Oracle Financial Services Operational Risk Economic Capital

User Guide

Release 8.0.3.0.0

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What's New in this Release

This section identifies updates in the Oracle Financial Services Operational Risk Economic Capital (OREC), Release 8.0.3.0.3.

- ▪ **Enhanced Reporting**: Reporting capabilities are enhanced with new dashboards and reports to accommodate all the above changes.

<u>Contents</u>

About the Guide

This section provides a brief description of the scope, the audience, the references, the organization of the User Guide, the common icons in the application and conventions incorporated into the User Guide. The topics in this section are organized as follows:

- Scope of the Guide
- Audience
- Where to Find Information
- How to Use this User Guide
- Common Icons
- Document Conventions

Scope of the Guide

The objective of this User Guide is to provide a comprehensive working knowledge to the users on Oracle Financial Services Operational Risk Economic Capital, Release 8.0.3.0.0. This User Guide is intended to help the user understand the key features and functions of Operational Risk Economic Capital application and use the application effectively. However, this User Guide is not meant to provide guidance on how to install and use Oracle Financial Services Analytical Application Infrastructure (OFSAAI). This User Guide is also not meant to provide details on installation of Oracle Financial Services Operational Risk Economic Capital, Release 8.0.3.0.0 data model.

Audience

This manual is intended for the following audience:

- OREC Analyst: This user is responsible for defining Units of Measure mappings, data preparation, calculation dataset, capital calculation, and capital allocation models.

- OREC Modeler: This user is responsible for sandbox modelling of calculation dataset, loss frequency, loss severity, loss correlation / copula, scenario correlation / copula, scenario modelling and external loss data scaling. This user can finalize these models and deploy for consumption in OREC capital calculation model.

- OREC Approver: This user is responsible for approving the Calculation Dataset, Capital Calculation, and Capital Allocation models.

- Administrator: The Administrator maintains user accounts and roles, archives data, loads data feeds, and so on. The administrator controls the access rights of users. This user ensures that the data is populated in the relevant tables as per the specifications. The user executes, schedules, and monitors the execution of Runs as batches.

Where to Find Information

For additional information on Oracle Financial Services Operational Risk Economic Capital, Release 8.0.3.0.0, refer to the following documents:

- Business Metadata Documents: These documents are grouped into two sets as follows:

  - Oracle Financial Services Operational Risk Economic Capital Release 8.0.3.0.0 Business Metadata: This document contains the definitions of the Business Metadata like Measures, Business Processors, Hierarchies, Hierarchy Attributes, Aliases, Derived Entities and Datasets present in OREC Application.

  - Oracle Financial Services Operational Risk Economic Capital Release 8.0.3.0.0 Rule Metadata: This document contains the definitions of Rules, Pooling, Optimizer and Processes.

- Technical Metadata: This document contains the definitions of the Table to Table (T2T) used in various portions of OREC application.

- Download Specifications: The format and structure of the RDBMS tables is specified in the Download Specifications (DL Specs). Download Specifications contain details of the attributes required for processing in OREC Application.

- Screen Outputs and R-Techniques Mapping: This document lists the R-techniques used in different outputs in the OREC application.

- OFSAAI documents: The set of OFSAAI documents packaged in the installer will help the user understand the functions of the various components of Oracle Financial Services Analytical Application Infrastructure (OFSAAI) used for OREC computation.

- OFSCAP Application Pack Installation Manual.

How to use this User Guide

The information in this User Guide is distributed in the following Chapters:

- **Chapter 1 - Introduction**: The objective of this chapter is to introduce the user to Oracle Financial Services Operational Risk Economic Capital, Release 8.0.3.0.0 and provide an overview of OREC Application.

- **Chapter 2 - Understanding the Application**: The objective of this chapter is to provide an understanding to the user on the various functions of OREC application.

- **Chapter 3 - OREC Production**: The objective of this chapter is to provide a detailed explanation of the Production module of the OREC application.

- **Chapter 4: OREC Sandbox Model**: The objective of this chapter is to provide a detailed explanation of the various Sandbox Modelling modules of the OREC application.

- **Chapter 5: Capital Calculation**: The objective of this chapter is to provide the details of the Capital Calculation Model, which is defined to capture the inputs for estimating Operational Risk Capital.

Common Icons

The common icons incorporated into OREC application are as follows:

Icons	Description
	Use this icon to add a new entry.
	Use this icon to view the details of an entry.
	Use this icon to edit details of an existing entry.
	Use this icon to delete an entry.
	Enter the name of an entry and click this icon to search for an entry.
	Use this icon to refresh the screen.
	Use this icon to select an entry to delete, edit or view the entry.
	Use this icon to view and select details in the particular browser.
	Use this icon to navigate between pages.

Table 1: Common Icons

Acronyms and Conventions

This section

Acronyms

BEICF	Business Environment and Internal Control Factors
BSP	Business Solution Packs
DT	Data Transformation
EDA	Exploratory Data Analysis
EL	Expected Loss
ET	Event Type
EVT	Extreme Value Theory
LDA	Loss Distribution Approach
LOB	Line of Business
UL	Unexpected Loss
VaR	Value at Risk

Conventions

Certain practices have been incorporated into this document, to help you easily navigate through the document. The following table lists some of the document conventions incorporated into this User Guide:

Conventions	Description
Bold	User Interface Terms
Italics	• Cross References • Emphasis

Table 2: Document Conventions

The other document conventions incorporated into this User Guide are as follows:

- Oracle Financial Services Operational Risk Economic Capital, Release 8.0.3.0.0 has been referred to as OREC application in this User Guide.

- In this document, a Note is represented as follows:

NOTE: Important or useful information has been represented as a **Note**.

1   Introduction

Oracle Financial Services Analytical Applications Infrastructure (OFSAAI) provides the core foundation for delivering the Oracle Financial Services Analytical Applications, an integrated suite of applications that is configured on a common account level relational data model and infrastructure components. Oracle Financial Services Analytical Applications enable financial institutions to measure and meet risk-adjusted performance objectives, cultivate a risk management culture through transparency, manage their policy holders better, improve the financial institution's profitability and lower the costs of compliance and regulation. All Oracle Financial Services Analytical Applications processes, including those related to business, are metadata-driven, thereby providing a high degree of operational and usage flexibility, and a single consistent view of information to all users.

Business Solution Packs (BSP) are pre-packaged and ready to install Analytical Solutions. These are available for specific analytical segments to aid the management in their strategic, tactical, and operational decision-making.

1.1   Overview of the Application

Basel regulation defines operational risk (in Para 644 BCBS 128 - Basel II dated June 2006) as the risk of loss resulting from inadequate or failed internal processes, people, and system or from external events. Globalization and deregulation clubbed with emerging sophistication of financial technology are making the activities of the financial institution more complex and extremely sensitive to different risks. Besides credit risk, market risk, and interest risk, operational risk affects the stability and the functioning of the financial institution considerably. Operational risk management is responsible for providing a framework for identifying, measuring, monitoring and managing all risks within the scope of the definition of operational risk.

Operational risk as generally seen is qualitative in nature. Financial institutions and supervisors need to manage operational risk due to a growing number of high profile operational losses. As proposed in the New Basel Capital Accord, the Basel committee realizes that risks other than Credit and Market Risk substantially affect the risk profiles of the financial institution. The new accord emphasizes on financial institutions to make Operational Risk assessment as one of the integral components of their Risk Management System.

Oracle Financial Services Operational Risk Economic Capital (OREC) application enables you to model the distribution of potential losses due to operational risk. In this application, a Loss Distribution Based approach consistent with Basel guidelines has been incorporated, to estimate the Economic Capital (EC) of the operational risk at the firm level. According to the Basel II guidelines, financial institutions are required to develop their own internal measurement methods that estimate the expected and unexpected operational losses based on the combined use of internal, relevant external and scenario data for Units of Measure which is a combination of Line of Business, Event Type, and other common dimension, if any.

Additionally, the following functions have been incorporated in OREC application:

- For an entity operating in multiple geographical locations, the data from the sister company can be included for risk computation with the internal loss data by using currency conversion, which is controlled through the User Interface (UI).

- Use of external entity data for better computation of EC through *Scaling* methodologies.

- Use of Copulas to simulate the frequency numbers, thereby managing the correlation between different Units of Measure/Scenarios to avoid any duplicity of biased event types.

- Increased options to compute positive definiteness and semi definiteness for correlation matrices along with smoothening option.

- Enhanced modelling methodologies to combine loss and scenario data using hybrid methods.

- Insurance benefit can be availed by checking insurance eligibility and applying the same on simulated losses.

- Various Data cleansing and data filtering methods during data preparation / calculation dataset modelling.

- Impact assessment of extreme risk scenarios on the risk factors and capital estimation can be done through the generic *Stress Testing Framework in OFSAAI.* For more information, refer to Oracle Financial Services Enterprise Modeling User Guide available in [OTN Documentation Library](#).

Oracle Financial Services Operation Risk Economic Capital, Release 8.0.0.0.0 onwards, has been integrated with Oracle Financial Services Operational Risk (out of box) application from a data mapping perspective.

2 Understanding the Application

The objective of Oracle Financial Services Operational Risk Economic Capital application is to calculate risk measures such as Operational Risk Value at Risk (VaR), Conditional VaR, and Expected and Unexpected Loss arising due to Operational Risk by executing loss distribution modeling on the historical data of the financial institution. This data can include internal loss data and scenario estimates of the financial institution, and external loss data. Insurance benefit adjustments are also supported.

2.1 Functional Flow

Granularity of Capital Calculation can be Line of Business, Event Type, and any other common dimension between all data sources. This combination acts as the Unit of Measure of Capital Calculation. OREC application calculates the Capital at the particular UOM granularities and aggregates to firm level.

External Loss Data, which is sourced from external entities can be scaled using various scaling methodologies and can be combined with Internal Loss Data to form combined Loss Data. Various Frequency Distributions and Severity Distributions are fitted and the best fit distributions are finalized. Along with this, the application can calculate and generate the Loss Correlation and Copula probabilities. These Copulas probabilities can be used while simulating loss Frequencies during Monte Carlo Simulation. Loss Severities can be simulated using the finalized loss distribution. Sum of loss severities provide the aggregate loss for the simulation.

Similarly, Scenario estimates, which are derived using various assessment approaches can be used to derive the Frequencies and Severity distributions and the associated parameters for various Scenarios. Scenario Correlation also can be generated along with Scenario estimates. Further, Scenario Copula probabilities can be generated using Scenario Correlation. These Copula probabilities are used while simulating Scenario Loss Frequencies during Monte Carlo Simulation. Scenario Loss Severities can be simulated using the finalized loss distribution. Sum of Scenario Loss Severities provide the aggregate scenario loss for the simulation.

Simulations of Loss and Scenario are followed by Insurance Adjustment. For a given Unit of Measure, if both Loss and Scenario are used, then these are aggregated to form a combined Loss distribution. Risk Measures are calculated at Unit of Measure level as well as firm level. Firm level risk measures are allocated back to the Units of Measure, Line of Businesses, and Legal Entities.

Following is the diagrammatic representation of the flow:
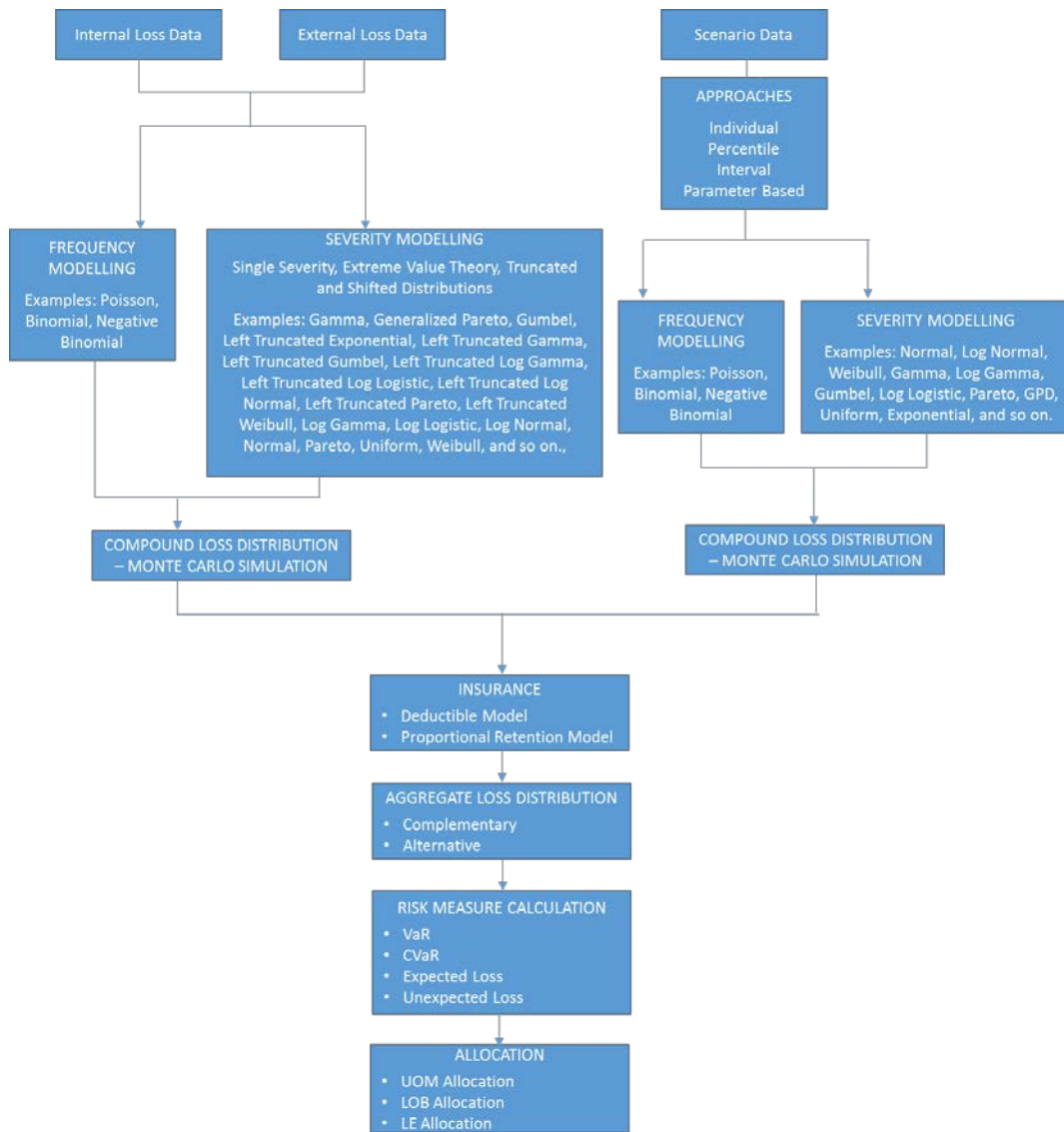
2.2   Product Flow

Following chart depicts the complete product flow. All the steps are explained in detail in subsequent sections.

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┌─────────────────────────────────────────────┐
│        Unit of Measure Mapping Definitions    │
└─────────────────────────────────────────────┘
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┌─────────────────────────────────────────────┐
│   Setting up assumption set through Calculation│
│                   Dataset                      │
└─────────────────────────────────────────────┘
                      ↓
┌─────────────────────────────────────────────┐
│   Data Preparation to move data from Staging to│
│                Processing area                 │
└─────────────────────────────────────────────┘
                      ↓
┌─────────────────────────────────────────────┐
│  Sandbox Modelling                            │
│    • External Loss Data Scaling               │
│    • Calculation Dataset Modelling            │
│    • Loss Frequency Modelling                 │
│    • Loss Severity Modelling                  │
│    • Scenario Modelling                        │
│    • Loss Dependency Modelling                 │
│    • Scenario Dependency Modelling            │
└─────────────────────────────────────────────┘
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┌─────────────────────────────────────────────┐
│          Capital Calculation Definition       │
└─────────────────────────────────────────────┘
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┌─────────────────────────────────────────────┐
│          Capital Allocation Definition        │
└─────────────────────────────────────────────┘
                      ↓
┌─────────────────────────────────────────────┐
│   Capital Calculation Run to calculate Risk   │
│      measures – VaR, CVaR, EL, and UL         │
└─────────────────────────────────────────────┘
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2.2.1 UOM Mapping Definitions

A Units of Measure (UOM) or (Operational Risk Category (ORC)) is the level (for example, organizational unit, operational loss event type, risk category, and so on) at which the financial institution's quantification model generates a separate distribution for estimating potential operational losses. This term identifies a category of operational risk that is homogeneous in terms of the risks covered and the data available to analyze those risks.

Depending on the nature and diversity of operational risk across an institution, financial institutions should define its UOMs. An institution's risk measurement system and capital charge calculation is greatly influenced by the number of UOMs used within the model. An institution should determine the optimum balance between granularity of the classes and volume of historical data for each class.

Hence, it is important to allow Financial Institutions to define UOM. OREC application allows OREC analyst to define these mappings between various common dimensions to Units of Measure.

Units of Measure can be a combination of any number of dimensions provided these dimensions are common across all sources of data, that is internal loss data, external loss data, scenarios and insurance policies. For example: UOM can be defined as a combination of Line of Business, Event Type and Risk Category. This allows for managing capital calculation granularity levels. Units of Measure can be defined on internal dimensions such as Internal LOB (Line of Business), Internal Event Type, and so on OR on standard dimensions such as Standard LOB, Standard Event Type, and so on.

Setting this up is an important activity before proceeding to next steps. For example, Internal LOB – ET UOM mapping is tabulated:

Units of Measure	Internal Line of Business	Internal Event Type
UOM1 – Retail Banking / Internal Fraud	Retail Banking	Internal Fraud
UOM2 – Retail Banking	Retail Banking	External Fraud
UOM3 – Commercial Banking / Internal Fraud / External Fraud	Commercial Banking	Internal Fraud External Fraud
UOM3 – Commercial Banking / Internal Fraud / External Fraud	Commercial Banking	Internal Fraud External Fraud

Similarly, separate UOM mapping definitions can be defined for Standard LOB and Standard ET.

This definition is an input to subsequent modelling definitions and hence capital calculation. During capital calculation, risk measures are calculated at these UOMs and aggregated at firm level.

2.2.2 Calculation Dataset

Calculation Dataset is the assumption set for OREC modelling. It is mandatory to define a Calculation Dataset, since it is an input for Capital Calculation model. This helps to define the following features:

- Legal entities for which capital needs to be calculated. It can be a single or combination of legal entities that can be part of one definition.

- Minimum time window to be used for Internal and external loss data.

- UOM mapping definition to be used for capital calculation (For example, Standard or Internal).

- Sources of data that are used for modelling - Internal Loss Data, External Loss Data, and Scenarios.

- Insurance Policy is used during Monte Carlo Simulation for insurance adjustment.

- Permission to include/exclude near misses, gain events, pending losses, legal losses, and so on during modelling.

- Date types (occurrence, identification, and accounting date) to be considered for internal and external loss for actual losses, near miss, and legal losses.

- Capping of legal loss inclusion by reserve date.

- Amount type to be used for modelling Internal/External loss - gross loss, net loss, net loss excluding insurance recovery, and so on.

- Percentage at which insurance benefit is capped - say 10%, 15%, or 20% - with a maximum cap at 20%.

- Inclusion of boundary incidents such as Operational Risk in credit area and Operational Risk in Market area.

- Outlier handling methods such as truncation and inter quartile range.

- Any other custom filter to include/exclude certain data.

These calculation datasets are input to various models and subsequently to capital calculation model. So, there can be a calculation dataset defined only to include internal loss data, another to include internal and external loss data and a third one to include internal loss, external loss data and scenarios. A combination of such calculation datasets can be created and made input to different capital calculation models to see the impact of these decisions on capital numbers.

OREC Analyst can define these calculation dataset. A calculation dataset defined in production can be modelled in sandbox to see the impact of these definitions and decide the following:

- Correctness of UOM mapping granularity.

- Time window for each UOM.

- De Minimis Threshold for fitting shifted or left truncated distribution in severity modelling later.

- Upper and Lower Bounds for Inter Quartile Range.

- Whether to include near miss, gains, pending losses, pending legal losses and so on at each UOM or not.

  For example, if the pending legal losses with reserve created are high for an UOM, then financial institutions can decide to include them so that capital numbers reflect potential legal losses.

If the preceding information is already available from external models, then they can be directly specified in the Calculation Dataset in production and sent for approval. Once approved, these definitions can be used in Sandbox Models and Capital Calculation Model.

2.2.3 Data Preparation

Data Preparation allows setting up various rules for moving data from stage area to processing area. This is a mandatory step since this moves all the data from Staging area to Processing area. This data can further be used for Sandbox modelling and Capital Calculation. Data moved using Data Preparation can be moved to Sandbox for Sandbox Modelling or can be directly used as part of Capital Calculation Run.

Pre-processing steps for Data Preparation: Following are the prerequisites for creating data preparation:

- Populate all stage tables as per download specifications. For more information, refer to the Business Metadata document and Technical Metadata Worksheets in OTN Documentation Library.

- Calculation Dataset should be available since dataset is an input to Data Preparation execution.

- Common dimension reclassification rules should be defined.

For example, Reclassification of internal line of business and internal event type to standard line of business and standard event type.

There are seeded reclassification rules available which can be changed. For more information on seeded rules, refer to data preparation process chart.

- UOM Mappings should be defined.

OREC analyst can use Graphical User Interface to define various criteria for moving the data. This majorly includes:

- Data to be moved - Internal Loss Data, External Loss Data, Scenario estimates, and Insurance Policies.

- Time period between which data should be moved.

- Effective Date Type for considering internal and external loss data.

For example, there are various dates captured as part of loss data like identification date, occurrence date, accounting date, and so on. Date selected here acts as effective date type for moving data for the selected time period.

- Currency Conversion to convert all amounts in all the sources to a single reporting currency to support modelling on the same base.

- Select Reclassification process to reclassify common dimensions. Seeded reclassification rules are available which can be updated based on the financial institutions Lines of Business, Event Type, and other common dimension. Reclassification ensures that all data are on the same base dimension and hence ready for modelling. Some examples of reclassification rules are:

 - Reclassifying Internal Line of Business to Standard Line of Business

- Reclassifying Internal Event Type to Standard Event Type.

- Reclassifying External Line of Business to Standard Line of Business

- Reclassifying External Event Type to Standard Event Type.

It is not mandatory to reclassify if the base data is already on the required common base. For example, if the financial institution is not using external loss data and internal losses, scenarios and insurance policies are already available on internal LOB and Internal Event Type, then UOM mappings can be defined only on internal LOB and internal Event Type. In this case, Capital Calculation granularity is internal LOB/internal Event Type and reclassification is not required. Further, reclassification is mandatory if Factor Based or Least Squares Method external loss data is to be used, because scaling happens on standard LOB in these methods.

- Scaling of Internal and External Loss Data during data movement from staging to processing. It is not mandatory to scale internal or external loss data. Various scaling methods supported are:

    - Internal Loss Data - Mean Based Scaling: In this method, mean for each loss period is calculated and each & every loss observation is scaled to have the same mean loss for all the periods. This can be done at each LOB level or entity level. Loss Bucketing is defaulted to 180 days for calculating mean and the same can be configured.

    - Internal Loss Data - Inflation Adjustment: Cost Inflation Index is supported for inflation adjustment. Inflation data is expected as download. Scaling will be done linearly based on the index values and number of historical days between actual loss date and reporting date. It can be configured to include other Inflation Indices and relevant formula for inflation adjustment.

    - External Loss Data - Inflation Adjustment: Cost Inflation Index is supported for inflation adjustment. Inflation data is expected as download. Scaling will be done linearly based on the index values and number of historical days between actual loss date and reporting date. It can be configured to include other Inflation Indices and relevant formula for inflation adjustment.

    - External Loss Data - Least Squares Method: Least Squares Method scaling happens on Standard LOB after reclassification of Internal and External Loss Data. This method is used to calculate the scaling factor for an external entity by comparing the losses of internal and external entity. If there are multiple external entities included, then one scaling factor per entity – LOB combination is calculated. This uses a minimizing function to calculate the scaling factor.

    - External Loss Data - Factor Based Scaling: Factor Based Scaling happens on Standard LOB after reclassification of Internal and External Loss Data. This method assumes existence of a universal power-law relationship between the operational loss amount within a certain time period and the size & exposure towards operational risk within a certain time period of different financial institutions. Various

scaling factors such as Gross Income, Asset Size, Profit, Volume of Transaction, and so on, representing size and exposure can be used. Arriving at scaling factors using this method involves modelling and hence is calculated in Sandbox and deployed from sandbox for consumption in data preparation. A deployed sandbox factor based scaling model can be selected in data preparation and accordingly external loss data is scaled during data preparation. If there are no Factor Based Scaling Models available in Sandbox, following is the suggested flow:
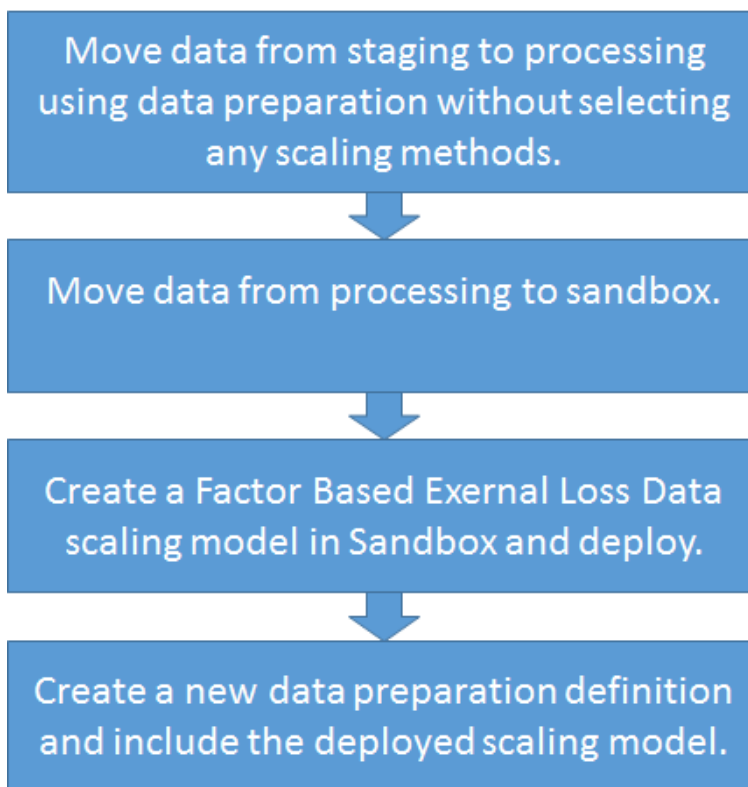
- ▪ External Loss Data - Direct download: If scaling factor is available from an external model, then the same can be provided as a direct download at Line of Business or Entity level. This will be used for scaling the external loss data.

For more details on the functionality, refer to Appendix A - Internal and External Loss Data Scaling.

Once all the preceding points are defined in data preparation, definition can be finalized. Finalized definitions can be executed with the following additional inputs:

- ▪ Calculation Dataset from production which is pending modelling or approved. If a pending modelling dataset is selected, then it indicates that data preparation is being executed to support calculation dataset modelling in Sandbox. If an approved modelling dataset is selected, then it indicates that data preparation is being executed to support other models such as external loss data scaling, frequency modelling, severity modelling, correlation modelling, and severity modelling in sandbox and capital calculation model in production. Selected dataset provides input for:

- UOM stamping.

- Loss data bucketing.

- Currency conversion of thresholds defined in dataset to the reporting currency of data preparation.

- MIS Date to indicate the effective date for moving the data.

Successful execution results in moving data from staging to processing area by applying all the rules defined in data preparation and the selected calculation dataset. For more information, refer to Data Preparation Process Chart available at OTN Documentation Library.

2.2.4 Sandbox Modelling

OREC modeller can access the sandbox area for modelling. This is the play area where modellers can model data, conduct various statistical tests, check the results, and finalize those models. Once finalized, these models can be used for Capital Calculation.

Data preparation should be executed with Approved Calculation Dataset to move data from Staging to Processing. Using the Sandbox Maintenance module of OFSAAI, this data needs to be moved to Sandbox area for continuing External Loss Data Scaling. For more information refer to Oracle Financial Services Enterprise Modeling User Guide available in OTN Documentation Library.

External Loss Data Scaling: This Sandbox model supports factor based power law scaling. Data moved from Processing to Sandbox without any scaling, can be used as input for this model. Scaling factor data for internal and external entities should be downloaded for the relevant period at the granularity of Line of Business or Entity. Linear Regression is used to establish a relationship between loss and scaling factor. Linear Regression provides the following:

- Slope of the linear equation for internal loss data and internal scaling factor

- Slope of the linear equation for external loss data and external scaling factor

Log Log Linear regression is supported in the Sandbox model. Various statistical techniques are supported to find a regression fit and determine the slope of Internal and External entities.

This Scaling model can be deployed from Sandbox. Once deployed, it can be used as input in a Data Preparation definition. Ratio of internal to external slope for each period and line of business and/or entity is used as scaling factor for scaling external loss data when data preparation is executed.

Data preparation should be executed with Calculation datasets pending modelling to move data from Staging to Processing. Using the Sandbox Maintenance module of OFSAAI, this data needs to be moved to Sandbox area for continuing Calculation Dataset Modelling. For more information refer to Oracle Financial Services Enterprise Modeling User Guide available in OTN Documentation Library.

- **Calculation Dataset Modelling**: Calculation Dataset defined in production can be modelled in Sandbox. All those Calculation Datasets which are marked for modelling in

production are available for Calculation Datasets modelling in sandbox. Following are supported in Calculation Dataset Modelling in sandbox:

- Ability to try different UOM combinations and decide on which UOMs to merge based on their data nature. It is expected that the first UOM definition is the granular level definition – 8 LOB / 7 ET (56 cells) which can be checked for homogeneity and UOMs can be redefined based on the statistical results.

- Decide the time window for each UOM. This can be over and above the minimum time window defined in production. This flexibility is to overcome the data scarcity problem in some UOMs.

- Decide the De-Minimis threshold for different UOMs. This is required for shifted OR left truncated severity modelling.

- Decide the lower and upper bound for different UOMs for Inter Quartile Range.

- Whether to include near miss, gains, pending losses, pending legal losses and so on at each UOM or not. For example, if the pending legal losses with reserve created are high for a UOM, then financial institutions can decide to include them so that capital numbers reflect potential legal losses.

- Conduct various statistical tests to decide the preceding points. All these statistical techniques are defined in R using OFSAA modelling framework. New R techniques can be registered and integrated with OREC application at client site.

A Data Preparation should be executed with approved calculation dataset to move data from staging from processing. Using the Sandbox Maintenance module of OFSAAI, this data needs to be moved to sandbox area for continuing frequency, severity, correlation, and scenario modelling. For more information refer to Oracle Financial Services Enterprise Modeling User Guide available in OTN Documentation Library.

- **Loss Frequency Modelling**: Frequency modelling allows modelers to finalize the frequency distribution for an UOM after checking EDA, fitting various distributions, checking the parameters, and Goodness of Fit output and other indicators such as PDF, CDF, PP plot, and QQ plot.

- **Loss Severity Modelling**: Severity modelling allows modelers to finalize the severity distribution for an UOM after checking EDA, fitting various distributions, checking the parameters, GOF output and other indicators such as PDF, CDF, PP plot, QQ plot. Shifted, truncated and non-truncated distributions can be fitted. They are mutually exclusive. Single Severity Distribution or EVT covering body distribution and tail distributions is also supported.

- **Scenario Modelling**: Scenario modelling allows modelers to model various scenarios. Scenario Modelling Supports following assessment methodologies:

  - **Individual Approach**: This assessment approach accepts frequency estimate and one severity estimate for each scenario. This is also known as single severity

approach. Poisson distribution is supported for frequency and single severity amount is treated as loss for all frequencies.

- **Interval Approach**: This assessment approach accepts multiple inputs consisting of lower and upper bound values along with frequency for each scenario. Various ranges of severity amounts can be specified with probable frequency. This is modelled to simulate scenario losses.

- **Percentile Approach**: The assessment approach adopts a four-point estimate percentile based model. The four scenario estimate points are:

    - **Typical Loss Frequency (TF)**: This represents the typical loss frequency of the occurrence of loss event.

    - **Typical Loss Severity (TS)**: This represents the estimate of the typical loss impact.

    - **Worst Case Frequency (WF)**: This represents the frequency of occurrence of loss event that has a loss impact, which exceeds the worst-case severity loss impact.

    - **Worst Case Severity (WS)**: This represents the estimate of the severe/extreme/worst case loss amount that is assumed to be at a certain percentile of the severity distribution. The percentile can be determined from the known typical loss frequency and the known worst-case loss frequency.

These four inputs are used to estimate the parameters of the frequency and severity distribution. Poisson is the frequency distribution supported with TF as the lambda of Poisson distribution, Weibull, and Lognormal are the supported severity distributions. Parameters of the severity distributions are estimated using the preceding four inputs.

There are two variants of Percentile Approach:

- **Pure Percentile Approach**: In this approach, all the four estimates are part of Scenario definition.

- **Unified Parameter Based Percentile Approach**: In this approach, TF and TS are calculated from the loss events of the UOM of the scenario. WF and WS are part of scenario definition. This effectively means that TF and TS which represents the body of a distribution are derived from loss and WF and WS which represents tail of a distribution are derived from scenario.

- **Parameter Based Approach**: Instead of using the default assessment methodologies, Parameter Based Approach can be used as an alternate. Parameter Based Approach allows users to directly select the frequency distribution, severity distribution, and its parameters for any Scenario.

Scenarios of the preceding methodologies can be modelled and simulated independently to verify the results. Once the scenarios are finalized, Scenario Model can be deployed from Sandbox for further use in Capital Calculation Model.

For more information on Scenario Models, refer to [Appendix B - Scenario Modelling](#).

- **Correlation / Dependency Modelling**:

  - **Loss Dependency Modelling**: Loss Correlation Modeling allows users to generate a correlation matrix between the losses of Units of Measure. Correlation Matrix can be generated based on Frequency or Aggregate Loss for the UOM. It can be generated using internal and/or external loss. The application supports Spearman, Pearson, and Kendall Correlation methods. This correlation matrix can be used to generate Gaussian or T Student Copula probabilities. Loss Dependency model can be deployed from Sandbox for further use in Capital Calculation run for loss frequency simulation.

  - **Scenario Dependency Modelling**: Scenario Correlation Modeling allows users to input correlation between scenarios. Scenario correlation matrix can be used to generate Gaussian or T Student Copula probabilities. Scenario Dependency model can be deployed from Sandbox for further use in Capital Calculation run for Scenario frequency simulation.

2.2.5 Capital Calculation Model

Capital Calculation Model is defined to capture the inputs for estimating Operational Risk Capital. After definition, execution of this model results in calculation of all the required risk measures such as Operational Risk VaR, Conditional VaR, Expected Loss, and Unexpected Loss for various UOMs and firm level followed by allocation of capital to various Legal Entities and Lines of Businesses.

Some salient features of the Capital Calculation model includes the following:

- It is possible to define a capital calculation model covering

  - Only Loss Distribution Approach model which means all UOMs use loss data.

  - Only Scenario Based Approach model which means all UOMs use scenario data.

  - Only Hybrid models which means all UOMs use both loss and scenario data.

  - A combination of LDA, SBA and Hybrid across UOMs.

- There are various ways in which Loss Frequency, Loss Severity, Scenario, Loss dependency, and Scenario dependency models can be developed. These are the following:

  - Import Sandbox Models

  - Import External Models (as download)

  - Manual Input of Model Details

It is possible to import one model (for example, loss frequency) from Sandbox and import another model (for example, loss severity) as Download and then specify a third one (for example, loss correlation). Any combination of the preceding methods can be used at individual model level.

It is possible to define and calculate capital without using Sandbox Models. This helps when you use external models. Model parameters can be downloaded or specified directly to calculate capital.

Pre-processing steps for Capital Calculation: Following are the prerequisites for creating Capital Calculation Model:

- Data Preparation should have been executed and data populated from all stage tables to processing tables. For more information, refer to the Business Metadata document and Technical Metadata Worksheets in OTN Documentation Library.

- Approved Calculation Dataset should be available. Data Preparation should have been executed with an approved Calculation Dataset.

- Sandbox Models should be deployed if Sandbox models are to be used. Frequency, Severity, Scenario, Loss Correlation, and Scenario Correlation models should be defined and deployed from Sandbox. This is optional and required only if Sandbox Models are planned to be used.

- External Models should be downloaded if external models are to be used. Frequency distribution and parameters, severity distributions and parameters for the UOM, loss correlation model, Frequency and Severity distribution and parameters for Scenarios, and Scenario correlation model should be downloaded and ready for use in Capital Calculation. This is optional and required only if External Models are planned to be used.

- Allocation parameters should be downloaded if capital needs to be allocated back to LOB and LE. This is optional and required only if allocation back to LOB and LE is required using factors other than ratio of actual losses.

Note: A combination of Sandbox and External Models can be used at a model level. Further, manual input option is also available.

