Oracle Financial Services Loan Loss Forecasting and Provisioning
User Guide

Release 8.0.3.0.0

August 2016

Part Number: E74821-01

ORACLE®
Financial Services

Contents

Preface

Intended Audience

Welcome to Release 8.0.3.0.0 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.

Documentation Accessibility

For information about Oracle's commitment to accessibility, visit the Oracle Accessibility Program website at http://www.oracle.com/pls/topic/lookup?ctx=acc&id=docacc.

Access to Oracle Support

Oracle customers have access to electronic support through My Oracle Support. For information, visit http://www.oracle.com/pls/topic/lookup?ctx=acc&id=info or visit http://www.oracle.com/pls/topic/lookup?ctx=acc&id=trs if you are hearing impaired.

Structure

1. Introduction
2. Understanding the LLFP Application
3. Expected Credit Loss (Allowance and Provision) Calculation in IFRS 9
4. IAS 39 and IFRS 9 (Draft) Based Runs
5. Understanding Provision Calculation Methods
6. Preparing for Execution
7. Execution
8. Loan Loss Forecasting & Provisioning Reports
9. Resolution of LLFP Implementation Issues

Related Information Sources

Oracle Financial Services Loan Loss Forecasting and Provisioning User Guide.

1 Introduction

Oracle Financial Services Loan Loss Provisioning and Forecasting (LLFP) 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 LLFP Application calculates expected loss as well as incurred loss.

The International Financial Reporting Standards (IFRS) has set standards for calculating loan losses and its subsequent provisioning. .IFRS 9 was published in 2014 and has 3 phases to it.

- IFRS 9 (Phase I): Classification and Measurement

- IFRS 9 (Phase II) Impairment

- IFRS 9: Phase III: Hedge Accounting

For more information refer, "IFRS 9 Financial Instruments" guidelines published by IASB in July 2014.

A Run in the LLFP Application specifies the approach (Expected Loss or Incurred Loss) to be used to calculate Loan Loss Provisioning. Broadly these approaches (IFRS 9 – Stage Determination and Expected Credit loss, 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:

- IFRS 9 Run – Includes two sub runs:

    - Stage Determination

    - Expected Credit Loss

- 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

Oracle Financial Services Loan Loss Provisioning and Forecasting Release 8.0.3.0.0, caters to the Impairment requirements of IFRS 9 standards which expects 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 LLFP Application are as follows:

- IFRS 9: Phase I- Classification & measurement

- IAS 39

- Other local accounting regulations as applicable

2   Understanding the LLFP 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 LLFP application functionalities are executed, helps in understanding, executing, and maintaining data in the LLFP Application.

2.1   IFRS 9 Run

During the financial crisis, the delayed recognition of credit losses on loans and other financial instruments is considered a weakness gave the existing accounting standards. Specifically, the existing model in IAS 39 (an 'incurred loss' model) delays the recognition of credit losses until there is evidence of a trigger event. Post the crisis, the International body for accounting standards (IASB) saw the need to be proactive in recognizing the losses. Hence, IASB has issued a fresh set of guidelines for Financial Instruments - IFRS 9 related to three areas. Impairment is one of the phases/areas covered by the IFRS 9 guidelines to handle expected credit losses. The expected credit loss guidelines of IFRS 9 are more proactive and forward-looking in terms of loss recognition. To be compliant with the IFRS 9 guidelines, OFSAA has upgraded its existing Loan Loss Forecasting and Provisioning application.

The IFRS 9 Run includes the Following Processes:

- Stage Determination
- Manual Reassignment (Optional)
- Expected Credit Loss Calculation

Stage Determination Run: The Stage Determination Run starts with the data population to obtain the data required for Stage Determination and ECL computation. The non-standard/external data formats are now reclassified to standard/internal data formats. The final subprocess is to assign a stage at an account level granularity (either through Individual or collective basis) based on the data provided and rules configured.

Manual Reassignment: This optional step enables the financial institutions to override the outcome of the Stage Determination Run and reassign the stage. This process goes through a Maker- Checker workflow with an audit trail. It caters to any judgmental or qualitative factors that need to be considered plus any reputable presumptions.

ECL Run: The ECL Calculation Run begins with the Methodology Selection subprocess to assign a specific calculation methodology for each of the accounts processed by the application. The selection of methods is based on specific factors that are taken into consideration by the application. Post methodology selection, the application then calculates the Expected Credit Loss, again at an account level granularity (either through Individual or collective basis), based on the approach as per the method selected. The ECL values are also calculated for off-balance-sheet accounts, undrawn portions, POCI accounts, and so on.

2.1.1 Brief Overview of IFRS 9 Guidelines

The methodologies to calculate the Expected Credit Loss for different instruments under various Credit Risk scenarios are provided by the IFRS 9 guidelines. The following are those instruments that fall under the scope of IFRS 9 Impairment standards:

- Financial Assets measured using 'Amortized cost' or 'Fair Value through OCI'

- Lease Receivables and Trade Receivables

- Contract Assets, Loan Commitments, and Financial Guarantees

The different methodologies highlighted by the standards, are:

- General Approach

- Simplified Approach

- Approach for Purchased or Originated Credit Impaired (POCI) Accounts

2.1.1.1 General Approach

The General Approach is for all instruments that are within the scope of IFRS 9 except for Lease Receivables, Trade Receivables, Loan Commitments, Contract Assets, and any other instruments that are Purchased or Originated Credit Impaired.

Under this approach, the standard requires the entity to measure the significance of an Increase in Credit Risk of the instrument, since its initial recognition. Based on the outcome, the entity provides for a 12 Month Expected Credit Loss or a Lifetime Expected Credit Loss.

- If the entity decides that there is 'No Significant Increase' in Credit risk, then the Allowance is equal to the 12 Month Expected Credit Loss.

- If the entity decides that there is a 'Significant increase' in Credit Risk, then the Allowance is equal to the Lifetime Expected Credit Loss.

The standard also provides detailed guidance on the factors to be considered to decide the significance of the Increase in the credit risk of an Instrument. In case, the instrument becomes impaired, the Allowance is equal to the difference between the Gross Carrying Amount and the present value of the expected cash flows.

2.1.1.2 Simplified Approach

IFRS 9 standards state that, for certain specific instruments, it is not essential to determine the significance of an increase in Credit risk. Instead, an Allowance equal to the lifetime Expected Credit Loss can be directly provided.

The instruments in the scope of the simplified approach are:

- Lease Receivables

- Trade Receivables, Loan Commitments, and Contract Assets without significant financing component

ORACLE®

- Trade Receivables, Loan Commitments, and Contract Assets with a significant financing component, and the entity choose to follow the simplified approach.

NOTE: For Trade Receivables, Loan Commitments, and Contract Assets with significant financing component, the entity has the option to choose either the general approach or the simplified approach.

2.1.1.3   Approach Purchased or Originated Credit Impaired (POCI) Accounts

The Allowance calculation of POCI accounts under this approach requires the calculation of the Lifetime Expected credit loss for each account, using the Credit Impaired EIR/EIS as the discount rate. The allowance is the cumulative change in the lifetime expected credit loss for the account since the date of initial recognition.

2.1.1.4   Determining Significance of Increase in Credit Risk

The standard also provides a viewpoint on the various factors that an organization should take into account to determine if a particular instrument (that is not Purchased or Originated Credit impaired) has seen a significant increase in credit risk or not. Some of the factors suggested by the standard are:

- Internal Price indicators of Credit Risk
- Attributes of Financial Instruments such as Covenants, Collateral, and so on.
- Credit Spread, Credit Default Swaps, Fair Value less than Amortized Cost
- External Credit Rating
- Internal Credit Rating
- Forecast of Financial Conditions
- Forecast of Economic Conditions
- Forecast of Business Conditions
- Increased Credit Risk on other financial instruments of the borrower
- An adverse change in the Regulatory, Technology environment of the borrower
- Change in value of the collateral
- Change in quality of guarantee
- Support from the Parent organization
- Expected changes in the Loan documentation
- Expected changes in the performance and behavior of the borrower
- Past due information
- Qualitative and non-Statistical Factors

2.1.2   LLFP: IFRS 9 Run - Stage Determination Run

2.1.2.1   Run Management

OFS LLFP application supports two sequential runs (Stage Determination and Allowance Calculation) that are seeded within the application to support the Expected Credit Loss (Allowance and Provision) calculation as per the IFRS 9 guidelines. The Stage Determination run starts with the data population sub-processes to obtain the data required for both Stage Determination. After this, the reclassification subprocess is executed to convert non-standard/external data formats to standard/internal data formats. The final stage is to evaluate the change in credit risk and macroeconomic factors to determine the stage at an account level granularity with the stage determination sub-process. Upon successful execution of the stage determination run, the application provides an option for the manual re-classification of the stages assigned to accounts, based on various parameters.

Upon completion of manual reclassification of stages, the application obtains the additional data required for ECL calculation. The Cash Flow and Forward Exposure sub-processes along with the Probability of Default calculation are performed and the ECL amount is calculated. Separate processes are applicable for the Provision Matrix and Specific provision methods. The application also displays the execution status of the Run through the UI. For more details, refer to the Run Management section. Upon successful execution, the outputs including but not limited to, Expected Credit Loss, Allowance, Provision, Effective interest rate, and so on are available for reporting.

2.1.2.2   Rating Re-classification

In this sub-process, the application re-classifies the external ratings to internal ratings. This is necessary because the wide variety and range of external ratings from various sources have to be mapped to the user's limited set of internal ratings, for ease of processing and comparisons.

2.1.2.3   BASEL Re-classification

Basel reclassification Rule is used to map the bank's customer type and product type to Basel Customer Type and Basel Product Type respectively. Product types, Customer types, and Asset classes are reclassified to standard values for further processing. This is performed with the aid of the following reclassification Rules:

- Basel Product Type Re-classification

- Basel Customer Type Re-classification

- Basel Asset Class Re-classification

Basel Product Type Re-classification

In Basel Product Type Re-classification, the bank's product type is mapped to the Basel product Type.

Basel Customer Type Re-classification

In Basel Customer Type Re-classification, the bank's customer type is mapped to the Basel Customer Type.

Basel Asset Class Re-classification

In Basel Asset Class Re-classification, the asset classes are standardized for further processing.

2.1.2.4   Stage Determination

Stage Determination is a subprocess in the Stage Determination run. The IFRS 9 guidelines require each account to be classified into three different stages on every reporting date, based on the significance of an increase in Credit Risk since initial recognition. The guidelines mandate the calculation of a 12 Month or Lifetime Expected Credit Loss for an account, depending upon the stage in which an account (instrument) has been classified into.

The LLFP application supports the 'Stage Determination' requirements of the IFRS 9 guidelines by considering the following factors to determine the Significance of Increase in Credit Risk, thereby deciding the stage in which a particular account is classified into:

- Rating for all customer types other than Retail (Long term or Short term)

- Delinquency 'Days-past-due' (DPD) and LTV for Retail customers

- Industry

- Country

- Devolvement status

- New account

- Restructured status

- Impaired/Default Status

The stage determination rules based on the IFRS 9 Rules are created using any one of the parameters provided above and each of these rules is available in the out of the box product.

The rules are pre-built and easily reconfigurable based on the internal risk policy of the bank or based on the regulator's directions.

The application allows the user to create new rules from the data available in the model, modify the existing rules, delete specific rules, and reorder the entire set of rules.

Collective Assessment: The ECL run can also determine the stage, collectively (at an aggregated level). For more information, refer to the Collective Assessment section.

Rating: This rule applies to the wholesale type of accounts. Depending upon the Rating on the Date of Initial Recognition and the Rating on the Current reporting date, the accounts are classified into one of the three stages. Rating as of Initial Recognition is obtained as a download

and is reclassified to the Internal Rating. The user can configure what number of notches degraded should be considered as a significant increase of Credit Risk

Delinquency Past Due days: This rule applies to all retail types of accounts.

LTV: This rule is applicable for specific product types such as Secured Lending and Residential Mortgage Exposure. This rule requires the pre-calculation of the LTV Change. Exposure LTV Ratio is obtained as a download. Exposure LTV Ratio on Date of Initial Recognition is obtained as a download. If the LTV change is greater than the application, it can classify such accounts from Stage 1 to 2. This value can be customized by the customer.

