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SAS® Studio 3.5

Developer's Guide to Writing Custom Tasks

SAS® Documentation

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SAS® Studio 3.5: Developer's Guide to Writing Custom Tasks

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Using This Book

Audience

SAS Studio: Developer's Guide to Writing Custom Tasks is intended for developers who need to create custom tasks for their site. This document describes the common task model for SAS Studio and explains the syntax used in this task model.

Accessibility

For information about the accessibility of this product, see Accessibility Features of SAS Studio 3.5 at support.sas.com.

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Introduction to the Common Task Model

About the SAS Studio Tasks

SAS Studio is shipped with several predefined tasks, which are point-and-click user interfaces that guide the user through an analytical process. For example, tasks enable users to create a bar chart, run a correlation analysis, or rank data. When a user selects a task option, SAS code is generated and run on the SAS server. Any output (such as graphical results or data) is displayed in SAS Studio.

Because of the flexibility of the task framework, you can create tasks for your site. In SAS Studio, all tasks use the same common task model and the Velocity Template Language. No Java programming or ActionScript programming is required to build a task.

The common task model (CTM) defines the template for the task. In the CTM file, you define how the task appears to the SAS Studio user and specify the code that is needed to run the task. A task is defined by its input data and the options that are available to the user. (Some tasks might not require an input data source.) In addition, the task has metadata so that it is recognized by SAS Studio.

In SAS Studio, a task is defined by the `Task` element, which has these children:

Registration
: The `Registration` element identifies the type of task. In this element, you define the task name, icon, and unique identifier.

Metadata
: The `Metadata` element can specify whether an input data source is required to run the task, any role assignments, and the options in the task.

  - The `Roles` element specifies the types of variables that are required by the task. Here is the information that you would specify in this element:
    - type of variable that the user can assign to this role (for example, numeric or character)
    - the minimum or maximum number of variables that you can assign to a role
    - the label or description of the role that appears in the user interface
  - The `Options` element specifies how to display the options in the user interface.

UI
: The `UI` element describes how to present the user interface to the user. A top-down layout is supported.

Dependencies
: The `Dependencies` element describes any dependencies that options might have on one another. For example, selecting a check box could enable a text box.

Requirements
: The `Requirements` element specifies what conditions must be met in order for code to be generated.

Code Template
: The `Code Template` element determines the output of the task. For most tasks, the output is SAS code.

Edit a Predefined Task

You cannot edit the code for a predefined task. However, you can copy the task code and edit the copy.

To view the code for a predefined task:

1. In the navigation pane, open the **Tasks and Utilities** section.
2. Expand the folder that contains the task.
3. Right-click the name of the task and select **Add to My Tasks**. A copy of the task is added to your **My Tasks** folder.
4. Open the **My Tasks** folder and select the copied task.
5. Click  . The XML and Velocity code for the task appears. You can now edit this code and save your changes to your **My Tasks** folder.

Using Sample Tasks

What Is the Difference between the Sample Task and the Advanced Task?

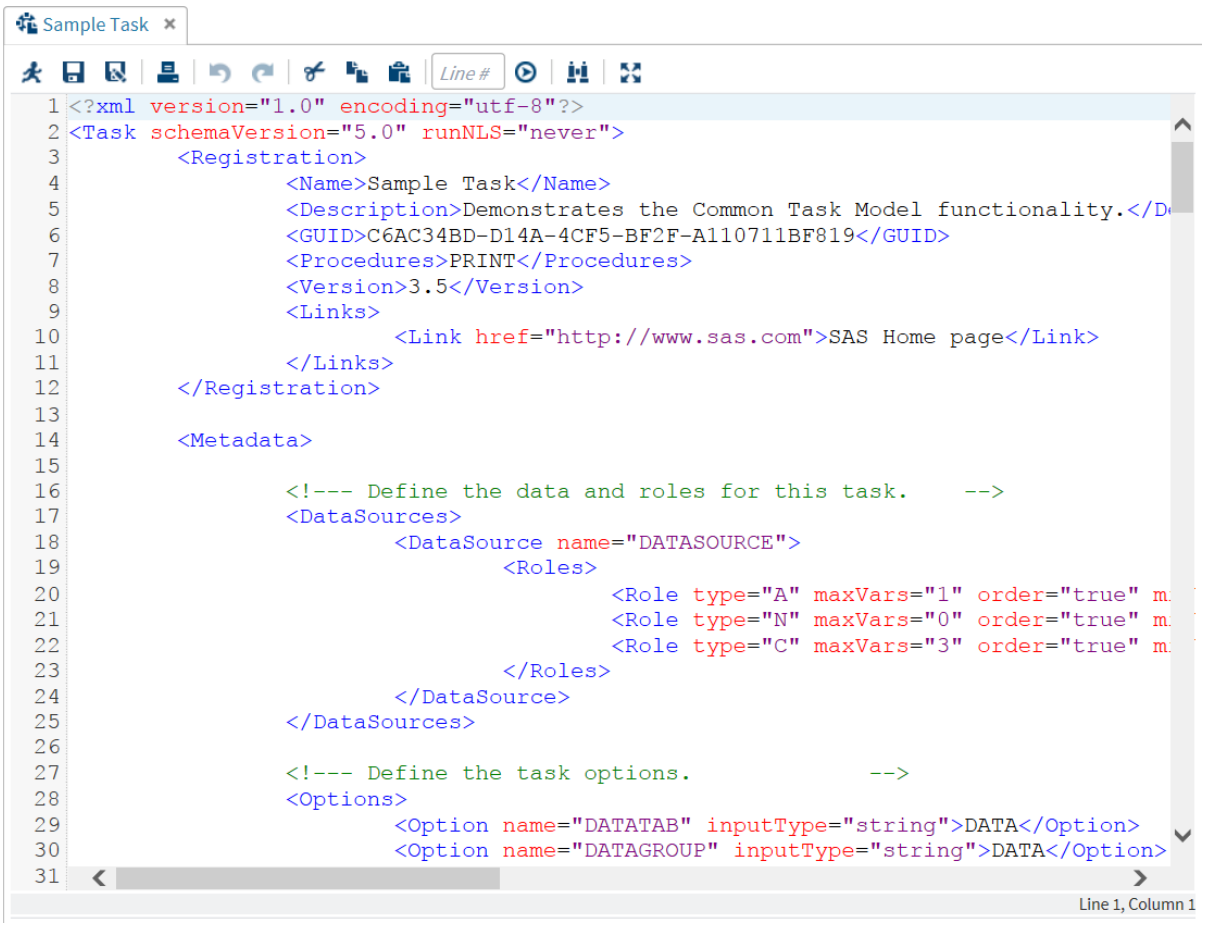
The Sample Task shows the controls that are available to you when writing a task. The Advanced Task shows some of the more complex functionality in the common task model. For example, the Advanced Task includes dependencies, the mixed effects builder, data linking, and return values.

View the Sample Task

To view the sample task:

1. In the navigation pane, open the **Tasks and Utilities** section.
2. Click and select **Sample Task**.

   The Sample Task that is shipped with SAS Studio appears.

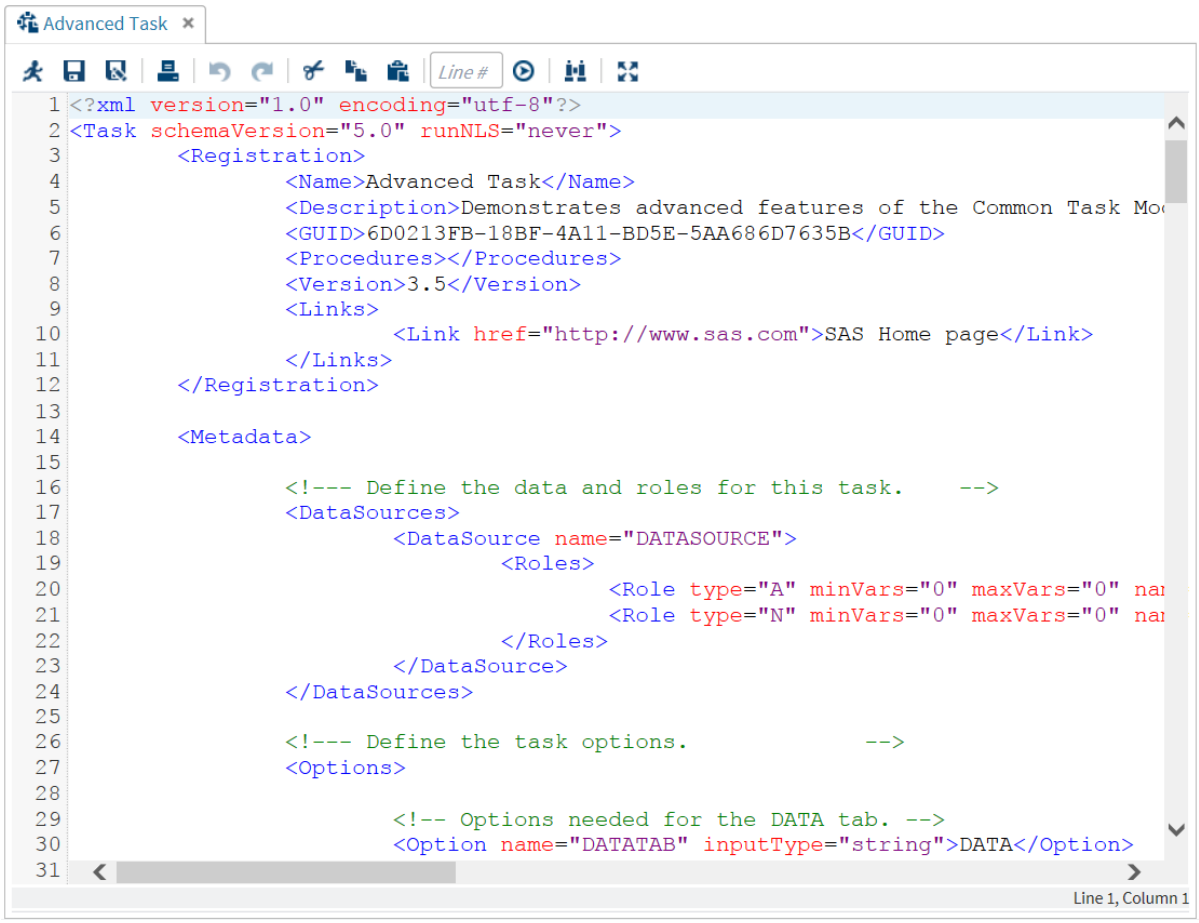


View the Advanced Task

To view the Advanced Task:

1. In the navigation pane, open the **Tasks and Utilities** section.
2. Click and select **Advanced Task**.

   The Advanced Task that is shipped with SAS Studio appears.