Following are the steps involved in development of a Capital Calculation Model:
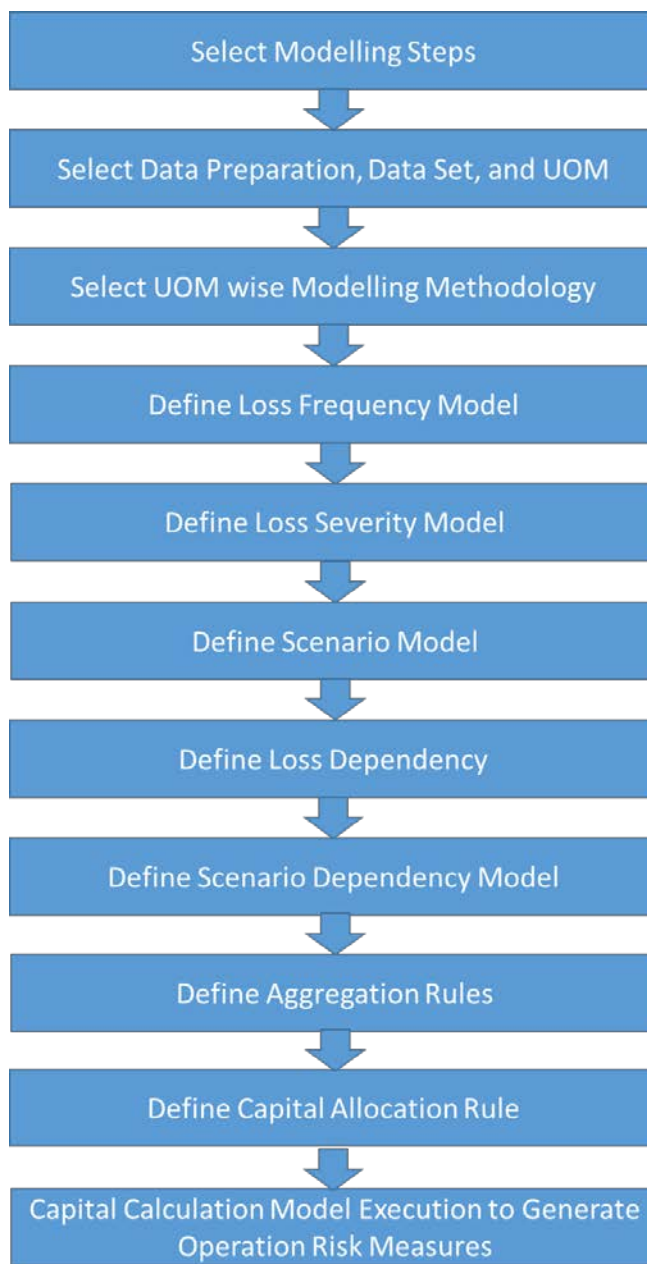
Select Modeling Steps: In this step, user can select steps which is to be included in the capital calculation definition.

- If Loss Distribution Approach is to be followed for few UOMs, then loss frequency and loss severity steps should be selected.

- If Loss correlation is required, then loss dependency modelling step should be selected along with loss frequency and loss severity.

- If Scenario Based Approach is to be followed for few UOMs, then scenario model should be selected.

- If Scenario correlation is required, then scenario dependency modelling step should be selected along with scenario model step.

- If both loss and scenario are used for the same UOMs, then aggregation rules should be defined to combine them.

Select Data Preparation, Calculation Dataset, and UOM: This step ensures that data preparation, calculation dataset, and Unit of Measure are selected. Selected data preparation provides the required loss data, scenarios, and insurance policies input. Selected calculation dataset acts as the filter while selecting various models in next steps. Unit of Measure mapping definition selected acts as the granularity at which Capital Calculation happens.

Select UOM wise Modelling Methodology: In this step, you can define the UOM wise modelling methodology. A UOM can use Loss Distribution Approach, Scenario Based Approach, or a Hybrid Approach (combination of loss and scenarios), for a given UOM. If Hybrid Approach is used, then aggregation approach should be defined as:

- **Weights Based Approach**: This approach allows users to define weights for inclusion of loss and scenarios on alternative or complementary basis. Alternative and Complementary are detailed under "Aggregation".

- **Unified Parameter Based Approach**: This approach allows users to combine loss and scenario using a percentile based scenario approach. If Unified Parameter Based Approach is selected, then scenarios with hybrid percentile approach should be selected for those UOMs.

Define Loss Frequency model: In this step, you can finalize the loss frequency distribution and/or parameters. This step is mandatory for all UOMs where modelling methodology is LDA or Hybrid with Weights based aggregation. A loss frequency model can be defined as follows:

- Frequency distribution and parameters can be imported from Sandbox model, external model, or through manual input.

- Frequency distribution can be imported from Sandbox without parameters. Parameter re-estimation happens during Capital Calculation Run.

Define Loss Severity model: In this step, loss severity distribution and/or parameters can be finalized. This step is mandatory for all UOMs where modelling methodology is LDA or Hybrid with Combining Approach as Weights. A loss severity model can be defined as follows:

- Severity distribution and parameters can be imported from Sandbox model, external model, or through manual input.

- Severity distribution can be imported from Sandbox without parameters. Parameter re-estimation happens during Capital Calculation Run.

Define Scenario model: In this step, you can finalize the scenarios to be used for Capital Calculation Run. This step is mandatory for all UOMs where modelling methodology is SBA or Hybrid. Scenarios and their estimates can be imported from sandbox or external models.

Define Loss dependency model: This is an optional step, which needs to be performed only when loss dependency needs to be factored in Capital Calculation. This step is applicable only to those UOMs where modelling methodology is LDA or Hybrid with Combining Approach as Weights. A loss correlation matrix can be imported from Sandbox model, external model, or through manual input. Using the correlation matrix, copula probabilities are generated during Capital Calculation Run.

Define Scenario dependency model: This is an optional step, which needs to be performed only when scenario dependency needs to be factored in Capital Calculation. This step is applicable only to those UOMs where modelling methodology is SBA or Hybrid. A scenario correlation matrix can be imported from sandbox model or external model or through manual input. Using the Scenario Correlation Matrix, Copula probabilities are generated during Capital Calculation Run.

Define Aggregation Rules: This is a mandatory step for all those UOMs where modelling methodology is Hybrid and combining methodology is Weights. In this case, loss simulation and scenario simulation happens independently. Weights should be provided to decide the ratio of scenario to loss for combining both. Following are the approaches:

Complementary Method: In the case of Complementary method, if the Credibility Factor (weights) specified is 10%, then 10% of scenario simulations and 90% of loss simulations are picked randomly during Capital Calculation Run.

Alternative method: In case of Alternative Method, if the Credibility Factor (weights) specified is 10%, then 10% of worst scenario simulated losses is picked and remaining 90% is taken from loss simulation during Capital Calculation Run.

This aggregation results in a combined simulation output for the UOM.

The preceding steps complete the Capital Calculation Model definition and the same can be approved by OREC approver.

2.2.5.1 Define Capital Allocation Rules

Capital Allocation is required to allocate the capital numbers calculated by executing a capital calculation run. Capital Allocation can be defined as an independent definition and approved. Capital numbers calculated can be allocated back to Units of Measure, Lines of Business, and Legal Entity:

- UOM Capital Allocation Method: Following factors can be used to allocate capital back to UOMs.

  - Variance – Covariance Method: Ratio of Variance of aggregated losses to Covariance of UOM is taken as allocation factor.

  - Ratio of Expected Losses – Ratio of EL at UOMs is taken as allocation factor.

- Ratio of Expected Shortfall – Ratio of Expected Shortfall at UOMs is taken as allocation factor. Expected shortfall is conditional VaR that is the average of all numbers above VAR.

- LOB Capital Allocation Method – Following factors can be used to allocate capital to Lines of Business.

  - Ratio of internal losses by LOB is taken as allocation factor. This takes actual gross loss for the period selected in data preparation.

  - Ratio of BEICF, TSA Capital, Revenue, Profit, and Exposure for LE can be provided as download and capital allocation happens on this ratio.

The preceding steps complete Capital Allocation Model definition. This can be approved by OREC approver.

2.2.6 Capital Calculation Run

An approved Capital Calculation definition can be executed to generate operational Risk Value at Risk, Conditional Value at Risk, Expected Loss, Unexpected Loss for the UOMs, and Entity. If Capital Allocation is required, then an approved Capital Allocation model should be made part of capital calculation run and accordingly all risk measures are allocated back to UOMs, LOBs, and LEs.

Depending on the steps selected, Capital Calculation Run follows the succeeding steps:
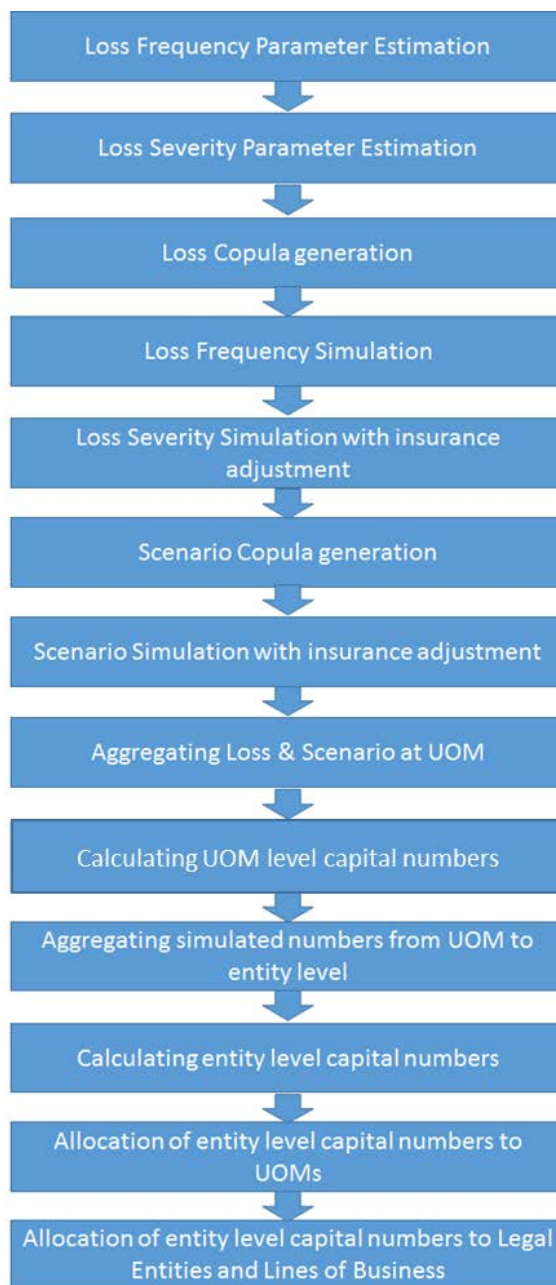
Loss Frequency Parameter Estimation: This is an optional step. If the frequency model is deployed without parameter, then parameter estimation for all the UOMs by fitting the selected distribution happens. Models are registered and executed in R to generate parameters. If Frequency model is already having parameters, then this step is not executed. This step is applicable only for those UOMs where modeling methodology is LDA or Hybrid with Weights based aggregation.

Loss Severity Parameter Estimation: This is an optional step. If the severity model is deployed without parameter, then parameter estimation for all the UOMs by fitting the selected distribution happens. Models are registered and executed in R to generate parameters. If Severity model is

already having parameters, then this step is not executed. This step is applicable only for those UOMs where modeling methodology is LDA or Hybrid with Weights based aggregation.

Loss Copula generation: This is an optional step. In this step, based on the loss correlation model available, loss copula probability are generated. If loss dependency modeling is not selected in the steps, then this step are not executed. This step is applicable only for those UOMs where modeling methodology is LDA or Hybrid with Weights based aggregation.

Loss Frequency Simulation: This is a mandatory step for all the UOMs where modeling methodology is LDA or Hybrid with Weights based aggregation. Depending on the number of simulations, those many loss frequency numbers are generated for each UOM. In this step:

- If loss copula is generated in the previous step, then it is used as probability input for loss frequency simulation.

- If loss copula is not generated in the previous step, then uniform probability is generated and used as input for loss frequency simulation.

Loss Severity Simulation: This is a mandatory step for all the UOMs where modeling methodology is LDA or Hybrid with Weights based aggregation. Taking loss frequency simulation output, loss severity is simulated for each UOM. Since loss frequency simulation is an input to loss severity simulation, it automatically incorporates Copula effect, if any, from the previous step. After the simulation of losses, insurance policies available for the UOM are adjusted to derive insurance adjusted severities.

Scenario Copula generation: This is an optional step. In this step, based on the Scenario correlation model available, Scenario Copula is generated. If Scenario Dependency modeling is not selected in the steps, then this step is not executed. This step is applicable only for those UOMs where modeling methodology is SBA or Hybrid. Depending on the number of simulations, those many loss frequency numbers are generated for each scenario. In this step:

- If Scenario Copula is generated, then it is used as probability input for Scenario Frequency simulation.

- If Scenario Copula is not generated, then uniform probability is generated and used as input for Scenario Frequency Simulation.

Scenario Simulation: This is a mandatory step for all the UOMs where modeling methodology is SBA or Hybrid. This step simulates scenarios for all scenario assessment methodologies. If there are more than one scenario for a UOM, then they are aggregated simulation wise to arrive at a combined scenario simulated losses. After the simulation of losses, insurance policies available for the UOM are adjusted to derive insurance adjusted severities.

Aggregating Loss and Scenario at UOM: This is a mandatory step for all the UOMs where modeling methodology is Hybrid and combining approach (that is, approach to aggregate loss and scenario) is based on weights. In such cases, a combined simulated loss array is arrived at for those UOMs by aggregating loss and scenario simulations. Aggregation is either based on "Alternative" or "Complementary" with weights assigned to loss and scenario.

Calculating UOM level capital numbers: This is a mandatory step irrespective of the modeling methodology. In this step, following risk measures are calculated for Regulatory and Economical Capital from the simulated UOM losses (LDA, SBA, or Hybrid):

- Value at Risk (VaR)

- Conditional Value at Risk (Average of losses above VaR)

- Expected Loss (Mean or Median)

- Unexpected Loss (VaR – Expected Loss)

Both Insurance Adjusted and Insurance Unadjusted numbers are calculated for the preceding.

Aggregating simulated numbers from UOM to entity level and Calculating entity level capital numbers: This is a mandatory step. In this step, simulated losses of all UOMs are added simulation wise to arrive at a single simulated loss vector. If copula is used for simulation, then this loss vector would represent diversified numbers. From this aggregated simulation loss, following risk measures are calculated:

- Value at Risk (VaR)

- Conditional Value at Risk (Average of losses above VaR)

- Unexpected Loss (VaR – Expected Loss)

This is termed as "Allocated VaR", "Allocated CVaR", and "Allocated Unexpected Loss" since this is what will be allocated to UOMs, LOBs, and LEs. OREC application also calculates VaR, CVaR, Expected Loss and Unexpected Loss by adding VaR, CVaR, EL and Unexpected Loss from all UOMs.

Both Insurance Adjusted and Insurance Unadjusted numbers are calculated for all the preceding risk measures. Similarly, both Regulatory and Economic capital numbers are calculated.

Capital Allocation: After the risk measures are calculated, it is important to allocate them to Units of Measure, Lines of Business, and Legal Entities from performance management perspective. Run level Risk measures calculated based on the aggregated simulation loss vector can be allocated to Units of Measure, Lines of Business, and Legal Entities.

UOM Allocation: For UOM allocation, the following allocation methods are supported:

- **Variance – Covariance Method**: In this method, ratio of Variance of aggregated simulation loss vector to co-variance of UOM simulation loss vector is taken as the allocation factor.

- **Ratio of Expected Losses**: In this method, ratio of Expected Losses of all UOMs is taken as the allocation factor.

- **Ratio of Expected Shortfall (CVaR)**: In this method, ratio of Expected Shortfall for all UOMs is taken as the allocation factor.

Note: UOM can have both calculated and allocated risk measure values. Calculated Risk Measures are based on the UOM simulated loss vector. Allocated Risk Measures are based on the risk measures allocated from aggregate level loss vector.

LOB and LE Allocation: For LOB and LE Allocation, the following allocation methods are supported:

- **BEICF** – Ratio of BECIF scores at LOB / LE is expected as download. Allocation happens in these ratios, respectively.

- **The Standardized Approach Capital** - Ratio of TSA Capital at LOB/LE is expected as download. Allocation happens in these ratios, respectively.

- **Revenue** - Ratio of Revenue at LOB / LE is expected as download. Allocation happens in these ratios, respectively.

- **Profit** - Ratio of Profit at LOB/LE is expected as download. Allocation happens in these ratios, respectively.

- **Exposure** - Ratio of Exposures at LOB/LE is expected as download. Allocation happens in this ratio.

- **Actual Losses** – Internal losses by LOB/LE is fetched from internal loss data as per the data preparation selected in the capital calculation run. Ratio of gross loss by LOB/LE to total loss by LOB/LE is considered for allocation.

3 OREC Production

OREC application has a Production and Sandbox area. Production area is meant for defining the following:

- Unit of Measure Mapping
- Data Preparation
- Calculation Dataset
- Capital Calculation Model
- Capital Allocation Model

Production area can be used independently or utilize data deployed from sandbox models for creating capital calculation definition. The roles and associated responsibilities in OREC Production are as tabulated:

OREC Analyst	Module	Create	Edit	View	Approval
	UOM Definition	Yes	Yes	Yes	No
	Data Preparation	Yes	Yes	Yes	No
	Calculation Dataset	Yes	Yes	Yes	No
	OREC Capital Calculation Model	Yes	Yes	Yes	No
	OREC Capital Allocation Model	Yes	Yes	Yes	No

Role	Module	Create	Edit	View	Approval
OREC Approver	Calculation Dataset Approval in Production	No	No	Yes	Yes
	OREC capital calculation model Approval in production	No	No	Yes	Yes
	OREC Capital Allocation Model Approval in Production	No	No	Yes	Yes

3.1 Units of Measure Mapping

An Operational Risk Category (ORC) or Unit of Measure (UOM) is the level (for example, organizational unit, operational loss event type, risk category, and so on) at which the financial institution's quantification model generates a separate distribution for estimating potential operational losses. This term identifies a

category of operational risk that is homogeneous in terms of the risks covered and the data available to analyze those risks.

3.1.1 Access Unit of Measure

You can access Unit of Measure from the OFS OREC application left pane as follows:
1. Click **OREC Production** under **Operational Risk Economic Capital**.
2. Select **Unit of Measure**.

The *Unit of Measure* window is displayed on the RHS with the Search Grid and the Unit of Measure Definition grid with the list of all the existing definitions.
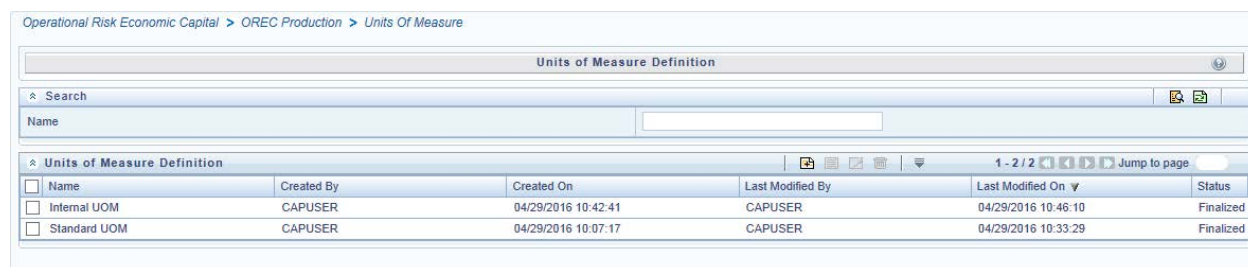
From the *Unit of Measure* window, you can search for existing definitions, create new definitions, view/edit/delete existing definitions.

3.1.1.1 Search for Existing Unit of Measure Definitions

You can search for existing Unit of Measure definitions, based on the definition Name.

To search for an existing UOM definition from the *Units of Measure Definition* page, enter the Name of the definition in the **Name** field under Search grid and click **Search** button.

3.1.1.2 Adding a Unit of Measure Mapping

You can create a Unit of Measure Mapping from the *Units of Measure Definition* window by performing the following procedure.

All the fields marked in red asterisks (*) are mandatory.
1. Click the **Add** button from the *Units of Measure Definition* grid.

The *Units of Measure Definition* window is displayed.

2. Enter the **Name** of the UOM Mapping.
3. Enter the UOM Mapping **Description**.
4. Click the **Source Hierarchy Selection** button and select the source Hierarchies from the *Hierarchy Selection* window.

   You can include an existing Hierarchy to the default list of Source Hierarchies in UOM. For more details on including an existing Hierarchy to the UOM Source Hierarchy, refer to *Dataset* section of *Oracle Financial Services Analytical Applications Infrastructure User Guide*, available at OTN Documentation Library.

5. Click the **Target Hierarchy Selection** button and select the source Hierarchies from the *Hierarchy Selection* window.

   UOM Members are stored in the dimension table. You can create new Hierarchies on this Dimension. For more details on new Hierarchy definition and new Member addition, refer to *AMHM* section of *Oracle Financial Services Analytical Applications Infrastructure User Guide*, available at OTN Documentation Library.

   NOTE: Do not include Entity Unit of Measures while resaving the Hierarchies via Metadata Resave Utility.

6. Click the **Map Units** button in the RHS of the *Units of Measure Definition* grid.

   The *Source Target Map* window is displayed.
7. Click each of the Source and Target items under the *Source Hierarchy Selection* and *Target Hierarchy Selection* grids and select the members that needs to be mapped.

   Upon selection of the members, a Cartesian table of the selected Source members are displayed under the *Source-Target Mapping* grid.

   The selected Target members are available in the Target column as drop down items.

8. Select the respective Target members for each of the Source items by selecting the appropriate member from the drop down list.
9. Click **Save** button in the *Source Target Map* window. The mapping is displayed under the *Definition Summary* grid of the *Units of measure Definition* window.
10. Click **Save** button to save the definition. The saved UOM definition is displayed in the *Units of Measure Definition* window in **Draft** status.
11. Click **Submit** button to submit the UOM Mapping definition. The definition is saved in **Finalized** status. Once submitted, this UOM Mapping definition is available for further use.

The **Audit Trail** section at the bottom of the window displays the metadata about the definition. The **User Comments** section facilitates you to add or update additional information as comments.

3.1.1.3   Viewing a Unit of Measure Definition

You can view an existing UOM definition from the *Units of Measure Definition* window.

To view the details of an existing UOM definition, perform the following procedure.
1. Select the check box adjacent to the UOM definition you want to view.
2. Click **View** button from the *Units of Measure Definition* grid.

   The details of the selected definition are displayed in the *Units of Measure Definition* window.

   NOTE: You cannot edit any of the fields of the definition while in **View** mode.

3.1.1.4   Editing a Unit of Measure Definition

You can edit the details of an existing UOM definition from the *Units of Measure Definition* window.

To edit the details of an existing UOM definition, perform the following procedure.
1. Select the check box adjacent to the UOM definition you want to edit.

   NOTE: Only those UOM mapping definitions, which are in **Draft** status can be edited.

2. Click **Edit** button from the *Units of Measure Definition* grid.

   The details of the selected definition are displayed in the *Units of Measure Definition* window in edit mode.
3. Edit the required fields of the UOM definition. For more details refer to Adding a Unit of Measure Definition section.
4. Click **Save** button.

   The details of the definition are updated and the definition is displayed under the *Units of Measure Definition* grid.

3.1.1.5   Deleting a Unit of Measure Definition

You can delete existing UOM definitions from the *Units of Measure Definition* window.

To delete one or more existing UOM definitions, perform the following procedure.
1. Select the check box(s) adjacent to the UOM definition(s) you want to delete.

   NOTE: Only those UOM mapping definitions, which are in **Draft** status can be deleted.

2. Click **Delete** button from the *Units of Measure Definition* grid.

A warning dialog is displayed.

3. Click **Yes** button.

The selected definitions are removed from the *Units of Measure Definition* window.
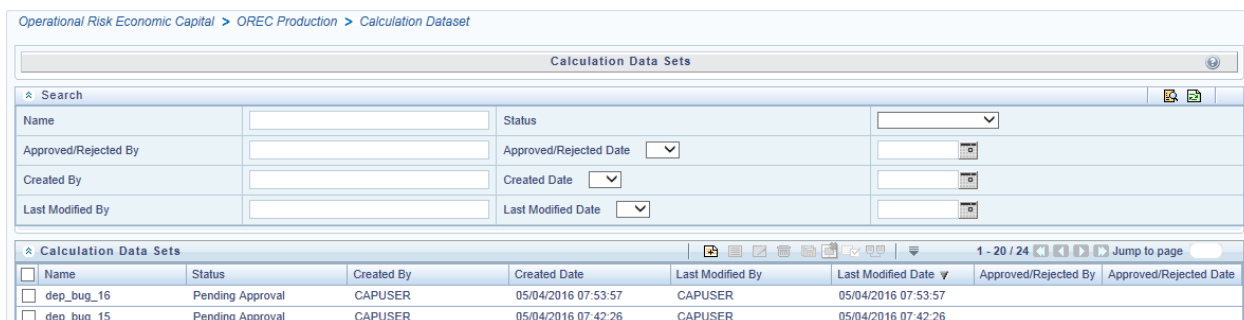
3.2   Calculation Dataset

Calculation Dataset is an assumption set definition covering all the assumptions which need to be followed throughout OREC modelling and Capital Calculation. These inputs are one time definitions and hence are made part of calculation dataset. Once approved, Calculation Dataset can be used as input for frequency, severity, correlation and scenario modelling in Sandbox and Capital Calculation Model in Production. Once a calculation dataset is approved, it cannot be changed.

3.2.1   Access Calculation Dataset

You can access Calculation Dataset from the OFS OREC application left pane as follows:

1. Click **OREC Production** under **Operational Risk Economic Capital**.
2. Select **Calculation Dataset**.

The *Calculation Datasets* window is displayed on the RHS with the *Search* Grid and the *Calculation Datasets* grid with the list of all the existing definitions.

From the *Calculation Dataset* window, you can search for existing definitions, create new definitions, view/edit/delete/copy/retire existing definitions.

3.2.1.1   Search for Existing Calculation Dataset Definitions

You can search for existing Calculation Dataset definitions, based on the search parameters such as Name, Status, Creation Date, and Last Modification Date.

To search for an existing Calculation Dataset definition, perform the following procedure:

1. Enter one or more details in the Search grid, depending on the fields, as tabulated:

Field	Description
Name	Enter the name of the definition which you want to search.

Field	Description
Status	Select the Status of the object which you want to search from the drop down list. The available values are: • Pending Modelling • Pending Approval • Approved • Rejected • Retired • Draft
Approved By	Enter the name of the Approver, to search the definitions that are approved by this user.
Last Modified By	Enter the name of the user, to search the definitions that are last modified by this user.
Approved/Rejected Date	Select <, >, or = from the drop down list and click ⬚ to specify the date to search for definitions which are approved/rejected before, after, or on the specified date.
Creation Date	Select <, >, or = from the drop down list and click ⬚ to specify the date to search for definitions which are created before, after, or on the specified date.

2. Click **Search** button from the *Search* grid.

   The list of definitions matching with the search criteria are displayed.

3.2.1.2   Adding a Calculation Dataset Definition

You can create a Calculation Dataset definition using the Common Parameters, Filters, and so on. To initiate the Calculation Dataset definition creation, perform the following procedure:

All the fields marked in red asterisks (*) are mandatory.

1. Click the **Add** button from the *Calculation Datasets* grid.

   The *Calculation Dataset* window is displayed.

2. Enter the **Name** of the definition.
3. Select the **Folder** from the drop down list.
4. Enter the definition **Description**.
5. Populate the details under the *Common Parameters* grid, as tabulated:

Field	Description
Legal Entity	Click **Select Legal Entity** button and select the legal entity from the *Hierarchy Browser* window.
Unit of Measure Definition	Select the UOM mapping definition from the drop down list.
Modeling Source Input	Based on the selection here, only those data are considered as input wherever this dataset is used. Select the check box(s) adjacent to the Date Source names that you want to select. The available values are: • Internal Loss Data • External Loss Data • Scenarios • Insurance Policies

Field	Description
Internal loss data Inclusion	This selection acts as a filter for further processing. Based on the selection here, internal loss incidents belonging to the following category are additionally included during modelling. Select the check box(s) adjacent to the Internal loss data Inclusion names that you want to select. The available values are: • Near Misses • Gain Events • Pending Legal Losses • Pending Other Losses • Bulk Losses **Note**: This field is enabled only if you have selected Internal Loss Data as the Modeling Source Input.
Minimum Window in Days	Enter the minimum number of days for which data should be used for modelling.
Loss Date Type	This indicates as to which date actual losses should be considered for. That is, based on the loss date selected here, the incident is included or excluded. Select the Loss Date Type from the drop down list. The available values are: • Identification Date • Occurrence Start Date • Occurrence End Date • Accounting Date **Note**: This field is enabled only if you have selected Internal Loss Data and/or External Loss Data as the Modeling Source Input.

Field	Description
Legal Loss Date Type	This is similar to actual loss/near miss for inclusion/exclusion. Note that there can be different date types possible for different loss types (actual, near miss, and legal). In case of legal loss, Reserve Date selection is also available. Reserve Date is the date on which reserves were created for a loss. It is possible that not all legal losses will have reserves created. Similarly pending losses may not have settlement date. Select the Legal Loss Date Type from the drop down list. - Identification Date - Occurrence Start Date - Occurrence End Date - Reserve Date - Settlement Date **Note**: This field is enabled only if you have selected Internal Loss Data as the Modeling Source Input.
Amount Type	Select the amount type from the drop down list. This amount is considered for modelling. The available values are: - Gross Loss - Net Loss Excluding Insurance Recovery - Net Loss - Gross Impact
Near Miss Date Type	This is similar to Loss Date Type for inclusion / exclusion, based on date selection for Near Miss incidents. Select the Loss Date Type from the drop down list. The available values are: - Identification Date - Occurrence Start Date - Occurrence End Date **Note**: This field is enabled only if you have selected Near Misses in the Internal loss data Inclusion field.
Cap Legal Losses Inclusion by Reserve Date?	This selection caps the inclusion of legal losses by reserve date. That is, legal losses which have reserve date are included only based on this date irrespective of selection in legal loss date type. Select **Yes** or **No** from the drop down list. **Note**: This field is enabled only if you have selected Internal Loss Data as the Modeling Source Input.

Field	Description
Insurance Benefit Cap (In %)	Enter the insurance benefit cap in percentage. This cap can be applied during insurance adjustment in capital calculation run.
Incident Type	This selection helps to include/exclude border losses. Select the check box(es) adjacent to the incident type names that you want to select. The available values are: • Operational Risk • Market Risk • Credit Risk **Note**: This field is enabled only if you have selected Internal Loss Data and/or External Loss Data as the Modeling Source Input.
Data Sufficiency Threshold	Enter the number of data sufficiency threshold. This is the minimum number of data points required for loss modelling, for any UOM.
Outlier Handling Method	Select the Outlier Handling Method from the drop down list. The available values are: • **Inter Quartile Range**: In this method, all the values between first and third quartile are used and the values below first quartile and above third quartile are replaced with a single value (one each for lower and upper bound). • **Truncation**: In case of Truncation, users can define the De Minimis Threshold (Left Truncation Threshold). If Truncation is selected, then left truncated distributions are fitted during Severity Modelling. Left truncated distributions are statistically adjusted for the left out values. • **Not Required** **Note**: This field is enabled only if you have selected Internal Loss Data and/or External Loss Data as the Modeling Source Input.
Inter Quartile Bounds	Select radio button adjacent to Calculate or Input to select the Inter Quartile Bounds value. System calculates inter quartile bounds automatically if Calculate is selected. This calculation happens during modelling of Calculation Dataset. **Note**: This field is enabled only if you have selected Inter Quartile Range as the Outlier Handling Method.

Field	Description
Scaling Factor	Enter the Scaling Factor value. Taking scaling factor value, lower and upper bounds are calculated as follows: 	Lower Bound	Q1+K*(Q3-Q1)	 	Upper Bound	Q3- K*(Q3-Q1)	 Where: Q1 = quartile 1 Q3 = quartile 3 K = Scaling Factor

6. Select the type of processing for the Dataset by selecting the radio buttons adjacent to either **Model Dataset** or **Specify** fields.

> **NOTE:** You are able to select these radio buttons only if you have selected Internal Loss Data or External Loss Data as Modeling Source Input.

If you have selected **Model Dataset** option, you are expected to navigate to **Calculation Dataset Modelling** module in Sandbox to model this dataset and deploy the same back to **Calculation Dataset** in production.

Once you deploy the Dataset Model from Sandbox, the Dataset model checks the status of the Dataset definition. If the status is Pending Modelling, the same is changed to Pending Approval.

If the status is already in **Pending Approval**, that means, the Dataset has already been modelled and has moved to **Pending Approval**. In such a case, a copy of the Dataset in Production is created and the new definition is moved to **Pending Approval** status.

If you choose Specify option, it is assumed that the required parameters are already available from an external model or some other source.

7. Select the following if you have opted for **Specify** option.
   a. Select the **Distribution Fitting Methodology** from the drop down list. The available values are the following:

      - Maximum Likelihood Estimate L-BFGS-B

      - Maximum Likelihood Estimate Neldar Mead

      - Maximum Likelihood Estimate Conjugate Gradient

      - Maximum Likelihood Estimate BFGS

   b. Select the **Bucket Length** from the drop down list. This is frequency bucket length which is used in Frequency and Correlation modelling.
   c. Select the **Currency** from the drop down list. This is the currency in which threshold/bounds are defined in the following grid.

Upon updating these fields, the *Unit Wise Summary* grid is populated with a table, which displays the details depending on the Outlier Handling Method selection, as follows:

- If Inter Quartile Range is selected as the Outlier Handling Method, the Unit of Measures, External Data, Internal Loss Data Inclusion, Time Window, De Minimis Threshold, Lower Bound, and Upper Bound are displayed.

    Additionally, you can select the check box adjacent to each UOMs to update the External Data Inclusion, De Minimis Threshold, Lower Bound, and Upper Bound details.

- If Truncation is selected as the Outlier Handling Method, the Unit of Measures, External Data, Internal Loss Data Inclusion, Time Window, and De Minimis Threshold (left truncation) are displayed.

    Additionally, you can select the check box adjacent to each UOMs to update the External Data Inclusion and De Minimis Threshold (left truncation) details.

NOTE: In case of Specify, preceding parameters are manually entered. If the Dataset is modelled in Sandbox and then deployed, they are automatically updated from the deployed model.

Click **Save** button to save the definition anytime during the definition process. The definitions are saved in **Draft** status.

Click **Submit** button to finish the definition process. Once submitted, the definition is displayed in the *Data Sets* window in the following statuses:

- **Pending Approval** status if you have selected Specify option.
- **Pending Modelling** status if you have selected Model Dataset option.

For more details on approval work flow, refer to Approve/Reject a Calculation Dataset Definition section. The definitions, which are in **Pending Modelling** status, are available for modelling. For more information, refer to Calculation Dataset Modelling section.

The **Audit Trail** section at the bottom of the window displays the metadata about the definition. The **User Comments** section facilitates you to add or update additional information as comments.

3.2.1.3   Viewing a Calculation Dataset Definition

You can view an existing Calculation Dataset definition from the *Calculation Dataset* window.

To view the details of an existing Calculation Dataset definition, perform the following procedure.
1. Select the check box adjacent to the Calculation Dataset definition you want to view.
2. Click **View** button from the *Calculation Dataset* grid.

    The details of the selected definition are displayed in the *Datasets* window.

NOTE: You cannot edit any of the fields of the definition while in **View** mode.

3.2.1.4   Editing a Calculation Dataset Definition

You can edit the details of an existing Calculation Dataset definition from the *Calculation Dataset* window.

To edit the details of an existing Calculation Dataset definition, perform the following procedure.
1. Select the check box adjacent to the Calculation Dataset definition you want to edit.

NOTE: You can edit a Calculation Dataset definition only when it is in **Draft** status.

2. Click **Edit** button from the *Calculation Dataset* grid.

    The details of the selected definition are displayed in the *Calculation Dataset* window in edit mode.

3. Edit the required fields of the Calculation Dataset definition. For more details, refer to Adding a Calculation Dataset Definition section.

4. Click **Save** button.

    The details of the definition are updated and the definition is displayed under the *Calculation Datasets* grid.

3.2.1.5   Copying a Calculation Dataset Definition

You can copy the details of an existing Calculation Dataset definition and create a new definition by changing the Name, Description, and Folder details, from the *Calculation Dataset* window.

To copy the details of an existing Calculation Dataset definition, perform the following procedure.

1. Select the check box adjacent to the Calculation Dataset definition you want to copy.

2. Click **Copy** button from the *Calculation Dataset* grid.

    The *Save As* window is displayed.

3. Enter the Name, Description, and select the Folder from the drop down box, for the new definition.

4. Click **OK** button.

    The details of the definition are saved and the definition is displayed under the *Calculation Datasets* grid. All the definition details except the Name, Description, and Folder remain the same as that of the parent definition.

3.2.1.6   Deleting a Calculation Dataset Definition

You can delete existing Calculation Dataset definitions from the *Calculation Datasets* window.

To delete one or more existing Calculation Dataset definitions, perform the following procedure.

1. Select the check box(s) adjacent to the Calculation Dataset definition(s) you want to delete.

NOTE: You can delete only those Calculation Dataset definitions, which are in Draft status.

2. Click **Delete** button from the *Calculation Datasets* grid.

    A warning dialog is displayed.

3. Click **Yes** button.

    The selected definitions are removed from the *Calculation Datasets* window.

3.2.1.7   Retire a Calculation Dataset Definition

You can retire an existing Calculation Dataset definition from the *Calculation Dataset* window.

To retire a Calculation Dataset definition, perform the following procedure.

1. Select the check box adjacent to the Calculation Dataset definition you want to retire.

   NOTE: You can retire only those Calculation Dataset definitions, which are in Approved status.