New Account: This rule applies to all accounts. It ensures that the new accounts are classified as Stage 1, immaterial of its rating, or DPD/LTV values as of the current reporting date.

Devolvement Status: This rule is applicable only for Loans and Guarantees (Direct Credit Substitutes). The rule classifies all devolved accounts in stage 2.

Industry: This rule is common for both retail as well as the wholesale type of accounts. The rule can be customized for each run to reflect the economic scenarios at that instance.

Country: This rule is common for both retail as well as the wholesale type of accounts. The rule can be customized for each run to reflect the economic scenarios at that instance.

Simplified: This rule is to ensure that certain product types are directly classified as Stage 2 by the application.

Restructured (Renegotiated or Modified): This rule ensures that renegotiated or modified accounts are retained in Stage 2 for a certain period (Observatory Period) beyond the date of modification. This time is calculated upfront by the pre-calculation process. The application checks if the time since the date of Modification (Current date – Date of Modification) is within the Observatory period. All modified accounts that are classified into stages 1 and 2 by earlier rules and within this period, will be bucketed into Stage 2. Any account classified into Stage 3 by earlier rules will be retained as Stage 3. The user can configure the duration of the Observatory period either as an absolute value or a percentage value.

Impaired: This rule ensures that all impaired accounts are classified into Stage 3.

Default: This rule ensures that all defaulted accounts are classified into Stage 3

Stage Migration Check: This rule is to ensure that there is no movement of accounts from Stage 3 to Stage 1 between two consecutive reporting dates.

NOTE: The Rules stated here are part of out of the box application. New Rules can be added to this list and the existing Rules can be modified or removed, depending on the Banks discrete Risk policy.

2.2   Manual Stage Reassignments

The Manual Stage Reassignments/Overrides UI enables the user to manually update any stage that was assigned to every account by the application using the Stage Determination rules. The

stage is assigned through the Stage Determination run. For more details on Stage Determination, refer to the Stage Determination Run section.

The manual reassignment of stage determination involves two steps:

- Manual reassignment step
- Approval process

The users who have the Maker (manual reassignment step) privileges can update the rating using the *Stage Reassignment* section of the *Maker Stage Reassignment* module.

The approval/rejection process is performed by the user who has the Checker privileges. The checker can use the *Stage Reassignment* section of the *Checker Stage Reassignment* module to approve/reject the reassignments done by the user who had the Maker privileges.

To know more about the Manual Reassignment Process, refer to the Manual Stage Reassignment Process section.

3 Expected Credit Loss (Allowance and Provision) Calculation in IFRS 9

The Manual Reassignment step in Stage Determination run has to undergo approval processes before the values can be used in ECL Run. Only those Manual Reassignment changes that are approved by the Checker will be used in ECL Run. Any overridden values in the Draft, Pending for approval, the Rejected status will not be considered. The ECL Run uses the results from the Manual Reassignment process with any Approved changes.

The ECL process computes the Expected Credit Loss, including the Allowance and Provision values. Generally, the Allowance is calculated for the drawn amount and the Provision is calculated for the Undrawn amount.

3.1 Methodologies and Stages Based ECL Calculation

There are four major out-of-the-box Methodologies available in the product. The user can choose the methodology that is applicable for every set of accounts/instruments based on the Customer Type, Product Type, and Default status. Each of the methodologies takes into cognizance the Stage classification of the accounts, which are Stage 1, Stage 2, and Stage 3, or a POCI account (POCI accounts are treated as Stage 4 internally). The four out of the box methodologies are:

- Cash Flow

- Forward Exposure

- Provision Matrix

- Specific Provision

Similarly, there are four sub-methods applicable for accounts in each of the stages (Stage 1, Stage 2, and Stage 3 plus POCI) within these methodologies. Stage one calculates the ECL for 12 months whereas all the other three stages (stage two, stage three, and stage four) calculate the ECL for a lifetime, but use different calculation approaches.

Collective Assessment: The ECL run can also determine the stage, collectively (at an aggregated level). For more information, refer to the Collective Assessment section.

3.1.1 Methodology Selection

The methodology selection is dependent on three factors, which are, Customer Type, Product Type, and Defaulted Flag. The bank can modify the methodology selection process by either adding more parameters or modifying the existing one. Based on these parameters, a different methodology can be assigned to different accounts, products, and so on.

3.1.2 Cash Flow Method

The Cash Flow method makes use of the Contractual Cash Flow, taking into consideration any prepayments, behavior patterns, etc. The Contractual cash flow is adjusted for Probability of Default (PD) and Loss Given Default (LGD) to compute the Expected Cash Flow (ECF),

The first step in the cash flow methodology is to validate if the contractual cash flows are available for the specific account. The Contractual cash flows can either be generated by the engine or obtained as a download.

NOTE: If the Cash Flow is not available, the account is processed through the Provision Matrix methodology.

3.1.2.1 Prerequisites

Before following the Contractual Cash Flow method, ensure that the following prerequisites are met.

- Contractual Cash Flows are expected to be available before the ECL computation process is executed. It can be either generated by Oracle's Cash Flow engine or by an external engine or provided as a download. The internal cash flow engine used is common across other OFSAA applications. For more details on Oracle's Cash Flow engine, refer to the *Oracle Financial Services Asset Liability Management User Guide* available at OTN Documentation Library.

- PD and LGD values are expected either as a model output from the models hosted in the Enterprise Modeling Framework or directly as an input. For More information on Oracle's Enterprise Modelling Framework, refer to OTN Documentation Library.

3.1.2.2 Cash Flow Calculations

There are two distinct ways of calculating the ECL under the Cash Flow method depending on how the undrawn portion of a financial instrument is treated. They are:

- Calculation of ECL with "Undrawn amount modeled within the Contractual Cash Flows"

- Calculation of ECL with "Undrawn amount" treated separately and outside the Cash flow approach

The following sections detail the ECL calculation for accounts in any of the 4 types (i.e. the 3 stages and POCI accounts); both with and without undrawn amount (as mentioned above).

Stage One Accounts

For accounts in Stage 1, the ECL is computed by considering the cash flows for the entire life of the instrument but only considering the 12-month Probability to default. The Contractual cash flows are adjusted for PD and LGD to compute the Expected Cash Flow (ECF). The values of Contractual Cash flow and Expected Cash flow are used to calculate the Cash Short Fall.

The ECL is calculated as the Net Present Value of Cash Short Fall.

The Effective Interest rate (EIR) is used for discounting while calculating the ECL.

NOTE: The PD for 12 months/1 years is considered for accounts in Stage one.

Stage Two Accounts

For accounts in Stage 2, the ECL is computed by considering the cash flows and the Probability to default for the entire life of the instrument. The Contractual cash flows are adjusted for PD and LGD to compute the Expected Cash Flow (ECF). The values of Contractual Cash flow and Expected Cash flow are used to calculate the Cash Short Fall.

The ECL is calculated as the Net Present Value of Cash Short Fall.

The Effective Interest Rate (EIR) is used for discounting while calculating the ECL.

NOTE: The PD for the lifetime or until the maturity of the account is considered for accounts in Stage two.

Stage Three Accounts

For accounts in Stage 3, the ECL is computed by considering the cash flows and the PD for the entire life of the instrument. Here the calculation slightly differs from that of Stage 2 accounts. The Contractual cash flows are adjusted for PD and LGD to compute the Expected Cash Flow (ECF). The Net present value (NPV) of Expected Cash flows are computed,

The ECL is calculated using the Carrying Amount and Net Present Value (NPV) of ECF.

The Effective Interest Rate (EIR) is used for discounting while calculating the ECL.

NOTE: The PD for the lifetime or until the maturity of the account is considered for accounts in Stage Three.

For POCI Accounts

For POCI Accounts, the ECL is computed by considering the cash flows and the PD for the entire life of the instrument. The contractual cash flows are adjusted for PD and LGD to compute the Expected Cash flows. The values of Contractual Cash flow and Expected Cash flow are used to calculate the Cash Short Fall.

NOTE: The PD for the lifetime or until the maturity of the account is considered for POCI accounts.

After calculating the Contractual Cash Flow, the ECL is calculated as the Present value of Cash Shortfall **adjusted for the ECL on Date of Initial Recognition**.

For POCI Accounts, instead of EIR, the credit adjusted EIR is used for discounting, while calculating the ECL.

NOTE: The PD values used in the Cash flow methodology are Cumulative values.

3.1.3 Forward Exposure

The forward exposure methodology involves the computation of the Forward Exposures (a proxy for forward-looking Exposure at Defaults) at a different point in time in the future until the life term of the instrument and then computing the Expected Credit Loss from them. The Forward Exposure values are calculated by the application using the Contractual cash flows. Again, the contractual cash flows can either be generated by Oracle's CFE or by an external engine.

The application also has a feature to take the Forward Exposure values and the corresponding forward dates directly as an input for processing. If both Cash Flows and Forward Exposure values are not available, then the account is processed through the Provision Matrix methodology.

This section details the steps involved in forwarding Exposure calculation for various stages. Note that the Forward Exposure method is not applicable for Stage three. If the product belongs to stage three, the account will be treated under the Cash Flow method.

Forward Exposure on each cash flow date is calculated from the cash flows generated/obtained as a download. The LLFP application calculates the Forward Exposure on each cash flow date as the Net present value of all future and current cash flows, discounted using the Effective Interest Rate (EIR) of the account or Cohort. Forward exposures are calculated until the maturity of the account.

3.1.3.1 Forward Exposure Calculations

Stage One Accounts

For Stage 1 accounts, the forward exposures up to the maturity/life term of the account are considered but only the 12 month PD is taken into account. The Per Period Loss is calculated from the Forward exposure, PD, and LGD values.

> **NOTE:** The Marginal PD for 12 months/1 years is considered for Stage one accounts.

After calculating the Per Period Loss, the ECL is calculated as the present value of Per Period losses.

The Effective Interest Rate (EIR) is used for discounting while calculating the ECL.

Stage Two accounts

For Stage 2 accounts, the forward exposures and the PD up to the maturity of the account are considered. The Per Period Loss is calculated using Forward Exposure, Marginal PD, and LGD.

> **NOTE:** The Marginal PD for the entire lifetime of the account is considered for Stage Two accounts.

After calculating the Per Period Loss, the ECL is calculated as the Present value of Per period losses

The Effective Interest rate (EIR) is used for discounting while calculating the ECL.

Stage Three accounts

The Forward Exposure approach for accounts in Stage 3 is similar to that of Stage 2.

POCI accounts

For POCI accounts, the forward exposures and the PD up to the maturity of the account are considered. Per Period Loss is calculated using the Forward Exposure, Marginal PD, and LGD.

> **NOTE:** The Marginal PD for the entire lifetime of the account is considered for POCI accounts.

After calculating the Per Period Loss, the ECL can be calculated as Net Present Value of Per Period Losses adjusted for the Expected Credit loss as of Initial recognition.

The Credit adjusted EIR is used for discounting while calculating the ECL.

3.1.3.2 Calculation of Forwarding Exposures as the Sum of Present Value of Cash flows using EIR

The LLFP application calculates the Forward Exposure on each cash flow date as the Net present value of all future and current cash flows, discounted using the Effective Interest Rate (EIR) of the account or cohort. The discounting period must be as per the Cash flow dates and not as per the buckets.

That is, Forward Exposure on each cash flow date is calculated as the sum of the Present Value of all the Future Cash Flows and the Current date Cash Flow (that is, Cash flow corresponding to that date).

The forward exposures are also adjusted for PD and LGD to calculate the Per Period losses and further, the Expected Credit Loss of the account.

3.1.4 Provision Matrix

The Provision Matrix subprocess is separated into two tasks:

- Allowance Calculation
- Provision Calculation

In the Allowance Calculation task, the application uses the Provision Matrix method to calculate the Allowance for all accounts classified under the provision matrix methodology and accounts for which Allowance calculation was skipped by previous methods. This calculation is done on the Carrying Amount (or the drawn amount). That is, the Allowance calculation is formulated using Carrying Amount and Provision Rate.

In the Provision Calculation task, the application uses the Provision Matrix method to calculate the Provision for all accounts that have an undrawn portion. This calculation is done on the undrawn amount. The Provision is calculated using Undrawn Amount, Credit Conversion Factor (CCF), and Provision Rate.

3.1.4.1 Provision Rate

The provision matrices are provided by the banks as an input into the staging tables. These provision matrices provide the provision rate that is applicable for a particular group of accounts based on the input factors associated with that account.