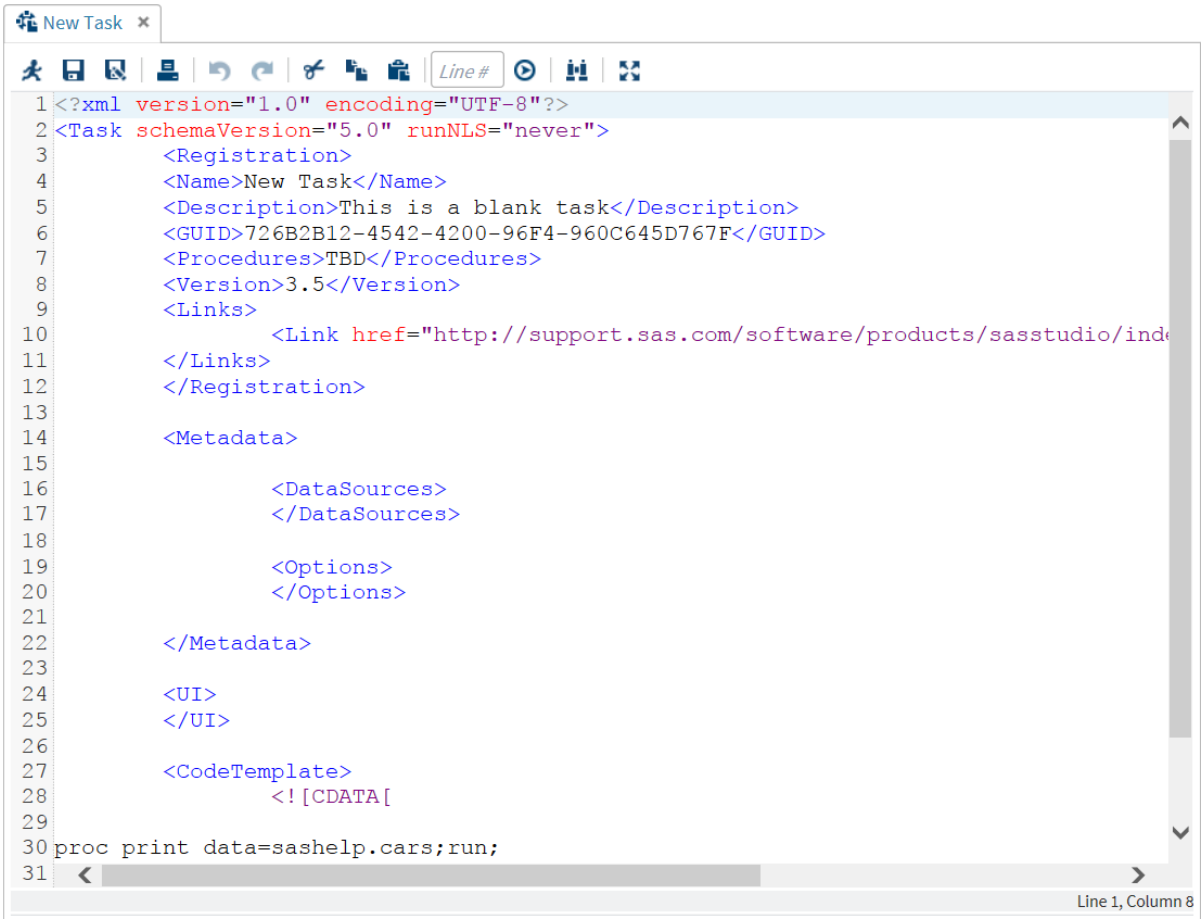
Create a New Task

A blank task is available to help you create a new task.

To create a new task:

1. In the navigation pane, open the **Tasks and Utilities** section.
2. Click and select **New Task**.

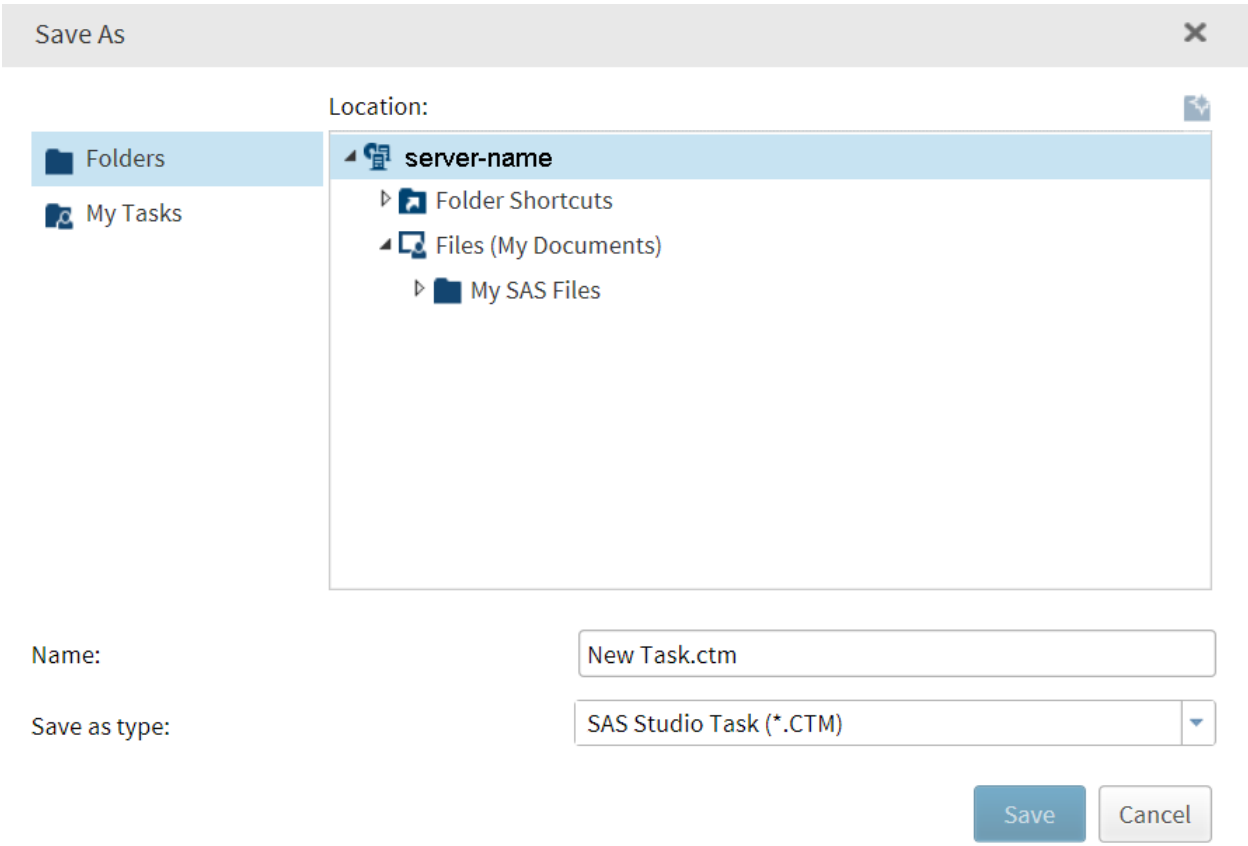
The new task appears in SAS Studio.



3 Use the blank task to create your task. For help with the Velocity Template Language, see *Apache Velocity User's Guide*.

4 To save the task, click  .

5 Enter a unique name for the task. The task is saved with the CTM file extension in your file system.



Create a Task with Default Option Settings

When you develop a task, you might want to include a default input data source or default option settings for the users at your site. In SAS Studio, you can save a task as a CTK file. When users at your site run this CTK file, they see your default settings.

Note: Before you can save a task, you must specify an input data set and all the options that are required to run the task.

To save a task:

1 Click . The Save As window appears.

2 Select the location where you want to save the task file. You can save this file in the **Folders** section or in your **My Tasks** folder. Specify a name for this file. For the file type, select **CTK Files (*.CTK)**. Click **Save**.

Note: In the **Tasks** section, you are still working with this task. If you save the task again, the CTK file in the **Folders** section is updated.

Validation Steps for the Task

When you run a task, SAS Studio validates the code by determining whether the XML is well formed, whether the Velocity template has any syntax errors, and whether there are any logical XML errors.

Testing a Task

To test your task, click  . (Alternatively, you can press F3.) A new tab that contains the user interface for the task appears in your work area. To view the SAS code for this task, click **Code**. The CTM code is still available from the original tab within the task.

Sharing Tasks

About CTM and CTK Files

After creating a task, you might want to share it with other users at your site. Tasks can be saved as CTM files or CTK files. A CTM file contains the XML and Velocity code for the task. To create a CTK file, a user opens the CTM file, sets several roles or options in the task user interface, and then saves the task. For more information about how to create a CTK file, see “Create a Task with Default Option Settings” on page 6.

You can share CTM and CTK files by attaching these files to an email or saving these files in a network location.

Accessing a Task Created by Another User

To access a task that is created by another user in SAS Studio:

1. Save the CTM or CTK file to your local computer. (This file could have been sent to you by email.)
2. In SAS Studio, open the **Folders** section and click  . The Upload Files window appears.
3. Specify where you want to upload the files and click **Choose Files** to select a file.
4. Click **Upload**.

Sharing a Task That You Created

If you save the CTM or CTK file to a shared network location, other users can create a folder shortcut to access the task from SAS Studio. The advantage to this approach is that you have only one copy of the CTM file.

To create a new folder shortcut, open the **Folders** section. Click  and select **Folder Shortcut**. Enter the shortcut name and full path and click **Save**. The new shortcut is added to the list of folder shortcuts.

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Working with the Registration Element

About the Registration Element

The `Registration` element represents a collection of metadata for the task. This element is required in order to know the type of task.

Here are the child elements for the `Registration` element:

Element Name	Description
`Name`	The name of the task. This name is used throughout the application to represent the task.
`Description`	A description of the task. This text could appear in the task properties or in tooltips for the task.
`GUID`	A unique identifier for the task.
`Procedures`	A list of SAS procedures that are used by this task.
`Version`	A simple integer value that represents the version of the task.
`Links`	A list of hyperlinks to help or resources related to this task. **Note:** If you do not have any resources to link to, this element is optional.

Example: The Registration Element from the Sample Task

Here is the `Registration` element from the Sample Task:

```
<Registration>
   <Name>Sample Task</Name>
   <Description>Demonstrates the Common Task Model functionality.</Description>
   <GUID>C6AC34BD-D14A-4CF5-BF2F-A110711BF819</GUID>
   <Procedures>PRINT</Procedures>
   <Version>3.5</Version>
   <Links>
      <Link href="http://www.sas.com">SAS Home page</Link>
   </Links>
</Registration>
```

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Working with the Metadata Element

About the Metadata Element

The `Metadata` element comprises two parts: the `DataSources` element and the `Options` element.

Working with the DataSources Element

About the DataSources Element

The `DataSources` and `DataSource` elements create a simple grouping of the data that is required for the task. If these elements are not specified, then no input data is needed to run the task.

The `DataSource` element is the only child of the `DataSources` element. Most tasks need only one data source, but multiple data sources can be defined. The `DataSource` element specifies the information about the data set for the task.

Attribute	Description
`name`	specifies the name assigned to this role.
`where`	specifies whether a filter is allowed for the data. The default value is `false`, and the user cannot filter the task from the task interface.

Working with the Roles Element

About the Roles Element

The `Roles` element is the only child of the `DataSource` element. The `Roles` element identifies the variables that must be assigned in order to run the task. This element groups the individual role assignments that are needed for a task.

The `Role` tag, which is the only child of the `Roles` element, describes one type of role assignment for the task.

Attribute	Description
`name`	specifies the name assigned to this role.

`type`	specifies the type of column that can be assigned to this role.
	Here are the valid values:
	`A`
	All column types are allowed. In the user interface, all columns are identified by the  icon.
	`N`
	Only numeric columns can be assigned to this role. In the user interface, numeric columns are identified by the  icon.
	`C`
	Only character columns can be assigned to this role. In the user interface, character columns are identified by the  icon.

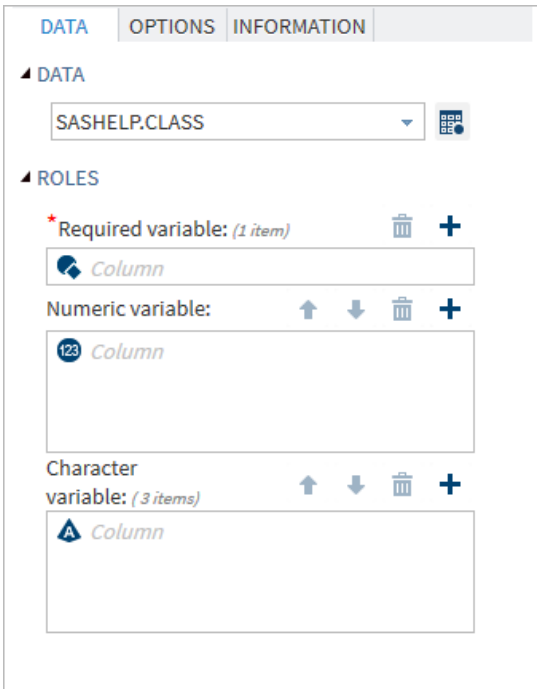
`minVars`	specifies the minimum number of columns that must be assigned to this role. If `minVars="0"`, the role is optional. If `minVars="1"`, a column is required to run this task and a red asterisk appears next to the label in the user interface.
`maxVars`	specifies the maximum number of columns that can be assigned to this role. If `maxVars="0"`, users can assign an unlimited number of columns to this role.
`exclude`	specifies the list of roles that are mutually exclusive to this role. If a column is assigned to a role in this list, the column does not appear in the list of available columns for this role.
`order`	specifies that the user can order the columns that are assigned to this role. Valid values are `true` and `false`. If `order="true"`, the user can use the up and down arrows in the user interface to modify the order.
`fetchDistinct`	specifies whether to calculate the distinct count for columns that are assigned to this role. The default value is `false`.