---

2. Click **Retire** button from the *Calculation Dataset* grid.

   A warning dialog is displayed.
3. Click **Yes** button.

   The selected definition is retired and the status is changed in the *Calculation Dataset* window.

3.2.1.8   Approve/Reject a Calculation Dataset Definition

You can approve/reject an existing Calculation Dataset definition, which is having **Pending Approval** status, from the *Calculation Dataset* window. Only those definitions, for which you have selected **Specify** option, requires an approval workflow. Only a user with Approver privileges can approve/reject a definition.

To approve/reject a Calculation Dataset definition, perform the following procedure.
1. Select the check box adjacent to the Calculation Dataset definition you want to approve/reject.
2. Click **Approve/Reject** button from the *Calculation Dataset* grid.

   The Calculation Dataset window is displayed.
3. Click **Approve** or **Reject** button.
   - Upon approving, the Calculation Dataset definition is made available for Dataset modelling. The status of the definition is changed to **Approved**.
   - Upon rejecting, the status of the Calculation Dataset definition is changed to **Rejected**. You can **Edit** this definition further and re-submit for approval.

3.3   Data Preparation

Data Preparation feature aids in moving the following data from the staging area to the processing area:

- Internal losses
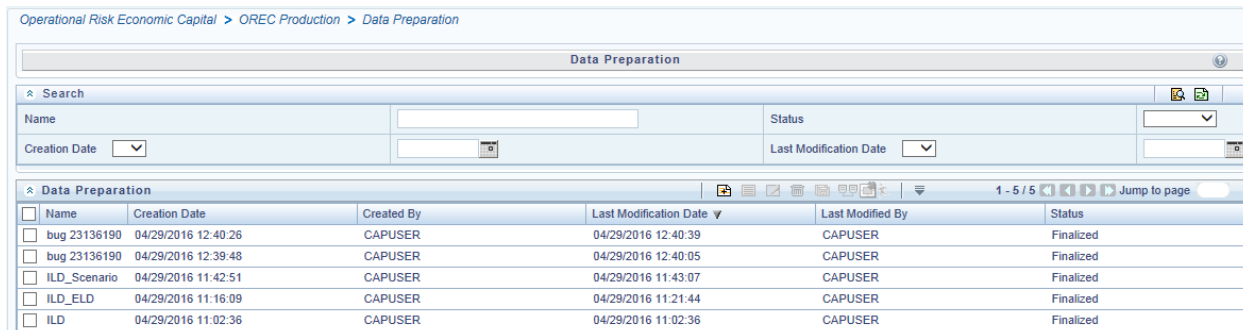
- External losses

- Scenarios

- Insurance policies

Data Preparation includes Internal and External loss data Scaling, Currency Conversion, UOM mapping, and Reclassification. Data Preparation works on all the available data, that is it simultaneously works on Internal, External, and Scenario data based on the availability, at the financial institutions. This data is ready to be modeled and can be consumed by the Sandbox model and the Capital Calculation Run.

3.3.1 Access Data Preparation

You can access Data Preparation from the OFS OREC application left pane as follows:

---

1. Click **OREC Production** under **Operational Risk Economic Capital**.
2. Select **Data Preparation**.

The *Data Preparation* window is displayed on the RHS with the Search Grid and the Data Preparation grid with the list of all the existing definitions.

Operational Risk Economic Capital > OREC Production > Data Preparation					
Data Preparation					

Search

Name			Status		
Creation Date			Last Modification Date		

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|	Name	Creation Date	Created By	Last Modification Date ▼	Last Modified By	Status
☐	bug 23136190	04/29/2016 12:40:26	CAPUSER	04/29/2016 12:40:39	CAPUSER	Finalized
☐	bug 23136190	04/29/2016 12:39:48	CAPUSER	04/29/2016 12:40:05	CAPUSER	Finalized
☐	ILD_Scenario	04/29/2016 11:42:51	CAPUSER	04/29/2016 11:43:07	CAPUSER	Finalized
☐	ILD_ELD	04/29/2016 11:16:09	CAPUSER	04/29/2016 11:21:44	CAPUSER	Finalized
☐	ILD	04/29/2016 11:02:36	CAPUSER	04/29/2016 11:02:36	CAPUSER	Finalized

From the *Data Preparation* window, you can search for existing definitions, create new definitions, view/edit/delete/copy/check dependency/retire existing definitions.

3.3.1.1   Search for Existing Data Preparation Definitions

You can search for existing Data Preparation definitions, based on the search parameters such as Name, Status, Creation Date, and Last Modification Date.

To search for an existing Data Preparation definition, perform the following procedure:

1. Enter one or more details in the Search grid, depending on the fields as tabulated:

Field	Description
Name	Enter the name of the definition which you want to search.
Status	Select the Status of the object which you want to search from the drop down list. The available values are: • Finalized • Retired • Draft
Creation Date	Select <, >, or = from the drop down list and click ▥ to specify the date to search for definitions which are created before, after, or on the specified date.
Last Modification Date	Select <, >, or = from the drop down list and click ▥ to specify the date to search for definitions which are modified before, after, or on the specified date.

2. Click **Search** button from the *Search* grid.

The list of definitions matching with the search criteria are displayed.

3.3.1.2   Adding a Data Preparation Definition

You can create a Data Preparation definition using the Common Parameters, Currency Conversion details, Reclassification Process and Unit of Measure Selection, and Scaling. To initiate the Data Preparation definition creation, perform the following procedure:

All the fields marked in red asterisks (*) are mandatory.

1. Click the **Add** button from the *Data Preparation* grid.

    The *Data Preparation definition* window is displayed.

2. Enter the **Name** of the definition.
3. Select the **Folder** from the drop down list.
4. Enter the definition **Description**.
5. Populate the details under the *Common Parameters* grid, as tabulated:

Field	Description
Data Source	Select the checkbox adjacent to the type of data, which you want to move from staging area to the processing area. ▪ Internal Loss Data ▪ External Loss Data ▪ Scenarios ▪ Insurance Policies Upon selecting the Internal Loss Data or External Loss Data, the Loss Date Type, Near Miss Date Type, and the Legal Loss Date Type fields are enabled.

Field	Description
Custom Filter	Select the values from the drop down list for the following: ▪ Internal Loss Data ▪ External Loss Data ▪ Scenarios ▪ Insurance Policies These custom filters can be defined through the Filter screen of Oracle Financial Services Analytical Applications Infrastructure. This helps in adding more data filters to restrict inclusion/exclusion of data. For more information, refer to Oracle Financial Services Analytical Applications Infrastructure User Guide in OTN Documentation Library.
Loss Data Period	Enter the number of days or the start date and end date, for which you want to move the loss data. ▪ Select the radio button adjacent to Days and enter the number of days. OR ▪ Select the radio button adjacent to Dates and enter the Start Date and End Date.
Scenario Period	Enter the number of days or the start date and end date for the, for which you want to move the scenario. ▪ Select the radio button adjacent to Days and enter the number of days. OR ▪ Select the radio button adjacent to Dates and enter the Start Date and End Date.
Effective Date Type	Select the effective date type from the drop down list. This date is considered for moving loss data. The available values are: ▪ Identification Date ▪ Occurrence Start Date ▪ Occurrence End Date ▪ Accounting Date

6. Select the **Reporting Currency** from the drop down list.
7. Select the **Currency Conversion Rate** as either **Historical Rates** or **Current Rate**.
8. Select the Reclassification Process. To select the Reclassification Process, perform the following procedure:
   a. Click the **Select** button adjacent to the **Reclassification Process** field.

The **Process Selection** window is displayed with the process details such as Segment, Process Name, and Process Code. You can search for the processes using the process name in the *Search* grid.

b. Select the check box adjacent to the process you want to select.
c. Click **Apply** button.

The selected process is displayed in the **Reclassification Process** field.

For more information on Process creation, refer to **Rules Run Framework** section in Oracle Financial Services Analytical Applications Infrastructure User Guide at [OTN Documentation Library](#).

For more information, refer to the Process Documents in [OTN Documentation Library](#).

9. Select the value for **Scaling Required?** field as either **Yes** or **No**, from the drop down list.

Upon selecting **Yes**, the Scaling Inputs filed is displayed with Internal Loss and External Loss fields. The following procedure is applicable only if you have selected **Yes** in the **Scaling Required?** field.

10. Select the check box adjacent to the Internal Loss and/or External Loss fields. The Internal Loss Data and/or External Loss Data tabs are displayed.
11. Click the *Internal Loss Data* tab.
12. Select the value for Scaling Methods from the drop down list. The available values are:
    - **Inflation** – In this method, Scaling is done linearly, based on the inflation index values and number of historical days between actual loss date and reporting date.
        o Select the **Inflation Index** from the drop down list in the *Inflation Parameters* grid if you have selected Inflation as the Scaling Method.
    - **Mean Based** - In this method, mean for each loss period is calculated and each and every loss observation is scaled to have the same mean loss for all the periods.
        o Select the radio button adjacent to either **Entity Level** or **LOB Level** as the value for **Mean Adjustment** in the *Mean Based Scaling* grid.
13. Click the *External Loss Data* tab.
14. Select the value for Scaling Methods from the drop down list. The available values are:
    - **Inflation** – In this method, Scaling is done linearly, based on the inflation index values and number of historical days between actual loss date and reporting date.
    - **Least Squares Method** - In this method, a minimizing function is used to derive the scaling factor. LSM calculations happen at entity – LOB combination. Internal loss data which is intended to be used for Capital Calculation are considered for this. External loss data for each external entity is compared with complete internal loss data and scaling factor is calculated at internal entity – LOB and external entity – LOB levels.
    - **Factor Based Scaling**: This method assumes the existence of a universal power-law relationship between the operational loss amount within a certain time period and the size and exposure towards operational risk within a certain time period in different financial institutions. Various scaling factors such as Gross Income, Asset Size, Profit, Volume of Transaction, and so on which represent the size and exposure can be used. Arriving at scaling factors using this method involves modelling. Therefore, it is calculated in Sandbox and deployed from Sandbox for consumption in Data Preparation.

NOTE: If you intent to use Factor Based Scaling, it expected that the Scaling Model definition is done and it is deployed from the Sandbox. Once deployed, select **Factor Based Scaling** > *External Loss Data* > and then select the deployed Sandbox model.

For more information related to Scaling Modelling and deployment, refer to Scaling section.

Perform the following procedure to select a deployed Scaling model:

a. Select the radio button adjacent to the **Entity Level** or **LOB Level**, at the Factor Applicability field.

b. Click the **Select** button adjacent to the **Model Name** field.

The *Scaling Summary* window is displayed with the deployed Scaling models list. You can search for the Scaling model definitions using the Scaling Model Name, Created By, Modified By, Created Date, or Modified Date, from the *Search* grid.

c. Select the check box adjacent to the Scaling model definition you want to select.

d. Click **Apply** button.

The selected Scaling model is displayed in the **Model Name** field.

- **Direct Download**: In this method, upon execution of the Data Preparation, the scaling factor value is generated through staging. This occurs on the MIS date provided during execution.
   o Select the **Inflation Index** from the drop down list in the *Inflation Parameters* grid if you have selected Inflation as the Scaling Method.

      OR

   o Select the radio button adjacent to either **Entity Level** or **LOB Level** as the value for **Factor Applicability** in the *Factor Based Scaling* grid. Also click the select button adjacent to the **Model Name** field and select Model Name from the *Scaling Summary* window. For more information, refer to Scaling section.

      OR

   o Select the radio button adjacent to either **Entity Level** or **LOB Level** as the value for **Direct Input Level** in the *Direct Input Parameters* grid.

For more details on all the Scaling methods, refer to Appendix A - Internal and External Loss Data Scaling.

Click **Save** button to save the definition anytime during the definition process. Upon clicking **Save** button, the definition details are saved in **Draft** status. You can edit such a definition anytime later.

Click **Submit** button to finish the definition process. Once submitted, the definition is displayed in the *Data Preparation* window. Upon clicking the Submit button, all the validations are performed and the definition is completed. The status of the Submitted definition changes from **Draft** to **Finalized**.

The **Audit Trail** section at the bottom of the window displays the metadata about the definition. The **User Comments** section facilitates you to add or update additional information as comments.

3.3.1.3   Viewing a Data Preparation Definition

You can view an existing Data Preparation definition from the *Data Preparation* window.

To view the details of an existing Data Preparation definition, perform the following procedure.

1. Select the check box adjacent to the Data Preparation definition you want to view.
2. Click **View** button from the *Data Preparation* grid.

The details of the selected definition are displayed in the *Data Preparation* window.

NOTE: You cannot edit any of the fields of the definition while in **View** mode.

3.3.1.4   Editing a Data Preparation Definition

You can edit the details of an existing Data Preparation definition from the *Data Preparation* window.

NOTE: You can edit only those definitions, which are in **Draft** status.

To edit the details of an existing Data Preparation definition, perform the following procedure.
1. Select the check box adjacent to the Data Preparation definition you want to edit.
2. Click **Edit** button from the *Data Preparation* grid.

   The details of the selected definition are displayed in the *Data Preparation* window in edit mode.
3. Edit the required fields of the Data Preparation definition. For more details refer to Adding a Data Preparation Definition section.
4. Click **Save** button to save the definition anytime during the update process. Upon clicking **Save** button, the definition details are saved in **Draft** status. You can again edit such a definition anytime later.
5. Click **Submit** button to finish the definition process. Once submitted, the definition is displayed in the *Data Preparation* window. Upon clicking the Submit button, all the validations are performed and the definition is completed. The status of the Submitted definition changes from **Draft** to **Finalized**.

The details of the definition are updated and the definition is displayed under the *Data Preparation* grid.

3.3.1.5   Copying a Data Preparation Definition

You can copy the details of an existing Data Preparation definition and create a new definition by changing the Name, Description, and Folder details, from the *Data Preparation* window.

To copy the details of an existing Data Preparation definition, perform the following procedure.
1. Select the check box adjacent to the Data Preparation definition you want to copy.
2. Click **Copy** button from the *Data Preparation* grid.

   The Save As window is displayed.
3. Enter the Name, Description, and select the folder from the drop down box for the new definition.
4. Click **OK** button.

   The details of the new definition are saved in **Draft** Status and the definition is displayed under the *Data Preparation* grid. All the definition details except the Name, Description, and Folder remain the same as that of the parent definition. You can edit the definition to update any details of the definition. For more details refer to Editing a Data Preparation Definition section.

3.3.1.6   Checking Dependencies of a Data Preparation Definition

The Data Preparation definitions are used in Dataset Modelling, ELD Scaling, Frequency, Severity, Correlation and Scenario Modelling in Sandbox. It is also used in production models.

You can check the dependency information of individual Data Preparation definitions from the *Data Preparation* window.

To check the dependency information of an existing Data Preparation definition, perform the following procedure.

1. Select the check box adjacent to the Data Preparation definition of which you want to you want to check the dependency information.
2. Click **Check Dependencies** button from the *Data Preparation* grid.

   The dependency information of the selected definition are displayed in the *Dependency Information* window with the details such as Child Object Name, Child Object Type, Folder, Parent Object Name, Parent Object Type, and Folder.

3.3.1.7   Retire a Data Preparation Definition

You can retire an existing Data Preparation definition from the *Data Preparation* window. Before retiring a definition, ensure that the definition does not have any dependencies present. To know more about dependency check, refer Checking Dependencies of a Data Preparation Definition section.

To retire a Data Preparation definition, perform the following procedure.

1. Select the check box adjacent to the Data Preparation definition you want to retire.
2. Click **Retire** button from the *Data Preparation* grid.

   A warning dialog is displayed.
3. Click **Yes** button.

   The selected definitions are retired and the status is changed in the *Data Preparation* window.

3.3.1.8   Run a Data Preparation Definition

You can execute a Data Preparation definition from the *Data Preparation* window.

To run a Data Preparation definition, perform the following procedure.

1. Select the check box adjacent to the Data Preparation definition you want to run.
2. Click **Run** button from the *Data Preparation* grid.

   > **NOTE:** Only those Data Preparations definitions which are in the **Finalized** status can be executed using Run functionality.

   The *Date Selection* dialog is displayed.

3. Click [icon] button and select the date on which you want to execute the Data Preparation definition.
4. Select the Calculation Dataset definition from the drop down list. You can click on the **Browse** button to view the details of the selected Calculation Dataset definition.
5. Click **OK** button. The execution is triggered and a confirmation dialog is displayed.

   Once successfully executed, the data is moved from the Staging area to the Processing area in the Production. This data can be used for modeling purposes in Sandbox. To avail this data for modeling, the same has to be made available in the Sandbox. To know more about moving the data from Production to Sandbox for modelling, refer to *Managing Sandbox* section in Oracle Financial Services Enterprise Modeling User Guide, available at OTN Documentation Library.

For more information on Run management, refer to Rule Run Framework section in Oracle Financial Services Analytical Applications Infrastructure User Guide, available at <u>OTN Documentation Library</u>.

3.3.1.9   Deleting a Data Preparation Definition

You can delete an existing Data Preparation definition from the *Data Preparation* window.

To delete one or more existing Data Preparation definitions, perform the following procedure.

1. Select the check box(es) adjacent to the Data Preparation definition(s) you want to delete.

   NOTE: You can delete only those Data Preparation definitions, which are in **Draft** status.

2. Click **Delete** button from the *Data Preparation* grid.

   A warning dialog is displayed.
3. Click **Yes** button.

   The selected definitions are removed from the *Data Preparation* window.

4   OREC Sandbox Model

Sandbox is the play area where Modellers can model various data using multiple combinations. Once you obtain satisfying results, you can deploy the same for Production purposes. OREC uses Sandbox for modelling Dataset, External Loss Data Scaling, Loss Frequency, Loss Severity, Loss Dependency, Scenario, and Scenario Dependency.

The roles and associated responsibilities in OREC Sandbox are as tabulated:

		Create	Edit	View
OREC Modeler	Frequency Modelling	Yes	Yes	Yes
	Severity Modelling	Yes	Yes	Yes
	Correlation Modelling	Yes	Yes	Yes
	Scenario Modelling	Yes	Yes	Yes
	Dataset Modelling	Yes	Yes	Yes
	External Loss Data Scaling Modelling	Yes	Yes	Yes

4.1   External Loss Data Scaling

Usually, the historical loss data in a financial institution do not completely represent its exposure to operational risk losses because of the following reasons:

- Not having enough historical loss events for estimating reliable parameters.

- No/very less number of high severity losses.

The high severity losses are required to conclude the loss distribution. A good estimation of this conclusion of the loss distribution is essential, especially if the financial institution was exposed to high severity-low frequency losses.

Therefore, the Basel Accord mandates the use of relevant external data in a financial institution's operational risk measurement system. The direct utilization of external data is not practical, since each individual external loss data comes from a financial institution that has its own risk profile and characteristics, such as the size of the financial institution providing the external data, the target-market that a financial institution is concentrating on, the level of control system when events happened, and so on. Also, each Line of Business of a financial institution is very likely to vary to each other in terms of risk profile and internal characteristics. Different financial institutions in size may present a greater or lesser number of loss events or operational loss amount in a certain period of time.

Hence, it is important to scale the external loss data. The scaling mechanism is intended to remove the specific characteristics of the external financial institution, so that the external data can be considered to

have the same characteristics as the internal data. After scaling is performed, external data can be added to financial institution's internal data and both can be used together.

4.1.1 Access Scaling

You can access Scaling from the OFS OREC application left pane as follows:

1. Click the **Sandbox** tab in Oracle Financial Services Analytical Applications Home Page.
2. Select the required Sandbox Infodom from the **Select Sandbox** drop down list.
3. Click **Scaling** under **OREC Sandbox Model**.

   The *Scaling Summary* window is displayed on the RHS with the *Search* Grid and the *Scaling Summary* grid with the list of all the existing definitions.

4.1.1.1 Search for Existing Scaling Definitions

You can search for existing Scaling definitions, based on the search parameters such as Scaling Model Name, Status, Created By, Modified By, Created Date, and Modified Date.

To search for an existing Scaling definition, perform the following procedure:

1. Enter one or more details in the Search grid, depending on the fields, as tabulated:

Field	Description
Scaling Model Name	Enter the name of the definition which you want to search.
Status	Select the Status of the object which you want to search from the drop down list. The available values are: • Retired • Deployed • Deleted • Draft
Created By	Enter the name of the user, to search the definitions that are created by this user.

Field	Description
Modified By	Enter the name of the user, to search the definitions that are modified by this user.
Created Date	Select <, >, or = from the drop down list and click [image] to specify the date to search for definitions which are created before, after, or on the specified date.
Modified Date	Select <, >, or = from the drop down list and click [image] to specify the date to search for definitions which are modified before, after, or on the specified date.

2. Click **Search** button from the Search grid.

   The list of definitions matching with the search criteria are displayed.
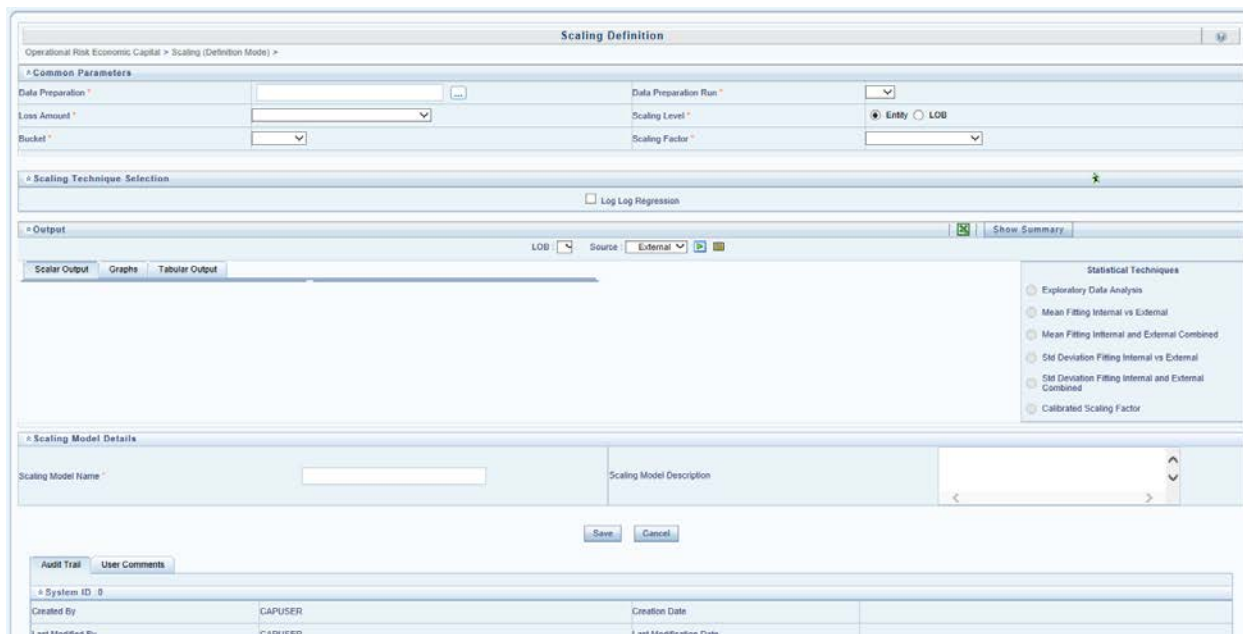
4.1.1.2   Adding a Scaling Definition

You can create a Scaling Definition from the *Scaling Summary* grid by performing the following procedure.

All the fields marked in red asterisks (*) are mandatory.

1. Click the **Add** button from the *Scaling Summary* grid.

   The *Scaling Definition* window is displayed.

2. Click the **Browse** button adjacent to the Data Preparation field to select the Data Preparation definition from the *Data Preparation* window.

NOTE: The Data Preparation definitions are listed in the *Data Preparation* window only if the Status is **Finalized**, loss is not scaled and both Internal Loss Data and External Loss Data are selected while defining the Data Preparation. For more information, refer to Adding a Data Preparation Definition section. Data which comes from Data Preparation undergoes Factor Based Scaling.

3. Select the **Data Preparation Run** from the drop down list adjacent to the **Data Preparation Run** field.
4. Select the **Loss Amount** from the drop down list adjacent to the **Loss Amount** field. The available values are:
   - Net Loss excluding insurance recovery
   - Net Loss
   - Gross Loss
   - Gross Impact
5. Select the radio button adjacent to either **Entity** or **LOB** for **Scaling Level**.
6. Select the value for **Bucket** from the drop down list. The available values are Monthly, Quarterly, and Yearly.
7. Select the value for **Scaling Factor** from the drop down list. The available values are Gross Income, Asset Size, Profit, and Volume of Transaction.

   NOTE: This field is enabled only if you have selected **Entity** as the **Scaling Level**.

8. Populate the values in *Unit Specific Parameters* grid as follows:

   NOTE: The *Unit Specific Parameters* grid is enabled only if you have selected **LOB** as the **Scaling Level**.

   - Select the check box(es) adjacent to the required Line of Business(es).
   - Select the Scaling Factor from the drop down list for each Line of Businesses. The available values are Gross Income, Asset Size, Profit, and Volume of Transaction.
9. Select the check box adjacent to the following default regression technique, from the *Scaling Technique Selection* grid.

   Log Log Regression

   NOTE: Statistical Techniques and Scaling Technique Selection can be enhanced using R registration techniques. To know more about registration of new techniques, refer to Register New Modelling Techniques section.

10. Click the **Execute** button in the *Scaling Technique Selection* grid.
11. Select the Statistical Technique by selecting the radio button adjacent to the available Statistical Techniques by clicking radio button adjacent to each techniques.

    Depending on the Statistical Technique selected, you can view the output in the *Output* grid, on *Scalar Output*, *Graphs*, or *Tabular Output* tabs.

    The Statistical Techniques available are the following:
    - **Exploratory Data Analysis (EDA)** – Selecting EDA displays the output with Statistics, Percentile, and Additional Statistics details. You can select the LOB and the Source (Internal, External, and Internal & External) from the drop down list. Depending on the selection, the data is filtered.

- **Mean Fitting Internal vs External** – Selecting this Statistical Technique displays scatter plot and regression statistics for both Internal and External Loss data separately.

- **Mean Fitting Internal and External Combined** – Selecting this Statistical Technique displays a single scatter plot fitting internal and external loss data together along with regression statistics.

- **Std Deviation Fitting Internal vs External** - This is exactly similar to **Mean Fitting – Internal vs External** except for the mean loss, which is replaced by standard deviation for each bucket.

- **Std Deviation Fitting Internal and External Combined** - This is exactly similar to **Mean Fitting – Internal and External Combined** except for mean loss, which is replaced by standard deviation for each bucket.

- **Calibrated Scaling Factor** – This shows the slope arrived at using Mean and Standard Deviation for internal and external entities.

	Mean	Standard Deviation	Average
Slope : Internal	(a)	(b)	[(a)+(b)] / 2
Slope : External	(c)	(d)	[(c)+(d)] / 2

From the *Output* grid, you can also perform the following:

- Click **Show Summary** button to view the Scaling LOB Summary and to create models for various LOBs. From the *Scaling LOB Summary* window, you can select the checkbox adjacent to the Serial Numbers of the Line of Business, and click **Model** button from the *LOB Wise Summary* grid to model the Scaling for the selected Scaling LOB. To understand the process of modelling based on LOBs from the *Scaling LOB Summary* screen, refer to the following procedure:

  The *Scaling Summary* screen is displayed with **Scaling Model Name** and **Scaling Model Description** under the *Scaling Model Details* grid.
    i. Select the checkbox adjacent to the Line of Business, which you want to model.
    ii. Click **Model** button from the *LOB Wise Summary* grid.

    The *Scaling Definition* screen is displayed.
    iii. Initiate Modelling. For more details, refer to Adding a Scaling Definition section.

12. Enter the name of the Scaling definition in the **Scaling Model Name** under *Scaling Model Details* grid.
13. Enter the description of the Scaling definition in the **Scaling Model Description** field.
14. Click **Save** button. The definition is saved in **Draft** Status and is displayed under the *Scaling Summary* grid.

For more details on the functionality, refer to the Appendix A - Internal and External Loss Data Scaling.

The **Audit Trail** section at the bottom of the window displays the metadata about the definition. The **User Comments** section facilitates you to add or update additional information as comments.

4.1.1.3 Viewing a Scaling Definition

You can view an existing Scaling definition from the *Scaling Summary* window.

To view the details of an existing Scaling definition, perform the following procedure.

1. Select the check box adjacent to the Scaling definition you want to view.
2. Click **View** button from the *Scaling Summary* grid.

The details of the selected definition are displayed in the *Scaling Summary* window.

NOTE: You cannot edit any of the fields of the definition while in **View** mode.

You can click on the **View Details** button present in the *LOB Wise Summary* grid to view the detailed output summary in the *Output Summary* window.

Perform the following procedure to view various reports:

- Select the Source from the drop down list either as **Internal** or **External**.

- Select the required Statistical Technique from the drop down list adjacent to the **Statistical Technique** field.

- Click **Apply** button.

The *Image Outputs*, *Tabular Outputs*, and *Scalar Outputs* grids are populated with relevant results.

You can view multiple results simultaneously after populating these using various **Source** - **Statistical Technique** combination.

You can also click on the graphs in *Image Outputs* grid to zoom and enhance the graphs.

4.1.1.4 Editing a Scaling Definition

You can edit the details of an existing Scaling definition from the *Scaling Summary* window.

To edit the details of an existing Scaling definition, perform the following procedure.

1. Select the check box adjacent to the Scaling definition you want to edit.

> **NOTE:** You can edit only those definitions, which are in **Draft** status.

2. Click **Edit** button from the *Scaling Summary* grid.

   The LOB Wise Summary details of the selected definition are displayed in the *Scaling Summary* window in edit mode.
3. Select the check box adjacent to the serial number of the required LOB.
4. Click **Model** button. The *Scaling Definition* window is displayed.
5. Edit the required fields of the Scaling definition. For more details refer to Adding a Scaling Definition section.
6. Click **Save** button.

   The details of the definition are updated and the definition is displayed under the *Scaling Summary* grid.

4.1.1.5 Deleting a Scaling Definition

You can delete an existing Scaling definition from the *Scaling Summary* window.

To delete one or more existing Scaling definitions, perform the following procedure.

1. Select the check box(s) adjacent to the Scaling definition(s) you want to delete.
2. Click **Delete** button from the *Scaling Summary* grid.

> **NOTE:** You can delete only those definitions, which are in **Draft** status.

   A warning dialog is displayed.
3. Click **Yes** button.

   The selected definitions are removed from the *Scaling Summary* window.

4.1.1.6 Copying a Scaling Definition

You can copy the details of an existing Scaling definition and create a new definition by changing the Name and Description.

To copy the details of an existing Scaling definition, perform the following procedure.

1. Select the check box adjacent to the scaling definition you want to copy.
2. Click **Copy** button from the *Scaling Summary* grid.

   The Save As window is displayed.
3. Enter the Name and Description for the new Scaling definition.
4. Click **OK** button.

   The details of the definition are saved and the definition is displayed under the *Scaling Summary* grid. All the definition details except the Name and Description remain the same as that of the

parent definition. You can edit these definition details later. For more information, refer to [Editing](#) [a Scaling Definition](#) section.

4.1.1.7   Retire a Scaling Definition

You can retire an existing Scaling definition from the *Scaling Summary* window.

To retire a Scaling definition, perform the following procedure.

1. Select the check box adjacent to the Scaling definition you want to retire.

NOTE: You can retire only those Scaling definitions which are in **Deployed** status.

---

2. Click **Retire** button from the *Scaling Summary* grid.

    A warning dialog is displayed.
3. Click **Yes** button.

    The selected definitions are retired and the status is changed to **Retired**, in the *Scaling Summary* window.

4.1.1.8   Deploy a Scaling Definition

You can deploy a Scaling definition from the *Scaling Summary* window.

To deploy a Data Preparation definition, perform the following procedure.

1. Select the check box adjacent to the Scaling definition you want to deploy.

NOTE: You can deploy only those definitions, which are in **Draft** status.

---

2. Click **Deploy** button from the *Scaling Summary* grid.

    The execution is triggered and a confirmation dialog is displayed.

4.2   Calculation Dataset Modelling

The Calculation Dataset which is defined in Production Infodom can be modelled in Sandbox Infodom. That is the data derived as per the Calculation Dataset defined in production Infodom can be modelled in Sandbox to check the behavior. The Dataset Modelling in Sandbox Infodom facilitates the following:

*   Different UOM combinations can be tried out to decide the best UOMs that can be used to merge, based on their data nature.
*   The time window for each UOM can be decided. This can be over and above the minimum time window specified by Dataset in Production. This flexibility overcomes the data scarcity problem in some UOMs.
*   Decide the De-Minimis threshold for different UOMs. This is required for severity modelling.
*   Decide whether to include the near miss, gains, pending losses, and so on at each UOM.
*   Conduct the following statistical tests to decide the preceding points:
    *   Exploratory Data Analysis
    *   Auto Correlation
    *   Inter Arrival Plot
    *   Threshold Analysis
    *   KS Test - 2 Sample

      o   AD Test - 2 Sample

      o   Cramer Test - 2 Sample

NOTE: All these statistical techniques are defined in R. To register R techniques, after implementation of the application, you can use the Enterprise Modeling module of OFSAAI. For more information on registration of R techniques and Enterprise Modeling, refer to Oracle Financial Services Enterprise Modeling User Guide, available at OTN Documentation Library. After the registration, the technique must be mapped with the distribution.

After all the statistical tests, the Dataset is finalized by deploying the same. Once the Dataset is deployed, it updates the Dataset definition in Production Infodom, which was used in Sandbox for modeling, with the following information:

- UOM level time window
- UOM level De-Minimis Threshold
- UOM level near miss, gain event, and pending losses inclusion / exclusion

A Calculation Dataset definition in Production, which is **Pending Modelling** status can be modelled through the *Calculation Dataset Modelling* module in Sandbox. After deploying, the status of the definitions change to **Pending Approval** in Production. Status of a Calculation Dataset in Sandbox changes to **Deployed** upon deploying the Dataset.

4.2.1 Access Dataset Modelling

You can access DataSet Modelling from the OFS OREC application left pane as follows:

1. Click the **Sandbox** tab in Oracle Financial Services Analytical Applications Home Page.
2. Select the required Sandbox Infodom from the **Select Sandbox** drop down list.
3. Click **Calculation DataSet Modelling** under **OREC Sandbox Model**.

The *Dataset Modelling* window is displayed on the RHS with the *Search* Grid and the *Dataset Modelling* grid with the list of all the existing definitions.

From the *Dataset Modelling* window, you can search for existing definitions, create new definitions, view/edit/delete/copy existing definitions.

4.2.1.1   Search for Existing Dataset Modelling Definitions

You can search for existing Dataset Modelling definitions, based on the search parameters such as Name, Status, Approved By, Modified By, Approved On, and Created On.

To search for an existing Dataset Modelling definition, perform the following procedure:

1. Enter one or more details in the Search grid, depending on the fields, as tabulated:

Field	Description
Name	Enter the name of the definition which you want to search.
Status	Select the Status of the object which you want to search from the drop down list. The available values are: • Pending Modelling • Pending Approval • Approved • Rejected • Retired • Draft
Created By	Enter the name of the user, to search the definitions that are created by this user.
Created On	Select <, >, or = from the drop down list and click 🔳 to specify the date to search for definitions which are created before, after, or on the specified date.
Modified By	Enter the name of the user, to search the definitions that are modified by this user.
Modified On	Select <, >, or = from the drop down list and click 🔳 to specify the date to search for definitions which are modified before, after, or on the specified date.

2. Click **Search** button from the *Search* grid.

   The list of definitions matching with the search criteria are displayed.

4.2.1.2   Adding a Dataset Modelling Definition

You can create a Dataset Modelling definition using the Common Parameters, Unit Specific Parameters, and so on. To initiate the Dataset Modelling definition creation, perform the following procedure:

All the fields marked in red asterisks (*) are mandatory.

1. Click the **Add** button from the *Dataset Modelling* grid.

   The *Dataset Modelling* window is displayed.
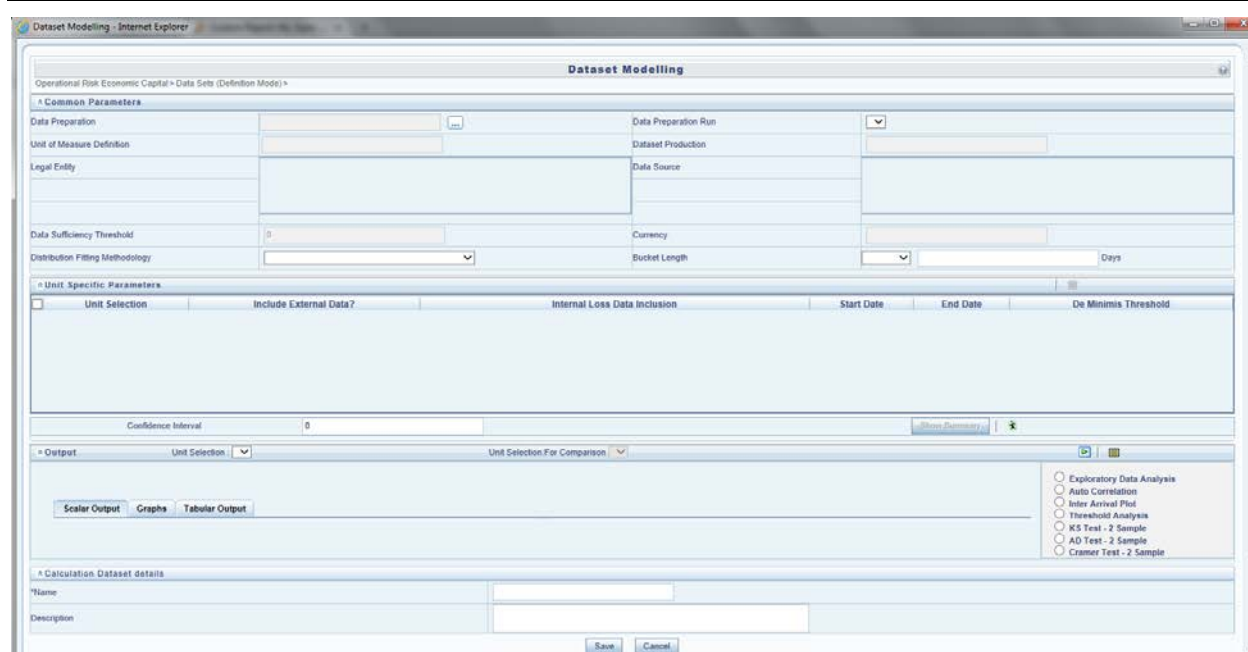
2. Click the **Browse** button to select the Data Preparation definition from the *Data Preparation* window.
3. Select the **Data Preparation Run** from the drop down list.
4. The **Unit of Measure Definition, Dataset** (from Production), **Legal Entity**, **Data Source**, **Data Sufficiency Threshold**, and **Currency** fields are auto populated, depending on the selected Data Preparation and Data Preparation Run. The Dataset populated here ca be modeled.

