Oracle Financial Services Enterprise Modeling

User Guide

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Oracle Financial Services Enterprise Modeling User Guide

Document Control

Version Number	Revision Date	Change Log
1.3	September 2021	Updated the Creating Schema-based Sandbox Definition section (Doc 32414718).
1.2	March 2021	Added the Variable Definition, Upload Scenario, Variable Shock Library, and Scenario Management sections to the Managing Stress Testing section (Doc 32649468).
1.1	June 2020	Removed the *Creating and publishing models using the integration of OFS EM with EMF Studio* section and related references to EMF Studio (Doc 31449904).
1.0	May 2020	Created the user guide for the OFS AAI Release 8.1.0.0.0.

Table of Contents

1 Preface

This guide provides information related to end-user tasks in Enterprise Modeling.

Topics:

1.1 Related Documents

This section identifies additional documents related to the OFS AAAI Application Pack. You can access Oracle documentation online from the Oracle Help Center (OHC) Documentation Library.

- Oracle Financial Services Advanced Analytical Applications Infrastructure (OFS AAAI) Application Pack 8.1.0.0.0 Installation and Configuration Guide
- Oracle Financial Services Analytical Applications Infrastructure Environment Check Utility Guide
- Oracle Financial Services Analytical Applications Infrastructure User Guide
- Oracle Financial Services Analytical Applications Infrastructure Administration Guide

To find additional information about how Oracle Financial Services solves real business problems, see our Web site at www.oracle.com/financialservices.

1.2 Conventions Used

The following table lists the conventions used in this guide.

Table 1: Convention Used in this guide

Convention	Meaning
Italics	• Names of books, chapters, and sections as references • Emphasis
Bold	• The object of an action (menu names, field names, options, button names) in a step-by-step procedure • Commands typed at a prompt • User input
`Monospace`	• Directories and subdirectories • File names and extensions • Process names • Code sample, including keywords and variables within the text and as separate paragraphs, and user-defined program elements within the text
<Variable>	Substitute input value

2 About Oracle Financial Services Enterprise Modeling

An enterprise modeling is a toolkit that enables an institution's IT policies to be enforced while providing flexibility and freedom that Data Scientists and Statistical Modelers desire.

Topics:

2.1 Overview

The core of Financial Institutions Models is Risk, Marketing, Financial Crime, and Enterprise Performance Analytical Applications. These models include traditional statistical techniques, modern machine learning methods, computational and simulation models. Oracle Financial Services Enterprise Modeling leverages popular statistical platforms such as the R platform and presents a framework for developing, deploying, and managing models at the enterprise level, for financial institutions.

As an enterprise modeling toolkit, Oracle Financial Services Enterprise Modeling enables an institution's IT policies to be enforced while providing flexibility and freedom that Data Scientists and Statistical Modelers desire. Administrative users grant analysts and modelers access to sandboxes - particular analytical subject areas of interest along with a subset of production data - for model building. Validated and approved models may then be promoted from sandboxes to the enterprise model repository. Models in the repository may then be woven into analytical application flows crafted by mixing data management tasks, model execution, and deterministic business logic.

As the use of models proliferate and as modeling becomes a self-service idea within financial institutions, authorized modelers may publish techniques -- parameterized templates of models that serve as building blocks or standardized blueprints for models - so that the best ideas from experienced modelers are captured and reused within the firm. Oracle Financial Services Enterprise Modeling supports techniques developed using R language.

Unique to the needs of large and medium-sized financial institutions is the need to project capital levels under a variety of macroeconomic conditions, to assess the institution's financial strength under different stress scenarios. The Stress Testing Framework within Oracle Financial Services Enterprise Modeling enables risk and finance officers to define various shocks and scenarios and to apply these conditions uniformly across different model execution runs.

Data lineage and traceability are central to a Financial Intuition's governance process. Oracle Financial Services Enterprise Modeling Application together with the pre-requisite Oracle Financial Services Analytical Applications Infrastructure Application provides a toolkit for developing complete end-to-end analytical applications with data lineage and traceability enabled at every step along the analytical workflow.

Topics:

- Oracle Financial Services Enterprise Modeling Workflow

2.1.1 Key Features and Advantages

The key features and advantages of Oracle Financial Services Enterprise Modeling are:

Table 2: Key features and advantages of Oracle Financial Services Enterprise Modeling

Model Registry	Centrally Manage and Control all in the enterprise
Statistical Technique Library	Catalog and publish best modeling practices via reusable templates, which are to be used as building blocks for models
Track model usage across applications	Real-time view of dependencies such as which applications use which models; which variables are used a model, etc. Perform what-if impact analysis for changes to data sets, variables, and models.
Modeling Sandboxes	Provision sandboxes with subsets of production data for modelers giving modelers complete freedom to build, test, and calibrate models using production data, while keeping the production environment locked-down for security and compliance needs. Readily deploy built models to locked-down production via a built-in workflow.
Integrated Platform (With Oracle Financial Services Analytical Applications Infrastructure)	Statistical modeling, Data management, and application deployment integrated into a unified platform so that models may be deployed for use within analytical applications quickly
Execute Models local to data	In-database (Oracle) execution of statistical models for high performance and scalability.
Foundation for Enterprise Stress testing	Enable baseline and stress executions of models defined within the platform

2.1.2 Enterprise-R support with Oracle Financial Services Enterprise Modeling

Oracle Financial Services Enterprise modeling application leverages the R statistical platform. R is an open-source statistical programming language and environment for computing and graphics. For more information about R, see the R Project for Statistical Computing at http://www.r-project.org. Oracle R Enterprise (ORE) is an in-database implementation of the R platform. ORE is a component of the Oracle Advanced Analytics Option of Oracle Database Enterprise Edition. ORE enables running R models within the Oracle Database Environment. For more information on ORE, see the Oracle R Enterprise User Guide.

Oracle Financial Services Enterprise Modeling Application supports ORE-based models and techniques, that is, models defined and registered within the platform may be executed on an ORE instance. R models may be scripted within the platform or may be imported into the platform from previously existing R scripts.

2.1.3 Concepts of Oracle Financial Services Enterprise Modeling

Oracle Financial Services Enterprise Modeling is built specifically to meet many of the needs of large Financial Institutions where external regulatory and internal governance policies.

Models may only be built and tested in a sandbox environment. A sandbox has to be provisioned and authorized for use (usually by an administrator) before it is visible to modelers. Any number of sandboxes may be provisioned, but generally, an enterprise may provide a sandbox for each department or analytical team. For e.g, there may be an LGD sandbox consisting of data needed to build and validate LGD models, and a separate one for PD modeling. Such segregation of modeling teamwork areas is desirable in practice, but it is not a requirement: there may be as few as a single sandbox for the entire organization

Sandboxes are provisioned along with data required for modeling. Tools are provided to aid administrators in provisioning sandboxes with subsets of production data. Datasets and variables abstract physical data sources from the modeler, and data in the sandbox is exposed to modelers using via datasets and variables. Models are built against datasets and variables, not physical data tables and columns. i.e, the underlying data is exposed as a logical dataset within the application, and modelers need not write any database-specific queries to obtain data for modeling. It is generally an administrative task to define datasets, and have a menu of datasets available for the modelers. When a sandbox is provisioned, one or more datasets can be associated with the sandbox.

Models in a sandbox can be changed (created/ edited) by anyone with access to the sandbox. Model versions are preserved in the sandbox along with execution and output histories. Once a model has been validated in the sandbox environment, the modeler may request that model be promoted to the locked-down "production" environment, and once promoted, the promoted model cannot be altered.

Modelers may create new models by using a registered technique from the technique library, as a template. A technique is simply a parameterized and reusable script. An enterprise may publish a menu of techniques and require that modelers use those techniques as the foundation for models. The act of model building is then reduced to selecting an appropriate technique, binding the technique to the appropriate dataset and variables, and providing runtime parameters to the script. Generally, a central data science team within an enterprise or a department is responsible for publishing techniques.

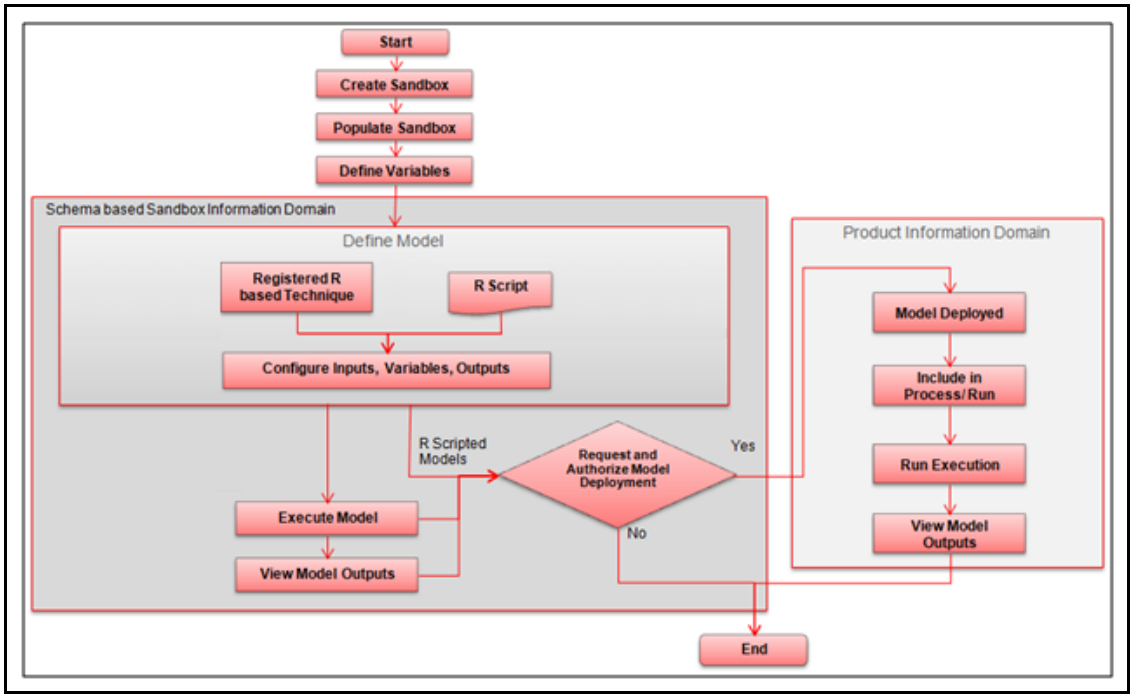
Not all models can be built using published techniques, and so an alternate way to build a model is to write an R script 'from scratch' and execute the script as a model. Regardless of how the model is built, the model must be bound to the dataset and variables before it can access data.

A business analyst may decide to include a published model (that is a promoted model) in the application flow. E.g., a capital computation application flow may include many steps, some of which may be steps to execute statistical models for computing PD and LGD. As the Oracle Financial Services Enterprise Modeling application is fully integrated with the Oracle Financial Services Analytical Applications Infrastructure (AAI), models promoted from Oracle Financial Services Enterprise Modeling application are available as tasks in AAI, and so can be included in any orchestrated execution of tasks (application run). Note that within a sandbox, executable models are also made available as tasks private to the sandbox, and so can be included in sandbox-specific orchestration of tasks.

2.1.4 Oracle Financial Services Enterprise Modeling Workflow

The workflow of Enterprise Modeling starts with creating and population a sandbox, then defining variables and model, and then executing the model. If the R scripted model is processed for Authorize model deployment then Product Information Domain workflow is performed.

Figure 1: Oracle Financial Service Enterprise Modeling workflow



2.2 Components of Oracle Financial Services Enterprise Modeling

The following are the components of the Oracle Financial Services Enterprise Modeling application:

- Sandbox
- Sandbox Maintenance
- Techniques Registration
- Variable Definition
- Modeling

2.2.1 Sandbox

Sandbox in Oracle Financial Services Enterprise Modeling refers to a restricted modeling environment, where the Data model is uploaded. It is implemented as an information domain.

The following information domains are required to perform operations in Oracle Financial Services Enterprise Modeling.

- Sandbox Information Domain: This information domain is used to create and execute business models. Based on the execution status and the generated output, you can verify the results and deploy the model into production.

  You can create the following type of Sandbox in the Oracle Financial Services Enterprise Modeling application.

  - Physical Sandbox: A Physical Sandbox is a restricted environment outside the Production information domain where there is the actual movement of data from the production information domain to the physical sandbox. Creating a sandbox with multiple datasets eliminates the need for having a sandbox definition for each dataset. You can upload the data model while defining the sandbox, or upload it later using the Import Model option in Data Model Maintenance. When you save the sandbox definition, the required tables are created in the sandbox information domain. However, data present in the tables are copied only after authorizing the sandbox population from the Sandbox Maintenance.
- Production Information Domain: This information domain allows you to request for model execution, and generate model outputs.

> **NOTE** Ensure the data model of the sandbox information domain should be a sub-set of the data model of the production information domain

2.2.2 Sandbox Maintenance

Sandbox Maintenance helps you to populate the data to the tables in the Sandbox information domain, based on the dataset and the filters in the Sandbox definition. You have the option to do a complete or incremental sandbox data population.

The Oracle Financial Services Enterprise Modeling application enables you to synchronize the different versions of a Data Model which exists in a Production and Sandbox Information Domain through Incremental Data Model Upload. You can refresh the details and fetch the incremental data model changes from Production to Sandbox Information Domain.

2.2.3 Techniques Registration

The technique is a set of generalized statistical algorithms that can be used to build analytical models. Oracle Financial Services Enterprise Modeling application is based on techniques developed using R script and ORE functions.

2.2.4 Variable Definition

Variable refers to a logical set of attributes that are likely to change based on the selected parameters. In a modeling environment variable plays a vital role in filtering the model parameters and to derive an estimate based on historical data. Variables are defined in the production information domain.

2.2.5 Modeling

Modeling refers to the process of designing a prototype based on a structured data model, considering all the variables for statistical analysis and to simulate real events and processes.

You can use the Modeling utility to measure and quantify risk. You can use the pre-defined models to predict business trends and validate the existing models. You can use R scripting (using R functions as well as ORE functions) or Open R to create business models. See Enterprise-R support with the Oracle Financial Services Enterprise Modeling section for more information.

Oracle Financial Services Enterprise Modeling enables you to run and execute R functions as well as ORE functions in the database, thereby greatly increasing scalability and performance.

You can create models in a Schema Based sandbox.

2.3 User Groups and Entitlements

The following table gives details about the User Groups in the Oracle Financial Services Enterprise Modeling Application.

Table 3: User Groups in the Oracle Financial Services Enterprise Modeling

User Group Name	User Group Description
Modeling Administrator	A user mapped to this group will have access to all the menu items for Enterprise modeling and will have authorization rights for sandbox population, model deployment, and modeling technique authorization.
Modeler Group	A user mapped to this group will have access to all the menu items for Enterprise modeling but will not have authorization rights for the sandbox population, model deployment, and modeling technique authorization.

3 General Features

This chapter explains the general features of the Oracle Financial Services Enterprise Modeling application UI. These are the common features that are found across the modules of Oracle Financial Services Enterprise Modeling. It describes the organization of the user interface and provides step-by-step instructions for navigating through the application.

Topics:

3.1 Home Page Components

The Home Page contains the following sections.

- Header
- Navigation List
- Tab Bar

Figure 2: Home Page

3.1.1 Header

The Header displays icons, buttons, and text for generic information and access to the OFSAA application's features. The following user-interface elements are displayed for EMF:

- **Applications:** Click this icon to display applications in a Tiles menu on the content window.
- **Administration:** Click this icon to display administration tools in a Tiles menu on the content window.
- **Sandbox:** Click this icon to display Sandboxes in a Tiles menu on the content window.
- **Language:** Displays the selected language. Click to select from the options in the drop down.
- **User Name:** Displays the logged-in user name. Click to select from the following options in the drop down:
  - **Preferences:** Select to set the *Home* page.

- **About:** Select to view the copyrights and third-party information.
- **Change Password:** Select to change the password in the *Change Password* window.
- **Logout:** Select to log out of the application.

- Last login date and time, and last failed login date and time: Click to view the last login date and time, and the last failed login date and time.
- Discover/Explore OFSAA Apps: Click to view the *OFSAA applications* web page for more details.

3.1.1.1 Applications

The applications available are displayed in a Tiles menu on the content window. Click the **Tiles** icon to open the selected application. For EMF, the following applications are available:

- Financial Services Enterprise Modeling
  - Data Management

    For more information, see the Oracle Financial Services Analytical Applications Infrastructure User Guide.
  - Sandbox Maintenance
  - Model Execution
  - Technique Registration
  - Stress Testing
  - Configure Execution Venue
- Common Tasks

  For more information, see the Oracle Financial Services Analytical Applications Infrastructure User Guide.
- Data Model Management
- Unified Analytical Metadata
- Operations
- Data Entry Forms and Queries
- Utilities
- Object Administration
- Metadata Browser

3.1.1.2 Administration

The administration feature displays on the **Tiles** menu. Click the Tiles to navigate further.

For more information, see the Oracle Financial Services Analytical Applications Infrastructure User Guide. For EMF, the following applications are available:

- Translation Tools
- Processing Modeling Framework (link to PMF User Guide)

3.1.1.3 Sandbox

The Sandbox icon from the header displays options in the **Tiles** menu. Click on the menu to display the following menu items:

- Modeling
- Model Creation
- Model Execution Status
- Model Output
- Model Deployment

Sandbox option is available only if EMF is enabled in your OFSAA application.

3.1.2 Navigation List

The Navigation list is a slide-in slide-out UI element that appears on clicking the **Menu** (three lines) icon. This element displays a list of links in a menu based on the application selected from the Applications menu and the access rights assigned to the logged-in user. Click on the various links in the list to navigate further and open in the content window.

For more details, see the Oracle Financial Services Analytical Application Infrastructure User Guide.

3.1.3 Tab Bar

The Tab bar contains icons and text to navigate to specific OFSAA application modules. Click on the **Home** button in Tabs to navigate to the *Applications* page on the content window. The elements displayed in Tabs are dependent on the OFSAA application logged into and the access roles assigned to the user.

3.2 Acronyms

The following table describes the acronyms commonly used in this application.

Table 4: Acronyms used in this document

Acronyms	Description
BA	Business Analysts
Infodom	Information Domain
LHS menu	Left-hand side menu
OFSAAI	Oracle Financial Services Analytical Application Infrastructure
OFSAA	Oracle Financial Services Analytical Applications
Production Infodom	Production Information Domain
RHS menu	Right-hand side menu
Sandbox Infodom	Sandbox Information Domain
SA	System Administrator

Acronyms	Description
URL	Uniform Resource Locator
UI	User Interface

4 Getting Started

To get started with Enterprise Modeling refer to the following topics.

Topics:

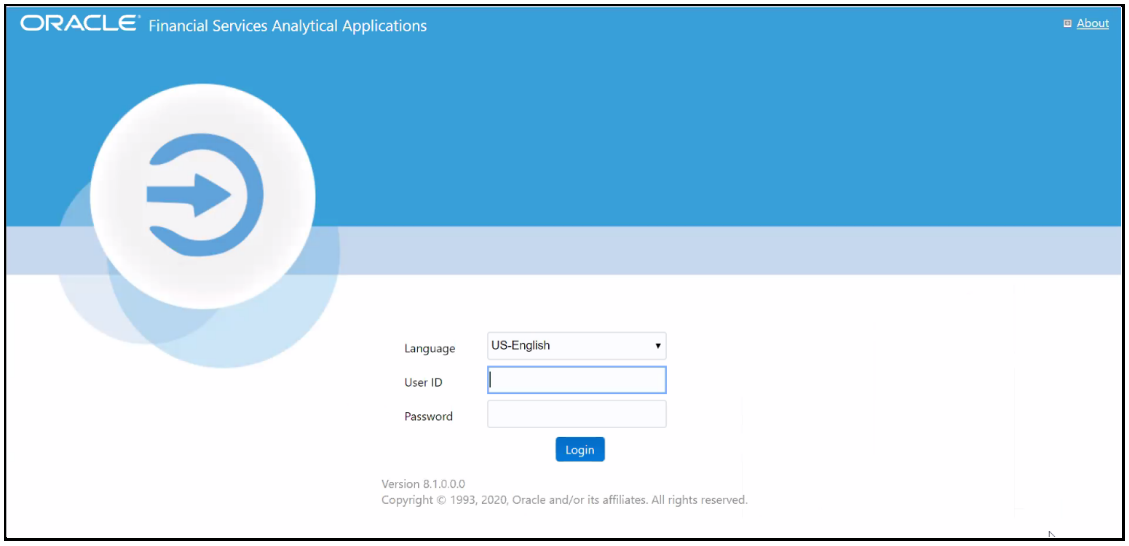
4.1 Logging into the Oracle Financial Services Enterprise Modeling Application

Once the application is installed and configured, you can access Oracle Financial Services Enterprise Modeling Application.

To access Oracle Financial Services Enterprise Modeling, follow these steps:

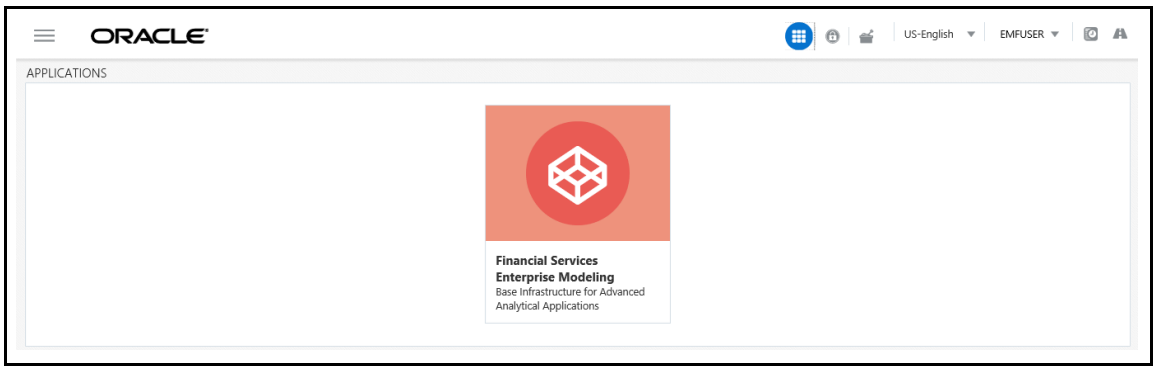
1. Enter the OFSAAI URL in your browser. The *Login* window is displayed.

Figure 3: Oracle Financial Services Enterprise Modeling Application Login Page



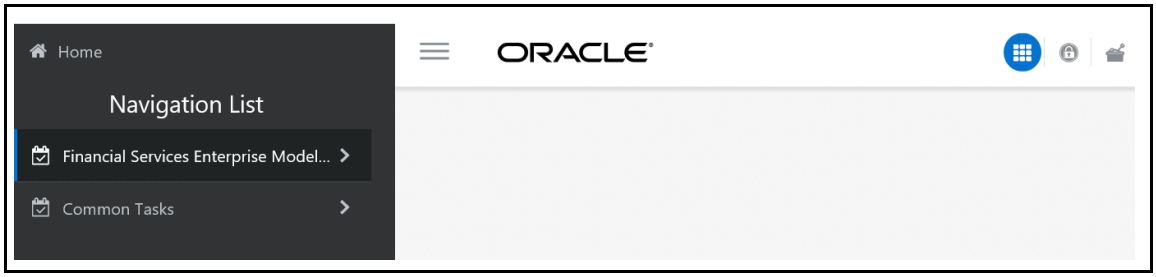
2. Select **Language**.
3. Enter your **User ID** and **Password**.
4. Click **Login**.
5. Click  from the header to display the applications in a Tiles menu.

Figure 4: Application Selection



6. Select **Financial Services Enterprise Modeling** from the Tiles menu. The *Enterprise Modeling Application Home* page is displayed with the Navigation list to the left.

Figure 5: Navigation List



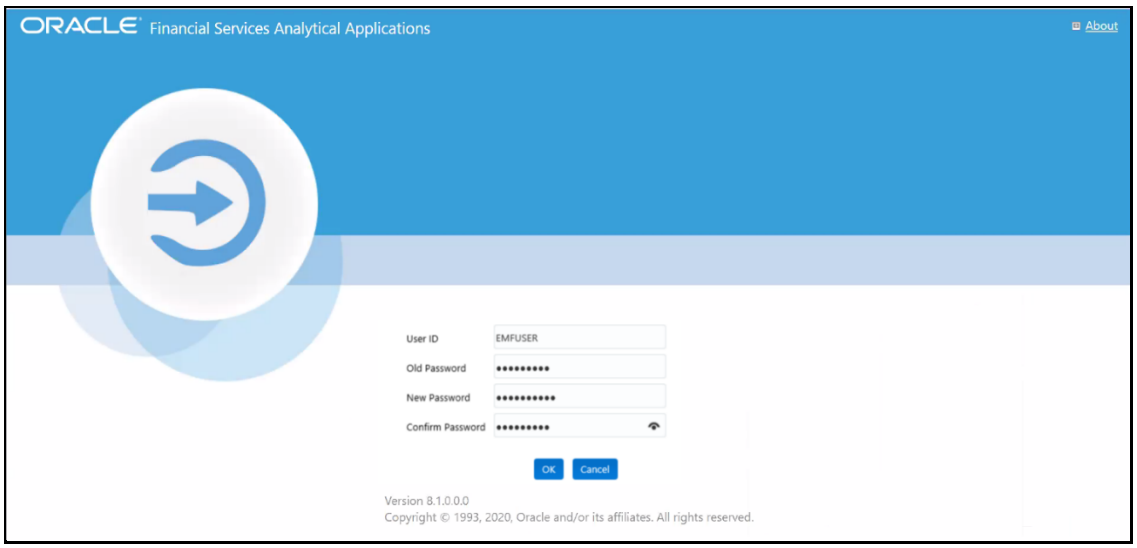
4.2 Changing Password

The first time you log in to the application, the *Change Password* window is displayed. Alternatively, you can also choose to change the password at any time.

To change a password, follow these steps:

1. Click the **User Name** drop down and select **Change Password** from the header at the top to display the *Change Password* window.

Figure 6: Change Password Window



2. Enter the **User ID**.
3. Enter the **Old Password**.
4. Enter **New Password** and re-enter in the **Confirm Password** field.
5. Click **OK**.

NOTE

- Passwords are displayed as asterisks while you enter. This is to ensure that the password is not revealed to other users.
- Ensure that the entered password is at least six characters long.
- The password must be alphanumeric with a combination of numbers and characters.
- The password should not contain spaces.
- Passwords are case sensitive and ensure that the Caps Lock is not turned ON.
- By default, the currently used password is checked for validity if password history is not set.
- The new password should be different from previously used passwords based on password history, which can be configured. If you encounter any of the following problems, contact the System Administrator:
- Your user ID and password are not recognized.
- Your user ID is locked after three consecutive unsuccessful attempts.
- Your user ID has been disabled.
- The guest user cannot change the password.