Example: DataSources and Roles Elements from the Sample Task

Here is an example of the `DataSources` and `Roles` elements from the Sample Task:

```
<DataSources>
   <DataSource name="DATASOURCE">
      <Roles>
         <Role type="A" maxVars="1" order="true" minVars="1"
            name="VAR"> Required variable</Role>
         <Role type="N" maxVars="0" order="true" minVars="0"
            name="OPTNVAR" exclude="VAR">Numeric variable</Role>
         <Role type="C" maxVars="3" order="true"
            minVars="0" name="OPTCVAR">Character variable<Role>
      </Roles>
   </DataSource>
</DataSources>
```

When you run this code, you get the Data and Roles sections in this example:



A red asterisk appears for the **Required variable** role because you must assign a column to this role. In the code, this requirement is indicated by `minVars="1"`.

Working with the Options Element

About the Options Element

The `Options` element identifies the options that are required in order to run the task. The `Option` tag, which is the only child of the `Options` element, describes the assigned option.

Attribute	Description
`name`	specifies the name assigned to this option.
`defaultValue`	specifies the initial value for the option.
`inputType`	specifies the input control for this option. Here are the valid values: ■ `checkbox` ■ `color` ■ `combobox` ■ `datepicker` ■ `distinct` ■ `dualselector` ■ `inputtext` ■ `mixedeffects` ■ `multientry` ■ `numstepper` ■ `numbertext` ■ `outputdata` ■ `radio` ■ `select` ■ `slider` ■ `string` ■ `textbox` ■ `validationtext` For more information, see “Supported Input Types” on page 15.
`indent`	specifies the indention for this option in the task interface. Here are the valid values: ■ `1`—minimal indention (about 17px) ■ `2`—average indention (about 34px) ■ `3`— maximum indention (about 51px)
`returnValue`	applies to strings that are used by input types (such as `combobox` and `select`) where the user has a selection of choices. If the `returnValue` attribute is specified in other contexts, this attribute is ignored. For more information, see “Specifying a Return Value Using the returnValue Attribute” on page 43.
`width`	specifies the width of the control. The width can be specified in %, em, or px. The default behavior is to autosize the control based on available width and content.

Supported Input Types

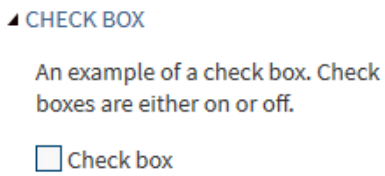
checkbox

This input type does not have additional attributes. The valid values for `checkbox` are `0` (unchecked) and `1` (checked).

Here is the example code in the Sample Task:

```
<Option name="GROUPCHECK" inputType="string">CHECK BOX</Option>
<Option name=labelCheck" inputType="string">
   An example of a check box.  Check boxes are either on or off.</Option>
<Option name="chkEXAMPLE" defaultValue="0" inputType="checkbox">
   Check box</Option>
```

Here is an example of a check box control in the user interface:



color

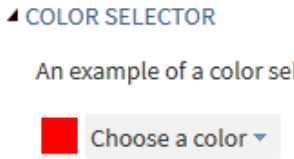
This input type has one attribute:

Attribute	Description
`required`	specifies whether a value is required. Valid values are `true` and `false`. The default value is `false`. **Note:** If the `required` attribute is set to `true` and no default value is specified, the user must select a color to run the task.

This input type does not have additional attributes. Here is an example from the sample task definition:

```
<Option name="GROUPCOLOR" inputType="string">COLOR SELECTOR</Option>
<Option name="labelCOLOR" inputType="string">An example of a color
   selector.</Option>
<Option name="colorEXAMPLE" defaultValue="red" inputType="color">
   Choose a color</Option>
```

Here is an example of a color control in the user interface:



combobox

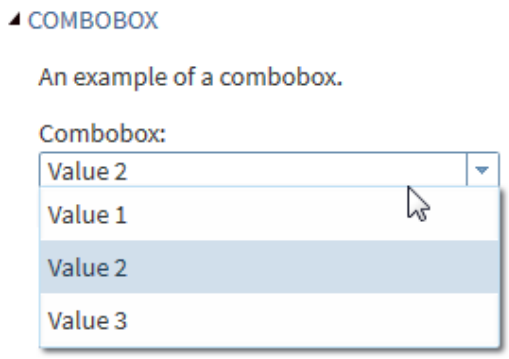
This input type has these attributes:

Attribute	Description
`required`	specifies whether a value is required. Valid values are `true` and `false`. The default value is `false`. **Note:** If the `required` attribute is set to `true` and no default value is specified, the combobox control displays the text specified in the `selectMessage` attribute.
`selectMessage`	specifies the message to display when a value is required for the combobox control and no default value has been set. The default message is `Select a value`.
`width`	specifies the width of the control. This value can be in percent (%), em, or px. By default, SAS Studio sizes the control based on the available width and content.
`editable`	specifies whether the user can enter a value in the combobox control. By default, users cannot enter a new value in the combobox control.

The code in the Sample Task creates a combination box called **Combobox**. This list contains three options: **Value 1**, **Value 2**, and **Value 3**.

```
<Option name="GROUPCOMBO" inputType="string">COMBOBOX</Option>
<Option name="labelCOMBO" inputType="string">An example of a combobox.</Option>
<Option name="comboEXAMPLE" defaultValue="value2" inputType="combobox"
   width="100%">Combobox:</Option>
<Option name="value1" inputType="string">Value 1</Option>
<Option name="value2" inputType="string">Value 2</Option>
<Option name="value3" inputType="string">Value 3</Option>
```

Here is an example of a combobox control in the user interface:



datepicker

This input type has these attributes:

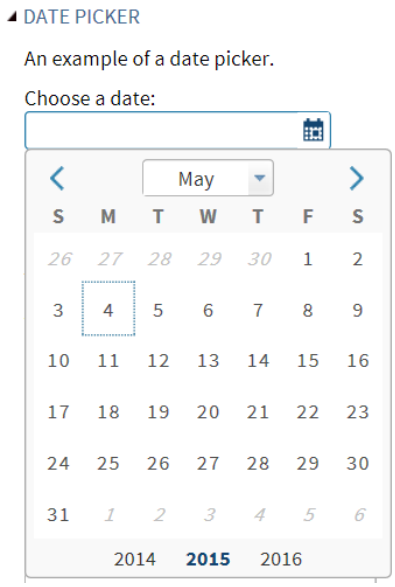
Attribute	Description
`format`	specifies the format of the date value. You can use any valid SAS date format. If no format attribute is provided, it defaults to mmddyys8. (12/24/93).
`required`	specifies whether a date is required. By default, no date is required.
`width`	specifies the width of the control. This value can be in percent (%), em, or px. By default, SAS Studio sizes the control based on the available width and content.

If you specify the `defaultValue` attribute for this input type, the value must be in ISO8601 format (yyyy-mm-dd).

The code in the Sample Task creates datepicker control with the label **Choose a date:**.

```
<Option name="GROUPDATE" inputType="string">DATE PICKER</Option>
<Option name="labelDATE" inputType="string">An example of a date picker.</Option>
<Option name="dateEXAMPLE" inputType="datepicker"
      format="monyy7.">Choose a date:</Option>
```

Here is an example of a datepicker control in the user interface:



distinct

This input type has these attributes:

Attribute	Description
`required`	specifies whether a value is required. The default value is `false`. **Note:** If the `required` attribute is set to `true` and no default value is specified, the combobox control displays the text specified in the `selectMessage` attribute.
`selectMessage`	specifies the message to display when a value is required for the combobox control and no default value has been set. The default message is `Select a value`.
`source`	specifies the role to use to get the distinct values. The `maxVars` control for the role must be set to 1. In other words, users can assign only one variable to this role.
`max`	specifies the maximum number of distinct values to obtain and display in the UI. By default, the maximum value is `100`. Larger maximum values might cause a long delay in populating the UI control. **Note:** Missing values are ignored, so missing values do not appear in the list of distinct values.
`width`	specifies the width of the control. This value can be in percent (%), em, or px. By default, SAS Studio sizes the control based on the available width and content.

In this example, you want the user of this task to see the first 15 distinct values for the response variable.

In the code, you first specify the `Datasources` element because an input data set is required to run this task. Then in the `Roles` element, you specify that only one response variable is required to run this task. The `name` attribute for this role is VAR.

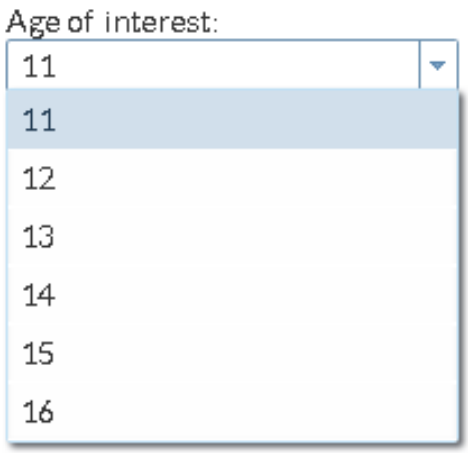
Now, you want to create an option that lists the first 15 distinct values in the VAR variable. The code for the distinct input type includes these attributes.

- The `source` attribute specifies that the values that appear in the **Age of interest** option come from the VAR role (in this example, the Age variable).
- The `max` attribute specifies that a maximum of 15 values should be available for the **Age of interest** option.

```
<DataSources>
   <DataSource name="DATASOURCE">
      <Roles>
         <Role type="A" maxVars="1" order="true" minVars="1"
            name="VAR">Response variable</Role>
```

```
      </Roles>
   </DataSource>
</DataSources>
<Options>
   <Option name="values" inputType="distinct" source="VAR"
      max="15">Age of interest:</Option>
</Options>
```

Here is an example of the distinct control in the user interface:



dualselector

This input type has these attributes:

Attribute	Description
`height`	specifies the height of the control. This value can be in em or px. If a height is not specified, SAS Studio sizes the control based on a reasonable default.
`required`	specifies whether any input text is required. Valid values are `true` and `false`. The default value is `false`.
`width`	specifies the width of the control. This value can be in percent (%), em, or px. By default, SAS Studio sizes the control based on the available width and content.

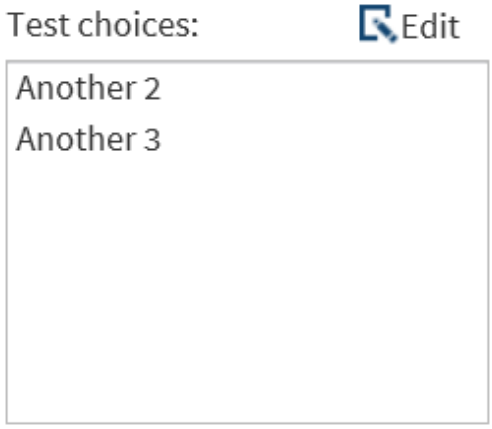
You can specify default values for the dualselector control by using the `defaultValue` attribute. Any default values that you specify are selected at run time. If you need to specify multiple default values, use a comma-separated list of values for the `defaultValue` attribute.

This example shows how the dualselector control works.