   You can click on the selected Data Preparation, Unit of Measure Definition, and Dataset Production to view the details.

5. Select the **Distribution Fitting Methodology** from the drop down list. This method is used during Frequency and Severity modelling. The available values are the following:

   ▪ Maximum Likelihood Estimate L-BFGS-B

   ▪ Maximum Likelihood Estimate Neldar Mead

   ▪ Maximum Likelihood Estimate Conjugate Gradient

   ▪ Maximum Likelihood Estimate BFGS

6. Select the **Bucket Length** in days from the drop down list. Bucketed data as per the selection is used for processing.
7. Select the check box(s) adjacent to the **Unit Selections** under *Unit Specific Parameters* grid and perform the following:
   - Select the value for **Include External Data?** field as **Yes** or **No** from the dropdown list. This allows for inclusion of external data for Units where internal data is not sufficient.
   - Click the **Browse** button adjacent to the **Internal Loss Data Inclusion** field to select the value and click **Apply** button. The values displayed here is dependent on the selected Calculation Dataset from production and inclusion as allowed by that can be selected here. The values are listed from the following set of values:

     ▪ Near Misses

- Gain Events

- Pending Legal Losses

- Pending Other Losses

- Bulk Losses

- Click ▣ button and select the **Start Date** of the Unit Selection. Start Date is defaulted based on the window selected in the selected Calculation Dataset. Window period can be increased for UOMs by moving the start date backwards. This should be within the larger data preparation window. This provides flexibility to increase data points.
- End Date for the Unit Selection is displayed based on the end date from the selected Calculation Dataset. This field cannot be edited. This is to avoid excluding latest data.
- Enter the **De Minimis Threshold** value. Data will be truncated based on this and sent for execution. This value is required for using either truncated or shifted distributions in Severity modelling.
- Enter the **Lower Bound** and **Upper Bound** values if Inter Quartile Range is selected. Lower Bound and Upper Bound values are calculated automatically (but editable) if scaling factor is provided in Dataset in Production. All values below and above lower and upper bound are replaced with lower and upper bound values during processing. This column is applicable only if IQR is selected.

8. Enter the confidence interval in the **Confidence Interval** field.
9. Click the **Execute** button from the *Output* grid. Input values and filters as selected are applied and data is sent for processing. R statistical models are created and executed for the selected values. Successful execution generates the required output.
10. Select the **Unit Selection** from the drop down list.
11. Select the required output. The available values are the following:
    - Exploratory Data Analysis
    - Auto Correlation
    - Inter Arrival Plot
    - Threshold Analysis
    - KS Test - 2 Sample
    - AD Test - 2 Sample
    - Cramer Test - 2 Sample
12. Click **View** button from the *Output* grid to view the outputs. You can change the inputs such as start date, bounds, de –minimis threshold and re-execute to re-generate the results. This is an iterative process which helps to finalize the input parameters which are used for frequency, severity and correlation models later.
13. Enter the Calculation Dataset Model Name in the **Name** field.
14. Enter the description in the **Description** field.
15. Click **Save** button to save the model definition. The saved definition is saved in **Draft** status and is displayed in *Dataset Modelling* window.

The **Audit Trail** section at the bottom of the window displays the metadata about the definition. The **User Comments** section facilitates you to add or update additional information as comments.

4.2.1.3   Viewing a Calculation Dataset Definition

You can view an existing Calculation Dataset definition from the *Calculation Dataset* window.

To view the details of an existing Calculation Dataset definition, perform the following procedure.

---

1. Select the check box adjacent to the Calculation Dataset definition you want to view.
2. Click **View** button from the *Calculation Dataset* grid.

   The details of the selected definition are displayed in the *Datasets* window.

   NOTE: You cannot edit any of the fields of the definition while in **View** mode.

   You can click on the **View Details** button present in the *Unit Specific Parameters* grid to view the detailed output summary in the *Output Summary* window.
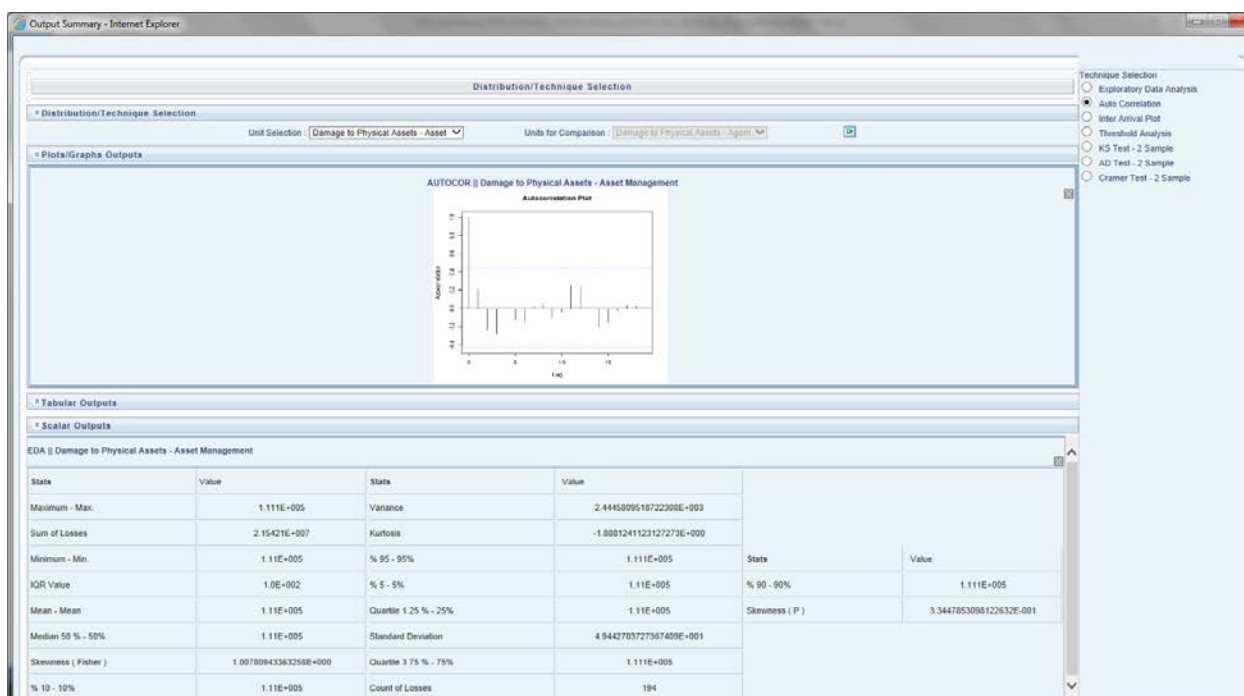
   Perform the following procedure to view various reports:

   - Select the value for **Technique Selection** from the drop down list.

   - Select the value for **Unit Selection** from the drop down list.

   - Select the value for **Units for Comparison** from the drop down list.

   - Click **Apply** button.

   The *Plots/Graphs Outputs*, *Tabular Outputs*, and *Scalar Outputs* grids are populated with relevant results.

   You can view multiple results simultaneously after populating these using various **Unit Selection** - **Units for Comparison** - **Statistical Technique** combination.

   You can also click on the graphs in *Image Outputs* grid to zoom and enhance the graphs.

4.2.1.4   Editing a Calculation Dataset Definition

You can edit the details of an existing Calculation Dataset definition from the *Calculation Dataset* window.

To edit the details of an existing Calculation Dataset definition, perform the following procedure.

1. Select the check box adjacent to the Calculation Dataset definition you want to edit.

   NOTE: You can edit a Calculation Dataset only when it is in **Draft** status.

2. Click **Edit** button from the *Calculation Dataset* grid.

   The details of the selected definition are displayed in the *Calculation Dataset* window in edit mode.
3. Select the checkbox adjacent to the Unit Selection, for which you want to define a model.
4. Click **Model** button from the *Unit Wise Summary* grid.
   The *Dataset Modelling* screen is displayed.
5. Initiate the Calculation Dataset Model definition. For more details refer to Adding a Calculation Dataset Definition section.
6. Click **Save** button.

   The details of the definition are updated and the definition is displayed under the *Calculation Datasets* grid.

4.2.1.5   Deploy a Dataset Modelling Definition

You can deploy a Dataset Modelling definition from the *Dataset Modelling* window.

To deploy a Dataset Modelling definition, perform the following procedure.
1. Select the check box adjacent to the Dataset Modelling definition you want to deploy.

   NOTE: You can deploy only those Calculation Dataset definitions which are in **Draft** status.

2. Click **Deploy** button from the *Dataset Modelling* grid. The *Modelling Dataset Summary* window is displayed.
3. Click **Deploy** button. Click **Yes** in the confirmation dialog.

   The execution is triggered and a confirmation message is displayed. The status of the deployed modelling definition changes to **Deployed**.

4.2.1.6   Retire a Dataset Modelling Definition

You can retire an existing Dataset Modelling definition from the *Dataset Modelling* window.

To retire a Dataset Modelling definition, perform the following procedure.
1. Select the check box adjacent to the Dataset Modelling definition you want to retire.

   NOTE: You can retire only those Calculation Dataset definitions which are in **Deployed** status.

2. Click **Retire** button from the *Dataset Modelling* grid.

   A confirmation dialog is displayed.
3. Click **Yes** button.

   The selected definition is retired and the status is changed to **Retired** in the *Dataset Modelling* window.

4.2.1.7   Copying a Dataset Modelling Definition

You can copy the details of an existing Calculation Dataset definition and create a new definition by changing the Name, Description, and Folder details, from the *Calculation Dataset* window.

To copy the details of an existing Calculation Dataset definition, perform the following procedure.

1. Select the check box adjacent to the Calculation Dataset definition you want to copy.
2. Click **Copy** button from the *Calculation Dataset* grid.

    The *Save As* window is displayed.
3. Enter the Name and Description for the new definition.
4. Click **OK** button.

    The details of the definition are saved and the definition is displayed in *Dataset Modelling* window in **Draft** status. All the definition details except the Name and Description remain the same as that of the parent definition.

4.2.1.8   Deleting a Dataset Modelling Definition

You can delete an existing Dataset Modelling definition from the *Dataset Modelling* window.

To delete one or more existing Dataset Modelling definitions, perform the following procedure.

1. Select the check box(s) adjacent to the Dataset Modelling definition(s) you want to delete.

    NOTE: You can delete only those Calculation Dataset definitions which are in **Draft** status.

2. Click **Delete** button from the *Dataset Modelling* grid.

    A warning dialog is displayed.
3. Click **Yes** button.

    The selected definitions are removed from the *Dataset Modelling* window.

4.3   Frequency Modelling

OREC modeling is about modeling count of events and modeling loss amount if event happens. Essentially these are two separate processes. Loss Estimation which strongly depends loss identifications and loss categorization. Bound within these two variables, one can put upper and lower limits of expected operational risk losses in future. However, count of such losses strongly depends on process control. These two aspects make the analysis of losses separated into two broad sections of frequency and severity.

4.3.1   Access Frequency Modelling

You can access Frequency Modelling from the OFS OREC application left pane as follows:

1. Click the **Sandbox** tab in Oracle Financial Services Analytical Applications Home Page.
2. Select the required Sandbox Infodom from the **Select Sandbox** drop down list.
3. Click **Frequency Modelling** under **OREC Sandbox Model**.

The *Frequency Modelling* window is displayed on the RHS with the *Search* Grid and the *Frequency Modelling* grid with the list of all the existing definitions.

Frequency Modelling							
Search							
Name		Status					
Created By		Created Date	▽				
Modified By		Modified Date	▽				
Deployed By		Deployed Date	▽				

Frequency Models						1 - 2 / 2 Jump to page	
☐ Name	Status	Created By	Created Date	Modified By	Modified Date ▽	Deployed By	Deployed Date
☐ TEST1	Draft	CAPUSER	05/09/2016 14:05:30	CAPUSER	05/12/2016 22:19:32		
☐ output test	Draft	CAPUSER	05/10/2016 11:53:07	CAPUSER	05/10/2016 11:53:07		

From the *Frequency Modelling* window, you can search for existing definitions, create new definitions, view/edit/delete/copy/check dependency/retire/deploy existing definitions.

4.3.1.1 Search for Existing Frequency Modelling Definitions

You can search for existing Frequency Modelling definitions, based on the search parameters such as Name, Status, Created By, Created Date, Modified By, Modified Date, Deployed By, and Deployed Date.

To search for an existing Frequency Modeling definition, perform the following procedure:

1. Enter one or more details in the Search grid, depending on the fields as tabulated:

Field	Description
Name	Enter the name of the definition which you want to search.
Status	Select the Status of the object which you want to search from the drop down list. The available values are: • Retired • Deployed • Draft
Created By	Enter the name of the user, to search the definitions that are last created by this user.
Created Date	Select <, >, or = from the drop down list and click 🗓 to specify the date to search for definitions which are created before, after, or on the specified date.
Modified By	Enter the name of the user, to search the definitions that are last modified by this user.
Modified Date	Select <, >, or = from the drop down list and click 🗓 to specify the date to search for definitions which are modified before, after, or on the specified date.
Deployed By	Enter the name of the user, to search the definitions that are last deployed by this user.

Field	Description
Deployed Date	Select <, >, or = from the drop down list and click [icon] to specify the date to search for definitions which are deployed before, after, or on the specified date.

2. Click **Search** button from the Search grid.

   The list of definitions matching with the search criteria are displayed.

4.3.1.2   Adding a Frequency Modelling Definition

You can create a Frequency Modelling definition using the Common Parameters, Unit Specific Parameters, Frequency Distribution Selection, Output, and Frequency Model Details. To initiate the Frequency Modelling definition creation, perform the following procedure:

All the fields marked in red asterisks (*) are mandatory.

1. Click the **Add** button from the *Frequency Modelling* grid.

   The *Frequency Modelling* definition window is displayed.

2. Select the radio button adjacent to either **Fit Distribution for Each UOM Individually** or **Fit Distribution for All UOMs together**.

   If **Fit Distribution for Each UOM Individually** is selected, then user can select one/few UOMs at a time and apply different filters/parameters. If **Fit Distribution for All UOMs together** is selected, then the Unit Selection is disabled under Unit Specific Parameters grid and the field displays **All**.

3. Click the **Browse** button to select the Data Preparation definition from the *Data Preparation* window.

4. Select the **Data Preparation Run** from the drop down list.

Upon selecting the Data Preparation Run, the **UOM Definition**, **Calculation Data Set**, and **Bucket Length** fields are auto populated with the respective values, depending on the Data Preparation and Data Preparation Run you have selected.

The Calculation Dataset in Production is picked, depending on the UOM definition selected. This Calculation Dataset should be in **Approved** status. You can click on the populated UOM definition and Calculation Dataset definition to open and view the mapping details and definition details respectively.

Along with this, the Unit Specific Parameters are also displayed under the *Unit Specific Parameters* grid.

You can click on the selected Data Preparation, UOM definition, and Calculation Dataset to view the details in a new window.

5. Select the check box adjacent to the Unit Selections under the *Unit Specific Parameters* grid and update the following:

   - **Internal Loss Data Inclusion**: Click the **Browse** button adjacent to the text field in the Internal Loss Data Inclusion column to pick the Internal Loss Data Inclusion. The Internal Loss Data Inclusion is dependent on the Calculation Dataset definition selected.

     If one UOM is selected in Unit selection, then this field is populated with the UOM level inclusion from data set, selected in *Common Parameters* grid.

   - **Start Date** and **End Date**: The Start Date and End Date are fetched and displayed from the selected Calculation Dataset. This time window can be expanded by updating the Start Date. But you cannot scale down the time window or edit the End Date.

     Also, the Start date cannot be expanded beyond the Start date of the Data Preparation definition.

   - **BEICF Scale Adjustment Factor**: Separate adjustment factor for each UOM can be provided. You can enter a positive number with two decimal places. You can adjust the scale parameter of the distribution to reflect the current Business Environment and Internal Control Factors, though this is optional. Adjustment happens during capital calculation though BEICF adjusted scale can be seen in the summary page

   - **BEICF Shape Adjustment Factor**: Separate adjustment factor for each UOM can be provided. You can enter a positive number with two decimal places. You can adjust the shape parameter of the distribution to reflect the current Business Environment and Internal Control Factors, though this is optional. Adjustment happens during capital calculation though BEICF adjusted scale can be seen in the summary page.

NOTE: It is possible to update the individual Unit Specific Parameters only if you have selected Fit Distribution for Each UOM Individually under *Common Parameters* grid. If you have selected Fit Distribution for All UOMs together, all the parameters are updated simultaneously.

---

6. Select the Frequency Distribution Selection as **Poisson**, **Binomial**, and/or **Negative Binomial**.
7. Click **Execute** button. Upon executing the definition, the various parameters you have provided in the definition are processed to generate the output, by the R engine.

After successful execution, you can view the results in the *Output* grid, after setting the required output display criteria. You can change the input parameters and re-execute to re-generate fresh output. This is an interative process.

Select the Unit Selection and Frequency Distribution Selection from the drop down list. This is to view the outputs for different UOMs and Frequency Distributions you have selected.

8. Select the radio button adjacent to the following to view the respective outputs:
   - Exploratory Data Analysis
   - Fitting Outputs
   - PDF CDF Graph
   - P-P Plot
   - Q-Q Plot
   - Auto Correlation Graph
   - Inter-Arrival Graph
   - Goodness of Fit Statistics
9. (Optional) Click **Show Summary** button to view the Unit Wise Summary details and to create models for various Units.

   The details are displayed under *Common Parameters* and *Unit Wise Summary* grids in Frequency Modelling window.

   The *Common Parameters* grid displays the details such as Data Preparation, Data Preparation Run, UOM definition, Calculation Dataset, and Bucket Length details.

   The *Unit Wise Summary* grid displays the Unit Selection, Distribution Code, Shape Param Name, Shape Param Value, Scale Param Name, and Scale Param Value details, by default. You also have an option to select the select the columns you want to display under *Unit Wise Summary* grid. To select the required columns, click the **Select** button at the RHS of the *Unit Wise Summary* grid, select the check boxes adjacent to the required columns, and click **Done** button.
   a. Select the checkbox adjacent to the Unit Selection, for which you want to define a model.
   b. Click **Model** button from the *Unit Wise Summary* grid.
   c. The *Frequency Modelling* screen is displayed.
   d. Initiate the Frequency Model definition. For more details, refer to Adding a Frequency Modelling Definition section.
10. Enter the Frequency Model Name in the **Frequency Model Name** field.
11. Enter the description in the **Frequency Model Description** field.
12. Select the Frequency Distribution value from the drop down list. The available values are Poisson, Binomial, and Negative Binomial.
13. Click **Save** button. Upon clicking the **Save** button, the definition details are saved in **Draft** status after performing all the validations and is displayed in the *Frequency Modelling* screen.

   The **Audit Trail** section at the bottom of the window displays the metadata about the definition. The **User Comments** section facilitates you to add or update additional information as comments.

Frequency Model Processing

The following are the steps involved in Frequency Modelling.
- Based on the Data Preparation filter, the internal loss data to be used is identified.
- Based on the Data set selected, those Dataset filters are applied across UOMs.
- The data sufficiency threshold filter is checked from Data set and is validated.

- UOM wise date window / bucket days are available from Data set. If dates are changed in Frequency model, this is used as the new filter. Dates can be increased in Frequency modelling.
- The internal loss data is bucketed as per the time bucket length chosen. Bucketing happens backwards starting from the End Date. If the last bucket is smaller (in days) than 50% of other buckets, then it is clubbed into last but one bucket. If the last bucket is more than 50% of the other buckets (in days), then it is treated as a separate bucket.
- The count of losses in each of the buckets are calculated.
- The bucket wise count of losses (ascending date wise) are passed as input to R for fitting various distributions and other goodness of fit tests.
- The results are displayed in the output area.
- You can finalize the distribution for all UOMs by checking the output of various distributions.

4.3.1.3   Viewing a Frequency Modelling Definition

You can view an existing Frequency Modelling definition from the *Frequency Modelling* window.

To view the details of an existing Frequency Modelling definition, perform the following procedure.
1. Select the check box adjacent to the Frequency Modelling definition you want to view.
2. Click **View** button from the *Frequency Modelling* grid.

The details of the selected definition are displayed in the *Frequency Modelling* window.

NOTE: You cannot edit any of the fields of the definition while in **View** mode.

You can click on the **View Charts** button present under the *Unit Wise Summary* grid to view the detailed output summary in the *Output Summary* window.
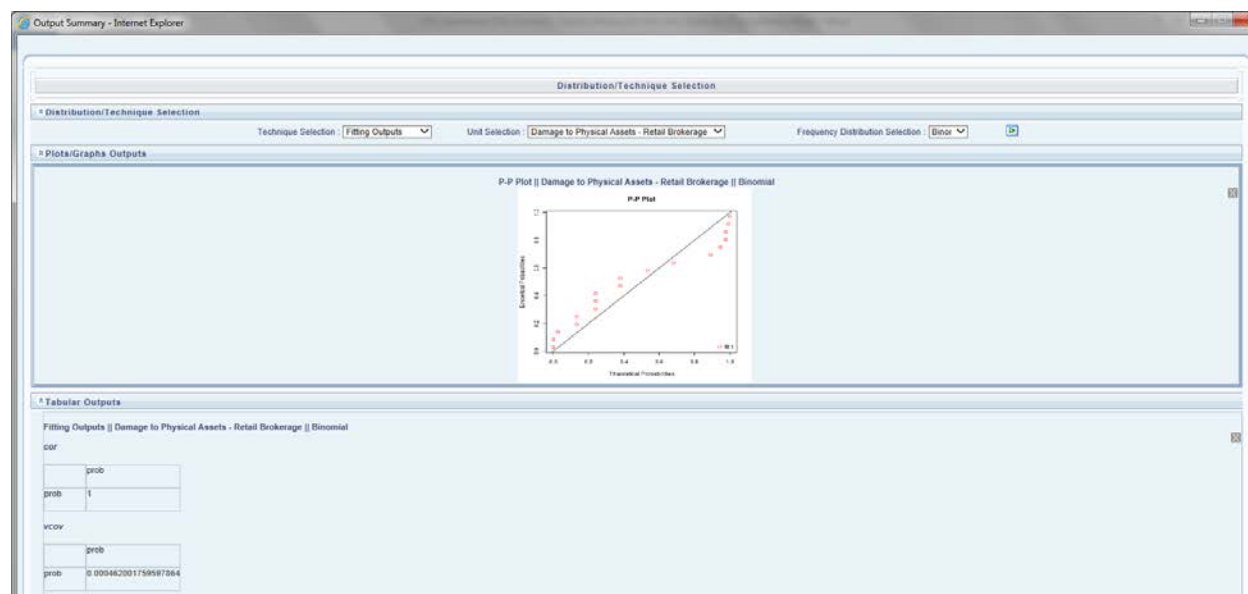
Perform the following procedure to view various reports:

- Select the required technique from the drop down list adjacent to the **Technique Selection** field.

- Select the value for **Unit Selection** from the drop down list.

- Select the value for **Frequency Distribution Selection** from the drop down list.

- Click **Apply** button.

The *Plots/Graphs Outputs*, *Tabular Outputs*, and *Scalar Outputs* grids are populated with relevant results.

You can view multiple results simultaneously after populating these using various **Technique** - **Unit Selection** - **Frequency Distribution** combination.

You can also click on the graphs in *Image Outputs* grid to zoom and enhance the graphs.

4.3.1.4   Editing a Frequency Modelling Definition

The edit functionality from the *Frequency Modelling* window enables you to define Frequency Models for various Units present in an existing Frequency Model definition.

NOTE: You can edit only those definitions, which are in **Draft** status.

To edit the details of an existing Frequency Modelling definition, perform the following procedure.
1. Select the check box adjacent to the Frequency Modelling definition you want to edit.
2. Click **Edit** button from the *Frequency Modelling* grid.

   The UOM details of the selected definition are displayed in the *Frequency Modelling* window. The details are displayed under *Common Parameters* and *Unit Wise Summary* grids.

   The *Common Parameters* grid displays the details such as Data Preparation, Data Preparation Run, UOM definition, Calculation Dataset, and Bucket Length details.

   The *Unit Wise Summary* grid displays the Unit Selection, Distribution Code, Shape Param Name, Shape Param Value, Scale Param Name, and Scale Param Value details, by default. You also have an option to select the select the columns you want to display under *Unit Wise Summary* grid. To select the required columns, click the **Select** button at the RHS of the *Unit Wise Summary* grid, select the check boxes adjacent to the required columns, and click **Done** button.
3. Select the checkbox adjacent to the Unit Selection, for which you want to define a model.
4. Click **Model** button from the *Unit Wise Summary* grid.
   The *Frequency Modelling definition* screen is displayed.
5. Initiate the Frequency Model definition. For more details, refer to [Adding a Frequency Modelling Definition](#) section.

   The **Audit Trail** section at the bottom of the window displays the metadata about the definition. The **User Comments** section facilitates you to add or update additional information as comments.

4.3.1.5   Copying a Frequency Modelling Definition

You can copy the details of an existing Frequency Modelling definition and create a new definition by changing the Name and Description, from the *Frequency Modelling* window.

To copy the details of an existing Frequency Modelling definition, perform the following procedure.
1. Select the check box adjacent to the Frequency Modelling definition you want to copy.
2. Click **Copy** button from the *Frequency Modelling* grid.

The *Save As* window is displayed.

3. Enter the Name and Description for the new definition.
4. Click **OK** button.

The details of the new definition are saved in **Draft** Status and the definition is displayed under the *Frequency Modelling* grid. All the definition details except the Name and Description remain the same as that of the parent definition. You can edit the definition to update any details of the definition. For more details refer to Editing a Frequency Modelling Definition section.

4.3.1.6 Checking Dependencies of a Frequency Modelling Definition

You can check the dependency information of individual Frequency Modelling definitions from the *Frequency Modelling* window.

To check the dependency information of an existing Frequency Modelling definition, perform the following procedure.

1. Select the check box adjacent to the Frequency Modelling definition of which you want to you want to check the dependency information.
2. Click **Check Dependencies** button from the *Frequency Modelling* grid.

The dependency information of the selected definition are displayed in the *Dependency Information* window with the details such as Child Object Name, Child Object Type, Folder, Parent Object Name, Parent Object Type, and Folder.

4.3.1.7 Retire a Frequency Modelling Definition

You can retire an existing Frequency Modelling definition from the *Frequency Modelling* window.

To retire a Frequency Modelling definition, perform the following procedure.

1. Select the check box adjacent to the Frequency Modelling definition you want to retire.

NOTE: You can retire only those Frequency Modelling definitions which are in **Deployed** status.

2. Click **Retire** button from the *Frequency Modelling* grid.
   The details of the definition are displayed.
3. Click **Retire** button in the details window.

A warning dialog is displayed.

4. Click **Yes** button.

The selected definitions are retired and the status is changed to **Retired** in the *Frequency Modelling* window.

4.3.1.8 Deploy a Frequency Modelling Definition

You can deploy a Frequency Modelling definition from the *Frequency Modelling* window.

To deploy a Frequency Modelling definition, perform the following procedure.

1. Select the check box adjacent to the Frequency Modelling definition you want to deploy.
2. Click **Deploy** button from the *Frequency Modelling* grid.

> **NOTE:** Only those Frequency Modelling definitions which are in the **Finalized** status can be deployed.

The execution is triggered and a confirmation dialog is displayed. The status of the definition is changed to **Deployed**.

4.3.1.9   Deleting a Frequency Modelling Definition

You can delete an existing Frequency Modelling definition from the *Frequency Modelling* window.

To delete one or more existing Frequency Modelling definitions, perform the following procedure.

1. Select the check box(es) adjacent to the Frequency Modelling definition(s) you want to delete.
2. Click **Delete** button from the *Frequency Modelling* grid.

    A warning dialog is displayed.
3. Click **Yes** button.

    The selected definitions are removed from the *Frequency Modelling* window.

4.4   Severity

Severity modelling allows modelers to finalize the severity distribution for an UOM after checking EDA, fitting various distributions, checking the parameters, GOF output and other indicators such as PDF, CDF, PP plot, QQ plot. Shifted, truncated, and non-truncated distributions can be fitted. They are mutually exclusive. Single Severity Distribution or EVT covering body distribution and tail distributions is also supported.

4.4.1   Access Severity

You can access Severity from the OFS OREC application left pane as follows:

1. Click the **Sandbox** tab in Oracle Financial Services Analytical Applications Home Page.
2. Select the required Sandbox Infodom from the **Select Sandbox** drop down list.
3. Click **Severity Modelling** under **OREC Sandbox Model**.

    The *Severity Modelling* window is displayed on the RHS with the *Search* Grid and the *Severity Modelling* grid with the list of all the existing definitions.
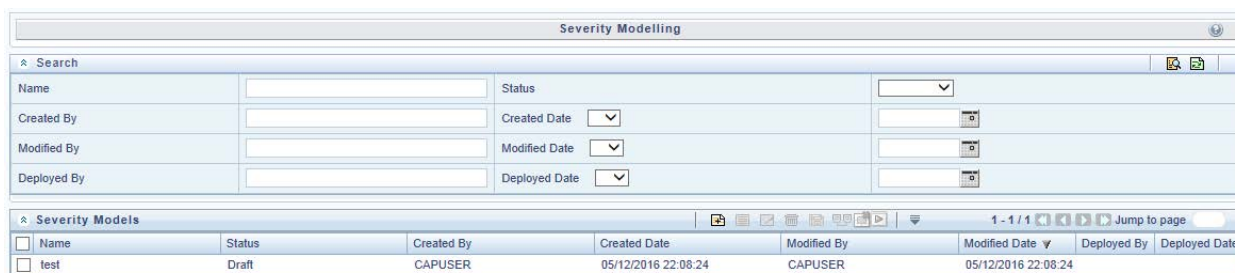
From the *Severity Modelling* window, you can search for existing definitions, create new definitions, view/edit/delete/copy/check dependency/retire existing definitions.

4.4.1.1 Search for Existing Severity Modelling Definitions

You can search for existing Severity Modelling definitions, based on the search parameters such as Name, Status, Created By, Created Date, Modified By, Modified Date, Deployed By, and Deployed Date.

To search for an existing Severity Modelling definition, perform the following procedure:

1. Enter one or more details in the Search grid, depending on the fields as tabulated:

Field	Description
Name	Enter the name of the definition which you want to search.
Status	Select the Status of the object which you want to search from the drop down list. The available values are: • Retired • Deployed • Draft
Created By	Enter the name of the user, to search the definitions that are last created by this user.
Created Date	Select <, >, or = from the drop down list and click 🗓 to specify the date to search for definitions which are created before, after, or on the specified date.
Modified By	Enter the name of the user, to search the definitions that are last modified by this user.
Modified Date	Select <, >, or = from the drop down list and click 🗓 to specify the date to search for definitions which are modified before, after, or on the specified date.
Deployed By	Enter the name of the user, to search the definitions that are last deployed by this user.
Deployed Date	Select <, >, or = from the drop down list and click 🗓 to specify the date to search for definitions which are deployed before, after, or on the specified date.

2. Click **Search** button from the Search grid.

   The list of definitions matching with the search criteria are displayed.

4.4.1.2 Adding a Severity Modelling Definition

You can create a Severity Modelling definition using the Common Parameters, Unit Specific Parameters, Severity Distribution Selection, Output, and Severity Model Details. To initiate the Severity Modelling definition creation, perform the following procedure:

All the fields marked in red asterisks (*) are mandatory.

1. Click the **Add** button from the *Severity Models* grid.

    The *Severity Modelling* definition window is displayed.

2. Click the **Browse** button adjacent to the **Data Preparation** field to select the Data Preparation definition from the *Data Preparation* window.
3. Select the **Data Preparation Run** from the drop down list.

    Upon selecting the Data Preparation Run, the following fields are auto populated:

    -   **UOM Definition**: Based on the data preparation definition selected, UOM definition that is part of the selected data preparation is auto populated. You can click on the UOM name hyperlink to open the UOM definition and see the mapping.
    -   **Calculation Data Set**: The Calculation Dataset in Production is picked, depending on the selected Data Preparation. This Calculation Dataset should be in **Approved** status.
    -   **Data Sufficiency Threshold**: This field is auto populated based on the selected dataset. This field is non-editable.
    -   **Amount Type**: This field is auto populated based on the selected dataset. This field is non-editable.
    -   **Distribution Fitting Methodology**: This field is auto populated based on the selected dataset. This field is non-editable.

    Along with this, the UOM definitions are also displayed under the *Unit Specific Parameters* grid.

    You can click on the selected Data Preparation, UOM Definition, and Calculation Data Set values to view the details in a new window.

4. Enter the **EVT Data Sufficiency Threshold** value.

    The EVT Data Sufficiency Threshold value is required, if you want to use Extreme Value Theory for few UOMs. When you try to use EVT, the sufficiency threshold availability is validated.

5. Select the check box adjacent to the **Unit of Measure**s under the *Unit Specific Parameters* grid and update the following:

- **Include External Data**: This field is auto populated based on the selected dataset. This field is non-editable.
- **Internal Loss Data Inclusion**: If one UOM is selected in Unit selection, then this field is populated with the UOM level inclusion from Data set selected in Common Parameters. You can choose to exclude few or all of them.
- **Start Date** and **End Date**: The Start Date and End Date are fetched and displayed from the UOM Definition. This time window can be expanded by updating the Start Date. But you cannot scale down the time window or edit the End Date.

  Also, the Start date cannot be expanded beyond the Start date of the Data Preparation definition.
- **Shift**: Select either **Yes** or **No**. If shift is selected as **Yes**, then de- Minimis threshold will be deducted from the severity loss numbers before fitting. Post simulation, the shifted number will be added back to the simulated values. This applies to all the selected UOMs.
- **De Minimis Threshold**: This field is auto populated based on the selected dataset. This field is non-editable.
- **EVT Threshold**: Enter the numeric value between 0 and 100 (two decimal places are allowed), which acts as a threshold value when EVT fitment is complete. This applies to all the selected UOMs.

6. Click **Single Severity Distribution** under *Severity Distribution Type* grid, select the values from the **Available Severity Distributions – Body** to **Selected Severity Distributions** and click **Apply** button. The available Severity Distributions are the following:

- Exponential

- Gamma

- Generalized Pareto

- Gumbel

- Left Truncated Exponential

- Left Truncated Gamma

- Left Truncated Gumbel

- Left Truncated Log Gamma

- Left Truncated Log Logistic

- Left Truncated Log Normal

- Left Truncated Pareto

- Left Truncated Weibull

- Log Gamma

- Log Logistic

- Log Normal

- Normal

- Pareto

- Uniform

- Weibull

OR

Click **EVT Fitment** under *Severity Distribution Type* grid, select the values from **Available Severity Distributions – Body** and **Available Severity Distributions - Tail** to **Selected Severity Distributions** and click **Apply** button.

The available Severity Distributions – Body values are the following:

- Exponential

- Gamma

- Generalized Pareto

- Gumbel

- Left Truncated Exponential

- Left Truncated Gamma

- Left Truncated Gumbel

- Left Truncated Log Gamma

- Left Truncated Log Logistic

- Left Truncated Log Normal

- Left Truncated Normal

- Left Truncated Pareto

- Left Truncated Weibull

- Log Gamma

- Log Logistic

- Log Normal

- Normal

- Pareto

- Uniform

- Weibull

The available Severity Distributions – Tail values are the following:

- Exponential

- Gamma

- Generalized Pareto

- ▪ Gumbel

- ▪ Log Gamma

- ▪ Log Logistic

- ▪ Log Normal

- ▪ Normal

- ▪ Pareto

- ▪ Uniform

- ▪ Weibull

7. Click **Execute** button. Upon executing the definition, the various parameters you have provided in the definition are processed to generate the output, by the R engine.

   After successful execution, you can view the results in the *Output* grid, after setting the required output display criteria.

   Select the require Unit Selection, Single Distributions, Selected Body, and Selected Tail from the drop down list and click **Output** button. This is to view the outputs for different UOMs and Frequency Distributions you have selected.

