

# **SAS<sup>®</sup> Customer Analytics for Communications 5.3**

## **User's Guide**



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# About This Book

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## Audience

This document focuses on explaining the tasks that you can perform by using the SAS Customer Analytics for Communications interface. You might be assigned to a specific role, which determines the tasks that you can perform. SAS Customer Analytics for Communications is designed for the following roles:

- Administrators who are responsible for setting up and maintaining the application environment and scheduling the scoring run of a project.
- Business analysts (also called analytical modelers) who perform the end-to-end tasks that are involved in the analytical workflow from analyzing the business problem to building the appropriate analytical models and capturing information about them.
- Data analysts who can perform the tasks of defining the target population and building the analytical base table (ABT) and thereby assist business analysts with model-building tasks. In addition, data analysts also initiate the scoring-related tasks.

For details, see “Roles and Capabilities” on page 9.

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## Prerequisites

Users of SAS Customer Analytics for Communications should have high-level analytical capabilities, strong reporting skills, and high-level knowledge of data management. In addition, users should be familiar with the following tasks:

- Analyze the underlying business challenge and define the target population.
- Define variables and build analytical base tables.
- Build and register analytical models in SAS Enterprise Miner.
- Interpret the analytical results of different models and present relevant business insights to marketing managers and senior management.

Before you start working with SAS Customer Analytics for Communications, make sure that all the following prerequisite tasks are complete as mentioned in the sequence below:

1. Complete tasks that are detailed in *SAS Communications Analytics Architecture: Administrator's Guide*. For information about how to access SAS Communications Analytics Architecture documentation, see [http://support.sas.com/documentation/onlinedoc/securedoc/index\\_caa.html](http://support.sas.com/documentation/onlinedoc/securedoc/index_caa.html)

2. Complete tasks that are detailed in *SAS Customer Analytics for Communications: Administrator's Guide*. For information about how to access SAS Customer Analytics for Communications documentation, see [http://support.sas.com/documentation/onlinedoc/securedoc/index\\_cac.html](http://support.sas.com/documentation/onlinedoc/securedoc/index_cac.html)

In addition, here are the prerequisites for using SAS Customer Analytics for Communications:

- A user ID and password for logging on to SAS Customer Analytics for Communications.
- A supported browser installed on your desktop client.
- A user ID and password for logging on to SAS Enterprise Miner to create and register analytical models.



# What's New in SAS Customer Analytics for Communications 5.3

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## Overview

SAS Customer Analytics for Communications has the following new features and enhancements:

- new user interface to complete the analytical workflow
- support for new analytical components

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## New User Interface for the Analytical Workflow

SAS Customer Analytics for Communications now has a Web-based user interface. This interface enables users to complete the end-to-end functional features of the entire modeling process from data selection and data processing to scheduling the scoring run of an analytical project. Most importantly, users have the flexibility to define the analytical base tables at run time.

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## Support for New Analytical Components

SAS Customer Analytics for Communications supports the following three new analytical components:

### customer acquisition

The customer acquisition component that SAS Customer Analytics for Communications offers produces the acquisition scores as an analytical output. This score gives the probability that a prospective customer will be acquired.

### association rules analysis

SAS Customer Analytics for Communications supports building analytical models based on the association rules technique. The output of this analytical model is a set of association rules that are produced at levels such as offer or service. This analysis in turn helps communications service providers (CSPs) enhance cross-sell and up-sell to a great extent.

### customer lifetime analysis

SAS Customer Analytics for Communications gives insights about the lifetime value of a customer. This value enables CSPs to predict for how long their customers are

**x** *SAS Customer Analytics for Communications.*

going to be on their network. As a result, CSPs can target their most profitable customers and retain them by implementing appropriate business strategies.

With the addition of these modules, SAS Customer Analytics for Communications is a comprehensive solution that enables CSPs to resolve the significant business challenges that arise in almost all stages of a customer lifecycle.

# Accessibility Features of SAS Customer Analytics for Communications

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## Overview

SAS Customer Analytics for Communications has not been tested for compliance with U.S. Section 508 standards and W3C Web content accessibility guidelines. If you have specific questions about the accessibility of SAS products, send them to [accessibility@sas.com](mailto:accessibility@sas.com) or call SAS Technical Support.

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## User Interface Layout

SAS Customer Analytics for Communications provides a framework to complete the entire modeling process from data selection and data processing to scheduling the scoring run of an analytical project. The application window contains the application bar and the workspace. Each workspace enables you to perform a group of related tasks within the application. The layout of the workspace differs depending on the workspace in which you are working.

To customize the application window and its features, select **File** ⇒ **Preferences**. For more information about the user interface layout, see Chapter 3 “The SAS Customer Analytics for Communications Interface.”

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## Themes


An application’s theme is the collection of colors, graphics, and fonts that appear in the application. The following themes are provided with this application: Flex Halo, SAS Corporate, SAS High Contrast, SAS Light, SAS Dark, Titanium, and Carbon. To change the theme for the application, select **File** ⇒ **Preferences** and go to the **Global Preferences** page.

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## Standard Keyboard Navigation

SAS Customer Analytics for Communications 5.3 can be navigated by using the keyboard. The following table includes some guidelines:

*Standard Keyboard Navigation Controls*

Task	Keyboard Control
Move forward through controls	TAB
Move backward through controls	SHIFT+TAB
Display the contents of drop-down lists	CTRL+DOWN ARROW
Scroll through contents of drop-down lists	DOWN ARROW and UP ARROW
Activate buttons, icons, links, menu selections, and list items when they are not dimmed	ENTER
Select check boxes when they are not dimmed	SPACEBAR
Select a different radio button when a radio button is not dimmed	DOWN ARROW, UP ARROW, RIGHT ARROW, and LEFT ARROW
Open a Help pop-up window from the  button	CTRL+?
<i>Note:</i> To ensure that the correct Help is displayed, select the field or section that the button is associated with before you use the keyboard shortcut.	

# Recommended Reading

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Here is the list of documents that you can refer to while using this document:

- *SAS Communications Analytics Architecture: Administrator's Guide*
- *SAS Customer Analytics for Communications: Administrator's Guide*
- *SAS Communications Analytics Architecture: User's Guide*

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## **Part 1**

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## Chapter 1

# About SAS Customer Analytics for Communications

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## Overview of SAS Customer Analytics for Communications

In the converged market, communications service providers (CSPs) face numerous business challenges to maximize their profits. At the same time, they have to focus on customer satisfaction. According to the recent research in the communications industry, acquiring new customers assures incremental revenues, and retaining profitable customers proves to be an effective driver of profit. Also, customer loyalty helps CSPs predict future profitability. In order to balance between profits and customer satisfaction, CSPs need an end-to-end analytical solution. This solution should enable them to address the following predominant business challenges:

- Segment customers based on their behavioral attributes.
- Acquire potential customers.
- Retain profitable customers.
- Predict the customer lifetime value.
- Implement appropriate strategies to offer new products and services to their existing customers.

SAS Customer Analytics for Communications helps you analyze complex behavioral patterns of customers in large volumes of data spread across multiple systems. It is a comprehensive solution that provides you with next-generation capabilities for

predictive analysis, rules analysis, and survival analysis. It alerts you about customers who are likely to purchase a new product or upgrade service. In addition, it also helps you identify customers who are likely to leave and customers who should be targeted in a campaign.

SAS Customer Analytics for Communications offers a complete package of analytical components to analyze data pertaining to the following business challenges:

- customer segmentation
- customer acquisition
- customer churn
- cross-sell
- up-sell
- association rules analysis
- customer lifetime

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## Benefits of SAS Customer Analytics for Communications

### ***Optimized Data Management***

SAS Customer Analytics for Communications uses a fully documented, customer-centric Foundation data mart that contains information about each customer. This data enables the solution to perform predictive analysis and use the analytical results in business intelligence (BI) reports.

### ***Dynamic Building of Analytical Base Tables***

SAS Customer Analytics for Communications offers the flexibility to define and build analytical base tables (ABTs) at run time. As a result, analytical modelers can have the following benefits:

- Complete user control over definition of variables through a user-friendly Web application.
- Easy analysis and processing of variables that are relevant to the specific-business problem at hand, such as customer churn, cross-sell, up-sell, and so on.
- Ease of performing various derivations based on business requirements rather than a static list.
- Metadata integration with SAS Platform to ensure seamless user experience while exporting ABTs to SAS Enterprise Miner for analytical modeling.
- End-to-end functional features to complete the entire modeling process from data selection and data processing to scheduling the scoring run of an analytical project.

### ***Customer Segmentation***

SAS Customer Analytics for Communications offers the flexible customer segmentation component. This analytical component enables CSPs to analyze customer behavior

based on their usage and revenue patterns and demographic profiles. This analysis helps CSPs understand the customer base better and gain insights of customers' behavioral patterns. Based on this information, CSPs can implement appropriate campaigning strategies.

### **Customer Acquisition Analysis**

According to recent studies, customer acquisition assures incremental revenue. However, it also incurs high costs. Therefore, it is essential for CSPs to target customers who are likely to be acquired. The customer acquisition component that SAS Customer Analytics for Communications offers produces the acquisition scores as an analytical output. This score gives the probability that a prospective customer will be acquired.

### **Customer Churn Analysis**

With its customer churn component, SAS Customer Analytics for Communications enables CSPs to predict the likelihood that a customer might depart. The output of this analytical component is the churn score, which CSPs can use to gain insight into timing and reasons for departure.

### **Greater Precision for Cross-Sell and Up-Sell**

SAS Customer Analytics for Communications offers the cross-sell and up-sell model that enables the CSPs to have a clear understanding of each customer's propensity to depart or to purchase additional products and services. As a result, CSPs can maximize average revenue per user (ARPU), minimize churn, and reduce risk.

SAS Customer Analytics for Communications also supports building association rules analysis models based on the association rules technique. By using these models, you can perform market basket analysis (MBA), association rules analysis, and sequence analysis. The output of these models is a set of association rules that are produced at various levels, such as offer or service. This analysis in turn helps CSPs enhance cross-sell and up-sell to a great extent.

### **Customer Lifetime Value (CLTV) Analysis**

SAS Customer Analytics for Communications gives insights about the lifetime value of a customer. This value indicates for how long customers will be on the network. As a result, CSPs can target their most profitable customers and retain them by implementing appropriate business strategies.

### **Seamless Integration with Other Solutions**

With its flexible and scalable architecture, SAS Customer Analytics for Communications can easily be integrated with other solutions, such as SAS Communications Analytics Architecture and SAS Offer Optimization for Communications.

The analytical scores that are generated in SAS Customer Analytics for Communications can be used to generate business intelligence (BI) reports in SAS Communications Analytics Architecture. These reports can be used by decision makers to make quick business decisions and implement appropriate business strategies. For details, see *SAS Communications Analytics Architecture: User's Guide*.

Similarly, SAS Offer Optimization for Communications can interface with SAS Customer Analytics for Communications to build ABTs for the microsegmentation and

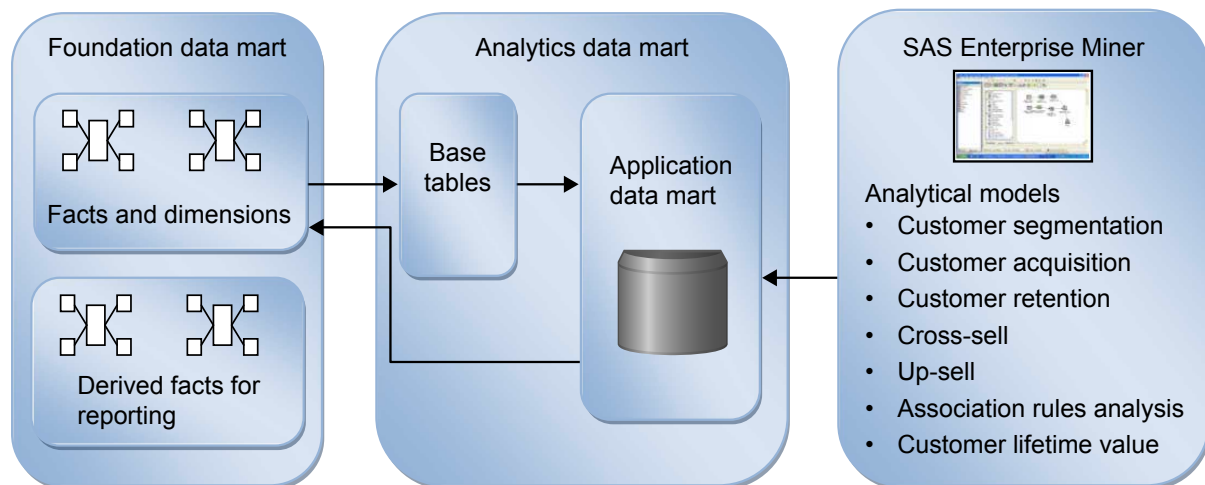
offer ranking workflow steps. For details, see *SAS Offer Optimization for Communications: Administrator's Guide*.

## How Does SAS Customer Analytics for Communications Work

### Overview of the Solution Workflow

SAS Customer Analytics for Communications turns data into insights about customer behavior. It extracts data from the Foundation data mart. This data is required for building ABTs and analytical models. The results of the analytical models are also written back to the Foundation data mart, and then these results are used in the BI reports. These reports help CSPs make strategic decisions and take proactive business actions.

**Figure 1.1** Solution Workflow



#### Foundation data mart

stores data extracted from external source systems. This data is used by the reporting data structures.

#### Analytics data mart

stores data that is required for completing the analytical tasks. You must configure the Analytics data mart with appropriate data before you start working with SAS Customer Analytics for Communications.

#### Base tables

a set of input tables that SAS Customer Analytics for Communications requires to complete the analytical tasks. These tables are populated with data from the Foundation data mart tables.

#### Application data mart

stores the configuration information that is required for generating ABTs for different analytical models. The analytical results that are generated as an output of the analytical models are also stored in this data mart. These results are finally written back to the Foundation data mart and then are used to generate BI reports for the analytical components.

### Analytical models

SAS Enterprise Miner enables analytical modelers to create and register analytical models. Sample SAS Enterprise Miner models are prepackaged for all the analytical components. In the model building phase, the model is built based on the ABT. During the scoring process, results are stored in the Analytics data mart and finally written back to the Foundation data mart.

## Solution Workflow

Here is the list of high-level steps that are involved in the SAS Customer Analytics for Communications workflow:

1. Populate the base tables with the required data. These tables are populated with data from the Foundation data mart. For details, see *SAS Customer Analytics for Communications: Administrator's Guide*.
2. Populate the Application data mart tables with preconfigured data. For details, see the post-installation instructions that are detailed in *SAS Customer Analytics for Communications: Administrator's Guide*.
3. Log on to SAS Customer Analytics for Communications as an administrator and configure the dimensional attribute values and any additional input tables or columns that are not configured through the post-installation instructions. For details, see Chapter 10 [“Configuring the Input Tables” on page 143](#).
4. Log on to SAS Customer Analytics for Communications as a business analyst or a data analyst and define the business problem for which the analytical model is to be built.
  - a. Define a project with a definite purpose to address the business problem. For details, see Chapter 5 [“Managing Projects” on page 23](#).
  - b. (Optional) Define the target population for the project. For details, see Chapter 6 [“Managing the Subset Criterion” on page 31](#).
5. Log on to SAS Customer Analytics for Communications as a business analyst or data analyst and perform the following tasks related to a modeling ABT. For details, see Chapter 7 [“Managing Analytical Base Tables” on page 52](#).
  - a. For a specific project, define the modeling ABT and its variables.
  - b. Build the modeling ABT.
  - c. Register the modeling ABT with the SAS Metadata Server.
6. Log on to SAS Enterprise Miner and complete the model-building tasks.
  - a. Build the appropriate analytical model depending on the purpose of your project.
    - customer segmentation
    - customer acquisition
    - customer churn
    - cross-sell
    - up-sell
    - association rules analysis
    - customer lifetime value
  - b. Register the model with SAS Metadata Server.

7. Log on to SAS Customer Analytics for Communications as a business analyst and complete the modeling tasks. For details, see Chapter 8 [“Managing Models” on page 115](#).
  - a. Capture the model’s information.
  - b. Publish the model if you want to create a scoring template for the model.

*Note:* Perform steps 7 and 8 for models that you want to score.

8. Log on to SAS Customer Analytics for Communications as a business analyst and complete tasks for the scoring mode. For details, see Chapter 9 [“Introduction to the Scoring Process” on page 133](#).
  - a. (Optional) Edit the subset criterion that is associated with the scoring model.
  - b. Define a scoring template for the published model.
9. As an administrator, complete the scoring tasks. For details, see *SAS Customer Analytics for Communications: Administrator’s Guide*.
  - a. Schedule and run the scoring process and generate the analytical scores.
  - b. Write back the scores to the Foundation data mart.
10. View business intelligence reports and analyze your data. For details, see *SAS Communications Analytics Architecture: User’s Guide*.

## Chapter 2

# Managing Access to SAS Customer Analytics for Communications

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## Roles and Capabilities

Different users might have access to different functionality depending on their assigned roles. Each role is mapped to a set of predefined capabilities. A capability, also known as an application action, defines the operations that a user can perform.

SAS Customer Analytics for Communications has three predefined roles—business analysts (also called analytical modelers), data analysts, and administrators. A predefined set of capabilities is available for each role. Capabilities are further categorized into three levels—project-related, scoring, and administrative.

### Project-related capabilities

Project-related capabilities are assigned to business analysts. These capabilities enable business analysts to view a project and its workflow, create new projects, create and build ABTs, capture and publish models, and so on. All project-related capabilities except for capabilities related to models are also assigned to data analysts. The following are examples of project-related capabilities:

- View, create, and delete projects.
- View, create, and delete subset criteria.
- View, create, build, register, and delete ABTs.
- View, capture, publish, and delete models.

*Note:* Administrators can view projects, subset criteria, ABTs, and models. In addition, they can also delete models.

### Scoring capabilities

Scoring capabilities are assigned to business analysts. Scoring capabilities enable business analysts to perform the following tasks:

- Edit the subset criterion that is associated with the published models.
- View, create, and delete scoring templates.

*Note:* Administrators can view scoring templates.

**Administrative capabilities**

Administrative capabilities are assigned to administrators. Administrative capabilities enable administrators to configure the Application data mart tables.

Using SAS Management Console, a system administrator can modify the roles and specify the capabilities according to the roles and responsibilities that are defined at your organization. The system administrator can also define new roles. If you have questions about your assigned role, contact your system administrator.

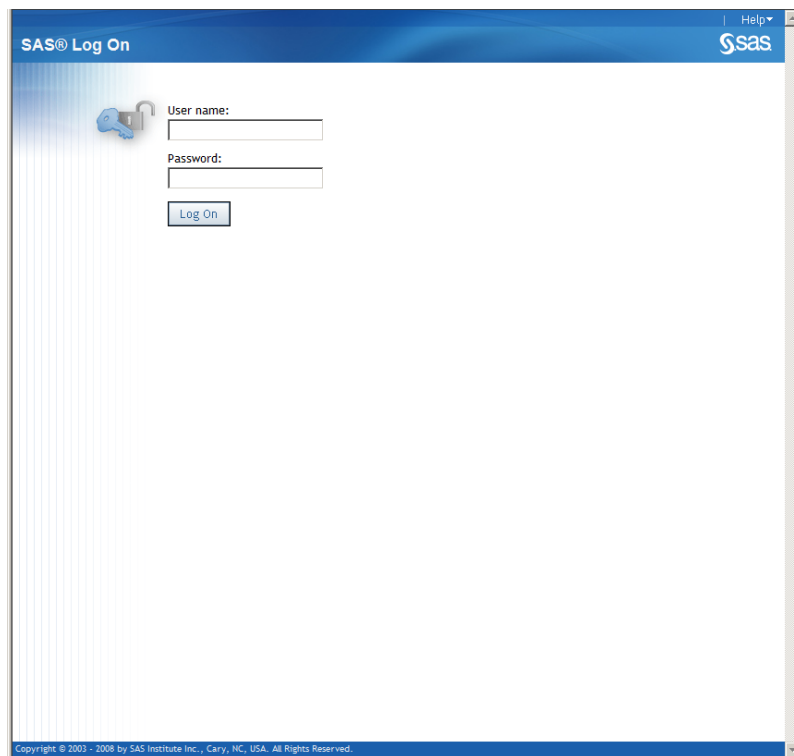
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## Log On to SAS Customer Analytics for Communications

To log on to SAS Customer Analytics for Communications, complete these steps:

1. To display the SAS Customer Analytics for Communications logon window, click the URL that is supplied by your system administrator or paste it in the address field of your Web browser. For example, you might enter **http://server01.abc.com:8080/SASCustAnalyticsforCommunication/**

**Display 2.1** Logon Window for SAS Customer Analytics for Communications



2. To log on, complete these steps:
  - a. In the **User name** field, type your user ID.
  - b. In the **Password** field, type the password for the user ID that you just entered.
  - c. Click **Log On**.

The main application window appears. For details, see [“Overview of the SAS Customer Analytics for Communications Interface”](#) on page 13.



*Note:* Your password is case sensitive. Your user name might be case sensitive, depending on the operating system that hosts the Web application server. For assistance, contact your system administrator.

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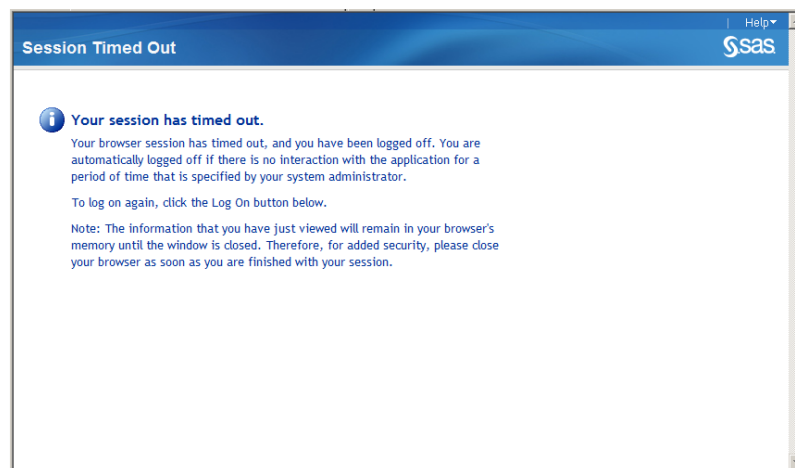
## Log Off from SAS Customer Analytics for Communications

To log off from SAS Customer Analytics for Communications, click **Log Off** on the application bar. Alternatively, on the **File** menu, select the **Log Off** option.

If you lose your connection to SAS Customer Analytics for Communications (for example, your session times out), you must begin again at the point where you last saved your work. By default, if there is no activity for 30 minutes, SAS Customer Analytics for Communications automatically logs you off and displays the logon window. Your system administrator can change the inactivity period and decide whether the **Log On** button will be available. As a best practice, you must save your work frequently.

The following is an example of the message that appears when your session has timed out:

**Display 2.2** Session Timed Out Message for SAS Customer Analytics for Communications





## Chapter 3

# The SAS Customer Analytics for Communications Interface

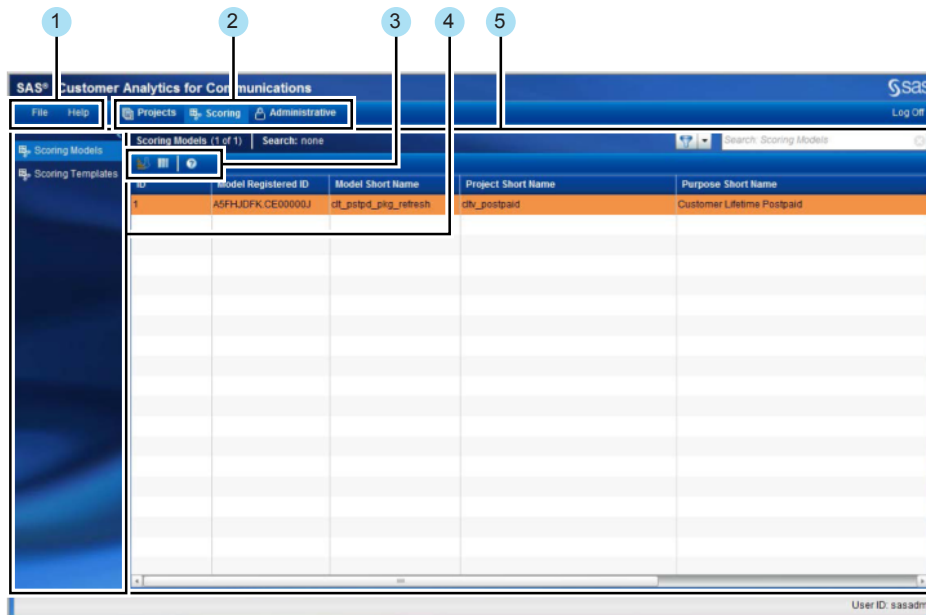
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## Overview of the SAS Customer Analytics for Communications Interface

When you log on to SAS Customer Analytics for Communications, the main application window appears. The application window contains the application bar and the workspace. Each workspace enables you to perform a group of related tasks within the application.

**Figure 3.1** The SAS Communications Analytics Architecture Interface

- 1 Menu bar
- 2 Workspace bar
- 3 Toolbar
- 4 Object Manager
- 5 Workspace

---

## Using the Application Bar

### Overview of the Application Bar

The application bar is located at the top of the application window and is part of the application banner. The application bar contains the menu bar, the workspace bar, and the **Log Off** option.

### The Menu Bar

#### Overview of the Menu Bar

The menu bar provides you the common menu options.

#### The File Menu

The following options are available on the **File** menu:

##### Recent Work

enables you to quickly access the recent most objects that you are working on.

**Preferences**

enables you to define your preferences for displaying information in the user interface.

**Log Off**

enables you to log off from the application.

**The Help Menu**

The following options are available on the **Help** menu:

**User's Guide (PDF)**

opens the *SAS Customer Analytics for Communications: User's Guide* in a separate browser window.

**SAS on the Web**

includes links to product support page, SAS customer support, and SAS home page. The product support page gives information about the documentation that is available for SAS Customer Analytics for Communications.




**About SAS Customer Analytics for Communications**

displays copyright and other information about SAS Customer Analytics for Communications.

**The Workspace Bar**

The workspace bar contains buttons that enable you to navigate across workspaces.

**Table 3.1** Workspace Buttons

Button	Purpose
	Opens the Projects workspace
	Opens the Scoring workspace
	Opens the Administrative workspace

**The Log Off Option**

Use the **Log Off** option to log off from the application.

---

## Working in the Workspaces

**Overview of Workspaces**

The SAS Customer Analytics for Communications interface contains workspaces for performing a group of related tasks within the application. You can navigate across the workspaces by using the workspace buttons that are available on the application bar. The

SAS Customer Analytics for Communications interface contains the following workspaces:





- Projects
- Scoring
- Administrative

## The Toolbar

The toolbar contains various options that enable you to quickly complete certain commonly performed tasks.

*Note:* The toolbar options might not be the same for each workspace.

**Table 3.2** *Toolbar Options*

Icon	Description	Related Task
	New	Creates a new object such as a project, subset criterion, ABT, variable, or scoring template
	Edit	Modifies an existing object
	Delete	Deletes an existing object
	Import	Imports an object such as a table, variable, and so on
Not available	<b>Menu</b> button	Enables you to open, create, delete, or import an object

## The Projects Workspace

### Overview of the Projects Workspace

The Projects workspace enables you to create and manage your projects. A project enables you to view, group, organize, and track all your tasks that you must perform it to address a specific business problem. For details, see *Chapter 5 Managing Projects*.

The Projects workspace is divided into three pages, which appear when you double-click a project in the Projects workspace. These pages enable you to define the project's workflow. Each page is represented by a tab.

## Pages in the Projects Workspace

### **Subset Criterion**

On this page, you create and manage your subset criterion. A subset criterion is a set of filters that you apply to obtain your target population—the population on which you want to build the ABT and the analytical model. For details, see *Chapter 6 Managing the Subset Criterion*.

### **Analytical Base Table**

On this page, you perform tasks related to the modeling ABT. These tasks include defining an ABT, creating variables for the ABT, registering ABT, sharing the ABT variables, and building the ABT. For details, see *Chapter 7 Managing the Modeling ABT*.

### **Models**

On this page, you capture the model-related information, manage the captured information, link a model to an ABT, and publish a model for scoring. This page is available only after you have created a modeling ABT. For details, see *Chapter 8 Managing Models*.

---

## The Scoring Workspace

This workspace enables you to perform tasks related to the published models. These tasks involve editing the subset criterion that is associated with the published model and managing the scoring templates. For details, see *Chapter 9 Introduction to the Scoring Process*.

---

## The Administrative Workspace

This workspace displays a list of tables that are configured in the Analytics data mart. You can use the Administrative workspace to configure the usage of these tables. You can also use this workspace to import metadata from the Foundation data mart tables into the Analytics data mart. For more information, see *Chapter 10 Working in the Administrative Workspace*.

---


## Where to Find Help

The help components embedded in the SAS Customer Analytics for Communications interface give you just-in-time and just enough information to complete a task. In addition, you can access the user's guide from the **Help** menu.

The SAS Customer Analytics for Communications interface has the following embedded help components:

Help pop-up

displays detailed information about the corresponding field or interface element.

Help pop-up is represented using the help icon . Click the help icon to view the information, which is displayed in a pop-up dialog box.

Tooltip

displays short, descriptive information about icons in a pane. A tooltip appears when you move your pointer over an icon in the interface.

Instructional text

displays information persistently in the interface near a field, group of fields, or a table. For example, data entry instructions and introductory text for fields and tables are a few examples of instructional text.



## Chapter 4

# Performing Common Tasks

---

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Change the Sort Order of a Column .....	20

---

## Overview of Common Components

Here are the common components of the SAS Customer Analytics for Communications interface:

- panes
- sections
- tables
- lists





This chapter explains the common tasks that you can perform when you work on these components.

---

## Resize a Window

You can resize a window if the default size of the window does not display complete information.

To resize a window, complete these steps:


1. Move your pointer to any of the borders of the window.
2. When your pointer changes to a , , , or , drag to resize the window.

---

## Resize a Pane

You can resize a pane if the default size of the pane does not display complete information. Also, you can resize a certain pane in order to provide more area for other panes.

To resize a pane, complete these steps:

1. Move your pointer to the horizontal or vertical divider.
2. When your pointer changes to a , drag to resize the pane.

---

## Working with Tables

### ***Change the Width of a Column***

If the default width of a column does not display complete information, you can change the column width. To change the width of a column, drag the boundary on the right side of the column heading until the column is the width that you want.

### ***Move a Column***

If the order in which the columns are displayed does not meet your needs, you can change the sequence of the columns. To move a column, click the column heading and drag the column to the desired location.

### ***Change the Sort Order of a Column***

You can sort data by only a single column at a time. To change the order in which a column is sorted, click the up or down arrow that is displayed in the column heading.

## Part 2

---

# Working in the Projects Workspace

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## Chapter 5

# Managing Projects

---

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---

## About Projects

### Overview of Projects

SAS Customer Analytics for Communications is built around the concept of projects. A project is a group that you create in order to address a specific business challenge such as customer acquisition, customer segmentation, cross-sell, up-sell, customer churn, and so on. Therefore, each project has a definite purpose depending on the business challenge that it addresses. Moreover, a project enables you to focus your analysis at a particular level (subject of analysis) and a subject group. The subject of analysis and the subset group for which you can analyze your data are predefined depending on the purpose of your project.