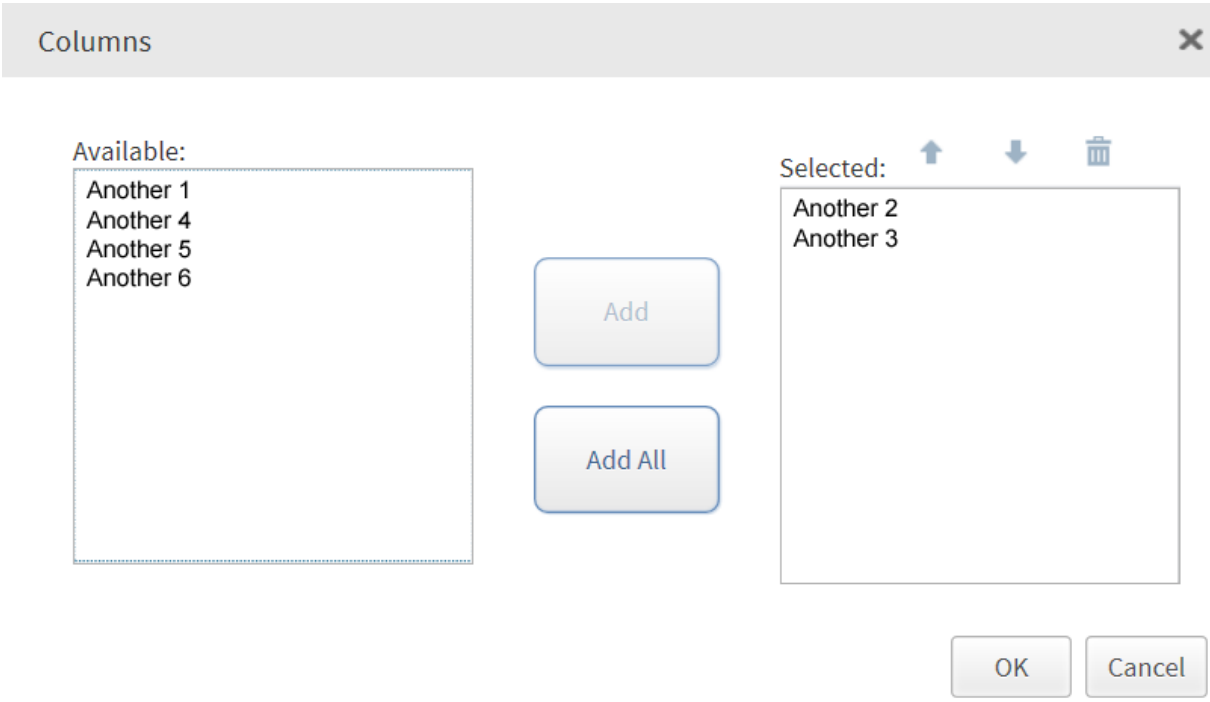
```
<Options>
   <Option name="ANOTHERLIST" inputType="dualselector"
```

```
      defaultValue="anothertest2, anothertest3">Test choices:</Option>
      <Option inputType="string" name="anothertest1">Another 1</Option>
      <Option inputType="string" name="anothertest2">Another 2</Option>
      <Option inputType="string" name="anothertest3">Another 3</Option>
      <Option inputType="string" name="anothertest4">Another 4</Option>
      <Option inputType="string" name="anothertest5">Another 5</Option>
      <Option inputType="string" name="anothertest6">Another 6</Option>
</Options>
<UI>
   <OptionChoice option="ANOTHERLIST">
      <OptionItem option="anothertest1"/>
      <OptionItem option="anothertest2"/>
      <OptionItem option="anothertest3"/>
      <OptionItem option="anothertest4"/>
      <OptionItem option="anothertest5"/>
      <OptionItem option="anothertest6"/>
   </OptionChoice>
```

When you run this code, the **Test choices** option appears in the user interface. In this example, the `defaultValue` attribute specifies to use the values for anothertest2 and anothertest3 as the default values for this option. As a result, **Another 2** and **Another 3** are automatically selected for the **Test choices** option.



To change the selected values, click **Edit**. A new dialog box appears. From this dialog box, the user can see a list of all the available variables and then select which variables to use for the **Test choices** option.



When the user clicks **OK**, any variables in the **Selected** pane now appear in the list of values for the **Test choices** option. To specify the order of the values in the **Test choices** option, use the up and down arrows for the **Selected** pane.

inputtext

This input type has these attributes:

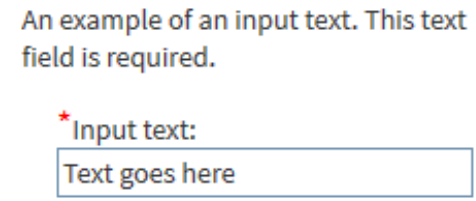
Attribute	Description
`required`	specifies whether any input text is required. Valid values are `true` and `false`. The default is `false`.
`missingMessage`	specifies the tooltip text that appears when the text box is empty but input text is required. No message is displayed by default.
`promptMessage`	specifies the tooltip text that appears when the text box is empty and the user has selected the text box.
`width`	specifies the width of the control. This value can be in percent (%), em, or px. By default, SAS Studio sizes the control based on the available width and content.

The code in the Sample Task creates a text box called **Input text**. The default value is “Text goes here.” If the user removes this text, the message “Enter some text” appears because a value is required.

```
<Option name="textEXAMPLE" defaultValue="Text goes here" inputType="inputtext"
   indent="1"
   required="true"
   promptMessage="Enter some text."
```

```
missingMessage="Missing text.">Input text:</Option>
```

Here is an example of an inputtext control in the user interface:



mixedeffects

A *model* is an equation that consists of a dependent or response variable and a list of effects. The user creates the list of effects from variables and combinations of variables.

Here are examples of effects:

main effect
: For variables Gender and Height, the main effects are Gender and Height.

interaction effect
: For variables Gender and Height, the interaction is Gender * Height. You can have two-way, three-way, ...*n*-way interactions.

  The order of the variables in the interaction is not important. For example, Gender * Height is the same as Height * Gender.

nested effect
: For variables Gender and Height, an example of a nested effect is Gender(Height).

polynomial effect
: You can create polynomial effects with continuous variables. For the continuous variable X, the quadratic polynomial effect is X*X. You can have second-order, third-order, ...*n*th-order polynomial effects.

The `mixedeffects` control enables users to create various model effects. You can define fixed effects, random effects, repeated effects, means effects, and zero-inflated effects. For the control to work properly, you must specify at least one of the role attributes, `roleContinuous` or `roleClassification`. If no roles are specified, the control is displayed but the user has no variables to work with.

Here are the attributes for the `mixedeffects` input type:

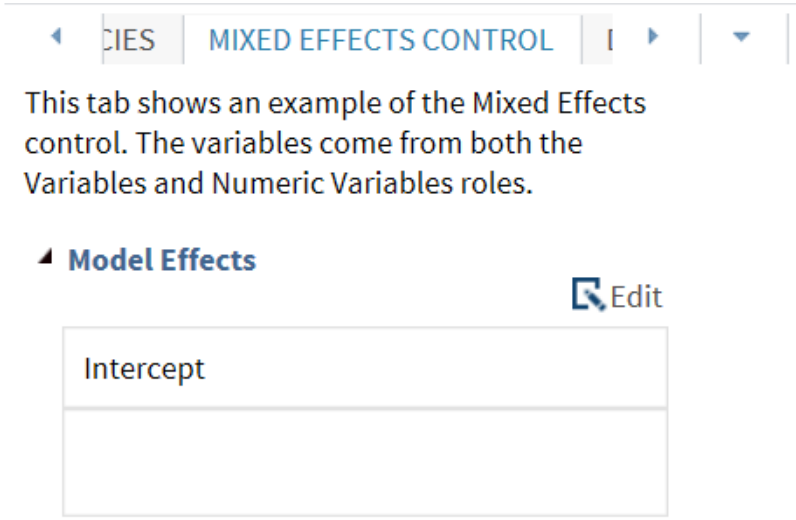
Attribute	Description
`effects`	specifies the list of effects that you want available from the task interface: ■ `fixed`—only fixed effects. This is the default value. ■ `fixedrandom`—fixed effects and random effects. ■ `fixedrandomrepeated`—fixed effects, random effects, and repeated effects. ■ `fixedrepeated`—fixed and repeated effects. ■ `meanszero`—means and zero-inflated effects.
`roleContinuous`	specifies the role that contains the continuous variables.
`roleClassification`	specifies the role that contains the classification variables.
`excludeTools`	specifies the effect and model buttons to exclude from the user interface. Valid values are `ADD`, `CROSS`, `NEST`, `TWOFACT`, `THREEFACT`, `FULLFACT`, `NFACTORIAL`, `POLYEFFECT`, `POLYMODEL`, and `NFACTPOLY`. Separate multiple values with spaces or commas.
`fixedInterceptVisible`	specifies whether the intercept option is available for fixed effects or mean effects. Valid values are `true` and `false`. The default value is `true`.
`fixedInterceptDefaultValue`	specifies the default value for the intercept option if `fixedInterceptVisible = true`. Valid values are `0` and `1`. The default value is `1`.
`randomInterceptVisible`	specifies whether the intercept option is available for random effects. Valid values are `true` and `false`. The default value is `true`.
`randomInterceptDefaultValue`	specifies the default value for the intercept option if `randomInterceptVisible = true`. Valid values are `0` and `1`. The default value is `1`.

Attribute	Description
width	specifies the width of the control. The width value can be specified in percent, em, or px. By default, the control is automatically sized based on the available width and content.

Here is an example of the mixedeffects control from the Advanced Task:

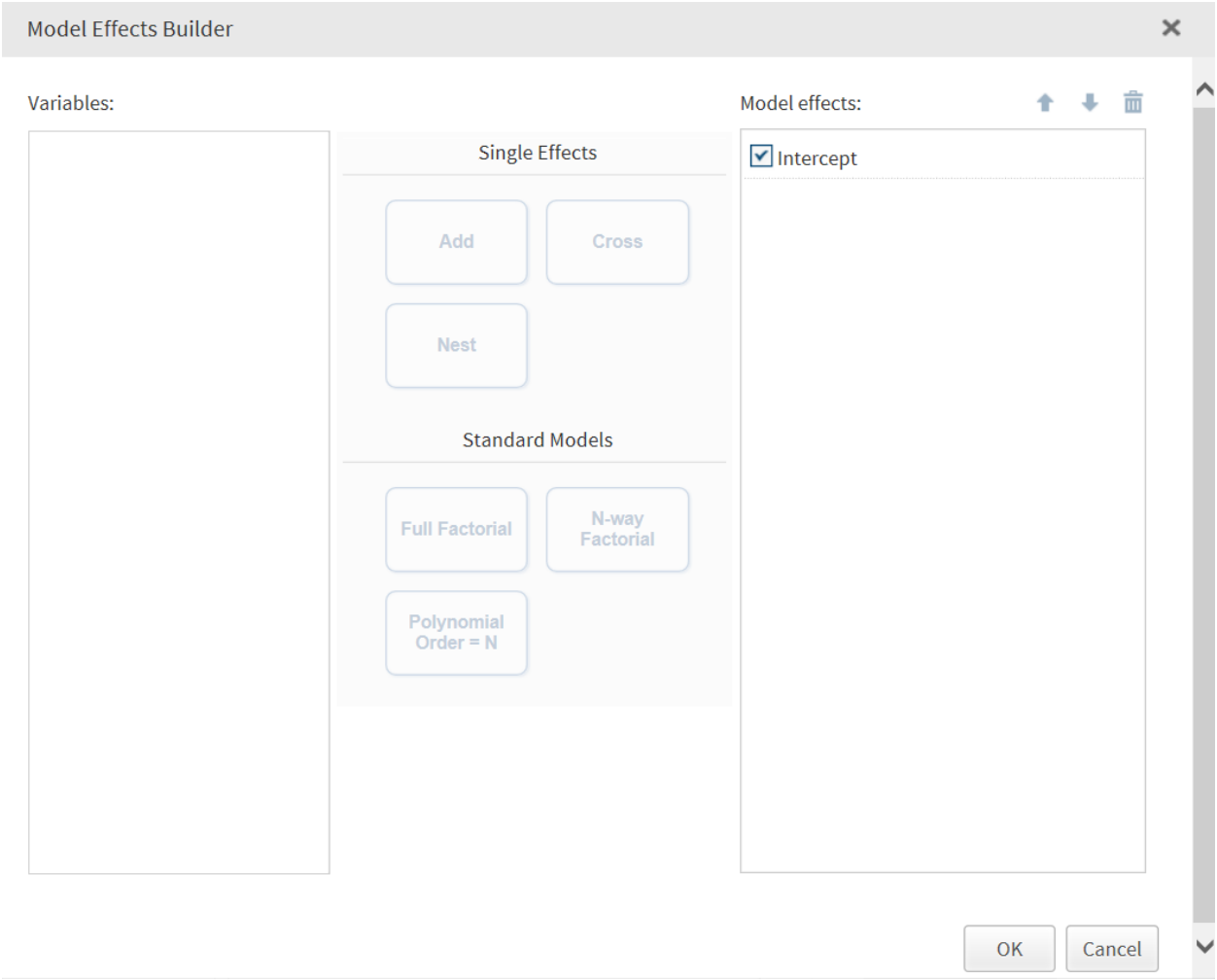
```
<Options>
   <Option name="MECTAB" inputType="string">MIXED EFFECTS CONTROL</Option>
    <Option name="MECTEXT" inputType="string">This tab shows an example
     of the Mixed Effects control.The variables come from both the
     Variables and Numeric Variables roles.</Option>
    <Option name="mixedEffects" inputType="mixedeffects"
        roleContinuous="dataVariablesNumeric" roleClassification="dataVariables"
       excludeTools="POLYEFFECT,TWOFACT,THREEFACT,NFACTPOLY"></Option>

...
</Options>
   <UI>
      <Container option="MECTAB">
            <OptionItem option="MECTEXT"/>
            <OptionItem option="mixedEffects"/>
        </Container>
   </UI>
```