In the out of the box product, different Provision matrices are assigned to different groups of accounts based on the following factors:

A) Customer Type

B) Product type

C) Stage

Banks must differentiate the provision rates for accounts in Stage 1, Stage 2, or 3 and POCI Accounts.

For Corporates and Retail, there are different ways of assigning the Provision Rates.

The provision rates can be computed for different instrument groups based on the historical data and adjusted for forward-looking factors using the Enterprise modeling framework. For more information, refer to OTN Documentation Library.

Assigning Provision Rates for Corporate accounts

The Provision Rates for Corporate accounts are assigned using the ratings provided and the corresponding rates assigned are in percentage terms.

For example:

Rating	Rates in %
AAA	1%
AA	3%
A	5%
BBB	10%
BB	20%
B	30%
CCC	40%
CC	50%
C	60%
DDD	70%
DD	80%
D	100%

Assigning Provision Rate for Retail accounts

The Provision Rates for Retail accounts are assigned using Delinquency Past Due (DPD) bands and the rates are in percentage terms.

Dates (DPD)	Rate
0-30 Days	1%
31-40 Days	5%

41-100 Days	30 %

The application uses Rules to determine the rates applicable for an account, based on the Stage, Product Type, and Customer Type. Rates are picked form matrices as in the examples provided.

3.1.5   Specific Provision

The LLFP application calculates stage-specific ECL values for all accounts, as per the IFRS 9 guidelines. According to the guidelines, it is required to calculate the 12 months ECL for accounts in Stage 1 and Lifetime ECL for accounts in Stage 2, Stage 3, and for POCI accounts. Within the specific provision method, to distinguish between these stages, the application calculates the 12 month PD and Lifetime PD, from the given PD term structures.

For accounts in Stage 1, Allowance is calculated as the product of Carrying Amount, 12 Month PD, and LGD. Also, Provision is calculated as the product of Undrawn Amount, CCF, 12 Month PD, and LGD.

For accounts in Stage 2, Stage 3, or POCI accounts, Allowance is calculated as the product of Carrying Amount, Lifetime PD, and LGD. Also, Provision is calculated as the product of Undrawn Amount, CCF, Lifetime PD, and LGD.

The ECL is derived as the sum of Allowance and Provision.

3.1.5.1   Calculation of 12 Month and Lifetime PD Values

The PD values are calculated from the PD term structures which are expected as a download. During processing, the PD term structures corresponding to accounts under Specific Provision methodology are also processed. This results in the interpolation and extrapolation of PD values until the maturity period of all the accounts.

For accounts with Maturity greater than 12 months (four quarters, two half years, one year, and so on), the 12 Month PD corresponds to the Cumulative PD at the end of the 12th Month and the Lifetime PD corresponds to the Cumulative PD of the period corresponding to the account's maturity date.

For accounts with Maturity less than 12 Months, the 12 Month PD and the Lifetime PD both correspond to the Cumulative PD of the period corresponding to the account's maturity date.

NOTE: Both the 12 Month PD and the Lifetime PD are calculated for all accounts irrespective of the stage. But only one among those is used for ECL computation, depending on the Stage.

3.1.5.2   Calculate the LGD Value

The LGD value that is used in the Specific Provision method is obtained from the processed LGD term structure. The input LGD term structures are processed to calculate the LGD values at the bucket frequency. This processing is applied for accounts under the Specific Provision methodology. Once the LGD term structures are processed, each account is associated with an LGD value against the current period. As mentioned in the section on LGD processing, the current period value corresponds to the 0th period or the 0th bucket.

This value is assigned as the LGD value that is used in the Specific Provision method.

ORACLE®

Also, The 12 Month PD, Lifetime PD, and the LGD values are stored for reporting.

3.2   Calculation of Allowance and Provision

After the consolidated ECL is calculated through any one of the multiple methodologies available, the Allowance and Provision values are determined. The Allowance and Provision values are calculated based on the Drawn and Undrawn portion of the accounts. For every Product type and Customer type, the application checks whether the Undrawn flag is Y or N. A Rule namely, the Undrawn Flag Assignment Rule handles the flag set for the Undrawn portion.

Under Cash Flow or forward Exposure methodology, depending on the inclusion of the undrawn portion in either the Cash flow or Forward exposure, the Expected Credit Loss value is apportioned as Allowance and Provision values, considering the carrying amount.

The Undrawn Flag Assignment Rule performs the check for the Undrawn flag across all the methodologies. After the check, depending on the value of the Undrawn flag, the following calculations can be made:

- If the Undrawn flag is Y and the ECL > Carrying Amount, then:

  - Allowance = Carrying Amount

  - Provision = ECL – Carrying Amount

- If the Undrawn flag is Y and the ECL < Carrying Amount, then:

  - Allowance = ECL

  - Provision = 0

- If the Undrawn flag is N and the ECL > Carrying Amount, then:

  - Allowance = Carrying Amount

- If the Undrawn flag is N and the ECL < Carrying Amount, then:

  - Allowance = ECL

If the Undrawn flag is N, the Provision is calculated using the Provision Matrix method. For more details, refer to the Provision Matrix section.

3.3   Impairment Gain or Loss Calculation

The final ECL is computed form Allowance and Provision values which are mentioned in the previous section. The Impairment Gain or Loss for the current period is computed by comparing the current reporting date's Allowance and Provision values with the previous reporting dates Allowance and Provision values.

ORACLE

3.4 Calculation of EIR under IFRS 9

3.4.1 Overview

IFRS 9 mandates the use of Effective Interest Rate (EIR) to discount to take in to account the Time value of money. The guidelines also mandate the use of Origination date EIR for Fixed-rate accounts and Current date EIR for Variable rate accounts.

Additionally, the guidelines require the banks to use Credit Adjusted Effective Interest Rate (CAEIR) in case of any Purchase or Originated Credit Impaired (POCI) accounts. As mentioned, for fixed-rate POCI accounts, the Origination date Credit Adjusted EIR is used, and for variable rate accounts, Current date Credit Adjusted EIR is used.

3.4.2 Computation of EIR/CAEIR

The LLFP application calculates any of these four values as applicable and when required. The application also gives an option to provide the EIR value as a download.

NOTE: EIR/CAEIR computation is applicable for only products under ODs, Cards, Loans, Investments, and Money Market instruments. In the case of Leases, the Lease rate is used as the discount rate. And for Letter of Credits and Guarantees, the discount rate is provided as a download through the EIR column in the Account Inception rates table is directly used.

3.4.2.1 If EIR/CAEIR is provided as a Download

If the value is provided as a download through the staging/fsi table Account Inception Rates, then the application populates the same into the processing table – Fact Account Details (FAD).

In the case of a fixed rate account, the application checks the availability of the EIR (CAEIR for POCI account) corresponding to the **given Account ID** and populates the same into FAD.

In the case of a variable rate account, the application checks the availability of the EIR (CAEIR for POCI account) corresponding to the given Account ID and the given MIS date before populating the same into FAD.

NOTE: In the case of a fixed rate account, the application does not check the MIS date, thereby the EIR (value as of origination date) of a different MIS Date (if available) can be copied into processing.

EIR Calculation Flag and Checking the Availability of EIR/CAEIR Value

The EIR EIS Calculation Flag determines the need to calculate the EIR/CAEIR value by the application.

- If the customer mandates the calculation of EIR/CAEIR, then the flag is updated as "Y" in the processing table.

- If the flag in Staging is NULL and if the processing table contains the EIR/CAEIR value, the flag in the processing table remains as NULL.

- If the flag in Staging is NULL and the processing table does not contain the EIR/CAEIR value, the flag in the processing table is marked as "A".

NOTE: You can mandate the calculation of the EIR/CAEIR by marking the EIR EIS Calculation Flag in staging tables as "Y".

Important: If Flag is Y or A, the application always calculates the EIR/CAEIR value. If the flag is "Y", the calculated value is also updated back into the Inception rates table.

3.4.2.2   Prerequisites for the calculation of EIR / CAEIR

The application requires the following values for the successful calculation of EIR / CAEIR:

- Cash Flows – As of Origination date for fixed-rate accounts or as of current date for Variable rate accounts.

- Fees (as of origination date) specific to EIR calculation and Deferred Fees (as of current date) in case of variable rate accounts.

- Total Premium / Discount or Deferred Premium / Deferred Discount.

- Outstanding as of Origination date for fixed-rate accounts or outstanding plus accrued interest as of Current date.

Additionally, a POCI account will require the following details:

- PD term structure valid as of origination date for fixed-rate accounts or as of current date for variable rate accounts.

3.4.2.3   Calculation of the EIR / CAEIR Value

- For fixed-rate accounts in Stage one, two, or three

  The application first adjusts the origination date outstanding with the Total fees (specific to EIR) and any premium or discount, post which, the Internal rate of return is computed on the adjusted outstanding amount with the Contractual cash flows as of origination date.

- For variable rate accounts in Stage one, two, or three

  The application first adjusts the current date outstanding with the deferred fees (specific to EIR) and any deferred premium or deferred discount, post which, the Internal rate of return is computed on the adjusted outstanding amount with the Contractual cash flows as of the current date.

- For fixed-rate POCI accounts

  The application first adjusts the origination date outstanding with the Total fees (specific to EIR) and any premium or discount. Secondly, the expected cash flows as of the origination date are calculated using the contractual cash flows and PD term structure as of the

origination date. Post which, the Internal rate of return is computed on the adjusted outstanding amount with the Expected cash flows as of the origination date.

▪ For variable rate POCI accounts

The application first adjusts the current date outstanding with the deferred fees (specific to EIR) and any deferred premium or deferred discount. Secondly, the expected cash flows as of the current date are calculated using the contractual cash flows and PD term structure as of the current date. Post which, the Internal rate of return is computed on the adjusted outstanding amount with the Expected cash flows as of the current date.

3.5 Collective Assessment

The Collective Assessment feature of the IFRS 9 Run of LLFP application enables you to form Cohorts (that is, group a set of accounts) based on various parameters/dimensions such that, accounts with similar characteristics are grouped and treated uniformly as a single account while determining the stage as well as computing the Expected Credit Loss (ECL) values.

3.5.1 Cohort Formation for Stage Determination Run

The Collective assessment feature is part of the IFRS 9 Stage Determination Run and it addresses the following two major aspects:

▪ Determine the stage of accounts with similar (Risk) characteristics in a similar manner

▪ Improvement in performance by reducing the total number of records to be treated

The application uses the following steps during the Stage determination process, specifically related to collective assessment:

▪ A configurable rule that defines the dimensions/Parameters deciding the set of accounts that are allowed to be processed, collectively.

▪ Cohort formation (grouping of accounts) is based on a given set of dimensions.

▪ Assigning/calculating Cohort level values based on the account level values, which are part of the Cohort.

▪ Determine the Stage for Cohorts

▪ Reassign the Cohort's stage back to individual accounts that are part of the Cohort.

These steps are detailed in the forthcoming sections:

3.5.1.1 Dimensions/Parameters Deciding the Type of Accounts that are allowed to be Processed Collectively

This process has been approached in the following two steps:

▪ Parameters/dimensions that mandatorily filter out specific accounts from the collective assessment.

Accounts matching the following parameters are eligible for collective assessment.

- The account should not have been restructured

- The account should not be impaired or defaulted

- The account should not be a POCI account

- The account should not have been devolved

- The account should not have been classified as stage three in the previous reporting date

NOTE: These are mandatory filters that cannot be changed.