Each project is a collection of predefined tasks that you must perform to analyze the business challenge. A project enables you to group, organize, and track all these tasks. These tasks include the following:

1. Define the target population.
2. Define an ABT and its variables.
3. Build and register the ABT.
4. Capture information about the analytical models that you built in SAS Enterprise Miner.
5. Publish the model if you want to use it for scoring.

## Examples of Projects

### **Business Challenge: Churn in Postpaid Customers**

In the postpaid scenario, customer churn is one of the most important business challenges. Recent studies in the communications industry indicate that reducing the customer churn rate is one of the major drivers to increase profits. Therefore, it is essential for communications service providers (CSPs) to retain their most profitable customers.

In SAS Customer Analytics for Communications, you can define a project to address customer churn for the postpaid payment mode. A customer can have one or more subscriptions. Therefore, for this project, the subject of analysis can be subscription and you can aggregate your data at the customer level. You can also restrict your target population to contain data pertaining to postpaid offers. Therefore, you can select the postpaid offers as the subject group.

Subsequently, you can define your target population, and by using appropriate predictive analysis technique, SAS Customer Analytics for Communications produces the churn score as the probability that these customers will churn in the outcome period. Based on these scores, you can implement proactive business strategies to reduce customer churn.

### **Business Challenge: Customer Lifetime Value**

Along with predicting the churn probability of a customer, it is also essential to know when the customer is likely to churn. In other words, the churn probabilities at varied time intervals need to be computed during the entire tenure of the customer. As a result, the customer lifetime value can be computed, which can give information about how long the customer will continue to be on the network.

In SAS Customer Analytics for Communications, you can define a project to compute the expected tenure of a customer. For this project, you can define customer as the subject of analysis.

Subsequently, you can define your target population and by using appropriate survival analysis technique, SAS Customer Analytics for Communications computes the expected tenure of a customer. Based on this output, the customer lifetime value can be computed, and you can implement proactive business strategies to increase customer loyalty.

## **More about Subject of Analysis and Subject Group**

In addition to the purpose, each project is associated with a subject of analysis, which determines the level at which you want to analyze your data. For example, when you define a project for customer acquisition, you would want your target population to contain only prospective customers. Therefore, your subject of analysis for this project can be prospective customers. The subject of analysis for a project depends on the purpose of the project. For example, for a project that you have created for customer churn, **Subscription** can be the only subject of analysis. However, for a project that you have created for association rules analysis, you can choose the subject of analysis from a predefined list of values. If you want to work with rules by using the market basket analysis node of SAS Enterprise Miner, then the subject of analysis can be **Customer Offer** or **Customer Service**. Similarly, if you want to work with rules by using the association node of SAS Enterprise Miner and use this node for sequence analysis, then subject of analysis can be **Customer Offer Agreement Date** or **Customer Service First Activation Date**.

You can define a subject group for a project. The subject group enables you to define your target population based on certain predefined groups. A subject group is a predefined group of members that share a common set of attributes. Thus, a subject group enables you to filter your target population. If you do not select a subject group, the target population will contain all records pertaining to the selected subject of analysis. For example, for a customer churn project, you can choose the subject group from a list of predefined values. These predefined values can be **Postpaid Customers and Subscriptions** or **Prepaid Customers and Subscriptions** depending on whether the purpose of your project is **Churn Postpaid** or **Churn Prepaid**.

For details about how to configure values for subject of analysis and subject group, see *SAS Customer Analytics for Communications: Administrator's Guide*.

---

## Defining Projects


### Overview of Project Creation

In SAS Customer Analytics for Communications, you create and manage projects in the Projects workspace. Depending on your assigned role, you can create projects and work on them. When you define a project, you are the owner of that project. Therefore, you can view and work on only those projects that you create. You can also modify or delete your projects. However, you cannot view or access projects that other users create.

*Note:* When you create a project, you are the default owner of the project. Other users cannot view your projects. However, if required, your administrator can assign the ownership of the project to another user. For more information, see *SAS Customer Analytics for Communications: Administrator's Guide*.

### Create a Project

To create a project, complete these steps:

1. Select the Projects workspace.
2. On the workspace toolbar, click . Alternatively, on the workspace toolbar, select **Menu** ⇒ **New Project**. The New Project window appears.

**Display 5.1** New Project Window

**New Project** [X]

Name: \*  Maximum 40 characters

Description:  Maximum 200 characters

Purpose: \* --Select-- ?

Subject of analysis: \* --Select-- ?

Subject group: None ?

Save Cancel

3. In the **Name** field, type a name of the project.
4. In the **Description** field, type a description of the project.
5. From the **Purpose** list, select the business need that the project addresses. Select the appropriate option depending on whether you are defining the target population for postpaid or prepaid payment modes. For example, if the project analyzes the churn problem in postpaid customers, select **Churn Postpaid** as the purpose of your project.
6. From the **Subject of analysis** list, select the level at which you want to analyze your data. Consequently, the subject of analysis determines the level of the ABT that is created later for the project.

*Note:* The subject of analysis that you can select for a project depends on the purpose that you select for the project. The following table lists the sample combinations of values that can be defined for **Purpose** and **Subject of analysis**.

**Table 5.1** Examples of Subject of Analysis Options

Purpose	Available Options for Subject of Analysis
<ul style="list-style-type: none"> <li>Churn Postpaid</li> <li>Churn Prepaid</li> </ul>	Subscription
<ul style="list-style-type: none"> <li>Segmentation Postpaid</li> <li>Segmentation Prepaid</li> <li>Customer Lifetime Postpaid</li> <li>Customer Lifetime Prepaid</li> </ul>	Customer



Purpose	Available Options for Subject of Analysis
<ul style="list-style-type: none"> <li>• Cross-sell Postpaid</li> <li>• Cross-sell Prepaid</li> <li>• Up-sell Postpaid</li> <li>• Up-sell Postpaid</li> </ul>	<ul style="list-style-type: none"> <li>• Customer</li> <li>• Subscription</li> </ul>
<ul style="list-style-type: none"> <li>• Association rules Postpaid</li> <li>• Association rules Prepaid</li> </ul>	<ul style="list-style-type: none"> <li>• Customer Offer</li> <li>• Customer Service Date</li> <li>• Subscription Service First Activation Date</li> <li>• Customer Offer Agreement Start Date</li> <li>• Customer Service</li> <li>• Subscription Service</li> </ul>
Customer Acquisition	Prospect Customer

7. From the **Subject group** list, select the appropriate subject group for the project.
8. Click **Save**. The project is added to the list of projects in the Projects workspace.

**TIP** When you create a project, a unique ID is automatically assigned to the project. You can use this ID to track your project in the application metadata. You can also use this ID to search for the project in the Projects workspace.

## Define a Project's Components

After you create a project, you can define its components on the following three pages:

### Subset Criterion

enables you to define the target population for your project.

### ABT

enables you to perform tasks related to a modeling ABT. These tasks include creating the modeling ABT and its variables, sharing the ABT if required, building the ABT, and registering it.

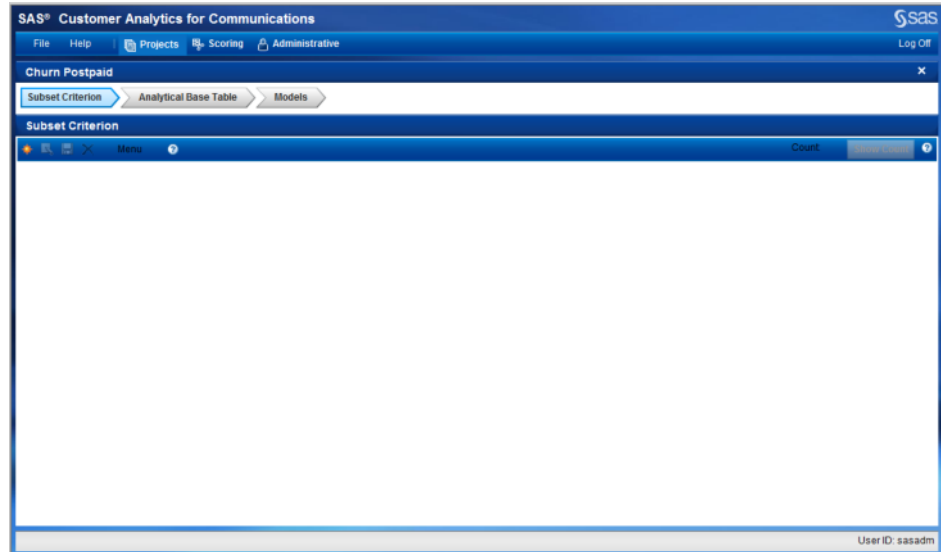
### Models

enables you to capture information about the analytical models that you have built for the project and publish these models if you want to use them for scoring.

These pages also indicate the workflow of a project.

To define a project's components, complete these steps:

1. In the Projects workspace, select the project for which you want to add components.
2. Open the project by double-clicking it. Alternatively, on the toolbar, select **Menu** ⇒ **Open**.

**Display 5.2** Pages of a Project

3. (Optional) On the Subset Criterion page, define a set of filters to obtain your target population. For details, see [Chapter 6, “Managing the Subset Criterion,”](#) on page 31.
4. On the Analytical Base Table page, define the modeling ABT and the ABT variables. For details, see [Chapter 7, “Managing Analytical Base Tables,”](#) on page 51.
5. On the Models page, capture the information about the models that you want to link to the ABT. For details, see [Chapter 8, “Managing Models,”](#) on page 115.

---

## Edit the Details of a Project

You can edit only name and description of a project.

To edit a project’s details, complete these steps:

1. In the Projects workspace, select the project that you want to edit.
2. In the Properties pane, click **Edit**.

**Display 5.3** Properties Pane of a Project

▼ Properties	
ID:	28
Name:	* Churn Postpaid
Description:	Churn Postpaid
Purpose:	Churn Postpaid
Subject of analysis:	Subscription
Date created:	August 17, 2011 02:04:14 PM
Subject group:	None
<div>OK</div> <div>Cancel</div>	

3. Change the name and description of the project according to your requirement.
4. Click **OK** to save the changes.

You can also edit the components of a project.


- To edit the subset criterion, see [“Edit a Subset Criterion” on page 48](#).
- To edit the ABT details, see [“Edit an ABT” on page 54](#).
- To edit the model information, see [“Edit a Model’s Information” on page 128](#).

---

## Delete a Project

When you delete a project, all components (subset criterion, ABT, and model information) that are associated with it are also deleted. You cannot recover the project data back. Therefore, make sure that you are deleting the correct project.

To delete a project, complete these steps:

1. In the Projects workspace, select the project that you want to delete.
2. On the toolbar, click . Alternatively, on the workspace toolbar, select **Menu** ⇒ **Delete**.
3. In the confirmation message box that appears, click **Yes**.



## Chapter 6

# Managing the Subset Criterion

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---

## About the Subset Criterion

### Overview of Subset Criterion

A subset criterion enables you to define the target population for your project. It contains a set of filters that you define in order to filter records that are significant for your analysis. When you build an ABT, the records that fulfill the subject group and subset criterion are used to populate the variables of the analytical base table (ABT).

*Note:* For a few purposes such as Customer Acquisition, certain subset criteria are predefined and are not displayed in the SAS Customer Analytics for Communications interface. These are the mandatory subset criteria (also called implicit subset criterion) that must be applied to derive the target population. For

more details, see *SAS Customer Analytics for Communications: Administrator's Guide*.

In SAS Customer Analytics for Communications, you can define only one subset criterion for each project. However, a subset criterion is optional. For example, if you want to use the entire population of a particular subject of analysis and subject group, you do not need to define a subset criterion. If you do not want to create a subset criterion for your project, you can directly proceed to define the ABT. For details, see [“Define an ABT” on page 52](#).

*Note:* A subset criterion is mandatory for an association rules analysis project. That is, you must not proceed with the subsequent tasks on the ABT and Models pages unless you define the subset criterion for the project.

## About Subset Maps

You apply the subset criterion on a subset map. A subset map is a group of tables that contain inter-related data about a particular subject of analysis. Defining a subset map is an administrative task. For details about how to define a subset map, see *SAS Customer Analytics for Communications: Administrator's Guide*.

A subset map is defined for a particular subject of analysis. For example, the subjects of analyses for a communications service provider (CSP) can be customers and subscriptions. Thus, your administrator can define subset maps for customers and subscriptions. For example, at the customer level, a subset map for all customers who have an active status can be defined. Further, you might want your target population to contain customers who belong to a certain age group. In this case, you can create a subset criterion and apply it on this subset map. Similarly, at the subscription-level, a subset map for all subscriptions that have an active status can be defined. On this subset map, you can define a subset criterion to filter subscriptions that are active for more than a certain period.

SAS Customer Analytics for Communications provides a set of predefined subset maps. Each subset map is based on different business attributes that can be considered while selecting the target population. Depending on the purpose for which you will be building the modeling ABT, you can use the appropriate subset map to define the subset criterion. The following table gives information about the predefined subset maps.

**Table 6.1** Predefined Subset Maps

Subset Map	Purpose
Payment Mode Subscriptions or Customers	<p>Enables you to select customers or subscriptions that have either prepaid or postpaid as the base offer payment mode.</p> <p>For example, you might want the target population to contain customers who have Postpaid as their Base Offer Payment Mode. To do so, when you define a subset criterion, select this subset map. When you define the filter condition, select the <b>Base Offer Payment Mode</b> variable, = (equal to) as the operator, and <b>Postpaid</b> as the value of the variable.</p> <p><i>Note:</i> You have to configure the payment mode values (Postpaid and Prepaid) as the dimensional attribute values of the Base Offer Payment Mode column of the Offer Bundle Dimension table. For details, see <a href="#">“Overview of Dimensional Attributes” on page 153</a>.</p>
Customers with Active Status	<p>Enables you to select customers whose status is active.</p> <p>For example, you want the target population to contain customers whose status is Active. To do so, when you define the subset criterion, select this subset map. When you define the filter condition, select the <b>Customer Status Code</b> variable, = (equal to) as the operator, and <b>Active</b> as the value of the variable.</p> <p><i>Note:</i> You have to configure the customer status codes (for example, Active, Dormant, and Suspended) as the dimensional attribute values of the Customer Status Code column of the Customer Dimension table. For details, see <a href="#">“Overview of Dimensional Attributes” on page 153</a>.</p>

Subset Map	Purpose
Subscriptions with Active Status	<p>Enables you to select subscriptions whose status is active.</p> <p>For example, you want the target population to contain subscriptions whose status is Active. To do so, when you define the subset criterion, select this subset map. When you define the filter condition, select the <b>Subscription Status Code</b> variable, = (equal to) as the operator, and <b>Active</b> as the value of the variable.</p> <p><i>Note:</i> You have to configure the subscription status codes (for example, Active, Dormant, and Suspended) as the dimensional attribute values of the Subscription Status Code column of the Subscription Dimension table. For details, see “<a href="#">Overview of Dimensional Attributes</a>” on page 153.</p>
Customers or Subscription for BG	<p>Enables you to select customers or subscriptions that belong to a specific business group (BG).</p> <p>For example, you want the target population to contain customers who belong to a business group whose ID is 7. To do so, when you define the subset criterion, select this subset map. When you define the filter condition, select <b>Business Group ID</b> as the variable, = (equal to) as the operator, and <b>7</b> as the value of the variable.</p> <p><i>Note:</i> In order to define the subset criterion, you must configure appropriate values for the Business Group ID column of the Customer X Business Group Tagging table.</p>
All Prospects	<p>Enables you to select only prospective customers in your target population. You must use this subset map when you want to build the analytical model for customer acquisition.</p>
Customer Service Selection Postpaid	<p>Enables you to create the modeling ABT for association rules analysis. You should select this subset map to analyze behavior of postpaid customers with reference to activation of services. In addition, after you choose this subset map, you can define filter conditions based on various service-level and customer-level attributes. The target population contains customers who satisfy the subset criteria. Therefore, the ABT would contain records of postpaid customers for the services that they activated at different points of time.</p>



Subset Map	Purpose
Customer Offer Selection Postpaid	Enables you to create the modeling ABT for association rules analysis. You should select this subset map to analyze behavior of postpaid customers with reference to agreement dates of offers. In addition, after you choose this subset map, you can define filter conditions based on various offer-level and customer-level attributes. The target population contains customers who satisfy the subset criteria. Therefore, the ABT would contain records of postpaid customers for the offers that they signed up for at different points of time.
Subscription Service Selection Postpaid	Enables you to create the modeling ABT for association rules analysis. You should select this subset map to analyze behavior of postpaid subscriptions with reference to activation of services. In addition, after you choose this subset map, you can define filter conditions based on various service-level and subscription-level attributes. The target population contains the subscriptions that satisfy the subset criteria. Therefore, the ABT would contain records of postpaid subscriptions for the services that are activated for these subscriptions at different points of time.
Customer Service Selection Prepaid	Enables you to create the modeling ABT for association rules analysis. You should select this subset map to analyze behavior of prepaid customers with reference to activation of services. In addition, after you choose this subset map, you can define filter conditions based on various service-level and customer-level attributes. The target population contains the customers who satisfy the subset criteria. Therefore, the ABT would contain records of prepaid customers for the services that they activated at different points of time.
Customer Offer Selection Prepaid	Enables you to create the modeling ABT for association rules analysis. You should select this subset map to analyze behavior of prepaid customers with reference to agreement dates of offers. In addition, after you choose this subset map, you can define filter conditions based on various offer-level and customer-level attributes. The target population contains the customers who satisfy the subset criteria. Therefore, the ABT would contain records of prepaid customers for the offers that they signed up for at different points of time.

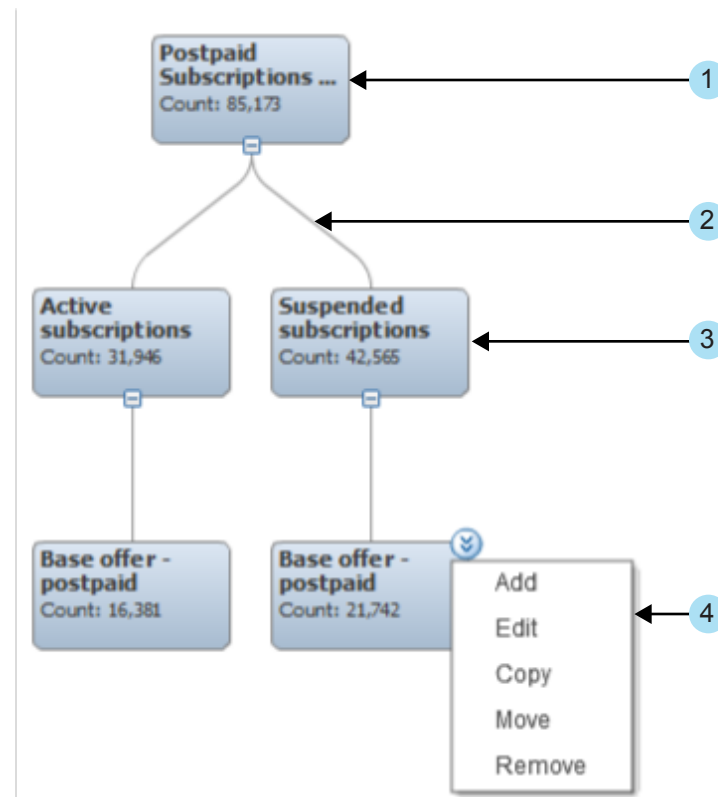
Subset Map	Purpose
Subscription Service Selection Prepaid	Enables you to create the modeling ABT for association rules analysis. You should select this subset map to analyze behavior of prepaid subscriptions with reference to activation of services. In addition, after you choose this subset map, you can define filter conditions based on various service-level and subscription-level attributes. The target population contains the subscriptions that satisfy the subset criteria. Therefore, the ABT would contain records of prepaid subscriptions for the services that are activated for these subscriptions at different points of time.
Rule-Based Customer Selection	Enables you to select customer population based on output of association rules analysis, which is rules. You should select this subset map to create a cross-sell or an up-sell model that is based on the association rules analysis models that you have created. In addition, after you choose this subset map, you can create filters based on various attributes of rules such as rule text, rule unit type (left hand or right hand of rule), and the ID values of services or offers, which are part of the rule.
Rule-Based Subscription Selection	Enables you to select subscription population based on output of association rules analysis, which is rules. You should select this subset map to create a cross-sell or an up-sell model that is based on the association rules analysis models that you have created. In addition, after you choose this subset map, you can create filters based on various attributes of rules such as rule text, rule unit type (left hand or right hand of rule), and the ID values of services or offers, which are part of the rule.

For a project, you have to select the correct combinations of purpose, subject of analysis, subject group, and subset map. For details, see [“Purpose-Specific Predefined Options for Subjects of Analysis and Subject Maps”](#) on page 161.

## How Is a Subset Criterion Represented?

### About Subset Criterion Representation

A subset criterion is represented as a hierarchical list, which progresses from top to bottom. A hierarchical list contains one or more levels of information. Each level is displayed as a node. Each node in a hierarchical list represents a certain filter definition. The hierarchical structure indicates the relationships between the nodes.

**Figure 6.1** Structure of a Hierarchical List

- 1 Primary node
- 2 Branch
- 3 Child node
- 4 Pop-up menu

### Structure of a Hierarchical List

The first level of a hierarchical list contains a single node, which is called the primary node. This node is created based on the subset map that you select for the subset criterion. Any subsequent level of the list is called a child level. At each child level, there can be one or more nodes, which are called child nodes. Each child node originates from a single parent node, which can also be a child node at the previous level. The lines that originate from the primary node and connect the child nodes are called branches. Each branch can connect one or more child nodes. A pop-up menu that is available for each node enables you to add, edit, or remove child nodes. It also enables you to copy or move nodes. For details, see [“Working with Hierarchical Lists” on page 44](#).

### Example: Subset Criterion

You have created a project, which has **Customer Lifetime Postpaid** as its purpose. For this project, you want to define the target population as customers who have an active status and satisfy any one of the following conditions:

#### Condition 1

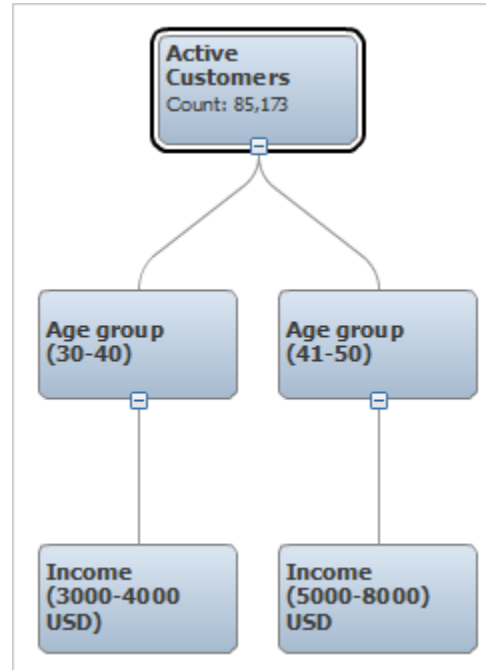
All customers in the age group of 20–30 years whose monthly income is greater than 3000 USD.

**Condition 2**

All customers in the age group of 31–50 years whose monthly income is greater than 5000 USD.

In this case, when you define a subset criterion, you can choose the subset map that is defined for active customers. You can then define the filter conditions as illustrated in the diagram below.

**Display 6.1** Subset Criterion Definition




---


## Define a Subset Criterion

### Overview

To define a subset criterion, first define the primary node of the hierarchical list. The primary node represents the entire population in a subset map. You can then add filter definitions (child nodes) to the primary node to derive the target population.

### Define the Primary Node

To define the primary node of a subset criterion, complete these steps:

1. In the Projects workspace, double-click the project for which you want to define the subset criterion.
2. Select the Selection Criterion page.
3. On the toolbar, click . Alternatively, on the toolbar, click **Menu** ⇒ **New**. The New Subset Criterion window appears.

**Display 6.2** New Subset Criterion Window

4. In the **Name** field, type a name of the subset criterion.
5. In the **Description** field, type a description of the subset criterion.
6. From the **Subset map** list, select the subset map that defines the population of your interest. If the subset map that you need is not available in the list, contact your administrator.


**TIP** After you select a subset map, you can check the **Subset map description** and **Tables and columns** fields to make sure that you have selected the right subset map. The **Tables and columns** field shows the tables and columns that constitute the subset map. While creating child nodes, you can apply filters on these columns.

7. Click **Save**. The New Subset Criterion window closes, and the primary node of the subset criterion is displayed in the Subset Criterion window.

The name of the primary node is same as the subset map that you choose. You can rename the primary node according to your requirement. For details, see [“Rename the Primary Node”](#) on page 45.

## Add a Child Node

To add a child node to the primary node of a subset criterion, complete these steps:

1. Point to the primary node, click , and then select **Add**. The Add Child Node window appears.

**Display 6.3** Add Child Node Window

**Add Child Node**

Name: \*   
Maximum 40 characters

Description:   
Maximum 200 characters

Parent node: status selection

Filter definition: ?

Conjunction	Variable	Operator	Value

Count:  ?

2. In the **Name** field, type a name for the filter. The name that you enter here is assigned as the node name in the hierarchical list. Make sure that you enter a meaningful name so that you can easily identify the filter definition.

**TIP** The node in the hierarchical list from which this node originates is displayed as the **Parent node**.

3. In the **Description** field, type a description for the filter.
4. Use the **Filter definition** table to define the filter conditions.

- a. Click to add a row in the table.

- b. In the **Variable** column, click . The Select Variable window appears.



Select a variable from the list of variables and then click **OK**. The list contains all the variables (columns) that are available in the subset map that you selected for the subset criterion.

**TIP** You can use the search feature to filter the list of variables. You can search either by variable name or by table name. The variables or tables that contain the text that you type appear in the list.

- c. Click in the **Operator** column, and then select the required operator from the list of operators. The operators in the list differ depending on which type of variable you select.

**Table 6.2** Variable Types and Available Operators

Variable Type	Available Operators
Character	<ul style="list-style-type: none"> <li>• = (equal to)</li> <li>• <math>\neq</math> (not equal to)</li> <li>• IN</li> <li>• NOT IN</li> </ul>
Numeric	<ul style="list-style-type: none"> <li>• = (equal to)</li> <li>• <math>\neq</math> (not equal to)</li> <li>• <math>\leq</math> (less than or equal to)</li> <li>• <math>\geq</math> (greater than or equal to)</li> <li>• &lt; (less than)</li> <li>• &gt; (greater than)</li> </ul>
Date	<ul style="list-style-type: none"> <li>• = (equal to)</li> <li>• <math>\neq</math> (not equal to)</li> <li>• <math>\leq</math> (less than or equal to)</li> <li>• <math>\geq</math> (greater than or equal to)</li> </ul>

- d. In the **Value** column, click .
- For a character or numeric variable, the Specify Value window appears. Specify the appropriate value for the variable. For details, see [“Working in the Select Value Window” on page 42](#).
  - For a date variable, the Specify Date window appears. Specify the appropriate date expression for the variable. For details, see [“Working in the Specify Date Window” on page 43](#).
- e. (Optional) If you want to add another filter condition, click  to add another row. From the **Conjunction** column, select an appropriate operator (**AND** or **OR**). Then, repeat steps from 4b to 4d.

**TIP** Select **AND** if you want the members in the target population to satisfy both the filter conditions. Otherwise, select **OR**.

*Note:* You can define a maximum of two filter conditions.

**Display 6.4** Child Node Filter Conditions

**Add Child Node**

Name: \* Suspended Subscriptions  
Maximum 40 characters

Description: Subscriptions that were created 8 months before and suspended now.  
Maximum 200 characters

Parent node: status selection

Filter definition: ?


Conjunction	Variable	Operator	Value
	Subscription Status Code	=	'SS_3'
AND	Subscription Creation Date	<	intnrx('DTMONTH', &RU...

Count Show Count ?

OK Cancel

**TIP** At each stage of defining a filter, you can verify the number of records of the subject of analysis that satisfy the filter conditions that you have specified so far, including the filter conditions in all the higher-level nodes on the same branch. To do so, click **Show Count**.

*Note:* Unless you have performed a Show Count operation at the level of the root node (that is, unless you have clicked **Show Count** on the Subset Criterion page), clicking **Show Count** in the Add Child Node window shows only the count, and not the percentage, of the returned records.

5. Click **OK**. The filter definition is added as a child node of the primary node.
6. On the toolbar, click  to save the changes.
7. (Optional) To add more filter definitions, select the primary node or the child node and repeat steps from 2 to 7.

### Working in the Select Value Window

In the Select Value window, you can either select a value from the list or type a value in the **Others** field.



**Display 6.5** Select Value Window

The Select Value window shows values for a variable only if the dimensional attribute values are configured for the variable in the Application data mart. For details, see [“Add Dimensional Attribute Values”](#) on page 154.

If you type a character or a text string in the field, be sure to enclose the value in single quotation marks. When you click **OK**, this value is populated as the dimensional attribute in the Application data mart.

### Working in the Specify Date Window

In the Specify Date window, you can either select a **Date** or specify a date in the **Other** field. The filter condition returns the records that satisfy the filter condition as of the specified date.

**Display 6.6** Specify Date Window

### Reference Datetime

This option provides you the flexibility to specify a date going forward or backward from the current system datetime. Select a reference date, select an operator, and then specify the number of months, weeks, or days by which you want to go forward or backward from the reference date. Currently, SAS Customer Analytics for Communications provides only one reference date: **Reference Datetime**.

**Reference Datetime** resolves to current system date. However, when you build your ABT, **Reference Datetime** automatically resolves to the specified ABT build date.

For example, you specify a filter condition similar to the following:

**SUBSCRIP\_ACTIVATION\_DT = Reference Datetime - 8 months**

When you click **Show Count**, the filter returns all customers who activated their subscriptions on a date that is eight months before the system date. However, when you build your ABT, the ABT is populated with customers who activated their subscriptions on a date that is eight months before the ABT build date. Therefore, the number of customers that is displayed when you click **Show Count** and the number of customer records in the modeling ABT might not be the same.

For example, consider that the current system datetime when you define the filter is **May 15, 2011**. When you click the **Show Count** button, the filter condition will return the number of customers who activated their subscriptions before **September 15, 2010**.

Now, consider that when you build your ABT, you specify **April 30, 2010** as the ABT build date. After the ABT building process is complete, the ABT will contain records for customers who activated their subscriptions before **August 30, 2009**.

### Other

In this field, you can enter an expression, including functions or macro variables, that resolves to a valid SAS datetime value.

Here are a few examples of valid expressions (for the en\_US English locale):

- `intnx('dtday', DATETIME(), 0, 'SAME')`  
resolves to the current system date and time.
- `intnx('dtmonth', DATETIME(), -5, 'SAME')`  
resolves to a date that falls five months before the current system date.
- `intnx('dtyear', DATETIME(), -2, 'END')`  
resolves to the last day of the year of the date that falls two years before the current system date.
- `intnx('dtday', '23:AUG:2010:23:59:59'dt, 0, 'SAME')`  
resolves to a constant datetime value of '23:AUG:2010:23:59:59'.

---

## Working with Hierarchical Lists

### Overview of the Pop-up Menu

The pop-up menu that is available at each node of the hierarchical list enables you to manage the subset criterion that you define.

The pop-up menu of the primary node has the following options:

#### Add

enables you to add a node to the primary node. For details, see [“Define the Primary Node” on page 38](#).

#### Rename

enables you to rename the primary node. For details, see [“Rename the Primary Node” on page 45](#).