5 Managing Sandbox

To manage your sandbox requirements refer to the following topics:

Topics:

5.1 About Sandbox

Sandbox is a restricted environment in which you can analyze the data on a trial and error basis and come up with an actual analysis that helps predict the risks and business opportunities for banking institutions. You can create a sandbox by selecting the required datasets and the information domain which you want to implement as the sandbox.

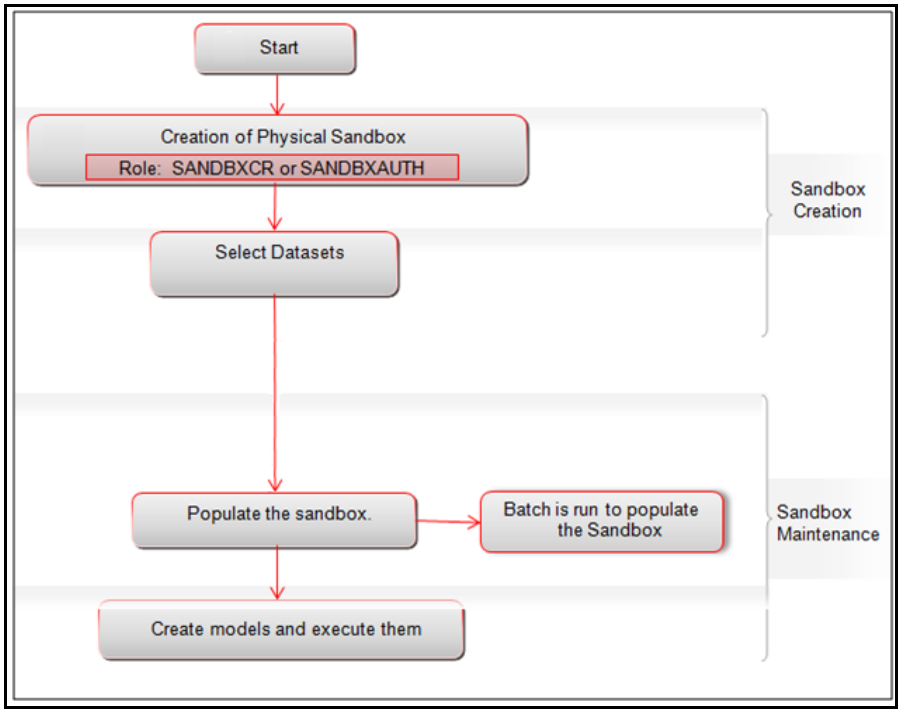
5.2 Workflow

This section explains the workflow of Sandbox. There is one type of Sandbox: Physical Sandbox

5.2.1 Physical Sandbox Workflow

Sandbox workflow starts with the creation of a Physical Sandbox, then select your datasets, populate the sandbox and create models to execute. The following image gives a detailed workflow of Physical Sandbox.

Figure 7: Physical Sandbox workflow



5.3 User Roles

This section explains the user roles required to define a Sandbox.

To create a sandbox, you must have the following user roles:

- SANDBXCR
- SANDBXAUTH

An authorizer must authorize the sandbox population and deletion.

To populate and delete a Sandbox, you must have the following user roles:

- SANDBXMOD
- SANDBXAUTH

For more information on User Groups, see User Groups.

5.3.1 Managing Sandbox

This section explains how to manage the Sandbox feature in the Oracle Financial Services Enterprise Modeling application.

Topics:

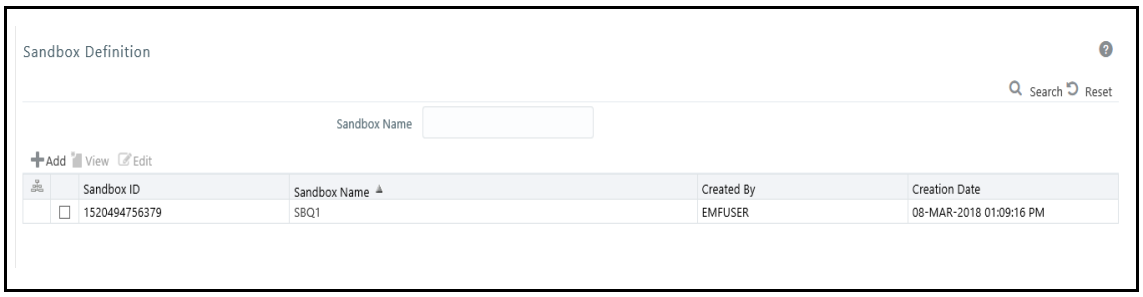
5.3.1.1 Accessing Sandbox Definition

You can access the *Sandbox Definition* page from the *Oracle Financial Services Enterprise Modeling Home* page.

To access the *Sandbox Definition* page, follow these steps:

1. Log in to Oracle Financial Services Enterprise Modeling.
2. Click  from the header to display the applications in a Tiles menu.
3. Select **Financial Services Enterprise Modeling** from the Tiles menu. The *Enterprise Modeling Application Home* page is displayed with the **Navigation** list to the left.
4. Click **Financial Services Enterprise Modeling** from the **Navigation** list to expand view the menu.
5. Click **Sandbox Maintenance** from the expanded **Navigation** list to view the next level of links in the menu. Click **Sandbox Creation** to display the *Sandbox Definition* window.

Figure 8: Sandbox Definition Page



5.3.1.2 Creating Sandbox

This feature allows you to create a sandbox where you can create and execute models.

> **NOTE** After creating a Sandbox you should refresh the screen so that the newly created sandbox is displayed in the Sandbox tab.
>
> If your OFSAA application is configured for Data Redaction (Advanced Security options), then your system administrator has to give certain Grants related to Data Redaction to the Sandbox schema for model execution to execute.
>
> See the section Data Redaction Grants to Sandbox Schema in the OFS Analytical Applications Infrastructure Administration Guide.

5.3.1.2.1 Creating Schema-based Sandbox Definition

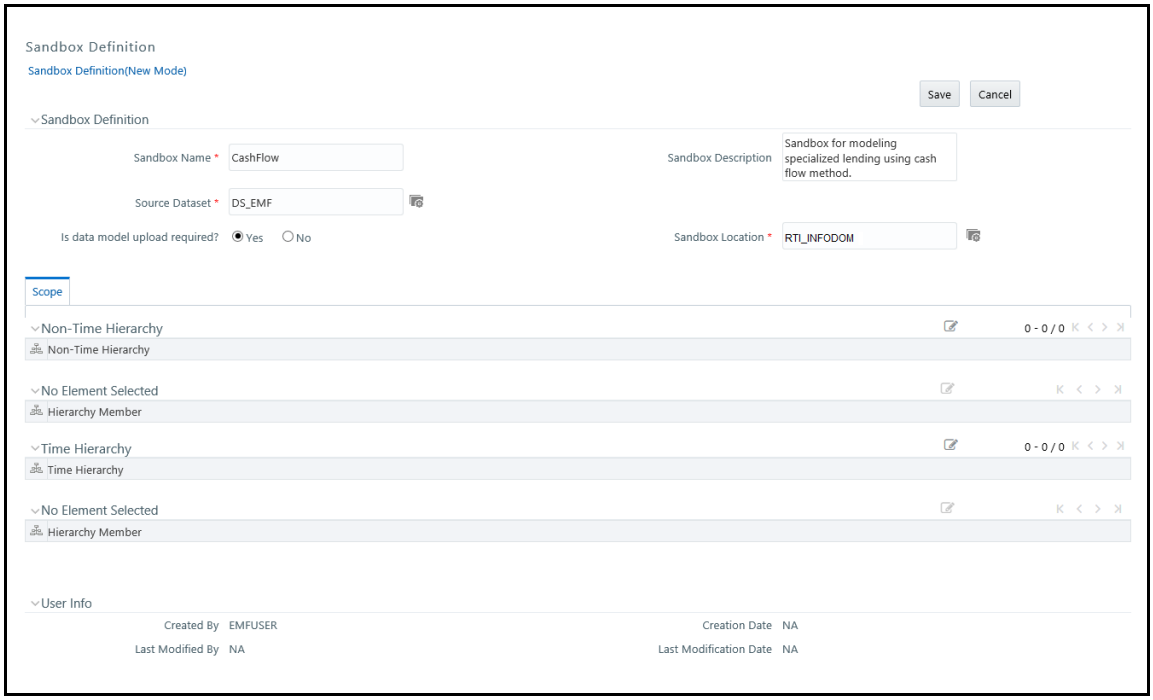
A Schema-based Sandbox is a restricted environment outside the Production information domain, where there is the actual movement of data from the production information domain to the physical sandbox. A schema-based sandbox is also called a physical sandbox. A sandbox can be created with multiple datasets, which eliminates the need for having a sandbox definition for each dataset.

To create a schema-based sandbox, follow these steps:

1. Select + from the **Sandbox Definition** toolbar. The *Sandbox Definition* window is displayed.

> **NOTE** The **Add** button is disabled if you select a checkbox in the grid.

Figure 9: Schema-based Sandbox Definition Window



2. Enter the following details:

Table 5: Field and Description

Field	Description
Sandbox Name	Enter a name for the sandbox. **Note**: Ensure that there are no special characters like `, {,},", ', ~, <,>, /, \, and multiple spaces. **Note:** Enter the alphabetical characters for the Sandbox Name in either uppercase or lowercase. If you enter the Sandbox Name in mixed case, then the EMF-R Execution fails with errors. For example, Sandbox Name can be **ofssdbox180** or **OFSSDBOX180**. If you have existing Sandbox Names in mixed case, then you must edit and update them from the **Database Details** window. For more information, see the **Database Details** section in the Oracle Financial Services Advanced Analytical Applications Infrastructure User Guide.
Sandbox Description	Enter a brief description of the sandbox.

Field	Description
Source Dataset	Select the required datasets. The datasets you want to select should match the Data Model of the sandbox. 1. Click and open the **Source Dataset Browser**. All the **Authorized Datasets** in the selected production Infodom are listed in the Hierarchical Browser. 2. Select the required dataset from the **Datasets** pane and click . To deselect a dataset select it from the **Selected Datasets** pane and click . 3. Click to view the details of the selected datasets. 4. Click to create a dataset. For more details on creating a dataset, see *Creating Data Set* section in the Oracle Financial Services Analytical Applications Infrastructure User Guide. **Note**: The Datasets based on Derived Entities are not supported.
Is data model upload required?	By default, the **Yes** option is selected. • Select **Yes** to upload the data model while saving the sandbox definition. • Select **No** if the data model is already uploaded.
Sandbox Location	This is the information domain you want to implement as a sandbox. 1. Click and open the **Sandbox Location Browser**. ▪ If **Yes** is selected for the **Is data model upload required?** option, the **Sandbox Location** pane displays the list of the Information Domains where the data model is not uploaded and the sandbox has not been defined. ▪ If **No** is selected for the **Is data model upload required?** option, the **Sandbox Location** pane displays the list of the Information Domains where the data model is uploaded and sandbox has not been defined. 2. Select the required infodom and click . To deselect the infodom select it from the **Selected Information Domain** pane and click .

Field	Description
Non Time Hierarchy	1. Click in the **Non Time Hierarchy** toolbar. The **Hierarchy Browser** displays all the Hierarchies/Filters from each selected Datasets. You can click "+" to expand the node to view the sub levels. 2. Select the required hierarchies and click . To deselect hierarchy by select it from the **Selected Members** pane and click . 3. Click **OK**. **Note**: Filter conditions are not considered while loading data into the Hive-based sandboxes. To load data with filters, you can use Data Mapping (T2T) to populate the sandbox. Otherwise, you can apply model-level filters while modeling.
Hierarchy member	Click in the **Hierarchy Member** toolbar and specify the members or nodes in the **Hierarchy** browser. You can click "+" to expand the node to view the sub levels. When you select a hierarchy member, the data belonging to that hierarchy will be copied to the sandbox.
Time Hierarchy	1. Click in the **Time Hierarchy** toolbar. The **Hierarchy** browser displays the available **Time Hierarchies** which is common across all the selected Datasets. You can click "+" to expand the node to view the sub levels. 2. Select the required time hierarchy and click to move it to the **Selected Hierarchies** pane. To deselect time hierarchies select from the **Selected Hierarchies** pane and click . 3. Click **OK**. **Note**: Time hierarchy selection is optional. However, if you do not select a time hierarchy, the following will occur: • Time referencing will not be applicable for model definitions. • For the model definitions, the variable browser will not show any variable definitions that have filters. • The shocking of transition matrix multi-factor models will not work in sandboxes • For models defined using techniques transition matrix - EWMA, MCEM, MC simulations, the execution may fail
Hierarchy Member	Click in the **Hierarchy Member** toolbar and specify the members or nodes in the **Hierarchy** browser. You can click "+" to expand the node to view the sub levels. Time hierarchy is used to group data based on time (year or month). When you select a time hierarchy member, the data belonging to that time hierarchy will be copied to the sandbox.

3. Click **Save**. The tables of the selected dataset get populated in the sandbox information domain.

5.3.1.3 Viewing Sandbox Definition

You can view individual Sandbox Definition details at any given point. To view the existing Sandbox Definition details in the *Sandbox Definition* window, follow these steps:

1. Select the checkbox adjacent to the Sandbox ID.
2. Click  in the **Sandbox Definition** toolbar.
   The *Sandbox Definition View* window is displayed with the details such as **Sandbox Name, Sandbox Description, Source Dataset, Sandbox Locations, Time, and Non Time Hierarchy** and **Hierarchical** members.

5.3.1.4 Modifying Sandbox Definition

You can update only the description and Time Hierarchy Member (if it is selected in the definition) of an existing schema-based Sandbox Definition. To modify Sandbox Definition, follow these steps:

1. Select the checkbox adjacent to the Sandbox ID whose details are to be updated.
2. Click  in the **Sandbox Definition** toolbar. The **Edit** button is disabled if you have selected multiple Sandbox IDs.
3. Modify the **Sandbox Definition** details as required.

   For more information, see the Creating Sandbox section.
4. You can edit **Time** and **Non-Time Filters** in the *Sandbox Definition Edit* page.

5.3.1.5 Searching Sandbox Definition

The *Sandbox Definition* page allows you to search the sandboxes that you want to view.

Topics:

- Sandbox Maintenance
- Accessing Sandbox Maintenance
- Requesting and Authorizing to Populate Sandbox
- Requesting and Authorizing to Delete Sandbox
- Incremental Data Model Upload
- Searching Sandbox Maintenance

To search for Sandbox, follow these steps:

1. Navigate to the *Sandbox Definition* page.

> **NOTE** By default, the *Sandbox Definition* page displays all Sandboxes.

2. Enter the name of the sandbox you want to search for.

3. Click . The filtered list is displayed.

5.3.1.5.1 Sandbox Maintenance

The *Sandbox Maintenance* window is used to map user groups to the sandbox definition which enables the users to create models in the sandbox.

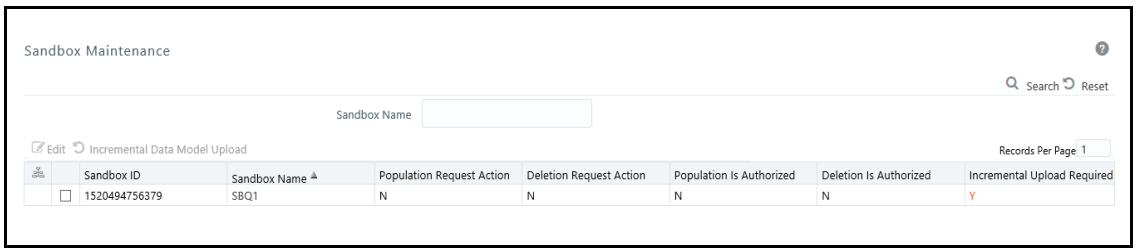
5.3.1.5.2 Accessing Sandbox Maintenance

You can access the *Sandbox Maintenance* page from the *Oracle Financial Services Enterprise Modeling Home* page.

To access the Sandbox Maintenance, follow these steps:

1. Log in to Oracle Financial Services Enterprise Modeling.
2. Click from the header to display the applications in a **Tiles** menu.
3. Select **Financial Services Enterprise Modeling** from the **Tiles** menu. The *Enterprise Modeling Application Home* page is displayed with the **Navigation** list to the left.
4. Click **Financial Services Enterprise Modeling** from the **Navigation** list to expand view the menu.
5. Click **Sandbox Maintenance** from the expanded **Navigation** list to view the next level of links in the menu. Click **Sandbox Maintenance** to display the *Sandbox Maintenance* window.

Figure 10: Sandbox Maintenance Page



5.3.1.5.3 Requesting and Authorizing to Populate Sandbox

The data type **Timestamp** is not supported during the sandbox population.

To request and authorize to populate sandbox in the *Sandbox Maintenance* window, follow these steps:

1. Select the sandbox which you want to populate and click in the Sandbox Maintenance toolbar. The **Edit** button is disabled if you have selected multiple checkboxes. The *Sandbox Maintenance (Edit Mode)* window is displayed.
2. While populating a Sandbox both Time and Non-Time Filters can be edited in the *Sandbox Maintenance* window.
3. In the Request Action tab, select **Complete for Populate Sandbox** to copy the required table data from the Production infodom to the Sandbox infodom based on the sandbox definition.

4. Click the **Authorize** tab, and select the **Populate Sandbox - Complete/ Incremental** checkbox to authorize the sandbox population. This tab is enabled only if your user role is mapped to the function SANDBXAUTH.
5. Click **Save** to confirm changes.
6. On authorization, a Sandbox-Populate batch is registered in the OFSAA Infrastructure Operations module. The batch will be available in the *Batch Scheduling* window with the Sandbox ID. This batch must be triggered from the *Batch Scheduling* window to complete the data population.

5.3.1.5.4 Requesting and Authorizing to Delete Sandbox

To request and authorize to delete sandbox in the *Sandbox Maintenance* window, follow these steps:

1. Select the sandbox which you want to delete and click in the **Sandbox Maintenance** toolbar. The **Edit** button is disabled if you have selected multiple checkboxes. The *Sandbox Maintenance (Edit Mode)* window is displayed.
2. In the Request Action tab, select the **Delete Sandbox** checkbox.
3. Click the **Authorize** tab, and select the **Delete Sandbox** checkbox to authorize the deletion. This tab will be enabled only if your user role is mapped to the function SANDBXAUTH.
4. Click **Save** to remove the Sandbox Definition.

5.3.1.5.5 Incremental Data Model Upload

The Increment Upload Required column in the *Sandbox Maintenance* window displays the status as "Y" or "N" depending on the need for Incremental Data Model Upload for the Sandbox definition. The **Incremental Data Model Upload** button is enabled only when the model versions between Production and Sandbox information Domain are different.

Incremental Data Model Upload facilitates you to synchronize the difference of a Data Model which exists in the Production and Sandbox Information Domain. You can refresh the details and fetch the incremental data model changes from Production to Sandbox Information Domain.

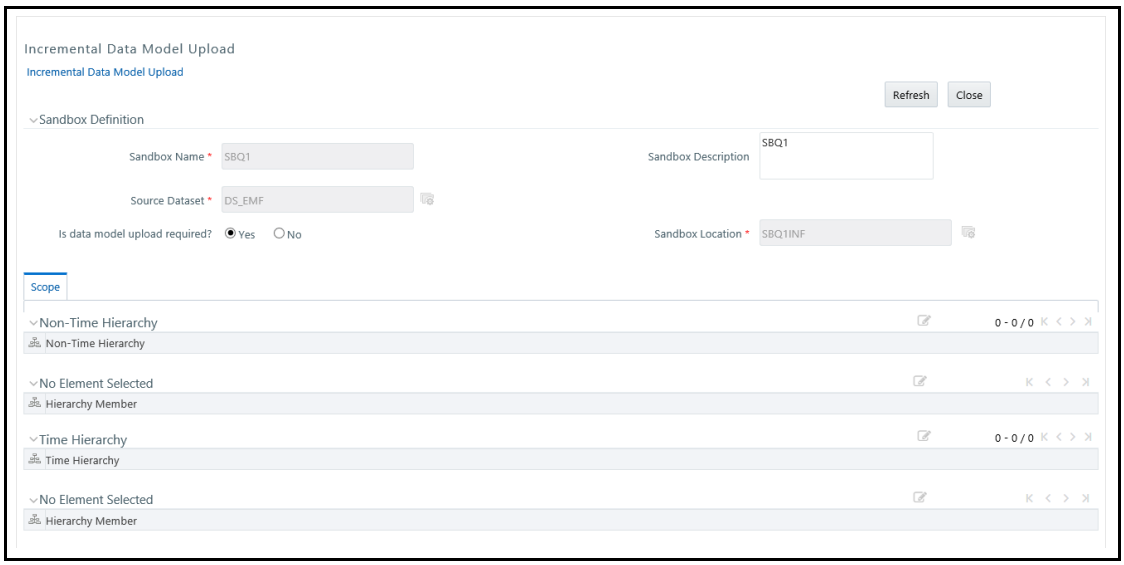
Note the following points:

- The **Incremental Data Model Upload** button will not be enabled for the sandboxes in which the No option is selected for the Is data model upload required? field, even though there is a difference between the model versions in the Production and Sandbox information domains.
- Incremental data model upload is supported only when the difference in sandbox and production is at table level, that is, the sandbox schema has at least one table less or more when compared to the production schema.
- Incremental data model upload is not supported for Hive-based sandboxes.

To perform an incremental data model upload, follow these steps:

1. Select the checkbox adjacent to the Sandbox ID which has the Increment Upload Required status as "Y". The status will be Y only when there is a difference in the model versions between Production and Sandbox information Domain.
2. Click from the **Sandbox Maintenance** toolbar. The *Incremental Data Model Upload* window is displayed with the selected Sandbox definition details in View mode.

Figure 11: Incremental Data Model Upload



3. Click **Refresh**. The incremental data model changes are fetched and updated.
4. An information dialog is displayed confirming successful incremental data model upload. Click **OK**.

Once the Incremental changes are updated to the Data Model in the Sandbox Information Domain, you need to re-save the details in the *Sandbox Definition* window. For more information, see the Modifying Sandbox Definition section.

5.3.1.5.6 Searching Sandbox Maintenance

The *Sandbox Maintenance* page allows you to search the sandboxes that you want to view.

To search for Sandbox Maintenance, follow these steps:

1. Navigate to the *Sandbox Maintenance* window.
2. Enter the name of the sandbox you want to search for.
3. Click . The filtered list is displayed.

6 Managing Techniques

This chapter provides information about Techniques in the Oracle Financial Services Enterprise Modeling application and step-by-step instructions to use this section.

Topics:

6.1 About Techniques

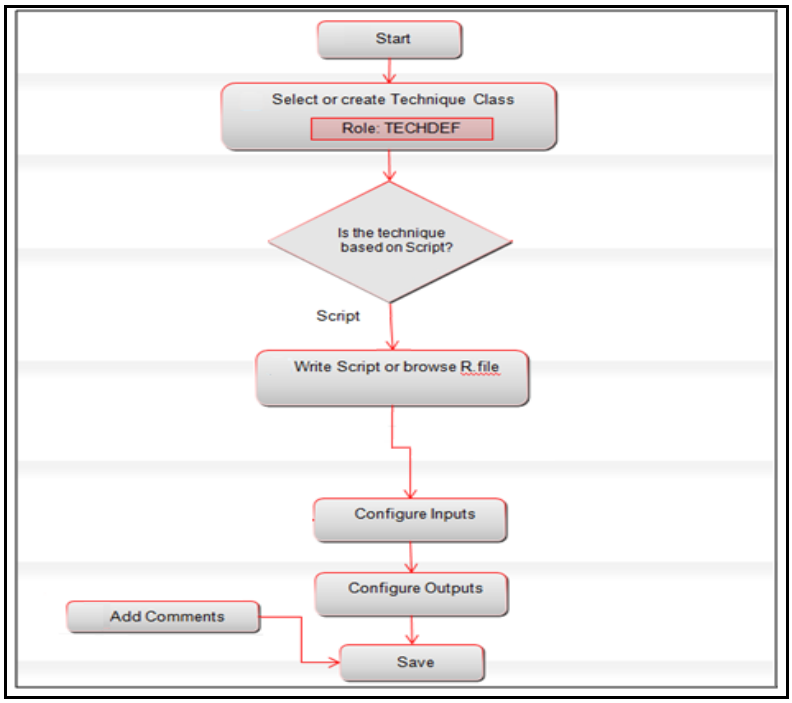
The technique is a set of generalized statistical algorithms that can be used to build analytical models. The Technique Registration module in Enterprise Modeling displays the techniques developed using an R script and ORE functions.

Topics:

6.1.1 Technique Registration Workflow

Technique Registration workflow starts by creating Technique Class, and then configuring Inputs and outputs and saving them.

Figure 12: Technique Registration Workflow



MANAGING TECHNIQUES

6.1.2 User Roles and Functions

The following functions should be mapped to the user to manage techniques:

- TECHDEF
- TECHAUTH

6.2 Managing Techniques

This section explains how to manage Techniques in the Oracle Financial Services Enterprise Modeling application.

Topics:

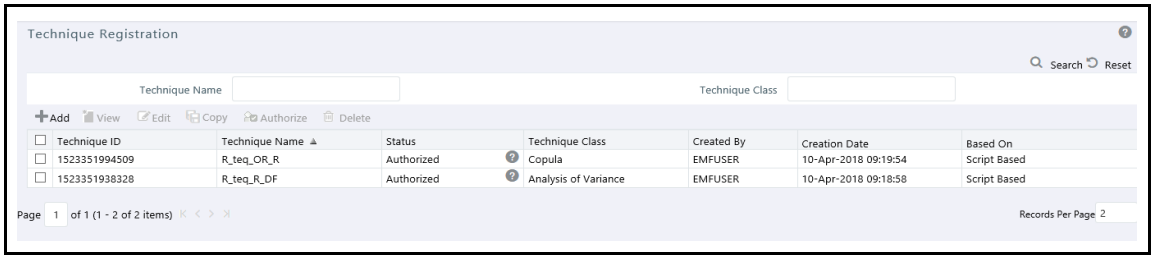
6.2.1 Accessing Techniques

You can access the *Technique Registration* window from the *Oracle Financial Services Enterprise Modeling Home* window.

To access the *Technique Registration* window, follow these steps:

1. Log in to Oracle Financial Services Enterprise Modeling.
2. Click  from the header to display the applications in a **Tiles** menu.
3. Select **Financial Services Enterprise Modeling** from the **Tiles** menu. The *Enterprise Modeling Application Home Page* is displayed with the **Navigation** list to the left.
4. Click **Financial Services Enterprise Modeling** from the Navigation list to expand view the menu.
5. Click **Technique Registration**. The *Technique Registration* window is displayed.

Figure 13: Technique Registration



MANAGING TECHNIQUES

6.2.2 Creating a Technique Based on Scripts

Oracle Financial Services Enterprise Modeling application enables you to create techniques based on scripts. The supported scripting languages are R or ORE. After registering the techniques, they can be used in model definitions. In the Model Script tab, you can write the script in your preferred language. The Declaration Block in the script is used to declare the input and output parameters. The format of the declaration block and the content should not be altered. The scripting should start only from the line after the declaration block.