If you run the Advanced Task, here is the resulting **Mixed Effects Control** tab:

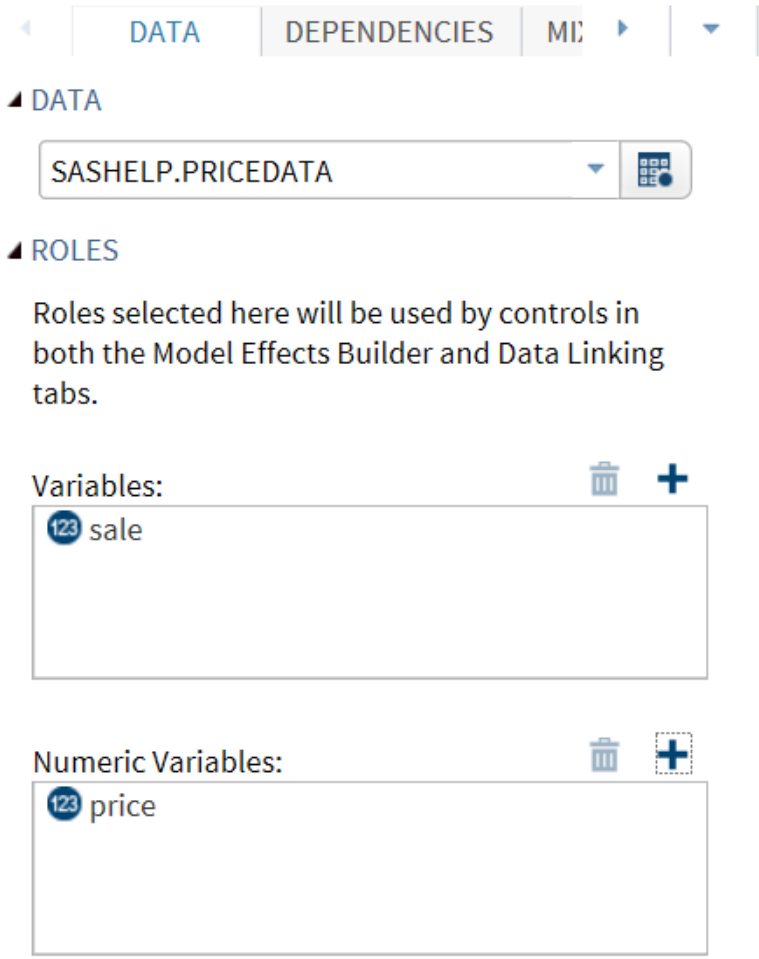


If you click **Edit**, the Model Effects Builder appears.

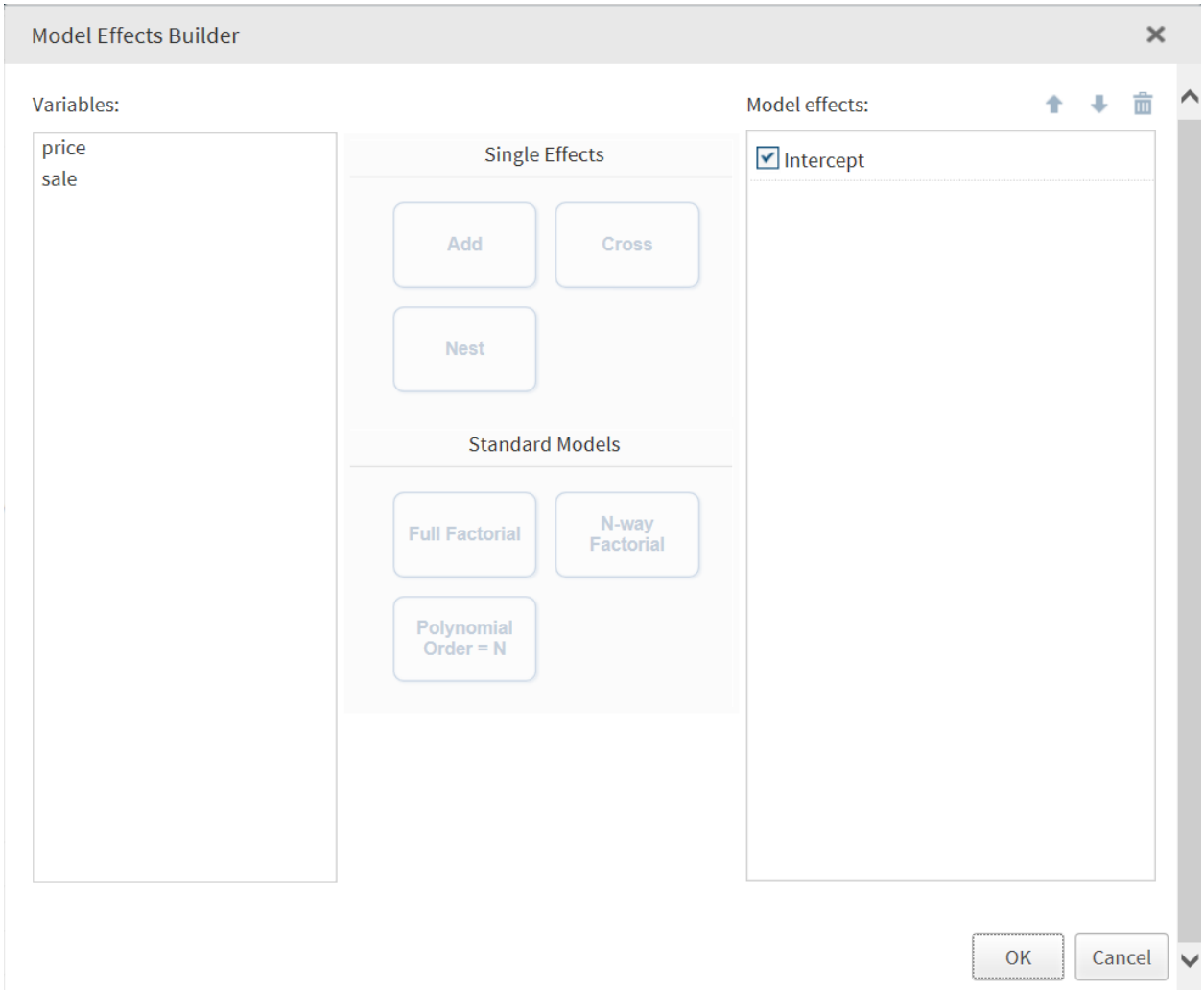
The component opens, but there are no variables to work with in the **Variables** pane. You must assign a variable to the continuous variable or classification variable role.



In the Advanced Task, close the Model Effects Builder and click the **Data** tab. Select an input data source (such as Sashelp.Pricedata) and assign variables to the **Variables** and **Numeric Variables** roles.



Return to the **Model Effects Control** tab and click **Edit**. Now, the price and sale variables are available from the **Variables** pane.



modelbuilder

Note: The `modelbuilder` control will be removed in a later release. All SAS Studio tasks that used the `modelbuilder` control have been revised to use the `mixedeffects` control.

The `modelbuilder` input type has these attributes:

Attribute	Description
`required`	specifies whether any input text is required. Valid values are `true` and `false`. The default value is `false`.
`roleContinuous`	specifies the role that contains the continuous variables. The default value is null.
`roleClassification`	specifies the role that contains the classification variables. The default value is null.

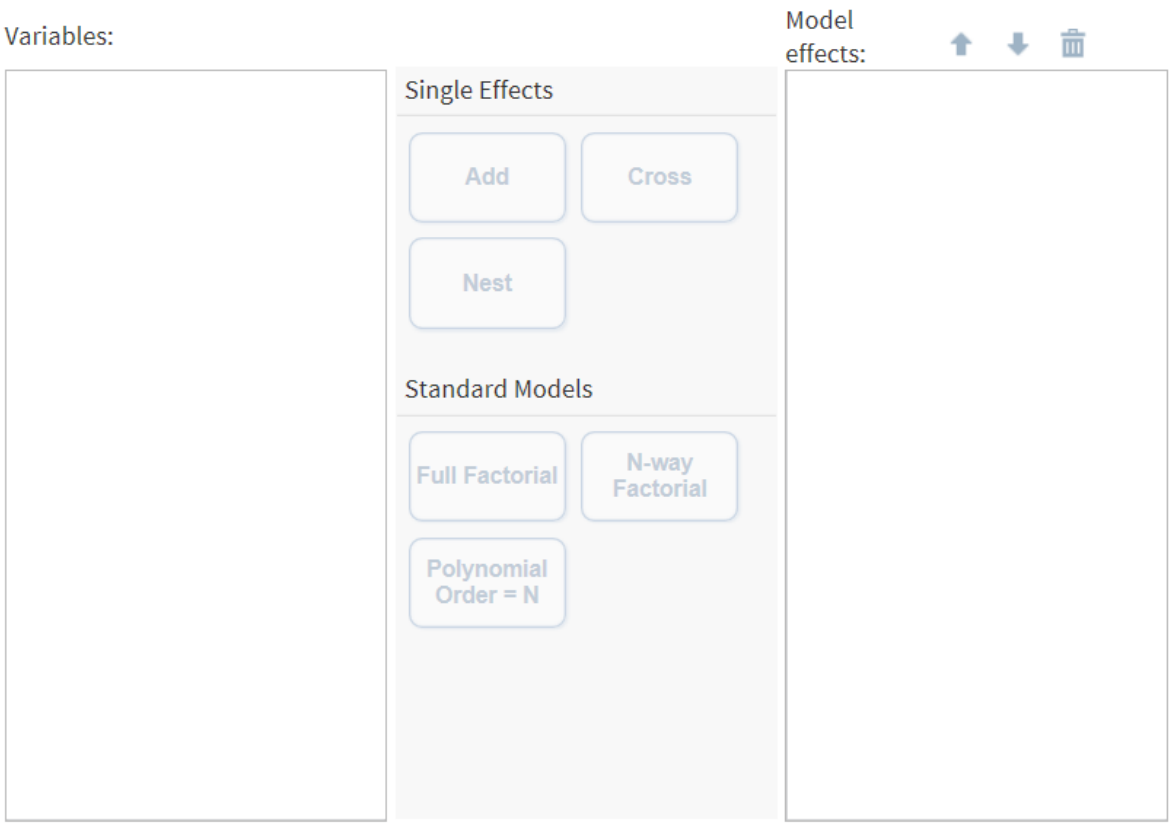
Attribute	Description
excludeTools	specifies the effect and model buttons to exclude from the user interface. Valid values are ADD, CROSS, NEST, TWOFACT, THREEFACT, FULLFACT, NFACTORIAL, POLYEFFECT, POLYMODEL, and NFACTPOLY. Separate multiple values with spaces or commas.
width	specifies the width of the control. The width value can be specified in percent, em, or px. By default, the control is automatically sized based on the available width and content.

Note: At least one of the role attributes (roleContinuous or roleClassification) is required. If both attributes are set to null, no variables are available to create the model.