The pop-up menu of a child node has the following options:

**Add**

enables you to add a new node to the child node. The steps for adding a node to a child node are similar to the steps for adding a node to the primary node. For details, see [“Add a Child Node” on page 39](#).

**Edit**

enables you to modify the name, description, and filter conditions of the child node. For details, see [“Edit a Child Node” on page 45](#).

**Copy**

enables you to create a copy of a child node in the same hierarchical list. For details, see [“Create a Copy of a Child Node” on page 46](#).

**Move**

enables you to move a child node below another node in the same hierarchical list. For details, see [“Move a Child Node to Another Location” on page 47](#).

**Remove**

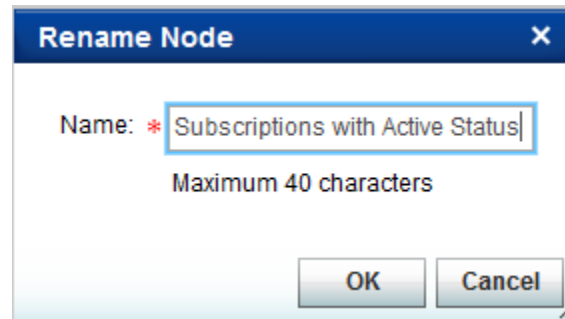
enables you to remove the child node from the hierarchical list. For details, see [“Remove a Child Node from a Hierarchical List” on page 48](#).

**Rename the Primary Node**

The primary node is the topmost node in a hierarchical list. To change the name of the primary node, complete these steps:

1. Point to the node, click , and then select **Rename**. The Rename window appears.

**Display 6.7** Rename Node Window




2. In the **Name** field, type a new name for the node, and then click **OK**.

**Edit a Child Node**

You can change the name and description of a child node. You can also change the filter definition that the node represents.

To edit a child node, complete these steps:

1. Point to the child node, click , and then select **Edit**. The Edit Filter window appears.

**Display 6.8** Edit Node Window

**Edit Node** [X]

Name: \* Suspended Subscriptions  
Maximum 40 characters

Description: Subscriptions that were created 8 months before and suspended now.  
Maximum 200 characters

Parent node: status selection

Filter definition: ?

Count: [Show Count ?]

Conjunction	Variable	Operator	Value
	Subscription Status Code	=	'SS_3'
AND	Subscription Creation Date	<	intrn('DTMONTH', &RU...


[OK] [Cancel]

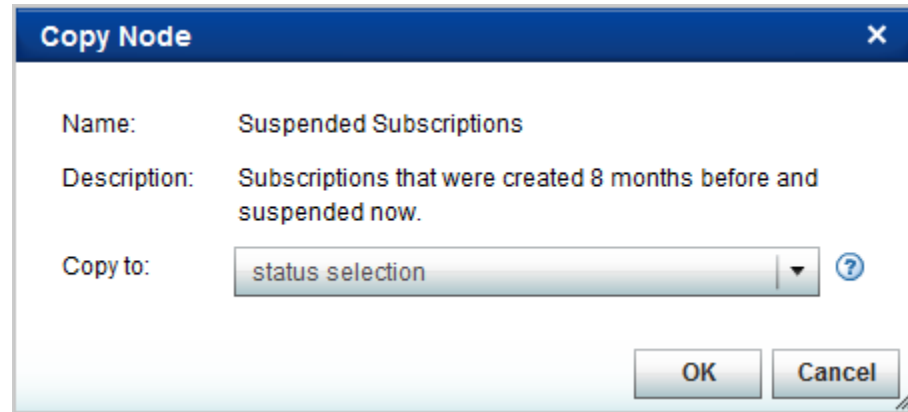
2. Change the name, description, and filter conditions as required.
3. Click **OK**.

### Create a Copy of a Child Node

The **Copy** option enables you to duplicate a filter definition that you have already defined as a child node. You can copy a child node and create another node, which can be above or below the current level or at the same level. However, you cannot copy a node to create another node as one of its child nodes. When you copy a node that has child nodes, all the child nodes are also copied.

To copy a child node, complete these steps:

1. Point to the child node, click , and then select **Copy**. The Copy Node window appears.

**Display 6.9** Copy Node Window



The **Copy Node** dialog box has a blue title bar with a close button. It contains three fields: **Name:** with the value "Suspended Subscriptions", **Description:** with the value "Subscriptions that were created 8 months before and suspended now.", and **Copy to:** with a dropdown menu showing "status selection" and a help icon. At the bottom right are **OK** and **Cancel** buttons.

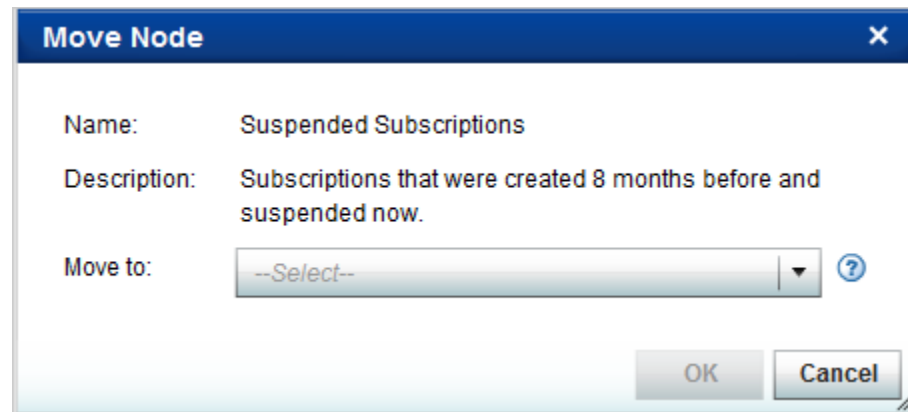
2. From the **Copy to** filter list, select the node below which you want to copy the current node.
3. Click **OK**.

### Move a Child Node to Another Location

The **Move** option enables you to restructure your hierarchical list. You can move a child node to another location, which is above or below the current level or at the same level. However, you cannot move a node to a location that is the same as that of its child node or parent node. When you move a node that has child nodes, all the child nodes are also moved.

To move a child node, complete these steps:

1. Point to the child node, click , and then select **Move**. The Move Node window appears.

**Display 6.10** Move Node Window



The **Move Node** dialog box has a blue title bar with a close button. It contains three fields: **Name:** with the value "Suspended Subscriptions", **Description:** with the value "Subscriptions that were created 8 months before and suspended now.", and **Move to:** with a dropdown menu showing "--Select--" and a help icon. At the bottom right are **OK** and **Cancel** buttons.

2. From the **Move to** filter list, select the node below which you want to move the current node.
3. Click **OK**.

### **Remove a Child Node from a Hierarchical List**

When you remove a node from a hierarchical list, all its child nodes are also removed. However, removing a node from a hierarchical list does not permanently delete the node unless you save the changes. For example, if you remove a node (and you have not yet saved the changes), you can use the **Revert** option to undo the Delete operation. However, after you save the changes, the undo operation is not possible.

To remove a child node from a hierarchical list, complete these steps:

1. Point to the child node, click , and then select **Remove**.
2. In the confirmation message box that appears, click **Yes**.


---

## **Edit a Subset Criterion**

You can change the name and description of a subset criterion. However, you cannot change the underlying subset map. If you want a subset criterion with a different subset map, you must delete the subset criterion that you have defined, and then create a new one.

You can edit the filter definitions of a subset criterion as and when you want to change. However, if you edit the filter definitions, after the ABT or an analytical model is built, you have to build the ABT and the analytical model again.

To edit a subset criterion, complete these steps:

1. Select the **Subset Criterion** page.
2. On the toolbar, click . Alternatively, on the toolbar, select **Menu** ⇨ **Edit**. The Edit Subset Criterion window appears.

Display 6.11 Edit Node Window

3. Change the name and description of the subset criterion as required.
4. Click **Save** to save the changes.
5. In the hierarchical list, you can modify the filter definitions. For details, see [“Edit a Child Node”](#) on page 45.

---

## Undo the Changes Made to a Subset Criterion

You can undo all the unsaved changes that you have made to a subset criterion. For example, if you edit a node and change the filter conditions, you can use the **Revert** option to retain the original filter conditions. To undo the changes made to a subset criterion, click the **Menu** button, and then select **Revert**.

*Note:* If there are no unsaved changes, the **Revert** option appears dimmed, indicating that it is unavailable.


---

## Delete a Subset Criterion

When you delete a subset criterion, the hierarchical list representing the subset criterion is deleted. After you delete a subset criterion, the Delete operation cannot be undone. Therefore, before deleting a subset criterion, make sure that you have selected the right project.

You can delete the subset criterion of a project for which a modeling ABT or an analytical model is built. However, in this case, you have to build the ABT and the analytical model again.

To delete a subset criterion, complete these steps:

1. Select the Subset Criterion page.
2. On the toolbar, click . Alternatively, on the toolbar, select **Menu** ⇒ **Delete**.
3. In the confirmation message box that appears, click **Yes**.



## Chapter 7

# Managing Analytical Base Tables

---

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## About Analytical Base Tables

After you define your business problem and the target population, you can proceed with the modeling process. This process typically begins with defining modeling analytical base tables (ABTs). A modeling ABT (simply called ABT in this document) is a flat table that is used as an input for building analytical models. A single record in this table represents the subject of analysis (for example, customer or subscription) and stores all data (variables) describing this subject. These variables are called ABT variables. The ABT variables that you define differ depending on the underlying business problem.

---

## Process Flow for Building an ABT

The SAS Customer Analytics for Communications interface enables you to complete the end-to-end tasks that are required to define, build, and register an ABT. As a result, you can dynamically build the ABT, register it, and seamlessly use it as an input to build the analytical model in SAS Enterprise Miner.

The following tasks are included in the process flow of building an ABT:

1. Define an ABT. For details, see [“Define an ABT” on page 52](#).
2. Create variables (columns) for the ABT. For details, see [“Creating ABT Variables” on page 57](#).
3. (Optional) Define an outcome variable, if applicable for the purpose for which you are building the ABT. For details, see [“Defining an Outcome Variable” on page 105](#).
4. Build the ABT. For details, see [“Build an ABT” on page 111](#).
5. (Optional) Share an ABT. For details, see [“Share ABT” on page 104](#).
6. Register the ABT with the SAS Metadata Server. For details, see [“Register an ABT with the SAS Metadata Server” on page 113](#).



---

## Define an ABT

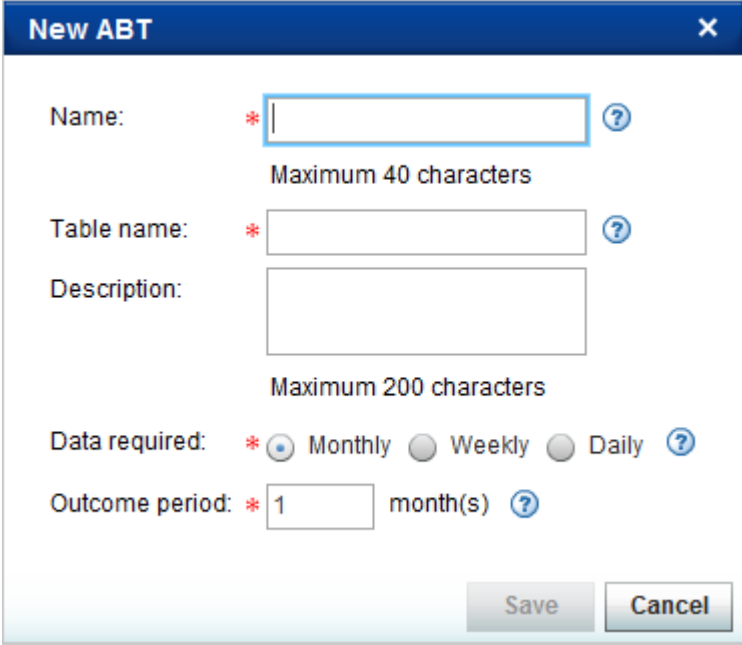
SAS Customer Analytics for Communications enables you to define one ABT per project.

To define an ABT, complete these steps:

1. In the Projects workspace, double-click the project for which you want to define the ABT.

2. Select the Analytical Base Table page.
3. On the toolbar, click  , and then select **New ABT**. Alternatively, on the toolbar, select **Menu** ⇒ **New** ⇒ **ABT**. The New ABT window appears.

**Display 7.1** New ABT Window



4. Enter the following information for the ABT:

*Note:* When you define an ABT, you must select the correct combinations of purpose, subject of analysis, time grain, and outcome period. For details, see [“Purpose-Specific Predefined Values for Outcome Period”](#) on page 168.

**Name**

Type a name of the ABT.

**Table name**

Type a name with which the ABT data set is to be created and stored in the database.

**Description**

Type a brief description of the ABT.

**Data required**

Depending on whether you want to store monthly aggregated data, weekly aggregated data, or daily aggregated data in the ABT, select the **Monthly**, **Weekly**, or **Daily** option. The option that you choose defines the time grain of the ABT. This option also restricts the tables (data sources) and the time periods that will be available to you when you define behavioral variables for your ABT. For example, if you select **Monthly**, the data sources that can be aggregated at the monthly level will be available to you for defining behavioral variables for the ABT. However, if you select **Daily**, the data sources that can be aggregated at the daily level will be available to you.

*Note:* The option will be available for your selection, depending on how your administrator has configured these options for each purpose. For example, for the Churn Prepaid purpose, your administrator might configure the **Weekly** option. In this case, only the **Weekly** option would be available for your

selection. For more information, see *SAS Customer Analytics for Communications: Administrator’s Guide*.

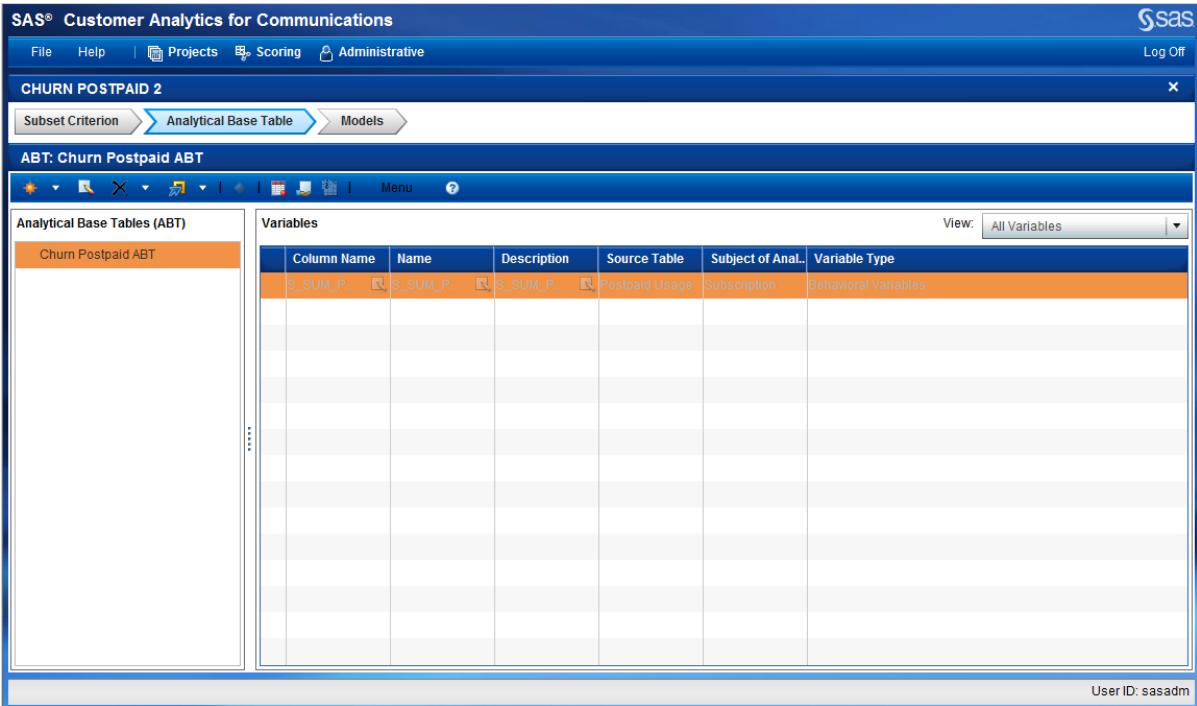
**Outcome period**

Specify the time period for which you want to observe (after the ABT build date) the particular event of interest. The time period that you specify is in months, weeks, or days depending on the option that you choose for the **Data required** field. The value for an outcome variable is calculated with reference to the last day of the outcome period. For details, see [“Overview of an Outcome Variable” on page 105](#).

*Note:* This field is not applicable to all types of models. For example, for a segmentation model, the outcome period is not applicable. However, if you are defining a customer churn model, then you must define the outcome period.

- 5. Click **Save**. The ABT name appears in the left pane of the Analytical Base Table page.

**Display 7.2** Analytical Base Table Page



*Note:* Depending on the purpose for which you are creating the ABT, after you create the ABT, certain variables (also called implicit variables) that appear dimmed are available in the Variables list. These are mandatory and predefined variables. You cannot delete these variables. For more information, see *SAS Customer Analytics for Communications: Administrator’s Guide*.


**Edit an ABT**

You can edit an ABT of a project that you own. You can change the name, description, the outcome period of an ABT.

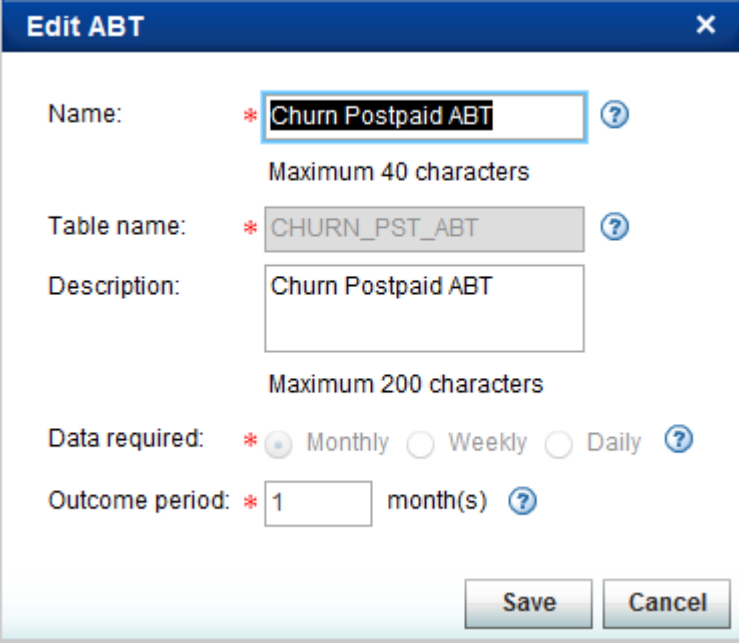
*Note:*

- If you have built an ABT, and then change the outcome period, you have to build the ABT again.
- If you want to change grain of analysis (daily, weekly, or monthly) of an ABT, you have to delete the ABT and define it again.

To edit an ABT, complete these steps:

1. On the Analytical Base Table page, select the ABT that is displayed in the table.
2. On the toolbar, click . Alternatively, on the toolbar, select **Menu** ⇒ **Edit ABT**. The Edit ABT window appears.

**Display 7.3** Edit ABT Window




3. Change the name, description, and outcome period of the ABT as required.
4. Click **Save**.

---

## Delete an ABT

When you delete an ABT, all its ABT variables will also be deleted.

To delete an ABT, complete these steps:

1. On the Analytical Base Table page, select the ABT that you want to delete.
2. On the toolbar, click , and then select **Delete ABT**. Alternatively, on the toolbar, select **Menu** ⇒ **Delete** ⇒ **ABT**.

## About ABT Variables

SAS Customer Analytics for Communications provides you the framework to dynamically create ABT variables at run time. You do not have to create and maintain a huge list of variables in advance. You can create only as many variables as you need, and you can create them only when you need them—that is, when you are working on your project.

SAS Customer Analytics for Communications enables you to create the following types of ABT variables. The variables are categorized on the basis of how they are derived and what type of information they store.

### Basic variables

These variables are further categorized as:

#### Behavioral

a variable that stores aggregated information about a customer's behavior over a period of time. For example, you can define a behavioral variable to compute the total number of outbound voice calls of a customer in the past three months.

#### Time-Based

a variable that stores the most recent information about a particular activity. For example, you can define a time-based variable to determine the channel type of the last interaction of a customer.

#### Direct

a variable that stores information as of the ABT build date. Age, marital status, income, and city are a few examples of direct variable.

### Derived

a variable that you can derive from existing ABT variables, with the help of mathematical or logical operators. Depending on whether a variable is derived using mathematical operators or logical operators, the variable can be categorized as follows:

#### Simple Derived

a variable that is derived with the help of mathematical operators such as + (addition), – (subtraction), \* (multiplication), / (division), and log. For example, you can use behavioral variables to create a derived variable that computes the usage proportion of voice calls. These behavioral variables can be D\_CNT\_VOC\_PSU\_CN\_L1M (total number of voice calls for postpaid customers in the last month) and D\_CNT\_VOC\_PSU\_CN\_L12M (total number of voice calls for postpaid customers in the past 12 months).

Simple derived variables are further categorized based on the type of expression that you define for these variables. The types of expressions that are available for defining a simple derived variable include: **Based on Numeric Variables**, **Based on Date Difference**, **Based on Date Operations**, and **Based on Prebuilt Formula**.

#### Complex Derived

a variable that is derived with the help of logical operators such as = (equal to), <> (not equal to), > (greater than), < (less than), AND, OR, IN, and NOT IN. For example, you can create a variable that indicates a churn event if the current status code of a subscription is DEACTIVATED, SUSPENDED, or CLOSED. Therefore, you can define the expression for this variable as follows:

```
CHURN = IF LST_SUB_STATUS IN ('DEACTIVATED', 'SUSPENDED', 'CLOSED') THEN 1
ELSE 0
```

## Creating ABT Variables

### Overview


The procedure to create a variable is the same irrespective of the type of variable that you are defining. This procedure includes the following steps:

1. Select the ABT for which you are defining the variables.
2. Select the type of variable that you want to define.
3. Depending on the type of variable that you want to define, specify appropriate details for the variable.
4. Save your variable definition.

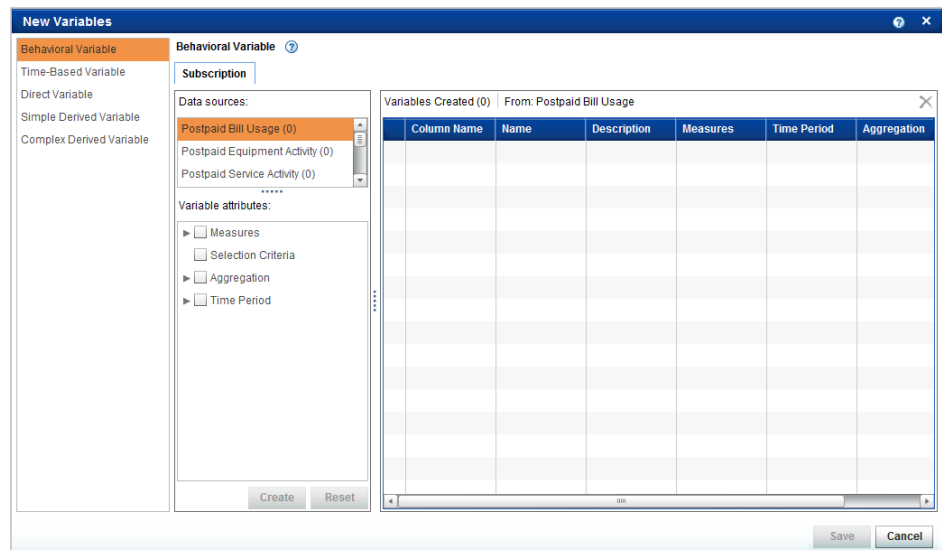
### Select the ABT

To define the ABT variables, you have to first select the ABT for which you are defining the variables.

To select the ABT, complete these steps:

1. In the Projects workspace, double-click the project for whose ABT you want to define the variables.
2. On the Analytical Base Table page, select the ABT that is displayed in the left pane.
3. On the toolbar, click  and select **ABT Variable**. Alternatively, on the toolbar, select **Menu** ⇒ **New** ⇒ **Variable**. The New Variables window appears.

**Display 7.4** New Variables Window



## Working in the New Variables Window

The New Variables window enables you to define all types of ABT variables. The New Variables window is divided into three panes:

left navigation pane

enables you to choose the type of variable that you want to define.

central pane

enables you define the variable attributes. The attributes that you specify for an ABT variable differ depending on the type of variable that you are defining.

right pane

contains the Variables Created table, which displays the properties of the variables that you have created.

## Specifying the Variable Attributes

For basic variables, you have to specify details such as the data source and one or more attributes. The details that you can specify for a basic variable depends on how your administrator has configured the input tables. For details, see Chapter 10 [“Configuring the Input Tables” on page 143](#).

Data source

is the source table from which your ABT variable is created. You have to select the data source from the list. The list shows all the tables that your administrator has configured for creating a specific type of variable. Select the data source depending on the type of information that you want your variables to store.

Variable attributes

enables you to define the type of information the ABT variable stores. Depending on the type of variable, you have to define one or more attributes. These attributes define the rules by which the ABT variables will be created.

Measures

columns of the selected data source that are configured as measures that can be aggregated while creating behavioral variables. One variable is created for each measure that you select. In other words, an ABT variable contains aggregated information pertaining to the corresponding column of the selected data source.

Display Columns

the configured columns of the selected data source. You have to select the columns that you want to use to create your variables. The columns that you select constitute the attributes of your interest about the record. One variable is created for each display column that you select.

Selection Criteria

enables you to define filters for a behavioral or a time-based variable. The first level of the list shows all those columns of the selected data source that are configured as dimensional attributes. The second level (when you expand a dimensional attribute) shows all the preconfigured values for the corresponding dimensional attribute. These values are referred to as dimensional attribute values. For details, see [“Add Dimensional Attribute Values” on page 154](#).

A variable can have only one criterion from the set of criteria (dimensional attribute values) available for a particular column (dimensional attribute) of the data source. For example, a variable can have either Service Category Code = Message, Service Category Code = Data, or Service Category Code = Voice as a



selection criterion. If you select all three codes, three different variables are created for each type of service. However, a variable can have multiple selection criteria if each of them is based on a different column of the selected data source. For example, you can apply the following subset criteria on a variable: Service Category Code = Voice and Event Direct Code = Outgoing.

#### Aggregation

defines the type of aggregation the behavioral variable computes.

**Table 7.1** Aggregation Types

Type	Description
Average	<p>Indicates that the variable contains the average of the selected measure for all the records in the selected data source. The average is computed based on the actual data that is available.</p> <p>For example, a variable based on the Number of Event measure can contain the average number of voice calls in the past six months for a given subscription. That is, this variable computes average number of calls for a subscription in the past six months.</p>
Count	<p>Indicates that the variable contains the count of all the records in the selected data source, regardless of the measure that you have selected.</p> <p>For example, the variable based on the Number of Event measure can contain the count of all voice calls in the <b>Postpaid Usage</b> data source in the past three months.</p>
Maximum	<p>Indicates that the variable contains the maximum value of the selected measure for all the records in the selected data source.</p> <p>For example, a variable based on the Number of Event measure can contain the maximum number of voice calls from the <b>Postpaid Usage</b> data source in the past three months.</p>
Minimum	<p>Indicates that the variable contains the minimum value of the selected measure for all the records in the selected data source.</p> <p>For example, a variable based on the Number of Event measure can contain the minimum number of voice calls in the <b>Postpaid Usage</b> data source in the past six months.</p>

Type	Description
Total	<p>Indicates that the variable contains the sum of the selected measure for all the records in the selected data source.</p> <p>For example, a variable based on the Number of Event measure contains the total number of voice calls in the <b>Postpaid Usage</b> data source in the past six months.</p>

#### Time Period

preconfigured values for time periods that are available for a behavioral variable. These values vary according to the level of the ABT (that is, whether you selected **Monthly**, **Weekly**, or **Daily** for the **Data required** field while defining the ABT). For details about how to configure the time periods, see *SAS Customer Analytics for Communications: Administrator's Guide*.

**Table 7.2** Examples of Preconfigured Time Periods

ABT Level	Preconfigured Time Periods
Daily	<p><b>Specific day</b></p> <p>includes time period values such as Base 1 Day, Base 2 Day, Base 3 Day, and so on. When the ABT is built, the variable contains the aggregated value for the time period that you choose. For example, you choose Base 6 Day as the time period. The ABT variable will contain the aggregated value for the sixth day of week before the ABT build date.</p> <p><b>Consecutive days</b></p> <p>includes time period values such as Last 2 Days, Last 3 Days, Last 4 Days, and so on. When the ABT is built, the variable contains the aggregated value for the time period that you choose. For example, you choose the Last 3 Days as the time period. The ABT variable will contain the aggregated value for the past three days before the ABT build date.</p>

ABT Level	Preconfigured Time Periods
Weekly	<p data-bbox="956 243 1374 583"><b>Specific week</b> includes time period values such as Base 1 Week, Base 2 Week, Base 3 Week, and so on. When the ABT is built, the variable contains the aggregated value for the time period that you choose. For example, you choose Base 6 Week as the time period. The ABT variable will contain the aggregated value for the sixth week before the ABT build date.</p> <p data-bbox="956 606 1374 947"><b>Consecutive weeks</b> includes time period values such as Last 2 Weeks, Last 3 Weeks, Last 4 Weeks, and so on. When the ABT is built, the variable contains the aggregated value for the time period that you choose. For example, you choose the Last 3 Weeks as the time period. The ABT variable will contain the aggregated value for the past three weeks before the ABT build date.</p>

ABT Level	Preconfigured Time Periods
Monthly	<p><b>Specific month</b> includes time period values such as Base 1 Month, Base 2 Month, Base 3 Month, and so on. When the ABT is built, the variable contains the aggregated value for the time period that you choose. For example, you choose Base 6 Month as the time period. The ABT variable will contain the aggregated value for the sixth month before the ABT build date.</p> <p><b>Consecutive Months</b> includes time period values such as Last 2 Month, Last 3 Month, Last 4 Month, and so on. When the ABT is built, the variable contains the aggregated value for the time period that you choose. For example, you choose Last 3 Months as the time period. The ABT variable will contain the aggregated value for the past three months before the ABT build date.</p> <p><b>Range of months</b> includes time period values such as Last 2–7 Month. When the ABT is built, the variable contains aggregated value for the time period that you choose. For example, you choose the Last 2–7 Month time period. The ABT variable will contain the aggregated value from the second month to the seventh month before the ABT build date.</p>

One behavioral variable is created for each time period that you select. In other words, a variable contains aggregated information pertaining to a single time period.

**Date (order by)**

the date column by which you want to order the records of the selected data source. This rearrangement of records is required when the time-based variable stores the most recent information.

The following table summarizes the variable attributes that you need to specify for each type of basic variable.

**Table 7.3** Rules for Defining ABT Variables

Attribute Name	Behavioral	Time-Based	Direct
Measures	Mandatory	Not applicable	Not applicable
Display Columns	Not applicable	Mandatory	Mandatory

Attribute Name	Behavioral	Time-Based	Direct
Selection Criteria	Optional	Optional	Not applicable
Aggregation	Mandatory	Not applicable	Not applicable
Time Period	Mandatory	Not applicable	Not applicable
Date (Order by)	Not applicable	Mandatory	Not applicable

*Note:* In this document, the data source names, measure names, and variable attribute names are indicative names. Your administrator might configure these objects with different names.