There are three types of input parameters that can be used in the script, namely Variable, Single Value Parameter, and Model Input. The input parameters can be defined from the Declaration block in the **Script Console** pane, or by right-clicking the parameter and selecting the Input type. The value of a single value parameter is defined from the *Inputs* window. However, the value of variables and model inputs are mapped during the model definition in which the technique is used.

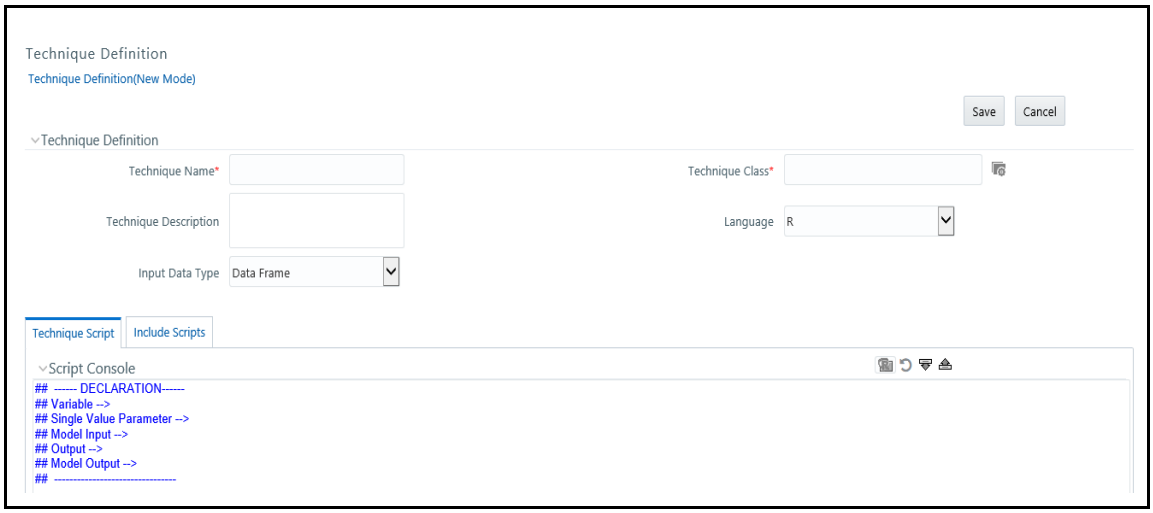
You can configure the numeric output by declaring it in the Declaration block (## Output -->), or by right-clicking the parameter and selecting the Output type. It is not required to declare output parameters for plots or graphical outputs.

The script should be valid. You can use ORE functions instead of R functions for better performance in the R script. All the object names or functions used in the script should be syntactically valid. Validation of the script is not done while registering the technique. If you already have defined a technique using an R script and saved it in a .R file, you can upload it and register it as a technique.

To create a technique using scripts, follow these steps:

1. Click **Technique Registration** from the **Navigation** list. The *Technique Registration* window is displayed.
2. Click + from the Technique Registration toolbar. The *Technique Definition* window is displayed.

Figure 14: Technique Definition



3. Enter the details as described in the following table. Fields marked in red asterisk (*) are mandatory.

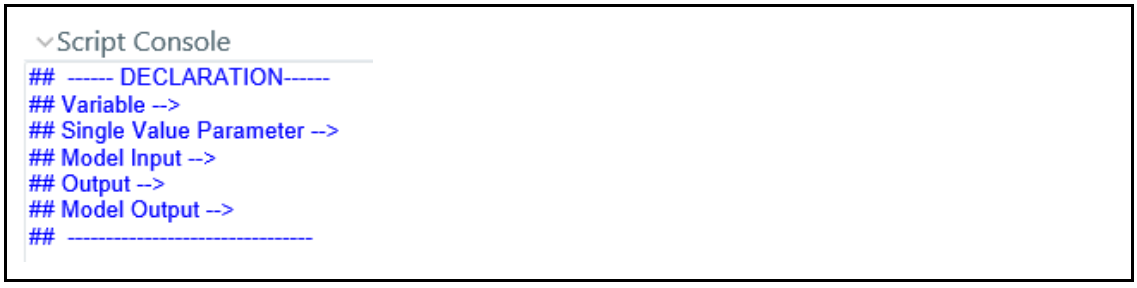
Table 6: Technique Definition window Fields and its Description

Field	Description
Technique Name	Enter a name for the technique. Ensure that there are no special characters like `, {,},", ', ~, <,>, /, \, and multiple spaces.
Technique Class	Technique Class is used for logically grouping the techniques. 1. Click and open the *Technique Class Selection* window. 2. Right-click **Technique Classes** or the technique class name under which you want to create a technique class, and click **Add Technique Class**. Enter the technique class name in the *Add Node* window. 3. Expand the Technique Classes tree, select the required technique class, and click . 4. Remove a selected technique class by selecting the technique class and clicking .
Technique Description	Enter a brief description of the technique.
Based On	Select the **Script** option.
Language	Select the scripting language. The options are: • R • MATLAB
Input Data Type	Select the input data type. • For Hive-based Infodoms, the input data types are Data Frame and HDFS file. • For RDBMS-based infodoms, the input data types are **RDBMS Data Frame** and **ORE Frame**.

R script based Technique Definition - Field Description

4. In the **Script Console** pane, enter the R script for the technique. For more information on how to use fitting and prediction, see the Fitting and Prediction Using R Script section.

Figure 15: Script Console



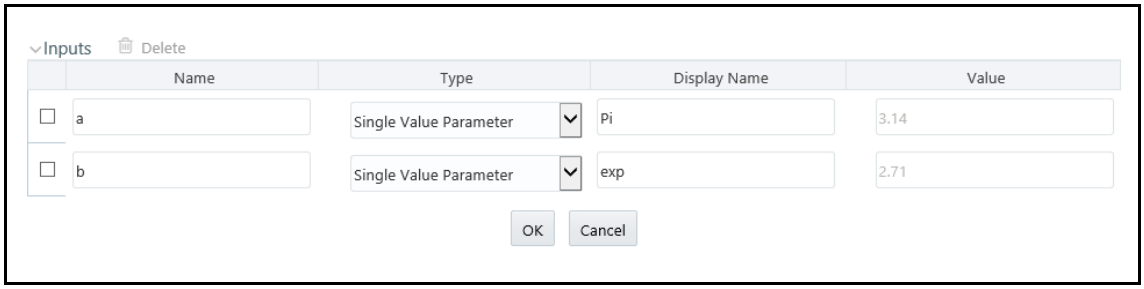
5. By default, the Script Console is displayed as shown above. Enter the following details:

- ## Variable --> Enter the variables you want to use in the R script separated by commas. You should map these variables to the corresponding variables which are available in the *Variable Management* window, during defining the model.
- ## Single Value Parameter --> Enter the input parameters you want to use in the R script.
- ## Model Input--> Enter the script variable names to which you want to load the output of another model in case of model chaining.
- ## Output --> Enter the output parameters you want to use in the R script.
- ## Model Output--> Enter the output object names you want to persist.

> **NOTE** The variables and input parameters are case-sensitive. The same name cannot be used for both variable and input parameters.

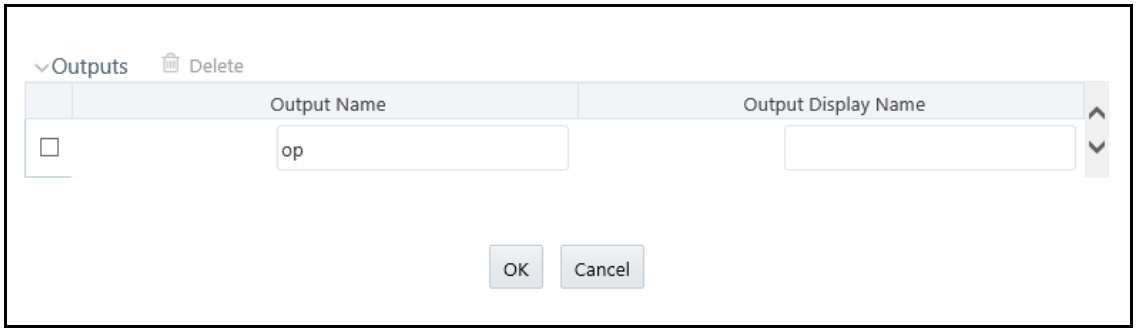
6. Click  from the Script Console toolbar. The *Inputs* window is displayed.

Figure 16: Inputs window



7. Enter Display Name for the Variables or Model Inputs you defined. The mapping of variables is done during the model definition.
8. Enter Display Name and Value for single value parameters you defined.
9. Select the parameter and click  to delete it.
10. Click  from the Script Console toolbar. The *Outputs* window is displayed.

Figure 17: Outputs window



11. Enter Display Name for the output parameter you defined.

12. Click  to browse and upload .R file. You can use this option if you have already defined a technique and saved it in an R file. Once uploaded successfully, the script is displayed in the **Script Console** pane.
13. Select the **Include Scripts** tab if you want to source already defined algorithms to your script.
    - Select the required algorithms/ scripts from the Scripts List tree and click .
    - You can view the scripts by selecting the script and clicking  .
    - After adding scripts, you can position the scripts as required by selecting them and clicking and .
14. Click the **Comments** tab and click  to add additional information, if required.
15. Click **Save**. If you have authorization privilege, then the technique is auto authorized and it can be used in creating models.

6.2.3 Authorizing a Technique

An authorizer has to authorize a technique before it can be used for model definition. Users who have the function TECHAUTH mapped to their user role can authorize the technique. If the user who created the technique has authorization privilege, then the technique is auto authorized. An authorizer can reject a technique if required.

To authorize or reject a technique, follow these steps:

1. Click **Technique Registration** from the **Navigation** list. The *Technique Registration* window is displayed.
2. Select the technique and click  . The *Authorize Technique* window is displayed.
3. Enter a brief description in the *Comments* field. This is mandatory for rejecting the technique.
4. Click **Approve** or **Reject**.

6.2.4 Viewing a Technique

This option allows you to view the details of user-defined techniques such as technique name, class, description, and script.

To view the technique details, follow these steps:

1. Click **Technique Registration** from the **LHS** menu. The *Technique Registration* window is displayed.
2. Select the checkbox adjacent to the Technique ID and click  in the **Technique Registration** toolbar. The *Technique View* window is displayed with all the technique details.

6.2.5 Modifying a Technique

You can update the details of a user-defined technique. If the technique is already mapped to a model, you cannot modify it. An alert message is displayed. You cannot modify the Technique Name and

Technique Class. For techniques based on an external library, you can modify External Library Name, function, and parameter details.

After modification, the technique should be authorized. If you have authorization rights, it will be auto authorized; else an authorizer has to approve it.

To modify a technique, follow these steps:

1. Click **Technique Registration** from the **LHS** menu. The *Technique Registration* window is displayed.
2. Select the technique you want to modify and click . This button is disabled if you have selected multiple techniques.
3. Modify the technique details. For more information, refer to Creating a Technique Based on the Scripts section.

6.2.6 Copying a Technique

You can create a copy of a user-defined technique with the required variants. The copied technique should be authorized. An authorizer has to approve or reject the copying of the technique. If you have authorization rights, it will be auto-authorized.

To copy a technique, follow these steps:

1. Click **Technique Registration** from the **LHS** menu. The *Technique Registration* window is displayed.
2. Select the technique you want to copy and click . This button is disabled if you have selected multiple techniques.
3. In the *Technique Definition Copy* window, you can:
4. Create a new technique with the existing details. Specify a new Technique Name and click **Save**.
5. Create a new technique by updating only the required details. Specify a new Technique Name and update the required details.

For more information, see the Creating a Technique Based on the Scripts section.

6.2.7 Deleting a Technique

You can delete a user-defined technique that is no longer required. However, if the technique is already mapped to a model, you cannot delete it.

An authorizer has to approve or reject the deletion of the technique. If you have authorization rights, it will be auto-authorized.

To delete a technique, follow these steps:

1. From the **LHS** menu, click **Technique Registration**. The *Technique Registration* window is displayed.
2. Select the technique you want to delete and click .
3. Click **OK** in the information dialog to confirm the deletion.

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6.2.8 Searching Techniques

The *Techniques Registration* window allows you to search for the techniques that you want to view.

To search for Techniques, follow these steps:

1. Navigate to the *Technique Registration* window.
2. Enter the Technique Name and Technique Class you want to search.
3. Click  . The filtered list is displayed.

7 Managing Variables

This chapter provides information about variables in the Oracle Financial Services Enterprise Modeling application and step-by-step instructions to use this section.

Topics:

7.1 About Variable Definition

Variable refers to a set of attributes that are likely to change based on the selected parameters. In a modeling environment, variables play a vital role in filtering the model parameters and deriving an estimate based on historical data. Variables are defined in the production information domain.

7.1.1 Managing Variables

This section explains how to manage variables in the Oracle Financial Services Enterprise Modeling application.

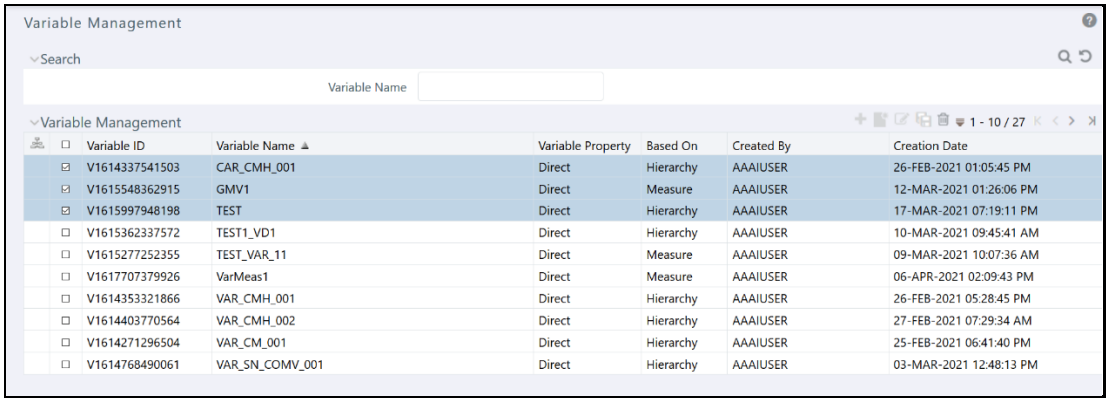
7.1.1.1 Accessing Variable Management

You can access the *Variable Management* window from the *Oracle Financial Services Enterprise Modeling Home* page.

To access the *Variable Management* window, follow these steps:

1. Log in to Oracle Financial Services Enterprise Modeling.
2. Click  from the header to display the applications in a **Tiles** menu.
3. Select **Financial Services Enterprise Modeling** from the **Tiles** menu. The *Enterprise Modeling Application Home Page* is displayed with the **Navigation** list to the left.
4. Click **Financial Services Enterprise Modeling** from the **Navigation** list to expand view the menu.
5. Click **Data Management** from the expanded **Navigation** list to view the next level of links in the menu. Click **Datasets and Variables**.
6. Click **Variable Definition**. The *Variable Management* window is displayed.

Figure 18: Variable Management Window



Topics:

- Adding Variable Definition
- Viewing Variable Definition
- Searching Variables
- Modifying Variable Definition
- Copying Variable Definition
- Deleting Variable Definition

7.1.1.1.1 Adding Variable Definition

The Add Variable Definition feature enables you to add a variable by filtering through the required parameters. The options available to filter the data vary depending on the variable type selected.

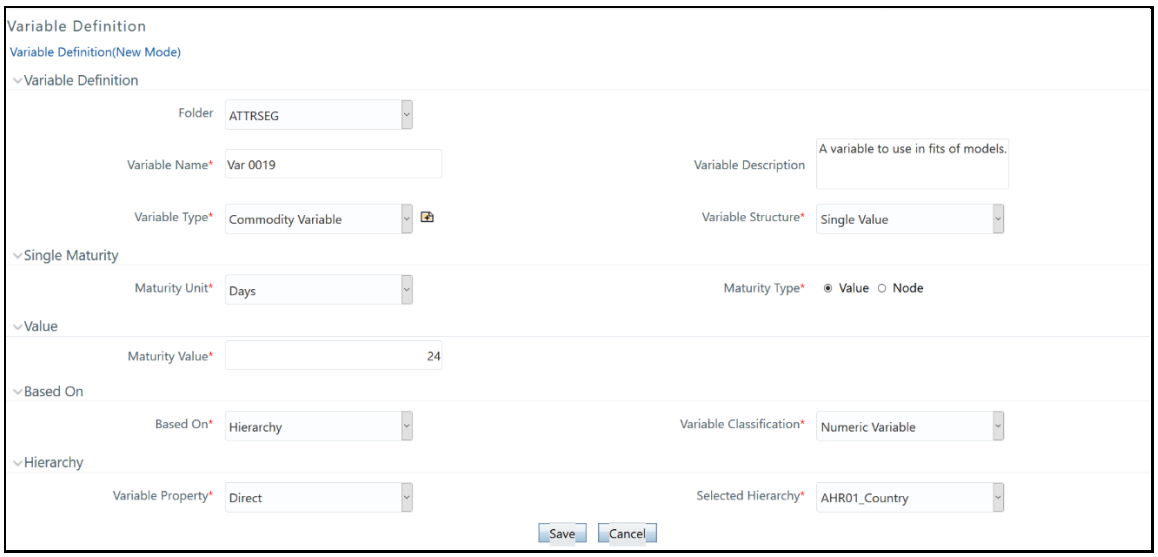
The variables created in the *Variable Definition* window are IDIOSYNCRATIC NUMERIC variables.

To add variable definition, follow these steps:

1. Select + from the **Variable Management** toolbar.

   The **Add** button is disabled if you have selected any checkbox in the grid. The *Variable Definition* window is displayed.

Figure 45. Variable Definition Window



2. Enter the Variable details as described in the table in the Adding Variable Definition section in Managing Stress Testing.

   The fields marked in red asterisk (*) are mandatory.

3. Click **Save** to upload the new Variable Definition details.

7.1.1.1.2 Viewing Variable Definition

You can view individual Variable Definition details at any given point.

To view the existing Variable Definition details, follow these steps:

1. Select the checkbox adjacent to the Variable ID.
2. Click  in the **Variable Management** toolbar. The *Variable Definition View* window is displayed with all the variable details.

7.1.1.1.3 Searching Variables

The *Variable Management* window allows you to search for the variables that you want to view.

To search for Variables, follow these steps:

1. Navigate to the *Variable Management* window.
2. Enter the name of the Variable Name you want to search.
3. Click  .The filtered list is displayed.

7.1.1.1.4 Modifying Variable Definition

You can modify only the Variable Description details if the variable is mapped to a definition. If the variable is not mapped to any definition, then all the filtering parameters can be modified.

To modify an existing Variable Definition, follow these steps:

1. Select the checkbox adjacent to the Variable ID whose details are to be updated.
2. Click  in the **Variable Management** toolbar.

   The **Edit** button is disabled if you have selected multiple Variable IDs. The *Variable Definition Edit* window is displayed.
3. Edit the Variable Definition details as required.

   For more information, see the Adding Variable Definition section.
4. Click **Save** to upload changes.

7.1.1.1.5 Copying Variable Definition

The *Copy Variable Definition* page enables you to quickly create a new Variable based on the existing variable parameters or by updating the required parameters.

To copy an existing Variable Definition, follow these steps:

1. Select the checkbox adjacent to the Variable ID whose details are to be duplicated.
2. Click  in the **Variable Management** toolbar.

   The **Copy** button is disabled if you have selected multiple Variable ID(s).
3. In the *Variable Definition Copy* window, you can:
   - Create a new variable with the existing details. Specify a new Variable Name and click **Save**.
   - Create a new variable by updating only the required details. Specify a new Variable Name and update the required details.

     For more information, see Adding Variable Definition section. Click **Save**. The new variable definition details are displayed in the *Variable Management* window.

7.1.1.1.6 Deleting Variable Definition

You can remove the variable definition(s) which are no longer required in the system, by deleting them from the *Variable Management* window. You cannot delete a variable that is mapped to any definition.

To delete a Variable Definition, follow these steps:

1. Select the checkbox adjacent to a Variable ID.
2. Click  from the **Variable Management** toolbar. A confirmation dialog is displayed.
3. Click **OK** to confirm the deletion.

8 Managing Modeling

This chapter provides information about Modeling in the Oracle Financial Services Enterprise Modeling application and step-by-step instructions to use features in Modeling.

Topics:

8.1 About Modeling

Modeling refers to the process of designing a prototype based on a structured data model, considering all the variables for statistical analysis and to simulate real events and processes. The modeling module enables you to measure and quantify risk. You can use pre-defined models to predict the business trends and also to validate the existing models.

Models are built based on various techniques and related parameters based on the business purpose. Models thus built use various metadata objects such as Measures, Hierarchies, Filters, Datasets, and so on. The techniques can be inbuilt techniques and user-defined script-based techniques.

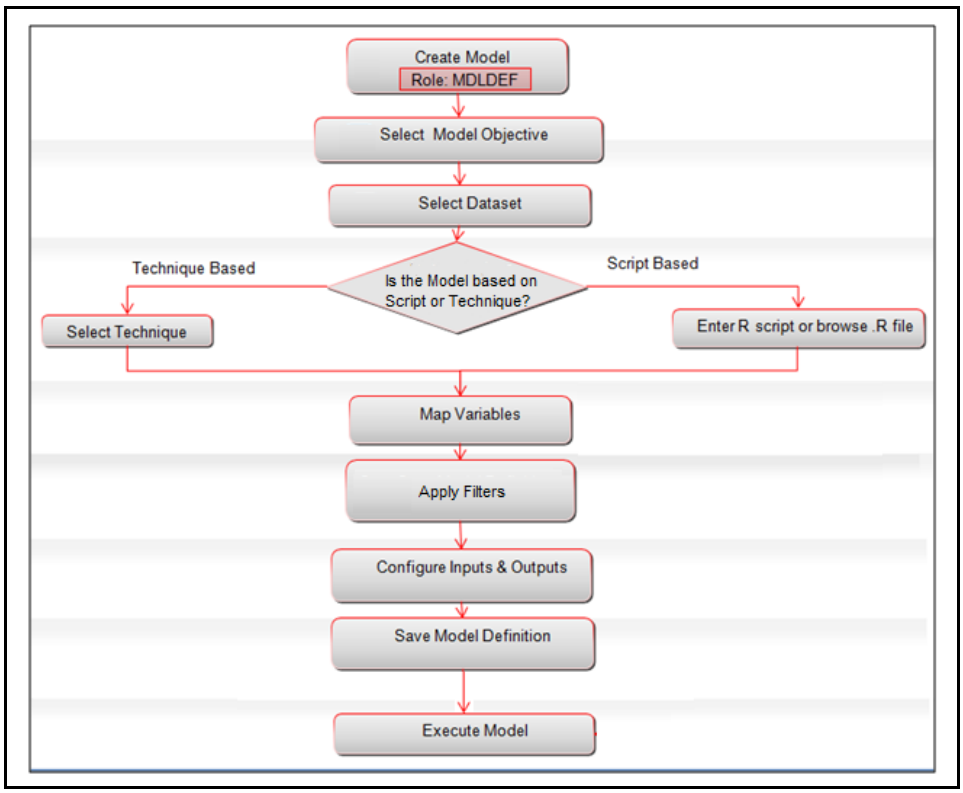
Oracle Financial Services Enterprise Modeling application supports developing statistical models using algorithms written in standard R. It also enables you to bring in already developed algorithms written in R for creating models based on them. Thus it provides a unified environment to build, host, and execute models across risk categories and a common framework to manage stress scenarios.

Topics:

8.1.1 Modeling Workflow

Modeling refers to the process of designing a prototype based on a structured data model, considering all the variables for statistical analysis and to simulate real events and processes. The modeling module enables you to measure and quantify risk. The workflow is represented below.

Figure 19: Model Creation Workflow



8.1.2 User Roles and Functions

Functions required to be mapped to the user for managing models are as follows:

- MDLDEF
- MDLAUTH
- MDLEXEC
- MDLOUTPUT
- MDLDEPLOY
- MDLCALIB
- MDLCHAMP

8.2 Managing Modeling

This section explains how to manage the modeling feature in the Oracle Financial Services Enterprise Modeling application.

Topics:

- Creating and Executing a Model
- Model Parameters
- Viewing Model Definition
- Modifying Model Definition
- Deleting Model Definition
- Searching Model Management

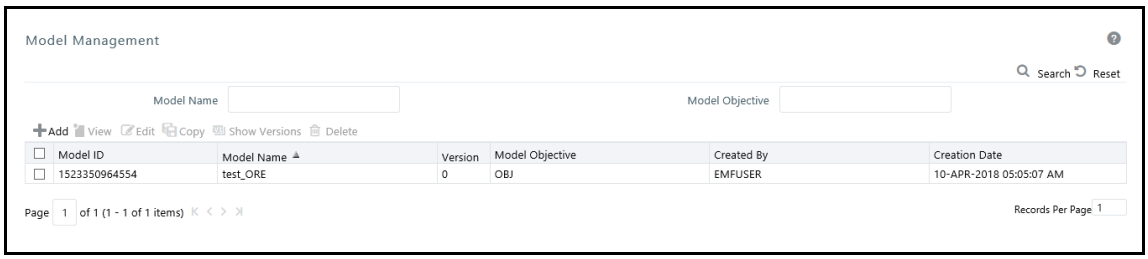
8.2.1 Accessing Model Management

You can access the *Model Management* window from the *Oracle Financial Services Enterprise Modeling Home* page.

To access the *Model Management* window, follow these steps:

1. Log in to Oracle Financial Services Enterprise Modeling.
2. Click  from the header to display the sandboxes in a **Tiles** menu.
3. Select the required Sandbox from the **Tiles** menu. The Navigation list to the left displays the link for Modeling. Click **Modeling** to expand the list.
4. Click **Model Creation**. The *Model Management* window is displayed.

Figure 20: Model Management



The latest version of the model definition is displayed, when you select a model. You can click  view the Model Definitions and click  to edit the Model Definition.

8.2.2 Model Versioning

The Model Definitions created in Oracle Financial Services Enterprise Modeling are versioned. The version of the Model Definition is displayed in the *Model Management* window. Select a model and click  to view different versions of the selected Model Definition.

When a Model Definition is created, it is saved as version 0. During subsequent modifications, the Model Definition is saved as different versions. For example, the version of a Model Definition is 0, after it is created. The version is updated to 1 after the Model Definition is edited. After editing a Model Definition, you can choose to save a Model Definition as a newer version or overwrite the existing version.

8.2.3 Modeling using Open R with HDFS Option

Oracle R Advanced Analytics for Hadoop (ORAAH)/Oracle R Connector for Hadoop (ORCH) is the default approach for running Open-R on HDFS. For the configurations required for creating and executing models in the Open R framework with the HDFS option, see *Configurations for Open-R with HDFS* section in OFS Analytical Applications Infrastructure Administration Guide.