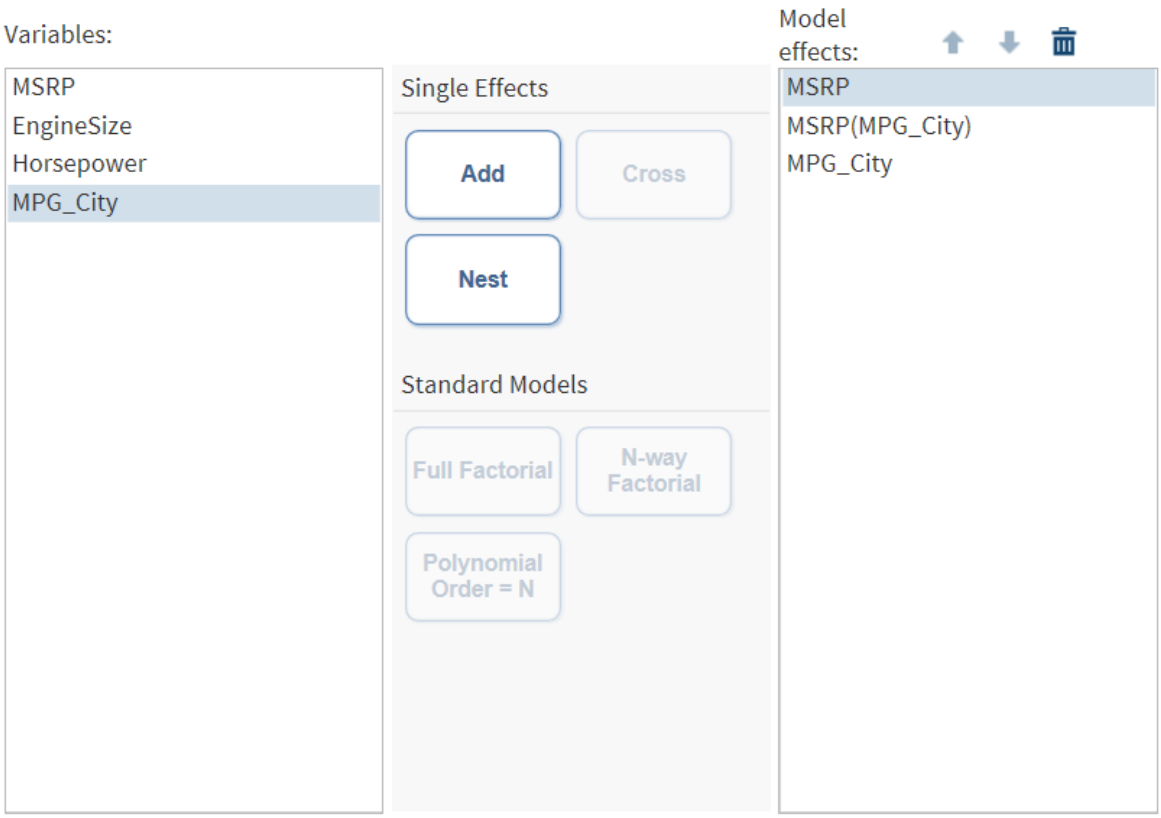
Here is some example code for the modelbuilder input type:

```
<Option excludeTools="THREEFACT,NFACTPOLY" inputType="modelbuilder"
   name="modelbuilder" roleClassification="classVariables"
   roleContinuous="continuousVariables"
   width="100%">Model</Option>
```

Here is an example of a modelbuilder control in the user interface:



After selecting an input data source and identifying the columns that contain the continuous or classification variables, you can start building your model. This example uses the Sashelp.Cars data set as the input data source. MSRP, EngineSize, Horsepower, and MPG_City are the continuous variables.



multientry

This input type has these attributes:

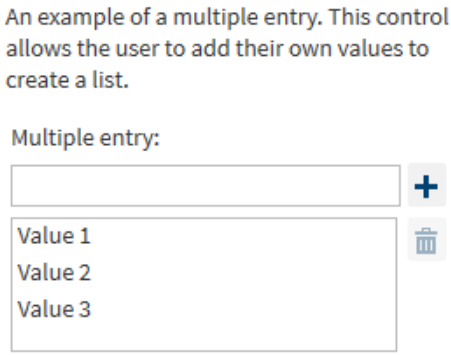
Attribute	Description
`required`	specifies whether a value is required. Valid values are `true` and `false`. The default value is `false`.
`width`	specifies the width of the control. This value can be in percent (%), em, or px. By default, SAS Studio sizes the control based on the available width and content.
`reorderable`	specifies whether the user can reorder the values in the list. Valid values are `true` and `false`. The default value is `false`.

The code in the Sample Task creates the **Multiple entry** option.

```
<Options>
   <Option name="labelMULTIENTRY" inputType="string">An example of a
      multiple entry. This control allows the user to add their own
      values to create a list.</option>
   <Option name="multientryEXAMPLE" inputType="multientry">Multiple entry:</Option>
</Options>

<UI>
```

```
...
   <OptionItem option="labelMULTIENTRY" />
   <OptionChoice option="multientryEXAMPLE">
      <OptionItem option="value1" />
      <OptionItem option="value2" />
      <OptionItem option="value3" />
   <OptionChoice>

...
```

In this example, the **Multiple entry** option has three values: **Value 1**, **Value 2**, and **Value 3**. To add additional values to the list, enter the name of the new value in the text box and click +.



To enable users to reorder the values in this list, set the `reorderable` attribute to `true`, as shown in this example.

```
<Options>
   <Option name="labelMULTIENTRY" inputType="string">An example of a multiple
      entry. This control allows the user to add their own values to create
      a list.</Option>
   <Option name="multientryEXAMPLE" inputType="multientry" reorderable="true">
      Multiple entry:</Option>
</Options>

<UI>
...
   <OptionItem option="labelMULTIENTRY" />
   <OptionChoice option="multientryEXAMPLE">
      <OptionItem option="value1" />
      <OptionItem option="value2" />
      <OptionItem option="value3" />
   <OptionChoice>

...
```

Now, the multientry control includes up and down arrows.

numbertext

This input type has these attributes:

Attribute	Description
`decimalPlaces`	specifies the number of decimal places to display. Valid values include a single value or a range. To create a field that allows 0 to 3 decimal places, specify `decimalPlaces="0,3"`. The maximum number of decimal places is 15.
`invalidMessage`	specifies the tooltip text that appears when the content is invalid.
`maxValue`	specifies the maximum value that is allowed. If the user tries to exceed this value, a message appears. The default value is `9000000000000`.
`minValue`	specifies the minimum value that is allowed. If the user specifies a value that is below the minimum value, a message appears.
`missingMessage`	specifies the tooltip text that appears when the text box is empty, but a value is required.
`promptMessage`	specifies the tooltip text that appears when the text box is empty, and the field has focus.
`rangeMessage`	specifies the tooltip text that appears when the value in the text box is outside the specified range.
`required`	specifies whether a value is required. Valid values are `true` and `false`. The default value is `false`.
`width`	specifies the width of the control. This value can be in percent (%), em, or px. By default, SAS Studio sizes the control based on the available width and content.

This example code creates a field called **Number text**.

```
<Option name="labelNUMBERTEXT" inputType="string">An example of a number
   text.  The minimum value is set to 0 and the maximum value is set to 100.
```

```
<Option name="numberTextEXAMPLE" defaultValue="1"
   inputType="numbertext"
   minValue="0"
   maxValue="100"
   promptMessage="Enter a number between 0 and 100."
   missingMessage="Enter a number between 0 and 100."
   rangeMessage="This number is out of range.  Enter a number between
      0 and 100.">
   invalidMessage="Invalid value. Enter a number between 0 and 100.">
   Number text:</Option>
```

Here is an example of the numbertext control in the user interface:

According to the code, the minimum value for this field is `0`, and the maximum value is `100`. Because 110 exceeds the maximum value, the default out of range message appears.

numstepper

This input type has these attributes:

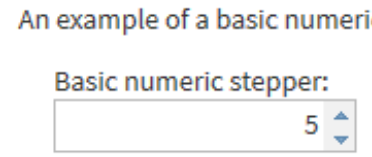
Attribute	Description
`decimalPlaces`	specifies the number of decimal places to display. Valid values include a single value or a range. To create a field that allows 0 to 3 decimal places, specify `decimalPlaces="0,3"`.
`increment`	specifies the number of values that the option increases or decreases when a user clicks the up or down arrow. The default value is `1`.
`invalidMessage`	specifies the tooltip text that appears when the content in the field is invalid.
`maxValue`	specifies the maximum value that is allowed. If the user tries to exceed this value, a message appears. The default value is `9000000000000`.
`minValue`	specifies the minimum value that is allowed. If the user specifies a value that is below the minimum value, a message appears.
`missingMessage`	specifies the tooltip text that appears when the field is empty but a value is required.
`promptMessage`	specifies the tooltip text that appears when the field is empty and the mouse is positioned over the field.
`rangeMessage`	specifies the tooltip text when the value in the text box is outside the specified range.

Attribute	Description
required	specifies whether a value is required. Valid values are true and false. The default value is false.
width	specifies the width of the control. This value can be in percent (%), em, or px. By default, SAS Studio sizes the control based on the available width and content.

The first example in the Sample Task creates an option with an assigned default value of 5.

```
<Option name="labelNumStepperEXAMPLE1" inputType="string">
   An example of a basic numeric stepper.</Option>
<Option name="basicStepperEXAMPLE" defaultValue="5" inputType="numstepper"
   indent="1">Basic numeric stepper:</Option>
```

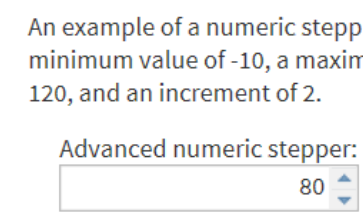
Here is an example of a numstepper control in the user interface:



The second example in the Sample Task creates an option with a specified minimum value, maximum value, and increment.

```
<Option name="labelNumStepperEXAMPLE2" inputType="string">
   An example of a numeric stepper with a minimum value of -10, a maximum value
      of 120, and an increment of 2.</Option>
<Option name="advancedStepperEXAMPLE" defaultValue="80" inputType="numstepper"
   increment="2"
   minValue="-10"
   maxValue="120"
   decimalPlaces="0,2"
   width="8em"
   indent="1">Advanced numeric stepper:</Option>
```

When you run the code, here is the resulting user interface:



outputdata

The outputdata input type creates a text box where the user can specify the name of the output data set that is created by a task.

This input type has these attributes:

Attribute	Description
`required`	specifies whether a name is required. The default value for this attribute is `false`, which means that no name is required.
`width`	specifies the width of the control. The width can be specified in (percent) %, em, or px. By default, SAS Studio determines the size of the control based on the available width and content.

Here are the two types of valid values for this control:

- a single-level name in the format *data-set-name*
- a two-level name in the format *library-name.data-set-name*

These names must follow SAS naming conventions. For more information, see "Names in the SAS Language" in *SAS Language Reference: Concepts*.

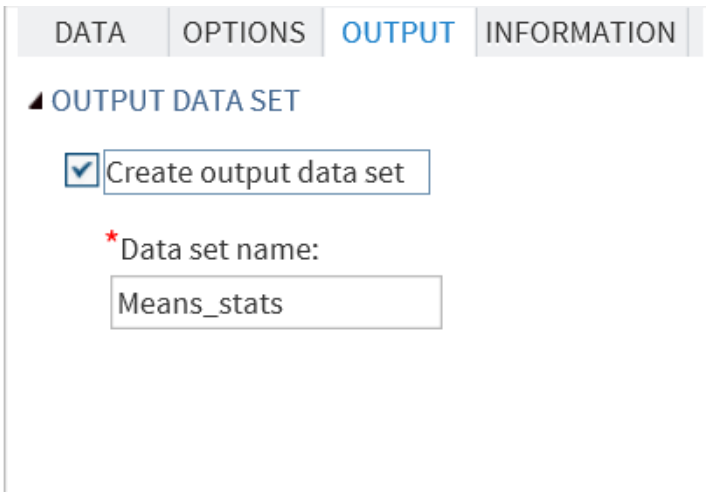
Note: If you specify a single-level member name, the library is determined by the application where you are running the task (such as SAS Studio, SAS Enterprise Guide, or the SAS Add-In for Microsoft Office) or by the SAS Server. To increase the flexibility in initializing the task, use a single-level data set name for the `defaultValue` attribute.

If you use the `defaultValue` attribute, SAS Studio checks to see whether this name is unique when you open the task. If the name is unique, the outputdata control in the task uses the default name specified. If the name is not unique, a suffix (starting with 0001) is added to the default name.

In this code example, the `defaultValue` attribute is Outputds. If no existing data sets use this name, Outputds appears as the name in the outputdata control. If an Outputds data set already exists, SAS Studio uses the suffix to create a unique name, such as Outputds0001. Using this technique prevents SAS Studio from overwriting an existing data set.

```
<Option defaultValue="Outputds" indent="1" inputType="outputdata"
   name="outputDSName" required="true">Data set name:</Option>
```

Here is an example of the outputdata control from the Summary Statistics task:



radio

This input type has one attribute:

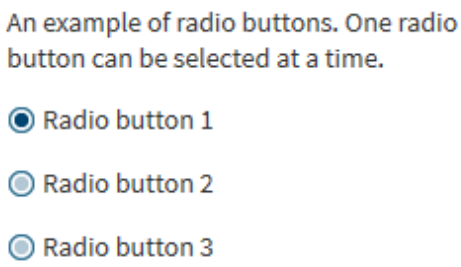
Attribute	Description
`variable`	specifies a variable that contains the name of the currently selected radio button.