For derived variables, you have to identify the variable with a unique name, select the source variables, and build the expression for the variables. For details, see [“Create a Simple Derived Variable” on page 76](#) and [“Create a Complex Derived Variable” on page 92](#).

## Create Behavioral Variables

When you build the ABT, the value for a behavioral variable is calculated as follows:

SELECT <aggregation> (<measure>)

FROM <data source>

WHERE (<<selection criteria> = <value>>)

AND (<time period> = <value>)

To create behavioral variables, complete these steps:

1. In the New Variables window, click **Behavioral Variable** in the left navigation pane.

**Display 7.5 Behavioral Variable Tab**

2. From the **Data source** list, select a data source. The list of measures and selection criteria is displayed depending on the data source that you select.

3. From the **Variable attributes** list, select the rules by which you want to create the ABT variables.

*Note:* You must select at least one measure, one aggregation type, and one time period. A selection criterion is optional.

- a. Click the arrow next to **Measures** to expand the list, and then select the required measures.
- b. (Optional) Click the arrow next to **Selection Criteria** to expand the list, and then select the required criteria. As a result, you can restrict the ABT to contain only those records that satisfy the selection criteria that you select here.
- c. Click the arrow next to **Aggregation** to expand the list, and then select the required aggregation levels for the variables.
- d. Click the arrow next to **Time Period** to expand the list, and then select the required time periods.

**TIP** Click **Reset** if you want to clear all the selected variable attributes.

4. Click **Create**. Based on the variable attributes that you have selected one or more variables are created. These variables are displayed in the Variables created table in the right pane of the New Variables window.

You can view the details of the variables that are created. The table might have one additional column for each selection criteria that you selected. Also, you can perform certain additional tasks in this window. For details, see [“Other Possible Tasks in the New Variables Window” on page 98](#).

**TIP** Repeat steps from 2 to 4 if you want to define variables for another data source.

5. (Optional) Click **Save**. The New Variables window closes, and the saved variables are displayed in the Variables Created table on the Analytical Base Table page.

### **Example: Creating a Behavioral Variable**

You want to define a variable that computes the total data volume that is downloaded during the peak hours in the past three months. To do so, you can define a behavioral variable.

To define this variable, complete these steps:

1. In the New Variables window, click **Behavioral Variable** in the left navigation pane.
2. From the **Data sources** list, select the **Postpaid Usage** data source.

**Display 7.6** Behavioral Variables: Data Source Selection

New Variables

Behavioral Variable

Time-Based Variable

Direct Variable

Simple Derived Variable

Complex Derived Variable

Behavioral Variable ?

Subscription

Postpaid Subscription Loyalty (0)

Postpaid Usage (0)

Subscription Dimension (0)

\*\*\*\*\*

Variable attributes:

☐ Measures

☐ Selection Criteria

☐ Aggregation

☐ Time Period

\*\*\*\*\*

CreateReset

Variables Created (0) | From: Postpaid Usage

Column Name	Name	Description	Measures	Time Period

SaveCancel

3. Select the following variable attributes:
  - a. Click the arrow next to **Measures**, and then select **Volume of Event**.

**Display 7.7** Behavioral Variables: Measures Selection

Variable attributes:

☒ Measures

- ☐ Duration of Event
- ☐ Number of Dropped Event
- ☐ Number of Event
- ☐ Number of Failed Event
- ☐ Usage Revenue Amount
- ☒ Volume of Event

► ☐ Selection Criteria

► ☐ Aggregation

► ☐ Time Period

Create Reset

- b. Click the arrow next to **Selection Criteria**.

**Display 7.8** Behavioral Variables: Selection Criteria

The screenshot shows a dialog box titled "Variable attributes:" with a list of selection criteria. The criteria are organized into a tree structure. The "Selection Criteria" section is expanded, showing several sub-criteria. The "Event Direction Code" and "Time Band Code" sections are also expanded, showing their respective options. The "Create" and "Reset" buttons are at the bottom right.

Variable attributes:

- ▼ ☒ Selection Criteria
  - ▶ ☐ Event Destination Access Category Code
  - ▼ ☒ Event Direction Code
    - ☒ Download
    - ☐ INCOMING
    - ☐ OUTGOING
  - ▶ ☐ Network Operator Code
  - ▶ ☐ Network Type Code
  - ▶ ☐ Product Access Category Code
  - ▶ ☐ Product Access Standard Code
  - ▶ ☐ Service Category Code
  - ▶ ☐ Service Delivery Technology Code
  - ▶ ☐ Service ID
  - ▼ ☒ Time Band Code
    - ☐ Off Peak
    - ☒ Peak

Create Reset

- Click the arrow next to **Event Direction Code**, and then select **Download**.
  - Click the arrow next to **Time Band Code**, and then select **Peak**.
- c. Click the arrow next to **Aggregation**, and then select **Total**.



**Display 7.9** Behavioral Variables: Aggregation Selection

Variable attributes:

- ▶ ☒ Measures
- ▶ ☒ Selection Criteria
- ▼ ☒ Aggregation
  - ☐ Average
  - ☐ Count
  - ☐ Maximum
  - ☐ Minimum
  - ☒ Total
- ▶ ☐ Time Period

Create Reset

- d. Click the arrow next to **Time period**, and then select **Last 3 Month**.

**Display 7.10** Behavioral Variables: Time Period Selection

Variable attributes:

- ▶ ☐ Measures
- ▶ ☐ Selection Criteria
- ▶ ☐ Aggregation
- ▼ ☐ Time Period
  - ☐ Base 1 Month
  - ☐ Base 2 Month
  - ☐ Base 3 Month
  - ☐ Base 4 Month
  - ☐ Base 5 Month
  - ☐ Base 6 Month
  - ☐ Last 12 Month
  - ☐ Last 2 to 7 Month
  - ☒ Last 3 Month
  - ☐ Last 6 Month
  - ☐ Last 9 Month

Create Reset

4. Click **Create**.
5. In the right pane, view the variables that are created in the Variables Created table. Four variables are created for each combination of variable attributes that you have defined.



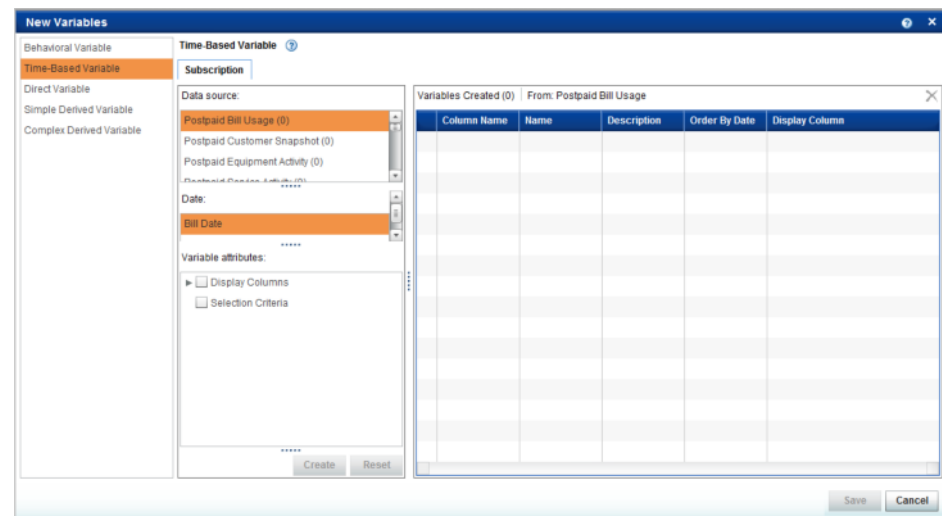
6. (Optional) Select the variables for which **Column Name** is generated as **D\_SUM\_PK\_PSU\_VL\_L3M**, **D\_SUM\_PK\_DNL\_VL\_L3M**, and **D\_SUM\_DNL\_PSU\_VL\_L3M**, and then on the toolbar click **X**.
7. Click **Save**.

## Create Time-Based Variables

To create time-based variables, complete these steps:

1. In the New Variables window, click **Time-Based Variable** in the left navigation pane.

**Display 7.12** Time-Based Variable Tab



2. From the **Data source** list, select a data source. The date and the variable attributes lists display values depending on the data source that you select.
3. From the **Date** list, select a date. The list shows the date type columns of the selected data source that can be used to identify the most recent records while creating time-based variables. In other words, in order to retrieve the most recent record, the records of the data source are ordered by the date column that you select from the list.
4. From the **Variable attributes** list, select the display columns and the selection criteria that will constitute the variables. You must select at least one display column. A selection criterion is optional.
  - a. Click the arrow next to **Display Columns** to expand the list, and then select the required display columns.
  - b. (Optional) Click the arrow next to **Selection Criteria** to expand the list, and then select the required criteria.

**TIP** Click **Reset** if you want to clear all the selected variable attributes.

5. Click **Create**. Based on the variable attributes that you have selected, one or more variables are created. These variables are displayed in the Variables Created table in the right pane of the New Variables window.

You can view the details of the variables that are created. You can perform certain additional tasks in this window. For details, see “Other Possible Tasks in the New Variables Window” on page 98.

**TIP** Repeat steps from 2 to 5 if you want to define variables for another data source.

6. (Optional) Click **Save**. The New Variables window closes, and the saved variables are displayed in the Variables table on the Analytical Base Table page.

### Example: Creating a Time-Based Variable

You want to define a variable that gives the most recent service activation date of a service (whose ID is equal to S9) from the Prepaid Service Activity base table. This table is ordered by activity date. To do so, you can define a time-based variable.

To define this time-based variable, complete these steps:

1. In the New Variables window, click **Time-Based Variable** in the left navigation pane.
2. From the **Data source** list, select **Prepaid Service Activity**.
3. From the **Date** list, select **Activity Status Date**.
4. Select the following **Variable attributes**:
  - a. Click the arrow next to **Display Columns** to expand the list, and then select **Service First Activation Date**.
  - b. Click the arrow next to **Selection criteria** to expand the list. Further expand **Service ID**, and then select **10 SERVICE ID**.

**Display 7.13** Time-Based Variable: Attributes Selection[illegible]

5. Click **Create**.
6. (Optional) In the right pane, view the variables that are created in the Variables Created table.

**Display 7.14** Time-Based Variables

The variable for which **Column Name** is generated as **LST\_S9\_RSA\_SRVFACDT\_BY\_ACTSTAT** is the variable of interest. The following table indicates the meaning of each string of the variable name.

**Table 7.5** Column Name of a Time-Based Variable

String	Meaning
LST	Is the code that is assigned to indicate a most recent variable.
S9	Indicates the code that is assigned to the dimensional attribute value (S9) that you have selected for the Service ID dimension. In other words, the code that is assigned to the target service that you have selected.
RSA	Indicates the code that is assigned to the data source (Prepaid Service Activity) that you have selected.
SRVFACDT	Indicates the code that is assigned to the display column (Service First Activation Date) that you have selected.

String	Meaning
BY_ACTSTAT	Indicates the code that is assigned to the date column (Activity Status Date) that you selected to order the records of the data source.

- (Optional) In the Variables Created table, select the variable for which **Column Name** is generated as **LST\_RSA\_SRVFACDT**, and then click **X**.
- Click **Save**.

## Create Direct Variables

To create direct variables, complete these steps:

- In the New Variables window, click **Direct Variable** in the left navigation pane.

**Display 7.15** Direct Variable Tab

- From the **Data source** list, select a data source. For example, you want to create variables that store the demographic details of the prospective customer, such as age, city, marital status, gender, and so on. For this, you might select the **Prospective Customer Dimension** data source.

Similarly, you want to create variables that store details about a subscription, such as the date on which the subscription was activated and the subscription type. For this, you might select the **Subscription Dimension** data source.

- In the **Variable attributes** list, click the arrow next to **Display Columns** to expand the list, and then select the required display columns.

*Note:* A direct variable stores a particular detail about a customer or a subscription as of the ABT build date. However, if the variable is marked as an outcome variable, the variable stores a particular detail about a customer or a subscription as of the outcome period end date.

**TIP** Click **Reset** if you want to clear all the selected variable attributes.

- Click **Create**. Based on the variable attributes that you have selected, one or more variables are created. These variables are displayed in the Variables Created table in the right pane of the New Variables window.

You can view the details of the variables that are created. Also, you can perform certain additional tasks in this window. For details, see “[Other Possible Tasks in the New Variables Window](#)” on page 98.

**TIP** Repeat steps from 2 to 4 if you want to define variables for another data source.

- (Optional) Click **Save**. The New Variables window closes, and the saved variables are displayed in the Variables Created table on the Analytical Base Table page.

### Example: Creating a Direct Variable

In your ABT, you want to define a variable that gives the subscription status from the Subscription dimension table as of the ABT build date. To do so, you can define a direct variable.

To define this direct variable, complete these steps:

- In the New Variables window, click **Direct Variable** in the left navigation pane.

**Display 7.16** Direct Variable Tab

The screenshot shows the 'New Variables' window with the 'Direct Variable' tab selected. On the left, the 'Subscription' data source is chosen. Under 'Variable attributes', the 'Display Columns' section is expanded, and 'Subscription Status Code' is selected. The 'Variables Created' table on the right is empty, with columns for Column Name, Name, Description, and Source Column. At the bottom right are 'Save' and 'Cancel' buttons.

- From the **Data source** list, select **Subscription Dimension**.
- Click the arrow next to **Display columns** to expand the list, and then select **Subscription Status Code**.
- Click **Create**.



**Display 7.17** *Direct Variable*

Variables Created (1) | From: Subscription Dimesion

Column Name	Source Column
D_SBD_SBST	Subscription Status Code

Save Cancel

## Create a Simple Derived Variable

### Common Steps

To create a simple derived variable, complete these steps:

1. In the New Variables window, click **Simple Derived Variable** in the left navigation pane.

**Display 7.18** Simple Derived Variable

2. In the central pane of the New Variables window, provide information for the following fields:

#### Type of expression

Select the type of expression that you want to define for the derived variable.

#### Based on Numeric Variables

This option enables you to define an expression by using numeric type of variables as an input. For example, you can use behavioral variables that compute an aggregated value of a measure for a certain period.

#### Based on Date Difference

This option enables you to define an expression that computes the difference between two date variables. Also, the output of the expression that you define is a numeric value. For example, you can use time-based variables or direct variables of date type to compute the difference between two dates.

#### Based on Date Operations

This option enables you to define an expression that computes a date by performing addition and subtraction operations on a date variable. Also, the

output of the expression that you define is a date value. For example, you can define an expression such as `Last_Usage_Date – 30`. The fixed time period that you define can be in days, weeks, or months.

### Based on Prebuilt Formula

This option enables you to define a variable based on a prebuilt formula, which is automatically generated based on the type for analysis that you want to perform.

### Type of analysis

This list is applicable only if you choose the **Based on Prebuilt Formula** option from the **Type of expression** list. Each option enables you to analyze the data from a different perspective such as trend in data, the spread of data, or the discontinuity in data. Depending on the type of analysis that you choose, the prebuilt formula for the derived variable differs.

### Name

Type a name for the variable. The variable is identified with this name in the SAS Customer Analytics for Communications interface. The name of a variable must be unique within an ABT.

### Column Name

Type a name for the corresponding column in the ABT. This is the actual name of the variable (column) as displayed in the ABT. A column name must be a valid SAS name and must not exceed 28 characters. Moreover, the column name must not be a SAS keyword that is reserved for a column. Here are the keywords that SAS reserves for columns: `_N_`, `_ERROR_`, `_NUMERIC_`, `_CHARACTER_`, and `_ALL_`.

### Description

Type a description for the variable. The description must not exceed 200 characters, including spaces.

3. Depending on the type of expression that you choose, perform the relevant steps.
  - For details, see [“Create a Simple Derived Variable Based on Numeric Variables” on page 77](#).
  - For details, see [“Create a Simple Derived Variable Based on Date Difference” on page 78](#).
  - For details, see [“Create a Simple Derived Variable Based on Date Operations” on page 79](#).
  - For details, see [“Create a Simple Derived Variable Based on Prebuilt Formula” on page 81](#).
4. You can perform certain additional tasks in this window. For details, see [“Other Possible Tasks in the New Variables Window” on page 98](#).
5. Click **Save**. The New Variables window closes, and the saved variables are displayed in the Variables table on the Analytical Base Table page.

**TIP** Click **Cancel** if you want to discard the created variables.

## Create a Simple Derived Variable Based on Numeric Variables

1. From the **Type of expression** list, select **Based on Numeric Variables**.
2. From the **Variables** list, select the variable that you want to use as an input variable. By default, the **Variables** list displays a list of all the existing behavioral, time-based, and direct variables. However, you can filter the variables by a particular variable type.

**Display 7.19** Simple Derived Variable: Numeric Variables

**Simple Derived Variable** ?

Type of expression: Based on Numeric Variables ?

Name: \*  ?

Column name: \*  ?


Description:   
Maximum 200 characters

Expression:


**Variables**  
All ▾  
S\_SUM\_PSU\_URVAT\_L6M  
D\_SUM\_PSU\_VL\_L3M  
D\_SUM\_PK\_PSU\_VL\_L3M  
D\_SUM\_PK\_DNL\_PSU\_VL\_L3M  
D\_SUM\_DNL\_PSU\_VL\_L3M

**Operators**  
+ - \*  
/ ( )  
...  
1 2 3  
4 5 6  
7 8 9  
0 log

Create Reset

- Click  to add the variable to the **Expression** field.
- Select the required operator, and then add another variable from the **Variables** list to the **Expression** field.


**TIP** Repeat steps from 1 to 4 to create the required expression for the derived variable.

- Click  to check whether the syntax of the expression is valid.
- Click **Create** to create the derived variable. The variable is added to the Variables Created table in the right pane.


**TIP** Click **Reset** if you want to clear the defined expression.

### Create a Simple Derived Variable Based on Date Difference


- From the **Type of expression** list, select **Based on Date Difference**.


- To select the first date variable, click  that is displayed next to **Variable 1**. The Search for Variable window appears.


**Display 7.20** Simple Derived Variable: Based on Date Difference

Simple Derived Variable 

Type of expression: 

Based on Date Difference 



Name: \*  

Column name: \*  


Description:

Maximum 200 characters

Expression:

Variable 1	Operator	Variable 2
<input type="text"/> 	minus (-)	<input type="text"/> 

Output difference in: \* 

Months 

Create

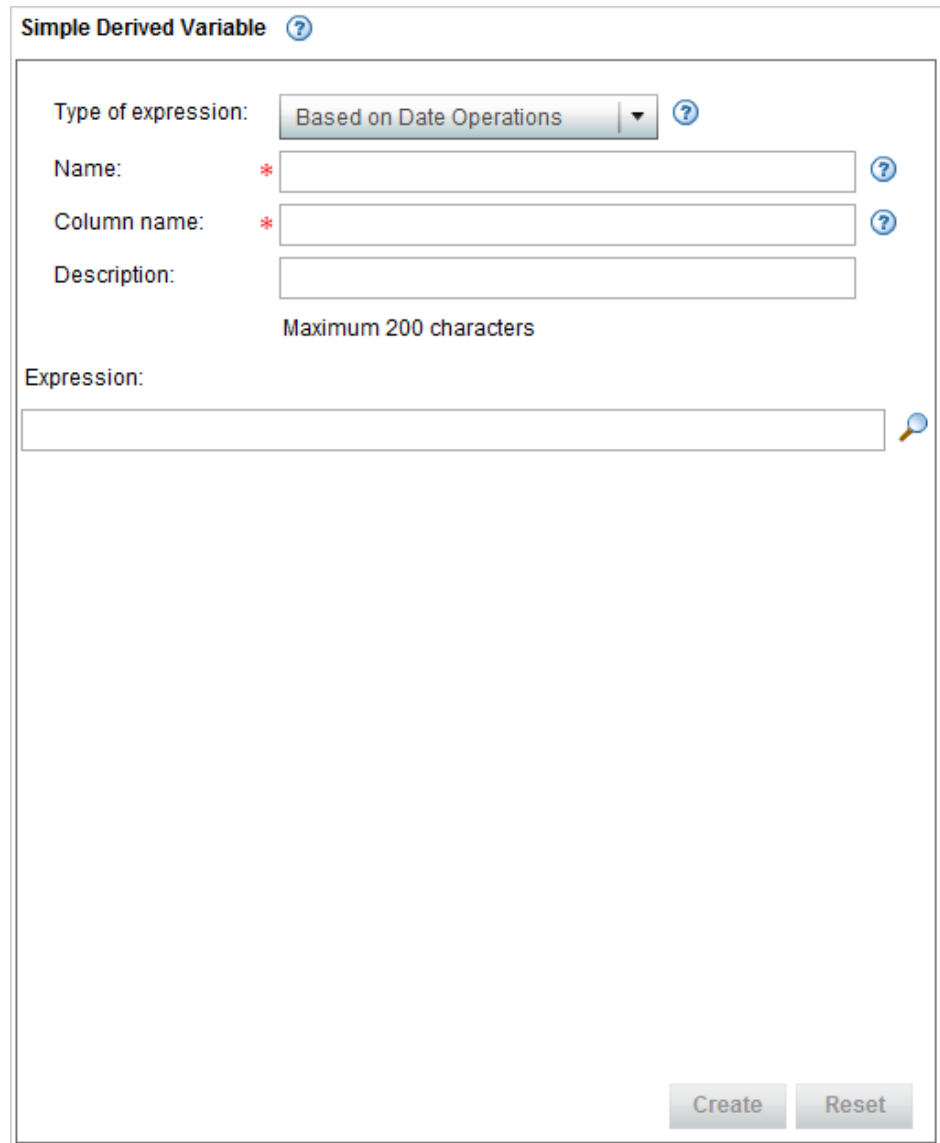
Reset

- Select the required variable and click **OK**.
- Repeat steps 2 and 3 for **Variable 2**.
- Select a format for the output difference. Depending on the option that you select, the derived variable stores the difference between the two dates (**Variable 1** and **Variable 2**) in days, weeks, or months.
- Click **Create** to create the derived variable. The variable is added to the Variables Created table in the right pane.

**TIP** Click **Reset** if you want to clear the defined expression.

### Create a Simple Derived Variable Based on Date Operations

- From the **Type of expression** list, select **Based on Date Operations**.

**Display 7.21** Simple Derived Variable: Date Operations


**Simple Derived Variable** ?

Type of expression: Based on Date Operations ?

Name: \* ?

Column name: \* ?

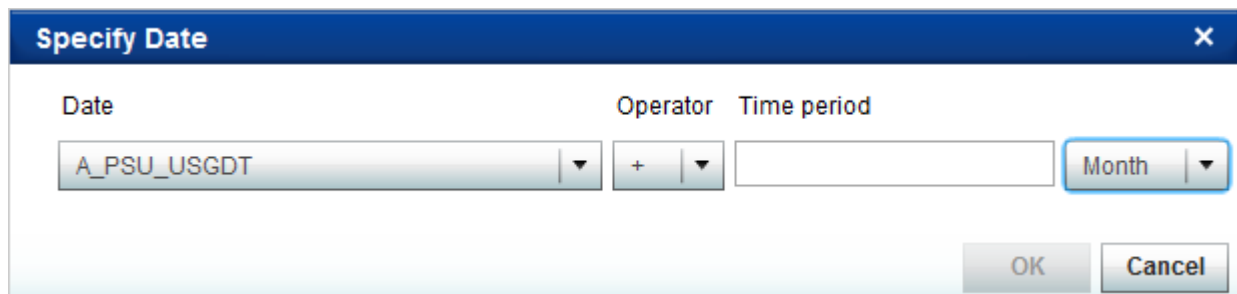
Description: ?

Maximum 200 characters

Expression: ?

Create Reset

2. To select the date variable, click ? that is displayed. The Select Date window appears.

**Display 7.22** Specify Date Window


**Specify Date** x

Date	Operator	Time period
A_PSU_USGDT	+	Month

OK Cancel

3. Select the required variable and click **OK**.
4. From the **Operator** list, select the + (addition) or — (subtraction) operator.

5. In the **Time period** field, type the fixed period that you want to add to or subtract from the variable that you have selected.
6. From the list, select **Days**, **Weeks**, or **Months** to indicate the unit of the fixed period that you have specified.
7. Click **OK** to create the expression for the derived variable.
8. Click **Create**. The variable is added to the Variables Created table in the right pane.

**TIP** Click **Reset** if you want to clear the defined expression.

### Create a Simple Derived Variable Based on Prebuilt Formula

These types of simple derived variables require a continuous data series as an input. The prebuilt formula is generated by using these input variables. Also, the prebuilt formula that is generated differs depending on the type of analysis that you choose.

*Note:* Before you define any of these variables, make sure that the input variables are populated with the required data. The input variables are behavioral variables that are defined for weekly or monthly time periods.

SAS Customer Analytics for Communications supports the following types of analysis:

#### Trend in data

This type of analysis indicates the behavioral pattern of the series of input variables. For example, there are six historical values of a customer's outbound usage in the past six months. In this case, the trend in data analysis indicates whether the customer's outbound usage is increasing, decreasing, or remaining constant. The trend in data is computed based on the following linear regression equation:

$$Y = a + bx$$

Here, Y is the input variable and x is the day, week, or month number in the series.

#### Spread of data

This analysis indicates how the data points in the input data series are spread from the average of the series. The spread of data is computed by using the following formula:

$$\sqrt{\frac{\sum_{i=1}^N (x_i - \bar{x})^2}{N}}$$

Here,  $\bar{x}$  is the average of the input data series and N is the number of time periods that are considered in the data series.

#### Discontinuity in data

This analysis indicates how the data points in the input data series are spread from the median. The discontinuity in data is computed by using the following formula:

$$\sum_{i=1}^n t\_cnt_i$$

Here,  $t\_cnt_i$  indicates whether the consecutive variables in the data series are widely spread from the median of the input data series. This value is computed by using the following formula:

$$t\_cnt_i = 1 \text{ if } abs((input\_var_i - input\_var_{i+1}) - median(input\_var_i - input\_var_{i+1})) > \text{Cutoff value} \text{ else } 0$$

In both these formulas, N is the number of the time periods that are considered in the data series.

To define a simple derived variable based on a prebuilt formula, complete these steps:

1. From the **Type of expression** list, select **Based on Prebuilt Formula**.

**Display 7.23** Simple Derived Variable: Prebuilt Formula

The screenshot shows the 'New Variables' dialog box with the 'Simple Derived Variable' tab selected. The 'Type of expression' is set to 'Based on Prebuilt Formula'. The 'Type of analysis' is 'Trend in data'. The 'Name' field is empty. The 'Column name' field is empty. The 'Description' field is empty. The 'Variables for computing trend in data' section shows 'Available items' with a list of variables: D\_SUM\_PSU\_VL\_B1M, D\_SUM\_PK\_PSU\_VL\_B1M, D\_SUM\_PK\_DNL\_PSU\_VL\_B1M, D\_SUM\_DNL\_PSU\_VL\_B1M, D\_SUM\_PSU\_VL\_B2M, D\_SUM\_PK\_PSU\_VL\_B2M, and D\_SUM\_PK\_DNL\_PSU\_VL\_B2M. The 'Selected items' list is empty. The 'Number of time periods' field is set to '(0 - 0) month(s)'. The 'Create' button is enabled. The 'Reset' button is disabled. The 'Variables Created (0)' table is empty.

2. Select the appropriate option from the **Type of analysis** list.
3. From the **Available items** list, select the first variable of the input data series.
4. Click to add the selected variable to the **Selected items** list.
5. In the **Number of time periods** field, enter the total number of variables in the input data series. This value should be inclusive of the first variable that you have selected. The **Create** button is enabled only if sufficient number of input variables are available.

*Note:*

- After you enter the time period, the subsequent variables in the data series are automatically entered to the **Selected items** list as a continuous series. For example, you select **D\_SUM\_PRU\_DR\_B1M** as the first variable of the data series and type 3 as the number of time periods. In this case, the other variables, **D\_SUM\_PRU\_DR\_B2M** and **D\_SUM\_PRU\_DR\_B3M** are added in sequence to the **Selected items** list.
  - If you want to change the data series, remove all the variables from the **Selected items** list, and then select the first variable of the new data series again. Also enter the number of time periods.
6. (Optional) If you have selected the **Discontinuity in data** option from the **Type of analysis** list, enter the cutoff value. This value indicates the maximum limit within which discontinuity between the consecutive data points is acceptable. For example, you type 0.5 as the cutoff value. Assume that the discontinuity between the consecutive data points is 0.7. In this case, the discontinuity indicator is marked as 1 for the specific pair of input variables.



### ***Example: Creating Simple Derived Variables***

#### ***Example: Creating Simple Derived Variable Based on Numeric Variables***

Assume that you have defined the two behavioral variables. The first variable computes the total number of voice calls in the past six months. The second variable computes the total number of all types of calls in the past six months. You want to define a numeric variable that computes the proportion of voice calls in the total number of calls. You want to compute this value for a period of past six months. To do so, you have to define a simple derived variable, whose expression is built based on numeric variables.

To define this simple derived variable, complete these steps:

1. In the New Variable window, select **Simple Derived Variable** in the left navigation pane.
2. Specify the following details for the variable:

**Display 7.24** Simple Derived Variable: Numeric Variables



**Simple Derived Variable** ?


Type of expression: Based on Numeric Variables ?

Name: \* Proportion of Voice Calls ?


Column name: \* PROPEN\_VOICE\_CALLS\_LAST\_6M ?


Description: Formula that computes the proportion of voice calls in the la  
Maximum 200 characters

Expression:  



Variables	Operators
Behavioral	
S_SUM_PSU_URVAT_L6M	
D_SUM_PSU_VL_L3M	
D_SUM_PK_PSU_VL_L3M	
D_SUM_PK_DNL_PSU_VL_L3M	
D_SUM_DNL_PSU_VL_L3M	
D_SUM_PSU_VL_B1M	
D_SUM_PK_PSU_VL_B1M	

Create Reset




















- a. From the **Type of expression** list, select **Based on Numeric Variables**.
- b. In the **Name** field, you can type *Proportion of Voice Calls*.
- c. In the **Column name** field, you can type *PROPN\_VOICE\_CALLS\_LAST\_6M*.
- d. In the **Description** field, you can type the *Formula that computes the proportion of voice calls in the last four months*.
3. Create the expression to define the formula.
  - a. Filter on **Behavioral Variables**.
  - b. From the list, select the variable that indicates the total number of voice calls in the past six months. For example, this variable can be **D\_SUM\_VOC\_PSU\_CN\_L6M**.
  - c. Click  to add the selected variable.
  - d. From the **Operator**, click **/**.


- e. From the list, select the behavioral variable that indicates the total number of calls in the past six months. For example, this variable can be **D\_SUM\_PSU\_CN\_L6M**.
- f. Click  to add the selected variable.

**Display 7.25** Simple Derived Variable: Expression

Expression:  

D\_SUM\_VOC\_PSU\_CN\_L6M/D\_SUM\_PSU\_CN\_L6M

Variables	Operators
All 	   
D_SUM_PK_PSU_VL_B6M	  
D_SUM_PK_DNL_PSU_VL_B6M	  
D_SUM_DNL_PSU_VL_B6M	  
D_SUM_PSU_VL_L6M	  
D_SUM_VOC_PSU_VL_L6M	 
<b>D_SUM_PSU_CN_L6M</b>	
D_SUM_VOC_PSU_CN_L6M	

- g. Click  to make sure that the expression, **D\_CNT\_VOC\_PSU\_CN\_L6M/D\_CNT\_PSU\_CN\_L6M** is valid.
- h. Click **Create**. The derived variable that is created is displayed in the right pane.