Topics:

8.2.3.1 Basic Functions

Use the following basic functions to get basic OFSAA Metadata details, basic Model details and basic Run details:

- ofs_get_log_handle()
- ofs_get_model_id()
- ofs_get_model_version()
- ofs_get_model_name()
- ofs_get_batch_run_id()
- ofs_get_task_id()
- ofs_get_infodom()
- ofs_get_dataset_codes()
- ofs_get_dataset_names()
- ofs_get_dataset_queries()
- ofs_get_output_names()
- ofs_get_meta_data_info()
- ofs_get_hive_schema_name()

Examples:

```
model_id       = OFSAAIRunnerHDFS::ofs_get_model_id();

batch_run_id = OFSAAIRunnerHDFS::ofs_get_batch_run_id();

meta_data_list = OFSAAIRunnerHDFS::ofs_get_meta_data_info();

ofs_get_meta_data_info() is a special function for getting dataset and
variable and its mapping info. This function returns a list for each of the
dataset.

Sample list for a single dataset looks like as given:

variable.names - contains all the script variables mapped for the dataset.
```

variable.index - contains the index of each selected variable in the dataset query.

variable.entity.attributes - contains actual base entity and attributes for the selected mata-data variable.

dataset.base.entities - contains all the base entities part of the dataset.

dataset.query - contains dataset query for fetching data.

NOTE All these attributes are available as vectors within the list.

```
print( meta_data_list );
$`Dataset_Name`
$`Dataset_Name`$variable.names
 [1] "x" "y" "z"

$`Dataset_Name`$variable.index
 [1] "1"   "2:3" "4"

$`Dataset_Name`$variable.entity.attributes
 [1] "DATASET_TABLE_1.DATASET_COLUMN1" "DATASET_TABLE_2.DATASET_COLUMN2"
"DATASET_TABLE_2.DATASET_COLUMN3" "DATASET_TABLE_3.DATASET_COLUMN4"

$`Dataset_Name`$dataset.base.entities
 [1] "DATASET_TABLE_1" "DATASET_TABLE_2" "DATASET_TABLE_3"

$`Dataset_Name`$dataset.query
 [1] "Dataset Query"
```

NOTE For multiple datasets, preceding lists get appended.

```
ofs_get_log_handle()       : returns, handle to an existing log handle.
ofs_get_model_id()       : returns, ID of the Model, as character/string.
ofs_get_model_version()    : returns, Version of the Model, as numeric.
ofs_get_model_name()       : returns, Name of the Model, as
character/string.
ofs_get_batch_run_id()   : returns, Batch Run Id of the Current Batch, in
which model is added for the execution, as character/string.
```

```
ofs_get_task_id()   : returns, Task Id of the Model in current Batch,
character/string

ofs_get_infodom()          : returns, OFSAA information Domain (Infodom )
Name, as character/string.

ofs_get_dataset_codes()   : returns, Dataset-Codes for all the selected
datasets, as character vector.

ofs_get_dataset_names()    : returns, Dataset-Names for all the selected
datasets, as character vector.

ofs_get_dataset_queries()  : returns, Dataset-Queries for all the selected
datasets, as character vector.

ofs_get_output_names()   : returns, selected Output names, as character
vector.

ofs_get_hive_schema_name() : returns, Hive schema name, as character/string.
```

8.2.3.2 ORAAH Based Functions for Spark/ORE

Following framework functions will help in connecting/disconnecting Spark/ORE(Hive). Internally these functions will use ORAAH for Spark/ORE connections. These functions will return TRUE on success and FALSE in case of any failures with the proper error message in the logger.

```
ofs_ORAAH_spark_connect()

ofs_ORAAH_spark_disconnect()

ofs_ORAAH_hive_connect()

ofs_ORAAH_hive_disconnect()
```

All the four functions return -

```
TRUE  : on Success

FALSE : on Failure
```

Note: ofs_ORAAH_spark_connect/ofs_ORAAH_spark_disconnect should be called first/last , before using any ORCH-Spark related function, like orch.glm2().

ofs_ORAAH_hive_connect/ofs_ORAAH_hive_disconnect should called first/last, before using any ORCH-ORE related functions.

8.2.3.3 RDBMS Connect Functions

```
ofs_rdbms_connect( arg.ofsaa.schema.name = c( "CONFIG", "ATOMIC" ) );

ofs_rdbms_disconnect( arg.ofsaa.schema.name = c( "CONFIG", "ATOMIC", "BOTH"
) )

These functions should be used to get RDBMS connections/disconnections.
OFSAA schema type should be passed as an argument. By default it connects to
Configuration Schema.

ofs_rdbms_connect( arg.ofsaa.schema.name = c( "CONFIG", "ATOMIC" ) );

returns -

     valid connection handle object in case of success.

     NULL in case of failure with proper error message in logger.
```

```
ofs_rdbms_disconnect( arg.ofsaa.schema.name = c( "CONFIG", "ATOMIC", "BOTH"
) )

returns -

     TRUE  : on Success

     FALSE : on Failure
```

Example:

```
atomic_conn_handle = OFSAAIRunnerHDFS::ofs_rdbms_connect(); #by default
configuration schema.

atomic_conn_handle = OFSAAIRunnerHDFS::ofs_rdbms_connect(
arg.ofsaa.schema.name = "ATOMIC" );

disconnect_status  = OFSAAIRunnerHDFS::ofs_rdbms_disconnect(
arg.ofsaa.schema.name "BOTH"  );
```

8.2.3.4 Usage

All these functions are available as part of the OFSAAIRunnerHDFS R package. This package is available under $FIC_DB_HOME/lib as part of the installation. This package needs to be installed on a machine that is running Rserve or client R Engine. Package reference should be used to avoid conflict with a similar function name.

Example:

```
OFSAAIRunnerHDFS::ofs_get_model_id();

OFSAAIRunnerHDFS::ofs_ORAAH_spark_connect();
```

8.2.4 Creating and Executing a Model

The Modeling module enables you to create and execute data models.

Topics:

> **NOTE** You can create models only in the Sandbox Information Domain.
>
> Modeling supports derived entities. However, a materialized view is not created in the Sandbox schema during Sandbox creation and you have to do it manually. Get the materialized view definition details from the production schema and create the materialized view in the Sandbox.

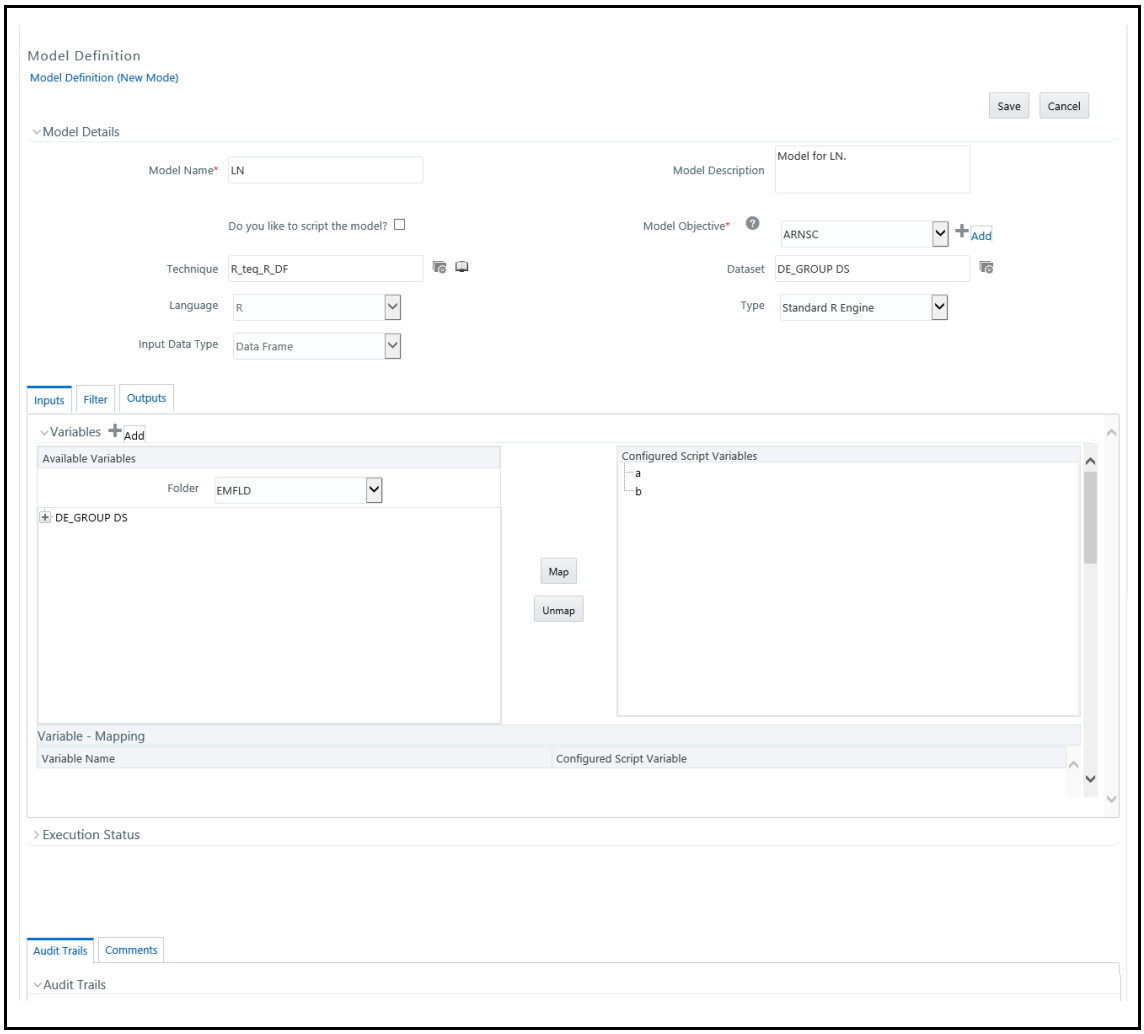
8.2.4.1 Creating a Model Using R Scripted Technique

You can create models using a technique that you have defined from the *Technique Registration* window. Execution Status Log is not displayed in the *Model Definition* window for models created using the Standard R Engine.

To create a model using the R scripted technique, follow these steps:

1. Select + from the **Model Management** toolbar. The *Model Definition* window is displayed. The **Add** button is disabled if you have selected any Model ID in the grid.

Figure 21: Model Definition page



2. Enter the **Model Definition** Details. The common fields are described in the following table. The grid below the **Model Details** section displays the various tabs available for the selected technique. To update the required information, see the following sections:

- Inputs
- Filter
- Outputs

Table 7: Model Definition - Field and its Description

Field	Description
Model Name	Specify a model name for the model definition. Model Name is case sensitive and does not allow duplication. For example, the model name "Linear Regression" is not allowed if a model with the name "linear regression" exists. Ensure that there are no special characters like `, {,},", ', ~, <,>, /, \, and multiple spaces.
Model Description	Enter a description of the model.
Do you like to script the model?	Select the checkbox to script the model in the **Model Script** pane.
Model Objective	Select the **Model Objective** from the drop-down list. You can also click + to create a **Model Objective**.
Technique	This field is disabled if you have selected to script the model. 1. Click and open the *Technique Selection* window. The pre-packaged techniques and user-defined (registered and authorized) R techniques are listed in the **Techniques** pane. 2. Click the + icon and expand the technique heading groups. 3. Select the required technique and click . 4. Click **OK**. The selected Technique details are displayed in the *Model Definition* window. If you have selected the R technique, click to view the script.

Field	Description
Dataset	By default, the dataset of the Sandbox is displayed. You can change the dataset if necessary. Dataset selection is mandatory: For models based on R scripted techniques if variables are declared in the R script. 1. Click to open the *Dataset Selection* window. The available datasets are listed in the **Datasets** pane. 2. Select a dataset and click to view the details of the selected datasets. Click to create a new dataset. For more details on creating a dataset, refer to the *Creating Data Set* section in Oracle Financial Services Analytical Applications Infrastructure User Guide. You can create a dataset using any of the tables which are part of the production information domain. But if you create a dataset with a table that is not part of the Sandbox and create a model using that dataset, then deploy the model to production infodom and execute it there. 3. Select the required Dataset based on which the model is to be created and click . Ensure the selected dataset is loaded with data, otherwise model execution will fail. You can select multiple datasets for models executed using Standard R Engine. If multiple datasets are used, you should use at least a variable from each dataset. 4. Click **OK**. **Note:** The Datasets based on Derived Entities are not supported.
Language	This field is not displayed for techniques based models. Select the scripting language from the drop-down list. The options are: • R • Input Data Type
Type	This field is not displayed for techniques based models. Select the type of engine from the drop-down list. The options are: • Standard R Engine • ORE Engine- This option is not displayed in Hive-based Infodoms.
Input Data Type	This field is displayed only in Hive-based infodoms for models based on R scripted techniques or if you select to script the model. Select the input data type. The options are **ORE Frame**, Data Frame, and HDFS File.

Fields marked in red asterisk (*) are mandatory.

3. Click **Save** to save the model definition details, after all the necessary details are updated.

4. Click **Preview Data** to view the data of the selected dataset. It displays the primary keys and the attributes/ columns of the tables in the selected dataset. Only those columns which are mapped to the variables in the script are displayed.

> **NOTE** In the case of the Hive-based Sandbox information domain, previewing data takes a long time and only 100 records are displayed.

5. Click **Execute**.

   The Execution Status grid displays the model execution log dynamically.

> **NOTE** For R-based models, the execution may fail if the dataset contains internal joins. Executing a model using the standard R engine with the new Cloudera jars is failing with model queries exceeding a certain limit. The workaround is to append UseNativeQuery=1 in the JDBC URL of the Hive schemas in which model definitions and executions happen. For example, jdbc:hive2:192.168.1.0:1000/default;useNativeQuery=1

8.2.4.2 Creating a Model using Script

This feature allows you to create models based on user-written scripts. The supported scripting languages are Standard R and ORE. The script should be valid.

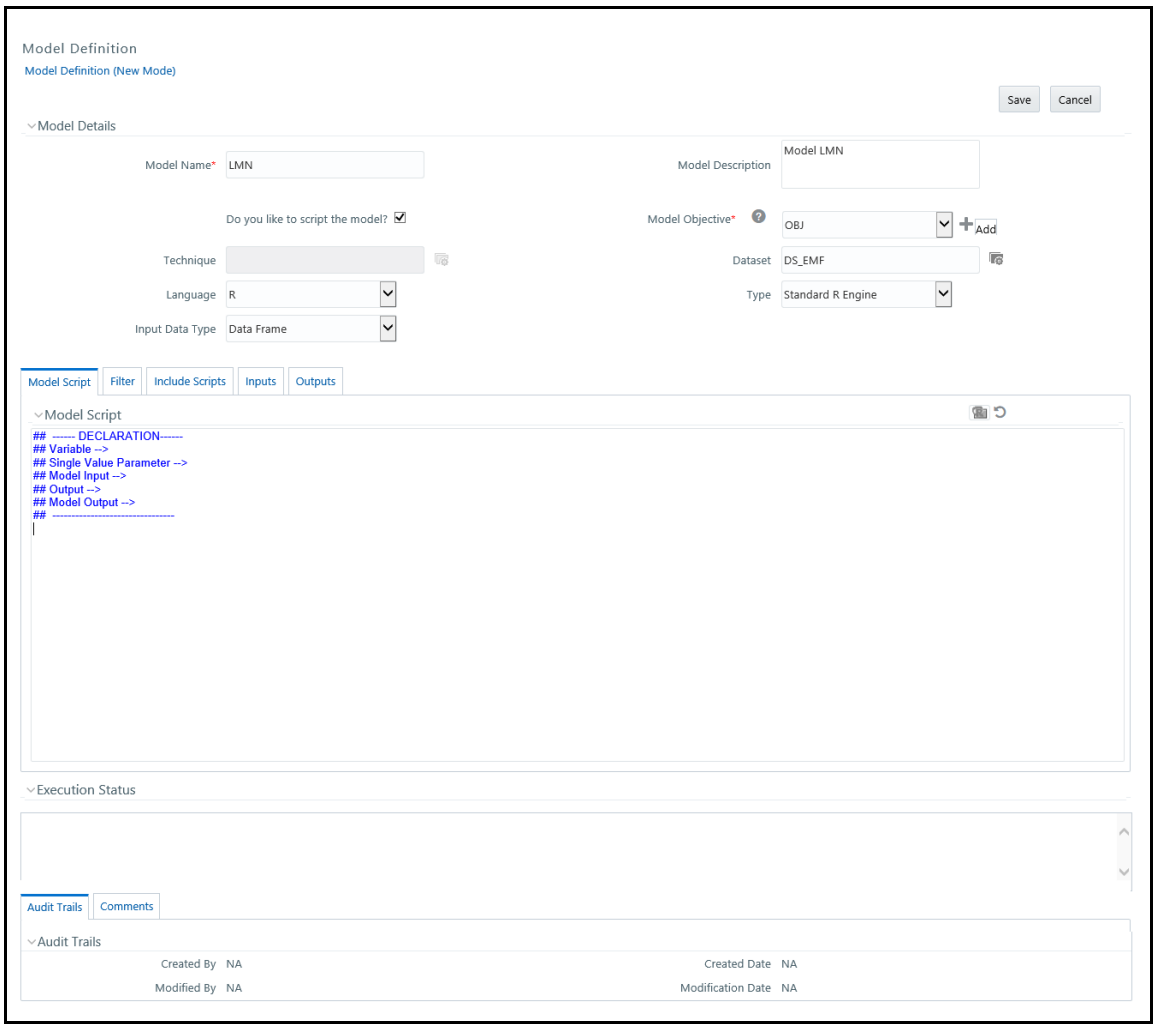
In the case of the R script, all the object names used in the R-script should be syntactically valid. You should select Language as ORE if you are using ORE functions in the script. ORE enables transparent access to data stored in the Database for scalability and high performance. For more information, see Enterprise Modeling support for R Scripts and Oracle R Enterprise (ORE) Statistical Functions.

The models defined based on R scripting can be directly deployed to the production infodom without an execution in the sandbox.

To create a model using a script, follow these steps:

1. Select  from the **Model Management** toolbar. The *Model Definition* window is displayed.

Model Definition



2. Enter the model definition details. The common fields are described in table 8. For R scripted model, click  to browse and upload .R file. You can use this option if you have already defined a technique and saved it in a .R file. Once uploaded successfully, the script is displayed in the **Model Script** pane.
Or
In the **Model Script** pane, enter the script for the model. For information on how to use fitting and prediction, see Fitting and Prediction Using R Script.

Figure 22: Script Console

> **NOTE** The format of the declaration and the content should not be altered. The scripting should start only from the line after the declaration block.

By default, the Model Script is displayed as shown above.

- ## Variable --> Enter the variables you want to use in the script separated by commas.
- ## Single Value Parameter --> Enter the input parameters you want to use in the script.
- ## Model Input --> Enter the script variable names to which you want to load the output of another model in case of model chaining.
- ## Output --> Enter the output parameters you want to use in the script.
- ## Model Output--> Enter the object names you want to persist.

> **NOTE** The variables and input parameters are case-sensitive. The same name cannot be used for both variables and input parameters.

You should explicitly define the outputs in the script that need to be updated back to tables. If the output is not defined, then the tables are not updated.

For example :

```
x = rbeta(100,1,2)
y = rbeta(100,1,2)op = lm(y~x)
If op$residuals needs to be updated then declare the output with a name.
For Example:
Residuals = op$residuals
```

The grid below the Model Details section displays the various tabs available. To update the required information, see the following sections:

- Filter
- Inputs
- Include Scripts
- Outputs

3. Enter valid script of the model in the selected scripting language. For more information on data usage and data handling when R script and ORE functions are used, see R Scripts and Oracle R Enterprise (ORE) Statistical Functions.
4. Click **Save** to save the model definition details, after all the necessary details are updated.

5. Click Preview Data to view the data of the selected dataset. It displays the primary keys and the attributes/ columns of the tables in the selected dataset. Only those columns which are mapped to the variables in the script are displayed.

> **NOTE** In the case of the Hive-based Sandbox information domain, previewing data takes a long time and only 100 records are displayed.

6. Click **Execute** to execute the model.

   You can view the status of the model execution dynamically in the Execution Status grid.

> **NOTE** Points about Model execution:
>
> - For R-based models, the execution may fail if the dataset contains internal joins.
> - Executing a model using the standard R engine with the new Cloudera jars is failing with model queries exceeding a certain limit. The workaround is to append UseNativeQuery=1 in the JDBC URL of the Hive schemas in which model definitions and executions happen.
>   For example:
>   jdbc:hive2:192.168.1.0:1000/default;useNativeQuery=1
> - Models executed using the Standard R engine will fail if multiple primary nodes are set in the ModelingFramework.XML
> - Users who are using ORE1.4.1 and R 3.1.1 may have to explicitly set session timezone in scripts registered within OFS EM by using the 'Sys.env(TZ=<time zone>)' R function. Alternatively, you may set the same call in the 'R_HOME/etc/Rprofile.site' file on the database server, where R_HOME is the home directory of the R instance on which ORE server packages are installed.

7. Click **Output** to view the output. For more information, see the View Model Outputs section.

8.2.5 Model Parameters

The grid in the Model Details section displays the various parameters applicable when a technique is selected. It is mandatory to update the required information in the tabs displayed and the parameters or fields in the available tabs vary depending on the technique selected. A few of the common input parameter types are explained below.

Topics:

- Inputs
- Include Scripts
- Outputs

8.2.5.1 Filter

In the **Filter** tab, you can add multiple non-time hierarchy members as filters.

1. In the *Model Definition* window, click + from the Filters toolbar. The *Filter Browser* window is displayed.
2. Select the **Data Filter** or **Hierarchy** to display the corresponding filters.
3. Select the required filter or hierarchy from the list and click ›. The selected filter is added to the **Selected Members** pane.

> **NOTE** If a Hierarchy is created on a table with the same column holding hierarchy Code and Description, then the hierarchy nodes will not be displayed in the *Hierarchy Browser* window on Hive connections. In such scenario, use the concat functionality in the **Description** field like concat(<TableName.ColumnName>). For example, concat(credit.age,'').

4. Click **OK**. The selected Filters are displayed in the grid.
5. Filters can be applied to both Production and Sandbox Information Domains. Select the required option Apply in Production or Apply in Sandbox to apply the filter in the required information domain.

> **NOTE** Data Element Filters created in the Filters screen are displayed when you select **Data Filter**.

8.2.5.2 Inputs

8.2.5.2.1 For Script based Models and R scripted Technique

The variables and model inputs you have declared in the **Model Script** pane are displayed in the **Inputs** tab.

1. From the Variables grid, map the configured script variables to the available variables in the system.
   - Select a variable from the **Available Variables** pane by expanding the required variable type and a variable in the **Configured Script Variables** pane, and click **Map**.
   - You can add a new variable and then use that variable for mapping.

— Click + to add new variables. The *Variable Definition* page is displayed. You can create a new variable from the *Model Definition* page, as per the requirement. For more information, see Adding Variable Definition section.

The mapping details are displayed in the Variable-Mapping grid. To unmap, select the variable from the **Configured Script Variables** pane and click **Unmap**.

> **NOTE** You cannot select a variable in the **Available Variables** pane which is already mapped to another variable in the script. That is, an OFSAA variable can be mapped to only one input variable in the model script. If you want to use the same OFSAA variable for mapping to multiple model input variables, create a copy of the variable and assign it to the required model input variables.
>
> The mapping of a single variable declared in the R script to multiple variables is not supported if ORE implementation is used.

2. From the Model Inputs grid, map the output of the model which you want to map to the declared Model Input.
   - Select a **Model Output** from the **Available Model Outputs** pane by expanding the required model and a **Model Input** from the **Model Inputs** pane, and click **Map**.

   The mapping details are displayed in the Configured Model Inputs grid. To unmap, select the **Model Input** from the **Model Inputs** pane and click **Unmap**.
3. From the **Input Parameters** grid, select the **Evaluation Type** from the drop-down list. You can execute model on the complete set of records in the dataset, on a group of records, or a set of rows.
   - Group- Select this option if the model needs to be executed on a group, which is defined using a grouping variable. Select the **Grouping Variable** from the drop-down list.
   - Row- Select this option if the model needs to be executed on a set of rows. Specify the **Number** of rows.
   - For **Evaluation Type** as Row, graphical output (plot) is not supported and the number of records processed is five times the value given in the **Number of Rows** field. These are limitations.
   - NA- Select this option if the model needs to be executed on the complete set of records in the dataset.
4. All single value parameters declared in the technique are displayed. Displays the Value if it was given while defining the technique. Else enter the appropriate value.

8.2.5.3 Include Scripts

This tab is used to source already defined algorithms to your script.

1. Select the required algorithms/ scripts from the Scripts List tree and click ›.
2. You can view the scripts by selecting the script and clicking .

3. After adding scripts, you can position the scripts as required by selecting them and clicking and .

8.2.5.4 Outputs

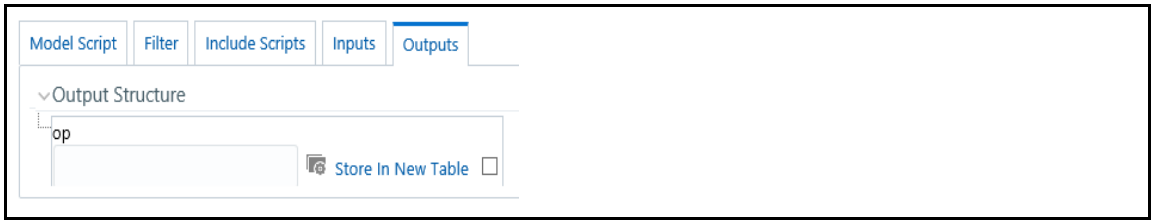
Outputs allow you to view the data that is stored in the table and also facilitates you to perform other actions that are included within this topic.

8.2.5.4.1 For R Scripted Technique and Script Based Models

The **Outputs** tab allows you to store the output values computed during the model execution to a table in your atomic schema by mapping the output value to a variable, which you have defined through the *Variables Definition* window. This is supported only for record-level outputs. Additionally, you can create a new table to store the output if it is a dataframe, vector, or matrix.

> **NOTE** You can view the Outputs tab only after declaring Output variables (## Output -->) in the model script.

Figure 23: Outputs tab



1. From the **Outputs** tab, click  corresponding to the declared output variable whose value you want to map to a variable. The *Variable Browser* window is displayed.
2. Select the appropriate variable and click **Ok**.
3. Select the checkbox corresponding to Store in New Table if you want to create a new table to store the output.

   New table name is <<Outputname>>_<<ModelID>>_<<Version Number>>. The combined length should not be more than 30. So ensure the Output name does not have any special characters.

   Note the following limitations:

   - Creating new tables for storing the model outputs is supported only for scripted models, executed using the ORE engine. New table creation may not work for the Evaluation type selected as Group and Row.
   - For models executed using the ORE engine, you can map only row-level outputs to variables.