- Dimensions that decides the set of accounts enabled for collective assessment

Using the Run Rule framework, the application enables you to define the dimensions that determine which set of accounts are allowed to be treated collectively. The Rule is flexible enough to allow you to include new dimensions, remove existing ones, and so on. In the out of the box product, the default dimensions are:

- Basel Customer Type

- Basel Product Type

3.5.1.2   Dimensions based on which Accounts are grouped

Once the accounts that are eligible for collective assessment are decided, the next step is to decide the parameters based on which the groups are formed. LLFP forms Cohorts based on the following dimensions:

- Basel Customer Type

- Basel Product Type

- Country

- Industry

In addition to the preceding dimensions,

For non-retail customer type, the following two dimensions are also considered for cohort formation:

- Rating (counterparty or issuer) on Initial Recognition and

- Rating (counterparty or issuer) as of the current date

For retail customer type, the following dimension is also considered for cohort formation:

- Delinquency past due days band

3.5.1.3 Assigning Values to Cohorts

Once the Cohorts are formed, they are treated as individual accounts. The next step is to assign representative values to the parameters of these Cohorts based on the values of accounts that are part of the Cohort. The following table highlights, how the representative values are computed for the given parameters of a Cohort:

FISD Columns	Values
Collective Individual Flag	"G"
Exposure Default Status Flag	"N"
LTV Flag	Calculated post cohorts automatically
Account Sequence Number	Cohort ID
Account SKey	-1
Basel Customer Type SKey	As per Cohort
Basel Product Type SKey	As per Cohort
Counterparty Rating DOIR SKey	As per Cohort
Counterparty Rating SKey	As per Cohort
Country SKey	As per Cohort
Delinquency Bank SKey	As per Cohort
Development Status CD	As per Cohort
Customer Industry SKey	As per Cohort
Issuer Rating DOIR SKey	As per Cohort
Issuer Rating SKey	As per Cohort
LTV Currency Ratio	Average
LTV DOIR Ratio	Average
MIS Date SKey	As per Run
Run SKey	As per Run

3.5.1.4 Stage Determination of Cohorts

For facilitating the Stage Determination process of the Cohorts, the application's Stage Determination Rule has been reconfigured to work either on Individual accounts not part of Cohorts or on Cohorts.

NOTE: The Stage Determination Rules do not process Individual accounts that are part of Cohorts.

3.5.1.5   Reassigning the Stages Assigned to Cohorts back to Individual Accounts

Once the stage is determined for the Cohorts, the same is assigned back to individual accounts.

3.5.1.6   Audit Trail

After this, the Cohort related records are removed from the IFRS Stage Determination fact table and moved to a new table for audit purposes.

3.5.2 Cohort Formation for ECL Run

The Cohort Formation (or Collective assessment) feature as part of the ECL run of the LLFP application addresses the following two aspects:

- Treat accounts with similar (Risk) characteristics in a similar manner
- Improvement in Performance by reducing the total number of records to be treated

The application enables Collective Assessment by following the subsequent processes:

- **Dimensions and filters that define the eligibility of accounts to form Cohorts** - Records satisfying these dimensions are eligible to form Cohorts (groups).

- **Dimensions that define the Formation of Cohorts** – These dimensions decide which set of records form a group and also in that sense decide the total number of groups as well.

- **Cohort level Parameters for ECL calculation** - Arrive at values for Parameters (associated with the Cohort) that are required for ECL calculation. This includes grouping cash flows / forward exposures, PD, and LGD.

- **ECL Calculation for Cohorts**- using any of the methodologies

- **Apportion calculated metrics** – Redistribute the metrics/values calculated at the cohort level to individual accounts.

- **Maintain Audit trail** – Store the cohorts formed during the run for future reference.

The system stores the Minimum number of accounts that are required for a cohort to be formed as a setup parameter – "MIN_ECL_COHORT_SIZE". This is to prevent the formation of groups with a fewer number of accounts, thereby creating a large number of small-sized cohorts, which eventually leads to an increase in processing time and a decrease inaccuracy. In the out of the box product, the "MIN_ECL_COHORT_SIZE" parameter is set to '50'.

One preprocessing step required is to arrive at the Remaining Time to Maturity band for each account, with each band having a six-month gap. The remaining time to maturity band for the accounts is calculated as the difference between MIS Date and the Original or Revised maturity date.

ORACLE®

If the Revised Maturity date is available, "Time to Maturity = Revised Maturity Date –MIS Date" else "Time to maturity = Original Maturity Date –MIS Date".

The calculated Time to Maturity is then converted to a specific band.

3.5.2.1 Dimensions and Filters that Define the Eligibility of Cohorts

The next step in the process decides the set of accounts that are eligible to form Cohorts. Following are the two eligibility types:

- Filters

  The filters decide the set of accounts that are eligible to form groups or Cohorts and are mandatory. Accounts are filtered based on the following factors:

  - Stage: 1 and 2

  - Default Flag: N

  - Impaired Flag: N

- Eligibility Dimensions

  The following filters are based on an extendable rule with a default set of dimensions that allow you to decide which set of accounts are eligible to form cohorts. By default the following dimensions are considered:

  - Basel Customer Type

  - Basel Product Type

  - Methodologies

You can add/modify the list of dimensions.

3.5.2.2 Dimensions that Define the Formation of Cohorts

The application creates Cohorts, based on homogenous values across the following dimensions. The total number of Cohorts formed is equal to the total number of such unique combinations across these dimensions. However, in case the number of accounts in any Cohort is less than the minimum size set in the parameter "ECL_MIN_COHORT_SIZE", the Cohort is disbanded and all related accounts are treated individually.

The dimensions considered to group Cohorts are the following:

- Basel Customer Type

- Basel Product Type

- IFRS Stage

- Methodology

- Cash Flow Undrawn Flag

- Current Internal Rating for non-"Retail" accounts or DPD Band for "Retail" accounts

- Time to Maturity band

- Currency

3.5.2.3   Cohort Level Parameters for ECL Calculation

The Cohort-level parameters, required for ECL calculation, are determined using the parameters of the accounts belonging to that Cohort. This is determined in two steps:

The first step includes identifying the parameters/values for dimensions that define the formation of a Cohort; these values are unique across all the accounts of a Cohort.

The second step includes identifying the parameters/values for dimensions that are derived from the account level values these values differ across the accounts of a Cohort and logic is used to arrive at Cohort level values (for example, Sum, weighted average, and so on.)

- Step 1: Dimensions used for Cohort Formation are the following:

    - Basel Customer Type

    - Basel Product Type

    - IFRS Stage

    - Methodology

    - Cash Flow Undrawn Flag

    - Current Internal Rating for non-"Retail" accounts or DPD Band for "Retail" accounts

    - Time to Maturity band

    - Currency

    For these dimensions/parameters, the unique values of each Cohort formed are populated as the value against these Cohorts.

- Step 2: Other parameters required for ECL Calculation are the following:

    The other set of parameters that are specific to ECL calculation and the values are arrived at a group level using the logic, as provided in the following table:

Columns	For Cohort	Formula
Account Start Date	Y	MIN
Original Maturity Date	Y	MAX
Revised Maturity Date	Y	MAX
Cash Flow Undrawn Flag	Y	As per Cohort
Collective Individual Flag	Y	"G"

ORACLE®

Basel Asset Class	Y	As per Cohort
Basel Customer Type	Y	As per Cohort
Basel Product Type	Y	As per Cohort
Carrying Amount in Natural Currency	Y	Sum
CCF Percent	Y	Average
Counterparty Rating	Y	As per Cohort
Delinquency Band	Y	As per Cohort
IFRS Stage	Y	As per Cohort
Issuer Rating	Y	As per Cohort
LGD Percent	Y	Weighted Average
ECL Computation Methodology	Y	As per Cohort
MIS Date	Y	As per Run
Run	Y	As per Run
Undrawn Amount in Local Currency	Y	Sum
Currency	Y	As per Cohort
Remaining Maturity Band	Y	As per Cohort

Grouping Contractual Cash Flows: In the case of a Cohort with Cash Flow methodology, the cash flows related to all accounts within the given Cohort are grouped based on the Bucket IDs assigned. All the cash flows of all related accounts are considered in this. At a bucket level, the Principal and Interest values of all related cash flows are summed up. Once grouped, the bucket start date, bucket end date, or data corresponding to the middle of the bucket is assigned as the cash flow date for that specific bucket.

Weighted average Loss Given Default: The Loss Given Default of the Cohort is calculated as the weighted average of LGD values of individual accounts which are part of the Cohort.

NOTE: The weighted average of Cohorts is done at a term structure level.

Weighted average Effective Interest Rate: The Effective Interest rate of the Cohort is calculated as the weighted average of EIR values of individual accounts which are part of the Cohort.

Grouping Forward Exposures: In case of a Cohort that has been assigned with a Forward Exposure methodology, the forward exposure values related to all accounts within the given Cohorts are grouped based on the Bucket IDs assigned earlier. All the Forward Exposures of all related accounts are considered for this. At a bucket level, the forward exposures are summed up. Once grouped, the bucket start date, bucket end date, or the data corresponding to the

middle of the bucket is assigned as the cash flow date for that specific bucket. For more information about the Forward Exposure method, refer to the Forward Exposure section.

Once the preceding steps are performed, the Cohorts are treated as individual accounts and the ECL values are computed based on the methodology that has been assigned to each Cohort.

3.5.2.4   Apportion Calculated Metrics

Once the Expected Credit Loss, Allowance, and Provision values for the Cohorts and individual accounts are computed, the Cohort level values are apportioned back to each account that is part of every Cohort. While apportioning the values, the carrying amount of each account is considered as the weighing factor.

3.5.2.5   Maintain Audit Trail

To ensure that the reporting layer does not treat the Cohorts as separate accounts and to maintain data for audit purposes the Cohorts and the corresponding values are copied into another table, Collective Assessment, and then are removed from the Account Details fact table.

3.6   The probability to Default (PD) Term Structure

Oracle's LLFP application enables the user/customer to provide a series a Probability of Default (PD) values across multiple periods – a PD Term Structure, to be used in the Expected Credit Loss calculation. These PD values are generally outputs of models that are specific to a set of product portfolios wherein they generate a series of PD values for different Ratings or DPD bands.

The LLFP application provides a staging area to obtain the PD term structures, which are expected as a download from the bank. These values can either be a Marginal PD or a Cumulative PD. If the bank is providing Cumulative PD, the application calculates the Marginal PD value, at the given frequency.

The staging tables can obtain these series of PD values (across multiple periods) from different Models and for different Ratings or DPD bands within a Model. Additionally, the staging tables can also accept the PD Term structures at different frequencies but for different Models.

NOTE: A particular model provides PD values at a constant frequency at any specific date.

The staging tables are required to be updated only when there is a change in the parameter values, such as Frequency, new Term structures, and so on or when the PD values change. The PD related staging tables need not be updated for every FIC MIS DATE.

3.6.1   Movement of Data from Stage to FSI tables

The data movement from the Stage tables to FSI tables happens using an SCD batch, which needs to be executed only when fresh data is loaded into the Stage tables. PD data moving into the FSI table are generally stored over time, thus it contains historic data.

During execution, the application considers only those PD term structures that are required within the given run, that is the PD values corresponding to the given ID and Rating/DPD are only considered.

The application then checks for accounts matching all of the below-given criteria:

- POCI account
- Fixed-Rate account
- EIR EIS Calculation Flag – 'Y' or 'A'

For these accounts, the application obtains the historic PD values based on the following:

1. 'Rating as of Initial recognition' in case of Rating based term structure
2. 'Active' DPD band in case of DPD band based term structure (Reason: on initial recognition, an account is always active)

3.6.2   Interpolation of PD Values to Buckets

The first step in the Interpolation process is the determination of the maximum number of buckets for which the PD values have to be interpolated and calculated for a given 'ID – Rating' combination. The application looks for the earliest Account Start Date and the latest Maturity Date and then calculates the total number of buckets between these two dates.

After this process, the application extends the total number of buckets to the nearest multiple as mentioned in the following list:

- 12 if Monthly buckets
- 4 if Quarterly buckets
- 2 if Half-yearly buckets
- 1 if Yearly buckets

NOTE: If the bucket frequency is greater than the PD Term structure frequency, the PD values are not calculated/interpolated.

Once the total buckets are determined, the PD values are then calculated against each of the bucket IDs.

3.6.2.1   Interpolation Step

The next step is the population of Marginal PD from the given term structure data to the max bucket for each period. This is populated as follows:

- Considering bucket frequency is monthly - If the input data is yearly, the marginal PD of every year is populated to the 12th monthly bucket of every period. That is Buckets 12, 24 36, and so on.

- Considering bucket frequency is Quarterly - If the input data is half-yearly, the marginal PD of every half year is populated to the 2nd Quarterly bucket of every period – 2, 4, 6, and so on.

NOTE: If the PD term structure is of the lesser period than the total number of buckets applicable, then the Marginal PD of the last period is repeated for all further buckets. e.g. If the total number of buckets is 36 (monthly) but the PD term structure was given for only 2 years, the second year value is populated for the third year as well, that is PD of Year 2 PD from the term structure is populated for 24th bucket and 36th bucket.