**Display 7.27** Simple Derived Variable: Date Difference

Simple Derived Variable

Type of expression: Based on Date Difference

Name: \* Current Tenure of a Customer

Column name: \* CUST\_CURR\_TENURE

Description: Formula that computes the current tenure of a customer  
Maximum 200 characters

Expression:

Variable 1	Operator	Variable 2
REFERENCE_DTTM	minus (-)	A_CSD_FRCSTDT

Output difference in: \* Days

Create Reset

- a. From the **Type of expression** list, select **Based on Date Variables**.
  - b. In the **Name** field, you can type *Current Tenure of a Customer*.
  - c. In the **Column name** field, you can type *CUST\_CURR\_TENURE*.
  - d. In the **Description** field, you can type *Formula that computes the current tenure of a customer*.
3. Create the expression to define the formula.
    - a. Select **Date Input Variable**.
    - b. In the **Variable 1** field, select **REFERENCE\_DTTM**.
    - c. In the **Variable 2** field, select **A\_CSD\_FRCSTDT**.
    - d. From the **Output difference in** list, select **Days**.
    - e. Click **Create**. In the right pane, view the expression that is created for the derived variable.

**Display 7.28** Simple Derived Variable: Date Difference

The screenshot shows a dialog box titled "Variables Created (1)" with a close button (X) in the top right corner. Inside the dialog is a table with four columns: "Column Name", "Name", "Description", and "Expression". The first row contains the following data:

Column Name	Name	Description	Expression
CUST_CURR_TENURE	Current Te...	Formula th...	intck("D",DAY,A_CSD_FRCSTDT,REFERENCE_DTTM)

Below the table, there are "Save" and "Cancel" buttons.

### **Example: Creating Simple Derived Variable Based on Date Operations**

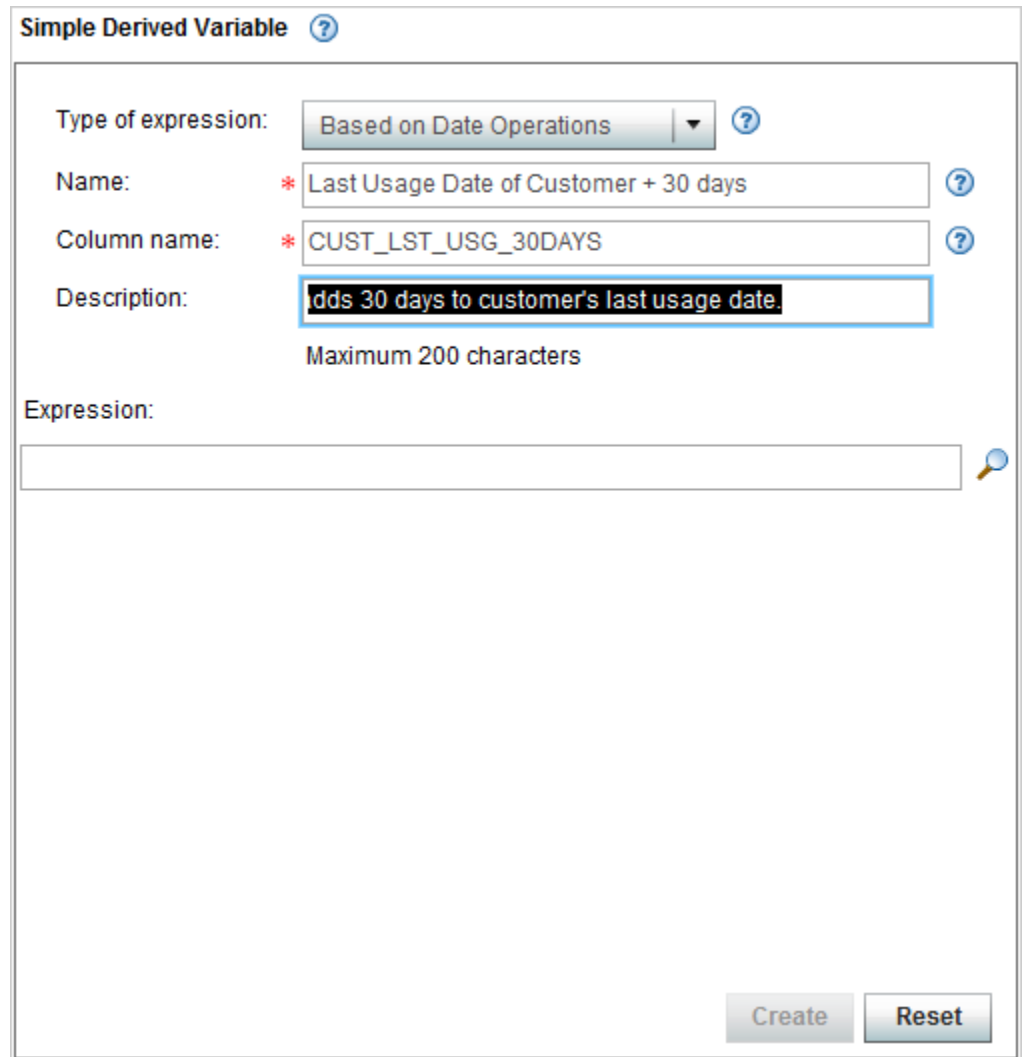
You want to define a date variable that computes a date based on the expression, which is computed by adding a fixed period in days to a time-based variable. The formula for this expression is as mentioned below:

$\text{Last\_Usage\_Dt} + 30 \text{ days}$

To do so, you have to define a simple derived variable, whose expression is built by using the addition operator on a date variable.

To define this simple derived variable, complete these steps:

1. In the New Variable window, select **Simple Derived Variable** in the left navigation pane.
2. Specify the following details for the variable:

**Display 7.29** Simple Derived Variable: Date Operations


**Simple Derived Variable** ?

Type of expression: Based on Date Operations ?

Name: \* Last Usage Date of Customer + 30 days ?

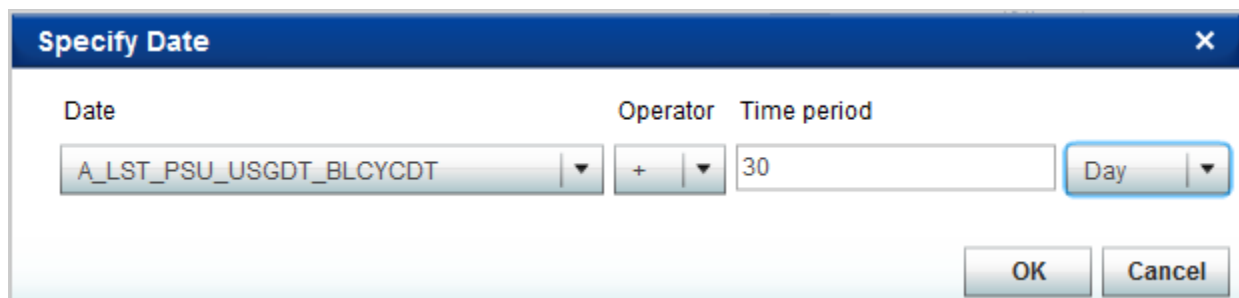
Column name: \* CUST\_LST\_USG\_30DAYS ?

Description: adds 30 days to customer's last usage date.  
Maximum 200 characters

Expression:

Create Reset

- a. From the **Type of expression** list, select **Based on Date Operations**.
  - b. In the **Name** field, you can type *Last Usage Date of Customer + 30 days*
  - c. In the **Column name** field, you can type *CUST\_LST\_USG\_30DAYS*.
  - d. In the **Description** field, you can type *Formula that adds 30 days to customer's last usage date*.
3. In the Specify Date window, create the expression to define the formula.

**Display 7.30** Specify Date Window


**Specify Date** X

Date	Operator	Time period
A_LST_PSU_USGDT_BLCYCDT	+	30
		Day

OK Cancel

- a. From the **Date** list, select the **A\_LST\_PSU\_USGDT\_BLCYCDT** time-based variable.
- b. From the **Operator** list, select **+**.
- c. In the **Time period** field, type **30**.
- d. From the list, select **Day**.
- e. Click **OK**. View the expression that is created for the derived variable.

**Display 7.31** Simple Derived Variable: Date Operations

The screenshot shows a dialog box titled "Simple Derived Variable" with a help icon. It contains the following fields and controls:

- Type of expression:** A dropdown menu set to "Based on Date Operations" with a help icon.
- Name:** A text field containing "Last Usage Date of Customer + 30 days" with a red asterisk and a help icon.
- Column name:** A text field containing "CUST\_LST\_USG\_30DAYS" with a red asterisk and a help icon.
- Description:** A text field containing "adds 30 days to customer's last usage date." with a "Maximum 200 characters" label below it.
- Expression:** A text field containing the formula `intnx('DTPDAY',A_LST_PSU_USGDT_BLCYCDT,+30,'same')` with a search icon.
- Buttons:** "Create" and "Reset" buttons at the bottom right.

- f. Click **Create**.
- g. Click **Save**.

### **Example: Create a Simple Derived Variable Based on a Prebuilt Formula**

Assume that you have defined a series of four behavioral variables that indicates the customer's outbound voice call usage for each month. You want to define an expression that computes the discontinuity in the series of the outbound voice calls usage in the past four months. To do so, you have to define a simple derived variable whose expression is generated based on a prebuilt formula.



To define this variable, complete these steps:

1. In the New Variable window, select **Simple Derived Variable** in the left navigation pane.
2. Specify the following details for the variable:
  - a. From the **Type of expression** list, select **Based on Prebuilt Formula**.
  - b. From the **Type of analysis** list, select **Discontinuity in data**.
  - c. In the **Name** field, you can type *Discontinuity in Outbound Usage*.
  - d. In the **Column name** field, you can type *DISCNT\_OB\_VOC\_CALLS\_L4M*.
  - e. In the **Description** field, you can type *Formula that computes the discontinuity in the outbound usage of a customer in the past four months*.
3. Generate the prebuilt formula.

**Display 7.32** Simple Derived Variable: Prebuilt Formula

**Simple Derived Variable**

Type of expression: Based on Prebuilt Formula

Type of analysis: Discontinuity in data

Name: \* Discontinuity in Outbound Usage

Column name: \* DISCNT\_OB\_VOC\_CALLS\_L6M

Description: Formula that computes the discontinuity in the outbound usage of a customer in t  
 Maximum 200 characters

Variables for discontinuity in data

Available items:
 

D\_CNT\_PSU\_CN\_B1M  
 D\_CNT\_OUT\_PSU\_CN\_B1M  
 D\_CNT\_PSU\_CN\_B2M  
 D\_CNT\_OUT\_PSU\_CN\_B2M  
 D\_CNT\_PSU\_CN\_B3M  
 D\_CNT\_OUT\_PSU\_CN\_B3M  
 D\_CNT\_PSU\_CN\_B4M

Selected items:
 

D\_CNT\_OUT\_PSU\_CN\_B1M  
 D\_CNT\_OUT\_PSU\_CN\_B2M  
 D\_CNT\_OUT\_PSU\_CN\_B3M  
 D\_CNT\_OUT\_PSU\_CN\_B4M

Number of time periods: \* 4 (2 - 4) month(s)

Cutoff value: \* 0.3 (0 - 1)

Create Reset



```
CASE WHEN (DIFF > 30 THEN CUST_TERM_DT =LAST_USAGE_DT_30_DAYS)
```

In this expression:

- DIFF is a simple derived variable that you compute based on a date difference (Reference Date — LAST\_USAGE\_DT).
- LAST\_USAGE\_DT\_30\_DAYS is the result that you can configure if the expression evaluates to TRUE. This can be a simple derived variable that you can define based on date operations (LAST\_USAGE\_DT +30).
- If the expression evaluates to FALSE, then the expression would return a NULL value.

To create a complex derived variable, complete these steps:

1. In the New Variables window, click **Complex Derived Variable** in the left navigation pane.

**Display 7.34** Complex Derived Variable

2. In the right pane of the New Variables window, provide information for the following fields:

#### **Name**

Type a name for the variable. The variable is identified with this name in the application interface. The name of a variable must be unique within an ABT and must not exceed 40 characters.


#### **Column name**

Type a name for the corresponding column in the ABT. This is the actual name of the ABT variable (column) as displayed in the ABT. A column name must be a valid SAS name and must not exceed 28 characters. Moreover, the column name must not be a SAS keyword that is reserved for a column. Here are the keywords that SAS reserves for columns: `_N_`, `_ERROR_`, `_NUMERIC_`, `_CHARACTER_`, and `_ALL_`.

#### **Description**

Type a description for the variable. The description must not exceed 200 characters, including spaces.

3. Create an expression for the derived variable.


- a. From the **Variables** list, select a variable. By default, the **Variables** list displays a list of all the existing behavioral, time-based, direct, and simple derived variables. However, you can filter the variables by a particular variable type.
- b. Click  to add the variable to the **Expression** field.
- c. Select the required operator, and then specify one or more values for the variable to form a valid logical condition.


The values must be separated by commas. A character value must be enclosed within single quotation marks. Use an initial zero for decimal fractions less than one. For example, enter 0.9 instead of .9.

- d. If you want to add another logical condition to the variable expression, select the conjunction operator **AND** or **OR**, and then repeat steps a through c.

If you want a record to satisfy the current condition along with the previous condition, select **AND**. If you want a record to satisfy either of the two conditions, select **OR**.



You can add a maximum of four logical conditions in a variable expression. The conditions are resolved in the same order in which they are specified.

- e. Click  to check whether the syntax of the expression is valid.

**TIP** Click  if you want to clear the specified conditions.

- f. (Optional) Select the **Change the default results** check box if you want to define the values that the expression returns.

*Note:* If you do not select the **Change the default results** check box, then 1 is returned if the expression evaluates to TRUE and 0 if the expression evaluates to FALSE.

- Click  that is displayed beside **Value if TRUE**. In the Select Value window, select the variable that you want the expression to return if it evaluates to TRUE. You must select a variable for this field. Otherwise, you will not be able to create the variable.
- (Optional) Click  that is displayed beside **Value if FALSE**. In the Select Value window, select the variable that you want the expression to return if it evaluates to FALSE.

**TIP** If the expression returns a NULL value when the expression evaluates to FALSE, then do not specify any value in the **Value if FALSE** field.

- g. Click **Create** to create the derived variable. The variable is displayed in the Variables Created table in the New Variables window.

*Note:* The **Expression** column in the Variables Created table shows the expressions of the complex derived variables. For details, see [“Expressions in Complex Derived Variables” on page 95](#).

4. Repeat steps 2 through 3 to create the required number of variables, and then click **Save**. The New Variables window closes and the saved variables are displayed in the Variables table on the Analytical Base Table page.

**TIP** Click **Cancel** if you want to discard the created variables.

## Expressions in Complex Derived Variables

If the expression of a complex derived variable has multiple conditions joined by AND or OR conjunctions, the expression is generated in a format similar to the following:

```
(CASE WHEN (<variable 1> <operator> <value> AND
<variable 2> <operator> <value> OR
<variable 3> <operator> <value>...) THEN <Value if TRUE> ELSE <VALUE if FALSE> END)
```

For example, you want to define a variable that determines the churn flag for a postpaid subscription based on either of the following conditions:

- The subscription status is DEACTIVATED, CLOSED, or SUSPENDED in the current month.
- There are no outbound and inbound calls in the past three months.

For this variable, you can build the expression as follows:

```
CASE WHEN(SUBS_STATUS_CD IN('DEACTIVATED','CLOSED','SUSPENDED') OR
TOT_PSU_L3M =0) THEN 1 ELSE 0
```

In this expression, SUBS\_STATUS\_CD is a time-based variable and TOT\_PSU\_L3M is a behavioral variable.

## Example: Creating a Complex Derived Variable

You want to define a target variable for the ABT that you want to build for your customer lifetime project. For this project, the deactivation indicator of a customer can be defined as the target variable. To do so, you can define a complex variable. The value of the complex derived variable is 1 if the customer churns before the reference date. The value of the variable is 0 if the customer does not churn before the reference date. In this case, you can build the appropriate expression for your complex derived variable (DEACT\_IND) as mentioned below:

```
(CASE WHEN (DIFF >=0 ) THEN 1 ELSE 0 END )
```


In this expression, DIFF is a simple derived variable that determines the difference between the reference date and the customer's deactivation date. The expression indicates that if the difference is greater than or equal to zero, then the customer has churned before the end of the history window. Therefore, the value of DEACT\_IND is 1. However, if the customer does not churn before the end of the history window, the value of DEACT\_IND is 0.


To do so, you have to define a complex derived variable.

To define this variable, complete these steps:

1. In the New Variables window, select **Complex Variable** in the navigation pane.
2. Enter the following details for the variables:

**Display 7.35** Complex Derived Variable Definition




Name: \* Customer's Deactivation Date 


Column name: \* DEACT\_IND 


Description: Customer's Deactivation flag  
 Maximum 200 characters

Expression: \*
 



Variable	Operator	Value	Conjunction
DIFF	>=	0	NONE
			NONE
			NONE
			NONE

**Variables**
☐ Change the default results of the expression 

All 

Tenure of the customer in months wrt refe...  
 DIFF

Value if TRUE:    
 Value if FALSE:  


- a. In the **Name** field, you can type *Customer's Deactivation Indicator*.
  - b. In the **Column name** field, you can type *DEACT\_IND*.
  - c. In the **Description** field, you can type *Customer's Deactivation Indicator*.
3. Define the expression.








must resolve the indicated errors. You can change the default values according to your requirement.

Click  to change the name, column name, or the description.


*Note:* If you rename the column name of a behavioral variable, make sure that it is not the same as the column name of the measure that is used to derive that variable.


### **Deleting Variables**

Based on the variable attributes you specify, SAS Customer Analytics for Communications creates variables for each unique combination of these attributes. However, you might not need all the variables that are created in the Variables Created table. You can delete such variables. Select the variable that you want to delete and click .

## **Edit Variable Properties**

On the Analytical Base Table page, the Variables table displays a list of all the variables that are available in the selected ABT. You can filter the variables by a particular variable type.

In the Variables table, you can edit a variable's name, column name, and description. To do so, click .

The  icon beside a variable indicates that the variable is a linked variable (that is, the variable is used in one or more derived variables). When you edit the column name of a linked variable, the expression of the derived variables that contain this linked variable are automatically updated to use the changed column name.

## **Importing Variables**

### **Overview**


In addition to creating new variables for your ABT, you can import variables from an existing ABT that is in a project that you have created. If you want to import variables from an ABT that is in a project that was created by another user, that ABT must be shared.

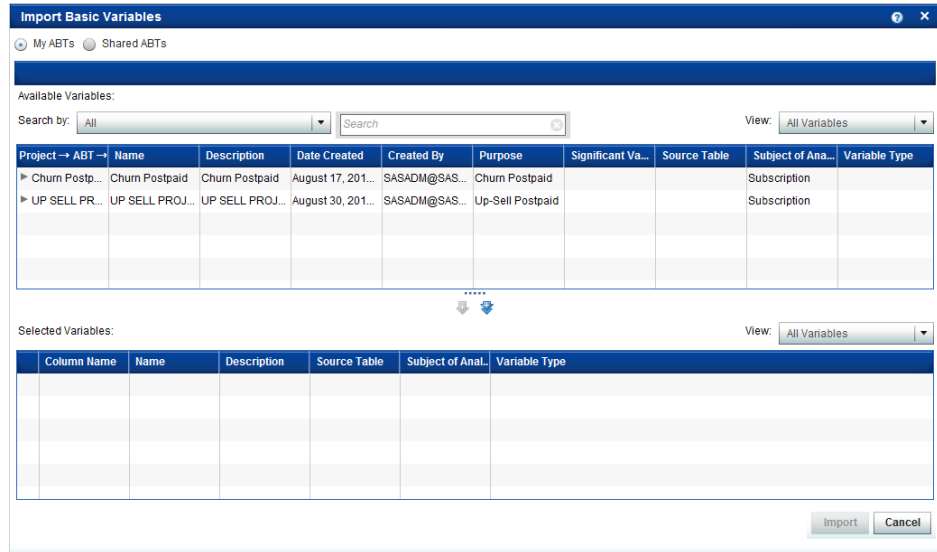
You can import variables from a source ABT based on the following conditions:

- The level at which the ABT is built (such as customer or subscription) is the same for both the source and the target ABT.
- The level of data aggregation is the same for both the ABTs. For example, the level of data aggregation for the source ABT is Monthly. In this case, you can import variables from this ABT only if the target ABT has a Monthly level of data aggregation.

### **Import Basic Variables**

To import basic variables from an ABT, complete these steps:

1. Select the Analytical Base Table page.
2. On the toolbar, click , and then select **Import Basic Variables**. Alternatively, on the toolbar, select **Menu** ⇒ **Import** ⇒ **Basic Variables**. The Import Basic Variables window appears.

**Display 7.38** Import Basic Variables Window


Using the Import Basic Variables window, you can import the basic variables, which include behavioral variables, time-based variables, and direct variables, from an ABT.

3. Select **My ABTs** if you want to import variables from the projects that you have created. Select **Shared ABTs** if you want to import variables from the projects that other users have created.
  - If you select **My ABTs**, the Available Variables table displays a list of all the projects that you have created. You can import variables from any or all of the projects.
  - If you select **Shared ABTs**, the Available Variables table displays a list of all the projects that have been created by other users and that have their ABTs shared. You can import variables from any or all of the projects.

*Note:* The first column of the Available Variables table shows information at three levels: project, ABT, and variables. You can click ► to expand a level and view the values at the next level. Other columns show information with respect to the information in the first column. For example, for a project, the **Date Created** column shows the date when the project was created. However, for an ABT, the **Date Created** column shows the date when the ABT was created.

4. In the Available Variables table, expand a project to view the ABT in that project. Further expand the ABT to view the list of behavioral, time-based, and direct variables in that ABT. By default, the table displays all three types of variables that the ABT contains. However, you can filter the variables by a particular variable type by selecting that variable type from the **View** list.

You can also use the **Search by** feature to search for a variable.

**Display 7.39** Import Basic Variables Window

Import Basic Variables

My ABTs Shared ABTs

Available Variables:

Search by: All Search View: All Variables

Project → ABT → Variable	Name	Description	Date Created	Created By	Purpose	Significant V...	Source Table	Subject of A...	Variable Type
▼ UP SELL PROJECT	UP SELL PR...	UP SELL PR...	August 30, 20...	SASADM@SA...	Up-Sell Postp...			Subscription	
▼ UP_SELL_ABt	UP SELL ABT	UP SELL ABT	August 30, 20...	SASADM@SA...					
S_SUM_PSU_UR...	S_SUM_PSU...	S_SUM_PSU...	August 30, 20...	SASADM@SA...		No	Postpaid Usa...	Subscription	Behavioral Vari...
D_LST_PSU_US...	D_LST_PSU...	D_LST_PSU...	August 30, 20...	SASADM@SA...		No	Postpaid Usa...	Subscription	Time Based Va...
D_LST_3G_PSU...	D_LST_3G_P...	D_LST_3G_P...	August 30, 20...	SASADM@SA...		No	Postpaid Usa...	Subscription	Time Based Va...

Selected Variables:

View: All Variables

Column Name	Name	Description	Source Table	Subject of Anal.	Variable Type

Import Cancel

*Note:* A dimmed variable in the Available Variables table indicates that a variable with the same definition already exists in your current ABT.

5. Select the variables that you want to import, and then click to add the selected variables to the Selected Variables table.

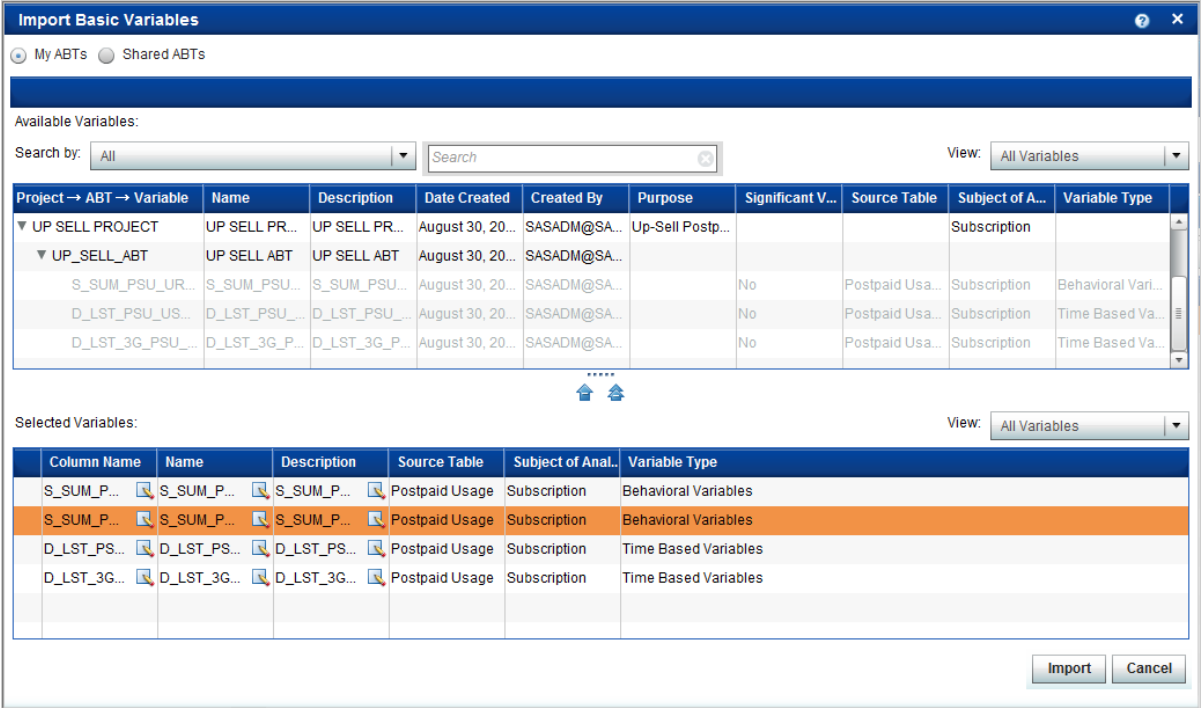
After you add a variable to the Selected Variables table, the variable appears dimmed in the Available Variables table.

#### TIP

- To select multiple adjacent variables, select a variable, hold down the SHIFT key, and then use the DOWN ARROW key to select the variables.
- To select multiple nonadjacent variables, select a variable, and then hold down the CTRL key while you click other variables that you want to select.
- Click if you want to add all the variables that are currently displayed in the Available Variables table to the Selected Variables table.
- If you want to remove a variable from the Selected Variables table, select the variable, and then click .
- If you want to remove all the variables from the Selected Variables table, click .

6. Repeat steps from 2 to 5 to select variables from other ABTs.
7. After you have added the desired variables to the Selected Variables table, click **Import**.


Display 7.40 Import Basic Variables Window



The Import Basic Variables window closes, and the imported variables are displayed in the Variables table in the Analytical Base Table page.

Import Derived Variables

To import derived variables from an ABT, complete these steps:

1. Select the Analytical Base Table page.
2. On the toolbar, click , and then select **Import Derived Variables**. Alternatively, on the toolbar, select **Menu** ⇨ **Import** ⇨ **Derived Variables**. The Import Derived Variables window appears.

**Display 7.41** Import Derived Variables Window

Import Derived Variables

My ABTs Shared ABTs

Available Variables:

Search by: All Search

Project → ABT → Var	Name	Description	Date Created	Created By	Purpose	Significant Variable	Expression
► Churn Postpaid	Churn Postpaid	Churn Postpaid	August 17, 2011 02:...	SASADM@SASPW	Churn Postpaid		
► CHURN POSTPAID...	CHURN POSTPAID 2	CHURN POSTPAID 2	August 29, 2011 03:...	SASADM@SASPW	Churn Postpaid		

Selected Variables: \*\*\*\*\* View: All Variables

Column Name	Name	Description	Source Table	Subject of Anal.	Variable Type

Import Cancel

Using the Import Derived Variables window, you can import the derived variables, which include simple derived variables and complex derived variables, from an ABT.

3. Select **My ABTs** if you want to import variables from the projects that you have created. Select **Shared ABTs** if you want to import variables from the projects that other users have created.
  - If you select **My ABTs**, the Available Variables table displays a list of all the projects that you have created. You can import variables from any or all of the projects.
  - If you select **Shared ABTs**, the Available Variables table displays a list of all the projects that have been created by other users and that have their ABTs shared. You can import variables from any or all of the projects.

*Note:* The first column of the Available Variables table shows information at three levels: project, ABT, and variables. You can click ► to expand a level and view the values at the next level. Other columns show information with respect to the information in the first column. For example, for a project, the **Date Created** column shows the date when the project was created. However, for an ABT, the **Date Created** column shows the date when the ABT was created.

4. In the Available Variables table, expand a project to view the ABT in that project. Further expand the ABT to view the list of simple derived and complex derived variables in that ABT.

*Note:* A dimmed variable in the Available Variables table indicates that a variable with the same definition already exists in your current ABT.

5. In the Available Variables table, select the variable that you want to import. The Selected Variables table displays the selected derived variable and the variables that constitute that derived variable. By default, the Selected Variables table displays all types of variables. However, you can filter the variables by a particular variable type by selecting that variable type from the **View** list.

**Display 7.42** Import Derived Variables Window

Import Derived Variables

My ABTs Shared ABTs

Available Variables:

Search by: All Search

Project -> ABT -> Var	Name	Description	Date Created	Created By	Purpose	Significant Variable	Expression
► Churn Postpaid	Churn Postpaid	Churn Postpaid	August 17, 2011 02:...	SASADM@SASPW	Churn Postpaid		
▼ CHURN POSTPAID...	CHURN POSTPAID 2	CHURN POSTPAID 2	August 29, 2011 03:...	SASADM@SASPW	Churn Postpaid		
▼ CHURN_POST...	Churn Postpaid ABT	Churn Postpaid ABT	August 29, 2011 03:...	SASADM@SASPW			
PROP_N_V...	Proportion of Voice ...	Formula that compu...	August 30, 2011 11:...	SASADM@SASPW		No	D_SUM_VOC_PSU_...

Selected Variables: \*\*\*\*\* View: All Variables

Column Name	Name	Description	Source Table	Subject of Anal.	Variable Type
PROP_N_V...	Proportion ...	Formula th...			Derived Variables
D_SUM_P...	D_SUM_P...	D_SUM_P...	Postpaid Usage	Subscription	Behavioral Variables
D_SUM_V...	D_SUM_V...	D_SUM_V...	Postpaid Usage	Subscription	Behavioral Variables

Import Cancel

*Note:* In the Available Variables table, you can select only one variable at a time.

6. Click **Import**. The derived variable and the associated variables are imported.
7. (Optional) Repeat steps from 2 to 5 to import variables from other ABTs.