8.2.5.4.2 Scenarios

Consider the following script where outputs are not configured. Then the framework output will be just the graphical output. That is, when the outputs are not chosen by the user, then the framework reports the last line's output as the only default output.

Note that the plots are always produced.

```
##  ---------DECLARATION------------
## Variable --> DepVar,IndepVar1,IndepVar2
## Single Value Parameter -->
## Output -->
##  --------------------------------
art.mod<-lm(DepVar ~ IndepVar1 + IndepVar2)

art.summ<-summary(art.mod)
coef( art.summ )
art.summ[[ "r.squared" ]]

#do some line plots
#plot()

#form new data.frame object
new.x.datafrme = data.frame(x=seq(from=range(IndependentVariable1)[ 1
],to=range( IndependentVariable1)[2],length=length(DependentVariable)))

#form new regression model
RegModel<-lm(DepVar ~ new.x.datafrme$x + IndepVar2)

#perform some operations on the new data
Plot(RegModel)
```

In this case, the output window will have a tree containing the components of the 'RegModel' object with the same name as the root node.

Alternatively, you can also put the intended objects name at the last line of the script as:

```
##  ---------DECLARATION------------
## Variable -->
## Single Value Parameter -->
## Output --> RegModel
##  --------------------------------
art.mod<-lm(DepVar ~ IndepVar1 + IndepVar2)
```

```
art.summ<-summary(art.mod)
coef( art.summ )
art.summ[[ "r.squared" ]]

#do some line plots
#plot()

#form new data.frame object
new.x.datafrme = data.frame(x=seq(from=range(IndependentVariable1)[ 1
],to=range( IndependentVariable1)[2],length=length(DependentVariable)))

#form new regression model
RegModel<-lm(DepVar ~ new.x.datafrme$x +
IndepVar2)

#perform some operations on the new data
Plot(RegModel)
RegModel
```

Here the output window will show a tree containing the components of the 'RegModel' object, but since the output name was not configured or specified, it will be held under a generic framework name 'OFSAAOutput'

One of the added advantages of configuring the outputs is that one can get more than one object as output as shown in the following script:

```
##  ---------DECLARATION------------
## Variable -->
## Single Value Parameter -->
## Output --> RegModel, art.mod
##  --------------------------------
art.mod<-lm(DepVar ~ IndepVar1 + IndepVar2)

art.summ<-summary(art.mod)
coef( art.summ )
art.summ[[ "r.squared" ]]

#do some line plots
#plot()
```

```
#form new data.frame object
new.x.datafrme = data.frame(x=seq(from=range(IndependentVariable1)[ 1
],to=range( IndependentVariable1)[2],length=length(DependentVariable)))

#form new regression model
RegModel<-lm(DepVar ~ new.x.datafrme$x +
IndepVar2)

#perform some operations on the new data
Plot(RegModel)
```

For the above script, the output window will contain trees for both 'RegModel' and 'art.mod'.

Here are the possible scenarios and the respective framework behavior:

- Case A: When no outputs are specified in the declaration block and outputs are not configured in the *Outputs* window:
  The value of the last evaluated expression is returned with the name 'OFSAAOutput' for the model execution.
- Case B: When no outputs are specified in the declaration block and the **Configure Outputs** button is clicked:
  All the objects from the script execution environment get listed as a tree with each object as separate nodes. Now you can choose the outputs to be reported. The selected ones will be placed in the declaration block. If you do not select any object as output, then the behavior will be the same as case A, for the model execution.
- Case C: Some objects are declared as outputs in the declaration block either by explicitly writing the correct names in the declaration block against the label Outputs or by right-clicking a valid object name and selecting it as output:
  Now, only those which are listed in the declaration block will come in the *Configure Outputs* window (as checked ones, since you have already selected them as the outputs explicitly).

8.2.6 Viewing Model Definition

You can view individual Model Definition details at any given point. To view the existing Model Definition details in the *Model Definition* window, follow these steps:

1. Select the checkbox adjacent to the Model ID.
2. Click  in the *Model Management* toolbar.

   An information dialog is displayed indicating that view mode is selected and any accidental changes will not be updated. Click **OK** to confirm and view the details.
3. In the Model Definition View window you can:

> **NOTE** Select **Preview Data** to view the variable parameters corresponding to the technique selected. In the case of the Hive-based Sandbox information domain, previewing data takes a long time and only 100 records are displayed.

4. Select **Execute** to process the model execution. The status of which can be verified in the Model Execution Status option, accessing **Oracle Financial Services Enterprise Modeling > Modeling > Model > Model Execution Status**.

8.2.7 Modifying Model Definition

You can update the model definition details of an existing Model in the *Model Definition* window:

> **NOTE** Modifying ORE models is not supported. Additionally, applying hierarchy filters for R scripted models in edit mode is not supported.

To modify model definition

1. Select the checkbox adjacent to the Model ID whose details are to be updated.
2. Click  in the **Model Management** toolbar. The **Edit** button is disabled if you have selected multiple Model IDs.
3. Edit the Model Definition details as required. Model Name, Technique, and Model Objective are not editable. You can update the Model Description, Dataset, and variable parameters based on the technique selected. For more information, see Creating and Executing a Model.
4. Once you have updated all the necessary details in the *Model Definition Edit* window, you can:
   - Click **Preview Data** to view the new Model Definition details before upload.

> **NOTE** In the case of the Hive-based Sandbox information domain, previewing data takes a long time and only 100 records are displayed.

   - Click **Save** to update the model definition details. You can choose to save a Model Definition as a new version or overwrite the existing version. For more details, see the Model Versioning section.
   - Click **Save** and select **Execute** to process the model execution. The status of which can be verified in the Model Execution Status option, accessing **Oracle Financial Services Enterprise Modeling > Modeling > Model > Model Execution Status**.

8.2.8 Deleting Model Definition

You can remove the model definitions which are no longer required by deleting them from the *Model Management* window.

1. Select the checkbox adjacent to the Model ID(s) whose details are to be removed.
2. Click in the **Model Management** toolbar.
3. Click OK in the information dialog to confirm the deletion.

8.2.9 Searching Model Management

The *Model Management* page allows you to search for the models that you want to view.

To search for models, follow these steps:

1. Navigate to the *Model Management* page.
2. Enter the Model Name and Model Objective.
3. Click . The filtered list is displayed.

8.3 Model Chaining

Model Chaining is used to input an object/objects from one model to another model. It can also be used for the separation of calibration and prediction. The objects persisted from any model that can be chained to any other model. In the case of ORE intermediate objects are saved in the ORE data-store whereas, in Standard-R / Open-R, objects are saved or persisted as a file.

The following tags are available in the Model Script Console:

- ##Model Input--> Enter the object names to which you want to map objects from some other model.
- ##Model Output--> Enter the object names you want to persist.

Object persisted out of an ORE-based model cannot be chained /inputted to Open-R / Standard-R based model and vice-versa.

Figure 24: Model Script Console

8.4 Model Execution Status

Model Execution Status in the Sandbox Information Domain enables you to verify the status of the executed model at any given point. The status can be Complete, Ongoing, or Failed based on the current processed stage of the system.

Topics:

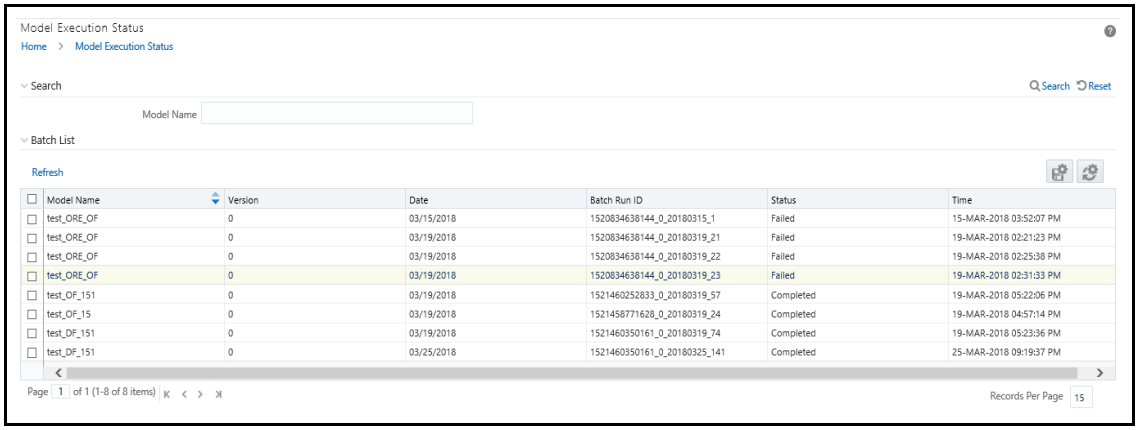
8.4.1 Accessing Model Execution Status

To access the *Model Execution Status* page, follow these steps:

1. Click the **Sandbox** tab.
2. Click Model Execution Status. The Model Execution Status page is displayed.

This menu is displayed only if you are in the sandbox infodom.

Figure 25: Model Execution Status



8.4.2 Searching Model Execution Status

The *Model Execution Status* page allows you to search the models that you want to view.

To search for Model Execution, follow these steps:

1. Navigate to the *Model Execution Status* page.
2. Enter the Model Name.
3. Click . The filtered list is displayed.

8.5 Model Outputs

The *Model Outputs* page in Sandbox Information Domain displays the outputs of all models executed in the selected Sandbox Information Domain. The *Model Outputs* page in Production Information Domain displays the outputs for the models deployed in the production Information Domain and also

those requested for execution. You can also view or download the derived output values as a .csv file and plots as .png files for reference.

Limitation: You cannot download the CSV file for ORE Model Output if data redaction is enabled.

Topics:

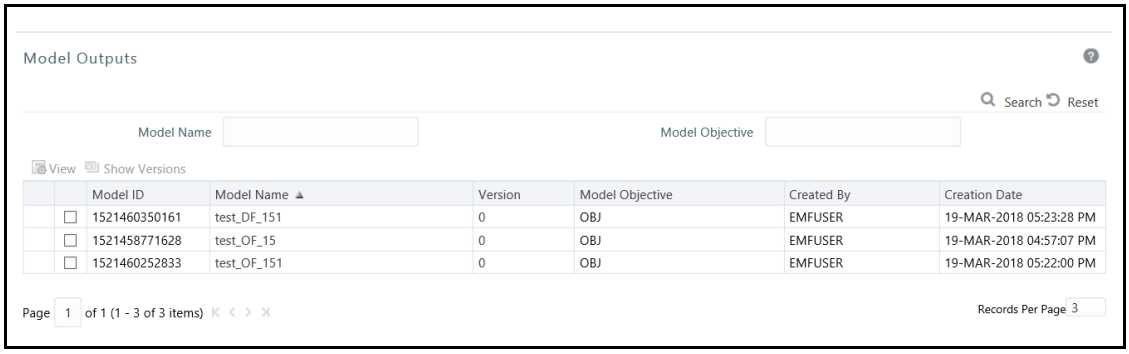
8.5.1 Accessing Model Outputs

You can access the *Model Outputs* page from the Sandbox.

To access the *Model Outputs* page from Sandbox, follow these steps:

1. Log in to Oracle Financial Services Enterprise Modeling.
2. Click  from the header to display the sandboxes in a **Tiles** menu.
3. Select the required Sandbox from the **Tiles** menu. The **Navigation** list to the left displays the link for Modeling. Click **Modeling** to expand the list.
4. Click **Model Output**. The *Model Outputs* page is displayed.

Model Outputs



8.5.2 Searching Model Outputs

The *Model Outputs* page allows you to search for the models that you want to view.

To search for Model Outputs, follow these steps:

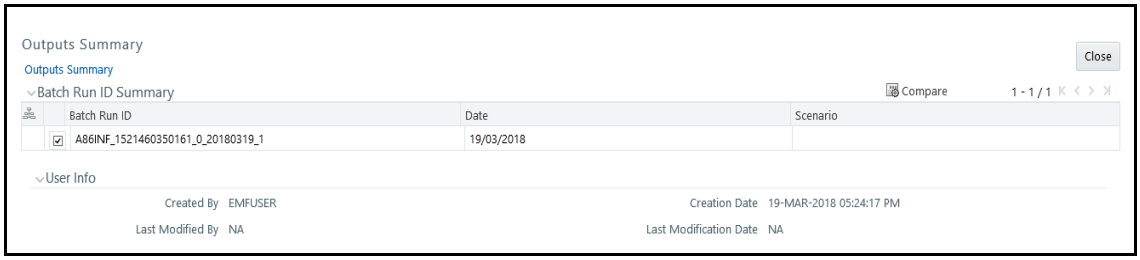
1. Navigate to the *Model Outputs* page.
2. Enter the **Model Name** and **Model Objective**.
3. Click  . The filtered list is displayed.

8.5.3 View and Compare Model Outputs

To view and compare the model outputs, follow these steps:

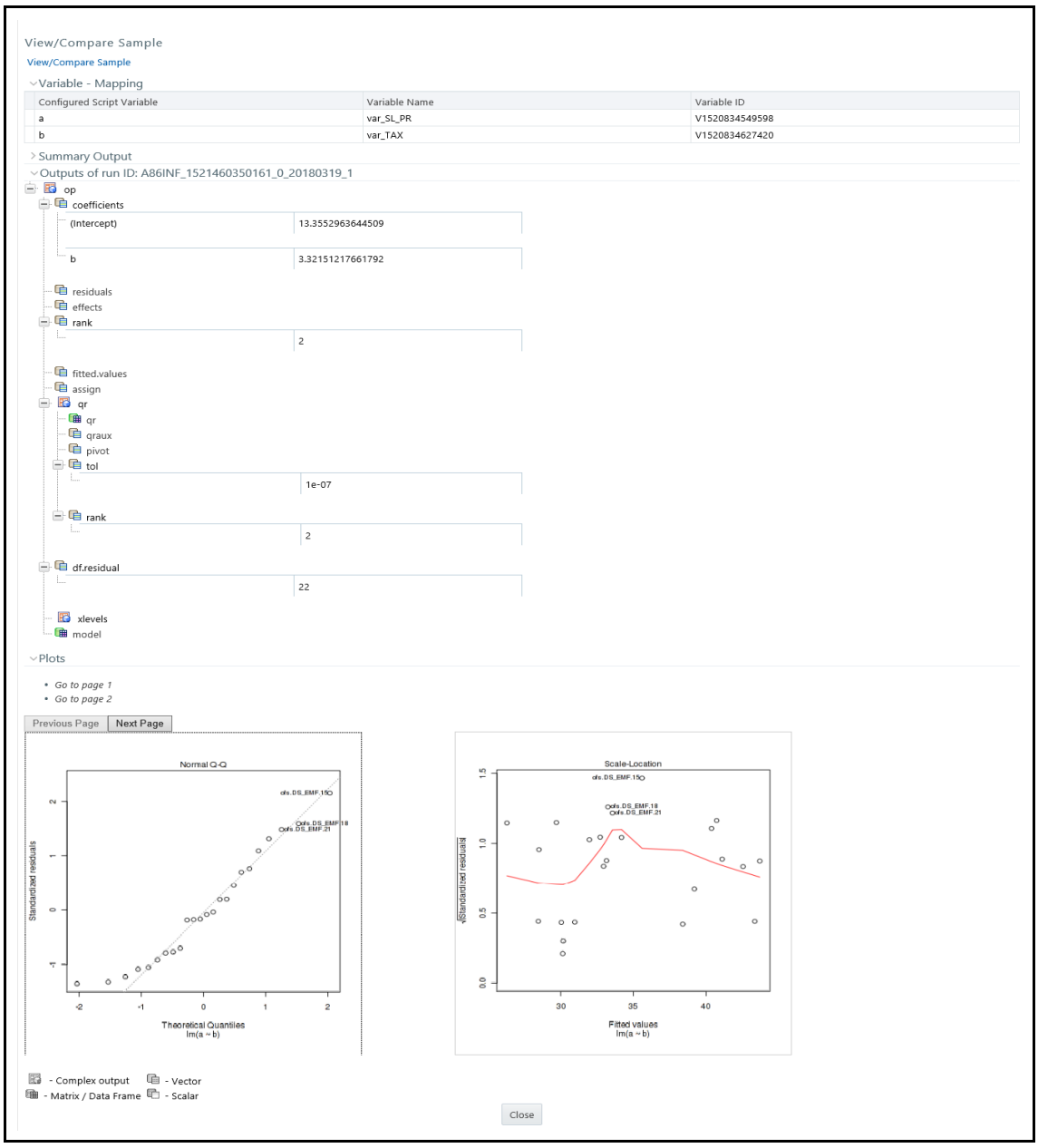
1. Select the checkbox adjacent to the Model ID.
2. Click  from the *Model Outputs* toolbar. The *Output Summary* window is displayed.

Figure 26: Outputs Summary window



3. Select the checkbox adjacent to a Batch Run ID to view the details or select multiple checkboxes to compare Batch Run IDs.
4. Click  to view details or compare Batch Run ID(s). The *View/Compare Sample* window is displayed with the comparison details of the selected models.
5. Click the links to view/download the derived values stored as .csv files or plots saved as image files.

Figure 27: Output window for R scripted models



6. Click the file name (.dat file) under the **Summary Output** pane to view the summary of outputs. This is displayed only for models based on Standard R Engine.
7. Click the links in the **Outputs** pane to download or view the derived values in .csv files.

8.6 Model Deployment

Model Deployment in the Sandbox Information Domain enables you to request for deployment of a model to the production information domain. Once you define a model and test it in the Sandbox, and if the testing (checking the results of model execution) results in concluding that the definition is

sound and satisfactory, promote the model to the production infodom to execute the model on the production data.

Since models based on R scripting can be directly deployed without execution, those models will be displayed in the *Model Deployment* window.

Topics:

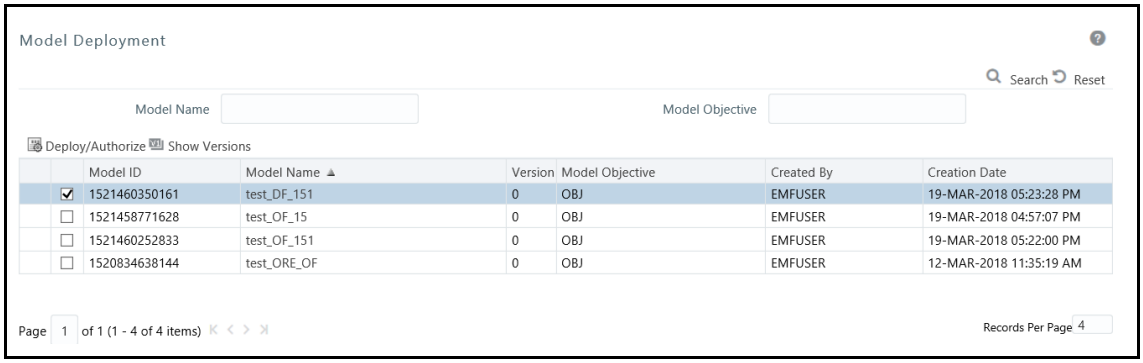
8.6.1 Accessing Model Deployment

To access the *Model Deployment* page, follow these steps:

1. Click  from the header to display the sandboxes in a **Tiles** menu.
2. Select the required Sandbox from the **Tiles** menu. The Navigation list to the left displays the link for Modeling. Click **Modeling** to expand the list.
3. Click **Model Deployment** to display the *Model Deployment* window.

   This menu is displayed only if you are in the sandbox infodom.

Model Deployment Page



8.6.2 Searching Model Deployment

The *Model Deployment* page allows you to search the models that you want to view.

To search for Model Deployment, follow these steps:

1. Navigate to the *Model Deployment* window.
2. Enter the Model Name and Model Objective.
3. Click  . The filtered list is displayed.

8.6.3 Requesting and Authorizing Model Deployment

You can request a model for deployment and view its status in the Processing Modeling Framework (PMF). You can view the current status of the model deployment life-cycle and click on the various symbols in the PMF diagram to view details for the specific state in the workflow.

> **NOTE** For more information on PMF, see the OFSAAI User Guide.

To request and authorize a model for deployment, perform the following steps:

1. Select the checkbox adjacent to **Model ID** and click  to display the *Model Deployment Authorization* window.
2. Select the **Request for Deployment** checkbox in the Model Deployment grid.
3. Once you have requested deployment, you can view the status for the model deployment in the PMF.
4. Click  from the header to display the Administration tools in the **Tiles** menu. Click **Processing Modeling Framework** from the **Tiles** menu to view a list of links. Click **Process Monitor** from the list and search for the Model that was requested for deployment. Click the link to display the *PMF* window. The window displays the state of the Model deployment.
5. Select **Authorize** from the **Authorize and Deploy** checkbox to authorize the deployment request. This radio button is enabled if you are mapped to the MDLAUTH function role. If you are not mapped to the role, an authorizer mapped to the role has to approve the deployment.

> **NOTE** Click the **My Inbox** link and then click **My Task** from the Navigation list. This link is available on the menu if your administrator has configured the required privileges to your user profile in the system. You can view notifications for the approval or rejection of the Model deployment here.

   For rejected requests, you can click the  Sandbox icon and edit the model from the *Model Creation* window. For more information, see Creating and Executing a Model. Once you have edited the Model, you can request again for approval to deploy and the process is a repeat of steps 1 to 3.

   Authorizers approving or rejecting model deployment requests can access from My Inbox > My Task as described previously. Click **Task ID** in the notification to display the *Model Deployment Authorization* window and approve or reject the model deployment.
6. Click **Save** to process the model deployment.

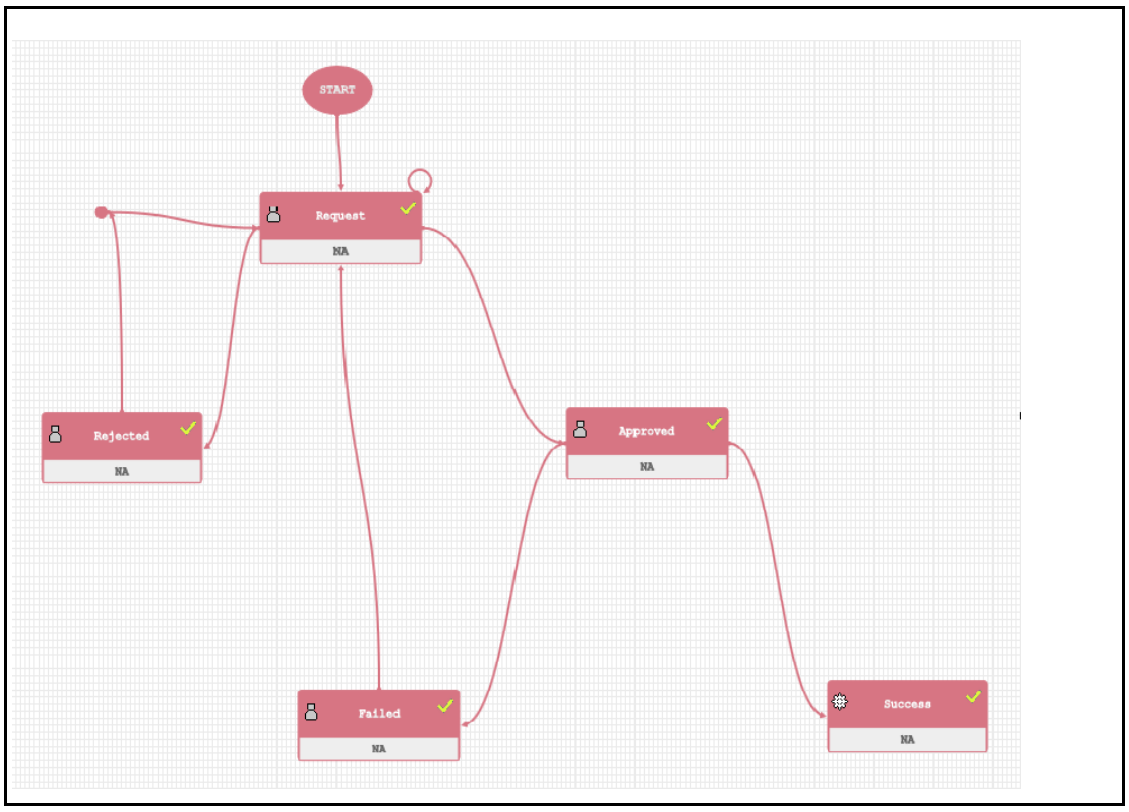
   On successful deployment, the model is available in the Run Rule Framework as a component. Run filter and process filter are supported for models stitched in a Run for execution.

To execute Open R models, pass the value for $HOST as a Run-Time parameter.

> **NOTE** Once deployed, you can view the success or failure of the Model deployment in the *PMF* window.

1. Click  from the header to display the Administration tools in the **Tiles** menu. Click **Processing Modeling Framework** from the **Tiles** menu to view a list of links. Click **Process Monitor** from the list and search for the Model that was deployed. Click on the link to display the *PMF* window. The window displays the state of the Model deployment as either Successful or Failed. You can click on the symbols to view more details. The following screenshot of the Model deployment on the PMF window is an example that has been through a cycle of model rejection and approval, and deployment failure and success.

Figure 28: Model deployment states on PMF window



8.7 Model Execution

The Model Execution module allows you to request for model execution and work with the champion challenger.

Topics:

- Searching for Request for Model Execution
- Champion Challenger

8.7.1 Request for Model Execution

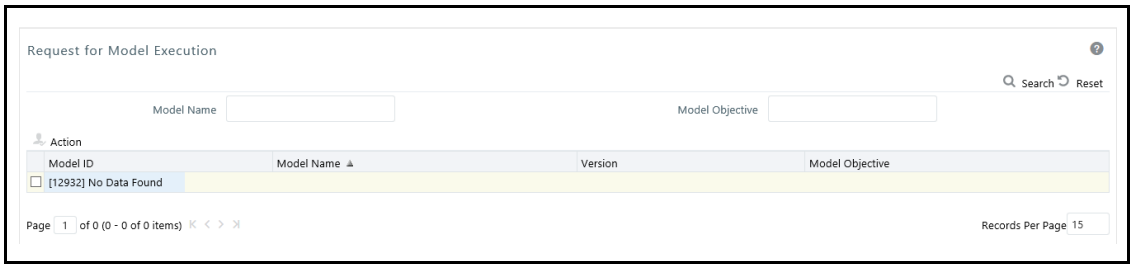
Request for Model Execution in the Production Information Domain enables you to request a batch execution for the selected model. A batch is scheduled in the Batch Processing and the model is executed in the production environment.

8.7.2 Accessing Request for Model Execution

To access the *Request for Model Execution* page, follow these steps:

1. Log in to Oracle Financial Services Enterprise Modeling.
2. Click  from the header to display the applications in a **Tiles** menu.
3. Select **Financial Services Enterprise Modeling** from the **Tiles** menu. The *Enterprise Modeling Application Home Page* is displayed with the **Navigation** list to the left.
4. Click **Financial Services Enterprise Modeling** from the **Navigation** list to expand view the menu.
5. Click **Model Execution** and then click **Process Management** to view the menu.
6. Click **Model Management** and then click **Request for Model Execution**. The *Request for Model Execution* window is displayed.

