Filter	Additional filters can be selected

4. Click **Save**.

The *Audit Trail* section at the bottom of the window displays the information on the activities undertaken in this window. The *User Comments* section facilitates you to add or update additional information as comments.

Viewing an HTM

You can view an HTM at any given point. To view an existing HTM:

1. Select the checkbox adjacent to the Parameter name.
2. Click the View  button from the toolbar.

The *View parameter* window displays the details of the selected HTM.

Editing an HTM

You can edit an existing HTM, other than the HTM name.

To edit an HTM:

1. Select the checkbox adjacent to the HTM name.

2. Click the Edit  button from the toolbar. The *edit Transition Matrix* window appears.
3. Only the Transition Matrix description can be edited in this window. Update the required details.
4. Click **Submit** to save the changes made.

Deleting an HTM

To delete an existing parameter:

1. Select the checkbox adjacent to the HTM name.
2. Click the Delete  button from the toolbar. A confirmation dialogue appears
3. Click **OK**. The HTM details are deleted.

2.7.2. Predicted Transition Matrix

Poisson Calculations

Poisson calculations are used to convert the probability from one frequency to another. For example, if the Transition Matrix frequency is annual, 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: $1 - \text{Exp}(-\phi t) = t\text{-year cumulative probability}$**
 - **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. The calculation is performed at a Monthly level which is 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 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, helps in understanding, executing, and maintaining data in the LLF&P Application.

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

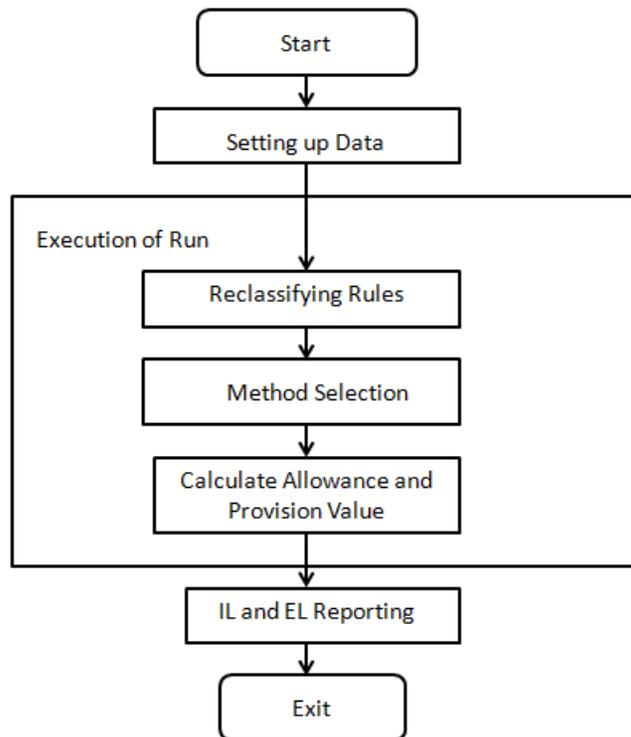
- [Provision Calculation](#)
- [Loss Forecasting](#)

3.1. Provision Calculation

Two types of approaches that are used to calculate provision which is 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: The provision Calculation method is expected to change.

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. The methodology is selected based on the 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. The 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 anyone account is treated by the CVB method then, all the other accounts should be treated by the CVB method. It is assumed that the same customer will not have the same product type if shared across a legal entity. Among all the accounts mapped to the 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 the client's data and requirement. Further, the Method override process may override the method, assigned by the rule, to ensure that all accounts of the customer, under the same product type, and are assigned the CVB method to if one of the accounts is assigned to the 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, the charge-off materiality threshold amount is 500. This is done using the **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 the Expected Loss Method is as follows:

1. Using the **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 staging 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 are 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 the EL approach is calculated when the Expected Interest Rate (EIR) and Expected Interest Spread (EIS) are as of the 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 the account start date it needs to be populated using **ACCT_ORIGINATION_CASH_FLOWS** DT. The 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, the account origination date should be in between the record start date and record end date of the transition matrix assigned.

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

This is done using the **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 identifies defaulted accounts. The allowance amount is a function of transition probability to default or impairment. To calculate allowance, you may keep an impaired state the same as the default grade scale or assign some other impaired state depending on the credit policy or outlook.

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

8. Similarly, assign an impaired state delinquency band.
9. The 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 the Reveleus_Parameter_Master table by changing LLF&PBUCKETLENGTH.

NOTE:

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

For example, the Input transition matrix cannot be monthly and LLF&PBUCKETLENGTH as Quarterly. In this case, all transition matrices should have a frequency period of 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. The cohort is formed according to such data. **Cohort_Identification** DT is used to achieve this.
11. After identifying such cohorts, data about 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 the cohort level with a relative weight of carrying amount of the account in the cohort. Weighted average LGD for the Collective Assessment rule is used for this.
13. For an account or at a cohort level (if the 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 the 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 components 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. The expected cash flow rate is derived from the cumulative loss rate using a Rule.
 - e. The expected cash flow amount is calculated using the cash flow amount and the 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 the EIR / EIS value in stage table values. If the EIR/EIS value is present in the staging 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, the account start date is mandatory for EIR EIS calculation
 - g. EIR EIS is calculated at the account level and not at the cohort level.
 - h. The 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 the cohort level with a 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 the cohort level with a 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 rates for all distinct currencies.
 - m. The Benchmark rate is interpolated and updated. If the 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. The 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 the discounting factor using the discounting rate assigned as above. This is done using the Periodic Discount Factor Calculation rule.
 - p. The present value of expected cash flow is calculated by multiplying cash flow with a discounting factor. Expected Cash Flow Present Value Calculation Rule does this task.
14. The amortized cost of an account is calculated as the sum of the present value of the expected cash flow of the account. Amortized cost calculation for individual assessment rule is used for this.

15. The amortized cost of a cohort is calculated as the sum of the present value of expected cash flow from the cohort. Amortized cost calculation for collective assessment rule is used for this.
16. A net charge-off is calculated using the Net Charge off Calculation Rule that subtracts cumulative recovery from gross charge-off. This is done for all product types.
17. The net charge-off rate is calculated from net charge-off as the proportion of the carrying amount. Net Charge-off Rate Calculation Rule is used for this.
18. Allowance is calculated as the difference between the 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 the cohort level as the difference between the 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 are calculated at the cohort level and then apportioned to the account level as per the allocation factor.
 - The allocation factor is calculated as per the proportion of the carrying amount of an account in the cohort. This is done using the **Allowance Allocation Factor Calculation Rule**.
 - To allocate cohort level amortized cost back to the account level as per the 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 the **Reporting Allowance Calculation Rule** which takes maximum and minimum of the carrying amount and calculated allowance. The allowance amount threshold check is applicable for all the methods in the EL run.
 - The threshold is checked against the 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 total of 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 the total allowance of its account-set, at which threshold was checked, is greater than the given threshold.
 - The threshold amount is assigned through rule at Legal Entity, Product type, and Reporting Currency level.