## Share ABT

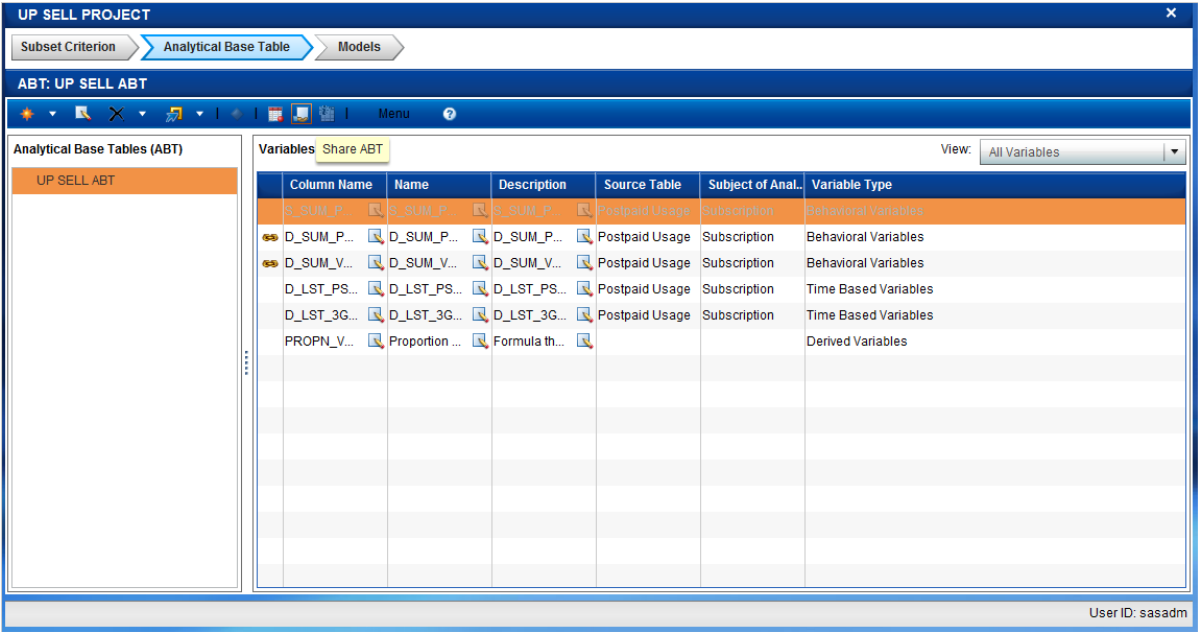
The variables that you create for an ABT in a project are available across all your projects. That is, you can import and use those variables in any of your projects. However, if you want those variables to be available to other users' projects as well, you must share the ABT that contains those variables.

You can share your ABT any time after you have defined it. This feature enables other users to import all the variables that you have already created for your ABT and the variables that you might create in the future.

To share an ABT, complete these steps:

1. Select the Analytical Base Table page.

Display 7.43 Analytical Base Table Page: Share ABT



2. On the toolbar, click . Alternatively, on the toolbar, select **Menu** ⇒ **Share ABT**.

*Note:* When you share an ABT, all the variables in that ABT are shared. It is not possible to share variables selectively.

## Stop Sharing an ABT

To stop other users from importing variables from your ABT, on the toolbar of the **Analytical Base Table** page, click . Alternatively, on the toolbar, select **Menu** ⇒ **Stop Sharing**.

## Defining an Outcome Variable

### Overview of an Outcome Variable

Typically, an outcome variable (also known as a dependent variable or target variable) defines the event of interest. For example, in a customer retention project, the event that is under consideration is customer churn.

An outcome variable indicates whether the associated event occurred within the specified period. For example, in a customer retention project, the outcome variable (CHURN) has a value of 1 (one) for a customer who churned within the specified outcome period. For a customer who did not churn during the specified outcome period, the outcome variable has a value of 0 (zero).


In a customer retention project, during the scoring process, the model generates the probability of the outcome variable having a value of 1. This value gives the probability that customer churns.


An outcome variable is mandatory for a project that is created to predict a certain event such as cross-sell, up-sell, or customer retention. That is, a project that is created to predict a certain event must have an outcome variable in its ABT in addition to other variables (input variables). An outcome variable is not required for a customer segmentation project.


An outcome variable can be a basic variable (behavioral, time-based, or direct) or a derived variable (simple derived or complex derived). Typically, an outcome variable is a complex derived variable that stores values in the form of 0 or 1. These values indicate the occurrence of the event that is under consideration. For details, see [“Recommended Purpose-Specific Outcome Variables” on page 170](#).

### Define an Outcome Variable

To mark a variable as an outcome variable, complete these steps:

1. On the Analytical Base Table page, select the variable that you want to mark as an outcome variable.
2. On the toolbar, click, . Alternatively, on the toolbar, select **Menu** ⇒ **Mark as Outcome Variable**.

You can have only one outcome variable in an ABT. The Variables table displays  beside an outcome variable.

If you want a different outcome variable, select that variable, and click  on the toolbar.

---


## Delete Variables

To delete the variables in an ABT, complete these steps:

1. On the Analytical Base Table page, select the variable that you want to delete.

#### TIP

- To select multiple adjacent variables, select a variable, hold down the SHIFT key, and then use the DOWN ARROW key to select the variables.
- To select multiple nonadjacent variables, select a variable, and then hold down the CTRL key while you click other variables that you want to select.

2. On the toolbar, click , and then select **Delete Variable**. Alternatively, on the toolbar, select **Menu** ⇒ **Delete** ⇒ **Variable**.
3. In the confirmation message box that appears, click **Yes**.



## Building an ABT

### About the ABT Building Process

After you have defined an ABT and its variables (columns) and marked one of the variables as outcome variable (if required), you can build the ABT. When you build an ABT, the ABT data set is created, and its variables are populated with data. After an ABT is built, it can be used as an input to a model.

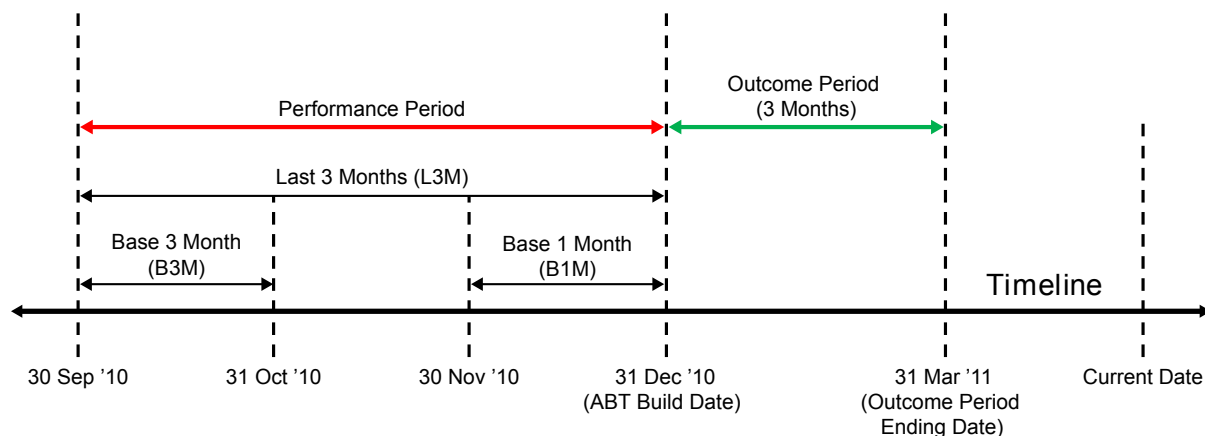
The values for the variables of an ABT are calculated with reference to the ABT build date—that is, the date that you specify when you build the ABT. However, value for the outcome variable of the ABT is calculated with reference to the outcome period end date—that is, the last day of the outcome period. Calculate the outcome period end date by adding the outcome period (a specified number of days, weeks, or months) to the ABT build date.

For example, let us consider that you have an ABT that has the following variables:

- behavioral variable, `D_CNT_SPI_INTCNT_L3M`, which computes the number of customer interactions in the past three months
- time-based variable, `A_LST_PCI_INTCAT_INTDT`, which computes the interaction category of the last interaction
- direct variable, `D_SBD_SBST`, which indicates the subscription status as of the ABT build date
- complex variable, `CHURN_FLG`, with the following expression:  

```
(CASE WHEN (D_CNT_SPI_INTCNT_L3M < 3) AND (A_LST_PCI_INTCAT_INTDT = 'COMPLAINT')
AND D_SBD_SBST IN ('DEACTIVATED', 'SUSPENDED', 'CLOSED') THEN 1 ELSE 0
```

**Figure 7.1** Time Window



`CHURN_FLG` is marked as outcome variable. When you build your ABT with reference to the ABT build date (that is, **31 Dec 2010** as shown in Figure 7.1, the values for these variables are calculated as follows:

- `D_CNT_SPI_INTCNT_L3M` is the total number of interactions (for the given subscription) that were initiated during **30 Sep 2010 - 31 Dec 2010**.

- A\_LST\_PCI\_INTCAT\_INTDT contains the category of the customer's last interaction as on **31 Dec 2010**.
- D\_SBD\_SBST shows the status of the subscription as on **31 Dec 2010**.

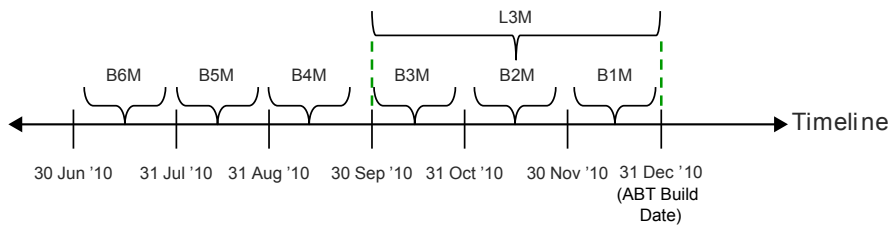
CHURN\_FLG is marked as outcome variable. Therefore, the value for this variable is calculated with reference to the outcome period end date—that is, **31 Mar 2011**.

Because CHURN\_FLG is based on three other variables, the values for these variables are calculated again with reference to the outcome period end date. However, these values are calculated temporarily and are not stored in the ABT data set.

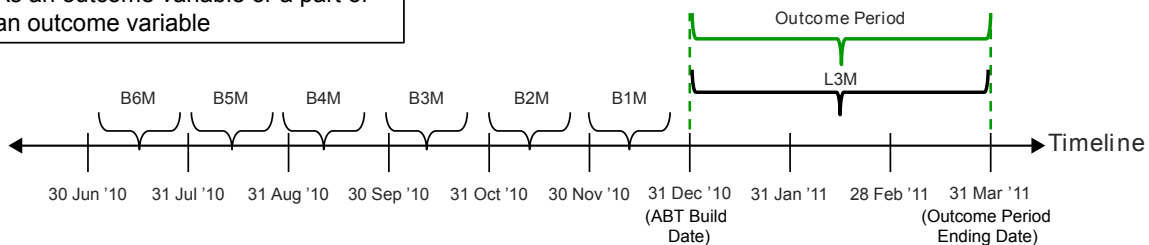
- D\_CNT\_SPI\_INTCNT\_L3M contains the total number of transactions (for the given subscription) that were performed during **31 Dec 2010 - 31 Mar 2011**.

**Figure 7.2** Computing Value for Behavioral Variable

Computation of Behavioral variable:  
Not an outcome variable or not a part  
of an outcome variable



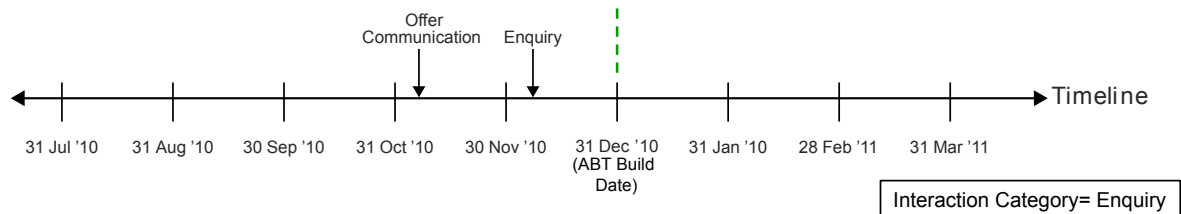
Computation of Behavioral variable:  
As an outcome variable or a part of  
an outcome variable



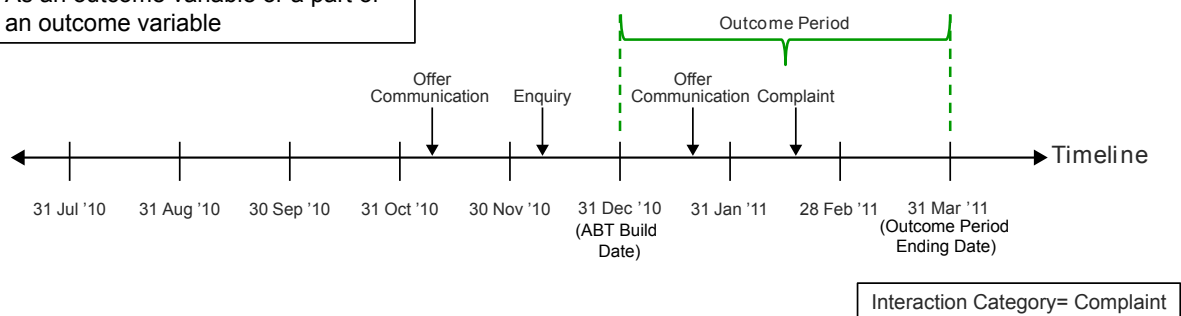
- A\_LST\_PCI\_INTCAT\_INTDT contains the category of the customer's last interaction that occurred as on **31 Mar 2011**.

**Figure 7.3** Computing Value for Time-Based Variable

Computation of Time-Based variable:  
Not an outcome variable or not a part  
of an outcome variable



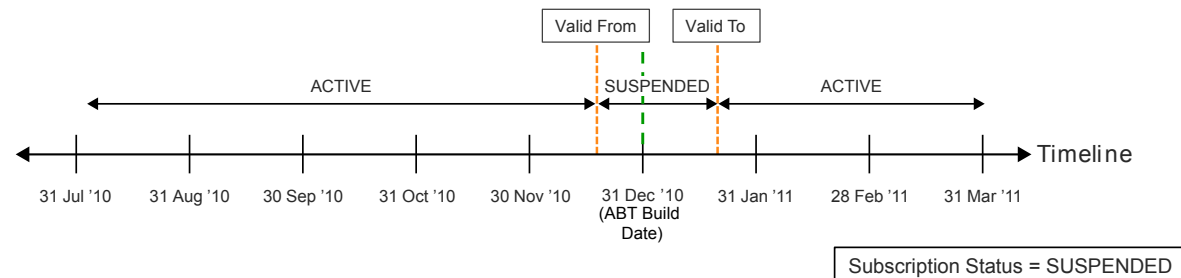
Computation of Time-Based variable:  
As an outcome variable or a part  
of an outcome variable



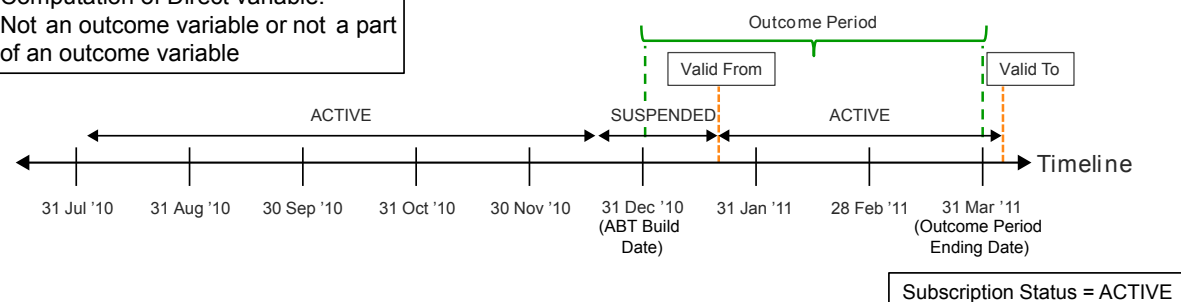
- D\_SBD\_SBST shows the status of the subscription as on **31 Mar 2011**.

**Figure 7.4** Computing Value of Direct Variable

Computation of Direct variable:  
Not an outcome variable or not a part  
of an outcome variable



Computation of Direct variable:  
Not an outcome variable or not a part  
of an outcome variable



- If the total number of customer interactions during **31 Dec 2010 - 31 Mar 2011** is less than 3, the category of the last interaction as on **31 Mar 2011** is COMPLAINT,

and the subscription status as on **31 Mar 2011** is either DEACTIVATED, SUSPENDED, or CLOSED. CHURN\_FLG contains a value of 1. This value indicates that the subscription churned during the outcome period.

In the final ABT data set, D\_CNT\_SPI\_INTCNT\_L3M, A\_LST\_PCI\_INTCAT\_INTDT, and D\_SBD\_SBST contain values with reference to the ABT build date (**31 Dec 2010**). However, CHURN\_FLG contains a value with reference to the outcome period end date (**31 Mar 2011**).

## Outcome-Based Filtering

According to the default configuration, SAS Customer Analytics for Communications applies an outcome-based filter on modeling and scoring ABTs. That is, during the modeling ABT building process or the scoring process, the subjects such as customers or subscriptions that meet the event under consideration during the performance period are not included in the final ABT data set. For example, in a retention project, the subscriptions that churn during the performance period are not included in the final ABT data set.

The records are filtered based on the definition of the outcome variable in the ABT. The value for the outcome variable is temporarily calculated with reference to the ABT build date. The final ABT data set contains only those records for which the value of the outcome variable (as of the ABT build date) is 0—that is, the records that do not meet the event under consideration during the performance period. The final ABT data set does not contain the records for which the value of the outcome variable (as of the ABT build date) is 1.

For example, consider that you have an ABT that has the following variables:

- LST\_SUB\_STATUS (a time-based variable that gives the current status code of a subscription)
- CHURN = IF LST\_SUB\_STATUS IN ('CLOSED', 'DEACTIVATED', 'SUSPENDED') THEN 1 ELSE 0

CHURN is marked as an outcome variable. Let us consider that you build your ABT with reference to 31 Dec 2010 (as shown in Figure 7.1) for a given subscription. The value of the LST\_SUB\_STATUS variable with reference to the ABT build date (performance period) is 'CLOSED'. In this case, the expression for the CHURN variable would return a value 1. Therefore, the final ABT data set will not contain the record for this subscription.

For more information about how to change the default configuration, see *SAS Customer Analytics for Communications: Administrator's Guide*.

## Build-Date Cap

According to the default configuration, SAS Customer Analytics for Communications applies a build-date cap when calculating the value of an outcome variable for a modeling or scoring ABT. That is, if the variables involved in the calculation of the outcome variable refer to a period that spans beyond the outcome period, then only the data pertaining to the outcome period is considered for the calculation.

For example, let us consider that you have an outcome variable (CHURN\_FLG) with the following definition:

```
(CASE WHEN(D_CNT_SPI_INTCNT_L6M < 3) AND (BD_SUM_SBU_BLUA_B3M
< 100) AND D_SBD_SBST IN('DEACTIVATED','SUSPENDED','CLOSED') THEN 1
ELSE 0
```

Out of the three variables on which the outcome variable CHURN\_FLG is based, the D\_CNT\_SPI\_INTCNT\_L6M variable contains the total number of customer interactions in the past six months. However, let us consider that you have specified an outcome period of three months (as shown in Figure 7.1).

When the value of CHURN\_FLG is calculated (with reference to the outcome period end date), the values of the three variables on which CHURN\_FLG is based are also temporarily calculated. However, according to the default configuration, the D\_CNT\_SPI\_INTCNT\_L6M will contain data pertaining to only three months—that is, it will contain the total number of transactions that were performed during **31 Dec 2010 - 31 Mar 2011**. The number of transactions that were performed during **30 Sep 2010 - 31 Dec 2010** will be ignored.

For more information about build-date cap and to change the default configuration, see *SAS Customer Analytics for Communications: Administrator's Guide*.

## About Stacked ABT

Generally, an ABT contains data with reference to a single date (ABT build date). This ABT can be referred to as a standard ABT. A standard ABT contains one record (with reference to the ABT build date) for each subject of analysis that satisfies the specified subset criterion as of the ABT build date.

However, if you want to have data in your ABT with reference to multiple dates, you must create a stacked ABT. When you create a stacked ABT, you specify multiple dates. For each date that you specify, a temporary ABT is created. Each temporary ABT contains one record (with reference to the corresponding date) for each subject that satisfies the specified subset criterion as of the corresponding date. The final ABT (stacked ABT) contains records from all of these temporary ABTs. Thus, the final ABT contains multiple records (each with reference to one of the specified dates) for each subject.

*Note:* If there is no data available for a subject with reference to a specified date, the corresponding temporary ABT will not contain a record for that subject. Therefore, for a given subject, a stacked ABT might not always contain records with reference to all the dates that you specify.

A stacked ABT might contain duplicate records for a subject. To uniquely identify each record, a stacked ABT contains two extra columns in addition to its defined variables (columns).

**BUILD\_DTTM**

contains the date with reference to which the record was retrieved.

**STACKED\_ABT\_ID**


a unique, identifying number that is assigned to each record in the ABT.

## Build an ABT

To build an ABT, complete these steps:

1. On the Analytical Base Table page, select the ABT that you want to build.


*Note:* Currently, SAS Customer Analytics for Communications supports only one ABT per project.

2. On the toolbar, click . Alternatively, on the toolbar, select **Menu** ⇒ **Build ABT**. The Build ABT window appears.

**Display 7.44** Build ABT Window

3. Depending on whether you want to build a standard ABT or a stacked ABT, select **Standard** or **Stacked**.

- Standard ABT



In the **Date** field, specify a build date for the ABT. To do so, click , and then select a date from the calendar.

*Note:* For a monthly ABT (that is, an ABT for which you specified **Monthly** for the **Data required** field while defining the ABT), you can select only the last day of a month from the calendar.

- Stacked ABT


- Discrete Dates


Select this option if you want your ABT to contain data with reference to discrete dates (for example, **31 March 2009**, **30 June 2009**, and **30 April 2010**).

In the **Date** field, click , and select a date. Repeat this operation to select the desired number of dates. If you want to remove a date from the list, click .

- Consecutive Dates



Select this option if you want your ABT to contain data with reference to consecutive dates (for example, **January 2009** through **December 2009**).

1. In the **Date** field, specify a start date. To do so, click , and then select a date.

2. In the **Months** field, specify the number of consecutive months. The number that you enter is inclusive of the start date.
4. Click **OK**. Depending on the number of variables in the ABT and the selected ABT build date, the ABT building process might take several minutes to complete.  beside the ABT name indicates that the ABT building process is in progress. While the ABT building process is in progress, you can proceed with other tasks that are allowed during the ABT building process. For example, you might work on another project. The ABT building process runs in an asynchronous mode. This means that the process continues to run even if you log off from the application. On the next logon, you see the updated status of the ABT building process.

The Analytical Base Table page does not automatically refresh to show the updated status of the ABT building process. You must manually refresh the page to see whether the ABT building process has completed successfully or failed. To refresh the page, you can do one of the following:

- Click the Subset Criterion, Analytical Base Table, or the Models page and then return to the Analytical Base Table page.
- Close the project and open it again.
- Log off from the application and log on again.

On the Analytical Base Table page,  beside the ABT name indicates that the ABT building process completed successfully.  indicates that the ABT building process failed.

*Note:* If the ABT building process fails, contact your administrator.

## Rebuilding an ABT

In a project, whenever you make changes that make the ABT data set inconsistent with the latest ABT definition, you must rebuild your ABT. These changes include the following:

- adding, modifying, or deleting the subset criterion
- adding or deleting variables from the ABT or changing the outcome variable
- modifying the column name of a variable
- modifying the outcome period of the ABT

Rebuilding the ABT ensures that the ABT data set contains the latest changes that you made in the subset criterion or the ABT definition.

*Note:* Changes in the names or descriptions of the subset criterion, ABT, or variables do not require you to rebuild your ABT.

---

## Register an ABT with the SAS Metadata Server


After you have built an ABT, you must register it with the SAS Metadata Server. Registering an ABT with the SAS Metadata Server makes the ABT available for building an analytical model in SAS Enterprise Miner.

*Note:* You can register an ABT with the SAS Metadata Server only after you have successfully built the ABT.

To register an ABT with the SAS Metadata Server:

1. On the Analytical Base Table page, select the ABT that you want to register with the SAS Metadata Server.

*Note:* Currently, SAS Customer Analytics for Communications supports only one ABT per project.

2. On the toolbar, click . Alternatively, on the toolbar, select **Menu** ⇒ **Register ABT with SAS Metadata**.

In SAS Management Console, on the **Folders** tab, a registered ABT is available at the following location:

**SAS Folders** ⇒ **User Folders** ⇒ **<User ID>** ⇒ **My Folder** ⇒ **CAC** ⇒ **<Project ID>**.

Here user ID is the ID, such as sasadm, with which you log on to SAS Customer Analytics for Communications. The project ID is the unique ID of the project that is associated with the model.

While creating a model in SAS Enterprise Miner, you can navigate to this location and use the ABT as a data source for the model.

*Note:* Whenever you rebuild your ABT with any updates, you must register the ABT again. This ensures that the SAS metadata is updated with the latest changes in the ABT.



## Chapter 8

# Managing Models

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## About Analytical Models

After you define and register your ABT, the input that you require to build the analytical model is available. You have to build the analytical model in SAS Enterprise Miner. The type of analytical model that you build depends on the underlying business problem. For example, for analyzing customer churn, you can build a predictive model. However, for computing the expected customer lifetime value, you can build a survival model. Based on the output of these models, you can analyze your business problem. The output of each type of model can be different. For example, the output of a churn model is the churn score. This score gives you the probability that a customer will churn in the specified period. Similarly, the output of the customer lifetime value model can be the expected tenure of a customer in months or weeks.

## Process Flow for Building Model

SAS Customer Analytics for Communications enables you to capture the model information and publish it for scoring. After you have built an ABT and registered it with the SAS Metadata Server, complete the following tasks:

1. Build a model in SAS Enterprise Miner and register it with the SAS Metadata Server. For details, see [“Building and Registering a Model”](#) on page 116.

2. Capture the model's information and link it to the modeling ABT that you created on the Analytical Base Table page. You perform this task on the Models page in the SAS Customer Analytics for Communications interface. For details, see [“Capture a Model's Information” on page 117](#).
3. Publish the model if you want to create a scoring template. You perform this task on the Models page in the SAS Customer Analytics for Communications interface. For details, see [“Publish a Model for Scoring” on page 129](#).

---

## Building and Registering a Model

### Overview

You can build and register an analytical model in SAS Enterprise Miner. For instructions on how to build and register a model in SAS Enterprise Miner, see the SAS Enterprise Miner Help.

*Note:* After you create a model in SAS Enterprise Miner, you create a model package for the model. When you register the model package, you have to specify the name with which you want to register the package. Make sure that the name that you specify here is less than 30 characters. Otherwise, the complete name will not be displayed in the Capture Model Information window of the SAS Customer Analytics for Communications interface.

SAS Customer Analytics for Communications provides sample SAS Enterprise Miner models for the following business problems:

- customer acquisition
- customer segmentation
- cross-sell
- up-sell
- market basket analysis
- sequence analysis
- customer lifetime value
- customer churn

The purpose of these models is to demonstrate their analytical flow in SAS Enterprise Miner. For more details about how to import these sample models, see *SAS Customer Analytics for Communications: Administrator's Guide*.

### Assumptions for Building Association Rules Analysis Models

When you build a model in SAS Enterprise Miner by using the association node or market basket analysis (MBA) node, the output is a rule statistics data set. When you build a model by using any one of these nodes, make sure that you set up the appropriate values for the following properties of the **Train** section:

The Number to Transpose Property

Number of rules in the score code that the model generates might not be same as the number of rules in the rule statistics data set. Therefore, while building rule

association models by using the MBA or the association node, the **Number to Transpose** property should be used appropriately.

#### The Recommendation Property

When you build an analytical model by using the MBA or the association node, the score code can be customized to serve two objectives:

- If you want scoring to be run based on the left-hand side of the rule, then set the **Recommendation** property to **Yes**.
- If you want scoring to be run for the entire bucket (left-hand side and right-hand side of a rule), then set the **Recommendation** property to **No**.

For more details about how to set these properties, see the SAS Enterprise Miner Help.

### **Assumptions for Building Customer Lifetime Value Model**

In SAS Enterprise Miner, you build the customer lifetime value (CLTV) model by using the Survival Analysis node. When you build the model, make sure that you set the correct options for the following properties:

#### The Time Interval Property

In the property table, the **Time Interval** property is available in the **Train** section.

- For CLTV prepaid, select **Week** from the **Time Interval** list.
- For CLTV postpaid, select **Month** from the **Time Interval** list.

#### The Mean Residual Life Property

In the property table, the **Mean Residual Life** property is available in the **Score** section. By default, this property is set to **None**. Therefore, to compute the lifetime of a customer by using this node, make sure that you set this property to either **Constant Hazard Exploration** or to **Restricted Mean**.


For more details about how to set these properties, see the SAS Enterprise Miner Help.

---

## **Capture a Model's Information**

You build and register a model in SAS Enterprise Miner. To make the model's information available in SAS Customer Analytics for Communications, you must capture the information.

To capture a model's information, complete these steps:

1. Select the Models page.
2. On the toolbar, click . Alternatively, on the toolbar, select **Menu** ⇒ **Capture Model Information**. The Capture Model Information window appears.

**Display 8.1** Capture Model Information Window

**Capture Model Information** [X]

SAS Enterprise Miner Models (4)

Name	ID	Description	Date Registered
churn_mult_var	A5FHJDFK.CE...		August 10, 201...
churn_reg_mo...	A5FHJDFK.CE...		August 9, 2011 ...
ch_nn	A5FHJDFK.CE...		July 29, 2011 0...
ch_dtree	A5FHJDFK.CE...		July 29, 2011 0...

Name: \*    
Maximum 40 characters

Description:    
Maximum 200 characters

Linked ABT:  ▼

Cutoff value: \*  ?

OK Cancel

The SAS Enterprise Miner Models table displays a list of the models that have been registered with the SAS Metadata Server and that are available for the selected project.

*Note:* The table does not display the models that have been already captured.

- From the list of models, select the model that you created in SAS Enterprise Miner by using the ABT that you created for your current project. Enter the following information for the model:

#### **Name**

By default, this field is populated with the name with which the model was registered with the SAS Metadata Server. However, you can type a meaningful name for the model. The name must not exceed 40 characters.

#### **Description**

Type a brief description for the model. The description must not exceed 200 characters.

#### **Linked ABT**

Select the ABT that you used to build the model in SAS Enterprise Miner.

*Note:* Currently, SAS Customer Analytics for Communications supports only one ABT per project.

4. Depending on which type of model whose information you are capturing, a set of additional fields is displayed. Specify appropriate values for these fields.

**Display 8.2** Capture Model Information: Segmentation

**Capture Model Information** [X]

SAS Enterprise Miner Models (1)

Name	ID	Description	Date Registered
s8_seg	A5FHJDFK.CE...		August 17, 201...

Name: \*    
Maximum 40 characters

Description:    
Maximum 200 characters

Linked ABT:  ▼

Number of segments: \*  ?

OK Cancel

**Number of segments**

Specify the number of segments that the model determined in SAS Enterprise Miner.

**Display 8.3** Capture Model Information: Churn

**Capture Model Information** [X]

SAS Enterprise Miner Models (3)

Name	ID	Description	Date Registered
churn_mult_var	A5FHJDFK.CE...		August 10, 201...
ch_nn	A5FHJDFK.CE...		July 29, 2011 0...
ch_dtree	A5FHJDFK.CE...		July 29, 2011 0...

Name: \*    
Maximum 40 characters

Description:    
Maximum 200 characters

Linked ABT:  ▼

Cutoff value: \*  ?

OK Cancel

**Cutoff value**

Specify a threshold value for the churn score that is generated by the model during the scoring process. The threshold value helps you conclude whether the event of interest will occur. That is, if the churn score is greater than or equal to the threshold value, you can say that the customer is likely to churn.