Figure 29: Request for Model Execution



8.7.3 Requesting for Model Execution

To request for model execution, follow these steps:

1. From the Request for *Model Execution* window, select the required model, and click  . The *Request for Model Execution* window is displayed.
2. Select the **Register Batch** checkbox.
3. Click **Save** to process for model execution.

   When there is a request for model execution, a batch is registered in the Operations framework which has to be executed from the *Batch Scheduling* window in the application. For more information, see the Operations section in the Oracle Financial Services Analytical Applications Infrastructure User Guide.

> **NOTE** The *Request for Model Execution* page displays all deployed models in the case of schema-based sandboxes.
>
> Market Risk (MR) Models will not be displayed on the *Request for Model Execution* window. To create and execute an MR Model, go to the *Run Definition* window.

8.7.4 Searching for Request for Model Execution

The *Request for Model Execution* page allows you to search for a specific model execution request.

To search for Request for Model Execution, follow these steps:

1. Navigate to the *Request for Model Execution* page.
2. Enter the **Model Name** and **Model Objective**.
3. Click  . The filtered list is displayed.

8.7.5 Champion Challenger

Champion refers to the first model deployed, after calibrating the parameters for a specific model objective. Challenger(s) refers to the subsequent models deployed for the same model objective but with different techniques used for predictions.

When several prediction models (challengers) are deployed and one of the challengers produces optimum output meeting all the prediction requirements, the same can be set as Champion.

Topics:

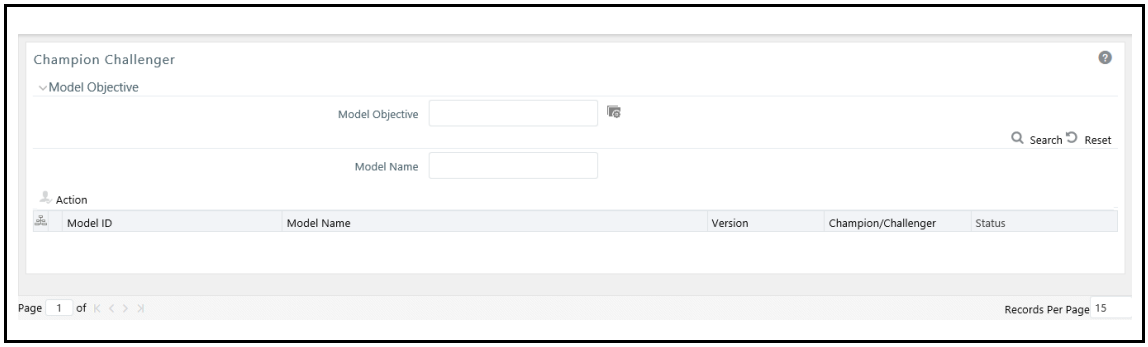
- Accessing Champion Challenger
- Searching for Champion Challenger
- Requesting New Champion

8.7.5.1 Accessing Champion Challenger

To access the *Champion Challenger* page, follow these steps:

1. Log in to Oracle Financial Services Enterprise Modeling.
2. Click  from the header to display the applications in a **Tiles** menu.
3. Select **Financial Services Enterprise Modeling** from the **Tiles** menu. The *Enterprise Modeling Application Home Page* is displayed with the **Navigation** list to the left.
4. Click **Financial Services Enterprise Modeling** from the **Navigation** list to expand view the menu.
5. Click **Model Execution** and then click **Process Management** to view the menu.
6. Click **Model Management** and then click **Champion Challenger**. The *Champion Challenger* window is displayed.

Figure 30: Champion Challenger



8.7.5.2 Requesting New Champion

To request a new champion, follow these steps:

1. Select the **Model Objective**, click and open the Model Objective browser.
2. Select the required **Model Objective** in the **Hierarchy** list and click .
3. Click **OK**. The window is refreshed to display the available models.
4. Select the checkbox adjacent to the model whose status has to be set to champion.
5. Click in the Champion Challenger toolbar. The *Request New Champion* window is displayed.
6. Select the **Request New Champion** checkbox.
   If you have been mapped to the MDLCHAMP function role, you can select **Authorize** checkbox to authorize a new champion.
7. Click **Save** to update the changes and return to the Champion Challenger window.
   In the *Champion Challenger* window, the status of the selected model is updated as Champion and Authorized.

8.7.5.3 Searching for Champion Challenger

The *Champion Challenger* page allows you to search for a specific champion challenger.

To search for Champion Challenger, follow these steps:

1. Navigate to the *Champion Challenger* page.
2. Enter the **Model Name**.
3. Click . The filtered list is displayed.

8.8 Configure Execution Venue

The machine details and compiler details required for model execution are configured on the *Model Execution Configuration* window.

Topics:

8.8.1 Prerequisites

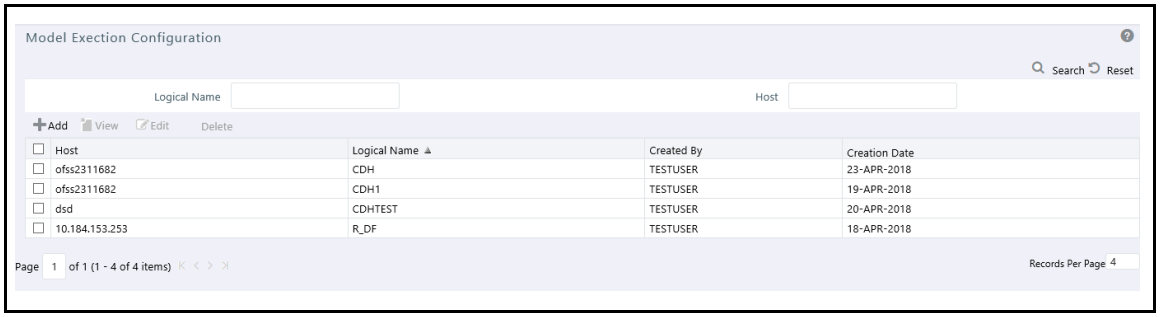
Configure as instructed in the section Configurations for OFSAAI Remote Invocation of Scripted Models Using Standard R Distributions of the OFS Analytical Applications Infrastructure Administration Guide.

8.8.2 Accessing Configure Execution Venue

To access the **Configure Execution Venue** menu, follow these steps:

1. Log in to Oracle Financial Services Enterprise Modeling.
2. Click from the header to display the applications in a **Tiles** menu.
3. Select **Financial Services Enterprise Modeling** from the **Tiles** menu. The *Enterprise Modeling Application Home Page* is displayed with the **Navigation** list to the left.
4. Click **Financial Services Enterprise Modeling** from the **Navigation** list to expand view the menu.
5. Click **Configure Execution Venue**. The *Model Execution Configuration* window is displayed.

Figure 31: Model Execution Configuration



8.8.3 Adding Model Execution Configuration

You can create a Model Execution Configuration from the *Model Execution Configuration* window.

To create a Model Execution Configuration, follow these steps:

1. Select button from the toolbar. The *Configure Execution Venue* window is displayed. The **Add** button is disabled if you select any existing **Host** in the grid.
2. Enter the **Execution Venue Details**. The fields are described in the following table:

Table 8: Execution Venue Details

Field	Description
Name	Enter the name for the execution venue. This field is case-sensitive and does not allow duplication. For example, the logical name "R_DF" is not allowed if the name "R_DF" exists. Ensure that there are no special characters such as `, {,},", ', ~, <,>, /, \, and multiple spaces.
Language	Select the language from the drop-down list. The options are MATLAB and R.
Input Data Type	Select the input data type. The options are **ORE Frame**, **Data Frame,** and **HDFS File**.
Machine Details	
User Name	Enter the user name with which Rserve is started on the remote machine.
Password	Enter the password for the preceding user.
Primary IP For Runtime Processes	Enter the machine's primary IP for runtime processes (IP address/host name of the remote machine where Rserve is running).
Shared Path	Enter the path of the Remote Machine or Server, which provides complete access rights to all users. The output of the executions will be created in the directory configured here. **Note:** Remote Machine or Server refers to the execution engine such as Rserve. The configured path should end with a directory separator at the end.
Output required in tables	Select **Yes** if you require the output in OFSAA tables.
Outputs required in CSV format	Select **Yes** if you require the output in CSV format.
Delete output files	Select **Yes** if you want to delete the output files. By default, this is **No**.
Class Name	Enter the Class Name of the execution implementation.
Is a primary node?	Select this option if the machine is a primary node.
SSH Port	Enter the SSH port number of OFSAA for file transfer between the remote machine and OFSAA.
SFTP Port	Enter the SFTP port number of OFSAA for file transfer between the remote machine and OFSAA.
MATLAB Specific Configurations	
Webservice URL	Enter the web service URL for executing the script on the MATLAB server.
Compiler Machine Details	
User name	Enter the user name for the compiler machine where the MATLAB compiler is running.

Field	Description
Password	Enter the password for the compiler machine.
Primary IP For Runtime Processes	Enter the machine's primary IP for runtime processes.
Compiler Path	Enter the compiler path where the R code will be compiled.
SSH Port	Enter the SSH port number of OFSAA to transfer files to the MATLAB compiler machine.
SFTP Port	Enter the SSH port number of OFSAA to transfer files to the MATLAB compiler machine.
Script Configuration	**Note:** This pane has two options: 1. Predefined scripts in the application and 2. Custom scripts that have to be uploaded.
Predefined scripts	1. Select the required scripts and click to move to selected scripts. 2. Click and to change the order of the selected scripts.
Upload scripts	1. Click the **Browse** button to upload custom scripts. 2. Select the required scripts and click to move to selected scripts. 3. Click and to change the order of the selected scripts. 4. Click  to view the details of the selected scripts.

3. Once you have updated all the necessary details, click **Save** to save the configure execution venue details.

8.8.4 Viewing Model Execution Configuration

You can view the Model Execution Configuration from the *Model Execution Configuration* window.

To view the details for an existing Model Execution Configuration, follow these steps:

1. Select the checkbox adjacent to the **Host**.
2. Click  button in the toolbar. The *Model Execution Configuration* window is displayed with details in view mode.

8.8.5 Modifying Model Execution Configuration

You can modify the Model Execution Configuration from the *Model Execution Configuration* window.

To modify an existing Model Execution Configuration, follow these steps:

1. Select the checkbox adjacent to the **Host** that you want to update.

2. Click  button in the toolbar. The *Model Execution Configuration* window is displayed in edit mode.
3. The **Edit** button is disabled if you select multiple Hosts.
4. Edit the Model Execution Configuration details as required. For more information on the fields, see Adding Model Execution Configuration.
5. Click **Save** to upload changes.

8.8.6 Deleting Model Execution Configuration

You can remove the Model Execution Configuration(s) that are no longer required in the system by deleting them from the Model Execution Configuration window.

To delete a Model Execution Configuration, follow these steps:

1. Select the checkbox adjacent to a **Host**.
2. Click  button from the toolbar. A confirmation dialog is displayed.
3. Click **OK** to confirm the deletion.

9 Managing Stress Testing

This chapter provides information about Modeling in the Oracle Financial Services Enterprise Stress Testing application and step-by-step instructions to use this section.

Topics:

9.1 About Stress Testing

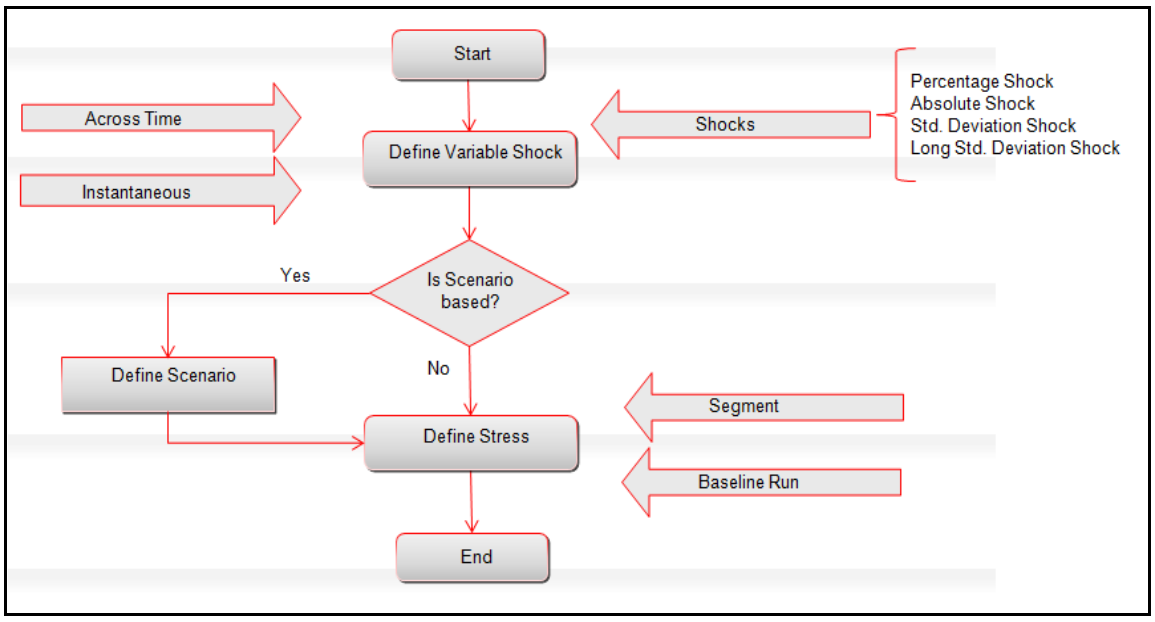
Stress testing is an integral part of a bank's risk measurement system and plays an important role in estimating the effects of potential financial crises on a bank's operations. Stress Testing or risk estimation technique refers to the process of examining the stability of a system or entity in adverse conditions. It involves testing beyond normal operational capacity, often to a breaking point, to observe the results. It also helps banks analyze to estimate the impact of movements in the variables on specific measures such as profitability and capital adequacy.

The Stress Testing utility supports the stress testing requirements across the entire suite of OFSAA products. It allows banks to define shocks and assess the impact of such shocks across multiple business areas.

The commonly accepted forms of Stress Testing are:

- Sensitivity Analysis: Shocks are applied to a single variable.
- Scenario Analysis: A scenario is defined as a shock to a single variable or a collection of shocks on multiple variables. Scenario analysis involves applying simultaneous shocks on multiple variables to assess the impact of the scenario on a measure or a set of measures. Scenarios are further classified into the following categories:
  - Historical Scenarios: These scenarios replicate past events docket. They are defined by specifying shocks to variables such that they replicate the movement seen during historical events.
    For example, the user may define a scenario that replicates the movement in stock market indices as observed during the catastrophic event. This scenario can then be applied to the current trading book portfolio of the bank to estimate the loss that might be incurred if a catastrophic event occurs. However, the historical scenarios may not cover the entire range of potential adverse conditions.
  - Hypothetical Scenarios: These scenarios are based on user judgment and address the other possible adverse movements in the variables.

Figure 32: Stress Testing Workflow



9.2 Variable Definition

Variable refers to a logical set of attributes that are likely to change based on the selected parameters. In a modeling environment, variables play a vital role in filtering the model parameters and deriving an estimate based on historical data. Variables are defined in the production information domain.

Topics:

- Accessing Variable Definition
- Adding Variable Definition

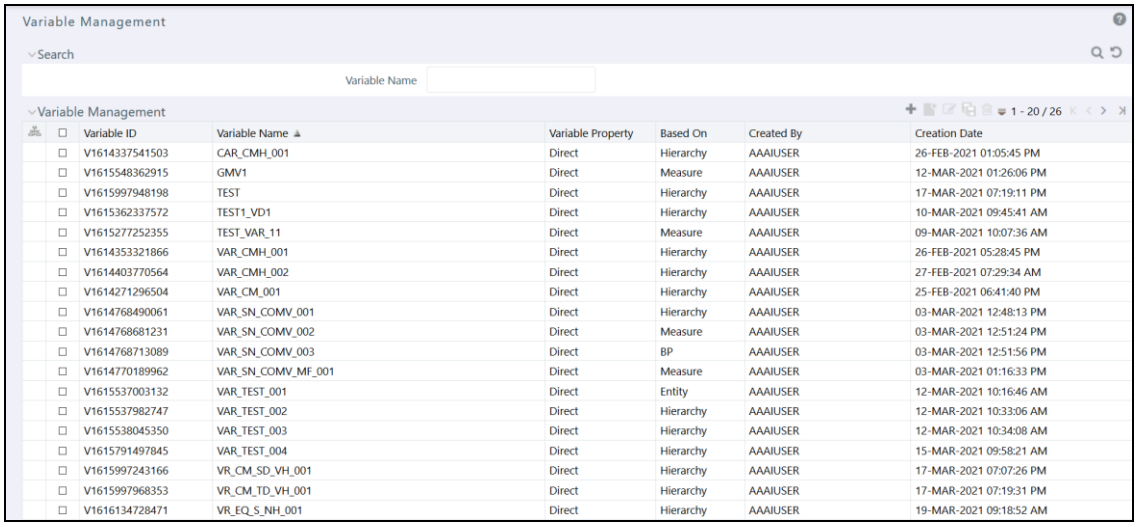
For more information about modifying, copying, and deleting Variable Definitions, see the Managing Variables section.

9.2.1 Accessing Variable Definition

1. Log in to Oracle Financial Services Enterprise Modeling.
2. Click from the header to display the applications in a **Tiles** menu.
3. Select **Financial Services Enterprise Modeling** from the **Tiles** menu.

   The Enterprise Modeling Application Home Page is displayed with the **Navigation** list to the left.
4. Click **Financial Services Enterprise Modeling** from the **Navigation** list to expand view the menu.
5. Click **Stress Testing** and then click **Variables** to display the **Variable Management** window.

Figure 44. Variable Management Window



Variable ID	Variable Name	Variable Property	Based On	Created By	Creation Date
V1614337541503	CAR_CMH_001	Direct	Hierarchy	AAAIUSER	26-FEB-2021 01:05:45 PM
V1615548362915	GMV1	Direct	Measure	AAAIUSER	12-MAR-2021 01:26:06 PM
V1615997948198	TEST	Direct	Hierarchy	AAAIUSER	17-MAR-2021 07:19:11 PM
V1615362337572	TEST1_VD1	Direct	Hierarchy	AAAIUSER	10-MAR-2021 09:45:41 AM
V1615277252355	TEST_VAR_11	Direct	Measure	AAAIUSER	09-MAR-2021 10:07:36 AM
V1614353321866	VAR_CMH_001	Direct	Hierarchy	AAAIUSER	26-FEB-2021 05:28:45 PM
V1614403770564	VAR_CMH_002	Direct	Hierarchy	AAAIUSER	27-FEB-2021 07:29:34 AM
V1614271296504	VAR_CM_001	Direct	Hierarchy	AAAIUSER	25-FEB-2021 06:41:40 PM
V1614768490061	VAR_SN_COMV_001	Direct	Hierarchy	AAAIUSER	03-MAR-2021 12:48:13 PM
V1614768681231	VAR_SN_COMV_002	Direct	Measure	AAAIUSER	03-MAR-2021 12:51:24 PM
V1614768713089	VAR_SN_COMV_003	Direct	BP	AAAIUSER	03-MAR-2021 12:51:56 PM
V1614770189962	VAR_SN_COMV_MF_001	Direct	Measure	AAAIUSER	03-MAR-2021 01:16:33 PM
V1615537003132	VAR_TEST_001	Direct	Entity	AAAIUSER	12-MAR-2021 10:16:46 AM
V1615537982747	VAR_TEST_002	Direct	Hierarchy	AAAIUSER	12-MAR-2021 10:33:06 AM
V1615538045350	VAR_TEST_003	Direct	Hierarchy	AAAIUSER	12-MAR-2021 10:34:08 AM
V1615791497845	VAR_TEST_004	Direct	Hierarchy	AAAIUSER	15-MAR-2021 09:58:21 AM
V1615997243166	VR_CM_SD_VH_001	Direct	Hierarchy	AAAIUSER	17-MAR-2021 07:07:26 PM
V1615997968353	VR_CM_TD_VH_001	Direct	Hierarchy	AAAIUSER	17-MAR-2021 07:19:31 PM
V1616134728471	VR_EQ_S_NH_001	Direct	Hierarchy	AAAIUSER	19-MAR-2021 09:18:52 AM

9.2.2 Adding Variable Definition

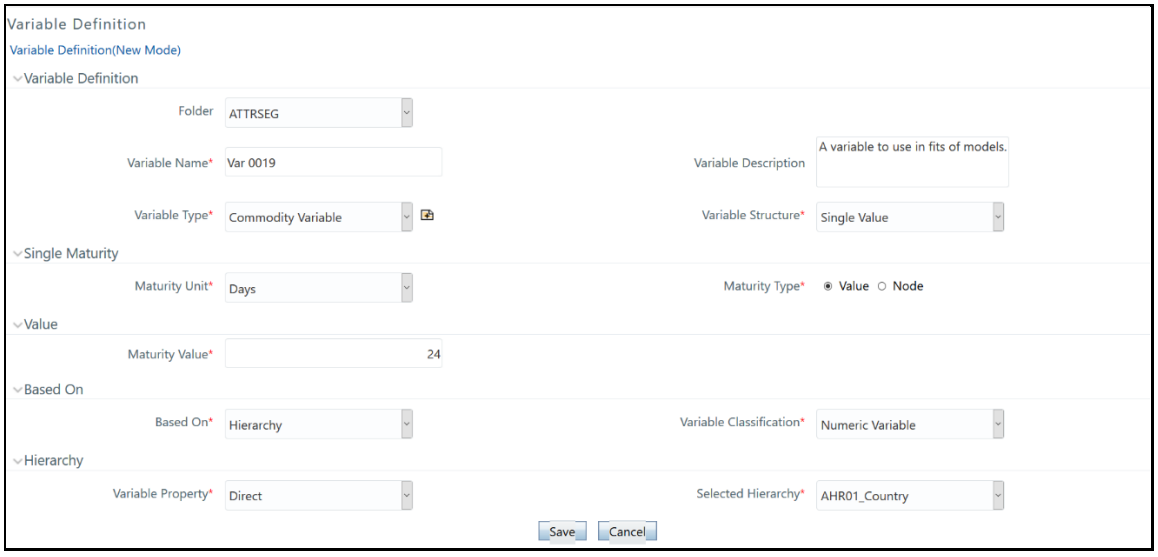
The Add Variable Definition page enables you to add a variable by filtering through the required parameters. The options available to filter the data vary depending on the variable type selected.

To add variable definition, follow these steps:

1. Select ➕ from the **Variable Management** toolbar.

   The **Add** button is disabled if you have selected any checkbox in the grid. The **Variable Definition Add** window is displayed.

Figure 45. Variable Definition Window



2. Enter the Variable details as described in the following table:

Table 10. Variable Definition - Field Descriptions

Field	Description
Fields marked in red asterisk (*) are mandatory.	
Folder	Select the folder in which you want to create the variable.
Variable Name	Enter a name for the variable. Ensure that there are no special characters like `, {,},", ', ~, <,>, /, \, and multiple spaces.
Variable Description	Enter the required description for the variable.
Variable Type	Select the variable type from the drop down list. The available options are: • Commodity Variable • Correlation Variable • Currency Variable • Equity Variable • General Macroeconomic Indicator Variable • Idiosyncratic Variable • Interest Rate Variable You can add a custom variable type by clicking  and entering a **Variable Type** name in the Variable Type window.
Variable Structure	Select the Variable Structure as either **Single Value** or **Term Structure** from the drop down list. The **Term Structure** option is available only if the **Variable Type** is selected as **Commodity Variable** or **Interest Rate Variable**. Click  from the Term Structure toolbar. Select the required variables from the Variable Browser window.
Single Maturity	This field is displayed only if **Variable Type** is selected as **Commodity Variable** or **Interest Rate Variable**: • Select the **Maturity Unit** as Days, Months, Quarters, or Years from the drop-down list. • Select the **Maturity Type** as either **Value** or **Node**.
Maturity Value	This field is displayed only if Commodity Variable or Interest Rate Variable is selected as Variable Type and Maturity Type is selected as Value. Specify a numeric value between 1 to 1000.
Node Selection	This field is displayed only if **Commodity Variable** or **Interest Rate Variable** is selected as **Variable Type** and **Maturity Type** is selected as Node. 1. Click  and select the required hierarchy from the Hierarchy browser window. 2. Click  and select the required node of the selected hierarchy from the Hierarchy browser window.

Field	Description
Based On	Select any of the following options from the drop-down list, based on which the variable definitions are created. • Hierarchy • Measure • Business Processor • Entity
Variable Classification	Select the required variable classification from the drop-down list. The options are **Numeric Variable**, **Nominal Variable**, and **Ordinal Variable**. The **Nominal Variable** and **Ordinal Variable** options are available only if you select Variable Type as **General Macroeconomic Indicator** or **Idiosyncratic Variable** and **Based on as Hierarchy**.
Variable Transformation	This feature is available for variables based on Measures, Business Processor, and Entity. 1. Click **Transformation** to define a transformation for the Variable. The **Technique Browser** for Transformation window is displayed. 2. Select the transformation you want to apply to the variable and click . The options are **Arithmetic**, **Exponential**, **Logarithm**, **Power**, and **Trigonometric**. 3. Click or to change the order in which the transformation has to be applied. Click **OK**. ▪ If **Arithmetic** is selected, select the **Operator** (Addition, Subtraction, Multiplication, and Division) from the drop-down list and enter the **Operator Value**. ▪ If **Logarithm** is selected, select the **Base** from the drop-down list. The options are 10, 2, and e. ▪ If **Power** is selected, enter the value of **Power**. ▪ If **Trigonometric** is selected, select the **Function** from the drop-down list. The options are Sine, Cosine, and Tangent. ▪ If **Exponential** is selected, the exponential value of the variable will be considered for the transformation of the variable.

3. If the variable is based on **Hierarchy**, follow these steps:
   - Select **Variable Property** as **Direct** or **Dummy** (variable in Binary form and used mainly in regression analysis). The **Dummy** option is available only if **Variable Type** is selected as **General Macroeconomic Indicator** or **Idiosyncratic Variable**.
   - Select the required Hierarchy from the **Selected Hierarchy** drop-down list.

> **NOTE** Hierarchy-based variables cannot be created on multi-level Business Intelligence hierarchies.

4. If the variable is based on **Measures**, follow these steps:

- Select **Yes** or **No** adjacent to **Apply Filters**.
- If **Yes** is selected, perform the following steps:

  i. Select the **Dataset** from the drop-down list. You can click ... to view the details of the selected dataset.

  ii. Select the **Measure** from the **Selected Measures** drop-down list. You can click + to add a new Business Measure.

  For more details on creating a Business Measure, see the **Creating Business Measure** section in the Oracle Financial Services Analytical Applications Infrastructure User Guide.

  iii. Click ✎ in the Filters grid to open the **Hierarchy browser**.

  iv. Select the hierarchy member(s) and click **OK**. The selected members are displayed in the **Filters** grid.

  v. Click a hierarchy member to invoke a grid with the member name.

  vi. Click ✎ in the hierarchy member grid and the Hierarchy Browser window is displayed.

  vii. Select the node(s) and click **OK**. The selected nodes are displayed in the Hierarchy member grid under Nodes.