8. Select the radio button adjacent to the following to view the respective outputs:
   - Exploratory Data Analysis
   - Fitting Outputs
   - PDF CDF Graph
   - P-P Plot
   - Q-Q Plot
   - Goodness of Fit Statistics

9. (Optional) Click **Show Summary** button to view the Unit Wise Summary details and to create models for various Units.

   The *Severity Model Details* window is displayed.

   The Severity Model Name, Severity Model Name Description, Calculation Data Set, UOM Definition, Data Sufficiency Threshold, and EVT Data Sufficiency Threshold details are displayed from the definition, under *Parameters* grid.

   The *Unit wise Summary* grid displays the UOM definitions with details such as Unit Name, Include Loss Data, External Loss Data, Start Date, End Date, Lower Bound, Upper Bound, De Minimis threshold, Right Truncation, and Severity Distribution Type-Body.

   You can also click the select button adjacent to the *Unit wise Summary* grid title to select the check boxes adjacent to the required columns and click **Done** button to select the columns to be displayed.

   a. Select the checkboxes adjacent to the Unit Names, for which you want to define a model.
   b. Click **Model** button.
   c. The *Severity Modelling* screen is displayed.
   d. Initiate the Severity Model definition. For more details, refer to Adding a Severity Modelling Definition section.

10. Enter the Severity Model Name in the **Name** field.

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11. Enter the description in the **Description** field.
12. Select the **Severity Distribution** value from the drop down list.
13. Select the **Severity Tail Distribution** value from the drop down list.

> **NOTE:** This filed is enabled on if you have selected a value from **Available Severity Distributions – Tail** list in EVT Fitment.

14. Click **Save** button. Upon clicking the **Save** button, all the validations are performed and the definition details are saved in **Draft** status. The saved definition is displayed in the *Severity Modelling* screen.

The **Audit Trail** section at the bottom of the window displays the metadata about the definition. The **User Comments** section facilitates you to add or update additional information as comments.

Severity Model Processing

The following are the steps involved in Severity Modelling.

- Based on the Data Preparation filter, the loss data to be used is identified (internal & external can be used for severity modelling).
- Based on the Data set selected, those Data set filters are applied across UOMs.
- The data sufficiency threshold is checked from Data set and is validated.
- For EVT fitments, the EVT data sufficiency threshold is checked and validated.
- UOM wise date window / bucket days are available from Dataset. If dates are changed in Severity model, this is used as new filter. Dates can be increased in Severity modelling. Date validations ensure that UOM wise data falls between Data Preparation and Dataset window.
- If Shift is used, then the UOM wise De Minimis threshold value is deducted from all the severity amounts. New values after deducting the threshold are fitted for various selected distributions. After simulating (in Capital Calculation model), this Shift value is added back to the simulated values.
- If left truncation is used, then De Minimis threshold is treated as the left truncation threshold. These truncated values are fitted for various selected distributions. If truncation is selected, then truncated distributions for the selected distribution should be selected. Left truncation can be used per UOM. Shift and Truncation cannot be used together.
- If IQR is used, values below and / or above the bounds are replaced with lower and upper bounds respectively. Shift and Inter Quartile Range cannot be used together.
- Shift / Truncation / IQR are mutually exclusive.
- If it is EVT fitment, then body and tail distributions need to be selected along with EVT threshold. This threshold is used to divide loss data into body and tail losses and passed to body distribution and tail distribution respectively.
- The finalized dataset is passed to R for the selected distribution. The selected distribution (truncated or otherwise) is fitted and fetch the output and show it on screen in the output section.
- The results are displayed in the output area.
- You can finalize the distribution for all UOMs by checking the output of various distributions.

4.4.1.3 Viewing a Severity Modelling Definition

You can view an existing Severity Modelling definition from the *Severity Modelling* window.

To view the details of an existing Severity Modelling definition, perform the following procedure.

1. Select the check box adjacent to the Severity Modelling definition you want to view.
2. Click **View** button from the *Severity Models* grid.

The details of the selected definition are displayed in the *Severity Model Details* window.

NOTE: You cannot edit any of the fields of the definition while in **View** mode.

You can click on the **View Charts** button present under the *Unit Wise Summary* grid to view the detailed output summary in the *Output Summary* window.
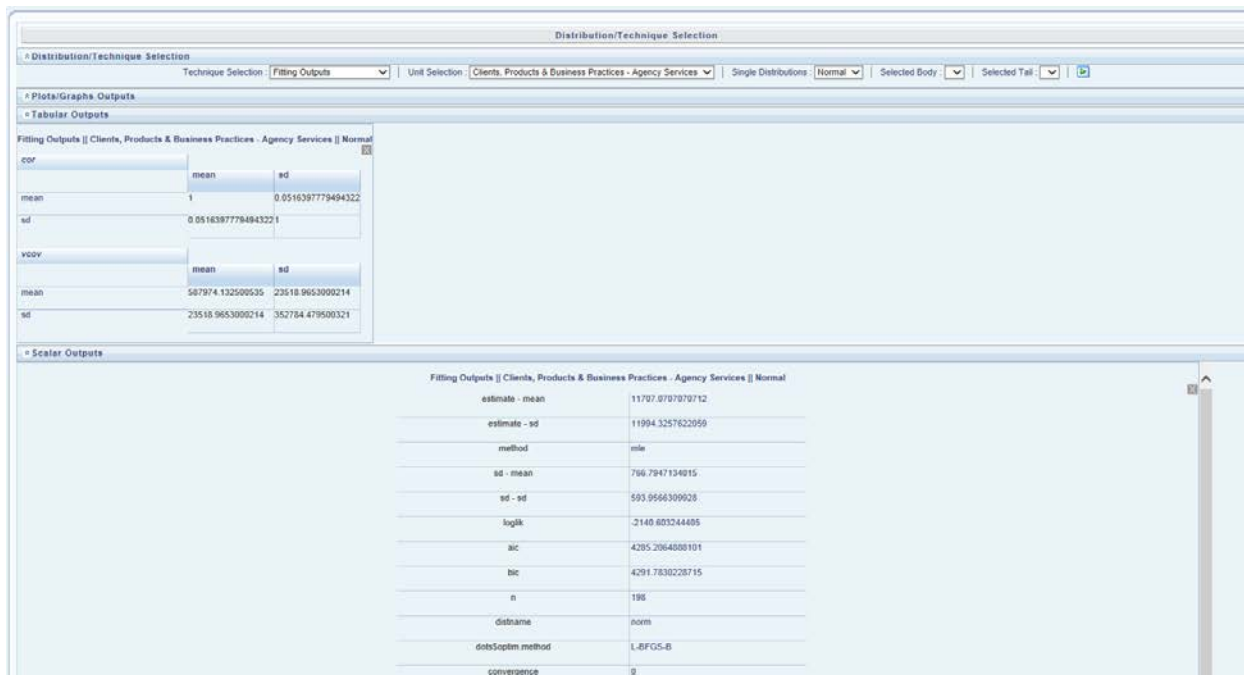
Perform the following procedure to view various reports:

- Select the required value from the drop down list adjacent to the **Technique Selection** field.

- Select the required value from the drop down list adjacent to the **Unit Selection** field.

- Select the required value for **Single Distributions** from the drop down list.

- Select the required value for **Selected Body** from the drop down list.

- Select the required value for **Selected Tail** from the drop down list.

- Click **Apply** button.

The *Plots/Graphs Outputs*, *Tabular Outputs*, and *Scalar Outputs* grids are populated with relevant results.

You can view multiple results simultaneously after populating these using various **Technique** - **Unit Selection** - **Severity Distribution** combination.

You can also click on the graphs in *Image Outputs* grid to zoom and enhance the graphs.

4.4.1.4   Editing a Severity Modelling Definition

The edit functionality from the *Severity Modelling* window enables you to define Severity Models for various Units present in an existing Severity Model definition.

NOTE: You can edit only those definitions, which are in **Draft** status.

To edit the details of an existing Severity Modelling definition, perform the following procedure.
1. Select the check box adjacent to the Severity Modelling definition you want to edit.
2. Click **Edit** button from the *Severity Models* grid.

   The *Severity Model Details* window is displayed.

   The Severity Model Name, Severity Model Name Description, Calculation Data Set, UOM Definition, Data Sufficiency Threshold, and EVT Data Sufficiency Threshold details are displayed from the definition, under *Parameters* grid.

   The *Unit wise Summary* grid displays the UOM definitions with details such as Unit Name, Include Loss Data, External Loss Data, Start Date, End Date, Lower Bound, Upper Bound, De Minimis threshold, Right Truncation, and Severity Distribution Type-Body.

   You can also click the select button adjacent to the *Unit wise Summary* grid title to select the check boxes adjacent to the required columns and click **Done** button to select the columns to be displayed.
3. Select the checkboxes adjacent to the Unit Names, for which you want to define a model.
4. Click **Model** button.
   The *Severity Modelling* screen is displayed.
5. Initiate the Severity Model definition. For more details, refer to Adding a Severity Modelling Definition section.

The **Audit Trail** section at the bottom of the window displays the metadata about the definition. The **User Comments** section facilitates you to add or update additional information as comments.

4.4.1.5   Copying a Severity Modelling Definition

You can copy the details of an existing Severity Modelling definition and create a new definition by changing the Name and Description, from the *Severity Modelling* window.

To copy the details of an existing Severity Modelling definition, perform the following procedure.
1. Select the check box adjacent to the Severity Modelling definition you want to copy.
2. Click **Copy** button from the *Severity Models* grid.

   The **Save As** window is displayed.
3. Enter the **Name** and **Description** for the new definition.
4. Click **OK** button.

   The details of the new definition are saved in **Draft** Status and the definition is displayed under the *Severity Modelling* grid. All the definition details except the Name, Description, and Folder remain the same as that of the parent definition. You can edit the definition to update any details of the definition. For more details refer to Editing a Severity Modelling Definition section.

4.4.1.6   Checking Dependencies of a Severity Modelling Definition

You can check the dependency information of individual Severity Modelling definitions from the *Severity Modelling* window.

To check the dependency information of an existing Severity Modelling definition, perform the following procedure.

1. Select the check box adjacent to the Severity Modelling definition of which you want to you want to check the dependency information.
2. Click **Check Dependencies** button from the *Severity Models* grid.

    The dependency information of the selected definition are displayed in the *Dependency Information* window with the details such as Child Object Name, Child Object Type, Folder, Parent Object Name, Parent Object Type, and Folder.

4.4.1.7   Retire a Severity Modelling Definition

You can retire an existing Severity Modelling definition from the *Severity Modelling* window.

To retire a Severity Modelling definition, perform the following procedure.

1. Select the check box adjacent to the Severity Modelling definition you want to retire.

NOTE: You can retire only those Frequency Modelling definitions which are in **Deployed** status.

2. Click **Retire** button from the *Severity Models* grid.
    The *Severity Model Details* window is displayed.
3. Click **Retire** button in *Severity Model Details* window.

    A warning dialog is displayed.
4. Click **Yes** button.

    The selected definitions are retired and the status is changed to **Retired** in the *Severity Modelling* window.

4.4.1.8   Deploy a Severity Modelling Definition

You can deploy a Severity Modelling definition from the *Severity Modelling* window.

To deploy a Severity Modelling definition, perform the following procedure.

1. Select the check box adjacent to the Severity Modelling definition you want to deploy.
2. Click **Deploy** button from the *Severity Models* grid.

    The *Severity Model Details* window is displayed.

3. Click **Deploy** button.

    The execution is triggered and a confirmation dialog is displayed. The status of the definition is changed **Deployed**.

4.4.1.9 Deleting a Severity Modelling Definition

You can delete an existing Severity Modelling definition from the *Severity Modelling* window.

To delete one or more existing Severity Modelling definitions, perform the following procedure.

1. Select the check box(es) adjacent to the Severity Modelling definition(s) you want to delete.
2. Click **Delete** button from the *Severity Modelling* grid.

   A warning dialog is displayed.
3. Click **Yes** button.

   The selected definitions are removed from the *Severity Modelling* window.

4.5 Scenario Modelling

Financial Institutions use scenario analysis of expert opinion in combination with external data to evaluate its exposure to high-severity events. Scenario is one of the four element of Advanced Measurement Approach as per BCBS guidelines. The OREC application facilitates the modelling of scenarios and allows you to use them as input for capital calculation.

The OFS OREC application supports the modelling of Scenarios based on the following approaches:

- Individual approach
- Interval approach
- Percentile approach
- Parameter based approach

4.5.1 Access Scenario Modelling

You can access Scenario Modelling from the OFS OREC application left pane as follows:

1. Click the **Sandbox** tab in Oracle Financial Services Analytical Applications Home Page.
2. Select the required Sandbox Infodom from the **Select Sandbox** drop down list.
3. Click **Scenario Modelling** under **OREC Sandbox Model**.

   The *Scenario Modelling* window is displayed on the RHS with the *Search* Grid and the *Scenario Modelling* grid with the list of all the existing definitions.

4.5.1.1   Search for Existing Scenario Modelling Definitions

You can search for existing Scenario Modelling definitions, based on the search parameters such as Name, Status, Created Date, Created By, Modified Date, Modified By, Deployment Date, and Deployed By.

To search for an existing Scenario Modelling definition, perform the following procedure:

    1. Enter one or more details in the Search grid, depending on the fields, as tabulated:

Field	Description
Name	Enter the name of the definition which you want to search.
Status	Select the Status of the object which you want to search from the drop down list. The available values are: • Retired • Deployed • Draft
Created Date	Select <, >, or = from the drop down list and click ▦ to specify the date to search for definitions which are created before, after, or on the specified date.
Created By	Enter the name of the user, to search the definitions that are created by this user.
Modified Date	Select <, >, or = from the drop down list and click ▦ to specify the date to search for definitions which are modified before, after, or on the specified date.
Modified By	Enter the name of the user, to search the definitions that are modified by this user.
Deployment Date	Select <, >, or = from the drop down list and click ▦ to specify the date to search for definitions which are deployed before, after, or on the specified date.
Deployed By	Enter the name of the user, to search the definitions that are deployed by this user.

    2. Click **Search** button from the Search grid.

        The list of definitions matching with the search criteria are displayed.

4.5.1.2   Adding a Scenario Modelling Definition

You can create a Scenario Modelling Definition from the *Scenario Modelling* grid by performing the following procedure.

All the fields marked in red asterisks (*) are mandatory.

1. Click the **Add** button from the *Scenario Models* grid.

   The *Scenario Selection* window is displayed.

2. Click the **Browse** button to select the Data Preparation definition from the *Data Preparation* window.

3. Select the **Data Preparation Run** from the drop down list.

   Upon selecting the Data Preparation Run, the following fields are auto populated:
   - **UOM Definition**: Based on the data preparation definition selected, UOM definition that is part of the selected data preparation is auto populated. You can click on the UOM name hyperlink to open the UOM definition and see the mapping.
   - **Calculation Data Set**: The Calculation Dataset in Production is picked, depending on the selected Data Preparation definition. This Calculation Dataset should be in **Approved** status.

   You can click on the selected Data Preparation, Calculation Dataset, and UOM Definition values, to view the details in a new window.

4. Select the value of **Unit Selection** from the available list of values. You can use **Control** key to select multiple values.

5. Select the value of **Assessment Methodology** from the available list of values. You can use **Control** key to select multiple values. The available values are:
   - Percentile Approach
   - Parameter Based Approach
   - Individual Approach
   - Interval Approach

6. Click [icon] button and select the date on which you want to start the Scenario from in the **Scenario From** field.

7. Click [icon] button and select the date until when you want to continue the Scenario in the **Scenario To** field.

8. Enter the Typical Severity value in the **Typical Severity (>=)** field. The value entered in this field is used to search for values greater than, lesser than, or equal to the Severity Amount. Positive integers should be accepted.

9. Enter the Typical Severity value in the **Worst Case Severity (>=)** field.
10. Click **Search** button from the *Scenario Filters* grid. The Scenarios that match with the selected Unit Selection and Assessment Methodology are displayed under the *Scenario Selection* grid.
11. Select the check boxes adjacent to the **Scenario ID(s)** to select the Scenarios under the *Scenario Selection* grid.
12. Enter the Scenario Model Name in the **Scenario Model Name** field.
13. Enter the description for the Scenario Model in the **Scenario Model Description** field.
14. Click **Save Scenarios for Modelling** button. The definition is saved in **Draft** Status and is displayed under the *Scenario Modelling* grid. Also, the *Scenario Modelling Summary* window is displayed with the list of selected Scenarios.

The fields in the *Scenario Model Details* grid is non-editable.

From the *Unit Wise Summary* grid, you can perform the following:

Select the values from the drop down lists adjacent to the Unit Selection and Assessment Methodology fields to filter the Scenarios.

Select the check boxes adjacent to the Scenario IDs and click **Model Scenarios** button to perform Scenario Modelling in the *Scenario Modelling* window. For more information, refer to Scenario Modelling section.

Click Add Scenarios for Modelling button to add more Scenarios for modelling. For more information, refer to Adding a Scenario Modelling Definition section.

Select the check boxes adjacent to the Scenario IDs and click Delete Scenarios button to remove the selected Scenarios from the list.

The **Audit Trail** section at the bottom of the window displays the metadata about the definition. The **User Comments** section facilitates you to add or update additional information as comments.

For more information on processing of Scenario Models for different assessment approaches, refer to Appendix B - Scenario Modelling.

Scenario Modelling

The *Common Parameters* grid in the *Scenario Modelling* window displays the Data Preparation, Data Preparation Run, Calculation Dataset, and UOM Definition details. These fields are non-editable.

The *Unit Specific Parameters* grid in the *Scenario Modelling* window displays the selected Scenarios with details such as Scenario ID, Scenario Name, Unit of Measure, Assessment Methodology, Type, Frequency Distribution, Severity Distribution, Parameter Names, and Parameter Values.

To model the selected Scenarios from the Scenario Modelling Summary window, perform the following procedure:

1. Select the check boxes adjacent to the **Scenario ID**s of the Scenarios, you want to model.

2. Select the value for **Frequency Distribution** from the drop down list. Available values are the following:

   - Poisson – Also enter the Parameter Value for the parameter **Lamda**.

   - Negative Binomial – Also enter the Parameter Values for the Parameters **Size** and **Prob**.

   - Binomial - Also enter the Parameter Values for the Parameters **Size** and **Prob**.

3. Select the value for **Severity Distribution** from the drop down list. Available values are the following:

   - Gumbell - Also enter the Parameter Values for the Parameters **Loc** and **Scale**.

   - Log Gamma - Also enter the Parameter Values for the Parameters **Shapelog** and **Ratelog**.

   - Log Logistic - Also enter the Parameter Values for the Parameters **Shape** and **Scale**.

   - Log Normal - Also enter the Parameter Values for the Parameters **Mean log** and **SD Log**.

   - Normal - Also enter the Parameter Values for the Parameters **Mean** and **SD**.

   - Pareto - Also enter the Parameter Values for the Parameters **Shape** and **Scale**.

   - Uniform - Also enter the Parameter Values for the Parameters **Min** and **Max**.

   - Weibull - Also enter the Parameter Values for the Parameters **Shape** and **Scale**.

   - Exponential - Also enter the Parameter Value for the Parameter **Rate**.

   - Gamma - Also enter the Parameter Values for the Parameters **Shape** and **Rate**.

   - Generalized Pareto - Also enter the Parameter Values for the Parameters **Shape** and **Scale**.

4. Enter the number of simulations in the **Number of Simulations** field.

5. Click **Execute** button. The model is executed and you can view the output under Scalar Output, Graphs, and Tabular Output tabs in the *Output* grid.

   You can select a Scenario from the drop down list adjacent to Scenario Selection field and click Apply button to view the outputs for that specific Scenario.

   You can also click the **View Details** button to view the outputs in the *Distribution/Technique Selection* window. From the *Distribution/Technique Selection* window, perform the following procedure to view various reports:

   - Select the required value from the drop down list adjacent to the **Technique Selection** field.

- Select the required value from the drop down list adjacent to the **Scenario Selection** field.

- Select the required value from the drop down list adjacent to the **Distribution Selection** field.

- Click **Apply** button.

The Tabular Outputs and Scalar Outputs grids are populated with relevant results.

You can view multiple results simultaneously after populating these using various Technique - Scenario - Distribution combination.

You can also click on the graphs in *Image Outputs* grid to zoom and enhance the graphs.

4.5.1.3   **Viewing a Scenario Modelling Definition**

You can view an existing Scenario Modelling definition from the *Scenario Modelling* window.

To view the details of an existing Scenario Modelling definition, perform the following procedure.

1. Select the check box adjacent to the Scenario Modelling definition you want to view.
2. Click **View** button from the *Scenario Models* grid.

   The details of the selected definition are displayed in the *Scenario Modelling Summary* window.

   NOTE: You cannot edit any of the fields of the definition while in **View** mode.

3. Select combinations of **Unit Selection** and **Assessment Methodology** to view relevant Scenarios under *Unit Wise Summary* grid.

   You can also select an Assessment Methodology and click on the **View Charts** button to view the outputs in the *Output Summary* window.

   From the *Output Summary* window, perform the following procedure to view various reports:

   - Select the required value from the drop down list adjacent to the **Technique Selection** field.

   - Select the required value from the drop down list adjacent to the **Scenario Selection** field.

   - Select the required value from the drop down list adjacent to the **Distribution Selection** field.

   - Click **Apply** button.

   The Plots/Graphs Outputs, Tabular Outputs, and Scalar Outputs grids are populated with relevant results.

   You can view multiple results simultaneously after populating these using various Technique - Scenario - Distribution combination.

   You can also click on the graphs in *Image Outputs* grid to zoom and enhance the graphs.

4.5.1.4   Editing a Scenario Modelling Definition

You can edit the details of an existing Scenario Modelling definition from the *Scenario Modelling* window.

To edit the details of an existing Scenario Modelling definition, perform the following procedure.

1. Select the check box adjacent to the Scenario Modelling definition you want to edit.

> **NOTE:** You can edit only those Scenario Modelling definitions which are in **Draft** status.

2. Click **Edit** button from the *Scenario Modelling* grid.

    The details of the selected definition are displayed in the *Scenario Modelling Summary* window in edit mode.

> **NOTE:** You cannot edit the details under *Scenario Model Details* grid.

3. Select the required Unit Selection and Assessment Methodology from the drop down list.
    The corresponding Scenarios are displayed.
4. Select the checkbox adjacent to the Scenarios and perform the following:
    *   Click **Model Scenarios** button to model the Scenario. For more details refer to Adding a Scenario Modelling Definition section.
    *   Click **Add Scenarios for Modelling** button to add new Scenarios to the model.
    *   Click **Delete Scenarios** to remove the selected Scenarios.
5. Click **Save** button.

    The details of the definition are updated and the definition is displayed under the *Scenario Modelling* grid.

4.5.1.5   Copying a Scenario Modelling Definition

You can copy the details of an existing Scenario Modelling definition and create a new definition by changing the Name and Description.

To copy the details of an existing Scenario Modelling definition, perform the following procedure.

1. Select the check box adjacent to the Scenario Modelling definition you want to copy.
2. Click **Copy** button from the *Scenario Modelling* grid.

    The *Save As* window is displayed.
3. Enter the **Name** and **Description** for the new Scenario Modelling definition.
4. Click **OK** button.

    The details of the definition are saved in Draft status and the definition is displayed under the *Scenario Models* grid. All the definition details except the **Name** and **Description** remain the same as that of the parent definition. You can edit these definition details later. For more information, refer to Editing a Scenario Modelling Definition section.

4.5.1.6   Deploy a Scenario Modelling Definition

You can deploy a Scenario Modelling definition from the *Scenario Modelling* window.

To deploy a Scenario Modelling definition, perform the following procedure.

1. Select the check box adjacent to the Scenario Modelling definition you want to deploy.

> **NOTE:** You can deploy only those Scenario Modelling definitions which are in **Draft** status.

2. Click **Deploy** button from the *Scenario Models* grid.
   The *Scenario Modelling Summary* window is displayed.
3. Click **Deploy** button in *Scenario Modelling Summary* window.

   The execution is triggered and a confirmation dialog is displayed. The status of the definition is changed **Deployed**.

4.5.1.7   Retire a Scenario Modelling Definition

You can retire an existing Scenario Modelling definition from the *Scenario Modelling* window.

To retire a Scenario Modelling definition, perform the following procedure.

1. Select the check box adjacent to the Scenario Modelling definition you want to retire.

> **NOTE:** You can retire only those Scenario Modelling definitions which are in **Deployed** status.

2. Click **Retire** button from the *Scenario Modelling* grid.
   The *Scenario Modelling Summary* window is displayed.
3. Click **Retire** button in the *Scenario Modelling Summary* window.

   A warning dialog is displayed.
4. Click **Yes** button.

   The selected definitions are retired and the status is changed to **Retired**, in the *Scenario Modelling* window.

4.5.1.8   Checking Dependencies of a Scenario Modelling Definition

You can check the dependency information of individual Scenario Modelling definitions from the *Scenario Modelling* window.

To check the dependency information of an existing Scenario Modelling definition, perform the following procedure.

1. Select the check box adjacent to the Scenario Modelling definition of which you want to you want to check the dependency information.
2. Click **Check Dependencies** button from the *Scenario Modelling* grid.

   The dependency information of the selected definition are displayed in the *Dependency Information* window with the details such as Child Object Name, Child Object Type, Folder, Parent Object Name, Parent Object Type, and Folder.

4.5.1.9   Deleting a Scenario Modelling Definition

You can delete an existing Scenario Modelling definition from the *Scenario Modelling* window.

To delete one or more existing Scenario Modelling definitions, perform the following procedure.

1. Select the check box(s) adjacent to the Scenario Modelling definition(s) you want to delete.

> **NOTE:** You can delete only those Scenario Modelling definitions which are in **Draft** status.

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2. Click **Delete** button from the *Scenario Modelling* grid.

   A warning dialog is displayed.
3. Click **Yes** button.

   The selected definitions are removed from the *Scenario Modelling* window.

4.6 Correlation

The Correlation model is used to define Correlation and Copula for Loss Data and Scenario. In case of loss data, correlation and copula matrix is generated between UOMs. This reflects the dependency structure between UOMs. In case of Scenario Correlation, correlation and copula matrix is generated between Scenarios. This reflects the dependency between Scenarios, that is, chance of multiple scenarios happening together.

4.6.1 Access Correlation Modelling

You can access Correlation Modelling from the OFS OREC application left pane, as follows:
1. Click the **Sandbox** tab in Oracle Financial Services Analytical Applications Home Page.
2. Select the required Sandbox Infodom from the **Select Sandbox** drop down list.
3. Click **Correlation Modelling** under **OREC Sandbox Model**.

   The *Correlation* window is displayed on the RHS with the *Search* Grid and the *List of Runs* grid with the list of all the existing runs.

4.6.1.1 Search for Existing Correlation Definitions

You can search for existing Correlation definitions, based on the search parameters such as Name, Status, Purpose, Created By, Creation Date, Deployed By, Deployed Date, Last Modified By, or Last Modification Date.

To search for an existing Correlation definition, perform the following procedure:
1. Enter one or more details in the *Search* grid, depending on the fields, as tabulated:

Field	Description
Name	Enter the name of the definition which you want to search.

Field	Description
Status	Select the Status of the object which you want to search from the drop down list. The available values are: • Retired • Deployed • Draft
Purpose	Select the purpose from the drop down list. The available values are: • Scenario Correlation • Loss Data Correlation
Created By	Enter the name of the user, to search the definitions that are created by this user.
Creation Date	Select <, >, or = from the drop down list and click to specify the date to search for definitions which are created before, after, or on the specified date.
Deployed By	Enter the name of the user, to search the definitions that are deployed by this user.
Deployed Date	Select <, >, or = from the drop down list and click to specify the date to search for definitions which are deployed before, after, or on the specified date.
Last Modified By	Enter the name of the user, to search the definitions that are last modified by this user.
Last Modification Date	Select <, >, or = from the drop down list and click to specify the date to search for definitions which are modified before, after, or on the specified date.

2. Click **Search** button from the *Search* grid.

The list of definitions matching with the search criteria are displayed.

4.6.1.2   Adding a Correlation Modelling Definition

You can create a Correlation Modelling definition from the *Correlation* grid by performing the following procedure.

All the fields marked in red asterisks (*) are mandatory.

1. Click the **Add** button from the *Correlation Models* grid.

The *Correlation Modelling* window is displayed.

2. Click the **Browse** button adjacent to the **Data Preparation** field to select the Data Preparation definition from the *Data Preparation* window.

3. Select the **Data Preparation Run** from the drop down list.

   Upon selecting the Data Preparation Run, the following fields are auto populated:
   - **UOM Definition**: Based on the data preparation definition selected, UOM definition that is part of the selected Data Preparation run is auto populated. You can click on the UOM name hyperlink to open the UOM definition and see the mapping.
   - **Calculation Data Set**: The Calculation Dataset in Production is picked, depending on the Data Preparation and Run selected. This Calculation Dataset should be in **Approved** status.
   - **Start Date**: This is populated from the Dataset.
   - **End Date**: This is populated from the Dataset.
   - **Time Bucket Length**: This is populated from the Dataset.

   You can click on the selected Data Preparation, Calculation Dataset, and UOM Definition values, to view the details in a new window.

4. Select the purpose of the definition from the drop down list. The available values are:
   - Loss Data Correlation
   - Scenario Correlation

   Upon selecting **Loss Data Correlation**, the Loss Data Type, Start Date. End Date, Time Bucket Length, Correlation Input, Matrix Validation Type, and Replace Negative Correlation fields are enabled under *Common Parameters* grid.
   - Select the value for **Loss Data Type**, from the drop down list. You can also click on the Show Loss Data button adjacent to the drop down, to view the details of the loss data. You can change the inclusion/exclusion for internal and external loss data using the Custom option. You can only use Internal or only External or a combination for each UOM. The available values are the following:
     - Internal
     - External

- o   Internal & External
- o   Custom
- Select the value for **Correlation Input**, from the drop down list. The available values are the following:
    - o   Frequency
    - o   Aggregate Loss Amount
- Select the value for **Matrix Validation Type**, from the drop down list. The available values are **Positive Definite** and **Positive Semi Definite**. This validates the generated correlation matrix for positive definiteness or positive semi definiteness, while moving to Copula generation.
- Enter the value for **Replace Negative Correlation** either as **0** or as **1**. This is optional. If this option is used, then all negative values in the Correlation matrix are replaced by the selected value.

Upon selecting **Scenario Correlation**, the Scenario Model, Matrix Validation Type, and Unit Value Correlation fields are enabled under *Common Parameters* grid.

- Select the value for **Scenario Model**, from the drop down list. This scenario model list is restricted to
    - o   Scenario Models generated for the same dataset as in common parameters section in sandbox.
    - o   Scenarios models already deployed from sandbox.

A correlation matrix based on the Scenarios from the deployed Scenario model is generated. You can edit the matrix and provide Correlation coefficient values between these Scenarios.

- Select the value for **Matrix Validation Type**, from the drop down list.
- Enter the value for **Unit Value Correlation** either as **0** or as **1**. The entered value replaces all blank cells in the Scenario Correlation matrix.

5. Select the Correlation tab and perform the following:

- Select the check box(s) adjacent to **Spearmans rho**, **Pearsons r**, and/or **Kendall Tau** as the Correlation Method in **Correlation Method Selection** field. This is applicable only for Loss Correlation. This field is not relevant for Scenario Correlation. For Scenario Correlation, you can directly input the Correlation coefficient values for Scenario Correlation matrix.
- Click **Execute** button from the *Output* grid. The selected data is processed and the output is generated.

Once executed, you can perform the following actions to view various outputs.

- Select the value for **Correlation Method** from the drop down list. The available values are Spearmans rho, Pearsons r, and Kendall Tau.
- Select the output type by selecting the radio button adjacent to one of the following:
    - o   Correlation Matrix
    - o   Covariance Matrix
    - o   Eigen Values
    - o   Eigen Vectors
    - o   Correlation Parameters
- Click button. The output according to the selected values, is displayed.
- From the *Output* grid of Correlation, you also perform the following:
    - o   Click **Edit** button to edit the generated Correlation matrix. You can edit coefficient

values if required. If matrix is edited, click Execute button to regenerate results. This results in regeneration of Eigen Values, Eigen Vectors, and Correlation Parameters, since Correlation matrix is the input for the same. If the matrix is not positive definite or positive semi-define, then click **Smoothen Correlation Matrix** button to smoothen the Correlation matrix. This uses smoothening techniques to convert the matrix to positive definite.

o Click **Previous Data** button to view the previous data. That is the correlation matrix before editing is restored.

6. Select the *Copula* tab and perform the following:
   - Select the check box(es) adjacent to **Gaussian** and/or **Students T** as the Copula Method in **Copula Method Selection** field.
   - Click **Execute** button from the *Output* grid.
   - Select the value for **Copula Method** from the drop down list. The available values are Gaussian and Students T.
   - Select the output type by selecting the radio button adjacent to one of the following:
     o **Copula Parameters**
       Copula Rho values are generated for the selected Correlation and Copula method.
   - Click ▶ button. The output according to the selected values, is displayed.
   - From the *Output* grid of Copula, you also perform the following:
     o Click *Scalar Output* tab to view the scalar output.
     o Click *Graphs* tab to view the graph output.
     o Click *Tabular Output* tab to view the tabular output.

7. Enter the Correlation Model Name in the **Correlation Model Name** field under *Correlation Model Submission* grid.

8. Enter the description for the Correlation Model in the **Correlation Model Description** field.

9. Select the correlation method from the drop down list adjacent to the **Correlation Method** field. The available values are Spearmans rho, Pearsons r, and Kendall Tau.

10. Select the copula method from the drop down list adjacent to the **Copula Method** field. The available values are Gaussian and Students T.

11. Click **Save** button. The definition is saved in **Draft** Status and is displayed under the *Correlation Modelling* grid.

The **Audit Trail** section at the bottom of the window displays the metadata about the definition. The **User Comments** section facilitates you to add or update additional information as comments.

Loss Correlation Model Processing

The following are the steps involved in Loss Correaltion Model processing:

- Based on the Data Preparation filter, the loss data to be used is identified (internal and external can be used for Correlation modelling).

- Based on the Data set selected, those Data set filters are applied.

- Based on the loss data type selection, internal or external or both are considered.

- Bucket used for Correlation matrix is the bucket finalized in the Calculation Data Set.

- If Correlation input is Frequency, then count of losses for each bucket is the input data.

- If Correlation input is Aggregate Loss Amount, then total loss amount for each bucket is the input data.

- Input data is executed to generate a UOM correlation matrix. This matrix indicates the Correlation between UOMs.

- If replace negative Correlation option is selected, then all negative values in the Correlation matrix are replaced with the replacement value.

- Correlation matrix can be edited if required. Reasons for editing could be to edit negative values or change few values to get a positive definite Correlation matrix.

- Edited matrix can be passed as input and re-executed. In this case, input data is the edited Correlation matrix. This results in regeneration of Eigen Values, Eigen Vectors, Determinant, Positive Definite, and Positive Semi Definite values.

- Instead of manual editing, smoothening option can be used. This results in using smoothening techniques to convert matrix to positive definite.

- Based on the results, you can select a Correlation method to generate Copula.

- Move to *Copula* tab. This validates whether the selected Correlation matrix is based on Matrix Validation Type.

- Generate Copula rho values in *Copula* tab.

- You can finalize and Deploy the model to be used further in Capital Calculation Run.

Scenario Correlation Model Processing

The following are the steps involved in Scenario Correaltion model processing:

Based on the deployed Scenario Model, a correlation matrix of the Scenarios from the selected Scenario model is drawn.

This Correlation matrix needs to be manually entered through editing.

Uni Value correlation can be used to fill up blank cells. For example, Correlation coefficient values can be entered only for tail scenarios and uni value correlation can be used for others to default it some value, say 1.

This matrix can be passed as input and model can be executed. In this case, input data is the Correlation matrix. Therefore, Covariance is not generated. This results in generation of Eigen Values, Eigen Vectors, Determinant, Positive Definite, and Positive Semi Definite values.

Matrix can be re-edited and executed multiple times to regenerate results.

Based on the results, move to *Copula* tab. This validates the Correlation matrix based on Matrix Validation Type.

Generate Copula rho values in *Copula* tab.

You can finalize and Deploy the model to be used further in Cpital Calculation Run.

4.6.1.3   Viewing a Correlation Modelling Definition

You can view an existing Correlation Modelling definition from the *Correlation Modelling* window.

To view the details of an existing Correlation Modelling definition, perform the following procedure.
1. Select the check box adjacent to the Correlation Modelling definition you want to view.
2. Click **View** button from the *Correlation Models* grid.

The details of the selected definition are displayed in the *Correlation Modelling* window.

NOTE: You cannot edit any of the fields of the definition while in **View** mode.

You can select from different Correlation or Copula Methods from Correlation and Copula tabs respectively and select the radio button adjacent to the Technique before clicking ▶ button to view various outputs while in **View** mode.

4.6.1.4   Editing a Correlation Modelling Definition

You can edit the details of an existing Correlation Modelling definition from the *Correlation Modelling* window.

To edit the details of an existing Correlation Modelling definition, perform the following procedure.

1. Select the check box adjacent to the Correlation Modelling definition you want to edit.

NOTE: You can edit only those Correlation Modelling definitions which are in **Draft** status.

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2. Click **Edit** button from the *Correlation Models* grid.

   The details of the selected definition are displayed in the *Correlation Modelling Summary* window in edit mode.
3. Edit the required fields of the Correlation Modelling definition. For more details refer to Adding a Correlation Modelling Definition section.
4. Click **Save** button.

   The details of the definition are updated and the definition is displayed under the *Correlation Modelling* grid.