**Display 8.4** Capture Model Information: CLTV

Capture Model Information

SAS Enterprise Miner Models (6)

Name	ID	Description	Date Registered
cltv_postpaid	A5FHJDFK.CE000...		July 29, 2011 11:2...
cltv_prepaid	A5FHJDFK.CE000...		July 29, 2011 12:2...
scr_qur_test	A5FHJDFK.CE000...		August 1, 2011 09:...
final_tenure_test	A5FHJDFK.CE000...		August 9, 2011 04:...
prpd_test	A5FHJDFK.CE000...		August 1, 2011 10:...
_t_test	A5FHJDFK.CE000...		August 5, 2011 10:...

Name:

\*

Maximum 40 characters

Description:

Maximum 200 characters

Linked ABT:

CLTV\_PREPAID\_TARGET\_TEST

Unit of expected customer tenure:

\*

--Select--

?

OK

Cancel

**Unit of expected customer tenure**

Select the unit of the expected customer tenure. The unit that you select must be the value that you select from the **Time Interval** field while building the model in SAS Enterprise Miner.

**Display 8.5** Capture Model Information: Cross-Sell or Up-Sell

Name	ID	Description	Date Registered
ch_dtree	A5FHJDFK.CE...		July 29, 2011 0...

Name: \*  Maximum 40 characters

Description:  Maximum 200 characters

Linked ABT:

Entity level name: \*  ?

Entity level value: \*  ?

Cutoff value: \*  ?

OK Cancel

**Entity level name**

Select the entity level that the output of the analytical model supports. For cross-sell and up-sell, the output of the analytical model is in the form of propensity scores, which indicate the propensity to purchase a certain service or offer. Therefore, select the appropriate entity (service or offer) accordingly.

**Entity level value**

Enter the value for the entity level name that you selected. The value that you enter here must be the same as the corresponding ID value in the Foundation data mart. Also, the value that you enter in this field is case sensitive. Therefore, make sure that you enter the value in the same case as it is available in the Foundation data mart. For example, consider that you select **Service** as the entity level name. You want to indicate that the propensity scores that the analytical model generates are for the International roaming service. The ID that is specified in the Foundation data mart for this service is INTL\_RM. In this case, you must type *INTL\_RM* in this field. If you want to indicate that the propensity scores are generated for multiple services, then you can enter these service names as comma-separated values.



**Cutoff value**

Specify a threshold value for the propensity scores that are generated by the model during the scoring process. The threshold value helps you conclude whether the event of interest will occur. For example, the propensity score for a certain service or offer can be greater than or equal to the threshold value. In this case, you can say that the customer is likely to purchase that service or offer.

**Display 8.6** Capture Model Information: Association Rules Analysis

**Capture Model Information**
✕

SAS Enterprise Miner Models (6)

Name	ID	Description	Date Registered
seq_test	A5FHJDFK.CE...		September 30, ...
rules_num_ch...	A5FHJDFK.CE...		September 16, ...
assoc_node_ti...	A5FHJDFK.CE...		October 4, 2011...
kr_mba_c_s	A5FHJDFK.CE...		July 28, 2011 1...

Name: \* 

Maximum 40 characters

Description: 

Maximum 200 characters

Linked ABT: sdsd ▾

Entity level name: \* --Select-- ▾ ?

Maximum number of rules: \*  ?

Cutoff values for rule statistics

Maximum right-hand items:

\*

?

Maximum left-hand items:

\*

?

Minimum lift:

\*

?

Minimum confidence (%):

\*

?

Minimum support (%):

\*

?

Rule statistics data set:
 

\*

?

Browse

OK
Cancel

The analytical model that you built for association rules analysis generates the output in the form of a rules data set. This data set contains the association rules that are derived from the association rules analysis. Therefore, when you capture the model information, you have to capture the entity level name, maximum number of rules, and the cutoff values for the rule statistics.

**Entity level name**

Select the entity level that the output of the analytical model supports. For association rules analysis, the output of the analytical model is in the form of association rules that are generated at either service or offer level. Therefore, select the appropriate entity (service or offer) accordingly.

**Maximum number of rules**

Enter the maximum number of rules that should be considered for the analysis. The number of rules that is derived as an output of the analytical model can be greater than the number of rules that you specify in this field. In this case, only the significant rules are selected from the rules set. Rules are marked as significant based on the cutoff values that you enter for the rules statistics.

For example, the analytical model derives 70 rules as an output. You specify the maximum number of rules as 50. In this case, only significant rules are selected. Now, consider that the number of significant rules is 60. In this case, the significant rules are selected based on the lift ratio. The first 50 significant rules that have a higher lift ratio are selected.

**Cutoff values for rule statistics**

The format of the association rule that is generated in the Rules data set is as mentioned below:

```
<Item 1 of left hand of rule> & <Item 2 of left hand of
rule> & and so on ==> <Item 1 of right hand of rule> & <Item
2 of right hand rule> & and so on
```

For example, the service-level rule that is generated as an output can be as follows:

```
Service_ID_1==>Service_ID_7
```

In this example, the left hand and right hand of the rule contains only a single item.

Rules are marked as significant if they satisfy the upper or lower limit that you have specified for the cutoff values that you enter for the following rules statistics.

**Maximum left-hand items**

Enter the maximum number of items in the left side of the rule that should be considered in order to identify a significant rule. For example, you type 2 as the cutoff value for the length of the left hand of rule. Only those rules whose left hand contains items less than or equal to 2 are considered for marking them as significant rules.

**Maximum right-hand items**

Enter the maximum number of items in the right side of the rule that should be considered in order to identify a significant rule. For example, you type 2 as the cutoff value for the length of the right hand of rule. Only those rules whose right hand contains items less than or equal to 2 are considered for marking them as significant rules.

**Minimum lift**

The lift ratio computes the ratio of confidence and expected confidence. The cutoff value that you enter for this statistic enable you to identify significant rules. For example, you enter 2 as the cutoff value for the lift ratio. In this case, only those rules that have the lift ratio greater than or equal to 2 are considered for marking them as significant rules.

**Minimum confidence**

The confidence rule statistic gives a percentage value. This value is computed as the ratio of number of customers or subscriptions that satisfy the rule and the number of customers or subscriptions that satisfy the left hand of rule. The cutoff

value that you enter for this statistic enables you to identify significant rules. For example, you enter the cutoff value of 65 for this statistic. Only those rules that have the confidence value greater than or equal to 65 are considered for marking them as significant rules.

#### Minimum support

The support rule statistic gives the percentage of the total number of customers or subscriptions that qualify for the rule. The cutoff value that you enter for this statistic enables you to identify significant rules. For example, you enter the cutoff value of 70 for this statistic. Only those rules that have the support value greater than or equal to 70 are considered for marking them as significant rules.

**Table 8.1** Example of Cutoff Values for Rule Statistics

Rule Statistic	Cutoff Value	Actual Value of the Rule Statistic
Maximum left-hand items	2	2
Maximum right-hand items	3	2
Minimum lift	4	6
Minimum confidence	60	63
Minimum support	70	78

For the above rule, all the rules statistics fulfill the upper or lower limit that is set for the cutoff value. Therefore, this rule is marked as significant and is selected for the analysis.

For the **Rule statistics data set** field, click **Browse** to select the data set that stores the information about the rules statistics. For example, for each rule, the data set contains details such as left-hand items, right-hand items, support, confidence, and lift.

**Display 8.7** Capture Model Information: Customer Acquisition

Name	ID	Description	Date Registered
acq pack	A5FHJDFK.CE...		October 4, 201...

Name: \*   
Maximum 40 characters

Description:   
Maximum 200 characters

Linked ABT:

Cutoff value: \*  ?

OK Cancel

**Cutoff value**

The analytical model that you built for customer acquisition generates the output in the form of acquisition score. Therefore, when you capture the model's information, you have to specify a threshold value for the acquisition score. The threshold value helps you conclude whether the event of interest will occur. For example, if the acquisition score is greater than or equal to the threshold value, you can say that the customer is likely to be acquired.

5. Click **OK**. The Capture Model Information window closes, and the model is added to the list of captured models on the Models page.


*Note:* You might rebuild the ABT that was used to create the model in SAS Enterprise Miner. In this case, you must delete the information about the captured model, rebuild the model with the latest ABT, and then capture the new information about the model.

## Edit a Model's Information

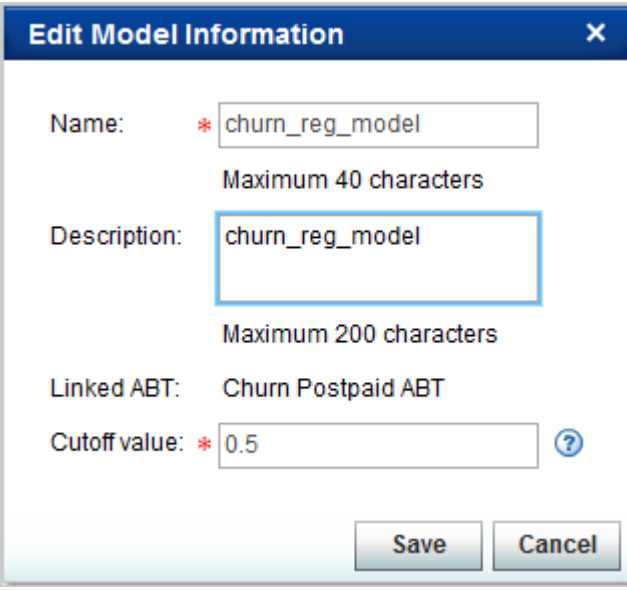
You can change the name and description of a model. You can also change the specific information such as the cutoff values that you captured for each type of model. When you change these values, there is an impact on the results that the model produces. Therefore, make sure that you make appropriate changes to the information that you have captured.

*Note:* For an association rules model, you can change the cutoff values for the rules statistics and the maximum number of rules. However, based on the new values that you have entered, a new set of rules is generated and the process of marking significant rules is run again. As a result, you will lose information about the earlier rules.

To edit a model's information:

1. On the Models page, select the model that you want to edit.
2. On the toolbar, click . Alternatively, on the toolbar, select **Menu** ⇒ **Edit Model**. The Edit Model Information window appears.

**Display 8.8** Edit Model Information



**Edit Model Information** [X]

Name: \* churn\_reg\_model  
Maximum 40 characters

Description: churn\_reg\_model  
Maximum 200 characters

Linked ABT: Churn Postpaid ABT

Cutoff value: \* 0.5 ?

[Save] [Cancel]

3. Change the model information according to your requirements.

*Note:* For a customer segmentation model, you cannot edit the number of segments that you have entered while capturing the model's information in the Capture Model Information window.

4. Click **Save**.

**TIP** Click **Cancel** if you want to discard the changes that you have made.


---

## Publish a Model for Scoring

After you have captured a model's information, you can decide whether you want to create a scoring template for that model. You have to publish the model only if you want to create a scoring template for it. After you publish a model, the model can be used for scoring.

Before you decide to publish a model, make sure that you have entered all the required information for the model. Once published, the model information cannot be changed. Moreover, after you publish a model for scoring, any changes that you make in the project's components (such as subset criterion, ABT, or variables) will not have any impact on the model in the scoring mode.

To publish a model, complete these steps:

1. On the Models page, select the model that you want to publish.
2. On the toolbar, click . Alternatively, on the toolbar, select **Menu** ⇒ **Publish for Scoring**.
3. In the confirmation message box that appears, click **Yes**. If the model is published successfully, a message is displayed that indicates that the model is published successfully.


If you receive an error message, contact your administrator.

---

## Delete a Model's Information

You can delete a model that is not published for scoring. You can also delete a model that you have published for scoring. However, in the later case, the published model will still be available in the Scoring workspace, and you can define a scoring template for it. For details, see [“Create a Scoring Template” on page 137](#).

To delete a model's information, complete these steps:

1. On the Models page, select the model whose information you want to delete.
2. On the toolbar, click . Alternatively, on the toolbar, select **Menu** ⇒ **Delete Model**.
3. In the confirmation message box that appears, click **Yes**.





## **Part 3**

---

# Working in the Scoring Workspace

### *Chapter 9*

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## Chapter 9

# Introduction to the Scoring Process

---

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---

## About the Scoring Process

The scoring process can begin after you complete the following tasks:

- Build and register the analytical model in SAS Enterprise Miner.
- Capture the model's information and publish the model in the SAS Customer Analytics for Communications interface.

In the ABT building process, the modeling ABT considers data that spans a historical period (in months or weeks). In model building process, the model learns through behavioral patterns in this data and generates the results, which is also called the score code.

In the scoring process, results are generated for the recent data. The scoring process is an automated process. All you need to do is define the scoring template and then schedule the scoring process to generate the scores on a regular basis. You can also define a subset criterion in the scoring mode to filter the target population.

---

## The Scoring Process

In the Scoring workspace, you must perform the tasks in the sequence mentioned below:

1. Make sure that you have published the models that you want to score.

2. (Optional) Edit the subset criterion that is available for the scoring model. For details, see [“Edit the Subset Criterion of a Published Model” on page 136](#).
3. Define a scoring template for the model. For details, see [“Create a Scoring Template” on page 137](#).

---

## View the Details about Published Models

When you publish a model in the Projects workspace, it is available in the Scoring workspace.

To view details about a published model, complete these tasks:

1. Select the Scoring workspace. The models that are published are displayed.
2. For each model that you have published, the following details are displayed:

### **ID**

displays the ID that SAS Customer Analytics for Communications generates for each model that is published.

### **Model Registered ID**

displays the ID that is generated when the model was registered in SAS Enterprise Miner. The model is registered in the metadata with this ID.

### **Model Name**

displays the model’s name that was entered while capturing the model’s information.

### **Project Name**

displays the name of the project that is associated with the model.

### **Purpose Name**

displays the purpose of the project.

### **Model Published Date**

displays the date on which the model was published.

3. (Optional) Double-click the model to edit the subset criterion.

---

## About the Subset Criterion in the Scoring Workspace

### **Overview of Subset Criterion**

When you publish a model, the subset criterion that you defined for the associated project is automatically attached to it. In the Scoring workspace, you can change this subset criterion according to your requirements. In the Scoring workspace, the subset criterion enables you to score the members of the subject of analysis that satisfy the subset criterion.

For example, you define a project for the customer acquisition purpose. For this project, you can define the subset criterion to filter the target population of prospective customers who participated and responded to certain campaigns that were organized by

the communications service provider (CSP). Let us assume that the codes for these campaigns are 5\_CAMPAIGN and 1\_CAMPAIGN. The following diagram illustrates the subset criterion that you can define to filter the target population for the modeling ABT.

**Figure 9.1** Subset Criterion for Modeling ABT

**All Prospects**  
Count: 10,000

**Campaign code**  
Count: 2,063

**Edit Node**

Name: \* Campaign code  
Maximum 40 characters

Description: Campaign code  
Maximum 200 characters

Parent node: All Prospects

Filter definition: ?

+ X Count: 2,063 (20.63%) Show Count ?

Conjunction	Variable	Operator	Value
	Campaign Code	IN	'5_CAMPAIGN','1_CAMPAIGN'

OK Cancel

Further, you can build the modeling ABT and the analytical model based on this population. However, in the scoring mode, the target population need not include the prospective customers who have already been contacted for any campaigns. In this case, you need to eliminate such customers from the scoring ABT. Therefore, in the Scoring workspace, you can edit the subset criterion as illustrated below to filter customers for whom the campaign code is a NULL value.

**Display 9.1** Subset Criterion for Scoring ABT

**Edit Node**

Name: \* Campaign code  
Maximum 40 characters

Description: Campaign code  
Maximum 200 characters

Parent node: All Prospects

Filter definition: ?

Count: 2,063 (20.63%) **Show Count** ?

Conjunction	Variable	Operator	Value
	Campaign Code	=	&NO_CAPMPAIGN_VALS.

**OK** **Cancel**

As a result, you can restrict the target population to include only those prospective customers who have not been contacted for any of the campaigns before.

**Edit the Subset Criterion of a Published Model**


You can edit the default subset criterion that is associated with a published model. The procedures to work with subset criterion for the scoring model is the same as the procedures of a subset criterion that you define for a project. For details, see [Chapter 6 Managing the Subset Criterion on page 31](#).

To edit a subset criterion for a published model, complete these steps:

1. In the Scoring workspace, from the object manager, click **Scoring Model**. The list of models that you have published for scoring are displayed.
2. Double-click the model whose subset criterion you want to edit. The subset criterion that is defined for the associated project is displayed.

*Note:* For few purposes such as customer acquisition, certain subset criteria are predefined and are not displayed in the SAS Customer Analytics for Communications interface. These are the mandatory subset criteria (also called implicit subset criterion) that must be applied to derive the target population. For

more details, see *SAS Customer Analytics for Communications: Administrator's Guide*.

3. On the toolbar, click . The Edit Subset Criterion window appears.
4. Edit the details about the subset criterion or the filter criteria according to your requirement. For details, see [“Edit a Subset Criterion” on page 48](#).

*Note:* You cannot delete the root node of the subset criterion.

---

## About the Scoring Template

In SAS Customer Analytics for Communications, you define the scoring template in the Scoring workspace. A scoring template enables you to associate the scoring process with a model and an ABT. In addition, the scoring template creates a code package for the score code that is generated in SAS Enterprise Miner. This code package is stored in a predefined location. Your administrator can schedule this package to run it at a predefined frequency, which can be daily, weekly, or monthly. For details, see *SAS Customer Analytics for Communications: Administrator's Guide*.


The code package that is created as a result of the scoring template performs the following tasks:

- Generates the scoring ABT that stores the significant variables from the modeling ABT.
- Applies the score code that the SAS Enterprise model generates.
- Generates the scored ABT that contains the analytical output of your interest. For example, for a churn model, this output can be a churn score. For a segmentation model, it can be a segment code and for a survival model, it can be the expected tenure of a customer.

---


## Create a Scoring Template

To create a scoring template, complete these tasks:

1. Select the Scoring workspace.
2. On the toolbar, click . Alternatively, on the toolbar, select **Menu** ⇨ **New**. The New Scoring Template window appears.

**Display 9.2** New Scoring Template Window

3. In the **Name** field, type a name for the scoring template.
4. In the **Description** field, type a description for the scoring template.
5. From the **Model** list, select a model for the scoring template. The list displays the models whose information you have captured in SAS Customer Analytics for Communications. A model that you have already used in a scoring template does not appear in the list. That is, you can use a model with only one scoring template.

**TIP** Before you select a model, you can click  to view the model information, such as the name of the model, the project that the model belongs to, and so on. You can also use this icon to search for a model.

6. In the **Table name** field, type a name with which the scoring ABT is created. The table name must be a valid SAS name and must not exceed 30 characters. Moreover, the table name must not be a SAS keyword that is reserved for a table. SAS reserves the following keywords for tables: `_NULL_`, `_DATA_`, and `_LAST_`.

*Note:* Make sure that the table name that you enter is unique across all scoring templates.

7. Click **Save**. The scoring template is added to the Scoring Templates list. The modeling ABT, the analytical model, and the scoring ABT are linked together through the scoring template. Also, the code package is created at the predefined location: `<SAS configuration directory>/AppData/SASCustAnalyticsCommServer/5.3/scoring/<Scoring template ID>/scr_act_run_exported_code`.

`<SAS configuration directory>` represents the path to the folder where SAS configuration data is stored. For example, on a Windows computer, this can be `C:/SAS/Config/Lev1`.

`<Scoring template ID>` represents the scoring template identification number—a unique number that is automatically assigned to each scoring template when it is created.



*Note:* After you create a scoring template, except for association analysis, the Significant Variables pane shows a list of variables that the model that is linked with the scoring template considers significant. In the scoring run, a scoring ABT is built with these significant variables. The model ignores the insignificant variables because only significant variables are required for scoring.

## Edit a Scoring Template

You can change the name and description of a scoring template.

To edit a scoring template, complete these steps:

1. In the Scoring workspace, select the scoring template that you want to edit.
2. In the Properties pane, click **Edit**.

**Display 9.3** Properties Pane


▼ Properties	
ID:	4
Name:	* CHURN SCORING
Description:	Churn Scoring Template
Project name:	CHURN POSTPAID 2
Model name:	churn_reg_model
Scoring ABT name:	CHURN_PST_SCR
Date created:	August 30, 2011 05:49:08 PM
Date modified:	August 30, 2011 05:49:08 PM
Scoring path:	C:/SAS/Config/Lev1/AppData/SASCustAnalyticsCommServer/5.3/scoring/4
Subject group:	None
<input type="button" value="OK"/> <input type="button" value="Cancel"/>	

3. Change the name and description of the scoring template according to your requirements.
4. Click **OK** to save the changes.

**TIP** Click **Cancel** if you want to discard the current changes and retain the original name and description.

## Delete a Scoring Template

To delete a scoring template, complete these steps:

1. In the Scoring workspace, select the scoring template that you want to delete.
2. On the toolbar, click . Alternatively, on the toolbar, select **Menu** ⇒ **Delete**.
3. On the confirmation dialog box that appears, click **Yes**.

## **Part 4**

---

# Working in the Administrative Workspace

*Chapter 10*

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## Chapter 10

# Configuring the Input Tables

---

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## About the Administrative Workspace

The Administrative workspace displays a list of tables that are configured in the Application data mart. These tables are called input tables. You can use the Administrative workspace to configure the usage of these tables. As a result, you can use these tables to define subset criterion and create ABT variables in the application. You can also use this workspace to import metadata from the Foundation data mart tables into the Application data mart. For more information, see *SAS Customer Analytics for Communications: Administrator's Guide*. You can work in the Administrative workspace only if you are assigned the administrator's role.

## Configuring the Application Data Mart Tables

### Viewing the Preconfigured Tables

As a post-installation task, your administrator populates the Application data mart tables with the appropriate data. This data is populated from certain Foundation data mart tables (dimension tables and fact tables) and base tables from the Analytics data mart. For details, see *SAS Customer Analytics for Communications: Administrator's Guide*. In the SAS Customer Analytics for Communications interface, you can view these preconfigured tables in the Administrative workspace. You can change this configuration according to your requirements if you have administrative privileges.

*Note:* The changes that you make to the preconfigured tables are effective only from your next logon.

### Configuring the Table Information

You cannot change certain information about the preconfigured tables, such as the library to which a table belongs. However, you can configure other information based on your requirements. The following list explains a few scenarios for which you can change the preconfigured information.

#### Data aggregation

For a particular table, you want to change the grain at which it stores data. For example, a table is preconfigured to capture data at **Daily** grain. In addition, you want to capture information at **Weekly** and **Monthly** grains. In this case, you can configure these grains for the table.

#### Subject of analysis

A certain table might store information about one or more subjects of analysis. If your administrator has configured only one subject of analysis, you can configure the other subjects of analysis. For example, for the **PST\_PD\_SERVICE\_ACTIVITY\_B** table, **Customer** and **Subscription** are the two subjects of analysis that are initially configured. As a result, this table would be available only for projects that analyze data pertaining to these subjects of analysis. However, this table is also required for projects that analyze data pertaining to **Subscription Service** and **Customer Service** subjects of analysis. In this case, you can configure these subjects of analysis for this table.

#### Dimensional attribute values

The names and values of analytical variables that are defined in the modeling ABT use the values of the dimensional attributes. Because these variables are implementation-specific, they cannot be prepopulated. Therefore, you can configure these values according to your requirements. For example, for the **CUST\_STATUS\_CD** column of the **CUST\_D** table, you can specify the dimensional values such as *ACTIVE*, *DORMANT*, and *SUSPENDED*.

#### New column information

A new column is added in a Foundation data mart table. If this column is significant for building the modeling ABT, you can import this column in the corresponding Application data mart table.

### New table

A new table is added in a Foundation data mart table, which is significant for building the modeling ABT. In this case, you can import this table in the Application data mart and configure it according to your requirements.

## Configuring the Table Usage

As a post-installation task, your administrator configures the usage of the tables that are configured in the Application data mart. As a result, you can use these tables when you define the subset criterion or ABT variables. You can change this default configuration according to your requirements. For example, the **PROSPECT\_CUST\_D** table can be initially configured for defining all types of basic ABT variables (time-based, behavioral, and direct) and subset criterion. However, you might not require this table when you define a behavioral variable. Therefore, you can update the table usage accordingly.

## Edit the Properties of a Table

To edit the properties of a table, complete these steps:

1. In the Administrative workspace, select the table whose properties you want to change.

**Display 10.1** Administrative Workspace

The screenshot displays the SAS Customer Analytics for Communications Administrative workspace. The interface includes a top navigation bar with 'File', 'Help', 'Projects', 'Scoring', and 'Administrative' tabs. Below the navigation bar, there is a search bar and a table list. The table list has columns for Name, Description, Table Name, Table Code, and Library. The 'Prepaid Subscription Loyalty' table is selected. To the right of the table list is a 'Properties' pane. The 'Properties' pane shows the following details for the 'Prepaid Subscription Loyalty' table:

- Table name: PRE\_PD\_SUBSCR\_LOYALTY\_B
- Name: Prepaid Subscription Loyalty
- Description: Prepaid Subscription Loyalty
- Table code: RSL
- Library: BASE
- Data aggregation: Week
- Subject of analysis: Customer, Subscription

The user ID 'sasadm' is visible in the bottom right corner of the interface.

2. In the Properties pane, click **Edit** to change the preconfigured properties of the table.

**Display 10.2** Properties Pane

**Properties**

Table name: OFFER\_D

Name: \* Offer Dimension

Description: Dimension to store data about offers

Table code: \* OFR ?

Library: DIM

Data aggregation: ☒ Month ?  
☐ Day  
☒ Week

Subject of analysis: ☐ Customer ?  
☐ Subscription  
☐ Customer Offer  
☐ Subscription Service  
☒ Offer  
☐ Services  
☐ Customer Service  
☐ Prospect Customer  
☐ Customer Offer Agreement Start Date  
☐ Subscription Service First Activation Date  
☐ Customer Service Date

OK Cancel

You can change the values according to your requirements.

**Table name**

displays the table name as defined in the metadata.

**Name**

a short name of table, which can easily identify the table in the SAS Customer Analytics for Communications interface. For example, if the table name is CUST\_AGRMNT\_D, you can type the table name as *Customer Agreement Dimension*.

**Description**

description of the table, which can briefly indicate its usage or purpose.

**Table code**

a unique code that is assigned to the table. The table code can contain only three characters. In addition, it cannot start with a number, and cannot contain special characters other than an underscore (\_). The table code is concatenated with codes of other attributes that are used in variable definitions to create default



variable names in a project. For example, for the SUBSCRIP\_D and SERVICE\_D dimensions, you can type the table code as *SUB* and *SRV* respectively.

#### **Library**

indicates the library to which the table belongs.

#### **Data aggregation**

indicates the grains at which the table stores data. If you select the lowest grain, **Day**, then the table can aggregate information at the other grains as well.

Therefore, you can select the other two grains, **Month** and **Week** also for the table. Also, this field is applicable to only those tables that you want to use for creating behavioral variables. You do not need to select a data aggregation level for a table that you plan to use for creating only direct or time-based variables.

#### **Subject of analysis**

indicates the type of information the table contains. You can select one or more options for this field. For example, if the table contains usage-related information for all subscriptions of a customer, you can select the subjects of analysis as **Customer** and **Subscription**.

In addition, the table would be available as a data source for a project, if the subject of analysis of the project is configured as one of the subjects of the analysis of the table.

*Note:* Before you select a subject of analysis for a table, make sure that the table has a key column that uniquely identifies each subject in the table. For example, you select **Customer** as the subject of analysis for a table. In this case, make sure that the table has the CUST\_ID column (with column type as **Key**), which uniquely identifies each customer in the table.

3. Click **OK**.

---

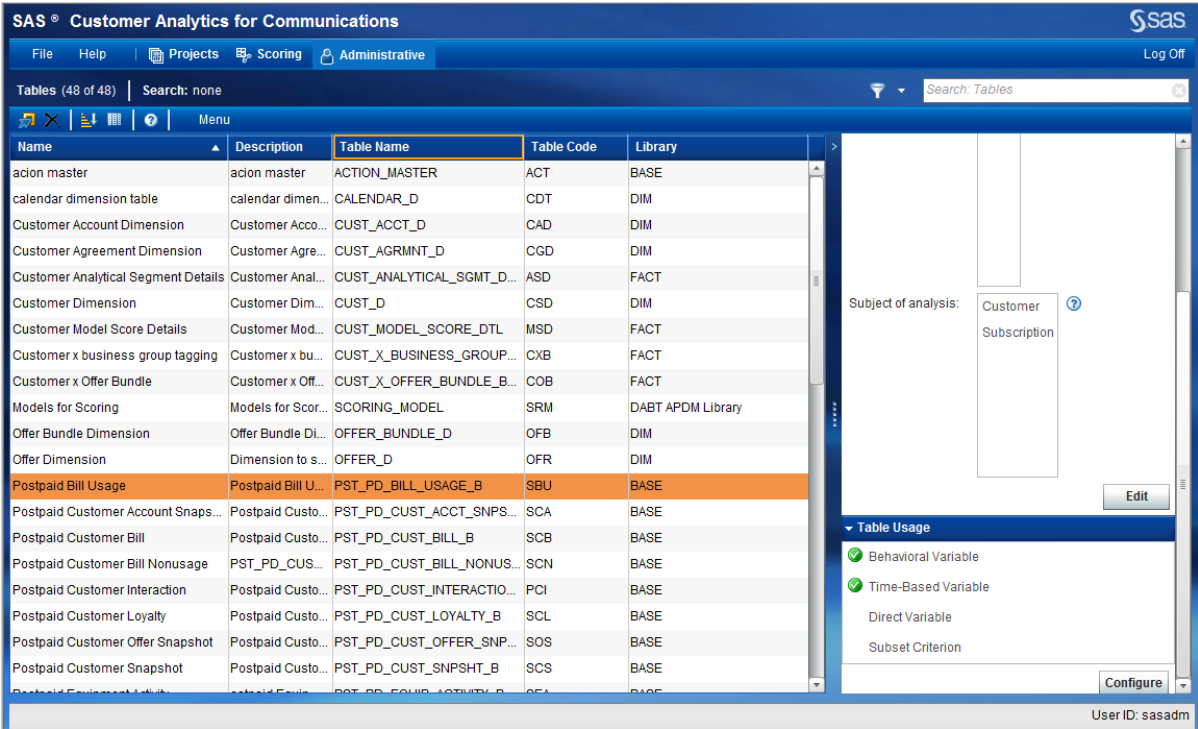
## Configure the Usage of a Table

A table that you configure for creating a particular type of variable appears in the **Data sources** list for that variable type in the New Variables window.

To configure the usage of a table, complete these steps:

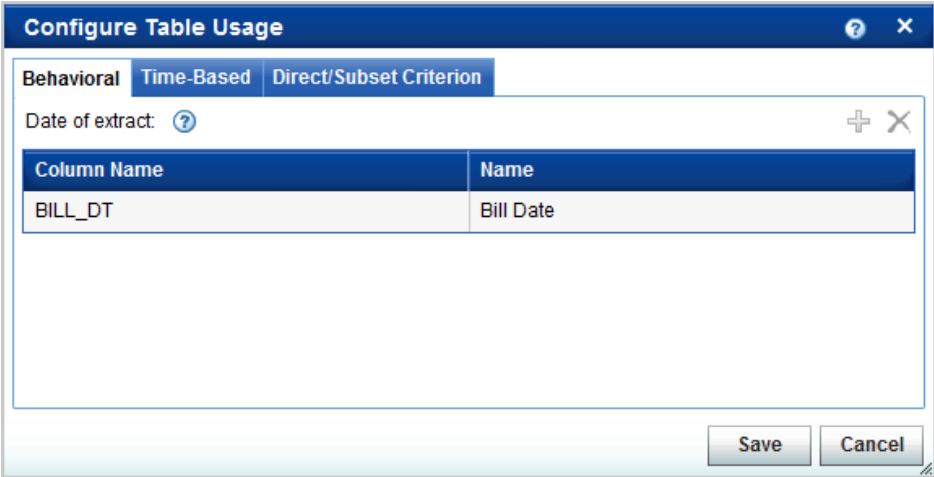
1. In the Administrative workspace, select the table whose usage you want to configure.