The next step is to interpolate the PD values for the intermediate buckets in each period. One of the following interpolation techniques is used to interpolate the PD values from the given frequency to the bucket frequency:

- Poisson process
- Arithmetic process
- Geometric process.

The interpolation technique gives the intermediate cumulative PD values for every bucket within the given period, which is the Cumulative PD for buckets 1 to 12, 13 to 24, 25 to 36, and so on (assuming input PD is yearly and bucket frequency is monthly).

The intermediate Marginal PD is calculated from the Intermediate Cumulative PD values.

The final step is the calculation of the final cumulative PD against every bucket ID, for every given combination of ID and Rating/DPD.

3.6.3 Assigning the PD Values for Each Cash Flow Date/Bucket

Irrespective of the methodologies, that is Cash Flow or Forward Exposure, the cumulative PD matching the account's Term structure ID, account's Rating or DPD and the bucket number is populated against the account's cash flow – based on the cash flow's bucket.

In the case of Forwarding Exposure methodology, additionally, the Marginal PD is calculated from the Cumulative PD for every cash flow bucket.

Post this step, the cumulative loss rate or the marginal PD loss rate is computed for each cash flow date.

3.7 Loss Given Default (LGD) Term Structure

The LGD Term Structure feature in the LLFP application allows you to change the LGD values over different periods by reflecting the changes in Loan value, collateral value, lien, and so on at an account level granularity. This also helps in obtaining more accurate ECL numbers while calculating the lifetime losses.

The processing of LGD Term Structures has the following four phases:

- Obtaining LGD Data in Staging

3.7.4 Using LGD data for ECL calculation

The bucket wise LGD values are assigned to the corresponding cash flows using the bucket ID stamped against those cash flows.

3.7.5 Collective Assessment

In the case of any Cohorts being formed, a set of processed LGD term structures are created in the processing table corresponding to each of the Cohort. The number of periods/buckets for a given Cohort is the maximum value of those individual accounts which are part of that Cohort. For the Cohort related series, the LGD against each period (Bucket ID) is calculated as the weighted average of the individual LGD values against the corresponding bucket ID with the carrying amount of the account being used as the weight.

NOTE: You need to load data to the LLFP LGD Term Structure Staging table. For more details regarding the table structure, refer to the Download Specification documents in MOS.

4   IAS 39 and IFRS 9 (Draft) Based Runs

LLFP Business Processes are majorly classified into the following:

- EL and IL Provision Calculation

- Loss Forecasting

4.1   EL and IL Provision Calculation

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

- Incurred Loss (IL) Approach

- Expected Loss (EL) Approach

Each approach is a separate Run in the LLFP application. *For more information on executing a Run, refer to chapter 5-*Execution. A high-level process flow to calculate provision is as follows:
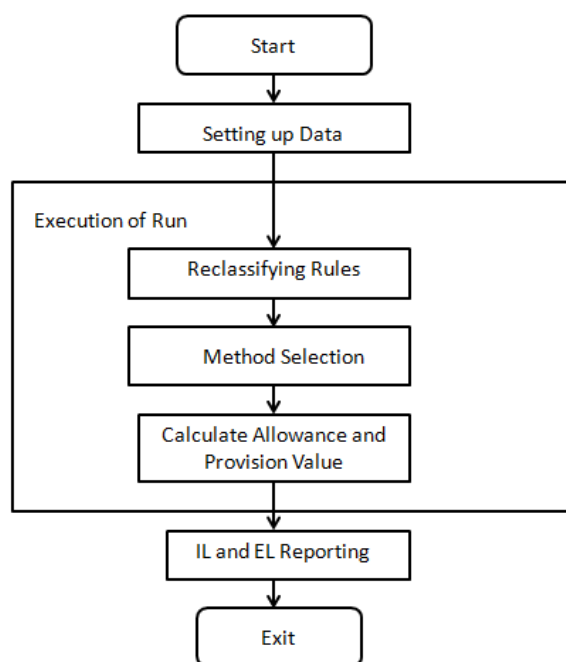
The Expected Loss Run applies any one of the following methods:

- 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.

4.1.1   Expected Loss (EL) Approach

EL Approach consists of the following major business processes:

- Basic Procedure

- Expected Loss Method

- Provision Matrix Method

- Recovery Rate Method

- Collateral Value Based (CVB) Method

- Net Charge off Calculation

- Provision Calculation

  - Currency Conversion

4.1.1.1   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

ORACLE®

- 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:** The 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.

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.

4.1.1.2 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 LLFP 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 LLFP to generate cash flows as on FIC_MIS_DATE. Also, the ALM process ID should be updated in the LLFP T2T.

4. Amortized cost using the EL approach is calculated when the Expected Interest Rate (EIR) and Expected Interest Spread (EIS) areas of account start date. If it is not provided as a download, then the application calculates the same. EIR or EIS calculation indicator needs to be updated to indicate that EIR and EIS need to be calculated. This flag is updated by task **EIR_EIS_Flag_Update** – which updates the flag to **A**.

5. To calculate EIR or EIS as of account origination date, LLFP 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 **CumIt_Impaired_Prob_Calc** DT. You can change monthly to quarterly/yearly by setting it up in the Reveleus_Parameter_Master table by changing LLFPBUCKETLENGTH.

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

NOTE: For example, the Input transition matrix cannot be monthly and LLFPBUCKETLENGTH 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 LLFP 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 sum total of 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.

4.1.1.3   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

Amortized cost = Carrying amount * (1 -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.

4.1.1.4   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 is 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: The 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.

4.1.1.5   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:

ORACLE®

- Collateral Value for each collateral

- Carrying amount and Recovery cost at the account level

- Account to collateral mapping

2. The Carrying Amount, Recovery Cost, and Collateral Value are converted to Reporting Currency.

3. The Shortfall (RCY) at customer and product type level is calculated as follows:

Shortfall = [∑Collateral value – (∑Carrying amount + ∑Recovery costs)]

4. If Shortfall > Threshold, an account with the same customer and product type and which has the highest carrying amount to which shortfall is not allocated is considered.

Account-level EoP Allowance (RCY) = Minimum (balance eligible shortfall, carrying amount)

5. If the customer does not have another account with the same product type, then the account level EoP Allowance is converted to the natural currency.

Eligible Allowance = Min (EoP Allowance, Carrying amount) in NCY.

6. Provision is then calculated and converted eligible allowance and Provision Value to Reporting Currency.

4.1.1.6   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.

4.1.1.7   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.

4.1.1.8   Currency Conversion

Allowance, Provision, and other reporting measures are converted to reporting currency using the **Key_Measure_RCY_Conv** task. 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.

4.1.2 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

4.1.2.1 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

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

5. (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)

6. 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.

4.1.2.2   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.

2. Typically, all retail customers having non-impaired accounts can be assessed collectively to calculate provision.

3. 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.

4. 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**.

5. 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.

6. 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 **CumIt_Impaired_Prob_Calc** DT.

7. Similarly, assign an impaired state delinquency band.

8. 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 LLFPBUCKETLENGTH.

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

9. 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.

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

11. 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 undrawn amounts 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 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

---

4.1.2.3   Provision Matrix Method

Refer to the Provision Matrix method explained in EL Approach.

4.1.2.4   Recovery Rate Method

Refer to the Recovery Rate Method explained in EL Approach.

4.1.2.5   Net- Charge off Calculation

Refer to Net-Charge off Calculation explained in EL Approach.

4.1.2.6   Provision Amount Calculation

Refer to Provision Calculation explained in EL Approach.

4.1.2.7   Currency Conversion

Refer to Currency Conversion explained in EL Approach.

4.2   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 LLFP 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; LLFP 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 (-Φ) = λ; where Φ = the probability of default values for a given period.

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

5. **Customer count & Exposure amount**: LLFP 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.

5   Understanding Provision Calculation Methods

This chapter gives a better understanding of the various methods applied by the LLFP 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.

5. Assign 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.

5.1   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.

ORACLE®

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 LLFP 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:

5.1.1   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:

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

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

The LLFP 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 a 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:** The 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.

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

4. 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.

5. 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

6. Some 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.

5.1.2 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.

5.1.3 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:

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

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

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

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 LLFP 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.

5.1.4 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 LLFP 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 accuracy. 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.

5.2 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.

5.3 Recovery Rate Method

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

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

- 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

5.4 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.

5.4.1 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:

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

In addition to the above, there could be a case where one customer is holding multiple accounts to be treated by 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.

ORACLE®

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

5.4.1.1   Allowance Calculation – Single Account

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

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

or

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

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

5.4.1.2   Allowance Calculation – Multiple Accounts

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

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

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

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

or

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

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.

5.5   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.

5.6   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.

5.7   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.

5.7.1 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.

$\textbf{Probability of Transition } = \textbf{Count of Transition between two grades }/$
$\textbf{Total Transition from a source grade}$.

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 LLFP 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.

5.7.1.1 Defining an HTM

To define an HTM, follow the below procedure:

ORACLE®

1. Select the Historical Transition matrix Definition option from the LHS. The Transition Matrix Summary page appears.
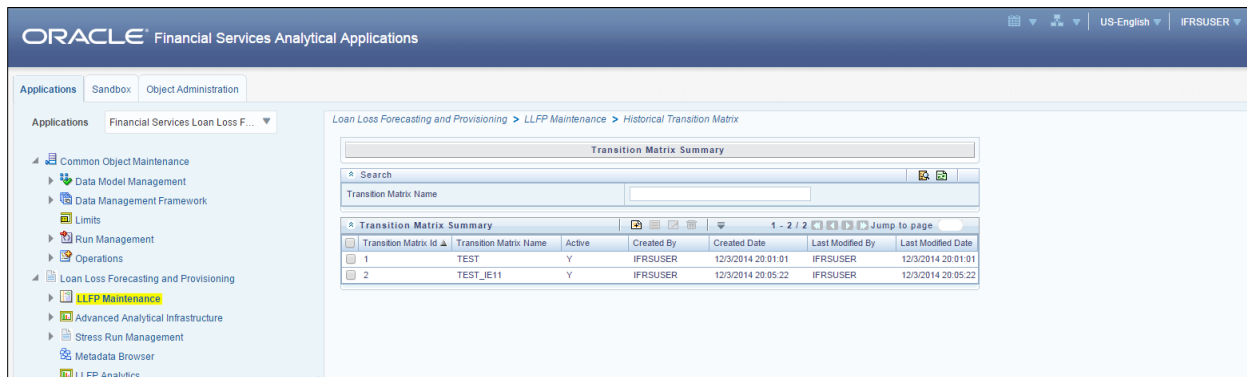
2. Click the Add icon. The Transition Matrix Definition screen comes up.

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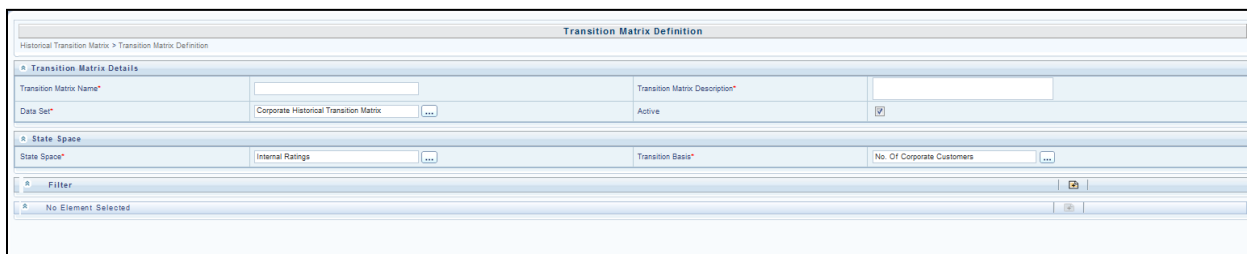
The *Audit Trail* section at the bottom of the window displays the information on the activities undertaken in this window. The *User Comments* section facilitates you to add or update additional information as comments.

5.7.1.2   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 [icon] button from the toolbar.

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

5.7.1.3   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 [icon] 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.