Provision Matrix Method

All exposures under the Provision Matrix method will be individually assessed. The Collective Assessment approach does not apply to the Provision Matrix method. The 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 the **Provision Rate Assignment Rule**. Amortized cost is calculated using the provision rate as

$$\text{Amortized cost} = \text{Carrying amount} * (1 - \text{Provision rate}).$$

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

NOTE: Each method calculates the 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, the Recovery rate method is followed. The recovery rate method requires a discounting of the recovery amount to the average recovery period based on the type of interest rate. Recovery amounts at the time of recovery are discounted using IRR for fixed interest rate assets. For variable interest rate assets, the discount rate is the original contractual spread added to interpolated benchmark rates. This is done using the type 3 rule **Discount Factor Calculation**.

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

The amortized cost for the 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 the difference between the carrying amount and amortized cost.

Collateral Value Based (CVB) Method

Collateral Value Based (CVB) Method is used for a retail customer of the mortgage portfolio. CVB Method is expected to be used to calculate the 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:

$$\text{Shortfall} = [\sum \text{Collateral value} - (\sum \text{Carrying amount} + \sum \text{Recovery costs})]$$
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.

$$\text{Account-level EoP Allowance (RCY)} = \text{Minimum (balance eligible shortfall, carrying amount)}$$
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.

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

Net- Charge off Calculation

A net charge-off is calculated using the Net Charge off Calculation Rule that subtracts cumulative recovery from gross charge-off. This is done for all product types. The net charge-off rate is

calculated from net charge-off as the proportion of the carrying amount. Net Charge-off Rate Calculation Rule is used for this.

Provision Amount Calculation

Provision is calculated as a difference between the allowance of the current period and allowance of the 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 the **Provision Calculation** rule.

Currency Conversion

Allowance, Provision, and other reporting measures are converted to reporting currency using the **Key_Measure_RCY_Conv** task. Please note that the exchange rate will be applied as defined in the **STG_FORWARD_EXCHG_RATES** table for the respective MIS date or earliest rate available till the previous five days of the pre-defined source. The Source of currency conversion rate should be given at the Legal Entity level in the V_ATTRIBUTE_ASSIGN_VALUE column of the **STG_LEGAL_ENTITY_ATTR_INTF** table with the corresponding parameter in V_ATTRIBUTE_VARCHAR_LABEL as “FX_SRC”. Cohort level provision is updated for reporting purposes 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 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. The methodology is selected based on the 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 the 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, the charge-off materiality threshold amount is 500. This is done using the **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 the 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 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 the forwarding Exposure Method using the T2T rule. This includes populating the 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. The allowance amount is a function of transition probability to default or impairment. To calculate allowance, you may keep the impaired state the same as the 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 the Poisson process. It is done using **Cumlt_Impaired_Prob_Calc** DT.
6. Similarly, assign an impaired state delinquency band.

7. The 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: The frequency period of the input transition matrix should be greater than that of bucket length. For example, the 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 the cash flow amount. The cohort is formed according to such data. **Cohort_Identification** DT is used to achieve this.
9. After identifying such cohorts, data about accounts forming a cohort is aggregated for collective treatment. This is done using T2T rule **COHORT_DATA_POPULATION**.

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

- Emergence Period
- LGD
- CCF

For an account or at a cohort level (if the 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 the 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 components 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. The expected cash flow rate is derived from the cumulative loss rate using a rule.
5. The expected cash flow amount is calculated using the cash flow amount and the expected cash flow rate calculated earlier.
6. Benchmark interest rate is populated till the highest maturity for all distinct benchmark curves mapped to accounts and risk-free rates for all distinct currencies. Interpolate the benchmark rate and update the interpolated benchmark rate. If the 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 the 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. The 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. The discounting rate used in the Forward Exposure Method for discounting future cash flow is a 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 the **Periodic Discount Factor Calculation** rule.
11. The present value of Expected Loss is calculated by discounting each cash flow with the discounting rate. This is done by multiplying cash flow with a discounting factor. **Loss Amount Present Value Calculation** rule does this task.
12. Allowance as of date is calculated as the sum of the Present Value of the Expected Loss Amount at the 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 the cohort level and then apportioned to account level as per allocation factor.
 - a. Allowance is calculated at a cohort level as the sum of the Present Value of Expected Loss Amount. This is done using type 3 rule **Allowance calculation using Forward Expected Loss - Collective Assessment**.
 - b. The allocation factor is calculated as per the proportion of the carrying amount of an account in the cohort. This is done using the **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 the **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 the [Provision Matrix method](#) explained in EL Approach.

Recovery Rate Method

Refer to the [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 the *total amount of exposures* across *product types*. The 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, then 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. The 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 the 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 the 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 the 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 the Poisson parameter.

Poisson Parameter = $1 - \exp(-\Phi) = \lambda$; 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 is 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. Pre-requisites

4.1.1. Loading Stage Tables

The below-mentioned runs are used for loading stage tables:

Run Name/Batch Id
stg_irc_rate_hist
Stage Market Variables
Extracts Data Load
Stage Account Cash Flows
Stage Cards
Stage Customer Details
Stage Customer Master
Stage Investments
Stage Loan Contracts
Stage Over Draft Accounts
Stage Party Rating Details
Stage Issuer Master
Stage Collateral
Stage Mitigants
Stage Exposure Mitigant Mappings
Stage Account Mitigant mappings

4.1.2. Batches

The batches and the respective runs are as mentioned below:

Batch: DIMENSION_DATA_POPULATION

Task Run Name
Geography Dimension Population
Industry Dimension Population
Organization Structure Dimension Population
Line of Business Dimension Population

Customer Type Dimension Population
Customer Dimension Population
Product Dimension Population
Issuer Dimension Population
Market Variables Dimension Population
Date Dimension Population
Mitigant Dimension Population from Mitigant master
Mitigant Dimension Population from Collateral master

Batch: MARKET_DATA_POPULATION

Task Run Name
IRC Master Population
IRC Data Population
IRC History Data Population
Exchange Rate History Data Population
General Market Data Population

Batch: ACCOUNT_DATA_POPULATION

Task Run Name
Account Dimension Population
Account Inception Rates Population

Batch: MITIGANT_MAP_DATA_POPULATION

Task Run Name
ACCT_MITIGANT_MAP_POPULATION
EXP_MTGNT_TO_ACCT_MTGNT_MAP

Batch: SEMI_STATIC_DATA_POPULATION

Task Run Name
Transition Matrix Master Population
Rating Transition Matrix Data Population
DPD Transition Matrix Data Population
Provision Matrix Master Population
Provision Matrix Data Population

Batch: Corporate_CAS

Task Name

Stage Cards
Stage Investments
Stage Loan Contracts
Stage OD Accounts

Batch: Retail_CRS

Task Run Name
Stage Cards
Loan Contracts
OD Accounts
Populate Fact Customer
Calculate the Previous Data Period

Batch: HTM Preparation

Task Run Name
Historic Transition Rates

4.1.3. Reclassification

For PR2 execution, the below runs are used. Their respective Process Name, Sub Process Name, and Task Run Names are also mentioned.