Display 10.3 Administrative Workspace




2. In the Table Usage pane, click **Configure**. The Configure Table Usage window appears.

Display 10.4 Configure Table Usage Window



3. Select the appropriate tab, depending on the type of ABT variables that you want to define using this table.

**Behavioral tab**


Click  to add a date column of the table. When the modeling ABT is built, data is extracted from the table based on the date that you have specified here.

*Note:* You can configure only one date of extract per input table.

For example, consider that you are configuring the **PST\_PD\_PAYMENT\_B** table, so that it can be used for defining behavioral variables. You can add the **PYMNT\_DT** column as the date of data extraction. A behavioral variable that


computes the total amount paid in the past six months is defined. The ABT build date is July 31, 2011. When the ABT is built, data is extracted for this variable such that **PYMNT\_DT** for each record is between the dates February 1, 2011 and July 31, 2011.

#### Time-Based tab


Click  to add a date. You can add one or more dates. When the modeling ABT is built, data is sorted based on these dates and the time-based variable is populated with the most recent data.

For example, consider that you are configuring the **PRE\_PD\_USAGE\_RECHARGE\_B** table, so that it can be used for defining the time-based variable. You can add the **PYMNT\_DT** as the date for sorting the records. A time-based variable that computes the latest recharge value for a subscription is defined. For a certain subscription, the recharge values are 10 USD, 20 USD, and 30 USD in the months of November 2011, December 2011, and February 2012 respectively. The ABT build date is January 31, 2011. When the ABT is built, the records are sorted based on the **PYMNT\_DT**. Therefore, the most recent recharge value (as of the ABT build date) 20 USD is populated as the variable value.

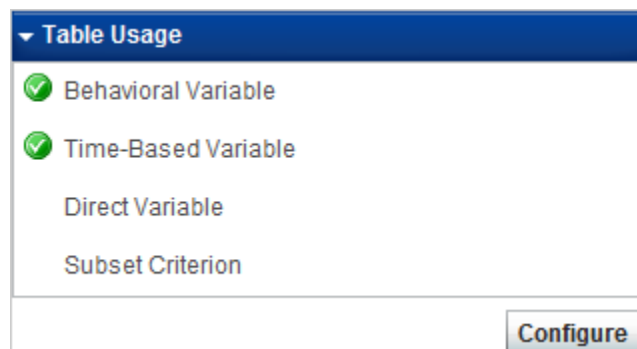
#### Direct and Subset Criterion tab

Click  to add date range values. When the modeling ABT is built, direct variables are populated based on the starting and ending date that you specify here. In addition, this table can also be used in a subset map based on which you can define a subset criterion.

For example, you want to configure the **CUST\_D** table, so that it can be used to define direct variables. To do so, you can add the **VALID\_START\_DTTM** and **VALID\_END\_DTTM** as the date range values. A direct variable that gives the status of a customer is defined. Consider that a particular subscription of a customer has an **Active** status until the month of January 2011. However, the customer churns in the month of February 2011. If the modeling ABT is built in the month of January, the variable value will contain the status as of the ABT build date. Therefore, the value for the direct variable will be **Active**.

4. Click **Save**. Depending on the information that you configure on each tab,  is displayed in the Table Usage pane, beside the respective type (behavioral, time-based, and direct) of variable and subset criterion.

#### Display 10.5 Table Usage Pane




## Import a Table from the Foundation Data Mart

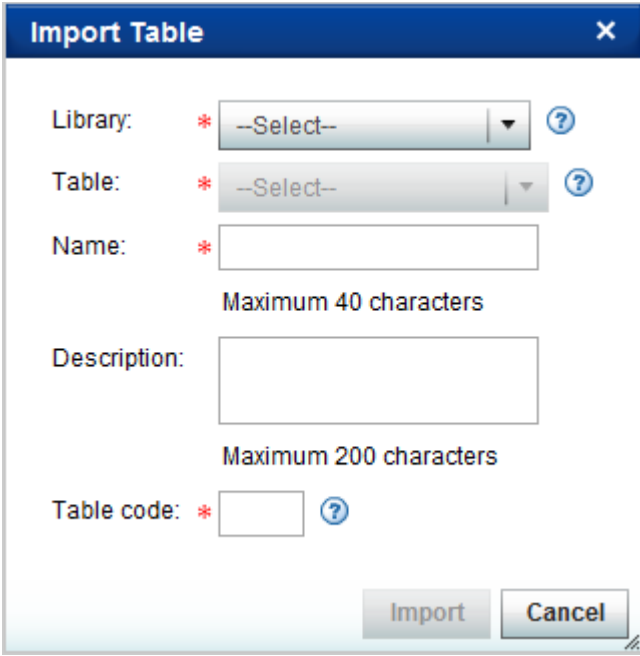
When a new table is added in the Foundation data mart, you can consider whether you need it for building the modeling ABT. If you want to use it in SAS Customer Analytics for Communications, you must import it in the Application data mart and configure its usage.

When you import a table, its columns are also imported into the application. SAS Customer Analytics for Communications automatically assigns certain data types, column types, and column codes to the columns of the table. You can edit these according to your requirements.

To import a table from the Foundation data mart, complete these steps:

1. Select the Administrative workspace.
2. On the toolbar, click . Alternatively, on the toolbar, select **Menu** ⇒ **Table**. The Import Table window appears.

**Display 10.6** Import Table Window



3. Specify the following details for the table:

### Library

Select the library from which you want to import the table.

### Table name

Select the table that you want to import.

### Name

Enter a name for the table such that it is easily identified in the SAS Customer Analytics for Communications interface.

### Description

Enter a description for the table to indicate its purpose or usage.

**Table code**

Type a unique three-character code for the table. The table code cannot begin with a number and cannot contain special characters other than an underscore (\_).

4. Click **Import**. The values that you have entered in this window are displayed in the Properties pane. You can configure the usage and properties of the table that you have imported according to your requirements. For details, see [“Edit the Properties of a Table” on page 145](#) and [“Configure the Usage of a Table” on page 147](#).


---

## Delete a Table from the Administrative Workspace

You can delete a table from the Administrative workspace if the table is no longer used in the application. If the table is used as a data source for creating variables or used in a subset map definition in a project, you cannot delete the table.

*Note:* Deleting a table from the Administrative workspace does not actually delete that table from the library. It simply deletes the table’s configuration details from the application.

To delete a table, complete these steps:

1. In the Administrative workspace, select the table that you want to delete.
2. On the toolbar, click . Alternatively, on the toolbar, select **Menu** ⇒ **Delete Table**.
3. In the confirmation message box that appears, click **Yes**.

---

## Import a Column of a Table

One or more columns can be added to a Foundation data mart table, which you have configured in the Application data mart. These columns can be significant for building the modeling ABT. Therefore, you can import these columns in the corresponding table of your Application data mart.


To import a column of a table, complete these steps:

1. In the Administrative workspace, double-click the table for which you want to import a column. The list of columns is displayed.



**Key**

represents the key columns such as CUST\_ID and SUBSCRIP\_ID.

5. (Optional) Click  to change the column details such as name, code, and column type.


---

## Delete a Column of a Table

You can delete a column from a table in the Administrative workspace if the column is no longer used in the application. If the column is used in a variable definition or a subset map definition in a project, you cannot delete the column.

*Note:* Deleting a column from a table in the Administrative workspace does not actually delete the column from the input table. It simply removes the column's configuration details from the application.

To delete columns from a table, complete these steps:

1. In the Administrative workspace, double-click the table from which you want to delete columns.
2. On the page that appears (the Columns page), select the column that you want to delete, and then on the toolbar, click . Alternatively, on the toolbar, select **Menu** ⇒ **Delete Column**.

*Note:* You can select and delete only one column at a time.

3. In the confirmation message box that appears, click **Yes**.

---

## Dimensional Attribute Values of a Column

### Overview of Dimensional Attributes

The values of columns, which are of **Dimensional Attribute** type can be implementation-specific and therefore cannot be preconfigured. Therefore, you have to configure all dimensional values according to your requirements. These values are required when you define a subset criterion or specify one or more dimensions when you define an ABT variable.

*Note:* For some columns of the dimensional attribute type, the values might be preconfigured. However, you must verify these values and change them according to your requirements.

SAS Customer Analytics for Communications enables you to either import or define dimensional values.

For example, you can define the following values for the **CUST\_STATUS\_CD** column of the **CUST\_D** table.

**Table 10.1** Example of Dimensional Attribute Values

Name	Value	Code	Description
Active Status Flag	‘ACTIVE’	ACT	Flag value for Customer with Active status
Dormant Status Flag	‘DORMANT’	DOR	Flag value for Customer with Dormant status
Suspended Status Flag	‘SUSPENDED’	SUS	Flag value for Customer with Suspended status


### Add Dimensional Attribute Values

To add dimensional attributes, complete these steps:

1. In the Administrative workspace, double-click the table in which you want to add dimensional values to a column.
2. In the Columns list that is displayed, select the column for which you want to add dimensional values. You must select a column of the type **Dimensional Attribute**.

### Display 10.8 Add Dimensional Attributes

[illegible]

3. In the Dimensional Attributes Values pane, click . The Add Dimensional Attribute Value window appears.



**Display 10.9** Add Dimensional Attribute Value Window

4. Enter the following details for the attribute values:

**Name**

Enter a meaningful name for the dimensional attribute value. The dimensional attribute value is identified by this name in the SAS Customer Analytics for Communications interface. The name must be unique within a column and must not exceed 40 characters.

**Value**

Enter a dimensional attribute value for the column. The value can be a number, character, macro variable, or a string containing numbers, characters, and an underscore (\_). A character must be enclosed within single quotation marks. A string must begin with a character or an underscore and must be enclosed within single quotation marks. A macro variable must begin with an ampersand (&) followed by a character and can contain numbers and an underscore.

**Code**

Enter a code for the dimensional attribute value. This code is concatenated with codes of other attributes used in variable definitions to create default variable names in a project. A code must be unique within a column and must not exceed three characters. Moreover, a code must begin with a character and must not include any special characters.

**Description**

Enter a description of the attribute value.

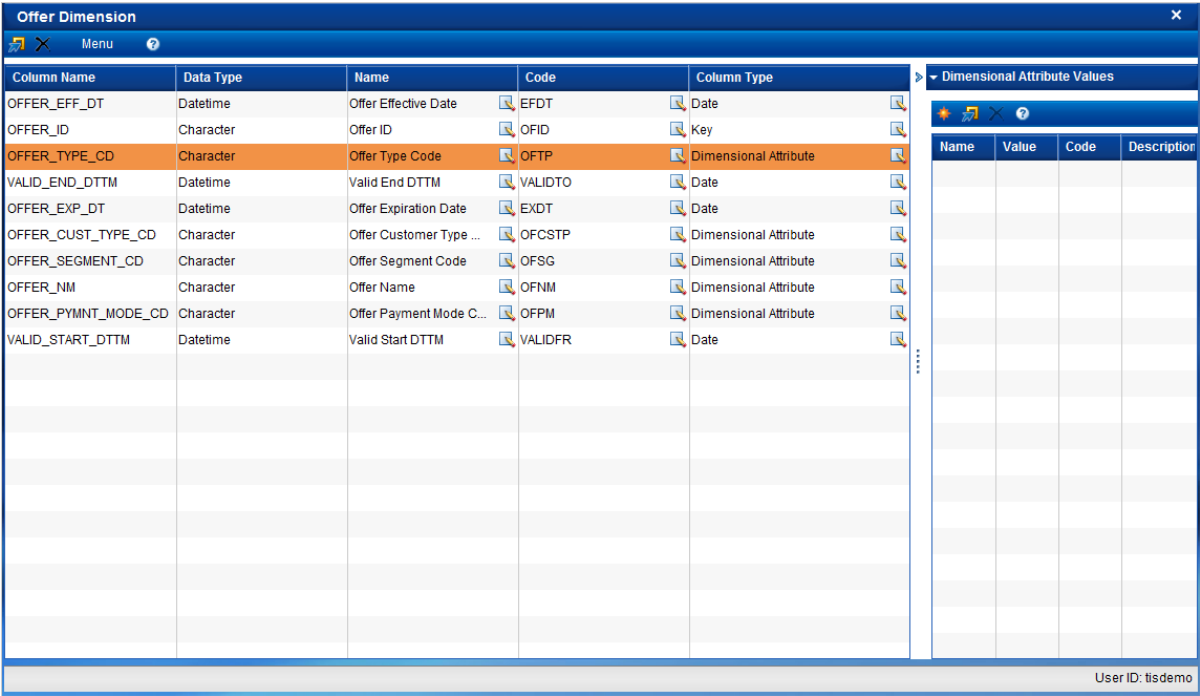
5. Click **Save**.

**Import Dimensional Attribute Values**

To import dimensional attribute values for a column, complete these steps:

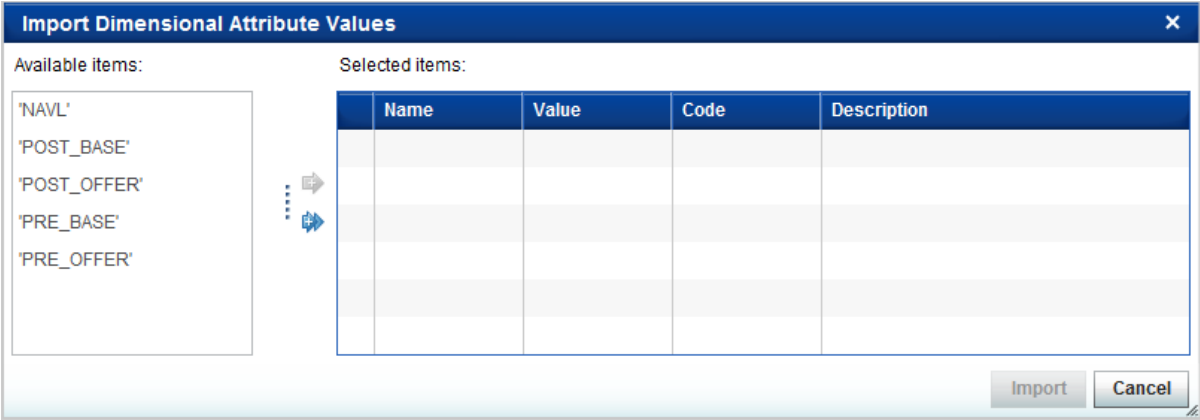
1. In the Administrative workspace, double-click the table in which you want to add dimensional values to a column.
2. In the Columns list that is displayed, select the column for which you want to add dimensional values. You must select a column of the type **Dimensional Attribute**.

Display 10.10 Import Dimensional Attribute Values



- 3. In the Dimensional Attributes Values pane, click . The Import Dimensional Attribute Values window appears.

Display 10.11 Import Dimensional Attribute Values Window




- 4. From the **Available items** list, select the values that you want to import.
- 5. Click to move the selected values to the **Selected items** list.  

**TIP** To move all the values to the **Selected items** list, click .
- 6. (Optional) Verify the name, code, value, and description of the dimensional attributes that you are importing.
- 7. Click **Import** to import the values that you have selected.

### **Delete a Dimensional Attribute Value**

You can delete a dimensional attribute value from a column if the dimensional attribute value is no longer used in the application. If the dimensional attribute value is used in a variable definition in a project, you cannot delete the value.

To delete a dimensional attribute value, complete these steps:

1. In the Administrative workspace, double-click the table in which you want to delete one or more dimensional values of a column.
2. In the Columns list that is displayed, select the column for which you want to delete dimensional values. You must select a column of the type **Dimensional Attribute**.
3. In the Dimensional Attributes Values pane, click .
4. In the confirmation dialog box that appears, select **Yes**.



## **Part 5**

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# Appendix

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## Appendix 1

# Purpose-Specific Selections

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## Purpose-Specific Predefined Options for Subjects of Analysis and Subject Maps

**Table A1.1** Purpose-Specific Predefined Options for Subjects of Analysis and Subject Maps

Purpose	Subject of Analysis	Recommended Subject Group	Recommended Subset Map	Implicit Subset Criterion for Modeling Run	Implicit Subset Criterion for Scoring Run	Implicit Variable Name in Modeling Run	Is Implicit Variable Used in Scoring Run?
Segmentation Prepaid	Customer	Prepaid Customers or Subscriptions	Payment Mode Subscriptions/Customers	Not Applicable	Active Customers	Not Applicable	Not Applicable
			Customers or Subscription for business group (BG)				
Segmentation Postpaid	Customer	Postpaid Customers or Subscriptions	Payment Mode Subscriptions/Customers	Not Applicable	Active Customers	Not Applicable	Not Applicable
			Customers or Subscription for BG				

Purpose	Subject of Analysis	Recommended Subject Group	Recommended Subset Map	Implicit Subset Criterion for Modeling Run	Implicit Subset Criterion for Scoring Run	Implicit Variable Name in Modeling Run	Is Implicit Variable Used in Scoring Run?
Churn Prepaid	Subscription	Prepaid Customers or Subscriptions	Payment Mode Subscriptions/Customers Customers or Subscription for BG	Not Applicable	Active Subscriptions	Total Prepaid Usage Revenue Amount for Last 6 Weeks	Yes
Churn Postpaid	Subscription	Postpaid Customers or Subscriptions	Payment Mode Subscriptions/Customers Customers or Subscription for BG	Not Applicable	Active Subscriptions	Total Postpaid Usage Revenue Amount for Last 6 Months	Yes
Cross-sell Prepaid	Customer	Prepaid Customers or Subscriptions	Payment Mode Subscriptions/Customers Customers or Subscription for BG Rule-Based Customer Selection Rule-Based Subscription Selection	Not Applicable	Active Customers	Not Applicable	Not Applicable



Purpose	Subject of Analysis	Recommended Subject Group	Recommended Subset Map	Implicit Subset Criterion for Modeling Run	Implicit Subset Criterion for Scoring Run	Implicit Variable Name in Modeling Run	Is Implicit Variable Used in Scoring Run?
Cross-sell Prepaid	Subscription	Prepaid Customers or Subscriptions	Payment Mode Subscriptions/Customers	Not Applicable	Active Subscriptions	Total Prepaid Usage Revenue Amount for Last 6 Weeks	Yes
			Customers or Subscription for BG				
			Rule-Based Customer Selection				
			Rule-Based Subscription Selection				
Cross-sell Postpaid	Customer	Postpaid Customers or Subscriptions	Payment Mode Subscriptions/Customers	Not Applicable	Active Customers	Not Applicable	Not Applicable
			Customers or Subscription for BG				
			Rule-Based Customer Selection				
			Rule-Based Subscription Selection				

Purpose	Subject of Analysis	Recommended Subject Group	Recommended Subset Map	Implicit Subset Criterion for Modeling Run	Implicit Subset Criterion for Scoring Run	Implicit Variable Name in Modeling Run	Is Implicit Variable Used in Scoring Run?
Cross-sell Postpaid	Subscription	Postpaid Customers or Subscriptions	Payment Mode Subscriptions/Customers	Not Applicable	Active Subscriptions	Total Postpaid Usage Revenue Amount for Last 6 Months	Yes
			Customers or Subscription for BG				
			Rule-Based Customer Selection				
			Rule-Based Subscription Selection				
Up-Sell Prepaid	Customer	Prepaid Customers or Subscriptions	Payment Mode Subscriptions/Customers	Not Applicable	Active Customers	Not Applicable	Not Applicable
			Customers or Subscription for BG				
			Rule-Based Customer Selection				
			Rule-Based Subscription Selection				

Purpose	Subject of Analysis	Recommended Subject Group	Recommended Subset Map	Implicit Subset Criterion for Modeling Run	Implicit Subset Criterion for Scoring Run	Implicit Variable Name in Modeling Run	Is Implicit Variable Used in Scoring Run?
Up-Sell Prepaid	Subscription	Prepaid Customers or Subscriptions	Payment Mode Subscriptions/Customers	Not Applicable	Active Subscriptions	Total Prepaid Usage Revenue Amount for Last 6 Weeks	Yes
			Customers or Subscription for BG				
			Rule-Based Customer Selection				
			Rule-Based Subscription Selection				
Up-Sell Postpaid	Customer	Postpaid Customers or Subscriptions	Payment Mode Subscriptions/Customers	Not Applicable	Active Customers	Not Applicable	Not Applicable
			Customers or Subscription for BG				
			Rule-Based Customer Selection				
			Rule-Based Subscription Selection				

Purpose	Subject of Analysis	Recommended Subject Group	Recommended Subset Map	Implicit Subset Criterion for Modeling Run	Implicit Subset Criterion for Scoring Run	Implicit Variable Name in Modeling Run	Is Implicit Variable Used in Scoring Run?
Up-Sell Postpaid	Subscription	Postpaid Customers or Subscriptions	Payment Mode Subscriptions/Customers	Not Applicable	Active Subscriptions	Total Postpaid Usage Revenue Amount for Last 6 Months	Yes
			Customers or Subscription for BG				
			Rule-Based Customer Selection				
			Rule-Based Subscription Selection				
Customer Lifetime Postpaid	Customer	Not Applicable	Payment Mode Subscriptions/Customers	Not Applicable	Active Customers	Tenure of the customer in months with respect to reference or ABT build date	Yes
			Customers or Subscription for BG			Customer Deactivation Date	No
						Customer Activation Date	No
Customer Lifetime Prepaid	Customer	Not Applicable	Payment Mode Subscriptions/Customers	Not Applicable	Active Customers	Tenure of the customer in weeks with respect to reference or ABT build date	Yes
			Customers or Subscription for BG			Customer Activation Date	No
Customer Acquisition	Prospective Customer	Not Applicable	All Prospects	Contacted Prospects	Fresh Prospects	Not Applicable	Not Applicable

<b>Purpose</b>	<b>Subject of Analysis</b>	<b>Recommended Subject Group</b>	<b>Recommended Subset Map</b>	<b>Implicit Subset Criterion for Modeling Run</b>	<b>Implicit Subset Criterion for Scoring Run</b>	<b>Implicit Variable Name in Modeling Run</b>	<b>Is Implicit Variable Used in Scoring Run?</b>
Association Rules Postpaid	Customer Offer	Not Applicable	Customer Offer Selection Postpaid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Association Rules Postpaid	Customer Service Activation Date	Not Applicable	Customer Service Selection Postpaid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Association Rules Postpaid	Subscription Service Activation Date	Not Applicable	Subscription Service Selection Postpaid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Association Rules Postpaid	Customer Offer Agreement Date	Not Applicable	Customer Offer Selection Postpaid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Association Rules Postpaid	Customer Service	Not Applicable	Customer Service Selection Postpaid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Association Rules Postpaid	Subscription Service	Not Applicable	Subscription Service Selection Postpaid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Association Rules Prepaid	Customer Offer	Not Applicable	Customer Offer Selection Prepaid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Association Rules Prepaid	Customer Service Activation Date	Not Applicable	Customer Service Selection Prepaid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Association Rules Prepaid	Subscription Service Activation Date	Not Applicable	Subscription Service Selection Prepaid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Association Rules Prepaid	Customer Offer Agreement Date	Not Applicable	Customer Offer Selection Prepaid	Not Applicable	Not Applicable	Not Applicable	Not Applicable

Purpose	Subject of Analysis	Recommended Subject Group	Recommended Subset Map	Implicit Subset Criterion for Modeling Run	Implicit Subset Criterion for Scoring Run	Implicit Variable Name in Modeling Run	Is Implicit Variable Used in Scoring Run?
Association Rules Prepaid	Customer Service	Not Applicable	Customer Service Selection Prepaid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Association Rules Prepaid	Subscription Service	Not Applicable	Subscription Service Selection Prepaid	Not Applicable	Not Applicable	Not Applicable	Not Applicable

## Purpose-Specific Predefined Values for Outcome Period

**Table A1.2** Purpose-Specific Predefined Values for Outcome Period

Purpose	Subject of Analysis	Time Grain	Minimum Value of Outcome Period	Maximum Value of Outcome Period	Default Value for Outcome Period
Segmentation Prepaid	Customer	Week	Not Applicable	Not Applicable	Not Applicable
Segmentation Postpaid	Customer	Month	Not Applicable	Not Applicable	Not Applicable
Churn Prepaid	Subscription	Week	1	3	1
Churn Postpaid	Subscription	Month	1	3	1
Cross-Sell Prepaid	Customer	Week	1	3	1
Cross-Sell Prepaid	Subscription	Week	1	3	1
Cross-Sell Postpaid	Customer	Month	1	3	1
Cross-Sell Postpaid	Subscription	Month	1	3	1
Up-Sell Prepaid	Subscription	Week	1	3	1
Up-Sell Prepaid	Customer	Week	1	3	1

Purpose	Subject of Analysis	Time Grain	Minimum Value of Outcome Period	Maximum Value of Outcome Period	Default Value for Outcome Period
Up-Sell Postpaid	Subscription	Month	1	3	1
Up-Sell Postpaid	Customer	Month	1	3	1
Association Rules Postpaid	Customer Offer	Month	Not Applicable	Not Applicable	Not Applicable
Association Rules Postpaid	Customer Service Activation Date	Month	Not Applicable	Not Applicable	Not Applicable
Association Rules Postpaid	Subscription Service Activation Date	Month	Not Applicable	Not Applicable	Not Applicable
Association Rules Postpaid	Customer Offer Agreement Date	Month	Not Applicable	Not Applicable	Not Applicable
Association Rules Postpaid	Customer Service	Month	Not Applicable	Not Applicable	Not Applicable
Association Rules Postpaid	Subscription Service	Month	Not Applicable	Not Applicable	Not Applicable
Association Rules Prepaid	Customer Offer	Week	Not Applicable	Not Applicable	Not Applicable
Association Rules Prepaid	Customer Service Activation Date	Week	Not Applicable	Not Applicable	Not Applicable
Association Rules Prepaid	Subscription Service Activation Date	Week	Not Applicable	Not Applicable	Not Applicable
Association Rules Prepaid	Customer Offer Agreement Date	Week	Not Applicable	Not Applicable	Not Applicable
Association Rules Prepaid	Customer Service	Week	Not Applicable	Not Applicable	Not Applicable
Association Rules Prepaid	Subscription Service	Week	Not Applicable	Not Applicable	Not Applicable
Customer Lifetime Postpaid	Customer	Month	Not Applicable	Not Applicable	Not Applicable
Customer Lifetime Prepaid	Customer	Week	Not Applicable	Not Applicable	Not Applicable
Customer Acquisition	Prospective Customer	Month	0	0	0

## Recommended Purpose-Specific Outcome Variables

**Table A1.3** Recommended Purpose-Specific Outcome Variables

Purpose	Subject of Analysis	Outcome Variable Definition
Segmentation Prepaid	Customer	Not Applicable
Segmentation Postpaid	Customer	Not Applicable
Churn Prepaid	Subscription	Customer churn is not explicit in case of Prepaid business. The occurrence of the event has to be inferred from the customer's behavior. For example, if the tenure on network of a subscription is greater than 30 days and the decrement in revenue in the past 2 weeks is less than 20 USD, then the churn flag is marked as 1 and 0 otherwise.
Churn Postpaid	Subscription	The churn flag is marked as 1 if the customer closes the subscription during the outcome period and 0 otherwise.
Cross-Sell Prepaid	Customer	The cross-sell flag is marked as 1 if the customer activates the target service or offer during the outcome window and 0 otherwise.
Cross-Sell Prepaid	Subscription	The cross-sell flag is marked as 1 if the target service or offer is activated for the subscription during the outcome period and 0 otherwise.
Cross-Sell Postpaid	Customer	The cross-sell flag is marked as 1 if the customer activates the target service or offer during the outcome period and 0 otherwise.
Cross-Sell Postpaid	Subscription	The cross-sell flag is marked as 1 if the target service or offer was activated for the subscription during the outcome period and 0 otherwise.
Up-Sell Prepaid	Subscription	The up-sell flag is marked as 1 if the target service or offer was activated for the subscription during the outcome period and 0 otherwise.



Purpose	Subject of Analysis	Outcome Variable Definition
Up-Sell Prepaid	Customer	The up-sell flag is marked as 1 if the customer activates the target service or offer during the outcome period and 0 otherwise.
Up-Sell Postpaid	Subscription	The up-sell flag is marked as 1 if the target service or offer is activated for the subscription during the outcome period and 0 otherwise.
Up-Sell Postpaid	Customer	The up-sell flag is marked as 1 if the customer activates the target service or offer during the outcome period and 0 otherwise.
Association Rules Postpaid	Customer Offer	Not Applicable
Association Rules Postpaid	Customer Service Activation Date	Not Applicable
Association Rules Postpaid	Subscription Service Activation Date	Not Applicable
Association Rules Postpaid	Customer Offer Agreement Date	Not Applicable
Association Rules Postpaid	Customer Service	Not Applicable
Association Rules Postpaid	Subscription Service	Not Applicable
Association Rules Prepaid	Customer Offer	Not Applicable
Association Rules Prepaid	Customer Service Activation Date	Not Applicable
Association Rules Prepaid	Subscription Service Activation Date	Not Applicable
Association Rules Prepaid	Customer Offer Agreement Date	Not Applicable
Association Rules Prepaid	Customer Service	Not Applicable
Association Rules Prepaid	Subscription Service	Not Applicable
Customer Lifetime Postpaid	Customer	The deactivation indicator is marked as 1 if the customer terminates the subscription before the reference date and 0 otherwise.
Customer Lifetime Prepaid	Customer	Customer churn is not explicit in case of Prepaid business. The occurrence of this event has to be inferred from the customer's behavior. For example, if there is no inbound or outbound usage in the past 30 days, then the deactivation indicator can be marked as 1 and 0 otherwise.

Purpose	Subject of Analysis	Outcome Variable Definition
Customer Acquisition	Prospective Customer	The acquisition indicator is marked as 1 if the prospective customer is acquired through a particular campaign and 0 otherwise.

# Glossary

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**ABT variable**

See analytical base table variable

**analytical base table**

a highly denormalized data structure that is designed to build an analytical model or to generate scores based on an analytical model. Short form: ABT.

**analytical base table variable**

a column in an analytical base table that is used to build a statistical model to predict defaults. Short form: ABT variable.

**analytical model**

a statistical model that is designed to perform a specific task or to predict the probability of a specific event.

**child level**

the level of information added below the primary node of a hierarchical list.

**child node**

a node of a hierarchical list that originates from a single node at a previous level.

**data mart**

a subset of the data in a data warehouse. A data mart is optimized for a specific set of users who need a particular set of queries and reports.

**dimension table**

in a star schema or snowflake schema, a table that contains data about a particular dimension. A primary key connects a dimension table to a related fact table. For example, if a dimension table named Customers has a primary key column named Customer ID, then a fact table named Customer Sales might specify the Customer ID column as a foreign key.

**fact table**

the central table in a star schema or snowflake schema. The fact table contains the individual facts that are being stored in the database as well as the keys that connect each fact to the appropriate value in each dimension.



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### ABT variables

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