5.7.1.4   Deleting an HTM

To delete an existing parameter:

1. Select the checkbox adjacent to the HTM name.

2. Click the Delete [icon] button from the toolbar. A confirmation dialogue appears

3. Click **OK**. The HTM details are deleted.

5.7.2   Predicted Transition Matrix

5.7.2.1   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: $1\text{-}Exp(\text{-}\varphi\, t)$ = t-year cumulative probability

   ▪ All other parameters apart from 'Poisson Parameter' (φ) are input. Thus we solve this for φ. (The value for 'Poisson Parameter' should be stored)

2. The calculation is performed at a Monthly level which is the default option provided in the LLFP 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)

6   Preparing for Execution

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

This chapter is classified into the following:

- Data Requirements

- Important Metadata Definition

6.1   Pre-requisites

6.1.1   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
Stage Guarantees

ORACLE®

Stage Leases Contracts
Stage Letter Of Credit Contracts
Stage Money Market Contracts

6.1.2 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
Country Dimension Population

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_Data_Cards
Account_Data_Investments
Account_Data_Loan_Contracts
Account_Data_OD_Accounts
Account_Data_Leases_Contracts
Account_Data_Guarantees
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
Stage Guarantees
Stage Leases Contracts

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

6.1.3   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
- I Run

6.1.4   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 > ∑ Expected future cash flows	$Specific\ Allowance$ $= Carrying\ Amount$ $- \sum Expected\ Future\ cash\ flow$
2	Carrying Amount <= ∑ 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 > ∑ Discounted Expected future cash	$NPV\ Allowance$ $= \sum Expected\ Future\ cash\ flow$ $- \sum Discounted\ Expected\ future\ cas$
2	Carrying Amount <= ∑ Discounted Expected future cash	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 the 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,

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

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.

6.2   Data Requirements

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

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

- Slowly Changing Dimension (*SCD*) data: It is a set of Dimension tables wherein data changes by a small amount regularly over some time. THE following SCD tables are used in LLFP:

- Stage customer type master

- Stage geography master

- Dim organization structure

  NOTE: To work with the OBP interface, the dim_org_structure table 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

ORACLE®

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 LLFP 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 Loan Contracts

▪ Stage Over Draft Accounts

▪ Stage Cards

▪ Stage Guarantees

▪ Stage Investments

▪ Stage Leases Contracts

▪ Stage Letter Of Credit Contracts

▪ Stage Money Market Contracts

▪ 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

6.3 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. Runskey marked as -1 will the actual historical data. For each run, data from -1 will be populated with execution runskey in the same table.

Approach Setting:

The Rules associated with this task are:

Provision Calculation Methodology Selection - EL Run

Provision Calculation Methodology Selection - IL Run

As mentioned earlier, Allowance can be calculated using 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 Poison process. Largely, Transition Probability may vary depending on the currency of exposure, product, and customer type of the account. In the pre-configured run, 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 a materiality flag based on for gross charge-off amount to be considered for Provision calculation.

7   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](#)

7.1   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. Mitigate Map Data Population

5. Semi Static Data Population

There is one base run each for EL and IL approach of LLFP. 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.

7.2   Run Management

The Run Management framework is a unique feature of the LLFP 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 Rules, Processes, and Runs.

- Provides details of Rules, Processes, and Runs.

- 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.

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

1. Select Oracle Financial Services Loan Loss Forecasting and Provisioning from the Select Applications drop-down list on the Left Hand Side (LHS) pane of the OFSAAI.

2. Click under Execute Run to open the Run Management Summary screen.

3. The *Run Management* module consists of the **Rule**, **Process**, and **Run** components.

For information on working on Run Management modules, refer to the *Rule Run Framework* section in *Oracle Financial Services Analytical Applications Infrastructure 8.0.0.0.0 User Guide* available in OTN Documentation Library.

7.3   Manual Stage Reassignments

The Manual Stage Reassignments/Overrides UI enables the user to manually update any stage that was assigned to every account by the application using the Stage Determination rules. The stage is assigned through the Stage Determination run. For more details on Stage Determination, refer to the Stage Determination Run section.

The manual reclassification of stage determination involves two steps:

- Manual reclassification step

- Approval process

The users who have the Maker (manual reclassification step) privileges can update the rating using the *Stage Reassignment* section of the *Maker Stage Reassignment* module.

The approval/rejection process is performed by the user who has the Checker privileges. The checker can use the *Stage Reassignment* section of the *Checker Stage Reassignment* module to approve/reject the reassignments done by the user who had the Maker privileges.

7.3.1   Access the Maker/Checker Stage Reassignment Module

You can access the Maker/Checker Stage Reassignment Module by clicking the **Maker Stage Reassignment** or **Checker Stage Reassignment** link from the LHS menu of the application home page. You will be able to see the **Maker Stage Reassignment** or **Checker Stage Reassignment** link depending on the user privileges assigned to you.

7.3.2   Maker - Stage Reassignment Process

You can retrieve the list of accounts, which have undergone Stage Determination Run by performing the following procedure:

1. Select the *Segment* from the drop-down list.

2. Select the *Stage Determination Run* from the drop-down list.

3. Select the *Execution Date* from the drop-down list.

4. Select the *Run Execution Name and Run Skey* from the drop-down list.

5. Enter any or all of the following details to filter your search:

Field	Description
Customer ID	Enter the Customer ID of the account, on which you want to perform manual reassignment.
Account ID/No	Enter the Account ID/No of the account, on which you want to perform manual reassignment.
Customer Name	Enter the Customer Name of the account, on which you

Field	Description
	want to perform manual reassignment.
Customer Type	Select the Customer Type from the drop-down list.
Product Type	Select the Product Type from the drop-down list.
Line of Business	Select the Line of Business from the drop-down list.
Country	Select the Country from the drop-down list.
Industry	Select the Industry from the drop-down list.
Previous Reported Stage	Select the Previous Reported Stage from the drop-down list.
Impaired	Select the Impaired from the drop-down list.
Restructured	Select the Restructured from the drop-down list.
Application Assigned Stage	Select the Application Assigned Stage from the drop-down list.
Workflow Status	Select the Workflow Status from the drop-down list. The available values are: • Approved • Draft • Pending Approval • Rejected
Show Non - Overridden Accounts	Select the radio button adjacent to the Show Non - Overridden Accounts if you retrieve the rating information related to the non-overridden accounts. If this option is selected, the Workflow Status is disabled.
Defaulted	Select the Defaulted from the drop-down list. The available values are: • Yes • No
POCI	The default status of POCI is set to N.

6. Click the **Search** button.

The account details with the selected search criteria are displayed under the *Selective Reassignment list* grid. The accounts are listed with the Customer ID, Customer Name, Account ID/No, Customer Type,

Product Type, Previous Reported Stage, and Application Assigned Stage details. Here, the UI mandates the use of at least one filter before hitting the Search button

7. Select the checkboxes adjacent to the Customer IDs of the accounts you wish to reassign stages.

8. Reassign stages from the drop-down under **Stage Reassigned** column for the selected accounts.

9. Enter the justification for reassigning stages in the **Justification** column.

If you want to reassign the stages of all the accounts in the **Selective Reassignment list**, perform the following:

10. Select the checkbox adjacent to the **Apply to all accounts** field under the *Group Reassignment* grid.

11. Select the required stage from the **Stage Reassigned** drop-down list.

12. Enter the justification for reassigning stages in the **Justification** column.

13. Click Apply to selected accounts button.

14. Click the **Save** button to save the details during the reassignment process.

15. Click the **Submit** button to save and submit the changes.

The user has the option to execute the stage determination to run multiple times on any FIC_MIS_DATE. By default, the ECL computation process will take the latest stage determination run data for processing.

However, the user has the option to determine which stage determination run should be processed for ECL calculation purposes. The FINALIZE RUN button in the Maker UI enables the user to do this.

Upon clicking the Finalize Run button, a pop up is displayed with the number of accounts in each workflow status and asks for a confirmation to mark a run as final. Once a run is marked as final, no more changes are allowed on that run.

It is possible to mark another run as final, even after a specific run is already finalized. The pop up additionally highlights that another run is marked as final and if the user confirms to override the same.

7.3.3   Checker - Stage Reassignment Approval/Rejection Process

You can retrieve the list of accounts, which have undergone Stage Determination Run by performing the following procedure:

1. Select the *Segment* from the drop-down list.

2. Select the *Stage Determination Run* from the drop-down list.

3. Select the *Execution Date* from the drop-down list.

4. Select the *Run Execution Name and Run Skey* from the drop-down list.

5. Enter any or all of the following details to filter your search:

Field	Description
Customer ID	Enter the Customer ID of the account, on which you want to perform manual reassignment.
Account ID/No	Enter the Account ID/No of the account, on which you want to perform manual reassignment.
Customer Name	Enter the Customer Name of the account, on which you want to perform manual reassignment.
Customer Type	Select the Customer Type from the drop-down list.
Product Type	Select the Product Type from the drop-down list.
Line of Business	Select the Line of Business from the drop-down list.
Country	Select the Country from the drop-down list.
Industry	Select the Industry from the drop-down list.
Previous Reported Stage	Select the Previous Reported Stage from the drop-down list.
Impaired	Select the Impaired from the drop-down list.
Restructured	Select the Restructured from the drop-down list.
Application Assigned Stage	Select the Application Assigned Stage from the drop-down list.
Workflow Status	The Workflow Status is set to **Pending Approval** for the user with checker privileges. This is to list all the re-assignment approval requests only.
Defaulted	Select the Defaulted from the drop-down list. The available values are: • Yes • No
Stage Reassigned	Select the reassigned stage from the drop-down list.
POCI	The default status of POCI is set to N.

6. Click the **Search** button.

The account details with the selected search criteria are displayed under the *Selective Reassignment list* grid. The accounts are listed with the Customer ID, Customer Name, Account ID/No, Customer Type,

Product Type, Previous Reported Stage, Application Assigned Stage, Stage Reassigned, and Justification details. Here, the mandatory use of the filter is NOT applicable

7. Select the checkboxes adjacent to the **Customer ID**s of the accounts you want to approve/reject the reassignment.

8. Select Approve/Reject from the drop-down under the **Decision (Approve / Reject)** column for the selected accounts.

9. Enter the comments for approving/rejecting the stage reassignment in the **Approver Comments** column.

If you want to approve/reject the reassignment of all the accounts in the **Selective Reassignment list**, perform the following:

10. Select the checkbox adjacent to the **Apply to all accounts** field under the *Group Reassignment* grid.

11. Enter the approver comments for approving/rejecting the reassignment in the **Approver Comments** column.

12. Select the required decision as Approve or Reject from the **Decision** drop-down list.

13. Click Apply to selected accounts button.

14. Click the **Submit** button to save and submit the changes.

7.4 Legal Entity based Security for Data and Metadata

This feature enhances the security of the LLFP application, in case multiple legal entities are using the same application instance. The feature facilitates the restriction of user access within the scope of a particular legal entity. The access is restricted in such a way that the user can view or execute the DATA and the METADATA of the legal entity to which the user is mapped to (one or many). The user is also restricted from viewing the data and metadata of other entities to which the user is not mapped to.

This has coverage in the following areas of the application:

- Folder/Segment based Security
- Run Management Screen
- Stage Reassignment Screens

7.4.1 Folder/Segment based Security

In OFSAA, the metadata is specific to a folder/segment. That is, the Metadata within one folder is not available under other folders. Also, the application is enabled with the folder-mapper security using which, user groups are mapped to specific folders/segments. Using these features, the user access is restricted to specific metadata based on the legal entity to which the user/user group is mapped.

ORACLE®

This is achieved using the following enhancements:

- Creating Legal Entity specific Folders

- Mapping User Groups to specific Folders, based on the Legal Entity they belong to.

- Mapping User Groups to specific Legal Entities, using the Mapper feature, which available as part of AAI.

Since a folder is specific to a legal entity and user groups are mapped to both Legal entities and folders, implicitly, each User Group (thereby a user under that User Group) can access only those Folders which are specific to the legal entity to which they have been assigned to.

7.4.1.1   Map Maintenance and Mapper Maintenance

The Map Maintenance section of the OFSAAI enables you to map Legal Entities with User Groups. The application expects you to create the Legal Entities and User Groups from the respective OFSAAI modules.

Once the required number of Legal Entities and User Groups are created, you can create Mapper Definitions from the Map Maintenance section of OFSAAI. For more details, refer to the *Map Maintenance* section in OFSAAI User Guide available at [OTN Documentation Library](#).

Once the Mapper definitions are created, you can define the mappings among the participating hierarchies, from the Mapper Maintenance section. For more details, refer to the *Mapper Maintenance* section in OFSAAI User Guide available at [OTN Documentation Library](#).