4.6.1.5   Copying a Correlation Modelling Definition

You can copy the details of an existing Correlation Modelling definition and create a new definition by changing the Name and Description.

To copy the details of an existing Correlation Modelling definition, perform the following procedure.

1. Select the check box adjacent to the Correlation Modelling definition you want to copy.
2. Click **Copy** button from the *Correlation Models* grid.

   The *Save As* window is displayed.
3. Enter the **Name** and **Description** for the new Correlation Modelling definition.
4. Click **OK** button.

   The details of the definition are saved and the definition is displayed under the *Correlation Modelling* grid. All the definition details except the **Name** and **Description** remain the same as that of the parent definition. You can edit these definition details later. For more information, refer to Editing a Correlation Modelling Definition section.

4.6.1.6   Checking Dependencies of a Correlation Modelling Definition

You can check the dependency information of individual Correlation Modelling definitions from the *Correlation Modelling* window.

To check the dependency information of an existing Correlation Modelling definition, perform the following procedure.

1. Select the check box adjacent to the Correlation Modelling definition of which you want to you want to check the dependency information.
2. Click **Check Dependencies** button from the *Correlation Models* grid.

    The dependency information of the selected definition are displayed in the *Dependency Information* window with the details such as Child Object Name, Child Object Type, Folder, Parent Object Name, Parent Object Type, and Folder.

4.6.1.7   Deploy a Correlation Modelling Definition

You can deploy a Correlation Modelling definition from the *Correlation Modelling* window.

To deploy a Correlation Modelling definition, perform the following procedure.

1. Select the check box adjacent to the Correlation Modelling definition you want to deploy.

    | **NOTE:**   You can deploy only those Correlation Modelling definitions which are in **Draft** status. |

2. Click **Deploy** button from the *Correlation Models* grid.
    The *Correlation Modelling* window is displayed.
3. Click **Deploy** button in *Correlation Modelling* window.

    The execution is triggered and a confirmation dialog is displayed. The status of the definition is changed **Deployed**.

4.6.1.8   Retire a Correlation Modelling Definition

You can retire an existing Correlation Modelling definition from the *Correlation Modelling* window.

To retire a Correlation Modelling definition, perform the following procedure.

1. Select the check box adjacent to the Correlation Modelling definition you want to retire.

    | **NOTE:**   You can retire only those Correlation Modelling definitions which are in **Deployed** status. |

2. Click **Retire** button from the *Correlation Models* grid.
    The *Correlation Modelling* window is displayed.
3. Click **Retire** button in the *Correlation Modelling* window.

    A warning dialog is displayed.
4. Click **Yes** button.

    The selected definitions are retired and the status is changed to **Retired**, in the *Correlation Modelling* window.

4.6.1.9   Deleting a Correlation Modelling Definition

You can delete an existing Correlation Modelling definition from the *Correlation Modelling* window.

To delete one or more existing Correlation Modelling definitions, perform the following procedure.

1. Select the check box(s) adjacent to the Correlation Modelling definition(s) you want to delete.

> **NOTE:**   You can delete only those Correlation Modelling definitions which are in **Draft** status.

2. Click **Delete** button from the *Correlation Models* grid.

    A warning dialog is displayed.

3. Click **Yes** button.

    The selected definitions are removed from the *Correlation Modelling* window.

5   Capital Calculation

5.1   Capital Calculation Model

Capital Calculation Model is defined in OREC Production to capture the inputs for estimating Operational Risk Capital. After definition, execution of this model results in calculation of all the required risk measures such as Operational Risk VaR, Conditional VaR, Expected Loss, and Unexpected Loss for various UOMs and firm level followed by allocation of capital to various Legal Entities and Lines of Businesses.

5.1.1   Access Capital Calculation Model

You can access Capital Calculation Model from the OFS OREC application left pane as follows:
1. Click **OREC Production** under **Operational Risk Economic Capital**.
2. Click **Capital Calculation Model**.

   The *Capital Calculation Model* window is displayed on the RHS with the *Search* Grid and the *Capital Calculation Models* grid with the list of all the existing definitions.

5.1.1.1   Search for Existing Capital Calculation Model Definitions

You can search for existing Capital Calculation Model definitions, based on the search parameters such as Model Name, Status, Unit of Measure, Reporting Date, Created By, Created Date, Approved/Rejected By, and Approved/Rejected Date.

To search for an existing Capital Calculation Model definition, perform the following procedure:
1. Enter one or more details in the Search grid, depending on the fields, as tabulated:

Field	Description
Model Name	Enter the name of the definition which you want to search.

Field	Description
Status	Select the Status of the object which you want to search from the drop down list. The available values are: • Pending Approval • Approved • Draft
Unit of Measure	Enter the Unit of Measure name of a definition which you want to search.
Reporting Date	Select <, >, or = from the drop down list and click [image] to specify the date to search for definitions which are reported before, after, or on the specified date.
Created By	Enter the name of the user, to search the definitions that are created by this user.
Created Date	Select <, >, or = from the drop down list and click [image] to specify the date to search for definitions which are created before, after, or on the specified date.
Approved/Rejected By	Enter the name of the user, to search the definitions that are approved/rejected by this user.
Approved/Rejected Date	Select <, >, or = from the drop down list and click [image] to specify the date to search for definitions which are approved/rejected before, after, or on the specified date.

2. Click **Search** button from the Search grid.

The list of definitions matching with the search criteria are displayed.

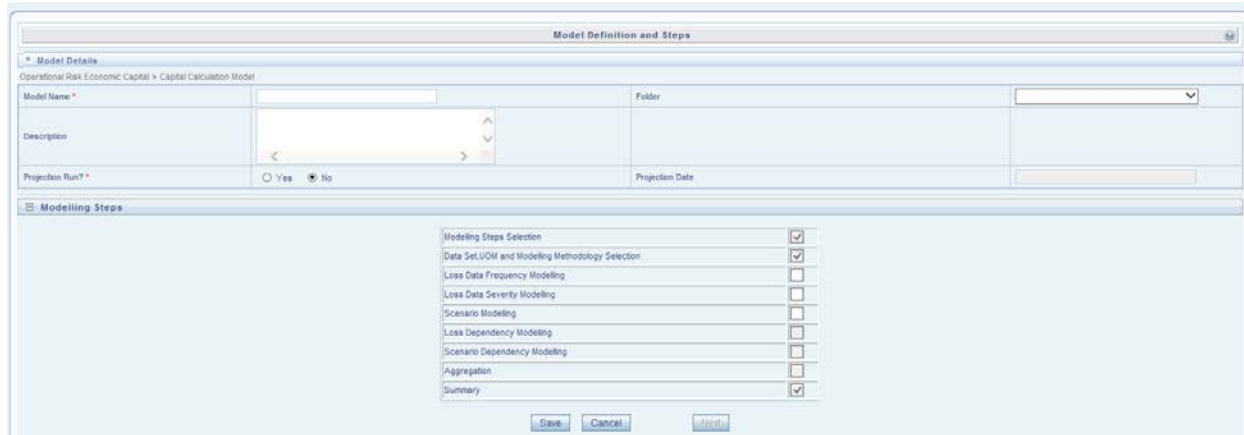### 5.1.1.2 Adding a Capital Calculation Model Definition

You can create a Capital Calculation Model definition from the *Capital Calculation Models* grid by performing the following procedure.

All the fields marked in red asterisks (*) are mandatory.

1. Click the **Add** button from the *Capital Calculation Models* grid.

The *Model Definition and Steps* window is displayed.

2. Enter the Capital Calculation Model Name in the **Model Name** field.
3. Select the Folder from the drop down list adjacent to the **Folder** field.
4. Enter the description in the **Description** field.
5. Select the radio button adjacent to **Projection Run?** field as **Yes** or **No**.
   Yes indicates that the definition is being created for projecting operational risk capital for future date. In this case, usage of Scenario Models is mandatory, since futuristic scenarios can be included.

   Upon selecting **Yes**, the **Projection Date** field is enabled.
6. Click the **Calendar** icon adjacent to the **Projection Date** field and select the projection date from the calendar.
7. Select the check box(s) adjacent to the modeling step values under *Modelling Steps* grid. The available values are:
   - Modelling Steps Selection
   - Data Set, UOM and modelling methodology Selection
   - Loss Data Frequency modelling
   - Loss data Severity modelling
   - Scenario modelling
   - Loss Dependency modelling
   - Scenario dependency modelling
   - Aggregation
   - Summary

   Following are the valid combinations for selecting the modeling steps:
   - Modelling Steps Selection, Dataset, UOM and Modeling Methodology Selection, Loss Data Frequency Modelling, Loss Data Severity Modelling, Scenario Modelling , Loss Dependency Modelling, Scenario Dependency Modelling, Aggregation, and Summary
   - Modelling Steps Selection, Dataset, UOM and Modeling Methodology Selection, Loss Data Frequency Modelling, Loss Data Severity Modelling, and Summary
   - Modelling Steps Selection, Dataset, UOM and Modeling Methodology Selection, Loss Data Frequency Modelling, Loss Data Severity Modelling, Loss Dependency Modelling, and Summary
   - Modelling Steps Selection, Dataset, UOM and Modeling Methodology Selection, Scenario Modelling, and Summary
   - Modelling Steps Selection, Dataset, UOM and Modeling Methodology Selection, Scenario Modelling, Scenario Dependency Modelling, and Summary

- Modelling Steps Selection, Dataset, UOM and Modeling Methodology Selection, Loss Data Frequency Modelling, Loss Data Severity Modelling, Scenario Modelling , Loss Dependency Modelling, Aggregation, and Summary
- Modelling Steps Selection, Dataset, UOM and Modeling Methodology Selection, Loss Data Frequency Modelling, Loss Data Severity Modelling, Scenario Modelling , Scenario Dependency Modelling, Aggregation, and Summary

8. Click **Save** button. The definition is saved in **Draft** status and message confirming the same is displayed.
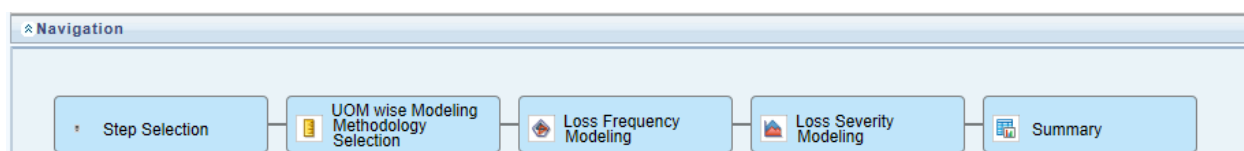
NOTE: You can navigate to the next screen only after saving the definition details.

9. Click **Next** button. The *Modelling Methodology Selection* window is displayed.

The *Modelling Methodology Selection* window is displayed with the *Navigation* grid.

The navigation grid is displayed as follows:

You can click on each item to navigate to the respective page.

10. Click the **Browse** button to select the Data Preparation definition from the *Data Preparation* window.
11. Select the **Data Preparation Run** from the drop down list.
12. The **UOM Definition**, **Calculation Dataset**, and **Reporting Currency** fields are auto populated, depending on the selected Data Preparation definition and Data Preparation Run combination.

Also the Unit of Measures, Modelling Methodology, and Combining Approach details are displayed in a table.

13. Select the modeling methodology for each UOMs, from the drop down lists adjacent to the UOM name and the Modelling Methodology column. Following are the available values, depending on the UOM type:
- Loss Distribution Approach
- Scenario Based Approach
- Hybrid Approach
- Not Relevant for Modelling

14. Select the Combining Approach from the drop down list, if you have selected Hybrid Approach as the Modelling Methodology. The available values are:
- Weights based Approach
- Unified Parameter Approach

15. Click **Save** button to save the definition anytime during the definition process. A warning message to state that the selections in the *Modelling Methodology Selection* window cannot be changed after saving.

16. Click **Yes** button. The definition is updated.

Once saved, you can click on the following to perform modeling. The following modeling options are displayed based on the combination selection you have made in the Modelling Steps:

- Loss Frequency Modeling

- Loss Severity Modeling

- Scenario Modeling

- Loss Dependency Modeling

- Scenario Dependency Modeling

- Aggregation

17. Click **Summary** button to view the summary of the definition.

18. Click **Submit** button to finish the definition process. Once submitted, the definition is displayed in the *Capital Calculation Models* window in **Pending Approval** status.

Loss Frequency Modeling

To perform Loss Frequency Modeling, perform the following procedure:

Select the Source Name by selecting the radio button adjacent to either **Import Model from Sandbox** or **Import Model from External Source**.

If you have selected, **Import Model from Sandbox**, perform the following under *Parameters* grid:

- Select the value for **Include Parameters** as either **Yes** or **No**.

  Yes indicates that the distribution and parameters generated and deployed in the Sandbox are meant to be used for Frequency Simulation.

  No indicates that the distirubtion finalized and deployed in the Sandbox should be used whereas parameters are to be re-estimated during the Capital Calculation Run. Selecting **No** results in re-estimation of parameters and frequency simulation whereas selecting **Yes** results only in Frequency Simulation. Re-estimation is generally necessary when input loss data has changed between the date of Frequency Modelling in Sandbox and the current date.

- Select the value for **Adjust BEICF** as either **Yes** or **No**.

  Yes indicates that you want to adjust the parameters deployed/re-estimated to reflect current Business Environment and Internal Control Factors. This is one of the places where current business environment and state of internal control factors can be incorporated to increase or decrease the parameter values.

  For example, if the BEICF has improved, then lambda value of poisson distribution can be decreased by X% to reflect the improvement.

  If **Yes** is selected, then additional columns to input the adjust factor are available against each UOM.

- Click the **Browse** button and select the **Model Name** from the list present in the *Frequency Model* window.

- The Time Bucket Length and Deployment Date are auto populated depending on the Frequency Model you have selected.

If you have selected, **Import Model from External Source**, perform the following under *Parameters* grid:

- The **Include Parameters** field is automatically set to Yes and you cannot update this.

    This indicates that external models need to be imported along with the distribution and parameters. Frequency simulation happens as part of Capital Calculation Run.

- Select the value for **Adjust BEICF** as either **Yes** or **No**.

    Yes indicates that you want to adjust the parameters deployed/re-estimated to reflect current Business Environment and Internal Control Factors. This is one of the places where current business environment and state of internal control factors can be incorporated to increase or decrease the parameter values.

    For example, if the BEICF has improved, then lambda value of poisson distribution can be decreased by X% to reflect the improvement.

    If **Yes** is selected, then additional columns to input the adjust factor are available against each UOM.

- Select the drop down list adjacent to **From** field to select the source. The available options are:

    o Database

    o Specify

- Select the DB Set from the available values in the drop down list adjacent to the DB Set field, if you have selected Database.

- The Time Bucket Length and Deployment Date are auto populated depending on the Frequency Model you have selected.

- Enter the Source details in the text field adjacent to the **Source** field.

- Select the **Distribution** from the drop down list for each **Unit Names** under *Unit Wise Details* grid. The available values are:

    o Poisson

    o Negative Binomial

    o Binomial

Loss Severity Modeling

To perform Loss Severity Modeling, perform the following procedure:

Select the Source Name by selecting the radio button adjacent to either **Import Model from Sandbox** or **Import Model from External Source**.

If you have selected, **Import Model from Sandbox**, perform the following under *Parameters* grid:

- Select the value for **Include Parameters** as either **Yes** or **No**.

Yes indicates that distribution and parameters generated and deployed in the Sandbox are used for Severity Simulation.

No indicates that distribution finalized and deployed in the Sandbox are used whereas parameters are to be re-estimated during the Capital Calculation Run. Selecting **No** results in re-estimation of parameters and Frequency simulation, whereas selecting **Yes** results only in Severity simulation. Re-estimation is generally warranted when input loss data has changed between the date of Frequency modelling in Sandbox and the current date.

- Click the **Browse** button and select the **Model Name** from the list present in the *Severity Modelling* window.

- The Deployment Date is auto populated depending on the Severity Model you have selected.

If you have selected, **Import Model from External Source**, perform the following under *Parameters* grid:

- The **Include Parameters** field is automatically set to **Yes** and you cannot update this.

  This indicates that external models are imported along with the distribution and parameters. Severity simulation happens as part of Capital Calculation Run.

- Select the drop down list adjacent to **From** field to select the source. The available options are:

  o Database

  o Specify

- Select the DB Set from the available values in the drop down list adjacent to the DB Set field, if you have selected Database.

- Enter the value for EVT Data Sufficiency Threshold in the text field adjacent to **EVT Data Sufficiency Threshold** field.

- Enter the Source Name in the text field adjacent to **Source Name** field.

- Click the **Calendar** icon adjacent to Deployment Date field and select the deployment date.

- Select the **Severity Distribution** from the drop down list for each **Unit Names** under *Unit Wise Summary* grid. The available values are:

  o Exponential

  o Gamma

  o Generalized Pareto

  o Gumbel

  o Log Gamma

  - o Log Logistic

  - o Log Normal

  - o Normal

  - o Pareto

  - o Truncated Gamma

  - o Truncated Gumbel

  - o Truncated Log Logistic

  - o Truncated Log Normal

  - o Truncated Normal

  - o Truncated Pareto

  - o Truncated Weibull

  - o Truncated Exponential

  - o Truncated Log Gamma

  - o Uniform

  - o Weibull

- Select the value for **EVT?** from the drop down list. The available values are:

  - o Yes: This results in adding another row for the same UOM. You have to provide tail distribution and its parameters here.

  - o No

- Select the value for **Shift** from the drop down list. The available values are:

  - o Yes: If yes, then it is assumed that de minimis threshold value should be reduced from Loss Severity values during parameter estimation (if being estimated) and added back to simulated values.

  - o No

- Enter the values in the **Value** columns for all the **Parameters**.

Scenario Modeling

To perform Scenario Modeling, perform the following procedure:

Select the Source Name by selecting the radio button adjacent to either **Import Model from Sandbox** or **Import Model from External Source**.

If you have selected, **Import Model from Sandbox**, perform the following under *Parameters* grid:

- Click the **Browse** button and select the **Model Name** from the list present in the *Scenario Modelling* window.

- The Deployment Date is auto populated depending on the Scenario Model you have selected.

If you have selected, **Import Model from External Source**, perform the following under *Parameters* grid:

- The **Include Parameters** field is automatically set to Yes and you cannot update this.

- Select the drop down list adjacent to **From** field to select the source. The available option is:

    o   Database

- Select the DB Set from the available values in the drop down list adjacent to the DB Set field, if you have selected Database.

- Click the calendar icon adjacent to **Deployment Date** field and select the deployment date.

- Enter the Source Name in the text field adjacent to **Source Name** field.

Depending on your selections, the *Unit Wise Summary* grid displays the various Scenarios and their corresponding details.

Loss Dependency Modeling

To perform Loss Dependency Modeling, perform the following procedure:

Select the Source Name by selecting the radio button adjacent to either **Import Model from Sandbox** or **Import Model from External Source**.

If you have selected, **Import Model from Sandbox**, perform the following under *Parameters* grid:

- The **Purpose** field is auto populated.

- Click the **Browse** button and select the **Model Name** from the list present in the *Correlation Model* window.

- The Loss Data Type, Correlation Input, Copula Method, and Correlation Method fields are auto populated with values from the Correlation Model, you have selected.

If you have selected, **Import Model from External Source**, perform the following under *Parameters* grid:

- The **Purpose** field is auto populated.

- Select the drop down list adjacent to **From** field to select the source. The available options are:

    o   Database

    o   Specify

- Select the DB Set from the available values in the drop down list adjacent to the DB Set field, if you have selected Database.

- Enter the Source Name in the text field adjacent to **Source** field.

- Click the calendar icon adjacent to **Deployment Date** field and select the deployment date.

- Select the drop down list adjacent to **Loss Data Type** field and select the Loss Data Type. The available options are:

  o Internal

  o External

  o Internal & External

  o Custom

- Select the drop down list adjacent to **Correlation Input** field and select the Correlation Input. The available options are:

  o Frequency

  o Aggregate Loss Amount

- Select the drop down list adjacent to **Correlation Method** field and select the Correlation Method. The available options are:

  o Spearman Rank Correlation

  o Pearson Rank Correlation

  o Kendall Tau

- Select the drop down list adjacent to **Copula Method** field and select the Copula Method. The available options are:

  o Gaussian

  o Student T

Depending on your selections, the *Correlation Matrix* grid displays the Correlation Matrix.

Scenario Dependency Modeling

To perform Scenario Dependency Modeling, perform the following procedure:

Select the Source Name by selecting the radio button adjacent to either **Import Model from Sandbox** or **Import Model from External Source**.

If you have selected, **Import Model from Sandbox**, perform the following under *Parameters* grid:

- The **Purpose** field is auto populated.

- Click the **Browse** button and select the **Model Name** from the list present in the *Correlation Model* window.

- The Deployment Date and Copula Method fields are auto populated with values from the Correlation Model, you have selected.

If you have selected, **Import Model from External Source**, perform the following under *Parameters* grid:

- The **Purpose** field is auto populated.

- Select the drop down list adjacent to **From** field to select the source. The available options are:

    o Database

    o Specify

- Select the DB Set from the available values in the drop down list adjacent to the DB Set field, if you have selected Database.

- Enter the Source Name in the text field adjacent to **Source** field.

- Click the calendar icon adjacent to **Deployment Date** field and select the deployment date.

- Select the drop down list adjacent to **Copula Method** field and select the Copula Method. The available options are:

    o Gaussian

    o Student T

Depending on your selections, the *Correlation Matrix* grid displays the various Units and their corresponding details.

Aggregation

The Aggregation tab displays the Unit of Measures, Modelling Methodology, Combining Approach, Credibility Algorithm, and Weights in % details under the *Credibility Algorithm* grid. To perform Aggregation, perform the following procedure:

- Select the value for Credibility Algorithm from the drop down list in Credibility Algorithm column, for all the Unit of Measures. The available values are:

    o Complementary

    o Alternative

- Enter the percentage value for weights in the **Weights in %** column, or all the Unit of Measures.

- Click **Save** button to save the details.

You can also click the **Next** button to view the Summary.

The **Audit Trail** section at the bottom of the window displays the metadata about the definition. The **User Comments** section facilitates you to add or update additional information as comments.

5.1.1.3   Viewing a Capital Calculation Model Definition

You can view an existing Capital Calculation Model definition from the *Capital Calculation Models* window.

To view the details of an existing Capital Calculation Model definition, perform the following procedure.

1. Select the check box adjacent to the Capital Calculation Model definition you want to view.
2. Click **View** button from the *Capital Calculation Models* grid.

The details of the selected definition are displayed in the *Model Definition and Steps* window.

NOTE: You cannot edit any of the fields of the definition while in **View** mode.

5.1.1.4   Editing a Capital Calculation Model Definition

You can edit the details of an existing Capital Calculation Model definition from the *Capital Calculation Models* window.

To edit the details of an existing Capital Calculation Model definition, perform the following procedure.

1. Select the check box adjacent to the Capital Calculation Model definition you want to edit.

NOTE: You can edit only those definitions, which are in **Draft** status.

2. Click **Edit** button from the *Capital Calculation Models* grid.

The details of the selected definition are displayed in the *Model Definition and Steps* window in edit mode.

3. Edit the required fields of the Capital Calculation Model definition. For more details refer to Adding a Capital Calculation Model Definition section.
4. Click **Save** button.

The details of the definition are updated and the definition is displayed under the *Capital Calculation Models* grid.

5. Click **Summary** button to view the summary of the definition.

6. Click **Submit** button to submit the changes in the definition for approval.

You can click the hyperlinks associated with the values present in various fields, to view the details.

5.1.1.5   Copying a Capital Calculation Model Definition

You can copy the details of an existing Capital Calculation Model definition and create a new definition by changing the Name, Description, and Folder details.

To copy the details of an existing Capital Calculation Model definition, perform the following procedure.

1. Select the check box adjacent to the Capital Calculation Model definition you want to copy.
2. Click **Copy** button from the *Capital Calculation Models* grid.

The *Save As* window is displayed.

3. Enter the **Name** and **Description** for the new Capital Calculation Model definition.
4. Select the folder for the new Capital Calculation Model definition, from the drop down list adjacent to the **Folder** field.
5. Click **OK** button.

The details of the definition are saved in and the definition is displayed under the *Capital Calculation Models* grid in **Draft** status. All the definition details except the **Name**, **Description**, and **Folder** remain the same as that of the parent definition. You can edit these definition details later. For more information, refer to Editing a Capital Calculation Model Definition section.

5.1.1.6   Approve/Reject a Capital Calculation Model Definition

You can approve/reject an existing Capital Calculation Model definition, which is in **Pending Approval** status, from the *Capital Calculation Models* window. Only a user with Approver privileges can approve/reject a definition.

To approve/reject a Capital Calculation Model definition, perform the following procedure.
1.   Select the check box adjacent to the Capital Calculation Model definition you want to approve/reject.
2.   Click **Approve** button from the *Capital Calculation Models* grid.

     The *Model Definition and Steps* window is displayed with the definition details.
3.   Click **Next** button. The *Modelling Methodology Selection* window is displayed.
4.   Click *Summary* after verifying the definition.
5.   Click **Approve** or **Reject** button.
     • Upon approving, the Status of the Capital Calculation Model definition is changed to **Approved**. This Capital Calculation Definition can now be executed using Run functionality. For more informaiton, refer to Execute a Capital Calculation Model Definition section.
     • Upon rejecting, the status of the Capital Calculation Model definition is changed to **Rejected**. You can **Edit** this definition further if you need to use this. For more information, refer to Editing a Capital Calculation Model Definition section.

5.1.1.7   Execute a Capital Calculation Model Definition

You can execute a Capital Calculation Model definition from the *Capital Calculation Modeling* window.

To run a Capital Calculation Model definition, perform the following procedure.
1.   Select the check box adjacent to the Capital Calculation Model definition you want to run.

     NOTE: You can execute only those definitions, which are in **Approved** status.

2.   Click **Run** button from the *Capital Calculation Models* grid.

     The *Run Definition* window is displayed.
3.   Enter the run name in the **Name** field.
4.   Enter the run description in the **Description** field.

     The **Capital Calculation Model** field is auto populated with the Capital Calculation Model name you have selected.

5.   Select the value for Simulation Type from the drop down list adjacent to the Simulation Types field. The available values are:

     • 1 Simulation – 1 Sample Size - This results in 1 simulation for the selected number of sample sizes. Also one set of risk measures (Ops Risk VaR, CVaR, EL, and UL) are generated.

- 1 Simulation – Multiple Sample Sizes - This results in 1 simulation but for multiple sample sizes. One set of risk measures is generated for each sample size. Average across all sample sizes is considered as final.

- Multiple Simulation – 1 Sample Size - This results in multiple simulation for one sample size. One set of risk measures is generated for each simulation. Average across all simulation is considered final.

6. Click the **Browse** button adjacent to the **Capital Allocation Model** field and select a Capital Allocation Model from the *Capital Calculation Models* window. To know more about Capital Allocaiton Models, refer to [Capital Allocation Model](#) section.

7. Enter the value for number of simulations in the text field adjacent to **No of Simulations** field.

   This field is enabled only if you have selected Multiple Simulations – 1 Sample Size in the **Simulation Types** field.

8. Enter the value for sample size in the text field adjacent to **Sample Size** field.

9. Enter the value for Random Seed in the text field adjacent to **Random Seed** field.

10. Click **Save** button. The *Run Execution Parameters* and *Additional Options* grids are displayed.

11. Select the checkbox adjacent to either of the following purposes in **Purposes** field:

    - Regulatory Capital

    - Economic Capital

    This option provides the flexibility to calculate only Regulatory Capital or Economic Capital or both.

    If you have selected **Regulatory Capital**, the *Regulatory Capital* grid is displayed. Enter the following values in this grid:

    - Select the value for **Adjust VaR using BEICF** from the drop down list. The available values are:

        o Entity Level - This results in adjustment of entity level capital numbers to reflect current business environment and internal control factors.

        o UOM Level - This results in adjustment of UOM level capital numbers to reflect current business environment and internal control factors.

        o Not Required - If BEICF is used in Frequency Modelling, then BEICF adjustment is not provided at this level. In such cases, this option is set to Not Required and is non-editable.

    - Enter the value for **BEICF Adjustment Input** field. If you have selected UOM Level in the **Adjust VaR using BEICF** field, click the **Browse** button to enter the BEICF Adjustment Input for each UOMs from the *UOM Level Data* window.

        This field is disabled if you have selected **Not Required** in the **Adjust VaR using BEICF** field.

    - Enter the Confidence Level in the text field adjacent to the **Confidence Level** field.

If you have selected **Economic Capital**, the *Economic Capital* grid is displayed. Enter the following values in this grid:

- Select the value for **Adjust VaR using BEICF** from the drop down list. The available values are:

    o Entity Level - This results in adjustment of entity level capital numbers to reflect current business environment and internal control factors.

    o UOM Level - This results in adjustment of UOM level capital numbers to reflect current business environment and internal control factors.

    o Not Required - If BEICF is used in Frequency Modelling, then BEICF adjustment is not provided at this level. In such cases, this option is set to Not Required and is non-editable.

- Enter the value for **BEICF Adjustment Input** field. If you have selected UOM Level in the **Adjust VaR using BEICF** field, click the **Browse** button to enter the BEICF Adjustment Input for each UOMs from the *UOM Level Data* window.

    This field is disabled if you have selected **Not Required** in the **Adjust VaR using BEICF** field.

- Enter the Confidence Level in the text field adjacent to the **Confidence Level** field.

12. Select the value for **Expected Loss** from the dropdown list. The available values are:

- Mean - Average of simulated values are taken as Expected Loss across UOMs.

- Median - Median of simulated values are taken as Expected Loss across UOMs.

- UOM Wise - Average of Median of simulated values are taken as Expected Loss for each UOM dependent on the selection.

If you have selected **UOM Wise** in the **Expected Loss** field, click the **Browse** button to select the expected loss for each UOMs from the *UOM Level Data* window.

13. Select the value for Insurance Benefit from the dropdown list. This field is enabled only if Calculation Dataset selected in the Capital Calculation Model has Insurance as a data source. The available values are:

- Yes - Insurance is adjusted for simulated severity values.

- No - Insurance is not adjusted for simulated severity values.

This provides you the option to define multiple run definitions on the same Capital Calculation Model and select **Yes** and **No** without having to define a different Capital Calculation Model. The *Additional Options* grid displays the values for Loss Data Dependency, Scenario Dependency, and BEICF Adjustment fields from the definition. The available values are:

- Yes

- No

By default, the value of Loss Data Dependency is set to **Yes**, if the Capital Calculation Model has Loss Data Dependency Modeling step turned on in Modeling Steps. Else, it is set to **No**.

If the value is **Yes**, it can be set to **No**. But if the value is **No**, it is non-editable.

By default, the value of Scenario Dependency is to **Yes** if the selected Capital Calculation Model has Scenario Dependency Modeling step turned on in Modeling steps. Else, it is set to **No**.

If the value is **Yes**, it can be set to No. But if the value is **No**, it is non-editable.

If the value of **Adjust BEICF** is **Yes** in Frequency Modeling, then this is set to Yes.

OR

If BEICF Adjustment Input is **Yes** in Regulatory and/or Economic Capital section, then it is set to **Yes**. If both are **No** then this is set to **No**. If **Yes**, it can be set to No. but, if the value is **No**, it is non-editable.

If the value is set to **No**, then that step is ignored for run for all three options as explained in the following list:

- If Loss Data Dependency is **No**, then loss Correlation/Copula is ignored for the run.

- If Scenario Dependency is **No**, then Scenario Correlation/Copula is ignored for the run.

- If BEICF adjustment is **No**, then Frequency Model ignores BEICF shape/scale adjustment parameters.

- If BEICF adjustment is **No**, then BECIF adjustment input at Regulatory Capital/Economic Capital level is ignored.

This provides you the option to define multiple run definitions on the same Capital Calculation Model and select **Yes** and **No** without having to define a different Capital Calculation Model.

14. Click the **Calendar** icon adjacent to the **MIS Date** field and select the date.
15. Click the **Create Batch** button to create a batch and execute the Capital Calculation at a later time from the Operations section of OFSAAI.

OR

Click **Create/Execute Batch** button to create the batch and execute the batch. Once executed, a confirmation dialog is displayed with the batch ID.

After execution, you can monitor the progress from the Operations module of OFSAAI. For more information on Operations module, refer to the *Oracle Financial Services Analytical Applications Infrastructure User Guide* available at OTN Documentation Library.

5.1.1.8   Retire a Capital Calculation Model Definition

You can retire an existing Capital Calculation Model definition from the *Capital Calculation Models* window.

To retire a Capital Calculation Model definition, perform the following procedure.

1. Select the check box adjacent to the Capital Calculation Model definition you want to retire.

> **NOTE:** Only those Capital Calculation Model definitions, which are in **Approved** status can be retired.

2. Click **Retire** button from the *Capital Calculation Models* grid.

   A warning dialog is displayed.
3. Click **Yes** button.

   The selected definition is retired and the status is changed to **Retired**, in the *Capital Calculation Models* window.

5.1.1.9   Deleting a Capital Calculation Model Definition

You can delete an existing Capital Calculation Model definition from the *Capital Calculation Models* window.

To delete one or more existing Capital Calculation Model definitions, perform the following procedure.
1. Select the check box(s) adjacent to the Capital Calculation Model definition(s) you want to delete.

> **NOTE:** Only those Capital Calculation Model definitions, which are in **Draft** status can be deleted.

2. Click **Delete** button from the *Capital Calculation Models* grid.

   A warning dialog is displayed.
3. Click **Yes** button.

The selected Capital Calculation Model definitions are removed from the *Capital Calculation Models* window.

5.2   Capital Allocation Model

Capital Allocation is required to allocate the capital numbers calculated by executing a capital calculation run. Capital Allocation can be defined as an independent definition and approved. Capital numbers calculated can be allocated back to Units of Measure, Lines of Business, and Legal Entity.

5.2.1 Access Capital Allocation Model

You can access Capital Allocation Model from the OFS OREC application left pane as follows:
1. Click **OREC Production** under **Operational Risk Economic Capital**.
2. Click **Capital Allocation Model**.

   The *Capital Allocation Model* window is displayed on the RHS with the *Search* Grid and the *Capital Allocation Models* grid with the list of all the existing definitions.

5.2.1.1   Search for Existing Capital Allocation Model Definitions

You can search for existing Capital Allocation Model definitions, based on the search parameters such as Model Name, Status, Created By, Last Modified By, Created Date, Last Modified Date, Approved/Rejected By, and Approved/Rejected Date.

To search for an existing Capital Calculation Model definition, perform the following procedure:

1. Enter one or more details in the Search grid, depending on the fields, as tabulated:

Field	Description
Model Name	Enter the name of the definition which you want to search.
Status	Select the Status of the object which you want to search from the drop down list. The available values are: • Pending Approval • Approved • Draft
Created By	Enter the name of the user, to search the definitions that are created by this user.
Last Modified By	Enter the name of the user, to search the definitions that are modified last by this user.
Created Date	Select <, >, or = from the drop down list and click ![icon] to specify the date to search for definitions which are created before, after, or on the specified date.
Last Modified Date	Select <, >, or = from the drop down list and click ![icon] to specify the date to search for definitions which are modified before, after, or on the specified date.
Approved/Rejected By	Enter the name of the user, to search the definitions that are approved/rejected by this user.
Approved/Rejected Date	Select <, >, or = from the drop down list and click ![icon] to specify the date to search for definitions which are approved/rejected before, after, or on the specified date.

2. Click **Search** button from the Search grid.

   The list of definitions matching with the search criteria are displayed.

5.2.1.2   Adding a Capital Allocation Model Definition

You can create a Capital Allocation Model definition from the *Capital Allocation Models* grid by performing the following procedure.

All the fields marked in red asterisks (*) are mandatory.

1. Click the **Add** button from the *Capital Allocation Models* grid.

   The *Capital Allocation* window is displayed.

2. Enter the Allocation Model Name in the **Allocation Model Name** field.
3. Select the Folder from the drop down list adjacent to the **Folder** field.
4. Enter the description in the **Description** field.
5. Select the value for UOM Capital Allocation Method from the drop down list adjacent to the **UOM Capital Allocation Method** field. The available values are:
   - Variance Covariance Method
   - Ratio of Expected Losses
   - Ratio of Expected Shortfall
6. Select the value for LOB Capital Allocation Factor from the drop down list adjacent to the **LOB Capital Allocation Factor** field. The available values are:
   - Profit
   - TSA Capital
   - Exposure
   - BEICF
   - Actual Losses
   - Revenue
7. Select the value for Legal Entity Capital Allocation Factor from the drop down list adjacent to the **Legal Entity Capital Allocation Factor** field. The available values are:
   - Actual Losses
   - BEICF
   - Exposure
   - Profit
   - Revenue
   - TSA Capital
8. Select the radio button adjacent to Qualitative BEICF Adjustment Required for LOB Capital field as **Yes** or **No**.
9. Select the radio button adjacent to Qualitative BEICF Adjustment Required for LOB Capital field as **Yes** or **No**.
10. Click **Save** button to save the definition anytime during the definition process. The definitions are saved in **Draft** status.

11. Click **Submit** button to finish the definition process. Once submitted, the definition is displayed in the *Capital Allocation Models* window in **Pending Approval** status.

The **Audit Trail** section at the bottom of the window displays the metadata about the definition. The **User Comments** section facilitates you to add or update additional information as comments.

5.2.1.3   Viewing a Capital Allocation Model Definition

You can view an existing Capital Allocation Model definition from the *Capital Allocation Models* window.