- [EL Run](#)
- [EL Run OBP Interface](#)
- [IL Run](#)

4.1.4. Thresholds

There are 2 types of thresholds:

- Recoverable period- Recoverable period is specified in months. When all receivables are expected within the recoverable period, the NPV allowance is 0.
- NPV - A threshold value in the natural currency of the account

Specific Allowance is a positive difference, if any, between the carrying amount of the account and sum of expected cash-flows. In other words, it is a shortfall in total expected cash-flow to meet the carrying amount of the account.

There are two scenarios based on the value of the carrying amount and expected cash-flow.

Scenario ID	Description	Specific Allowance Formula
-------------	-------------	----------------------------

1	Carrying Amount > \sum Expected future cash flows	<i>Specific Allowance</i> $= \text{Carrying Amount}$ $- \sum \text{Expected Future cash flow}$
2	Carrying Amount <= \sum Expected future cash flows	Specific Allowance = 0

Note: if the carrying amount is less than the sum of future expected cash flows then it will be less than the sum of the discounted value of future expected cash flows.

NPV Allowance

NPV allowance is to account for the discounting impact of the expected future cash-flow in the allowance amount. It is the difference between the sum of expected future cash flow and the sum of the discounted value of it.

There are two scenarios based upon the value of carrying amount and the discounted value of expected cash-flow.

Scenario ID	Description	NPV Allowance Formula
1	Carrying Amount > \sum Discounted Expected future cash flow	<i>NPV Allowance</i> $= \sum \text{Expected Future cash flow}$ $- \sum \text{Discounted Expected future cash flows}$
2	Carrying Amount <= \sum Discounted Expected future cash flow	NPV Allowance = 0

Furthermore, NPV allowance is considered as zero, based on the following conditions –

1. NPV Allowance Threshold check

If the Carrying Amount of the account is less than a threshold value (NPV Allowance Threshold) then NPV Allowance = 0.

NPV Threshold can be specified in natural currency at the product and legal entity level. NPV Threshold value can be configured at the product, legal entity, and currency level using a reclassification rule. The configured value is treated as the default value for any execution unless any other value is passed as input at an account level during the execution. If any value is passed as an NPV allowance threshold during the execution then it will supersede the default value.

2. Recoverable Period check

If the last expected future cash-flow date is within the recoverable period (which is specified in months) from the FIC MIS date then NPV Allowance = 0. In other words, the number of months it takes for the last expected future cash-flow of the account from MIS date, should be greater than the recoverable period, to have NPV allowance as per the formula mentioned earlier in the section. That is,

$$\text{NPV Allowance} = 0; \text{ if Last Expected Future Cashflow date} \\ > \text{MIS Date} + \text{Recoverable Period (in Months)}$$

The recoverable Period is specified in months at the product level. It can be configured at the product and legal entity level using a reclassification rule. The configured value is treated as the default value for any execution unless any other value is passed as input at an account level during the execution. If any value is passed as a recoverable period during the execution then it will supersede the default value.

4.2.Data Requirements

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

Primary 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 some time. THE following SCD tables are used in LLF&P:
 - stage customer type master
 - stage geography master
 - dim organization structure

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

- Setup Data: Setup Data is static data and does not change at regular intervals. A list of setup data tables is provided in the **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 Exposure data of Product Processors. The Product Processor tables have been represented in the following tables:
 - stage cards
 - stage investments
 - stage loan contracts
 - stage overdraft 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 the customer master table for customer reclassification purposes and to get customer-specific attributes in the 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 the EL-OBP interface, collateral specific tables are used. For the EL run, Mitigant related tables are used.

NOTE:

- The 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.
- The transition frequency unit should be consistent across periods, that is, if it is a 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 period starting from period 1, that is, if the transition matrix is available for 3 years then it should be for the first three consecutive years. In the case of the 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 set up a table, follow the Run Chart

4.3.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**. The current Application supports only 1-1 mapping of External Rating to Internal Rating. This rule is expected to be reviewed and customized based on the 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. Runskye marked as -1 will the actual historical data. For each run, data from -1 will be populated with execution runskye 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 the Cash-Flow method or the Provision Matrix Method. In the case of Cash-flow based method, impaired assets need to be treated based on the recovery rate method whereas non-impaired can be treated with the projected cash flow and EIR or EIS in the expected loss approach or with the risk-free rate in the 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 the following criteria:

- Impairment Status
- Customer Type
- Product

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

Transition Matrix Mapping:

The Rules associated with this task are:

Transition Matrix Assignment:

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

- Currency
- Customer Type
- Product

This rule is expected to be reviewed and customized based on the 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 the provision matrix method wherein provision rate is assigned to an account based on its rating or delinquency days or both. If Provision Matrix gave is only *rating-based* then the delinquency band given at account level, if any, is ignored and vice-versa for the *delinquency-based* matrix.

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

- Impairment Status
- Customer Type
- Product

This rule is expected to be reviewed and customized based on the 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 purposes, 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 the future purpose of regulatory capital calculation and reporting.

This rule is expected to be reviewed and customized based on the 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 the probability of transition to impairment for an account, an impairment state should be identified. The transition probability of rating identified as impaired state and below will be aggregated to be counted as impairment probability. The impaired state may vary depending on the various factors of an account.

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

- Currency
- Customer Type
- Product

This rule is expected to be reviewed and customized based on the 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 to form a cohort. Cash flow and allowance are then, calculated at the cohort level. Amortized cost and allowance calculated at the cohort level are allocated back to the account level based on the allocation factor of an account. The allocation factor is typically carrying the 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 the 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 the staging table is checked for the quality of data. Any erroneous data that is not processed and is reported in the log file.

SCD is executed in the 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. The provision Matrix method and Recovery Rate method are part of both the Runs. In the EL run, an account can be mapped to either of the EL, Provision Matrix, or Recovery Rate method. Similarly, in the 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 the 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 the LHS pane to open the **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

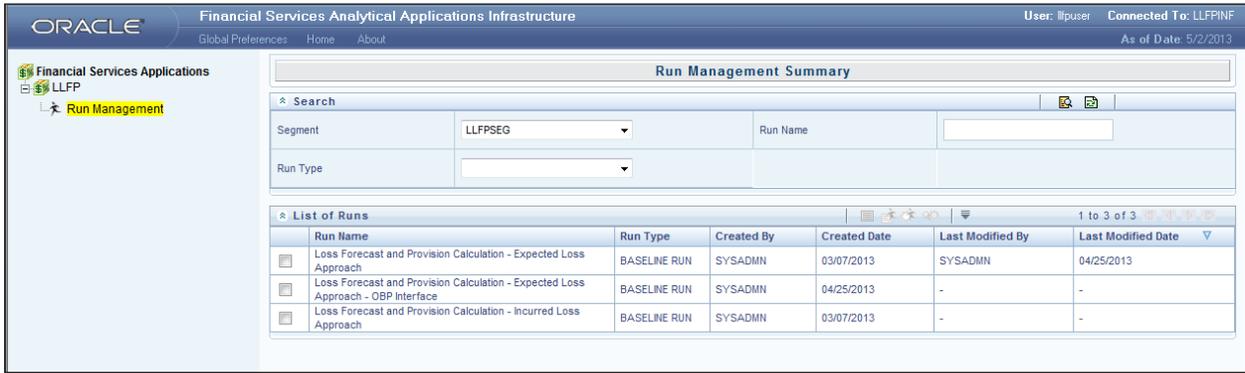
The Run management Summary screen displays the list of runs defined in the PR2, except the Immediate Execution Option **Yes** in the grid. It provides the following details of the run:

- 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**.