7.4.2   Run Management Screen

The Run Management UI in LLFP is used to launch/execute a Run. Within the UI, you are allowed to select multiple run-time parameters with Legal Entity being one of them. Here, you can select a Legal entity based on which the data corresponding to that entity is considered for processing.

With the Legal Entity based Security feature, the application restricts the user from selecting legal entities to which the user is not mapped to. Using the Mapper feature of AAI, each User Group is mapped to Legal Entities as per the requirement of the bank and the hierarchy. The Legal Entity selection form of the Run Management Screen takes into cognizance the User Group-to-Legal Entity mapping and disables the legal entities to which the User Group is not mapped to, thereby disallowing the user from selecting the Legal entities to which the user is not part of.

Using this feature, the users are now restricted to execute runs for data belonging only to the legal entity to which they are mapped, thereby increasing data security, based on Legal Entities.

7.4.2.1   Legal Entity Selection for Run Execution

The Execute Run section of OFSAAI enables you to create and execute Runs. You can only execute those Runs which are created for the Legal Entity, to which you are mapped to.

1. Click the Execute Run button, the *Execute Run Parameters* screen is displayed:

2. Click [...] button adjacent to the Legal Entity field.

    The *Hierarchy Selector* screen is displayed:

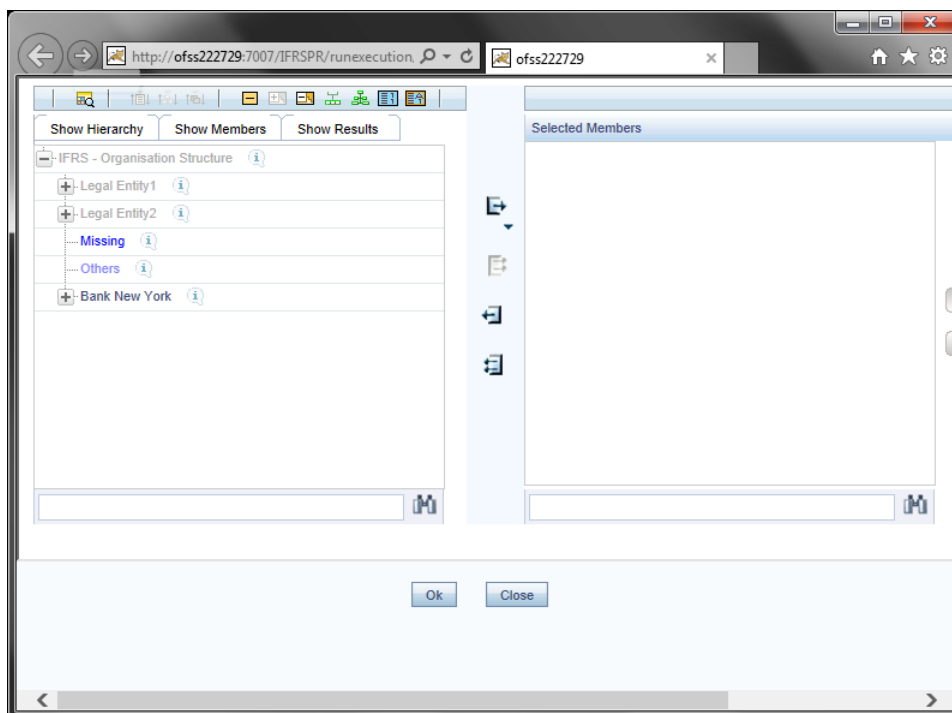In the Hierarchy Selector, only those Legal Entities, which are mapped to you are enabled.

3. Select the required Legal Entity and click the **OK** button. The selected Legal Entity is displayed in the **Legal Entity** field.

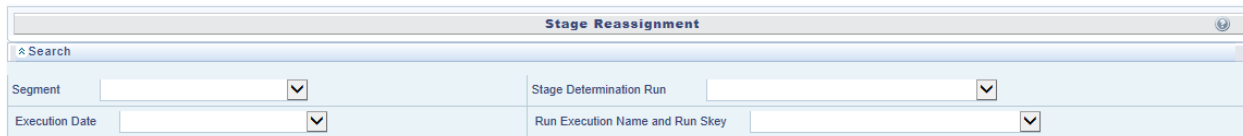### 7.4.3 Stage Reassignment Screens

The Stage Reassignment UI allows you to reassign the stages or approve/reject the changes. Through the screens (maker or checker screens) you can select a Run and view the corresponding data, both the input as well as the results. Currently, the screens allow you to select any of the Runs and thereby enabling the view of the data of all legal entities leading to data leakage between legal entities.

With the introduction of the Legal Entity based Security feature, the application restricts the access to data belonging to a specific legal entity from users who are not mapped to that legal entity. To enable this, the folder security feature has been incorporated in the Stage reassignment UI, where the Folders are mapped to Legal entities and are accessible only to those users who are mapped to that legal entity.

The also introduces a dropdown list with the Folders specific to the legal entity to which the User (User Group) is mapped to. Once the user selects a specific folder, only those Runs under the selected folder is listed for the user. Thus, the user is restricted to access only those Runs and data specific to the legal entity that the user is mapped to.

7.4.3.1   Segment Selection in the Application

In the *Maker Stage Reassignment* and *Checker Stage Reassignment* screens of Stage Reassignment process, the user is asked to select the Segment from the drop-down list. This file only displays those Segments, to which the user has access to.

Stage Reassignment			
⌃ Search			
Segment		Stage Determination Run	
Execution Date		Run Execution Name and Run Skey	

For more information, refer to Maker - Stage Reassignment Process and Checker - Stage Reassignment Approval/Rejection Process sections.

8   Loan Loss Forecasting and Provisioning Reports

LLFP uses the Oracle Dashboard reporting tool for IFRS 9 (Expected Credit Loss), 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 displays only those Skey's corresponding to the execution date and Run name.

Oracle Business Intelligence also 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.

8.1   IFRS 9

8.1.1   IFRS 9 Stage Determination

- **Stage Classification Overview**: This report depicts the percentage of number accounts present in each stage, including POCI accounts.

- **Stage Classification by Line of Business**: This report depicts the number of accounts present in each stage, across multiple LOBs, Product Types, and Products. At the Account Level, the report provides further information such as account number, status to indicate whether the account is in POCI or not, the application assigned stage as of the previous reporting date, the final stage (post override approval), the application assigned stage of the current reporting date, currency, the outstanding amount, and the undrawn amount.

ORACLE®

- **Stage Transition Matrix**: This report provides you the transition details of accounts between two reporting dates. The Previous Reporting Date Stage selector enables you to decide whether the application assigned stage or the overridden stage is displayed.

- **Stage Classification Trend**: This report displays the percentage of the number of accounts in different stages on the previous reporting date and current reporting date.

- **Stage Classification by Product Type**: This report displays the percentage of the number of accounts in different stages for various product types.

- **Stage Classification by Customer Type**: This report displays the percentage of the number of accounts in different stages for various customer types.

8.1.2 IFRS 9 Expected Credit Loss

8.1.2.1 Home

- **Stage Classification Overview**: Provides you the percentage of number accounts present in each stage, including POCI accounts.

- **Stage Classification Trend**: This report displays the percentage of the number of accounts in each stage for both Previous Reporting Date and Current Reporting Date.

- **Allowance & Provision Trend**: This report displays the Allowance and Provision amounts in each month.

- **Allowances - Stage-wise overview**: This report displays the percentage of Allowance amount allocation in each stage.

- **Provision - Stage-wise overview**: This report displays the percentage of Provision amount allocation in each stage.

8.1.2.2 Stage Determination

- **Stage Classification Overview**: Provides you the percentage of number accounts present in each stage, including POCI accounts.

- **Stage Classification by Line of Business**: Provides you the number accounts present in each stage, per multiple LOBs, Product Types, Product, and Account Level. At the Account Level, the report provides the information such as account number, status to indicate whether the account is in POCI or not, the application assigned stage of the previous reporting date, the final stage (any overridden stage, that has been approved), the application assigned stage of the current reporting date, currency, the outstanding amount, and the undrawn amount.

- **Stage Transition Matrix**: This report provides you the transition details of accounts between two reporting dates. The **Previous Reporting Date Stage** selector enables you to decide whether the application assigned stage or the overridden stage is displayed.

- **Stage Classification Trend**: This report displays the percentage of the number of accounts in different stages on the previous reporting date and current reporting date.

- **Stage Classification by Product Type**: This report displays the percentage of the number of accounts in different stages for various product types.

- **Stage Classification by Customer Type**: This report displays the percentage of the number of accounts in different stages for various customer types.

8.1.2.3 Allowance and Provision

- **Allowance & Provision by Line of Business**: This report displays the gross carrying amount, undrawn amount, allowance, provision, and net charge off per each LoBs. Along with this, this report provides you the chart for the gross carrying amount, undrawn amount, allowance, provision, and net charge off per each LoBs. Also, the sum of Allowance and Provision and the Allowance amounts are displayed for each LoBs as a percentage of carrying amount.

- **Allowances - Stage-wise overview**: This report displays the percentage of Allowance amount allocation in each stage.

- **Provision - Stage-wise overview**: This report displays the percentage of Provision amount allocation in each stage.

- **Allowance & Provision Trend**: This report displays the total Allowance and Provision amounts in each month.

- **Allowance Trend - Stage-wise**: This report displays the Allowance amounts in each month for each stage.

- **Provision Trend - Stage-wise**: This report displays the Provision amounts each month for each stage.

- **Allowance and Provision Trend - POCI Accounts - Absolute and Percentage Terms**: This report displays the trend of Sum of Allowance and Sum of Provision values, specifically for POCI accounts.

8.1.2.4 Cohorts Composition

- **Cohorts Composition across Stages**: This pie chart depicts the number of Cohorts in each of the three Stages with a percentage of their composition and drill-down capability.

  The drill-down further details out at each Stage and cohort level a tabular report depicting the parameters of the Cohorts and the number of accounts that form the Cohort. A link from this report leads to another tabular report where the users can view data across similar parameters by selecting any Stage value.

- **ECL Cohorts Composition across Stages**: This pie chart depicts the number of ECL Cohorts across various Stage values, with a percentage of their composition, and drill down capability.

ORACLE

The drill down further details out at each Stage and cohort level a tabular report depicting parameters of the ECL cohorts along with the number of accounts, Total Exposure, ECL value, and percentage of ECL to Total Exposure for each of the Cohorts. A link from this report leads to another tabular report where the users can view data across similar parameters by selecting any Stage value.

8.2 Loan Loss Forecasting

8.2.1 Home Page

- **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 Provisions - Basel asset classes

  - Historical Transition

  - Predicted 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 Exposures

- **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 drop-down. 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.

8.2.2 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.

8.2.3   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 the Rating Transition Matrix fact table. It is identified with the Period Applicable column 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 the DPD Transition Matrix fact table. It is identified with the Period Applicable column 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.

8.2.4   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.

8.2.5 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 LLFP 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.

8.2.6 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.

9   Resolution of LLFP 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 LLFP 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.

9.1   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**.