- If **No** is selected, select the Measure from the **Selected Measures** drop-down list. You can click + to add a new Business Measure.

  For more details on creating a Business Measure, see the **Creating Business Measure** section in the Oracle Financial Services Analytical Applications Infrastructure User Guide.

5. If the variable is based on **Business Processor**, follow these steps:
   - Select the Business Processor from the **Selected BP** drop-down list.

     You can click + to add a new Business Processor.

     For more details on creating a Business Processor, see **Adding a Business Processor** section in the Oracle Financial Services Analytical Applications Infrastructure User Guide.
6. If the variable is based on Entity, follow these steps:
   - Click Entity to open the **Entity and Attribute** window.

     The available tables are displayed under the **Available Entities** section.
   - Select the checkbox corresponding to the table you want to select.

     The available columns in the selected table are displayed under the **Available Attributes** section.
   - Select the Attribute for which you want to create the variables and click **Save**.

     The selected attributes are displayed in the **Selected Attributes** section.
7. Click **Save** to save the new Variable definition details.

The Audit Trails grid at the bottom of the **Variable Definition** window displays metadata information about the Variable definition created.

9.3 Upload Scenario

The financial institutions may be required to conduct stress tests based on the supervisory stress scenarios provided by the Regulators. In such a case, the regulators will provide the data to be used for running the stress tests for different scenarios such as Baseline, Adverse, or Severely Adverse. You can upload the data that is available in an Excel spreadsheet to the OFS Enterprise Modeling framework and conduct the tests.

Topics:

9.3.1 Accessing Upload Scenario

To access the Upload Scenario window, follow these steps:

1. Log in to Oracle Financial Services Enterprise Modeling.
2. Click  from the header to display the applications in a **Tiles** menu.
3. Select **Financial Services Enterprise Modeling** from the **Tiles** menu. The Enterprise Modeling Application Home Page is displayed with the **Navigation** list to the left.
4. Click **Financial Services Enterprise Modeling** from the **Navigation** list to expand view the menu.
5. Click **Stress Testing** and then click **Upload Scenario**. The **Upload Scenario** window is displayed.

9.3.2 Uploading New Scenario

This option allows you to upload scenario data that you have got from regulators in an Excel file.

> **NOTE** Rollback is not handled if wrong Scenario data is uploaded. To upload a scenario, follow these steps:

To upload a scenario, follow these steps:

1. From the **Upload Scenario** window, click from the **Upload Scenarios** toolbar. The **Upload Scenario** window is displayed.
2. Enter the details as tabulated:

Table 11. Upload Scenario - Field Descriptions

Field	Description
Fields marked in red asterisk (*) are mandatory.	
Source	Enter the source name from whom you got the scenario data.
Scenario Name	Enter the scenario name.
Scenario File	Click Browse and select the appropriate scenario file. Click  to upload the file to the setup.
Effective Date	Specify the duration for which the scenario data is effective. This is optional. Click  and select the Start Date and End Date.

3. Click **Save**.

9.3.3 Deleting Upload Scenarios

You can remove the upload scenarios that are no longer required in the system, by deleting them from the **Upload Scenario** window.

To delete upload scenarios, follow these steps:

1. Select the checkbox adjacent to the Source that you want to delete.
2. Click  in the **Upload Scenarios** toolbar.
3. Click OK in the information dialog to confirm the deletion.

9.3.4 Searching Upload Scenarios

The **Upload Scenario** window allows you to search for specific uploaded scenarios. To search for uploaded scenarios, follow these steps:

1. Navigate to the **Upload Scenarios** window.
2. Enter the name of the Source.
3. Click **Search**  . The filtered list is displayed.

9.4 Variable Shock Library

Variable Shock refers to modulating the data causing an adverse shift in the value of a variable. The Variable Shock Library within the Stress Testing framework facilitates you to define multiple shocks to variables and maintaining a library of such shocks in the Production Information Domain. You can also view, modify, copy, and delete variable shock definitions.

Topics:

9.4.1 Accessing Variable Shock Library

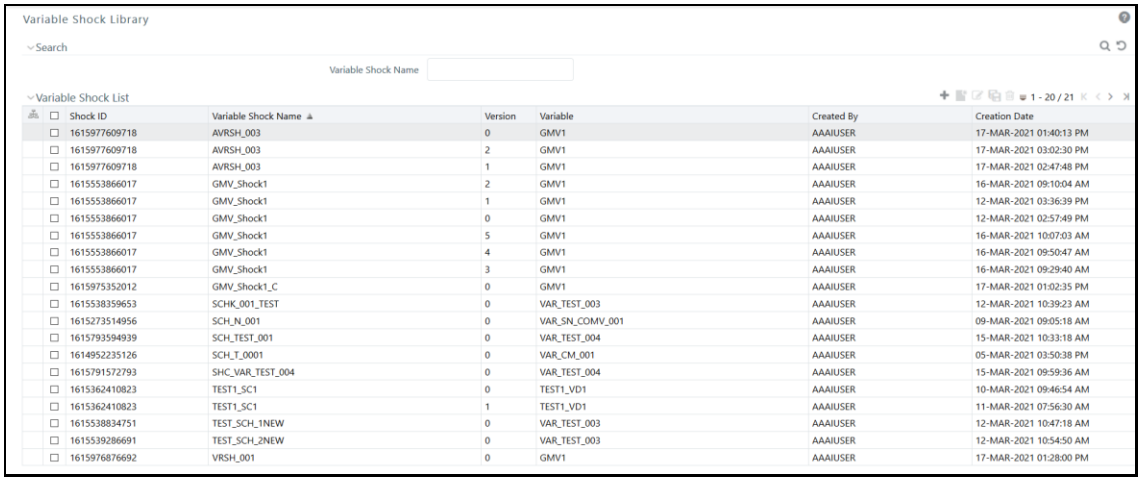
To access the Variable Shock Library page, follow these steps:

1. Log in to Oracle Financial Services Enterprise Modeling.
2. Click  from the header to display the applications in a **Tiles** menu.
3. Select **Financial Services Enterprise Modeling** from the **Tiles** menu.

   The Enterprise Modeling Application Home Page is displayed with the **Navigation** list to the left.
4. Click **Financial Services Enterprise Modeling** from the **Navigation** list to expand view the menu.
5. Click **Stress Testing** and then click **Variable Shock**.

   The **Variable Shock Library** window is displayed.

Figure 46. Variable Shock Library Window



Shock ID	Variable Shock Name	Version	Variable	Created By	Creation Date
1615977609718	AVRSH_003	0	GMV1	AAAIUSER	17-MAR-2021 01:40:13 PM
1615977609718	AVRSH_003	2	GMV1	AAAIUSER	17-MAR-2021 03:02:30 PM
1615977609718	AVRSH_003	1	GMV1	AAAIUSER	17-MAR-2021 02:47:48 PM
1615553866017	GMV_Shock1	2	GMV1	AAAIUSER	16-MAR-2021 09:10:04 AM
1615553866017	GMV_Shock1	1	GMV1	AAAIUSER	12-MAR-2021 03:36:39 PM
1615553866017	GMV_Shock1	0	GMV1	AAAIUSER	12-MAR-2021 02:57:49 PM
1615553866017	GMV_Shock1	5	GMV1	AAAIUSER	16-MAR-2021 10:07:03 AM
1615553866017	GMV_Shock1	4	GMV1	AAAIUSER	16-MAR-2021 09:50:47 AM
1615553866017	GMV_Shock1	3	GMV1	AAAIUSER	16-MAR-2021 09:29:40 AM
1615975352012	GMV_Shock1_C	0	GMV1	AAAIUSER	17-MAR-2021 01:02:35 PM
1615538359653	SCHK_001_TEST	0	VAR_TEST_003	AAAIUSER	12-MAR-2021 10:39:23 AM
1615273514956	SCH_N_001	0	VAR_SN_COMV_001	AAAIUSER	09-MAR-2021 09:05:18 AM
1615793594939	SCH_TEST_001	0	VAR_TEST_004	AAAIUSER	15-MAR-2021 10:33:18 AM
1614952235126	SCH_T_0001	0	VAR_CM_001	AAAIUSER	05-MAR-2021 03:50:38 PM
1615791572793	SHC_VAR_TEST_004	0	VAR_TEST_004	AAAIUSER	15-MAR-2021 09:59:36 AM
1615362410823	TEST1_SC1	0	TEST1_VD1	AAAIUSER	10-MAR-2021 09:46:54 AM
1615362410823	TEST1_SC1	1	TEST1_VD1	AAAIUSER	11-MAR-2021 07:56:30 AM
1615538834751	TEST_SCH_1NEW	0	VAR_TEST_003	AAAIUSER	12-MAR-2021 10:47:18 AM
1615539286691	TEST_SCH_2NEW	0	VAR_TEST_003	AAAIUSER	12-MAR-2021 10:54:50 AM
1615976876692	VRSH_001	0	GMV1	AAAIUSER	17-MAR-2021 01:28:00 PM

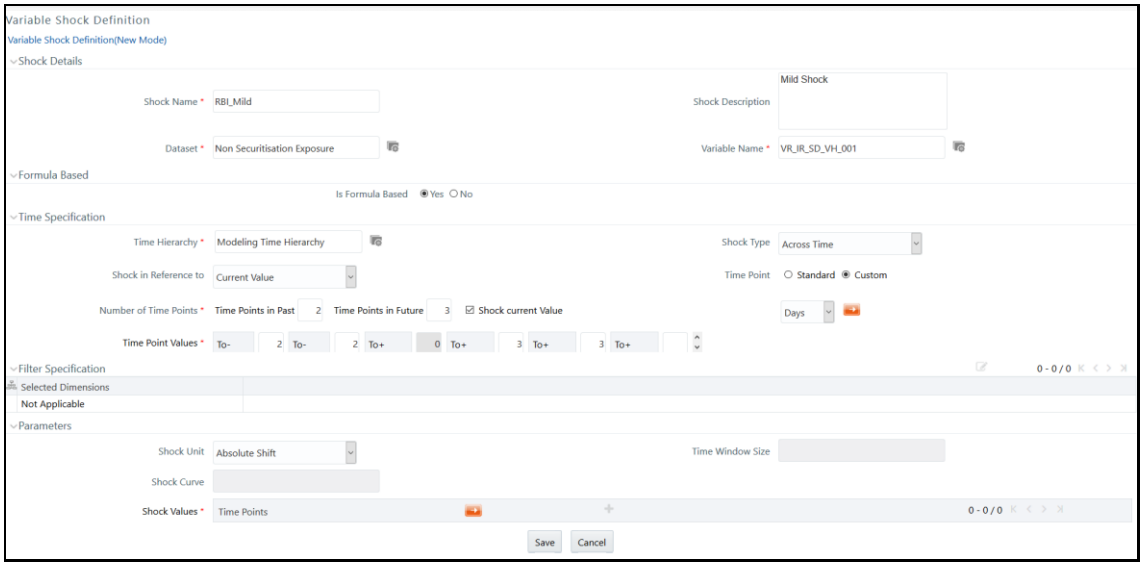
9.4.2 Adding Variable Shock Definition

This feature facilitates you to define a variable shock by filtering through the specific required parameters. The options available to filter the data vary depending on the variable type selected.

To add variable shock definition, follow these steps:

1. Select  from the **Variable Shock List** toolbar. The **Add** button is disabled if you have selected any checkbox in the grid. The **Variable Shock Definition (New Mode)** window is displayed.

Figure 47. Variable Shock Definition Window



2. Enter the Variable shock details as described in the following table:

Table 12. Variable Shock Definition - Field Descriptions

Field	Description
Fields marked in red asterisk (*) are mandatory.	
Shock Name	Enter a name for the variable shock. Ensure that there are no special characters like `, {,},", ', ~, <,>, /, \, and multiple spaces.
Shock Description	Enter the required description for the variable shock.
Dataset	1. Click and open the Dataset browser. The available datasets are listed in the Members pane. 2. Select the required Dataset based on which the variable shock is to be created and click . 3. Click **OK**. **Note:** The Datasets based on Derived Entities are not supported.
Variable Name	1. Click and open the Variable browser. The defined variables are listed in the Members pane. 2. Select the required variable based on which the variable shock is to be created and click . If you want to create Categorical Shock, select Nominal or Ordinal Variable. 3. Click **Ok**.
Is Formula based	Select **Yes** if the variable shock is based on a formula.
Time Specification: Specify the shifts in the value across multiple time points.	

Field	Description
Time Hierarchy	1. Click  and open the Hierarchy browser. The available Time Hierarchies are listed in the Members pane. 2. Select the required Time Hierarchy based on which the variable shock is to be created and click . 3. Click **Ok**.
Shock Type	Select the shock type from the drop-down list, as either: • **Across Time** - to specify shocks at multiple time points and the occurrence of which can be in the past or the future. • **Instantaneous** - if you do not have specific time points and want to shock the data based on the current values. Selecting Instantaneous will disable the other options in the Time Specification of Shock grid.
If the Across Time option is selected in the Shock Type	The **Shock in Reference** is selected as **Current Value**. Select **Time Point** as either **Standard** or **Custom**. • **Standard**- Select this option if you want to use system-generated standard **Time Point values**. ▪ Specify the **Number of Time Points** and click  . The **Time Point values** are auto-populated. • **Custom**- Select this option if you want to specify custom **Time Point Values**. ▪ Specify the **Number of Time Points** and click  . Enter required **Time Point Values**. Specify the frequency from the drop-down list as **Days**, **Weeks**, **Months**, or **Years**.
Filter Specification: Define the filtering criteria for the specified shock. The option is available only for **Idiosyncratic Variables**. Multiple shocks can be applied across filters that are specified based on combinations of dimensions. **Note:** While defining a Variable Shock across time, a Dataset with Date Filter should be selected. For more information, see the **Creating Data Set** section in the Oracle Financial Services Analytical Application Infrastructure User Guide. 1. Click  in the **Filter Specification** toolbar and open the **Filter Browser** window. 2. Click  to open the **Hierarchy Browser** window. 3. Select the required hierarchy(s) and click . 4. Click **OK** and return to the **Filter Browser**. 5. In the Hierarchical list, click  to expand a node and select the required checkbox. 6. Click and move the selection to the **Selected Hierarchies** pane. 7. Click **OK**. The selected hierarchies are displayed in the **Selected Dimensions** pane.	
Shock Parameters: Specify quantum of shifts in variables, based on time specification and shock curve.	

Field	Description
Shock Unit	This field is not displayed for **Idiosyncratic Variables** (categorical variable). Select the shock unit from the drop-down list. The available options are: • Percentage Shift • Absolute Shift • Absolute Value • Standard Deviation Shift • Long Standard Deviation Shift A shock value may be positive or negative.
Time Window Size	If you have selected **Standard Deviation Shift** or **Long Standard Deviation Shift** as **Shock Unit**, this field is enabled with a default value "2". You can change the same by entering the required value.
Shock Curve	Shock Curve is enabled for term structure variables. Select any of the following options from the drop-down list. • Parallel • Twist • Inversion
Sampling Percentage	This field is displayed for categorical variables. By default, the sampling percentage is selected as 100. Specify the percentage of data for which you want to apply shock.
Seed Value	Seed is the start point of the sequence, which is used to ensure the same set/ sequence of data is selected every time for applying shock since each seed value corresponds to the same sequence. Select **Enter seed value** from the drop-down list and enter the Seed Value as required. By default, 1234 is selected. Select **Random seed value** if you want to use system-generated random value as Seed Value.

Field	Description
Shock Values	Shock Value is the quantum of the shift in the variable. You can specify Shock Values across filters and time points. If **Shock Unit** is selected as **Absolute Value**, click  and enter the required shock value for the **Time Points**. You can specify a shock that involves a transition from one category to another or map the selected to a shock category. 1. Click  in the **Shock Value** toolbar. The **Category Browser** window is displayed. 2. Select the required category and click . 3. Click **OK**. 4. Click  to generate the list of shock values that are selected. The selected Time Points are displayed for each selected category. 5. Click  against the listed category and specify the values for each category from the Category Browser window. 6. Click **OK**.
If you select No for Is Formula based option, the following fields are displayed: This option is used if you want to apply shock based on the uploaded Scenario values.	
Source	Select the source from the drop-down list. This lists the sources which have provided the scenario data that is uploaded in the system.
Scenario Name	Select the appropriate Scenario from the drop-down list. It displays the Scenarios uploaded for the selected source.
Column	Select the appropriate column from the drop-down list. It shows all the columns of the scenario file uploaded for the selected source and scenario name. The value in the selected column is considered as the shocked value. **Note:** The Column list is not refreshed when you change the Source.

3. Click **Save**. The new variable shock details are saved and displayed in the **Variable Shock Library** window.

9.4.3 Viewing Variable Shock Definition

You can view individual Variable Shock Definition details at any given point. To view the existing Variable Shock Definition details, follow these steps:

1. Select the checkbox adjacent to the Shock ID.
2. Click  from the **Variable Shock List** toolbar. The **Variable Shock Definition View** window is displayed with the variable shock details.

9.4.4 Modifying Variable Shock Definition

You can modify only the Shock Description if the selected shock is mapped to a Variable definition. If not, then all the filtering parameters can be modified except the Shock Name. When you modify any of the Variable Shock parameters other than the Shock Description, the details are uploaded as an incremented version without overwriting the existing definition details.

To modify an existing Variable Shock Definition follow these steps:

1. Select the checkbox adjacent to the Shock ID whose details are to be updated.
2. Click in the **Variable Shock List** toolbar.

   The **Edit** button is disabled if you have selected multiple Shock IDs. The **Variable Shock Definition Edit** window is displayed.
3. Edit the Variable Shock Definition details as required.

   For more information, refer to **Add Variable Shock Definition**.
4. Click **Save** to save the changes.

9.4.5 Copying Variable Shock Definition

The Copy Variable Shock Definition facilitates you to quickly create a new Shock Definition based on the existing shock variables or by updating the values of the required variables.

To copy an existing Variable Shock Definition follow these steps:

1. Select the checkbox adjacent to the Shock ID whose details are to be duplicated.
2. Click in the **Variable Shock List** toolbar. The **Copy** button is disabled if you have selected multiple Shock ID(s).
3. In the **Variable Shock Definition Copy** window, you can:
   - Create a new variable shock definition with existing variables. Specify a new **Variable Name** and click Save.
   - Create a new variable shock definition by updating the required variables. Specify a new Variable Name and update the required details. For more information, refer to **Add Variable Shock Definition**. Click **Save**.

The Variable Shock details are displayed in the **Variable Shock Library** window.

9.4.6 Deleting Variable Shock Definition

You can remove the variable shock definition(s) which are not used in Scenario Definition and which are no longer required in the system, by deleting them from the Variable Shock Library window.

To delete for Variable Shock Definition, follow these steps:

1. Select the checkbox adjacent to the Shock ID whose details are to be removed.
2. Click in the **Variable Shock List** toolbar.
3. Click **OK** in the information dialog to confirm the deletion.

9.4.7 Searching Variable Shock Library

The Variable Shock Library page allows you to search specific model execution request.

To search for Variable Shock Library, follow these steps:

1. Navigate to the **Variable Shock Library** window.
2. Enter the **Variable Shock Name**.
3. Click **Search** . The filtered list is displayed.

9.5 Scenario Management

The Scenario in Stress Testing refers to a set of unusual, hypothetical events structured within the variables. A scenario can be defined using variable-based shocks and every single Variable Shock constitutes a scenario.

Scenario Management within the Stress Testing enables you to define and maintain multiple Scenarios on the same set of Variables in the Production Information Domain. You can also view, modify, copy, and delete scenario(s).

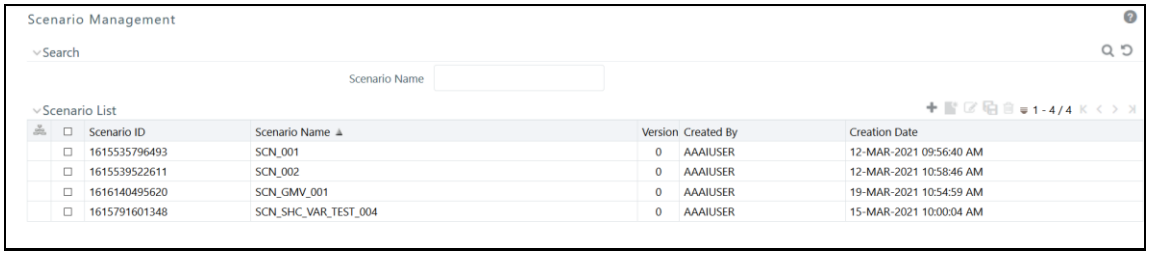
Topics:

9.5.1 Accessing Scenario Management

To access the **Scenario Management** page, follow these steps:

1. Log in to Oracle Financial Services Enterprise Modeling.
2. Click from the header to display the applications in a **Tiles** menu.
3. Select **Financial Services Enterprise Modeling** from the **Tiles** menu. The Enterprise Modeling Application Home Page is displayed with the **Navigation** list to the left.
4. Click **Financial Services Enterprise Modeling** from the **Navigation** list to expand view the menu.
5. Click **Stress Testing** and then click **Scenario**. The **Scenario Management** page is displayed.

Figure 48. Scenario Management Window

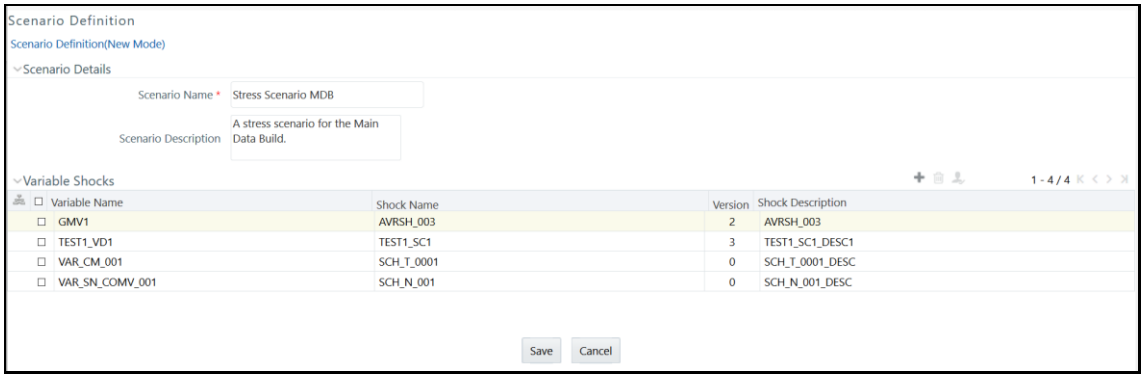


9.5.2 Adding Stress Testing Scenario

You can create stress testing scenario by associating the appropriate Variable Shock Definitions. To add stress testing scenario definition, follow these steps:

1. Select ➕ from the **Scenario List** toolbar. The Add button is disabled if you have selected any checkbox in the grid. The **Scenario Definition** window is displayed.

Figure 49. Scenario Definition Window



2. Enter the Scenario details as described in the following table:

Table 13. Scenario Definition - Field Descriptions

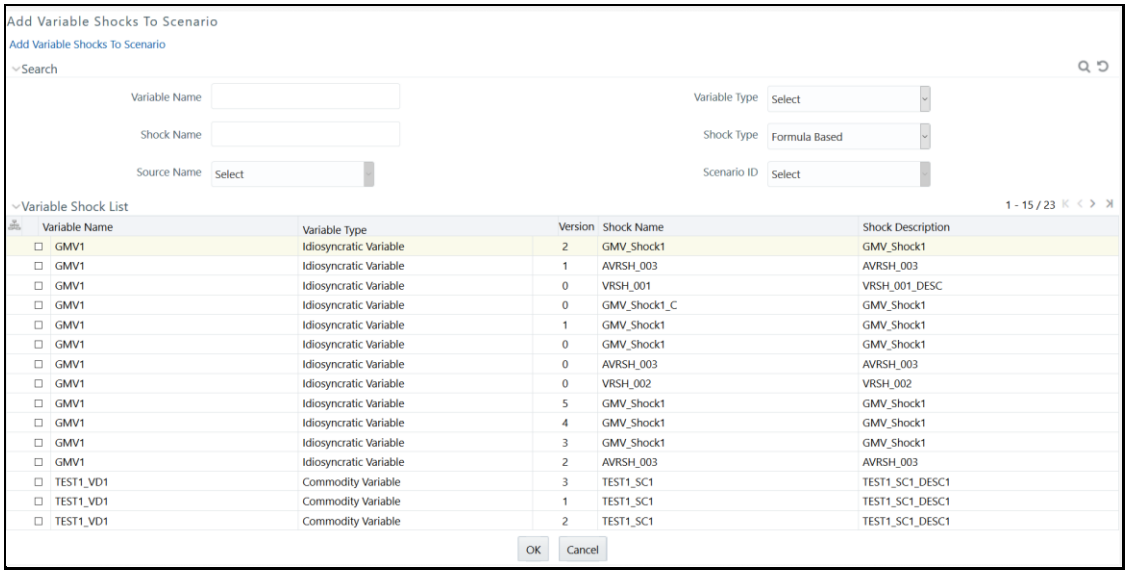
Field	Description
Fields marked in red asterisk (*) are mandatory.	
Scenario Name	Enter a name for the scenario. Ensure that there are no special characters like `, {,},", ', ~, <,>, /, \, and multiple spaces.
Scenario Description	Enter the required description for the scenario.

To add Variable Shock to the scenario, follow these steps:

1. Select ➕ from the **Variable Shocks** toolbar.

   The **Add** button is disabled if you have selected any checkbox in the grid. The **Add Variable Shocks to Scenario** window is displayed.

Figure 50. Add Variable Shocks to Scenario Window



2. Select the required variable(s) by clicking on the adjacent checkbox in the **Variable Shock List** grid.

   You can also make use of the Search option to search for a variable by specifying Variable Name, Shock Name, or even by selecting the Variable Type, Shock Type, Source, and Scenario from the drop-down list.

3. Click **OK**.

   The selected variables are listed in the **Variable Shock** grid in the **Scenario Definition** window.

   You can also remove a variable by selecting the adjacent checkbox and clicking .

4. Click **Save**.

   The scenario details are saved and displayed in the **Scenario Management** window.

9.5.3 Viewing Stress Testing Scenario

You can view individual Scenario Definition details at any given point. To view the existing Scenario Definition details, follow these steps:

1. Select the checkbox adjacent to the Scenario ID.
2. Click in the **Scenario List** toolbar.

   The **Scenario Definition View** window is displayed with the scenario details and the mapped variable shock.

9.5.4 Modifying Stress Testing Scenario

You can modify only the Scenario Description if the selected scenario is mapped to a Stress definition. If not, then all the filtering parameters can be modified except the Scenario Name. When you modify any of the Scenario parameters other than the Scenario Description, the details are uploaded as an incremented version without overwriting the existing scenario details.