To view the details of an existing Capital Allocation Model definition, perform the following procedure.

1. Select the check box adjacent to the Capital Allocation Model definition you want to view.
2. Click **View** button from the *Capital Allocation Models* grid.

   The details of the selected definition are displayed in the *Capital Allocation* window.

NOTE: You cannot edit any of the fields of the definition while in **View** mode.

5.2.1.4   Editing a Capital Allocation Model Definition

You can edit the details of an existing Capital Allocation Model definition from the *Capital Allocation Models* window.

To edit the details of an existing Capital Allocation Model definition, perform the following procedure.

1. Select the check box adjacent to the Capital Allocation Model definition you want to edit.

   NOTE: You can edit only those definitions, which are in **Draft** or **Rejected** statuses.

2. Click **Edit** button from the *Capital Allocation Models* grid.

   The details of the selected definition are displayed in the *Capital Allocation* window in edit mode.
3. Edit the required fields of the Capital Allocation Model definition. For more details refer to Adding a Capital Allocation Model Definition section.
4. Click **Save** button.

   The details of the definition are updated and the definition is displayed under the *Capital Allocation Models* grid.

5.2.1.5   Copying a Capital Allocation Model Definition

You can copy the details of an existing Capital Allocation Model definition and create a new definition by changing the Name, Description, and Folder details.

To copy the details of an existing Capital Allocation Model definition, perform the following procedure.

1. Select the check box adjacent to the Capital Allocation Model definition you want to copy.
2. Click **Copy** button from the *Capital Allocation Models* grid.

   The *Save As* window is displayed.
3. Enter the **Name** and **Description** for the new Capital Allocation Model definition.
4. Select the folder for the new Capital Allocation Model definition, from the drop down list adjacent to the **Folder** field.
5. Click **OK** button.

The details of the definition are saved in and the definition is displayed under the *Capital Allocation Models* grid in **Draft** status. All the definition details except the **Name**, **Description**, and **Folder** remain the same as that of the parent definition. You can edit these definition details later. For more information, refer to Editing a Capital Allocation Model Definition section.

5.2.1.6 Approve/Reject a Capital Allocation Model Definition

You can approve/reject an existing Capital Allocation Model definition, which is in **Pending Approval** status, from the *Capital Allocation Models* window. Only a user with Approver privileges can approve/reject a definition.

To approve/reject a Capital Allocation Model definition, perform the following procedure.

1. Select the check box adjacent to the Capital Allocation Model definition you want to approve/reject.
2. Click **Approve** button from the *Capital Allocation Models* grid.

   The *Capital Allocation* window is displayed with the definition details.
3. Click **Approve** or **Reject** button.
   - Upon approving, the status of the Capital Allocation Model definition is changed to **Approved**. Once Approved, this definition is made available for use in Capital Calculation Model execution.
   - Upon rejecting, the status of the Capital Allocation Model definition is changed to **Rejected**. You can **Edit** this definition further if you need to use this. For more information, refer to Editing a Capital Allocation Model Definition section.

5.2.1.7 Retire a Capital Allocation Model Definition

You can retire an existing Capital Allocation Model definition from the *Capital Allocation Models* window.

To retire a Capital Allocation Model definition, perform the following procedure.

1. Select the check box adjacent to the Capital Allocation Model definition you want to retire.

   > **NOTE:** Only those Capital Allocation Model definitions, which are in **Approved** status can be retired.

2. Click **Retire** button from the *Capital Allocation Models* grid.

   A warning dialog is displayed.
3. Click **Yes** button.

   The selected definition is retired and the status is changed to **Retired**, in the *Capital Allocation Models* window.

5.2.1.8 Deleting a Capital Allocation Model Definition

You can delete an existing Capital Allocation Model definition from the *Capital Allocation Models* window.

To delete one or more existing Capital Allocation Model definitions, perform the following procedure.

1. Select the check box(s) adjacent to the Capital Allocation Model definition(s) you want to delete.

NOTE: Only those Capital Allocation Model definitions, which are in **Draft** status can be deleted.

2. Click **Delete** button from the *Capital Allocation Models* grid.

    A warning dialog is displayed.
3. Click **Yes** button.

    The selected Capital Allocation Model definitions are removed from the *Capital Allocation Models* window.

5.3   Run Definition Summary

5.3.1   Access Run Definition Summary

You can access Run Definition Summary from the OFS OREC application left pane as follows:
1. Click **OREC Production** under **Operational Risk Economic Capital**.
2. Click **Run Definition Summary**.

    The *Run Definition Summary* window is displayed on the RHS with the *Search* grid and the *Run Definition* grid with the list of all the existing definitions.

5.3.1.1   Search for Existing Run Definitions

You can search for existing Run definitions, based on the search parameters such as ID, Model Name, Last Modified By, Created By, Last Modified Date, and Created Date.

To search for an existing Run definition, perform the following procedure:
1. Enter one or more details in the Search grid, depending on the fields, as tabulated:

Field	Description
ID	Enter the ID of the definition which you want to search.
Model Name	Enter the name of the definition which you want to search.
Last Modified By	Enter the name of the user, to search the definitions that are modified last by this user.
Created By	Enter the name of the user, to search the definitions that are created by this user.
Last Modified Date	Select <, >, or = from the drop down list and click ⬚ to specify the date to search for definitions which are modified before, after, or on the specified date.
Created Date	Select <, >, or = from the drop down list and click ⬚ to specify the date to search for definitions which are created before, after, or on the specified date.

2. Click **Search** button from the *Search* grid.

The list of definitions matching with the search criteria are displayed.

5.3.1.2   Viewing a Run Definition

You can view an existing Run definition from the *Run Definition Summary* window.

To view the details of an existing Run definition, perform the following procedure.
1.   Select the check box adjacent to the Run definition you want to view.
2.   Click **View** button from the *Run Definition* grid.

The details of the selected definition are displayed in the *Run Definition* window.

NOTE: You cannot edit any of the fields of the definition while in **View** mode.

5.3.1.3   Editing a Run Definition

You can edit the details of an existing Run definition from the *Run Definition Summary* window.

To edit the details of an existing Run definition, perform the following procedure.
1.   Select the check box adjacent to the Run definition you want to edit.
2.   Click **Edit** button from the *Run Definition* grid.

The details of the selected definition are displayed in the *Run Definition* window in edit mode.

3.   Edit the required fields of the Run definition. Only the *Var Options* and *VaR Options* grids and the associated fields/sub grids can be edited. For more information, refer to [Execute a Capital Calculation Model Definition](#) section.
4.   Click **Save** button.

The details of the definition are updated and the definition is displayed under the *Run Definition* grid.

6   Operational Risk Economic Capital Reporting

A reporting dashboard is also provided with the OREC application. This involves a combination of graphical as well as tabular reports. You are provided with report filters to view data in different ways. These include selection of Date, Capital Calculation Run, and Execution Identifier for Regulatory Capital/Economic Capital and Insurance Adjusted/Insurance Unadjusted.

A model run using Run execution is all that the dashboard needs. The dashboard queries the same database using filters like Run descriptions, execution date and so on.

6.1   Dashboards and Reports

Following are the Dashboards and the underlying reports present in the OREC application.

- **Analysis by LE**

    - **Model Details**: The Model Details report displays the details such as Legal Entity, Internal Loss Data, External Loss Data, Scenario, Dependency, Insurance Benefit, Confidence Level - Regulatory Capital, and Confidence Level - Economic Capital.

    - **Capital Summary**: The Capital Summary report displays the details such as VaR, CVaR, Expected Loss, and Unexpected Loss.

    - **Trend of Regulatory vs Economic Capital**: The Trend of Regulatory vs Economic Capital report displays the selected date on the X axis and the amount in thousands in Y axis. The Economic Capital and Regulatory Capital are displayed as lines. You can mouse over these to view the details as depicted in the following figures:

      Calendar Date: 2/4/2011
      Economic Capital: 88509.93

      Calendar Date: 2/4/2011
      Regulatory Capital: 32939.07

    - **Internal Losses by Line of Business**: The Internal Losses by Line of Business report displays the percentage of individual loss amounts for various departments in different sectors of a pie chart.

    - **Internal Losses by Event Type**: The Internal Losses by Event Type report displays the percentage of individual loss amounts due to various reasons in different sectors of a pie chart.

    - **Trend of Legal Entity Losses**: The Trend of Legal Entity Losses report displays the Gross Loss Amount and Net Loss Amount along with the number of events for the previous month.

    - **Scenarios by VaR**: The Scenarios by VaR report displays the details of the Scenarios such as Scenario ID, Scenario Name, Scenario VaR, Line of Business, Location, Event Type, and Unit of Measure.

- **Projected Trend of Regulatory vs Economic Capital**: The Projected Trend of Regulatory vs Economic Capital report displays the end of the next quarter date on the X axis and the amount in thousands in Y axis. The Economic Capital and Regulatory Capital are displayed as lines. You can mouse over these to view the details as depicted in the following figures:

```
Projection Date: 5/31/2014
Economic Capital: 88509.93
```

```
Projection Date: 5/31/2014
Regulatory Capital: 32939.07
```

- **Trend of Line of Business Losses**: The Trend of Line of Business Losses report displays the Gross Loss Amount and Net Loss Amount along with the number of events for the previous month.

- **Trend of Event Type Losses**: The Trend of Event Type Losses report displays the Net Loss Amount and Gross Loss Amount for Number of Events in Month/Quarter/Year.

- **Top Internal Losses**: The Top Internal Losses report displays the Incident details such as Incident ID, Name, Description, Internal Line of Business, Internal Event Type Description, Standard Line of Business, Standard Event Type, Location, Occurrence Start Date, Identification Date, Status, Gross Loss, Insurance Recovery, Other Recovery, and Net Loss.

- **Top External Losses**: The Top External Losses report displays the Incident details such as Incident ID, Name, Description, Internal Line of Business, Internal Event Type, Standard Line of Business, Standard Event Type, Location, Occurrence Start Date, Identification Date, Status, Gross Loss, Insurance Recovery, Other Recovery, and Net Loss.

- **Legal Loss Details**: The Legal Loss Details report displays the incident details such as Incident ID, Name, Description, Internal Line of Business, Internal Event Type, Standard Line of Business, Standard Event Type, Location, Occurrence Start Date, Identification Date, Status, Gross Loss, Insurance Recovery, Other Recovery, and Net Loss.

- **Near Miss Incident Details**: The Near Miss Incident Details report displays the incident details such as Incident ID, Name, Description, Internal Line of Business, Internal Event Type, Standard Line of Business, Standard Event Type, Location, Occurrence Start Date, Identification Date, Status, Gross Loss, Insurance Recovery, Other Recovery, and Net Loss.

- **Top Scenarios by Impact**: The Top Scenarios by Impact report displays the Scenario details such as Top Scenarios by Impact, Scenario ID, Scenario Name, Internal Line of Business, Internal Event Type, Standard Line of Business, Standard Event Type, Location, Assessment Methodology, Type, Minimum Frequency, Typical Frequency,

Worst Case Frequency, Typical Severity, Worst Case Severity, Upper Bound, and Interval Bucket.

- **Analysis by LOB**

    - **Model Details**: The Model Details report displays the details such as Internal Loss Data, External Loss Data, Scenario, Dependency, Insurance Benefit, Confidence Level - Regulatory Capital, and Confidence Level - Economic Capital of the Legal Entity.

    - **Capital Summary**: The Capital Summary report displays the details such as VaR, CVaR, Expected Loss, and Unexpected Loss.

    - **Trend of Regulatory vs Economic Capital**: The Trend of Regulatory vs Economic Capital report displays the selected date on the X axis and the amount in thousands in Y axis. The Economic Capital and Regulatory Capital are displayed as lines. You can mouse over these to view the details as depicted in the following figures:

    Calendar Date: 2/4/2011
    Economic Capital: 88509.93

    Calendar Date: 2/4/2011
    Regulatory Capital: 32939.07

    - **Internal Losses by Event Type**: The Internal Losses by Event Type report displays the percentage of individual loss amounts due to various reasons in different sectors of a pie chart.

    - **Scenarios by VaR**: The Scenarios by VaR report displays the details of the Scenarios such as Scenario ID, Scenario Name, Scenario VaR, Line of Business, Location, Event Type, and Unit of Measure.

    - **Projected Trend of Regulatory vs Economic Capital**: The Projected Trend of Regulatory vs Economic Capital report displays the end of the next quarter date on the X axis and the amount in thousands in Y axis. The Economic Capital and Regulatory Capital are displayed as lines. You can mouse over these to view the details as depicted in the following figures:

    Projection Date: 5/31/2014
    Economic Capital: 88509.93

    Projection Date: 5/31/2014
    Regulatory Capital: 32939.07

    - **Trend of Line of Business Losses**: The Trend of Line of Business Losses report displays the Gross Loss Amount and Net Loss Amount along with the number of events for the previous month.

    - **Trend of Event Type Losses**: The Trend of Event Type Losses report displays the Gross Loss Amount and Net Loss Amount along with the number of events for the previous month.

- **Top Internal Losses**: The Top Internal Losses report displays the Incident details such as Incident ID, Name, Description, Internal Line of Business, Internal Event Type Description, Standard Line of Business, Standard Event Type, Location, Occurrence Start Date, Identification Date, Status, Gross Loss, Insurance Recovery, Other Recovery, and Net Loss.

- **Top External Losses**: The Top External Losses report displays the Incident details such as Incident ID, Name, Description, Internal Line of Business, Internal Event Type, Standard Line of Business, Standard Event Type, Location, Occurrence Start Date, Identification Date, Status, Gross Loss, Insurance Recovery, Other Recovery, and Net Loss.

- **Legal Loss Details**: The Legal Loss Details report displays the incident details such as Incident ID, Name, Description, Internal Line of Business, Internal Event Type, Standard Line of Business, Standard Event Type, Location, Occurrence Start Date, Identification Date, Status, Gross Loss, Insurance Recovery, Other Recovery, and Net Loss.

- **Near Miss Incident Details**: The Near Miss Incident Details report displays the incident details such as Incident ID, Name, Description, Internal Line of Business, Internal Event Type, Standard Line of Business, Standard Event Type, Location, Occurrence Start Date, Identification Date, Status, Gross Loss, Insurance Recovery, Other Recovery, and Net Loss.

- **Top Scenarios by Impact**: The Top Scenarios by Impact report displays the Scenario details such as Top Scenarios by Impact, Scenario ID, Scenario Name, Internal Line of Business, Internal Event Type, Standard Line of Business, Standard Event Type, Location, Assessment Methodology, Type, Minimum Frequency, Typical Frequency, Worst Case Frequency, Typical Severity, Worst Case Severity, Upper Bound, and Interval Bucket.

- **Analysis by UOM**

  - **Model Details**: The Model Details report displays the Internal Loss Data, External Loss Data, Scenario, Diversification Benefit, Insurance Benefit, Confidence level Regulatory Capital, and Confidence level Economic Capital details of the Legal Entity.

  - **Capital Summary**: The Capital Summary report displays the Value at Risk (Var), Conditional Value at Risk (CVaR), Expected Loss, and Unexpected Loss occurred in the selected date.

  - **Unit of Measure wise Risk Measures**: The Unit of Measure wise Risk Measures report displays the details of risk measures available for different UOMs. These details include Methodology, Capital, CVar, Expected Loss, Unexpected Loss, Internal Loss Data Inclusion, External Loss Data Inclusion, Number of Scenarios, Loss Data Frequency, and Loss Data Severity.

- **Frequency Modelling Distribution Details**: The Frequency Modelling Distribution Details report displays the Frequency Model Distributions and their respective Parameters in different UOMs.

- **Severity Modelling Distribution Details**: The Severity Modelling Distribution Details report displays the □ Severity Model Distributions and their respective Parameters in different UOMs.

- **UOM wise Scenario VaR**: The UOM wise Scenario VaR report displays the Scenario value at Risk for different UOMs with the details such as Scenario ID, Scenario Name, Frequency Distribution, Severity Distribution, and Scenario VaR.

- **Correlation / Copula Details**: The Correlation / Copula Details report displays the Loss Data Correlation, Loss Data Correlation Method, Loss Data Copula Method, Scenario Correlation, and Scenario Copula Method along with the capital summary details such as VaR, CVaR, Expected Loss, and Unexpected Loss.

- **UOM Definition**: The UOM Definition report displays all the UOMs and their respective Constituents.

- **Top Internal Losses**: The Top Internal Losses report displays the Incident details such as Incident ID, Name, Description, Internal Line of Business, Internal Event Type Description, Standard Line of Business, Standard Event Type, Location, Occurrence Start Date, Identification Date, Status, Gross Loss, Insurance Recovery, Other Recovery, and Net Loss.

- **Top External Losses**: The Top External Losses report displays the Incident details such as Incident ID, Name, Description, Internal Line of Business, Internal Event Type, Standard Line of Business, Standard Event Type, Location, Occurrence Start Date, Identification Date, Status, Gross Loss, Insurance Recovery, Other Recovery, and Net Loss.

- **Legal Loss Details**: The Legal Loss Details report displays the incident details such as Incident ID, Name, Description, Internal Line of Business, Internal Event Type, Standard Line of Business, Standard Event Type, Location, Occurrence Start Date, Identification Date, Status, Gross Loss, Insurance Recovery, Other Recovery, and Net Loss.

- **Near Miss Incident Details**: The Near Miss Incident Details report displays the incident details such as Incident ID, Name, Description, Internal Line of Business, Internal Event Type, Standard Line of Business, Standard Event Type, Location, Occurrence Start Date, Identification Date, Status, Gross Loss, Insurance Recovery, Other Recovery, and Net Loss.

- **Top Scenarios by Impact**: The Top Scenarios by Impact report displays the Scenario details such as Top Scenarios by Impact, Scenario ID, Scenario Name, Internal Line of Business, Internal Event Type, Standard Line of Business, Standard Event Type, Location, Assessment Methodology, Type, Minimum Frequency, Typical Frequency,

Worst Case Frequency, Typical Severity, Worst Case Severity, Upper Bound, and Interval Bucket.

- **Model Comparison**: The Model Comparison dashboard provides you the following reports, which compares the Capital Calculation Run and Execution Identifier in two different periods.

  - **Model Comparison**: Model Comparison report provides you the list of models with the details such as Legal Entity, Internal Loss Data, External Loss Data, Scenarios, Diversification Benefit, Insurance Benefit, Confidence Level – Regulatory Capital, and Confidence Level – Economic Capital.

  - **Capital Summary**: The Capital Summary report lists the Cvar and VaR of Regulatory Capital and Economic Capital.

  - **Unit of Measure wise Risk Measures**: The Unit of Measure wise Risk Measures report displays the list of Unit of Measures with the Methodology, Var, CVar, Expected Loss, and Unexpected Loss details.

  - **Frequency Modelling Distribution Details**: The Frequency Modelling Distribution Details report displays the list of Unit of Measures with the Frequency Distributions and corresponding Parameters.

  - **Severity Modelling Distribution Details**: The Frequency Modelling Distribution Details report displays the list of Unit of Measures with the Severity Distributions and corresponding Parameters.

  - **UOM wise Scenario VaR**: The UOM wise Scenario VaR report displays the list of Unit of Measures with Scenario ID, Scenario Name, Frequency Distribution, Severity Distribution, and Scenario.

  - **Correlation / Copula Details**: The Correlation / Copula Details report displays the name of the Correlation / Copula method used and the Capital Summary information.

  - **UOM Definition**: The UOM Definition report displays the list of Unit of Measures and their corresponding Constituents.

- **Top X Analysis**

  - **Model Details**: The Model Details report displays the Internal Loss Data, External Loss Data, Scenario, Dependency, Insurance Benefit, Confidence level Regulatory Capital, and Confidence level Economic Capital details of the Legal Entity.

  - **Capital Summary**: The Capital Summary report displays the details such as VaR, CVaR, Expected Loss, and Unexpected Loss.

  - **Legal Entities by Capital Consumption**:

  - **Unit of Measure by Capital Consumption**: The Unit of Measure by Capital Consumption report displays a bar graph with Unit of Measures in the X axis and Capital Amount in the Y axis.

- **Line of Business by Capital Consumption**: The Line of Business by Capital Consumption report displays a bar graph with Line of Businesses in the X axis and Capital Amount in the Y axis.

- **Line of Business - Event by Internal Losses**: The Line of Business - Event by Internal Losses report displays a bar graph with Line of Business – Event Types in the X axis and Loss Amount in the Y axis. This report displays the Gross Loss Amount and Net Loss Amount for each event type.

- **Legal Entities by Internal Losses**: The Legal Entities by Internal Losses report displays a bar graph with Legal Entity in the X axis and Loss Amount in the Y axis. This report displays the Gross Loss Amount and Net Loss Amount for the legal entity.

- **Unit of Measure by Internal Losses**: The Unit of Measure by Internal Losses report displays a bar graph with Unit of Measures in the X axis and Loss Amount in the Y axis. This report displays the Gross Loss Amount and Net Loss Amount for each UoM.

- **Line of Business by Internal Losses**: The Line of Business by Internal Losses report displays a bar graph with Line of Businesses in the X axis and Loss Amount in the Y axis. This report displays the Gross Loss Amount and Net Loss Amount for each LoB.

- **Event Type by Internal Losses**: The Event Type by Internal Losses report displays a bar graph with Event Types in the X axis and Loss Amount in the Y axis. This report displays the Gross Loss Amount and Net Loss Amount for each event type.

- **Scenarios by VaR**: The Scenarios by VaR report displays the details of the Scenarios such as Scenario ID, Scenario Name, Scenario VaR, Line of Business, Location, Event Type, and Unit of Measure.

- **Executive Dashboard**

  - **Model Details**: The Model Details report displays the Internal Loss Data, External Loss Data, Scenario, Dependency, Insurance Benefit, Confidence level Regulatory Capital, and Confidence level Economic Capital details of the Legal Entity.

  - **Regulatory vs Economic Capital**: The Regulatory vs Economic Capital report displays the VaR, CVaR, Expected Loss, and Unexpected Loss in the form of a bar graph, with Regulatory Capital and Economic Capital in the X axis and Capital Amount in the Y axis.

  - **Capital Consumption by Legal Entity**: The Capital Consumption by Legal Entity report displays the capital used by various legal entities in the form of a pie chart. The legal entities are indicated in various colors in sectors of the pie chart.

  - **Capital vs Losses Trend**: The Capital vs Losses Trend report displays the Capital and Gross Loss in the form of a line graph, for the selected period.

  - **LOB Capital vs Losses**: The LOB Capital vs Losses report displays the Capital and Gross Loss in the form of a line graph, for the various LoBs.

- **Capital Consumption by Line of Business**: The Capital Consumption by Line of Business report displays the capital used by various LOBs in the form of a pie chart. The LOBs are indicated in various colors in sectors of the pie chart.

- **Unit of Measure**: The Unit of Measure report displays the selected UOM and the corresponding VaR value.

- **Internal Losses breaching VaR**: The Internal Losses breaching VaR report displays the LOB with Event Type and Internal Gross Loss.

- **External Losses breaching VaR**: The External Losses breaching VaR report displays the LOB with Event Type and External Gross Loss.

- **Scenarios breaching VaR**: The Scenarios breaching VaR report displays the Scenario name, LOB, Event Type, and the loss amount as Scenario Impact.

Appendix A - Internal and External Loss Data Scaling

Inflation Based Scaling for Internal and External Loss Data

In this method, scaling is done linearly based on the index values and number of historical days between actual loss date and reporting date for Internal and External loss separately.

*Scaling Factor = (Inflation Index for the Reporting Date/Inflation Index for the Loss Date) * (Number of days between reporting date and loss date/Number of days between Inflation Date nearest to reporting date and inflation date nearest to loss date)*

Mean Based Scaling for Internal Loss Data

In this method, mean for each loss period is calculated and each and every loss observation is scaled to have the same mean loss for all the periods. It can be represented as follows:

$$x_{i,T-t,rescaled1} = \frac{x_{i,T-t,observed}}{\overline{x}_{T-t}} \overline{x}_T \quad (1)$$

Where;

$x_{i,T-t,rescaled1}$	represents the rescaled time loss number "i" for period T-t to take into account differences of the mean	
$x_{i,T-t,observed}$	represents the observed loss number "i" for period T-t	
$\overline{x}_{T-t}$	represents the mean loss for period T-t	
$\overline{x}_T$	represents the mean loss for the last available period T	

Mean is calculated for each period by the following steps:

- Complete loss data is segregated into 180 days buckets starting backwards from the reporting date.
- Mean loss for each bucket is calculated.

Scaling factor is calculated as follows:

Scaling Factor = mean loss for last available period T divided by mean loss for the period T-t

- Each observed loss is multiplied by the Scaling Factor.

Mean Based scaling can be applied for the following:

- Entity as a whole or

- By different Internal LOBs

If it is applied Entity wide, complete data is taken into consideration for arriving at mean for all the periods.

If it is applied LOB wise, then data for different internal LOBs is taken into consideration for arriving at mean for all the periods and scaling factor is worked out accordingly.

Note:

- Default bucket is fixed at180 days. You can configure the same by changing the OR_MEAN_BASED_SCALE_BUCKT_LEGTH column in SETUP_MASTER table as mentioned in Appendix B.

- If the last bucket is less than 90 days, then data is clubbed with the last but one bucket. Users can configure the same by changing OR_MEAN_BASED_SCALE_BUCKT_ADJ column in SETUP_MASTER table as mentioned in Appendix B.

Least Squares Method for External Loss Data Scaling

In this method, a minimizing function is used to derive the scaling factor. LSM calculations happen at entity – LOB combination. Internal loss data intended to be used for capital calculation are considered. External loss data for each external entity is compared with complete internal loss data and scaling factor is calculated at internal entity – LOB and external entity – LOB level. Following are the steps for calculating the scaling factor for the LOB:

- Percentile for each internal loss is calculated **(Percentile P_i)**.

- Scaling factor is considered as 1 to begin with.

  - External loss data is scaled by multiplying external loss and scaling factor.

  - Internal and scaled external loss data are taken together and percentile for each loss is calculated **(Percentile P_{ie})**.

  - Difference between the percentile values for each internal loss is calculated.

    Difference **$(P_i - P_{ie})$ = Percentile P_i - Percentile P_{ie}**

  - Difference is squared.

    Square of **P_i-P_{ij} = [(P_i - P_{ie}) * (P_i - P_{ie})]**

  - Sum of difference values for all internal losses is calculated.

    Sum **(Square of P_i-P_{ij})**

- Scaling factor is reduced from 1 to 0.99 and step (b) is repeated. This will result in a new Sum **(Square of P_i-P_{ij})**

- Difference between **Sum (Square of P_i-P_{ij})** of scaling factor 1 and scaling factor 0.99 is calculated.

  Sum (Square of P_i-P_{ij}) for scaling factor 1 - Sum (Square of P_i-P_{ij}) for scaling factor 0.99.

- Scaling factor is reduced from 0.99 to 0.98 and a new **Sum (Square of P_i-P_{ij})** and difference between 0.99 and 0.98 is calculated.

- This loop is continued till the difference becomes negative. Last scaling factor which returns a positive difference before the difference turns negative for the first time is finalized as the scaling factor.

- If the difference does not turn negative at any point of time, scaling factor is considered as 1 by default.

Note:

- Least Squares Method scaling is done on Standard LOBs. Internal and External LOBs should be reclassified to Standard LOB as part of data preparation to use Least Squares Method.

- This method supports only scaling down of external losses.

Factor Based Scaling for External Loss Data

In this method, scaling factor is calculated as follows:

- Select the data preparation

- Select additional filters:

  - Loss Amount to be used for linear regression fitting (Gross Loss, Net Loss excluding Insurance Recovery or Net Loss). This is the dependent variable.

  - Select Entity / LOB. This is the level at which scaling factor are calculated. If LOB is selected, then it is expected that LOB reclassification from Internal to Standard and External to Standard is selected in the data preparation.

  - Select Scaling factor for the entity or different LOBs. This is the independent variable. Scaling factors could be:

    - Gross Income

    - Profit

    - Asset Size

    - Volume of transactions

  - Scaling factor value for both internal and external entity should be available for month or quarter or year.

  - Select Time Bucket into which loss data and scaling factor are divided and used for linear regression fitted.

- Scaling factor uploaded as input is converted into bucket time. For example, Gross Income for quarter / month / year provided as download are converted into selected bucket time.

- Default start month for financial year is taken as April and bucketing happens accordingly for both loss and scaling factor. Start Month for the financial year can be updated in OREC_POWER_LAW_FIN_YR_START_MONTH column of SETUP_MASTER table.

- Mean Loss and Standard Deviation of Loss for each bucket period for internal and external entity OR for internal LOBs and External LOBs are calculated. Similarly, scaling factor value for each bucket for internal and external entity OR for internal LOBs and External LOBs is calculated.

- Log values of Mean Loss, Standard Deviation of Loss and Scaling factor value are calculated for Internal and External entity OR Internal LOBs and External LOBs.

- Following regression fitting is carried out and regression statistics provided to help user find out whether the selected scaling factor is a good indicator of losses:

  - Log of mean of internal loss amount and log of internal scaling factor for internal entity or LOBs.

  - Log of mean of external loss amount and log of external scaling factor value for all external entities or LOBs.

  - Log of Standard Deviation of internal loss amount and log of internal scaling factor for internal entity or LOBs.

  - Log of Standard Deviation of external loss amount and log of external scaling factor value for all external entities or LOBs.

  - Log of mean of internal and external loss amount and log of internal and external scaling factor for internal and external entities or LOBs.

  - Log of standard deviation of internal and external loss amount and log of internal and external scaling factor for internal and external entities or LOBs

- Preceding regression fittings provides the slope values for the following:

	Mean	Standard Deviation	Average
Slope : Internal	(a)	(b)	[(a)+(b)] / 2
Slope : External	(c)	(d)	[(c)+(d)] / 2

- Average of Mean and Standard Deviation slope is taken as the final slope value for internal entity and external entities separately or each LOB separately. These values are deployed when a sandbox scaling model is deployed.

- Deployed scaling model can be selected in a data preparation when external scaling method = Factor Based Scaling.

- ▪ Scaling Factor is calculated run time during data preparation as follows:

Scaling Factor for each external entity for each bucket =

Internal Slope * Log of scaling factor value for the bucket/External Slope * Log of scaling factor value for the bucket

Scaling Factor for each external entity – LOB for each bucket =

Internal LOB Slope * Log of scaling factor value for the bucket/External LOB Slope * Log of scaling factor value for the bucket

- ▪ This scaling factor is multiplied with the actual loss amount to derive the scaled loss.

Note: Factor based scaling is performed on Standard LOBs when scaling level is LOB. Internal and External LOBs should be reclassified to Standard LOBs as part of data preparation to use Factor Based Scaling.

Appendix B - Scenario Modelling

The Scenario assessment approaches used in the OREC application are the following:

- Individual Approach
- Parameter Based Approach
- Percentile Approach
- Interval Approach

Modelling methodologies for each of these are detailed in the following sections:

NOTE: For all Scenario Modeling approaches, the Frequency Distribution of Scenario Events is expected to be defined by assuming a yearly simulation interval.

Individual Approach

Frequency Model

The steps involved in Frequency Model for Individual Approach are the following:

1. It is expected that the Scenario Frequency Mean is available. This is the mean of the Frequency Distribution.

2. You can also download the Minimum Frequency and Maximum Frequency estimates. These two estimates are optional and are available if these were captured in addition to the Scenario Frequency Mean estimate, while conducting the Scenario Analysis. The Minimum Frequency must be less than or equal to the Frequency Mean and the Maximum Frequency must be greater than or equal to the Frequency Mean.

3. If the Minimum Frequency and Maximum Frequency estimates have not been specified, then the Frequency Distribution which is used to model the Scenario Frequency is Poisson distribution with its mean parameter equal to the Frequency Mean estimate.

4. If the Minimum Frequency and Maximum Frequency estimates have been specified, then the frequency distribution which is used to model the Scenario Frequency is determined first by calculating the frequency variance using the following formula:

$$\left[\frac{\max(Maximum\ Frequency - Frequency\ Mean, Frequency\ Mean - Minimum\ Frequency)}{3}\right]^2$$

If the computed Frequency Variance is greater than the Frequency Mean estimate, then the Frequency Distribution used is Negative Binomial distribution with the following parameters:

$$\beta = \frac{Frequency\ Variance}{Frequency\ Mean} - 1$$

$$n = \frac{Frequency\ Mean}{\beta}$$

If the Frequency Variance is less than or equal to the Frequency Mean, then the Frequency Distribution used is Poisson distribution with its mean parameter equal to the Frequency Mean estimate.

NOTE: If the preceding formula does not result in correct probability for Negative Binomial, then Poisson is used.

Severity Model

In this approach, there exists single severity estimate per scenario. Unlike Internal Loss Data, it is possible to fit a Scenario severity distribution based on a single Severity estimation point. During Scenario Severity simulation, the Severity estimate arrived using individual based approach is used directly. That is Frequency generated is multiplied by the Severity amount.

Parameter Based Approach

Frequency Model

The steps involved in Frequency Model for Parameter Based Approach are the following:

1. Select a Frequency Distribution type. The application provides you the option to select any of the Frequency Distributions supported in Frequency Modelling for loss data.

2. Enter the parameter(s) corresponding to the selected distribution.

Severity Model

The steps involved in Severity Model for Parameter Based Approach are the following:

1. Select a Severity Distribution type. The application provides you the option the user to select any of the supported Severity Distributions. All the distributions supported for Loss Severity Modelling (except truncated distributions) are available.

2. Enter the parameter(s) corresponding to the selected Severity Distribution.

Percentile Based Approach

Frequency and Severity Model

OREC application provides a four-point estimate percentile based model for operational risk VaR computation. The four Scenario estimate points comprise of the following:

- **Typical Loss Frequency (TF)**: This represents the typical loss frequency of the occurrence of loss event.

- **Typical Loss Severity (TS)**: This represents the estimate of the typical loss impact.

- **Worst Case Frequency (WF)**: This represents the probability of occurrence of loss event that has a loss impact, which exceeds the worst-case severity loss impact.

- **Worst Case Severity (WS)**: This represents the estimate of the severe/extreme/worst case loss amount that is assumed to be at a certain percentile of the severity distribution. The percentile is determined from the known typical loss frequency and the known worst-case loss frequency.

The following diagram depicts the modelling methodology:
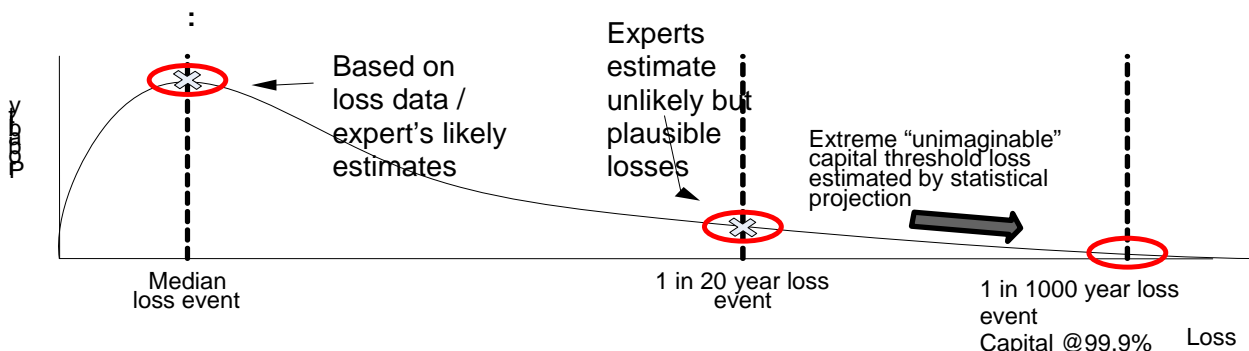
Case 1: Pure Scenario Based Modeling (Typical – Worst Case)

This case is applicable in the absence of sufficient internal loss data. This is a pure Scenario modeling case where the workshop participants have given inputs for both typical loss and worst-case events. The inputs given by the participant are used to arrive at the parameters for the distribution-fitting curve for frequency and severity.

The steps involved in Pure Scenario Based Modeling are the following:

- Typical Loss Frequency (TF) is equated with the mean/Lambda of the Poisson Frequency Distribution.

- Typical Loss Severity (TS) is equated with the median of the Severity Distribution. The supported distributions are Lognormal and Weibull.

- Worst Case Severity (WS) estimate is equated to a specific quantile of Severity Distribution.

If Severity Distribution selected is Lognormal, the following equations are applicable:

μ = log (TS)

This is derived after equating TS to the median of the lognormal distribution.

CDF (WS) = (1- WF/TF) – [WS is equated to the quantile (1 – WF/TF)]

Using the CDF equation of the lognormal distribution, the above equation is transformed into the following:

$$\Phi\left(\frac{\log(WS) - \mu}{\sigma}\right) = 1 - \frac{WF}{TF}$$

The Sigma parameter of the Lognormal distribution is computed from the preceding equation and the equation for μ mentioned earlier:

$$\sigma = \frac{\log(WS) - \log(.\ TS)}{\Phi^{-1}\left(1 - \frac{WF}{.\ TF}\right)}$$

If the Severity distribution selected is Weibull, the following equations are applicable:

$$TS = \theta[\ln(2)]^{1/\alpha}$$

This is derived after equating TS to the median of the Weibull distribution.

CDF (WS) = (1-WF/TF)

Where, WS is equated to the quantile (1 – WF/TF).

Using the CDF equation of the Weibull distribution, the preceding equation is transformed into the following:

$$1 - e^{-(\frac{WS}{\theta})^{\alpha}} = 1 - \frac{WF}{TF}$$

The α and θ parameters of the distribution are computed from the preceding equation and from the equation for TS calculation.