Run Management Summary			
Search			
Segment	LLFSG	Run Name	
Run Type			

Search Panel



Run Management Summary Screen

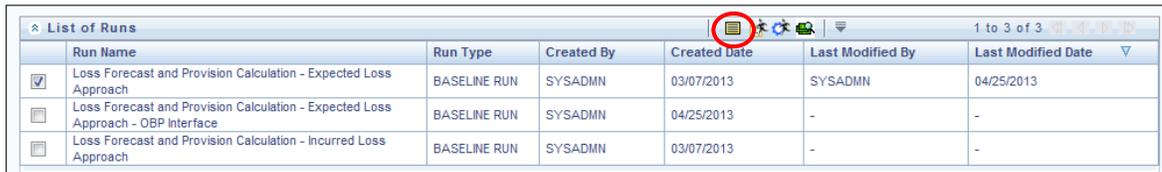
You can see the complete list of Runs with the help of pagination by navigating from one page to another by clicking the (Next) (Previous) icons. By clicking the (No Records) icon, you can provide the number of records to be displayed per page or on the bar. You can also sort the records to view it in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

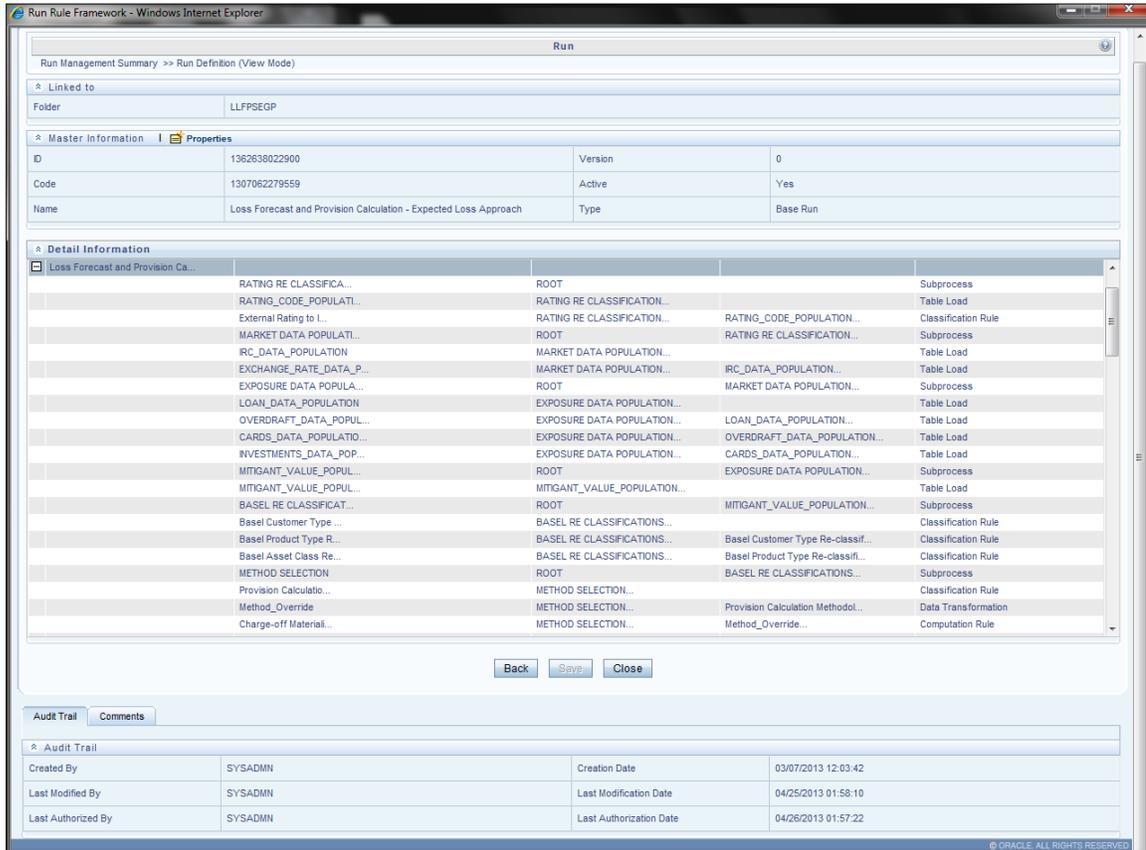
View a Run

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

The **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. The parent-child relationship between Legal Entity will be as defined in the 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 the case of Consolidated, all intra-group exposures are excluded.
Reporting Currency	You can define reporting currency by selecting one in this field. The allowance threshold is based on reporting currency.

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

Run Parameters Screen

Run Execution Parameters

In addition to the Run Default parameters, the **Run Execution Parameter** window allows you to enter and save the Run execution parameters. By clicking the  button, a batch with the

entered Run execution parameters is created. The batch created can be executed by clicking the 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. The parent-child relationship between legal entities will be as defined in the DIM_ORG_STRUCTURE table.
Consolidation Type	The 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 the 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 the case of Consolidated, all intra-group exposures are excluded.
Reporting Currency	You can define reporting currency by selecting one in this field. NOTE: The exchange rate will be applied as defined in the STG_FORWARD_EXCHG_RATES table for the respective MIS date or earliest rate available until the previous five days of the pre-defined source. The 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, the 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 <ul style="list-style-type: none"> • Beginning of Bucket • Mid of Bucket • End of Bucket If you select the Beginning of Bucket , it means the benchmark interest rate as of the first day of the month will be used as the discount rate. Similarly <i>mid</i> means middle of the month and <i>end</i> means the end of the month. The beginning, mid, and end are referred to as bucket-period and not calendar month.
Interpolation Method	If the exact interest rate is not available for the period of cash flow,

Field	Description
	then the application needs to be calculated by interpolating from the available interest rate. The method to be used for interpolation can be selected from this dropdown box. Methods available in pre-configured Run are <ul style="list-style-type: none"> • 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 - Windows Internet Explorer

Run Details

Run Name: Loss Forecast and Provision Calculation - Expected Loss Approach

Run Execution Parameters

Legal Entity * : Bank New York

Consolidation Type * : Consolidated

Reporting Currency * : US Dollar

Bucket Convention * : Beginning of the Bucket

Interpolation Method * : Linear

FIC MIS Date * : [Calendar Icon]

Run Execution Description : [Text Field]

Buttons: Save, Execute, Close

Audit Panel

Created By	SYSADMN	Created Date	03/07/2013
Last Modified By	SYSADMN	Last Modified Date	04/25/2013