One radio button must be selected. If none of the values for the radio button list include the `defaultValue` attribute, the first button in the list is selected.

The example in the Sample Task creates an option called **Radio button group label** with **Radio button 1** selected by default.

```
<Options>
   <Option name="labelRADIO" inputType="string">An example of radio buttons.
      One radio button can be selected at a time.</Option>
   <Option name="radioButton1" variable="radioEXAMPLE" defaultValue="1"
      inputType="radio">Radio button 1</Option>
   <Option name="radioButton2" variable="radioEXAMPLE"
      inputType="radio">Radio button 2</Option>
   <Option name="radioButton3" variable="radioEXAMPLE"
      inputType="radio">Radio button 3</Option>

...
</Options>
```

Here is how this radio control appears in the user interface:



select

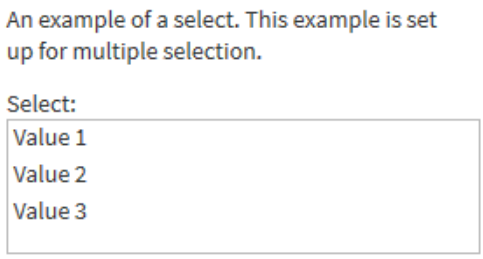
This input type has these attributes:

Attribute	Description
`multiple`	specifies whether users can select one or multiple items from the list. Valid values are `true` and `false`. The default value is `true`.
`required`	specifies whether the user must select a value from the list. Valid values are `true` and `false`. The default value is `false`.

Attribute	Description
sourceLink	specifies that the data for this control should come from another option. For more information about this attribute, see “Populating the Values for a Select Control from a Source Control” on page 44.
width	specifies the width of the control in percent (%), em, or px.
height	specifies the height of the control in em or px.

The Sample Task creates an option called **Select**.

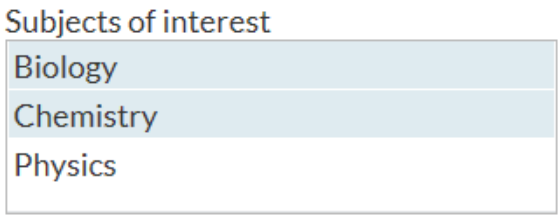
```
<Option name="labelSELECT" inputType="string">An example of a select.
   This example is set up for multiple selection.</Option>
<Option name="selectEXAMPLE" inputType="select" multiple="true">Select:</Option>

<UI>
...
<OptionItem option="labelSELECT" />
<OptionChoice option="selectEXAMPLE">
   <OptionItem option="value1"/>
   <OptionItem option="value2"/>
   <OptionItem option="value3"/>
</OptionChoice>
```



This example creates a selection list called **Subjects of interest** and has three choices: Biology, Chemistry, and Physics. The `defaultValue` attribute specifies the item or items that should be selected by default. Multiple items are in a comma-separated list. In this example, item1 (Biology) and item2 (Chemistry) are selected by default.

```
<Option name="selectExample" inputType="select" multiple="true"
   defaultValue="item1, item2">Subjects of interest</Option>
   <Option name="item1" inputType="string">Biology</Option>
   <Option name="item2" inputType="string">Chemistry</Option>
   <Option name="item3" inputType="string">Physics</Option>
```

Here is an example of the select control in the user interface:



slider

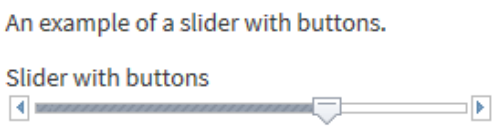
This input type has these attributes:

Attribute	Description
`discreteValues`	specifies the number of discrete values in the slider. For example, if `discreteValues="3"`, the slider has three values: a minimum value, a maximum value, and a value in the middle.
`maxValue`	specifies the maximum value for this option.
`minValue`	specifies the minimum value for this option.
`showButtons`	specifies whether to show the increase and decrease buttons for the slide. Valid values are `true` and `false`. The default value is `true`.

The first example in the Sample Task creates a slider option with buttons.

```
<Option name="labelSliderEXAMPLE1" inputType="string">
      An example of a slide with buttons.</Option>
<Option name="labelSliderEXAMPLE1" defaultValue="80.00"
   inputType="slider" discreteValues="14" minValue="-10"
   maxValue="120">Slider with buttons</Option>
```

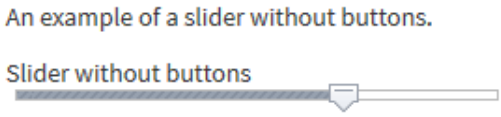
When you run the code, here is the resulting user interface:



The second example in the Sample Task creates a slider option without buttons.

```
<Option name="labelSliderEXAMPLE2"
   inputType="string">An example of a slider without buttons.</Option>
<Option name="labelSliderEXAMPLE2" defaultValue="80.00"
   inputType="slider" discreteValues="14" minValue="-10"
   maxValue="120" showButtons="false">Slider without buttons</Option>
```

When you run the code, here is the resulting user interface:



string

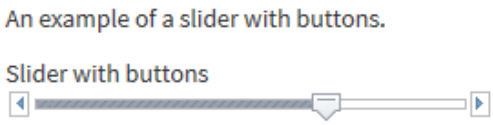
The `string` input type can be used to display informational text to the user, to define strings for the `OptionChoice` tags, and to define string values that are used by the Velocity code.

Attribute	Description
`returnValue`	is the string that is returned in the control's Velocity variable (instead of the control's name). This attribute applies only when the string is used in an `OptionChoice` tag.

The code for the Sample Task contains several examples of the string input type. In the code for the slider option, the explanatory text (**An example of a slider with buttons**) is created by the string input type.

```
<Option name="labelSliderEXAMPLE1" inputType="string">
   An example of a slider with buttons.</Option>
<Option name="labelSliderEXAMPLE1" defaultValue="80.00"
   inputType="slider" discreteValues="14" minValue="-10"
   maxValue="120">Slider with buttons</Option>
```

When you run the code, here is the resulting user interface:



textbox

The `textbox` input type enables the user to enter multiple lines of text. This input type has these attributes:

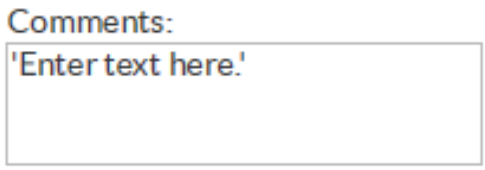
Attribute	Description
`required`	specifies whether any input text is required. Valid values are `true` and `false`. The default value is `false`.
`width`	specifies the width of the control. This value can be in percent (%), em, or px. By default, SAS Studio sizes the control based on the available width and content.
`height`	specifies the height of the control. This value can be in em or px. By default, SAS Studio sizes the control based on the available height and content.

Attribute	Description
splitLines	specifies whether to split the text into an array of lines. The split is determined by the newline character. The default value is false.

If you specify the defaultValue attribute with this input type, you can specify the initial string to display in the text box. In this example, the text 'Enter text here' appears in the text box by default. Note the use of single quotation marks around the text. This example shows how you would include single quotation marks in your default text. These quotation marks are not required.

```
<Option name="textSimple" required="true" inputType="textbox"
      defaultValue="'Enter text here'">Text Box</Option>
```

Here is an example of a textbox control in the user interface. Note this example uses the default text. When the user types in the textbox control, this text disappears.



validationtext

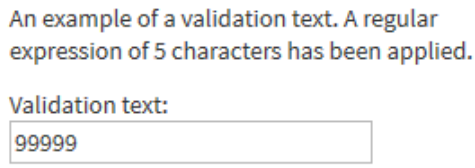
This input type has these attributes:

Attribute	Description
required	specifies whether any input text is required. Valid values are true and false. The default value is false.
invalidMessage	specifies the tooltip text to display when the content in the text box is invalid. By default, no message is displayed.
missingMessage	specifies the tooltip text that appears when the text box is empty but text is required. By default, no message is displayed.
promptMessage	specifies the tooltip text that appears when the text box is empty and the text box is selected. By default, no message is displayed.
regExp	specifies the regular expression pattern to use for validation. This syntax comes directly from JavaScript Regular Expressions.
width	specifies the width of the control. This value can be in percent (%), em, or px. By default, SAS Studio sizes the control based on the available width and content.

The code for the Sample Task creates a text box called **Validation text**.

```
<Option name="labelVALIDATIONTEXT" inputType="string">An example of a validation
   text. A regular expression of 5 characters has been applied.</Option>
<Option name="validationTextExample" defaultValue="99999"
   inputType="validationtext"
   promptMsg="Enter a string 5 characters long."
   invalidMsg="More than 5 characters have been entered."
   regExp="\d{5}">Validation text:
</Option>
```

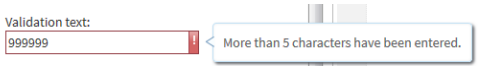
When you run the code, here is the resulting user interface:



If you remove the default value from this box, the `Enter a string 5 characters long` message appears.

When the user begins entering a value, this message appears: `Enter a string 5 characters long`.

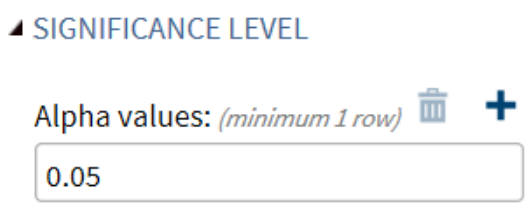
If the specified value is more than five characters, the message for an invalid value appears.



Organizing Options into a Table Component

The `OptionTable` element defines a table component that contains one or more custom-defined columns. Each column contains one input type, and each column can have a different input type. Within a column, each row has the same input type control. If you specify the `addRemoveRowTools` attribute, users can add and delete rows from the table.

Here is an example from the Pearson Correlation task (in the Power and Sample Size group):



Use these attributes to create the table:

Attribute	Description
`name`	specifies the name assigned to the option.
`label`	specifies the label for the table in the user interface.
`indent`	specifies the indention for this option in the task interface. Here are the valid values: ■ `1`—minimal indention (about 17px) ■ `2`—average indention (about 34px) ■ `3`——maximum indention (about 51px)
`initialNumberofRows`	specifies the number of empty rows in a new table. By default, this value is `1`.
`addRemoveRowTools`	specifies whether to enable the user to add and remove rows from the table. Valid values are `true` and `false`. When this value is set to `true`, icons for adding and removing rows appear above the table. By default, this value is `false`, so the task interface contains only the number of rows that you specified using the `initialNumberofRows` attribute.
`showColumnHeadings`	specifies whether to show the column headings in the table. Valid values are `true` and `false`. The default value is `false`, and no column headings are displayed.
`minimumRequiredRows`	specifies the minimum number of rows that must be completed. This value must be greater than or equal to 1. The default value is `1`.
`noIncompleteRows`	specifies whether incomplete rows are allowed in the table. Valid values are `true` and `false`. The default value is `false`. If this attribute is set to `true`, the task cannot run if there are any incomplete rows in the table.

The `OptionTable` element can have only one child, the `Columns` element. The `Columns` element can contain multiple `Column` elements. Each `Column`element describes a column in the table.

Each column must be defined in an `Option` element in the metadata. In the `Option` element, the values for the `name` and `width` attributes are ignored. Specify the initial column width by using the `width` attribute in the `Column` element.

You can use these input types for the columns in the option table:

- checkbox
- combobox
- numbertext
- numstepper
- textbox

Here are the attributes for the Column element:

Attribute	Description
name	specifies the name of the column. This attribute is required.
label	specifies the label of the column.
defaultValues	specifies a list of default values for the first several rows. These values apply only when the table is created. If this attribute is not specified for the column, the value of defaultValue for the cell is used instead. The defaultValues column attribute takes precedence over the defaultValue cell attribute.
width	specifies the initial width of the column. This width is in pixels. If you do not specify a width, the column width is an estimate based on the properties of the column widget.