To modify an existing Scenario Definition, follow these steps:

1. Select the checkbox adjacent to the **Scenario ID** for which the details are to be updated.
2. Click  in the **Scenario List** toolbar. The **Edit** button is disabled if you have selected multiple Scenario IDs. The **Scenario Definition Edit** window is displayed.
3. Edit the Scenario Definition details as required. For more information, refer **Add Stress Testing Scenario.**
4. Click **Save** to save the changes.

9.5.5 Copying Stress Testing Scenario

The Copy Stress Testing Scenario facilitates you to create a Scenario definition based on the existing details or by updating the values and remapping the required variables.

To copy an existing Stress Testing Scenario Definition, follow these steps:

1. Select the checkbox adjacent to the **Scenario ID** for which the details are to be duplicated.
2. Click  in the **Scenario List** toolbar.

   The **Copy** button is disabled if you have selected multiple Scenario IDs.
3. In the Scenario Definition Copy window, you can:
   - Create a new scenario definition with existing variables. Specify a new Scenario Name and click **Save**.
   - Create a new scenario definition by updating the required variables. Specify a new Variable Name and remap the required variables. For more information, refer **Add Stress Testing Scenario**. Click **Save**.

The scenario definition details are displayed in the Scenario Management window.

9.5.6 Deleting Stress Testing Scenario

You can remove only those scenarios which are not mapped to any Stress Definitions and which are no longer required in the system, by deleting them from the Scenario Management window.

To delete an existing Stress Testing Scenario Definition, follow these steps:

1. Select the checkbox adjacent to the Scenario ID whose details are to be removed.
2. Click  in the **Scenario List** toolbar.
3. Click **OK** in the information dialog to confirm the deletion.

9.5.7 Searching Scenarios

The Scenario Management page allows you to search for scenarios. To search for Scenarios, follow these steps:

1. Navigate to the **Scenario Management** window.
2. Enter the Scenario Name.

3. Click **Search** . The filtered list is displayed.

9.6 Stress Definition

Stress refers to modeling a series of scenarios to analyze the impact of extreme market conditions and to measure the risk. This module enables you to create a stress definition. You can either specify a stand-alone execution of a Scenario or map a Scenario(s) to a Baseline Run. The integrated process helps you to assess the impact of a Scenario across multiple areas. You can also view, modify, and delete stress definitions.

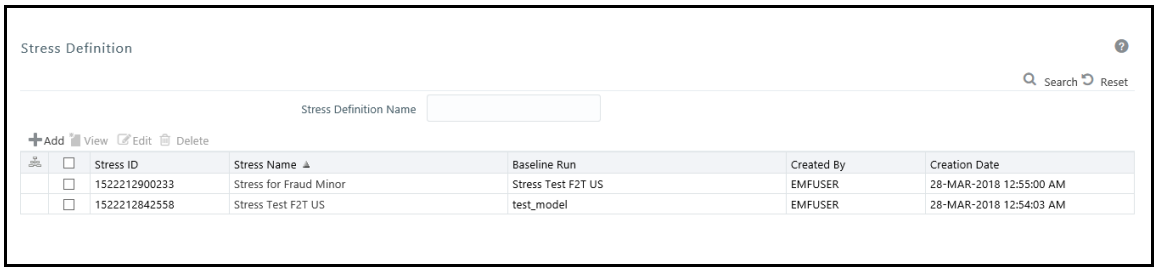
Topics:

9.6.1 Accessing Stress Definition

To access the *Stress Definition* page, follow these steps:

1. Log in to Oracle Financial Services Enterprise Modeling.
2. Click from the header to display the applications in a **Tiles** menu.
3. Select **Financial Services Enterprise Modeling** from the **Tiles** menu. The *Enterprise Modeling Application Home Page* is displayed with the **Navigation** list to the left.
4. Click **Financial Services Enterprise Modeling** from the **Navigation** list to expand view the menu.
5. Click **Stress Testing** and then click **Stress Definition**. The *Stress Definition* window is displayed.

Figure 33: Stress Definition Page



9.6.2 Adding Stress Definition

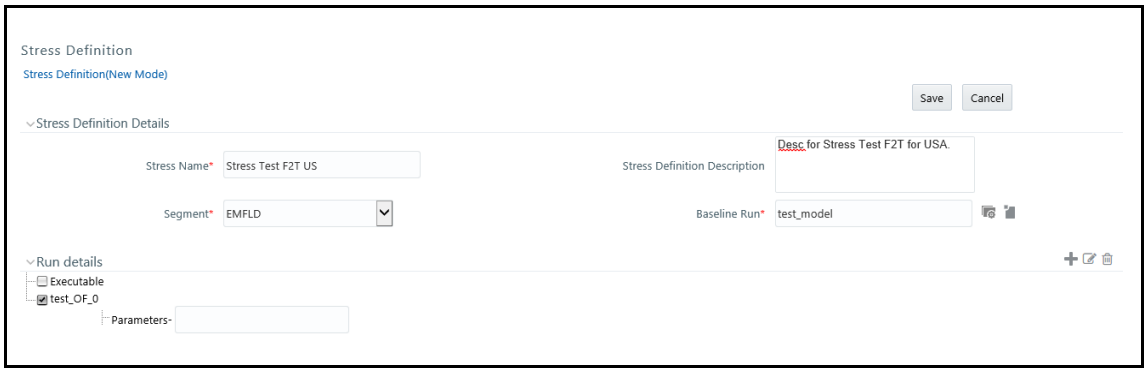
Stress definition can be based on stress scenarios or business assumptions. A business assumption is essentially a process comprising of multiple rules, which facilitate the computation of the impact of the assumption on base cash flows. Business assumptions are non-variable based.

Scenario-based stress testing involves applying simultaneous shocks on multiple variables to assess the impact of the scenario on a measure or a set of measures.

To add stress definition, follow these steps:

1. Select + from the **Stress Definition List** toolbar. The *Stress Definition* Add window is displayed. The **Add** button is disabled if you have selected any checkbox in the grid.

Figure 34: Stress Definition Page



2. Enter the Stress Definition details as described in the following table:

Table 9: Stress Definition - Field Descriptions

Field	Description
Stress Name	Enter a name for the stress definition. Ensure that there are no special characters like `, {,},", ', ~, <,>, /, \, and multiple spaces.
Stress Definition Description	Enter the required description for the stress definition.
Segment	Select the **Segment** from the drop-down list. The list displays all segments mapped to your user group.
Base Line Run	1. Click and open the **Baseline Run** browser. The available Baseline Runsin the selected Segment are listed in the **Hierarchical** pane. 2. **Note:** Select the required Baseline Run based on which stress definition is to be created and click . 3. Click **OK**. 4. Click and view the selected baseline Run details.

Fields marked in red asterisk (*) are mandatory.

3. In the Run Details grid, all the processes and tasks associated with the selected baseline run are displayed.
   - You can insert a new process to the selected Baseline run.
     - Select + from the **Stress Definition List** toolbar. The *Stress Definition Add* window is displayed where you can enter details for the new stress definition.
   - You can replace a process in the selected baseline run with another process. The process replacement can happen only for the processes, which are directly placed under the run.
     - Select the checkbox adjacent to the process and click to replace it with another process. The *Tasks Browser* window displays all the processes, which are defined in the selected segment and infodom.
     - Select the required process from the list and click >. You cannot select a process that is already present in the baseline run.
   - You can modify or replace a task within a process with another task.
     - Select the checkbox adjacent to the task and click . The *Tasks Browser* window displays all the tasks, which are defined in the selected segment and infodom.
     - Select the required process from the and click >.
   - Select a task and click to delete it.
   - Select a process and click to delete it.
   - Set the precedence in which the tasks need to be executed.
     - Click adjacent to the **Precedence** field of a task. The available scenarios/ tasks are listed in the *Precedence Browser* window.
     - Select the tasks in the order in which they need to be executed and click >. You can change the order by clicking ^ and v.
   - Provide the Parameters for the task in the **Parameters** field.

> **NOTE** If the configuration is set to RRF, then the **Parameters** field value must be specified within double quotes.

4. Click **Save**. The stress definition details are saved and displayed in the *Stress Definition* window.

9.6.3 Executing Stress Definition

After creating stress definition, you need to create Manage Run Definition. Based on the Run Type (Single Request or Multiple Request), you need to execute the stress definition from the *Batch Execution* window or *Batch Group Execution* window respectively. You can also monitor the status of stress definition execution.

To execute stress definition, follow these steps:

1. Log in to Oracle Financial Services Enterprise Modeling.
2. Click  from the header to display the applications in a **Tiles** menu.
3. Select **Financial Services Enterprise Modeling** from the **Tiles** menu. The *Enterprise Modeling Application Home Page* is displayed with the **Navigation** list to the left.
4. Click **Financial Services Enterprise Modeling** from the **Navigation** list to expand view the menu.
5. Click **Model Execution** and then click **Process Management** to view the menu.
6. Click **Execution** and then click **Manage Run Execution**. The *Manage Run Execution* window is displayed.
7. Click  from the **List** toolbar. The *Manage Run Definition* window is displayed.
8. Click  in the **Run** field and select the **Stress Definition** that you want to execute from the *Run Selector* window.

   For more information, see the Manage Run Definition section in the Oracle Financial Services Analytical Application Infrastructure User Guide.
9. Click **Save**.
10. Execute the stress definition:
    a. If you have selected Type as Single Request in the *Manage Run Execution* window:
       i. Go to Execution > Batch Execution. The *Batch Execution* window is displayed. For more information on how to execute a Batch, see the Execute Batch section in the Oracle Financial Services Analytical Applications Infrastructure User Guide.
       ii. Click **Execute Batch**.
    b. If you have selected Type as Multiple Request in the *Manage Run Execution* window:
       i. Go to Execution > Batch Group Execution. The *Batch Execution* window is displayed.

          For more information on how to execute a Batch Group, see the *Batch Group Execution* section in the Oracle Financial Services Analytical Application Infrastructure User Guide.
       ii. Click **Start**.

To monitor the stress execution:

For Batch Execution:

1. Go to **Execution** and then **Batch Monitor**. The **Batch Monitor** window is displayed.
2. Select the Stress Definition whose execution you want to monitor and select the Batch Run details.

   For more information, refer to the Monitor Batch section in the Oracle Financial Services Analytical Application Infrastructure User Guide.
3. Click  to start monitoring.

To view log files:

1. Log in to Oracle Financial Services Enterprise Modeling.
2. Click from the header to display the applications in a **Tiles** menu.
3. Select **Financial Services Enterprise Modeling** from the **Tiles** menu. The *Enterprise Modeling Application Home Page* is displayed with the **Navigation** list to the left.
4. Click **Common Tasks** from the **Navigation** list to expand view the menu.
5. Click **Operations** to view the menu.
6. Click **Processing Report.** The *Batch Processing Report* window is displayed.
7. Select the **Information Date** and **Batch Status** from the drop-down lists.

   For more information, see the Batch Processing Reports section in the Oracle Financial Services Analytical Application Infrastructure User Guide.

9.6.4 Viewing Stress Definition

You can view individual Stress Definition details at any given point.

To view the existing Stress Definition details, follow these steps:

1. Select the checkbox adjacent to the Stress ID.
2. Click in the **Stress Definition** toolbar. The *Stress Definition View* window is displayed with the stress definition details along with the mapped scenarios.

9.6.5 Modifying Stress Definition

You can modify only the Stress Description and Scenario for any selected Stress Definition.

To modify an existing Stress Definition, follow these steps:

1. Select the checkbox adjacent to the Stress ID whose details are to be updated.
2. Click in the **Stress Definition List** toolbar.

   The **Edit** button is disabled if you have selected multiple Stress IDs. The *Stress Definition Edit* window is displayed.
3. Edit the Stress Definition details as required. For more information, refer to Add Stress Definition.

   While editing Stress Definition, you cannot unmap a scenario that is mapped to the stress definition. You can only change the version of the scenario.
4. Click **Save** to save changes.

9.6.6 Deleting Stress Definition

You can remove the stress definitions, which are no longer required in the system, by deleting them from the *Stress Definition Summary* window.

> **NOTE** Stress definitions, which use PR2 Base Line Run and have batch registered for processing, cannot be deleted. However, Stress definitions, which use RRF Base Line Run, can be deleted irrespective of whether it has batch registered for processing.

To delete a Stress Definition, follow these steps:

1. Select the checkbox adjacent to the Stress ID whose details are to be removed.
2. Click  in the **Stress Definition List** toolbar.
3. Click **OK** in the information dialog to confirm the deletion.

9.6.7 Searching Stress Definition

The *Stress Definition* page allows you to search for a specific model execution request.

To search for Stress Definition, follow these steps:

1. Navigate to the *Stress Definition* page.
2. Enter the **Stress Definition Name**.
3. Click  .

   The filtered list is displayed.

10 R Scripts and Oracle R Enterprise (ORE) Statistical Functions

Topics:

10.1 Data usage when R script is used entirely

While defining a model scripted in R, the user can select Dataset and Variables to assign data (table columns) to the R/ ORE objects used within the script. Oracle Financial Services Enterprise Modeling application prepares data from the dataset, variables, and other attributes like filters chosen for the model and will make the same available as user-specified R objects/ frames.

No specific treatment is required in the script for using the data. Users can just have an R data.frame object say 'GDP' and a variable (table.column) assigned to it and use 'GDP' as is in the script.

10.2 Data usage when ORE native implementation is employed - Oracle Financial Services Enterprise Modeling application - Specifics to be considered

The data which is prepared from the dataset and variables as explained in the previous section, will be available in this case as a named ORE ore.frame object ('OFSDATASET') when ORE native implementations are used (that is, when the Is ORE implementation used? checkbox is selected). Hence, the R objects(data) must always be accessed through the ore.frame object 'OFSDATASET'.

For instance, if two objects say 'x' and 'y' are used and dataset/ variables are chosen for 'x' and 'y' in the model definition, then the objects 'x' and 'y' should be accessed in the script as 'OFSDATASET$x' and 'OFSDATASET$y' respectively.

An illustration to explain the R and ORE cases is given in the following section:-

For a simple regression model which is entirely scripted in R, that uses a dataset and three variables (DependentVariable, IndependentVariable1 and IndependentVariable2), the user should not select the Is ORE implementation used? checkbox. In this case the R script is as follows:

```
art.mod<-lm(DependentVariable ~ IndependentVariable1 + IndependentVariable2)

art.summ<-summary(art.mod)

coef( art.summ )

art.summ[[ "r.squared" ]]


#do some line plots
```

```
new.x.datafrme = data.frame(x=seq(from=range(IndependentVariable1)[ 1
],to=range( IndependentVariable1)[2],length=length(DependentVariable)))
```

Here the variables chosen for the model are accessed directly in the script as IndependentVariable1, IndependentVariable2, and DependentVariable.

Whereas for a parallel ORE implementation of the same (a dataset and three variables DependentVariable, IndependentVariable1 and IndependentVariable2) using ORE statistical functionalities, user must check the Is ORE implementation used? checkbox and the script is as follows:

```
art.mod<-ore.lm(DependentVariable ~ IndependentVariable1 +
IndependentVariable2, data=OFSDATASET)

art.summ<-summary(art.mod)

coef( art.summ )

art.summ[[ "r.squared" ]]


#do some line plots

new.x.orefrme = data.frame(x=seq(from=range(OFSDATASET$IndependentVariable1
)[ 1 ],to=range(OFSDATASET$IndependentVariable1)[2],length=
length(OFSDATASET$DependentVariable)))

#perform some operations on the new data
```

Here the variables chosen for the model are accessed from OFSDATASET as OFSDATASET$IndependentVariable1, OFSDATASET$IndependentVariable2, OFSDATASET$DependentVariable.

10.3 Data Handling

It is highly recommended that data required from the database should be pulled through the framework provided a mechanism, that is, using dataset and variables and not with any explicit DB connections. This ensures proper security, authenticity, and auditing.

Auditing is enabled in the definition windows by introducing audit trails that capture and display the user details and the date of creation/ modification, along with comments.

For instance, here is a sample script where data is fetched from the DB directly (not through framework). This way of accessing the database resident data in a model is not recommended.

```
con<-dbConnect(Oracle(),"userName","password")

qry<-"select EventLoss as Y, CardType as X1, AccBalance as X2, CustSalary as
X3 from CustTable where  Default= 'Y' "

res<- dbSendQuery(con, qry)

OperationalData<-fetch(res)

dbDisconnect(con)


#Model Logic

NewRegModel<-lm(Y~X1+X2+X3, data= OperationalData)
```

```
Plot(NewRegModel)
NewRegModel
```

Here is how a script for the same purpose can be created for accessing data via framework dataset and variables. Define 'EventLoss', 'CardType', 'AccBalance', and 'CustSalary' from the table 'CustTable' as variables in the Oracle Financial Services Enterprise Modeling application. while defining the model, select these variables and assign them to R objects (the R names used within the script) say, 'IndepVariable1', 'IndepVariable2', 'IndepVariable3' and 'DepVar' from the *Configure Inputs* window.

```
#Assuming EventLoss, CardType, AccBalance, CustSalary from #CustTable are
defined as variables in a data set, and that #dataset is selected for
variable assignments to the respective R #variable names: Y, X1, X2, and X3.

NewRegModel<-lm(DepVar ~ IndepVariable1+ IndepVariable2+ IndepVariable3)

#The variables are made directly available to the R
#environment by the framework

Plot(NewRegModel)
NewRegModel
```

10.4 Logging

R processing log that captures script processing information, any warnings, errors, or exceptions from the script, gets generated in the database server at '$ORACLE_HOME/dbs' since the R executable runs completely on the database server. Purging of the files is recommended regularly.

10.5 Fitting and Prediction Using R Script

To support fitting and prediction using R script, the output objects can be stored in the datastore using ore.save() during the fitting and retrieve it using ore.load() during prediction.

ore.save() saves an R object or a list of R objects to the specified datastore in the current user's schema of the connected database.

ore.load() loads all of the R objects stored in a specified datastore from the current user's schema of the connected database.

For more information, see the Oracle® R Enterprise User's Guide (E36761-08).

The approach to use ore.save() and ore.load() is explained with the following example:

10.5.1 R scripting

10.5.1.1 Fitting

```
fit<-lm(y~x)
ore.save(fit, name='regression_fit', overwrite=TRUE)
```

`ore.save()` will store the R object 'fit' in the datastore with the name 'regression_fit'. overwrite is a logical value specifying whether to overwrite the datastore if it already exists; the default is FALSE.

The overwrite flag is set to true to make sure that ore.save() does not fail. This is one way of doing it; otherwise, the user's script should check for the existence of the datastore object.

10.5.1.2 Prediction

```
ore.load('regression_fit')
predict<-predict(fit)
```

`ore.load()` is going to load all the R objects in the datastore 'regression_fit'.

From the datastore user should know the R object name to be used in the predict call.

10.5.2 ORE scripting

The approach is the same as explained above, but the Is ORE implementation used? checkbox to be checked.

10.5.2.1 Fitting

```
ore_fit<-ore.lm(y~x, data=OFSDATASET)
ore.save(ore_fit, name='ore_regression_fit', overwrite=TRUE)
```

10.5.2.2 Prediction

```
ore.load('ore_regression_fit')
predict<-ore.predict(ore_fit,  newdata=OFSDATASET)
```

11 User Groups

Topics:

11.1 User Groups

The user groups for the Enterprise Modeling are described for the following:

Table 10: User Groups

User Group Name	User Group Description
Modeling Administrator	A user mapped to this group will have access to all the menu items for Enterprise modeling and will have authorization rights for the sandbox population, model deployment, and modeling technique authorization.
Modeler Group	A user mapped to this group will have access to all the menu items for Enterprise modeling but will not have authorization rights for the sandbox population, model deployment, and modeling technique authorization.

11.2 User Group - Role Mapping

The user groups for the Enterprise Modeling are described for the following:

Table 11: User Group to Role Mapping

Group Name	Role Name
Modeler	Alias Access
Modeler	Alias Read Only
Modeler	Alias Write
Modeler	Atomic excel upload write
Modeler	BMM Hierarchy Access
Modeler	BMM Hierarchy Read Only
Modeler	BMM Hierarchy Write
Modeler	BMM Processor Access
Modeler	BMM Processor Read Only

Group Name	Role Name
Modeler	BMM Processor Write
Modeler	Batch Access
Modeler	Batch Read Only
Modeler	Batch Write
Modeler	Config excel advanced
Modeler	DEFQ Manager
Modeler	DEFQ write
Modeler	DI Write
Modeler	DMM Write
Modeler	DQ Access
Modeler	DQ Advanced
Modeler	DQ Read
Modeler	DQ Write
Modeler	DT Write
Modeler	Dataset Access
Modeler	Dataset Read Only
Modeler	Dataset Write
Modeler	Derived Entity Access
Modeler	Derived Entity Read Only
Modeler	Derived Entity Write
Modeler	Dimension Access
Modeler	Dimension Read Only
Modeler	Dimension Write
Modeler	ETL Analyst
Modeler	Essbase Cube Access
Modeler	Essbase Cube Read Only
Modeler	Essbase Cube Write
Modeler	MDB Write

Group Name	Role Name
Modeler	MF Access
Modeler	MF Advanced
Modeler	MF Read
Modeler	MF Write
Modeler	Manage Run Access
Modeler	Manage Run Read Only
Modeler	Manage Run Write
Modeler	Measure Access
Modeler	Measure Read Only
Modeler	Measure Write
Modeler	Obj Migration Access
Modeler	Obj Migration Read
Modeler	ObjectAdmin advanced
Modeler	Oracle Cube Access
Modeler	Oracle Cube Read Only
Modeler	Oracle Cube Write
Modeler	Process Access
Modeler	Process Read Only
Modeler	Process Write
Modeler	Rule Access
Modeler	Rule Read Only
Modeler	Rule Write
Modeler	Run Access
Modeler	Run Read Only
Modeler	Run Write
Modeler	STF Access
Modeler	STF Advanced
Modeler	STF Read

Group Name	Role Name
Modeler	STF Write
Modeling Administrator	Alias Access
Modeling Administrator	Alias Authorize
Modeling Administrator	Alias Read Only
Modeling Administrator	Alias Write
Modeling Administrator	Atomic excel advanced
Modeling Administrator	Atomic excel upload write
Modeling Administrator	BMM Hierarchy Access
Modeling Administrator	BMM Hierarchy Authorize
Modeling Administrator	BMM Hierarchy Read Only
Modeling Administrator	BMM Hierarchy Write
Modeling Administrator	BMM Processor Access
Modeling Administrator	BMM Processor Authorize
Modeling Administrator	BMM Processor Read Only
Modeling Administrator	BMM Processor Write
Modeling Administrator	Batch Access
Modeling Administrator	Batch Advanced
Modeling Administrator	Batch Authorize
Modeling Administrator	Batch Phantom
Modeling Administrator	Batch Read Only
Modeling Administrator	Batch Write
Modeling Administrator	Config excel advanced
Modeling Administrator	DEFQ Manager
Modeling Administrator	DEFQ access
Modeling Administrator	DEFQ advanced
Modeling Administrator	DEFQ authorize
Modeling Administrator	DI Write
Modeling Administrator	DMM Write

Group Name	Role Name
Modeling Administrator	DQ Access
Modeling Administrator	DQ Advanced
Modeling Administrator	DQ Authorize
Modeling Administrator	DQ Read
Modeling Administrator	DQ Write
Modeling Administrator	DT Write
Modeling Administrator	Dataset Access
Modeling Administrator	Dataset Authorize
Modeling Administrator	Dataset Read Only
Modeling Administrator	Dataset Write
Modeling Administrator	Derived Entity Access
Modeling Administrator	Derived Entity Authorize
Modeling Administrator	Derived Entity Read Only
Modeling Administrator	Derived Entity Write
Modeling Administrator	Dimension Access
Modeling Administrator	Dimension Authorize
Modeling Administrator	Dimension Read Only
Modeling Administrator	Dimension Write
Modeling Administrator	ETL Analyst
Modeling Administrator	Essbase Cube Access
Modeling Administrator	Essbase Cube Authorize
Modeling Administrator	Essbase Cube Read Only
Modeling Administrator	Essbase Cube Write
Modeling Administrator	MDB Write
Modeling Administrator	MF Access
Modeling Administrator	MF Advanced
Modeling Administrator	MF Authorize
Modeling Administrator	MF Read

Group Name	Role Name
Modeling Administrator	MF Write
Modeling Administrator	Manage Run Access
Modeling Administrator	Manage Run Read Only
Modeling Administrator	Manage Run Write
Modeling Administrator	Measure Access
Modeling Administrator	Measure Authorize
Modeling Administrator	Measure Read Only
Modeling Administrator	Measure Write
Modeling Administrator	Obj Migration Access
Modeling Administrator	Obj Migration Advanced
Modeling Administrator	Obj Migration Read
Modeling Administrator	Obj Migration Write
Modeling Administrator	ObjectAdmin advanced
Modeling Administrator	Oracle Cube Access
Modeling Administrator	Oracle Cube Authorize
Modeling Administrator	Oracle Cube Read Only
Modeling Administrator	Oracle Cube Write
Modeling Administrator	PR2 Administrator
Modeling Administrator	Process Access
Modeling Administrator	Process Advanced
Modeling Administrator	Process Authorize
Modeling Administrator	Process Read Only
Modeling Administrator	Process Write
Modeling Administrator	Publish Metadata
Modeling Administrator	Rule Access
Modeling Administrator	Rule Advanced
Modeling Administrator	Rule Authorize
Modeling Administrator	Rule Read Only

Group Name	Role Name
Modeling Administrator	Rule Write
Modeling Administrator	Run Access
Modeling Administrator	Run Advanced
Modeling Administrator	Run Authorize
Modeling Administrator	Run Read Only
Modeling Administrator	Run Write
Modeling Administrator	STF Access
Modeling Administrator	STF Advanced
Modeling Administrator	STF Read
Modeling Administrator	STF Write

12 EMF Object Migration

This section presents information related to EMF Object Migration prerequisites.

For detailed information on how to migrate objects, see the *Command Line Utility* section in the Oracle Financial Services Analytical Infrastructure Applications User Guide.

Topics:

12.1 Prerequisites

For Modeling Framework and Stress Testing objects:

- Migrate the Sandbox before you migrate your Models. This is important since you can migrate Models to the same Sandbox across environments.
- The availability of the application with the same APP_ID in the source and target environment is a prerequisite for Sandbox Migration.
- If the “Data model upload required” checkbox is selected for the sandbox definition, the infodom code provided in the SANDBOXINFODOM attribute should be a clean infodom where no model upload is done.
- Do not perform Technique migration between infodoms, it is not allowed. However, you can perform Technique migration between environments.
- Create Data Source for Sandbox Infodom to migrate R or ORE-based models.

NOTE The dependency migration of models is not supported. Since the dependent metadata for a model can be in the production Infodom, a user who is granted rights to the sandbox may not have rights to the production infodom to create this dependent metadata. This would create conflict and hence dependency migration of models cannot be done.

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