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																																																																																														
Run Name	Loss Forecast and Provision Calcul			Run ID	1362638022900																																																																																									
Run Type	BASELINE RUN																																																																																													
<div style="display: flex; justify-content: space-between; align-items: center;"> Run Execution Details 1 to 10 of 10 </div> <table border="1"> <thead> <tr> <th>Run Key</th> <th>Run Execution Id</th> <th>FIC MIS DATE</th> <th>Execution Status</th> <th>Execution Date</th> <th>Time of Execution</th> <th>Reporting flag</th> </tr> </thead> <tbody> <tr><td><input type="checkbox"/></td><td>1</td><td>1368087052966</td><td>12/31/2010</td><td>COMPLETE</td><td>05/09/2013</td><td>17:32:53</td><td>-</td></tr> <tr><td><input type="checkbox"/></td><td>2</td><td>1368166763674</td><td>12/31/2010</td><td>COMPLETE</td><td>05/10/2013</td><td>11:49:26</td><td>-</td></tr> <tr><td><input type="checkbox"/></td><td>3</td><td>1368171821075</td><td>12/31/2010</td><td>COMPLETE</td><td>05/10/2013</td><td>18:52:13</td><td>-</td></tr> <tr><td><input type="checkbox"/></td><td>4</td><td>1368205591919</td><td>12/31/2010</td><td>FAILED</td><td>05/10/2013</td><td>22:36:33</td><td>-</td></tr> <tr><td><input type="checkbox"/></td><td>5</td><td>1368339367851</td><td>12/31/2010</td><td>COMPLETE</td><td>05/13/2013</td><td>20:34:02</td><td>-</td></tr> <tr><td><input type="checkbox"/></td><td>99</td><td>1368205591919</td><td>12/31/2010</td><td>FAILED</td><td>05/10/2013</td><td>22:36:33</td><td>-</td></tr> <tr><td><input type="checkbox"/></td><td>100</td><td>1368339367851</td><td>12/31/2010</td><td>COMPLETE</td><td>05/13/2013</td><td>20:34:02</td><td>-</td></tr> <tr><td><input type="checkbox"/></td><td>101</td><td>1368448585776</td><td>12/31/2010</td><td>FAILED</td><td>05/13/2013</td><td>18:24:01</td><td>-</td></tr> <tr><td><input type="checkbox"/></td><td>102</td><td>1368450288094</td><td>12/31/2010</td><td>FAILED</td><td>05/14/2013</td><td>10:28:19</td><td>-</td></tr> <tr><td><input type="checkbox"/></td><td>103</td><td>1368461561781</td><td>12/31/2010</td><td>COMPLETE</td><td>05/14/2013</td><td>11:03:43</td><td>-</td></tr> </tbody> </table>								Run Key	Run Execution Id	FIC MIS DATE	Execution Status	Execution Date	Time of Execution	Reporting flag	<input type="checkbox"/>	1	1368087052966	12/31/2010	COMPLETE	05/09/2013	17:32:53	-	<input type="checkbox"/>	2	1368166763674	12/31/2010	COMPLETE	05/10/2013	11:49:26	-	<input type="checkbox"/>	3	1368171821075	12/31/2010	COMPLETE	05/10/2013	18:52:13	-	<input type="checkbox"/>	4	1368205591919	12/31/2010	FAILED	05/10/2013	22:36:33	-	<input type="checkbox"/>	5	1368339367851	12/31/2010	COMPLETE	05/13/2013	20:34:02	-	<input type="checkbox"/>	99	1368205591919	12/31/2010	FAILED	05/10/2013	22:36:33	-	<input type="checkbox"/>	100	1368339367851	12/31/2010	COMPLETE	05/13/2013	20:34:02	-	<input type="checkbox"/>	101	1368448585776	12/31/2010	FAILED	05/13/2013	18:24:01	-	<input type="checkbox"/>	102	1368450288094	12/31/2010	FAILED	05/14/2013	10:28:19	-	<input type="checkbox"/>	103	1368461561781	12/31/2010	COMPLETE	05/14/2013	11:03:43	-
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<input type="button" value="Close"/>																																																																																														

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.

Run Execution Details																	
<input checked="" type="checkbox"/>	1	1368087052966	12/31/2010	COMPLETE	05/09/2013	17:32:53	-										
<input type="checkbox"/>	2	1368166763674	12/31/2010	COMPLETE	05/10/2013	11:49:26	-										
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<input type="checkbox"/>	100	1368339367851	12/31/2010	COMPLETE	05/13/2013	20:34:02	-										
<input type="checkbox"/>	101	1368448585776	12/31/2010	FAILED	05/13/2013	18:24:01	-										
<input type="checkbox"/>	102	1368450288094	12/31/2010	FAILED	05/14/2013	10:28:19	-										
<input type="checkbox"/>	103	1368461561781	12/31/2010	COMPLETE	05/14/2013	11:03:43	-										
<div style="display: flex; justify-content: space-between; align-items: center;"> Run Execution Parameters 1 to 10 of 10 </div> <table border="1"> <tbody> <tr> <td>Bucket Convention</td> <td>Beginning of the Bucket</td> </tr> <tr> <td>Consolidation Type</td> <td>Consolidated</td> </tr> <tr> <td>Interpolation Method</td> <td>Linear</td> </tr> <tr> <td>Legal Entity</td> <td>Bank New York</td> </tr> <tr> <td>Reporting Currency</td> <td>US Dollar</td> </tr> </tbody> </table>								Bucket Convention	Beginning of the Bucket	Consolidation Type	Consolidated	Interpolation Method	Linear	Legal Entity	Bank New York	Reporting Currency	US Dollar
Bucket Convention	Beginning of the Bucket																
Consolidation Type	Consolidated																
Interpolation Method	Linear																
Legal Entity	Bank New York																
Reporting Currency	US Dollar																

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.

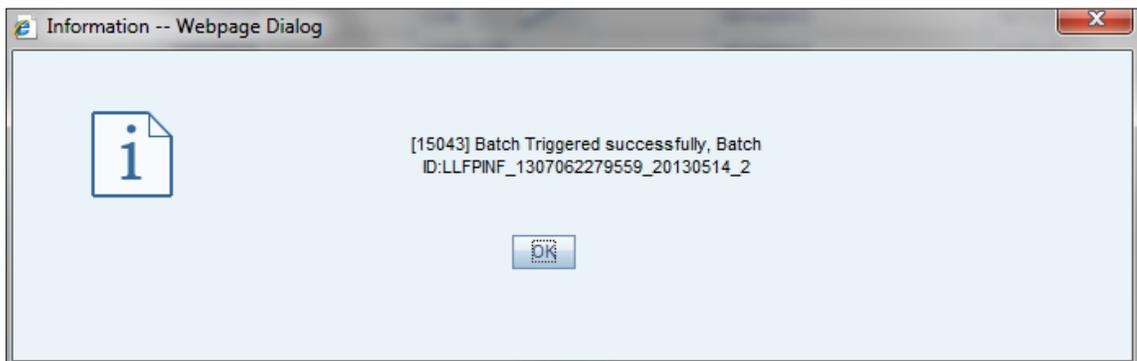
Audit Panel			
Created By	SYSADMIN	Created Date	03/07/2013
Last Modified By	SYSADMIN	Last Modified Date	04/25/2013

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 are available to trigger a batch.



Batch triggered dialog box

5.2.5. Database Design

Logical Data Model

The 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 workbook which is available in the following OTN Documentation Library location: [Run Management Data Model](#).