Case 2: Hybrid modeling or Unified Parameter Based Approach (Combination of tailed Scenario Estimate with Actual Internal Loss data)

This case is applicable when sufficient loss data is available. This is the hybrid modeling case, which is a combination of Internal Loss Data elements and Scenario data elements. This is also termed as Unified Parameter Based Approach, where you can arrive at the parameters based on both Loss Data and Scenarios. Internal Loss Data is used to define and derive the body of the loss distribution. Worst Case Scenario estimates are used to define and derive the tail of the same loss distribution.

The statistical methodology follows an approach where, Scenario assessments provide the estimate for tail (WS and WF) while empirical data is used for body (TF and TS).

The steps involved in this process are the following:

The scale parameter of the Frequency and Severity distribution is estimated using the Internal Loss Data through the existing functionalities available in the system for arriving at the parameter estimates using data.

The system possess the functionality whereby you need to provide the Worst Case Severity (WS) and the Worst Case Frequency (WF). The WS estimate is equated to a specific quantile of severity distribution, which you have selected.

Finally, you need to select a severity distribution based on which the parameters of the distribution are arrived at.

If the selected Severity Distribution is Lognormal:

CDF (WS) = (1- WF/λ)

Where, WS is equated to the quantile (1 – WF/λ)

Using the CDF equation of Lognormal Distribution and this equation you can arrive at the sigma parameter of the distribution.

$$\sigma = \frac{\log(WS) - \mu}{\Phi^{-1}\left(1 - \dfrac{WF}{\lambda}\right)}$$

If the selected Severity Distribution is Weibull:

CDF (WS) = (1- WF/λ)

Where, WS is equated to the quantile (1 – WF/λ)

Using the CDF equation of the Weibull distribution, this equation is transformed to the following:

$$1 - e^{-(\frac{WS}{\theta})^{\alpha}} = 1 - \frac{WF}{\lambda}$$

Interval Based Scenario Severity Model

In this approach, the following inputs (example) are expected as downloads for each Scenario:

Interval No	Number of years (Frequency)	Lower Bound	Upper Bound
1	25	25,612	134,145
2	15	72,540	288,435
3	5	89,532	601,467
4	10	510,250	1,400,000
5	75	12,50,000	15,00,750

These inputs consist of lower and upper bound values for each Scenario along with Frequency.

1. Sort the intervals provided in ascending order of lower bound of Severity amount.

2. Calculate the Normalized Frequency as follows:

    Typical Risk scenario is defined as probability of happening and Financial Impact. For example mis-selling products is a Scenario. Probability of occurring is 1 in 10 years and financial impact being 1M USD. Under same Scenario you can define multiple probabilities and related financial impact. 1 in 10 years is nothings but 10% (=1/10) probability of happening said event in a year with severity amount as given.

Interval No	Number of years (Frequency)	Lower Bound	Upper Bound	Normalized Frequency
1	25	25,612	134,145	3
2	15	72,540	288,435	5
3	5	89,532	601,467	15
4	10	510,250	1,400,000	7.5
5	75	12,50,000	15,00,750	1

1 in 25 years is equal to 3 in 75 years, which is equal to 75/3.

$$Normalized\ Frequency = Highest\ \text{Event Expected Occurrence Base Years} / \text{Event Expected Occurrence Base Years}$$

3. Calculate Overlap percentage for each interval.

   a. Check for each interval, if lower bound of said Severity intervals falls within lower and upper bound of its earlier intervals. All such cases require overlap correction. Only in cases where there is overlap case proceed to step c.

   b. Exit this calculation with output as zero overlap, for no case of overlap.

   c. Percentage Overlap = *(b1 - a2) / (b1 -a1)*

   Where;

   - b1 is the upper Severity bound for the Scenario with the lesser lower Severity bound.

   - a2 is (if a2 < b1) is the lower Severity bound for the Scenario with the greater (or equal) lower Severity bound.

   - a1 is the lower Severity bound for the Scenario with the lesser lower Severity bound.

   d. Note that a Scenario could have overlapped with multiple Scenarios and the percentage overlap is always calculated similarly. Because if Scenario 3 intersects with multiple Scenarios (1 and 2), then the cumulative normalized frequency is determined first by calculating the percentage overlap with Scenario 1, and then calculating the percentage overlap with Scenario 2, and summing the results from each step.

> **NOTE:** Since intervals are sorted by increasing Severity lower bound, at each step of the process, only those intervals above the interval in question when calculating the cumulative normalized frequency are considered.

4. Calculate Cumulative Common Frequency as follows:

Execute this process only for those cases where overlap process output is non zero. In cases where overlap process output is found to be zero, Cumulative Common Frequency should be set equal to normalized frequency and do not perform this calculation.

$$\text{Cumulative Common Frequency} = mhi + (\text{Percentage Overlap}) \times mlo,$$

Where;

- **mhi** is the normalized frequency for the scenario with the greater lower severity bound.

- **mlo** is the normalized frequency for the scenario with the lesser lower severity bound.

5. Calculate Interval Simulation Adjustment Factor as follows:

$$\textit{Highest} \text{ Event Expected Occurrence Base Years} /$$
$$\text{Sum of Adjusted Cumulative Common Frequency}$$

In this example, it is In this case, it is 75/43.

6. Prepare Interval Probability as follows:

   a. Interval Probability is equal to dividing each adjusted cumulative common frequency by sum total of adjusted cumulative common frequency.

   b. These proportions are for highest event expected occurrence year meaning for events happening in 75 years in this case.

   c. For each interval, there should be one interval probability present.

7. Annualize the Interval Probability by dividing each Interval Probability by Interval Simulation Adjustment Factor. For each interval, there should be one Annualized interval probability. Sum total of Annualized interval probability is always less than 1.

8. Prepare Annualized Interval Probability Buckets as follows:

   a. There should be n+1 probability buckets whereby n is count of intervals.

   b. For first bucket, subtract the sum total of Annualized Interval Probability from 1. This will give upper bound of first Probability Bucket. Lower bound is zero.

   c. For second bucket:

   i. Lower bound = upper bound of first bucket

   ii. Upper bound = lower bound of first bucket plus annualized interval probability for first interval

d. For subsequent buckets:

    i. Lower bound = upper bound of (n-1)th bucket

    ii. Upper Bound = lower bound of nth bucket plus annualized interval probability for (n-1)th interval where n is bucket no

e. Note:

    i. Note Bucket count = Interval Count +1

    ii. First bucket has been added to take care of probability that scenario never results into any losses due to low probability.

    iii. Hence, Bucket N is synonymous to N-1 Interval for all buckets except first bucket, which has been additionally induced

    iv. Severity lower and upper bound will be same as given by user with only difference is first bucket both lower and upper bound are zero. In this case, it becomes the following:

Bucket No	Cumulative Common Frequency	Interval Probability	Annualized Interval Probability	Bucket Probability Lower Bound	Bucket Probability Upper Bound	Bucket Severity Lower Bound	Bucket Severity Upper Bound
1				0	42.67%	0	0
2	3	7%	4%	42.67%	46.67%	25,612	134,145
3	7	16%	9.33%	46.67%	56%	72,540	288,435
4	21	49%	28%	56%	84%	89,532	601,467
5	10	23%	13.33%	84%	97.33%	510,250	1,400,000
6	2	5%	2.67%	97.33%	100%	12,50,000	15,00,750

9. Simulate the Scenario Losses as follows:

a. Simulate the random numbers using Uniform distribution.

b. Check in which bucket random number falls. Simulate the severity from corresponding severity bounds.

c. Number of simulations is same as input provided in capital calculation model definition.

Appendix C - Register New Modeling Techniques

Registering a new modelling techniques facilitates you to include additional techniques other than the out of the box capabilities of the OFS OREC application. This is achieved through the Oracle Financial Services Enterprise Modeling capabilities of the Oracle Financial Services Advanced Analytical Applications Infrastructure Application Pack.

To create a new modelling technique in OFS OREC application, as the initial step, you need to register the new technique through the Technique Registration section of Modeling Options module. For more information, refer to **Technique Registration Workflow** section of *Oracle Financial Services Enterprise Modeling User Guide* available at OTN Documentation Library.

Once the technique is registered, perform the following procedure:

1. Make an entry in OREC_MODEL_SETUP_DATA table in sandbox schema for this technique with the following values:

    a. Required V_MODULE_CODE and V_OBJECTIVE_ID are the following:

V_MODULE_CODE	V_OBJECTIVE_ID
1505	Scaling
1506	Frequency Modeling
1507	Severity Modeling
1508	Scenario Modeling
1512	Dataset Modeling

    b. Create a new N_MODEL_EXEC_SEQUENCE and V_MODEL_TYPE_CODE for the selected MODULE_CODE.

    c. Create the V_TECHNIQUE_ID as in the MF_TECHNIQUE_MASTER table in config schema for the newly created technique.

    d. Populate the values for N_NUMBER_OF_IMAGES, V_DISTRIBUTION_APPLICABLE, V_DEPLOYMENT_APPLICABLE, and other attributes as per the technique created.

    e. Make a new entry in DIM_DISTRIBUTION_FITTING_TYPE table in sandbox schema and populate the corresponding V_DISTR_FITTING_TYPE_CODE as V_DISTRIBUTION_CODE in this table, if the value of V_DISTRIBUTION_APPLICABLE is 'Y'.

2. Make an entry in the FSI_OREC_TECHNIQUE_MLS table in sandbox schema for this technique with a new RHS_ID and description within the MODULE_CODE selected (V_RMODEL_CODE to be same as the V_MODEL_TYPE_CODE entered in OREC_MODEL_SETUP_DATA table).

3. Fetch the INPUT and OUTPUT details for the new technique by executing the following query in the config schema with the TECHNIQUE_ID as the parameter:

SELECT * FROM MF_INPUT_OUTPUT_MASTER

     WHERE V_UNIQUE_ID IN

         (SELECT V_OBJECT_MAPPED_CODE

           FROM MF_MAP_ITEMS

         WHERE V_OBJECT_CODE = '&TECHNIQUE_ID')

4. Make entries in FSI_OREC_MODULE_INPUT_MAP and FSI_OREC_MODULE_OUTPUT_MAP tables in sandbox schema for the new technique and its respective INPUT and OUTPUT IDs fetched from step 3.

If the OUTPUT is an image, V_OUTPUT_ID and V_OUTPUT_OBJECT_NAME columns should be left blank in the FSI_OREC_MODULE_OUTPUT_MAP table.

Once you perform this procedure, the registered technique will be available on the modeling screen as a new RHS entry to view the output.

Appendix D - Configurations for OREC Application

Make the following entries in the SETUP_MASTER and DIM_DATA_ORIGIN tables are made, before the initialization of OREC application.

Table: **SETUP_MASTER**

Column: **V_COMPONENT_CODE**

Value	Business Justification
OR_OREC_LEGAL_ENTITY	The default Legal Entity Mapping from OR Application to OREC Application. As OR is not capturing the Legal Entity, it should be setup in OREC application. You have to update the entity skey value in the V_COMPONENT_VALUE column.
OREC_MULTIPLE_LOB_IMPACT_OPTION	Currently while creating an incident in OR application, when there is a case of multiple impacts in multiple LOBs, you do not have option for treatment of the following incidents: ▪ Option 1 - Treat these as a single incident and entire impact to the business unit with the highest impact. ▪ Option 2 - Treat these as separate incidents in each of the impacted business units and subsequently in those UOMs. ▪ Option 3 - Treat these as a single incident and entire impact to the business unit that caused this incident. Since this is not part of the current application, you are provided with an option to configure it in the SETUP_MASTER table with one of the options (1,2 or 3).By default it is set to option 1 with value '1' in the column V_COMPONENT_VALUE.
DEFAULT_OR_OREC_SCN_FX_RATE_SRC	This is the default OR Application to OREC Application exchange rate Source Code for scenario data. As OR application is not capturing the Exchange rate source, it should be setup in OREC application. You can update the exchange rate source code in the V_COMPONENT_VALUE column.
OR_MEAN_BASED_SCALE_BUCKT_	OREC Mean based scaling bucket width adjustment is

Value	Business Justification
ADJ	required to consider the left over days in which you can merge with last bucket or create new bucket. You have to provide the adjustment days. (for example: 45)
OR_MEAN_BASED_SCALE_BUCKT_LEGTH	The number of buckets in OREC Mean based scaling is divided based on this number. You can update the bucket length in days. (for example: 180)
OR_MEAN_BASED_SCALE_BUCKT_LEGTH_DEFLT	The number of buckets in OREC Mean based scaling. The number of buckets are divided based on this number. You can update the bucket length in days. This default value is taken if you do not give the bucket length. (for example:- 180)
OR_MEAN_BASED_SCALE_BUCKT_ADJ_DEFLT	OREC Mean based scaling bucket width adjustment is required to consider the days left before you can merge with last bucket or create new bucket. The entered default value will be taken if you do not provide the adjustment days. (for example: 40)
OREC_FREQ_BUCKT_ADJ_VAL OREC	The Frequency bucket width adjustment is required to indicate the days left before you can merge with the last bucket or create new bucket. You have to provide the adjustment percentage of bucket length (That is, if the value is 0.5 and bucket length is 90 days then the adjustment days are 45).
OREC_POWER_LAW_FIN_YR_START_MNTH_DEFLT	OREC Power law bucket indicates the financial year starting month of the corresponding financial institution. This default value is taken you do not give the financial year start Month as per their financial institution. (For example. 'APR')
OREC_POWER_LAW_FIN_YR_START_MONTH	OREC Power law bucket indicates the financial year starting month on which the power law of corresponding financial institution starts. You have to provide the Financial start Month in this column.
OREC_INSURANCE_RATING_DATA_SRC	Multiple ratings are available as OREC application has to consider the rating agency based on this value from multiple rating agencies, User has to provide the rating agency code in the V_COMPONENT_VALUE column against the code.

Table: **DIM_DATA_ORIGIN**

Column: **V_DATA_SOURCE_CODE**

Value	Business justification
OFSAAOR	This indicates the default data source code. As OR application is not capturing the data source code, OREC application will have a default value of 'OFSAAOR'.

Appendix E - Understanding Key Terms and Concepts

Value-at-Risk - Value at Risk (VaR) is the maximum loss not exceeding a given probability defined at the confidence level, over a given period of time.

Conditional Value-at-Risk – Conditional Value-at-Risk is defined as the mean of the loss α-tail distribution. CVaR is derived by taking a weighted average between the VaR and losses exceeding the VaR.

Expected and Unexpected Loss - The expected loss is the mean annual aggregate loss, and the unexpected loss is the annual aggregate loss in excess of this mean, up to a particular confidence level (say, 95 or 99 per cent confidence). The following diagram gives a detailed explanation of Expected and Unexpected loss:
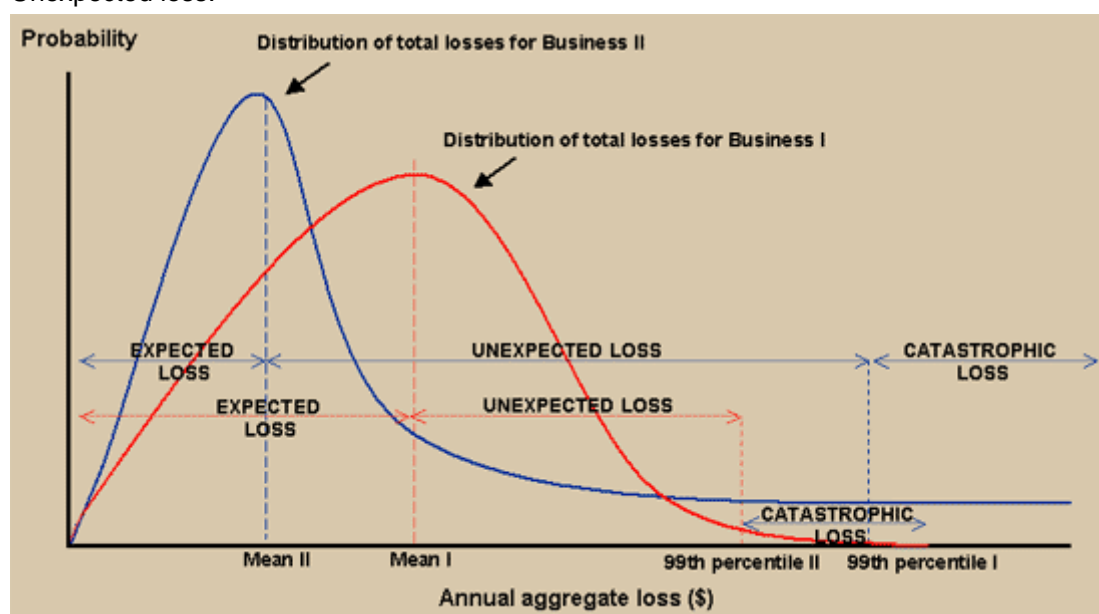
Figure 1: Expected and Unexpected Loss

Data Model- is a logical map that represents the inherent properties of the data independent of software, hardware or machine performance considerations. The data model consists of entities (tables) and attributes (columns) and shows data elements grouped into records, as well as the association around those records.

Dataset - It is the simplest of data warehouse schemas. This schema resembles a star diagram. While the center contains one or more FACT tables, the points (rays) contain the dimension tables as represented in the following diagram:
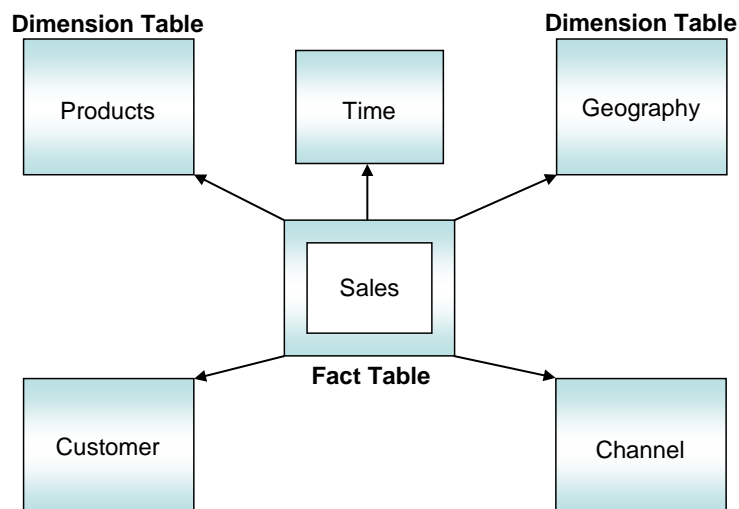
Figure 2: Data Warehouse Schemas

Metadata – A term used to denote data about data. Business metadata objects are available in the form of Measures, Business Processors, Hierarchies, Dimensions, Datasets, Cubes, and so on. The commonly used metadata definitions in this User Guide are Hierarchies.

Star Schema: In a star schema, only one join is required to establish the relationship between the FACT table and any one of the dimension tables which optimizes queries as all the information about each level is stored in a row. The set of records resulting from this star join is known as a dataset.

Hierarchy – A tree structure across which data is reported is known as a hierarchy. The members that form the hierarchy are attributes of an entity. Thus, a hierarchy is necessarily based upon one or many columns of a table. Hierarchies may be based on either the FACT table or dimensional tables.

Measure - A simple measure represents a quantum of data and is based on a specific attribute (column) of an entity (table). The measure by itself is an aggregation performed on the specific column such as summation, count or a distinct count.

Business Processor – This is a metric resulting from a computation performed on a simple measure. The *computation that is performed on the measure often involves the use of statistical, mathematical or database* functions.

Advanced Analytical Infrastructure – The Oracle Operational Risk Economic Capital Modeling Environment performs estimations for a given input variable using historical data. It relies on pre-built statistical applications to build models. The framework stores these applications so that models can be built easily by business users. The metadata abstraction layer is actively used in the definition of models. Underlying metadata objects such as Measures, Hierarchies, and Datasets are used along with statistical techniques in the definition of models.

Appendix F - Frequently Asked Questions

1. **Is using Sandbox for modelling a compulsory step?**

   No. Sandbox is an optional trial area. If all required inputs for Capital Calculation model are available through External Models, then those can be downloaded and used in Capital Calculation model. Alternatively, those can be manually specified in the Capital Calculation Model definition. In such cases, Sandbox models are not required. Hence, it is possible to bypass Sandbox and work only in Production infodom.

   For example:

   Loss Frequency Distribution: Sandbox Model can be used to fit various distributions to internal loss data, check the distribution parameters, goodness of fit results, pp plot, qq plot, pdf, and cdf graphs. This helps in finalizing the distribution for the Unit of Measure.

   If the distribution is already finalized and the parameters are known through external models, then the same can be downloaded or specified while defining a Capital Calculation Model, without referring to Sandbox.

2. **Is it possible to use OREC application only for Monte Carlo Simulation?**

   Yes. It is possible to use OREC application only for Monte Carlo Simulation and generation of risk measures such as VaR, CVaR, Expected Loss, and Unexpected Loss followed by capital allocation to UOMs, LOBs, and LEs. It is expected that external models provide all the inputs required for Capital Calculation Model. Some of the important inputs are:

   - Frequency Distribution and Parameters for all UOMs.
   - Severity Distributions and Parameters for all UOMs.
   - Scenario Frequency and severity distribution and their parameters for all scenarios.
   - Loss Correlation Matrix.
   - Scenario Correlation Matrix.
   - In this case, sandbox models are not at all used.

3. **Is it possible to use models which are both internal and external to OREC during Capital Calculation Model definition?**

   Yes. It is possible to use both internal and external models at each step of Capital Calculation Model. To illustrate:

   Frequency model can be imported from Sandbox, Severity model can be imported from external models through download and loss correlation can be specified manually.

   All loss models (loss frequency, loss severity, and loss correlation matrix) can be modeled in Sandbox and imported whereas all Scenario models (Scenario models for various assessment methodologies and Scenario Correlation matrix) can be modeled outside and imported from external models (download or specify).

4. **How the frequency parameters are annualized when shorter buckets are used?**

   Shape parameter of the frequency distribution is annualized by extrapolating the shorter bucket to a year as follows:

*Annualized shape parameter = Original shape parameter * Annualized Time Bucket*

Where;

- Annualized Time Bucket = 365 / time bucket length.
- Scale parameter is not annualized.
- Annualization is followed by BECIF adjustment, if any.

5. **How does OREC application support incorporating BEICF (Business Environment and Internal Control Factors) in Capital Calculation Models?**

OREC application supports various ways in which BEICF factors can be incorporated to reflect its impact on the capital. Following are the options:

- **Scenario Model**: During scenario workshops, BEICF can be considered and incorporated while arriving at scenario estimates. This is brought into OREC application during scenario download and hence automatically taken care.

- **Loss Frequency Model**: During Capital Calculation Model definition, in loss frequency modeling step, BEICF shape and scale adjustment factors can be provided. This moves up or down the parameters of the frequency distribution and the same are reflected during frequency simulation which in turn will impact the final capital number. The factors can be provided during loss frequency modeling in sandbox and imported to capital calculation model or specified directly. BEICF Adjustment happens after annualizing frequency distribution parameters when shorter time buckets are used.

- **BEICF Adjustment as a Capital Calculation Run Parameter**: While executing a capital calculation run, BEICF factor can be provided. This is used to adjust the VaR number. It can be provided either at entity level or at each UOM level.

- **BEICF as an Allocation Factor**: BEICF scores can be provided as an allocation factor to allocate capital back to Lines of Business or Legal Entities. In this case, BEICF scores are expected as download. This download value is the ratio of BECIF scores between various LOBs or Legal Entities and should add to 1. In this case, there is no impact on VaR numbers but LOBs and LEs numbers are impacted because of it being used as an allocation factor. This serves as a performance management indicator.

- BEICF adjustment is optional in all the preceding cases.

6. **How does truncated distribution work?**

OREC application supports fitting truncated distributions for each UOM in loss severity modeling in Sandbox. Steps are as follows:

- Left Truncated Distributions are supported.
- De Minimis Threshold is a mandatory input since de minimis threshold acts as the point at which truncation happens.
- Data points above the de minimis threshold value is fitted using truncated distributions and parameters are calculated.

7. **How does loss severity simulation happen for truncated and non truncated distributions?**

During Capital Calculation Model, loss severity models can either be imported from Sandbox or

from external models. Irrespective of truncated or non-truncated distribution, severity simulation happens as follows:

Let us say, the severity distribution is lognormal or truncated log normal distribution.

In simulation 1, if the frequency for the UOM is, say 25, then 25 loss severities are generated.

A random probability between 0 and 1 through uniform distribution is generated.

This random probability is passed as follows:

severity amount = qlnorm (p, meanlog, sdlog)

where;

qlnorm = inverse CDF of lognormal distribution

p = random probability representing the quantile and

meanlog and sdlog = parameters of lognormal distribution.

In this case, 25 random probabilities are passed as p with meanlog and sdlog which results in 25 severity loss amount for the UOM for the first simulation.

8. **How does shifted distribution work?**

   OREC application supports using shifted distributions for each UOM in loss severity modeling in Sandbox. Steps are as follows:

   De Minimis Threshold is a mandatory input since de minimis threshold acts as the shift point that is, all severity amounts for the UOM are shifted downwards by de minimis threshold amount.

   Regular distributions (that is, non truncated) can be fitted to the shifted severity amounts.

   This generates the parameters of the selected distribution.

9. **How does loss severity simulation happen for shifted distribution?**

   During Capital Calculation Model, loss severity models can either be imported from Sandbox or from external models. If it is shifted distribution, then following steps are followed during simulation

   Let us say, the severity distribution is lognormal distribution.

   In simulation 1, if the frequency for the UOM is, say 25, then 25 loss severities are generated.

   A random probability between 0 and 1 through uniform distribution is generated.

   This random probability is passed as follows :

   severity amount = qlnorm (p, meanlog, sdlog)

   where;

   qlnorm = inverse CDF of lognormal distribution

   p = random probability representing the quantile and

   meanlog and sdlog = parameters of lognormal distribution.

   In the preceding case, 25 random probabilities are passed as p with meanlog and sdlog which results in 25 severity loss amount for the UOM for the first simulation.

   Shift Amount (that is, de minimis threshold) is added back to all the severity amounts generated in the previous step.

10. **How is EVT modelling supported in the application?**

    OREC application supports EVT modeling in Sandbox by allowing users to fit different distributions for body and tail for loss amounts of a given UOM. Steps are as follows:

    EVT threshold is taken as a user input. This threshold divides the loss data into body and tail.

    Users can specify the body distribution (say, normal distribution) and tail distribution (say, GPD).

    Body distribution is fitted to all data points below EVT threshold. Similarly, Tail distribution is fitted to all data points above EVT threshold.

    Users can check the parameters of the body and tail distributions, their GOF, PP plot, QQ plot, and finalize the distributions and its parameters.

11. **How does loss severity simulation happen for EVT distribution?**

    During Capital Calculation Model, loss severity models can either be imported from sandbox or from external models. If it is EVT distribution, then following steps are followed during simulation

    Let us say, the body distribution is normal distribution and tail distribution is GPD and EVT Threshold amount is 2500000.

    EVT Threshold percentile is calculated using empirical CDF function that is, percentile at 2500000 is calculated. Let us assume this percentile is 0.95. This percentile value is expected as download for external models.

    A random probability between 0 and 1 through uniform distribution is generated. If the number of frequency for the UOM is 25, then 25 random probabilities are generated.

    If the first random probability is below or equal to 0.95, then loss amount is generated from body distribution as below:

    Probability for body distribution is calculated as follows:

    Random Probability / EVT Threshold Percentile.

    Probability for the body distribution is passed as following to get the first severity amount:

    severity amount = qnorm (p, mean, sd)

    where;

    qnorm = inverse CDF of normal distribution

    p = probability representing the body quantile and

    mean and sd = parameters of normal distribution.

    If the second random probability is above 0.95, then loss amount is generated from tail distribution as follows:

    A random probability between 0 and 1 through uniform distribution is generated.

    This random probability is passed as follows :

    severity amount = qgpd(p, loc, scale, shape, lower.tail = TRUE)

    where;

    qgpd = inverse CDF of GPD.

    p = probability representing the tail quantile and

loc, scale and shape = parameters of GPD.

This method ensures that loss simulation draws proportionate values from body and tail based on EVT Threshold percentile.

12. **Why we get error "Data does not follow … distribution" error? And how can we overcome this error?**

Every data has its own characteristic which is suitable for a particular distribution or class of distribution. If we try to fit the data which does not follow a particular distribution, we end up doing a force fit which may lead to errors.

Another reason can be the choice of buckets. Frequency modeling depends on bucketing. Change in the bucket window and time period can substantially alter the data characteristics. It is advised to choose a correct bucket structure for the output to match the expectation. Hence, it is always advisable to go through the Sandbox Modeling Framework which provides a lot of tools like Goodness of Fit, PP plot, or QQ Plot to judge the fit.

13. **When is Parameter Based Approach expected to be used for Scenario Modelling?**

OREC application supports scenario modeling for following assessment methods:

- Individual Approach
- Interval Approach
- Percentile Approach

If you are using an assessment methodology different from the preceding, then Parameter Based Approach can be used and frequency and severity distributions and their parameters can be directly provided.

14. **How does OREC application incorporate loss correlation / dependency impact into Capital Calculation Process?**

OREC application supports incorporating loss dependency during frequency simulation as follows:

Loss Correlation Matrix can be generated in Sandbox and imported to capital calculation model. Using bucketed loss input, correlation matrix for the UOMs can be generated using various methods such as Spearman, Pearson, Kendall. Positive definiteness and positive semi-definiteness of the correlation matrix can be checked and model can be deployed from sandbox.

Loss Correlation Matrix can be downloaded from an external model into capital calculation model or specified directly. In this case, it is expected that the matrix is positive definite or semi-definite. This correlation matrix is used to generate Gaussian or T-Student Copula probabilities for UOMs. Depending on the number of simulations given in capital calculation run, those many sets of copula probabilities are generated.

This copula probability is used to generate frequency for the UOM.

For Example: If the number of simulations are one lac, then one lac copula probabilities are generated for each UOM. For UOM1, if Poisson is the distribution and lambda = 25, then frequency is generated as follows:

frequency = qpois (p, lambda)

where;

qpois = inverse CDF of Poisson distribution

p = copula probability representing the quantile and

lambda = lambda

In this case, all the one lac probabilities are passed as p with lambda = 25 which results in 1 lac frequency numbers for the UOMs.

Loss Frequency simulated represents the impact of correlation / dependency.

15. **How does OREC application incorporate scenario correlation / dependency impact into Capital Calculation Process?**

    OREC application supports incorporating scenario dependency during scenario frequency simulation as follows:

    Scenario Correlation Matrix can be generated in Sandbox and imported to capital calculation model. Positive definiteness and positive semi-definiteness of the correlation matrix can be checked and scenario model can be deployed from sandbox.

    Scenario Correlation Matrix can be downloaded from an external model into capital calculation model or specified directly. In this case, it is expected that the matrix is positive definite or semi-definite.

    This correlation matrix is used to generate Gaussian or T-Student Copula probabilities for the Scenarios. Depending on the number of simulations given in capital calculation run, those many sets of copula probabilities are generated.

    This copula probability is used to generate frequency for the Scenarios.

    For Example: If the numbers of simulations are one lac, then one lac copula probabilities are generated for each Scenario. For Scenario1, if Poisson is the distribution and lambda = 25, then frequency is generated as follows:

    frequency = qpois (p, lambda)

    where;

    qpois = inverse CDF of Poisson distribution

    p = copula probability representing the quantile and

    lambda = lambda

    In the preceding case, all the 1 lac probabilities are passed as p with lambda = 25 which results in 1 lac frequency numbers for the Scenario.

    Scenario Frequency simulated represents the impact of correlation / dependency.

16. **Why do we get copula failure errors?**

    Copula is generated based on the correlation matrix between UOMs or Scenarios. There are a few obvious reasons for copula failure which are as follows:

    Erroneous insertion of data under User Specified resulting in correlation value <-1 or >1.

    Correlation matrix should be Symmetric with all diagonal elements equal to 1.

    For example: UOM1 to UOM2 has correlation value of 0.5 but UOM2 to UOM1 has been inserted

as 0.6.

If the correlation matrix is not positive definite or semi-definite, then copula may fail to generate copula probabilities.

17. **How do we incorporate incremental loss data between different capital calculation periods?**

Since it is possible to have incremental loss data between two dates, it is important incorporate them in capital calculation models. Following are the ways in which it can be incorporated:

Without Re-defining frequency and severity models: If the incremental data is not expected to change the nature of underlying distribution, then this approach is suggested. Following steps reduces the effort required to create new frequency and severity models. Existing models can be re-used and parameters re-estimated without additional effort.

Execute a new data preparation run to bring in incremental data into the system.

Define a new capital calculation model or copy an existing capital calculation and edit.

Select the old period frequency and severity model from sandbox.

Import the models without parameters. This will retain the old distribution but re-estimate the parameters based on the new data preparation.

Ensure that dataset between the new data preparation, new capital calculation model, frequency and severity model is same.

Re-defining frequency and severity models: If the incremental data is expected to change the nature of underlying distribution, then start afresh and redefine all models.

18. **What are the methods supported to combine loss and scenario data for a Unit of Measure ?**

Hybrid modeling can be used to combine loss data and scenario data for a Unit of measure. This is required mainly for those UOMs where there is insufficient loss data. Following are the ways in which it can be done:

Weights Based Approach: In this approach, loss and scenario are modeled separately for the UOM and combined using Alternative or Complementary method. This results in picking losses from loss or scenario based on weights provided.

Unified Parameter Approach: In this approach, a scenario which used hybrid percentile method is used that is., parameters of the scenario frequency and severity distribution are derived using both loss and scenario. This is single model developed by combining loss and scenario. Scenario Modeling supports this approach.

19. **How does a Random Number Seed function?**

Simulation programs make use of a pseudorandom number generator that requires a seed. If none is provided, a System Generated seed will be used. This is used to separate the different simulations within a single run. Any positive integers can be a random seed.

20. **How are VaR numbers calculated?**

If correlation is used, VaR algorithm attempts to retain the respective weights of various UOMs with respect to each other when frequency for each UOM is simulated. Due to this when

simulated losses are summed across the UOMs to get financial institution level VaR, it avoids forming simultaneous peaks for each UOM. This peculiar structure results in diversified VaR.

21. **How are risk measures calculated at Entity level ?**

    OREC application calculates two sets of risk measures at Entity Level.

    Simulated losses of all UOMs are added simulation wise to arrive at a single loss vector at entity level. From this aggregated simulation loss vector, following risk measures are calculated at entity level:

    Value at Risk (VaR)

    Conditional Value at Risk (Average of losses above VaR)

    Unexpected Loss (VaR - Expected Loss)

    This is termed as "Allocated VaR", "Allocated CVaR", and "Allocated Unexpected Loss" since this is what will be allocated to UOMs, LOBs, and LEs.

    Entity level VaR, CVaR, Expected Loss and Unexpected Loss are also calculated by adding VaR, CVaR, EL and Unexpected Loss across all UOMs.

    Both Insurance Adjusted and Insurance Unadjusted numbers are calculated for the preceding.

22. **What is the difference between Calculated VaR and Allocated VaR at UOM level?**

    Calculating Risk Measures at UOM level: Following risk measures are calculated for Regulatory and Economical Capital from the simulated UOM losses (LDA, SBA, or Hybrid):

    Value at Risk (VaR)

    Conditional Value at Risk (Average of losses above VaR)

    Expected Loss (Mean or Median)

    Unexpected Loss (VaR - Expected Loss)

    Both Insurance Adjusted and Insurance Unadjusted numbers are calculated for the preceding.

    Allocated Risk Measures from Entity to UOM level: Allocated VaR, Allocated CVaR and Allocated Unexpected Loss from entity level are allocated back to UOM level using various UOM allocation methods. This results in an additional set of risk measures at UOM level.

    Insurance Adjusted and Insurance Unadjusted numbers are calculated for all the preceding risk measures in both the cases. Similarly, both Regulatory and Economic capital numbers are calculated.

23. **How will the outlier scaling factor be used and what would be the range for the same?**

    OREC application provides inter quartile method for handling outliers. Q1 and Q3 are inter quartile ranges

    > *Lower Bound = Q1 + K*(Q3 -Q1)*

    > *Upper Bound = Q3 - K*(Q3 -Q1)*

    K is outlier scaling factor. Outlier Scaling Factor value of 0 ensures that lower and upper bound is equal to Q1 and Q3 respectively. Positive value for K will keep the lower bound above Q1 and upper bound below Q3. Negative value for K will keep the lower bound below Q1 and upper

bound above Q3 respectively. It is advised to keep K values closer to 0 on both positive and negative side to get reasonable bound values. If they drift farther from 0, it may result in wide gap which will defeat the very purpose of outlier handling. Floor for lower bound and upper bound are Q1 and Q3 respectively. Lower and upper bound values generated using the scaling factor can be changed, if required/

If IQR is used, then all values below and above Q1 and Q3 are replaced by lower and upper bound values respectively during severity modeling.

24. **What is the use of Custom Filters in Data Preparation?**

Custom Filter allows user to define filters in addition to what is provided in data preparation and dataset while loading data from stage. Some of the examples are:

Exclude / Include few external legal entities while loading external loss data.

Exclude / Include losses above a certain amount while loading external loss data.

Exclude / Include scenarios based on certain statuses.

Exclude / Include data of few legal entities for internal loss data, scenario and insurance policies.

Exclude / Include specific Lines of Business.

Exclude / Include specific Event Types.

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