ORACLE®

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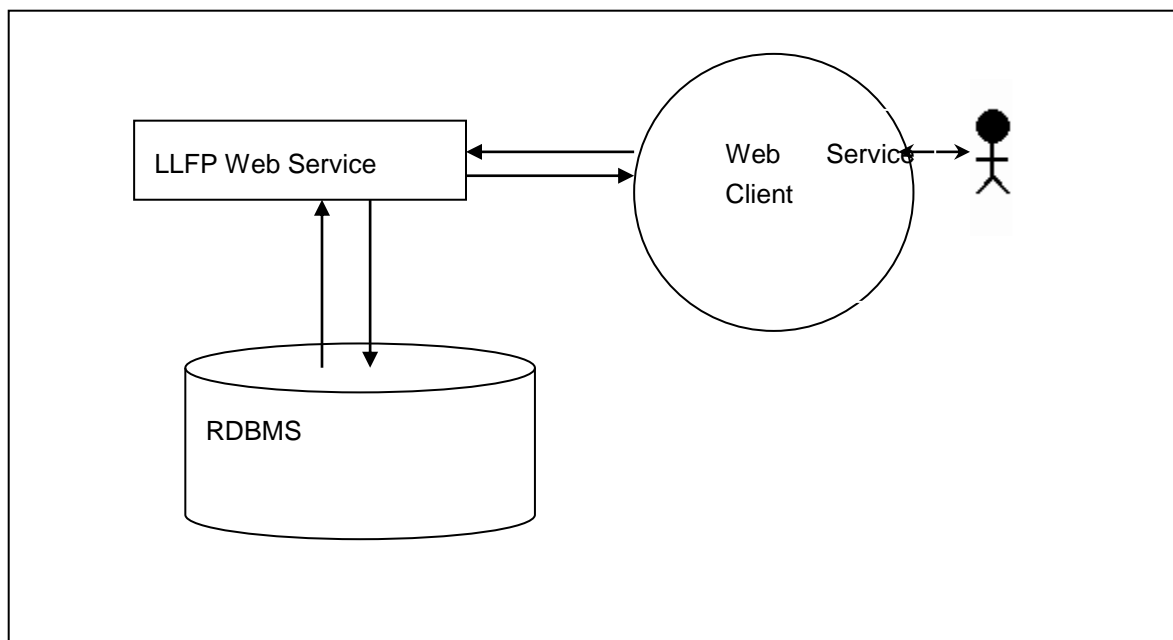
In this approach, a new run, comprising of an only expected cash-flow method for provision calculation is created. This is triggered through a web-based online call by the OBP collection module. In a day, multiple calls are made to the provision calculation run by managers handling different sets of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

9.2.1 Prerequisite

LLFP Application 8.0 version and above should be installed.

9.3   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">
```

ORACLE®

```
                    <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>
```

1. 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>
```

ORACLE®

```
<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:

  $f_X(x) = e^{-x}$, for x 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; : : : ; r)

  $N(t) = N_1(t) + N_2(t) + … + N_r(t)$

  This process is referred to as splitting the process.

  The LLFP 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 LLFP 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%
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.

- LLFP 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 the Rating Transition Matrix fact table (for wholesale) and DPD Transition Matrix fact table (for retail). It is identified with the Period Applicable column 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 LLFP be used with other cash flow engines instead of Oracle CFE? If yes, then what is required to be done?

Oracle LLFP can be used with other cash flow engines. LLFP 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 LLFP are calculated as of which date?

Effective Initial Rate and Effective Initial spread provided by Oracle LLFP 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 LLFP?

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 LLFP?

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 LLFP?

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 the 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 LLFP compute the EIR/EIS for impaired state accounts?

No, LLFP 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 LLFP Application data flow is represented in the following diagram:
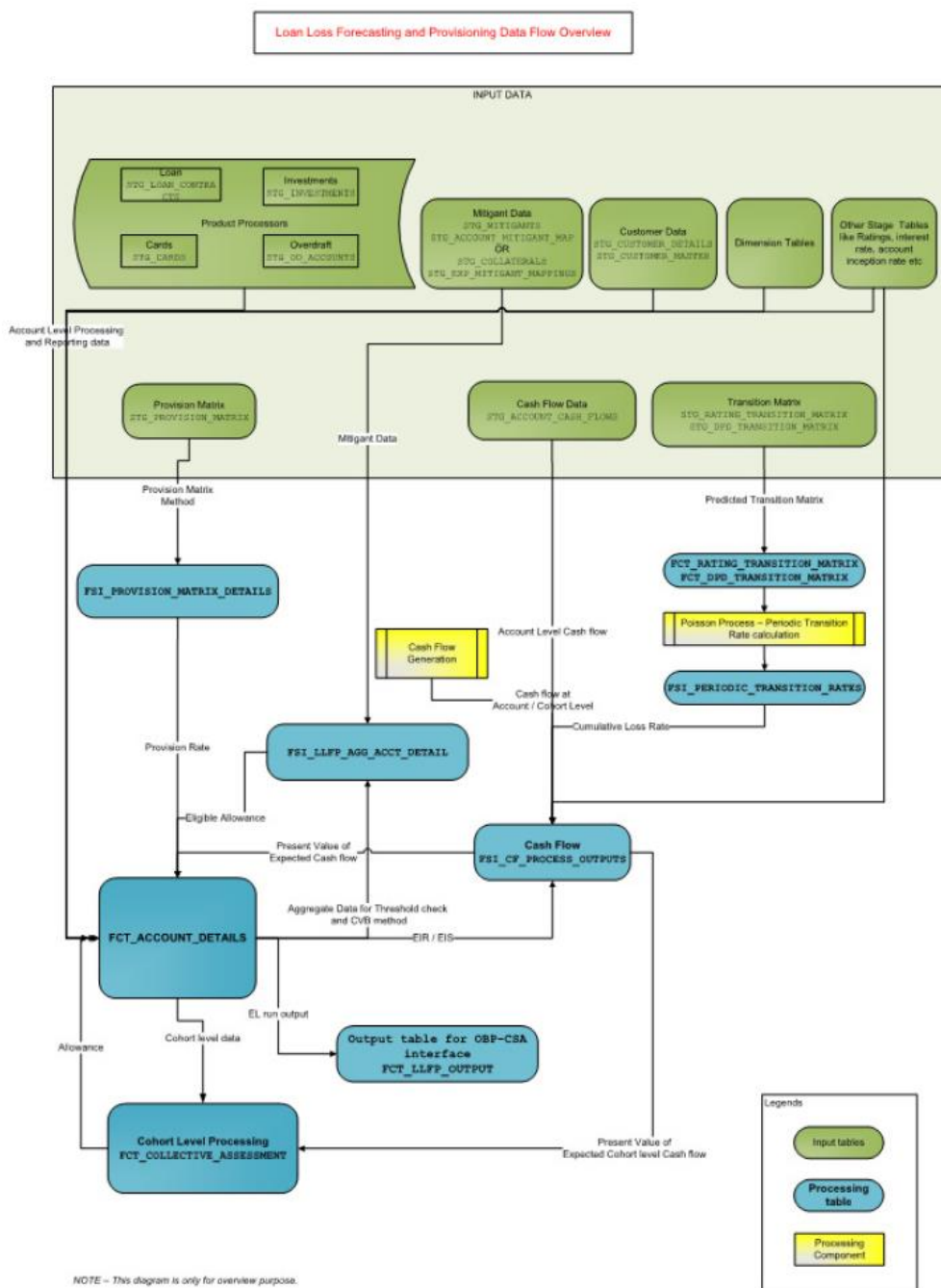
Annexure G: Generating Download Specification

Data Model for Oracle Financial Services Loan Loss Forecasting and Provisioning is available upon customer request, as an ERwin file. Download Specifications can be extracted from this model. Refer to the whitepaper present in OTN Documentation Library for more details.

Acronyms and Glossary Terms

Allowance:	Allowance is an amount set aside for adequacy to absorb the potential credit losses in a Bank's portfolio of loans, HTM securities, or other assets.
Allowance account	When financial assets are impaired by credit losses and the entity records the impairment in a separate account (For example an allowance account used to record individual impairments or a similar account used to record a collective impairment of assets) rather than directly reducing the carrying amount of the asset, it shall disclose a reconciliation of changes in that account during the period for each class of financial assets (IFRS 7 PARA 16)
Amortized cost:	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.
Benchmark interest rate:	A rate used as a yardstick for measuring or setting other interest rates; for example LIBOR
Carrying Cost:	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
Cash flow engine:	This is an OFSAA Specific terminology. Cash Flow Engine is a component used in the Oracle ALM application.
Cash Flow Method:	This implies calculating the amortized cost of underlying assets the LLFP Application will project cash flows. It typically includes Loans and Held-to-Maturity securities (HTM Securities). This is an OFSAA specific term.
CFE	Cash Flow Engine
Charge off:	Process of removing uncollectible loans or closed accounts or other assets from the Balance Sheet.
Contractual cash flow:	This conveys that cash flows are generated using terms and conditions as specified in the contract. This is contrasted against the expected cash flows where cash flows are multiplied by probability which is not part of the contract.

Credit Conversion Factor:	This term is generally referred from Basel accord by BIS. The credit risk exposure attached to off-balance sheet items is calculated by multiplying the face amount of each of the off-balance sheet items by the credit conversion factor. Thus, this serves as a numerical factor for conversion.
Effective interest rate	The Effective Interest Rate (EIR) is the rate that exactly discounts estimated future cash flows to the net carrying amount of the financial instrument through the life of an asset. In 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.
EL Approach	Expected Loss Approach
Emergence Period:	The emergence period is typically defined as the time it takes from the date a loss event occurred to the date the entity identifies it has occurred.
Expected Cash Flows:	Contractual cash flows adjusted for expected credit losses. This involves the reduction of future cash flow by the percentage of expected credit losses.
Expected Loss Approach	The expected loss model requires an entity to make an ongoing assessment of expected credit losses, which may require earlier recognition of credit losses.
Recovery Cost	It represents the cost of recovery to recover the outstanding amount of the account, in case of default.
Fair Value:	As defined by IASB, it is the amount for which an asset can be exchanged or liability is settled, between knowledgeable, willing parties in an arm's length transaction.
Fic_MIS DATE:	This is OFSS specific terminology meaning current date or date stamp for which data belongs to which is also referred to as the current date.
Fixed interest rate:	A loan or other financial asset with an interest rate that will remain

	at a constant rate for the entire life. (Maturity)
Gain and Loss	A gain or loss on a financial asset that is measured at amortized cost and is not part of a hedging relationship (see paragraphs 89–102 of IAS 39) shall be recognized in profit or loss when the financial asset is derecognized, impaired or reclassified by paragraph 5.3.2, and through the amortization process (IFRS 9 Phase1, PARA 5.4.2)
Held for trading:	A financial asset or financial liability is held for trading if: i) It is acquired or incurred principally 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).
Held-to-Maturity securities (HTM):	A security that a company intends to hold until its date of Maturity.
HTM	Held to Maturity
Incurred But Not Reported (IBNR):	The losses about exposures that have not been reported as such by the obligor.
IL Approach	Incurred Loss Approach
Impaired Asset:	An asset which is carried at more than its recoverable amount if its carrying amount exceeds the amount to be recovered through use or sale of the asset (Ref: IAS 36). However, for the scope of this application impaired status is downloading.
Impairment Loss	The impairment loss is the difference between the carrying amount of the financial asset before the change in estimate and the present value of the expected cash flows of that asset after including the change in estimate, that is, the difference between carrying amount before the change and amortized cost estimated after factoring the change

Inception / Initial Recognition:	This is the date from which IFRS 9 is applicable for a given bank. IFRS 9 tells us that on this date, the entity shall recognize the asset to be valued either as a fair value or amortized cost. For 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)
Incurred loss Approach:	Under IAS 39, an entity accounts for credit losses in financial assets only if a loss event has occurred without considering the effects of future expected losses.
Initiation Data:	This is an OFSS specific term. This means EIR or EIS of required exposures calculated as of initiation date 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 LLFP application will calculate EIR/EIS/IRR and store the same as part of initiation data,
LLFP	Loan Loss Forecasting and Provisioning
OBP(Oracle Banking Platform)	This is similar to EL Run in terms of functionality, except that, it uses underlying tables compatible with the OBP interface.
Period Applicable:	This is the period for which the Transition matrix is applicable.
PM	Provision Matrix
Provision Amount:	An expense set aside as an incremental allowance (Allowance = Loan loss Reserve) for bad loans over and above the previous year allowance.
Provision Method:	This implies that to calculate the amortized cost of an underlying asset the LLFP Application will use provision rates and cash flows will not be generated for the same. The method is common for both

	impaired and non-impaired status of the 'Receivable type of assets'. This is an OFSS specific term.
TM	Transition Matrix
Transaction costs	They are incremental costs that are directly attributable to the acquisition, issue, or disposal of a financial asset or financial liability (see Appendix a paragraph AG13). An incremental cost is one that would not have been incurred if the entity had not acquired, issued or disposed of the financial instrument (IAS 39, PARA 9)
Variable interest rate:	An interest rate that changes according to the underlying or Benchmark interest rates index like Treasuries or LIBOR rates

ORACLE®

Oracle Financial Services Loan Loss Forecasting and Provisioning User Guide, Release 8.0.3.0.0

August 2016

Oracle Corporation

World Headquarters

500 Oracle Parkway

Redwood Shores, CA 94065

U.S.A.

Worldwide Inquiries:

Phone: +1.650.506.7000

Fax: +1.650.506.7200

http://www.oracle.com/us/industries/financial-services/

ORACLE®