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 the radio button, CALENDAR for the calendar.
 - F_IS_MANDATORY: Stores the information about whether the parameter is mandatory or not.
 - N_DISPLAY_ORDER: Specifies the order in which the parameters need to appear on the screen.
 - F_IS_DEFAULT_PARAM: Specifies if the parameter is default or not.
 - F_NODE_SELECTION: Specifies if the hierarchy selection is a 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 a previous run skey as a parameter from which data needs to be fetched for future use. Primarily, it performs the 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 the 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 a 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 the 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. The overall allowance value for the Run is displayed. It has an additional filter on the 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 to the account level. For each level of drill through, corresponding filters need to be selected separately.

The 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 the LOB level.

The 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

The 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 dropdown. You can select the Asset class and the period filters. There are no drill-down reports provided in this report. The report is in a 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 the line of business level with three measures;

Gross charge off

Net Charge off

Recoveries

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

6.3. Transition Matrix

The 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 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 - the beginning of the period, the end of the 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 on 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 on the home page.

Stressed Impaired Assets Across Business Lines: The report summarizes the impaired assets across the 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 a variable rate, instruments weighted average EIS is calculated.

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

6.6. Loss Forecast

The 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 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 period: The report gives the graphical representation of customer count and exposure value. Accordingly, the percentage report is also computed graphically.

Chapter 7 Resolution of LLF&P Implementation Issues

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

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

- **To calculate EIR or EIS, transition matrix, and interest rates about the account start date are required.**
- **Old accounts may not have the transition matrix as of the 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 the 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 about a given period for all the accounts having their account start date in the given period. This will enable benchmarking.

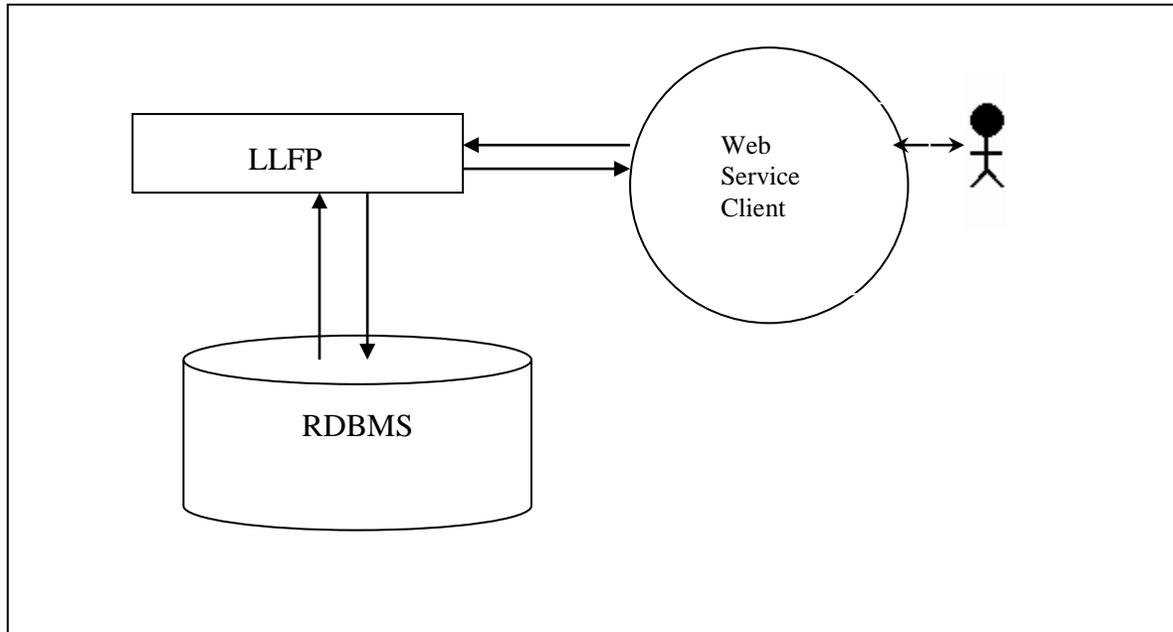
○In the LLF&P Application, you need to define a separate run named aptly. In this run, you can assign the appropriate transition matrix to the concerned exposures and define a run only till EIR or EIS calculations. Later post verification, you can post the same to the INCEPTION TABLE. Later in the provision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

7.1 Web Service call for provision calculation

The Web Service call option is used to calculate the provision amount for the impaired accounts. Specific Allowance, NPV Allowance, and Recoupment schedule are calculated based upon the expected Cash-flow, its present value, and potential NPV allowance, at each recoupment using the **Expected Cash Flow Method**.

Architecture



In this approach, a new run, comprising of an only expected cash-flow method for provision calculation is created. This is triggered through a web-based online call by the OBP collection module. In a day, multiple calls are made to the provision calculation run by managers handling different sets of accounts. At times, multiple calls are also made for the same account.

Prerequisite

LLFP Application 8.0 version and above should be installed.

7.2 LLFP web service call functionality

The LLFP web service calls the LLFP method for the Expected Cash Flow Method Run calculation. A new run, comprising of an only expected cash-flow method for provision calculation is created. This is triggered through a web-based online call by the OBP collection module.

Follow the below procedure to obtain the web service call functionality:

1. LLFP web service is accessible using the service endpoint or wsdl URL. The request should be sent as a 'String' in a specific format.

Example of a String in the specific format:

```
<?xml version="1.0" encoding="UTF-8"?>
<LLFP TYPE="REQUEST">
  <ACCOUNT_ID>V1</ACCOUNT_ID>
  <FIC_MIS_DATE>20140623</FIC_MIS_DATE>
  <CASH_FLOWS>
    <CASH_FLOW id="1">
      <DATE>20140723</DATE>
      <VALUE>30</VALUE>
    </CASH_FLOW>
    <CASH_FLOW id="2">
      <DATE>20140822</DATE>
      <VALUE>25</VALUE>
    </CASH_FLOW>
  </CASH_FLOWS>
  <DISCOUNT_RATE>5</DISCOUNT_RATE>
  <CARRYING_AMOUNT>1000</CARRYING_AMOUNT>
  <NPV_THRESHOLD>100</NPV_THRESHOLD>
  <RECOVERABLE_PERIOD>2</RECOVERABLE_PERIOD>
  <PRODUCT_CODE>p10001</PRODUCT_CODE>
  <CURRENCY>USD</CURRENCY>
  <LEGAL_ENTITY>E500002</LEGAL_ENTITY>
  <RECOVERY_COST>50</RECOVERY_COST>
</LLFP>
```

2. The String is taken as the input for calculation. The response to the String should be a text in XML style.

Example of the text in XML style:

```
<?xml version="1.0" encoding="UTF-8"?>
<LLFP TYPE="RESPONSE">
  <REQUEST_ID>0</REQUEST_ID>
  <FIC_MIS_DATE>2014-06-23 00:00:00</FIC_MIS_DATE>
  <ACCOUNT_ID>V1</ACCOUNT_ID>
  <CURRENCY>USD</CURRENCY>
  <PRODUCT_CODE>p10001</PRODUCT_CODE>
  <LEGAL_ENTITY>E500002</LEGAL_ENTITY>
```

```
<DISCOUNT_RATE>5</DISCOUNT_RATE>
<CARRYING_AMOUNT>1000</CARRYING_AMOUNT>
<NPV_THRESHOLD>100</NPV_THRESHOLD>
<RECOVERABLE_PERIOD>2</RECOVERABLE_PERIOD>
<RECOVERY_COST>50</RECOVERY_COST>
<SPECIFIC_ALLOWANCE>995</SPECIFIC_ALLOWANCE>
<NPV_ALLOWANCE>52.25</NPV_ALLOWANCE>
<TOTAL_ALLOWANCE>1047.25</TOTAL_ALLOWANCE>
<RECOUPMENTS>
  <RECOUPMENT ID=1>
    <RECOUPMENT_PERIOD>1</RECOUPMENT_PERIOD>
    <RECOUPMENT_AMOUNT>0</RECOUPMENT_AMOUNT>
  </RECOUPMENT>
  <RECOUPMENT ID=2>
    <RECOUPMENT_PERIOD>2</RECOUPMENT_PERIOD>
    <RECOUPMENT_AMOUNT>4.75</RECOUPMENT_AMOUNT>
  </RECOUPMENT>
  <RECOUPMENT ID=3>
    <RECOUPMENT_PERIOD>3</RECOUPMENT_PERIOD>
    <RECOUPMENT_AMOUNT>23.75</RECOUPMENT_AMOUNT>
  </RECOUPMENT>
</RECOUPMENTS>
</LLFP>
```

This completes the web service call procedure. The output is sent as an XML.

The calculation is mentioned in the [Threshold](#) section

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 the 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:

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

- **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 $N_i(t)$ = no. of events of type i during $(0; t]$ for $i = 1; 2; \dots; r$

$$N(t) = N_1(t) + N_2(t) + \dots + N_r(t)$$

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 period like each year individually throughout the lifetime 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 years, 6 years and so on. This makes the Marginal Transition Matrix a better choice over the 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%

Year 1 - Transition Matrix							
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 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.
- The provision matrix method is assigned for a specific condition and as the default method for all unless otherwise specified.
- In case cash flow is given as download, then all accounts are treated individually.
- The 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 the same collateral. Such accounts are not assigned any provision calculation method and, hence, the Provision amount is not calculated for it.
- For the Poisson process, the desired frequency period should be less than the input matrix frequency period.
- To calculate the proper coefficient, no consecutive interest rates in the historical interest rate curve table should be precisely the same.
- A maximum of 100 data points (interest rate points) can be given for interpolation coefficient calculation.
- LLFP does not handle the partial allocation of mitigant value to an account, i.e. 100% of the mitigant value is considered to be associated with the account.
- The threshold can only be applied at product-type, Legal Entity, and Currency level.
- Accounts with a Negative balance or 0 as the 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 the 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 to be done?

Oracle LLF&P can be used with other cash flow engines. LLF&P uses the Oracle cash flow engine to generate contractual cash flow at the account level and cash flow as of the 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 the **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 the 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 the 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?

The 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. The cohort is formed according to such data. Allowance and provision amount is calculated for the cohort and then allocated back to the account level using the carrying amount as an allocation factor.

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

In the case of the 'rating-only' provision matrix, the delinquency band is considered as missing (value 0) and the 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?

The transition Matrix should be:

- Complete
- Square

- The transition frequency unit should be consistent across periods.
 - Transition Matrix should be available for continuous-time period starting from period 1
In the case of the 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. The 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 a different interval, for example, TM1 with 1year, 3 years, 5 years, and so on?
- No. Refer to 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 the staging table for each run.
12. Can the EL and IL approaches be combined and executed?
- Yes. To combine the EL and IL run, the 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 frequencies for example TM1 with 1 year, 6 months, 1 month, and so on?
- No. To generate Lamda for the Poisson process and subsequent usage, Transition Matrix needs to be of the same frequency for all periods. Please refer to 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 the collective assessment?
- Accounts having similar behavior 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 a weight for individual allocation, the allowance may be compared with individual treatment. If the allocation factor is other than the Carrying amount then there will be some difference.
16. Why recoveries are not part of the collective assessment assignment?
- The recovery pattern and impact on cash flow parameters may not be the same. To maintain homogeneity of accounts within the cohort these accounts are not part of the collective assessment.
17. Can we download TM with a non-continuous period? For example TM1 with applicable periods 1, 3, 5 years, and so on.
- No. Refer to Question No. 10 for more details.
18. Are EIR and EIS calculated collectively or individually?

EIR/EIS is calculated at the account level and not at the cohort level. Then, it is allocated back to the account level using the carrying amount of the account in the cohort as an 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 the account level and then an internal rating based provision matrix can be mapped to it.
21. Which Transition Matrix is used for Loss Forecasting?
The transition Matrix mapped to the accounts is used for Loss Forecasting. Also, the same matrix is used for Provision calculation in the Cash flow-based approach.
22. Is the 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 the 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 until the average recovery period is done using a 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 staging 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?
The Charge-off amount threshold is in the 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 users give average recovery period for monthly, quarterly, or yearly period?
The average recovery period can be in Days, Months, or Years.
30. Can users give an 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?

The 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 impact this decision, it helps to arrive at actual LGD.

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

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

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

No. If cash flow is given as download then the 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.

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 are correct, and faithfully reflects reality. Therefore, this chapter contains detailed information necessary for the 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 document: [Oracle Financial Services Cash Flow Dictionary](#).

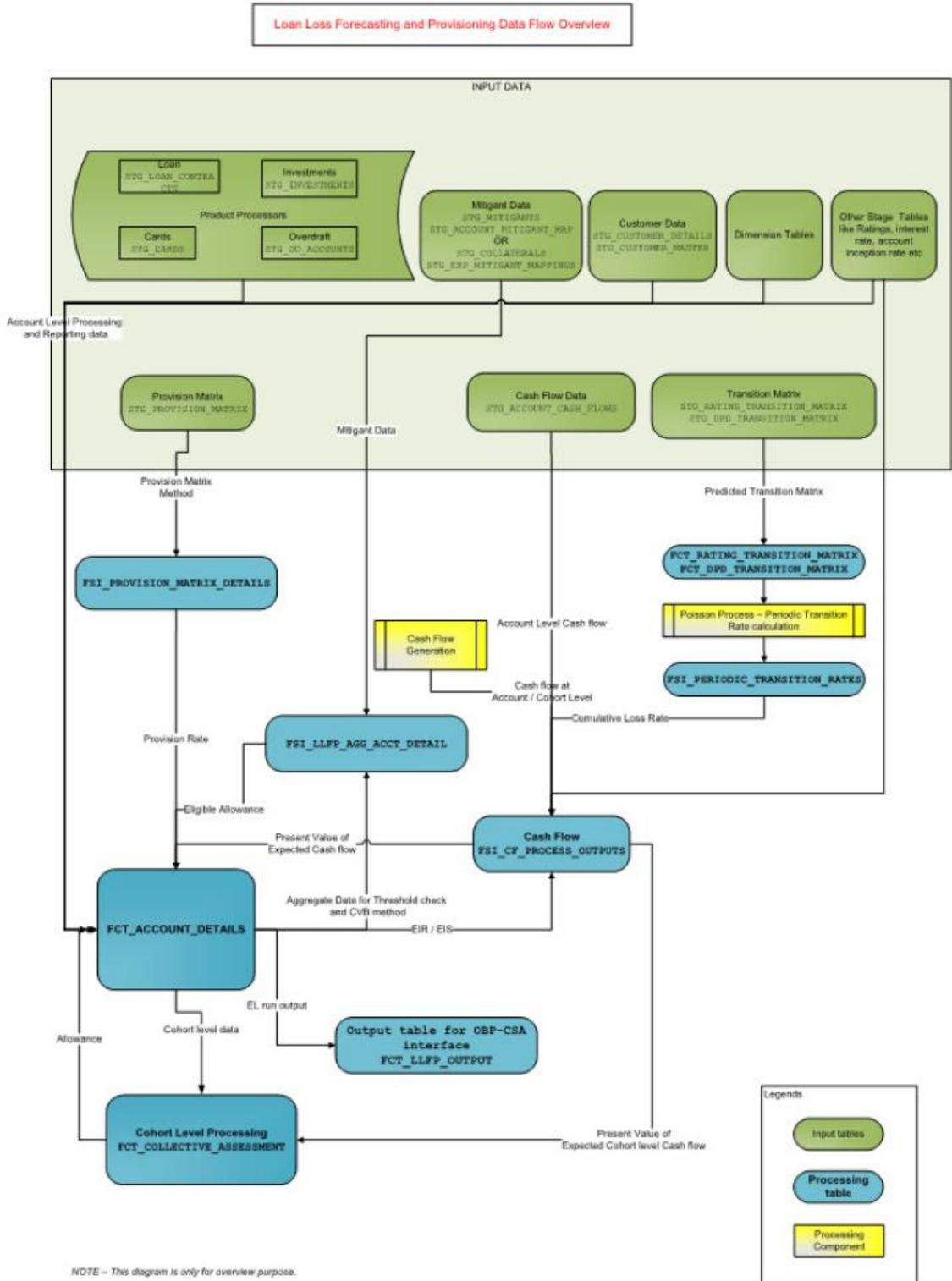
Annexure E: Product Type Mapping

Each product in STG_PRODUCT_MASTER should be mapped to one of the Product Type as mentioned in the following document, available in the following OTN Documentation Library location. Also, each product type should be mapped to the product subcategory, product category, and product group as mentioned therein.

[Product Types and Categories](#)

Annexure F: Data Flow

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



Annexure G: Generating Download Specification

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 to the whitepaper present in [OTN](#) for more details.

Acronyms and Glossary Terms

<u>Allowance:</u>	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.
<u>Allowance account</u>	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)
<u>Amortized cost:</u>	The 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.
<u>Benchmark interest rate:</u>	A rate used as a yardstick for measuring or setting other interest rates; for example LIBOR
<u>Carrying Cost:</u>	The carrying cost of an asset is its value stated (carried) in the books of accounts on a measurement date. Also called Current-Carrying Cost
<u>Cash flow engine:</u>	This is an OFSAA Specific terminology. Cash Flow Engine is a component used in the Oracle ALM application.
<u>Cash Flow Method:</u>	This implies calculating the amortized cost of underlying assets the LLF&P Application will project cash flows. It typically includes Loans and Held-to-Maturity securities (HTM Securities). This is an OFSAA specific term.
<u>CFE</u>	Cash Flow Engine
<u>Charge off:</u>	Process of removing uncollectible loans or closed accounts or other assets from the Balance Sheet.
<u>Contractual cash flow:</u>	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.
<u>Credit Conversion Factor:</u>	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 a numerical factor for conversion.
<u>Effective interest rate</u>	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 the context of IFRS 9, this means the rate that exactly discounts probability-weighted future cash flows to the net carrying amount of the financial instrument through the life of an asset.
<u>EL Approach</u>	Expected Loss Approach
<u>Emergence Period:</u>	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.
<u>Expected Cash Flows:</u>	Contractual cash flows adjusted for expected credit losses. This involves the reduction of future cash flow by the percentage of expected credit losses.
<u>Expected Loss Approach</u>	The expected loss model requires an entity to make an ongoing assessment of expected credit losses, which may require earlier recognition of credit losses.
<u>Recovery Cost</u>	It represents the cost of recovery to recover the outstanding amount of the account, in case of default.

<u>Fair Value:</u>	As defined by IASB, it is the amount for which an asset can be exchanged or liability is settled, between knowledgeable, willing parties in an arm's length transaction.
<u>Fic MIS DATE:</u>	This is OFSS specific terminology meaning current date or date stamp for which data belongs to which is also referred to as the current date.
<u>Fixed interest rate:</u>	A loan or other financial asset with an interest rate that will remain at a constant rate for the entire life. (Maturity)
<u>Gain and Loss</u>	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 by paragraph 5.3.2, and through the amortization process (IFRS 9 Phase1, PARA 5.4.2)
<u>Held for trading:</u>	A financial asset or financial liability is held for trading if: <ul style="list-style-type: none"> i) It is acquired or incurred principally to sell or repurchase 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).
<u>Held-to-Maturity securities (HTM):</u>	A security that a company intends to hold until its date of Maturity.
<u>HTM</u>	Held to Maturity
<u>Incurred But Not Reported (IBNR):</u>	The losses about exposures that have not been reported as such by the obligor.
<u>IL Approach</u>	Incurred Loss Approach
<u>Impaired Asset:</u>	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.
<u>Impairment Loss</u>	An impairment loss is a 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, the difference between carrying amount before the change and amortized cost estimated after factoring the change
<u>Inception / Initial Recognition:</u>	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 the amortized cost this is the date on which EIR will be calculated. In the case of applicable loans and bonds on this date, the Effective interest rate is calculated. Hence expected loss on this date will be zero. (IFRS 9 Phase 1)
<u>Incurred loss Approach:</u>	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.
<u>Initiation Data:</u>	This is an OFSS specific term. This means EIR or EIS of required exposures calculated as of initiation date is available for all future dates. This includes the IRR of contractual cash flows as well. This data is available across the runs and for all future references. The 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,
<u>LLF&P</u>	Loan Loss Forecasting and Provisioning
<u>OBP(Oracle Banking Platform)</u>	This is similar to EL Run in terms of functionality, except that, it uses underlying tables compatible with the OBP interface.

<u>Period Applicable:</u>	This is the period for which the Transition matrix is applicable.
<u>PM</u>	Provision Matrix
<u>Provision Amount:</u>	An expense set aside as an incremental allowance (Allowance = Loan loss Reserve) for bad loans over and above the previous year allowance.
<u>Provision Method:</u>	This implies that to calculate the 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.
<u>TM</u>	Transition Matrix
<u>Transaction costs</u>	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)
<u>Variable interest rate:</u>	An interest rate that changes according to the underlying or Benchmark interest rates index like Treasuries or LIBOR rates



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