Here is an example that uses the OptionTable element:

```
<OptionTable name="optionTable" initialNumberOfRows="3" addRemoveRowTools="false">
   <Columns>
      <Column name="colNumberText" label="NumberText" labelKey="alphaKey">
         <Option inputType="numbertext" minValue="1" maxValue="10"
            decimalPlaces="0,4" required="true"/>
      </Column>

      <Column name="colNumStepper" label="NumStepper">
        <Option inputType="numstepper" minValue="0" maxValue="10"
          decimalPlaces="0" increment="1" required="true"
           missingMessage="Custom missing message: Enter a number between
              0 and 10."
           invalidMessage="Custom invalid message: Enter a number between
              0 and 10."/>
      </Column>

      <Column name="colCheckBox" label="CheckBox">
         <Option inputType="checkbox"/>
      </Column>

      <Column name="colTextBox" label="TextBox">
         <Option inputType="textbox" required="true"/>
```

```
            </Column>

            <Column name="colComboBox" label="ComboBox">
               <Option inputType="combobox" defaultValue="average" required="true">
                  <Option name="none" inputType="string">None</Option>
                  <Option name="average" inputType="string">Average of values</Option>
                  <Option name="total" inputType="string">Sum of values</Option>
               </Option>
            </Column>
         </Columns>
      </OptionTable>
```

Specifying a Return Value Using the returnValue Attribute

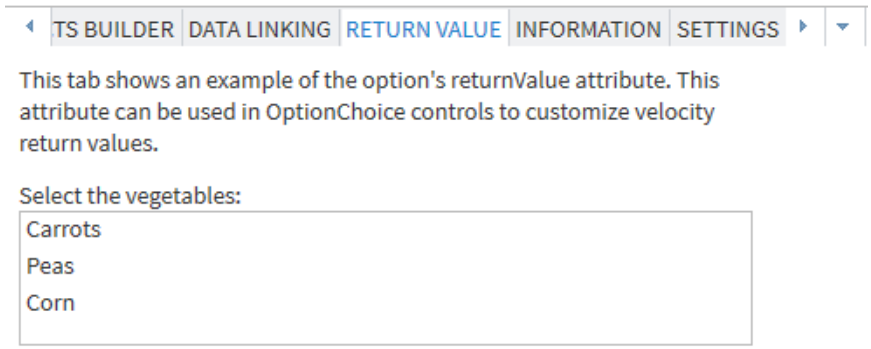
For input types (such as `combobox` and `select`) that enable users to select from a list of choices, the default behavior is to return the name of the selected item in the list. However, because the `name` attribute must be unique for every option, this default behavior could be limiting in some scenarios.

When you specify the `returnValue` attribute on an `Option` element, the string that is specified for the `returnValue` attribute is returned instead of the name.

The following example is available from the Advanced Task. In this example, the $vegetables Velocity variable has the value of `1`, `2`, or `3`, depending on what option item the user selected in the user interface. If you do not specify the `returnValue` attribute, the Velocity variable returns carrots, peas, or corn.

```
<Options>
   <Option name="RETURNVALUETAB" inputType="string">RETURN VALUE</Option>
   <Option name="labelReturnValue" inputType="string">This tab shows an example
      of the option's returnValue attribute.  This attribute can be used
      in the OptionChoice controls to customize Velocity return
      values.</Option>
<Option name="vegetables" inputType="select" multiple="true">Select the
      vegetables</Option>
   <Option name="carrots" returnValue="1" inputType="string">Carrots</Option>
   <Option name="peas" returnValue="2" inputType="string">Peas</Option>
   <Option name="corn" returnValue="3" inputType="string">Corn</Option>
</Options>
<UI>
   <Container option="RETURNVALUETAB">
      <OptionItem option="labelReturnValue"/>
      <OptionChoice option="vegetables">
         <OptionItem option="carrots"/>
         <OptionItem option="peas"/>
         <OptionItem option="corn"/>
      </OptionChoice>
...
   </Container>
</UI>
```

If you run the Advanced Task, here is the resulting **Return Value** tab.



Populating the Values for a Select Control from a Source Control

About Data Linking

Data linking is a way to populate a control based on the contents of another control. Data linking is currently supported when a select control links to data from a role or from the model effects builder. If the select control links to anywhere else, any children in the `OptionChoice` element are ignored.

The select control is the recipient of the data. The control that the select input type links to is called the source. To link a select input type to its source, you define the `sourceLink` attribute and use the name of the source control.

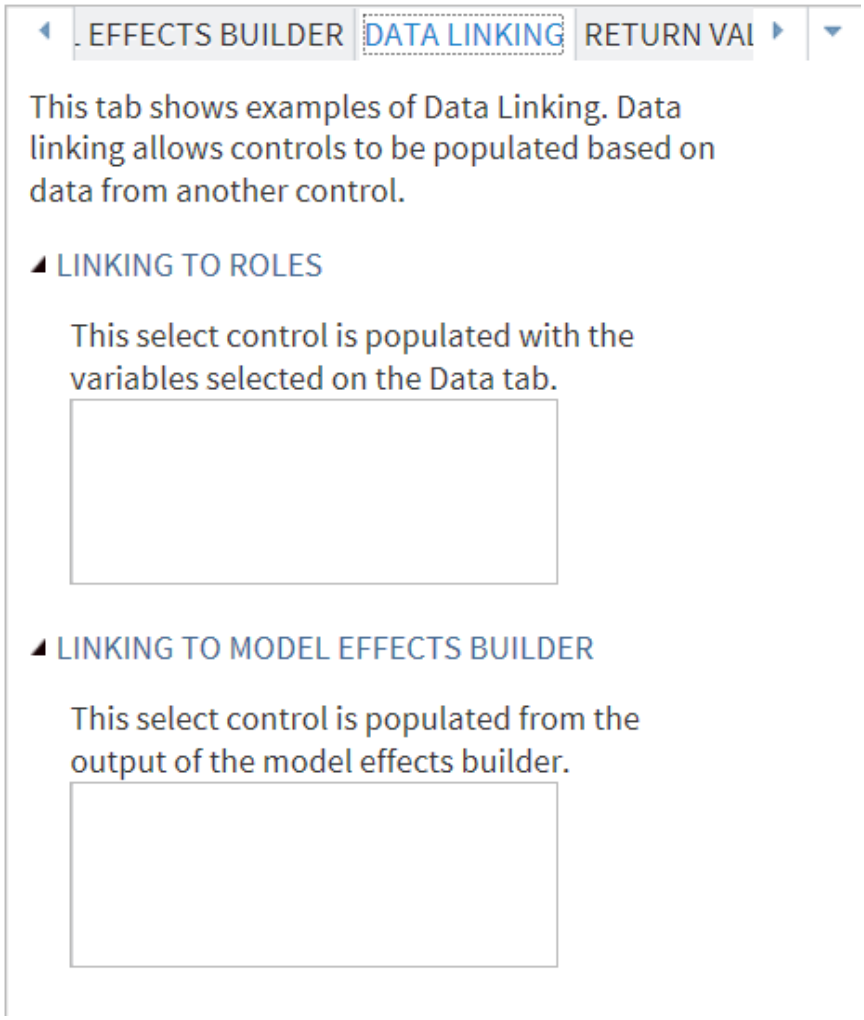
The Velocity code that is returned for the select control uses the same Velocity structure that you would expect from the source control.

This example is from the Advanced Task.

```
<Option name="DATALINKINGTAB" inputType="string">DATA LINKING</Option>
<Option name="DATALINKINGTEXT" inputType="string">This tab shows examples of data
   linking.  Data linking allows controls to be populated based on data from
   another control</Option>
<Option name="ROLELINKING" inputType="string">LINKING TO ROLES</Option>
<Option name="selectRoles" inputType="select" multiple="true"
   sourceLink="dataVariables">This select is populated from the Variables
   selected from the Data tab.</Option>
<Option name="MEBLINKING" inputType="string">LINKING TO MODEL EFFECTS
   BUILDER</Option>
<Option name="selectMEB" inputType="select" multiple="true"
   sourceLink="modelBuilder">This select is populated from the output of
   the Model Effects Builder.</Option>

...
<UI>
   <Container option="DATALINKINGTAB">
      <OptionItem option="DATALINKINGTEXT"/>
      <Group option="ROLELINKING" open="true">
         <OptionChoice option="selectRoles"/>
      </Group>
```

```
      <Group option="MEBLINKING" open="true">
         <OptionChoice option="selectMEB"/>
      </Group>
   </Container>
...
</UI>
```

If you run the code for the Advanced Task, here is the resulting **Data Linking** tab.



Linking to a Role

If a select control is linked to a role, the values in the select control are the current list of roles in the roles option. In this example, the name of the role variable is NUMVAR (specified in the `name` attribute). In the select control, the `sourceLink` attribute links to NUMVAR.

```
<DataSources>
   <DataSource name="PRIMARYDATA">
      <Roles>
         <Role type="N" maxVars="0" order="true" minVars="0" name="NUMVAR"
            exclude="VAR">Numeric Variable</Role>
      </Roles>
   </DataSource>
```

```
</DatatSources>
<Options>
   <Option name="roleList" inputType="select" sourceLink="NUMVAR"/>
```

The Velocity variable that is created for the select control is $roleList. The contents of the $roleList variable mimic the output of a typical role control. For more information, see “How Role Elements Appear in the Velocity Code” on page 78.

Linking to Effects from the Model Builder

If a select control is linked to a `modelbuilder` input type, the values in the select control are the list of effects in the model effects builder.

An additional attribute called `sourceType` can be used to set a filter on the data that is sent to the select control. Currently, the only defined filter is ‘filterClassification’. When this filter is specified, only classification effects appear in the select control.

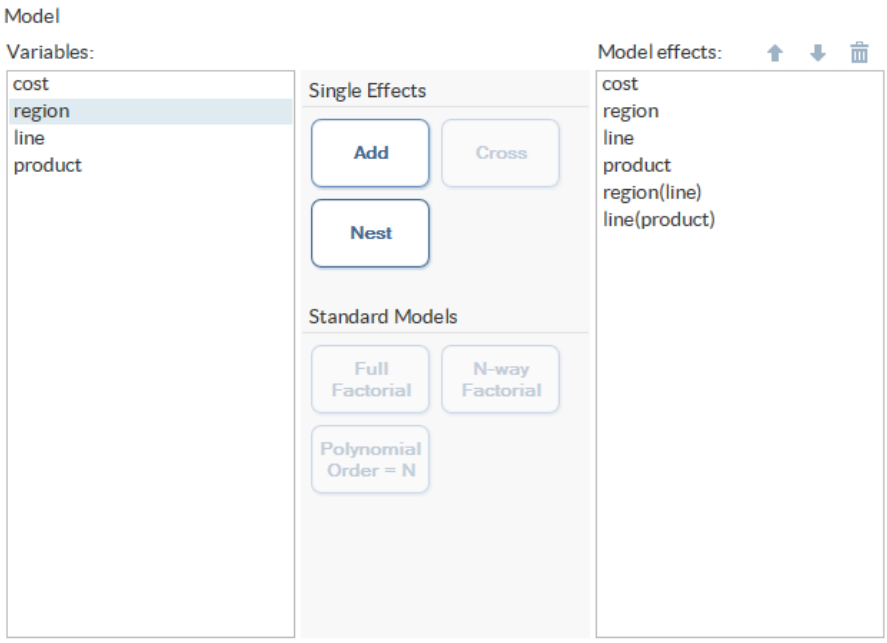
In this example, the modelbuilder control is named MEB. In the select control, the `sourceLink` attribute links to MEB, and the `sourceType` attribute specifies the ‘filterClassification’ filter. As a result, only classification effects appear in the source control.

```
<Options>
   <Option name="meb" inputType="modelbuilder" roleContinuous="CONTVARS"
      roleClassification="CLASSVARS"/>
   <Option name="mebList" inputType="select" sourceLink="MEB"
      sourceType="filterClassification"/>
</Options>
```

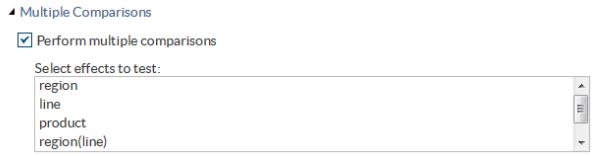
The Velocity variable that is created for the select control is $mebList. The contents of the $mebList variable mimic the output of the model effects builder. For more information, see “modelbuilder” on page 87.

Another example is in the Linear Regression task. In this task, the effects listed in the model builder are the options for the **Select the effects to test** option on the **Options** tab.

The **Variables** pane in the model builder lists the variables that the user assigned to either the **Classification variables** role or the **Continuous variables** role. The user can create main, crossed, nested, and polynomial effects. These effects appear in the **Model effects** pane.



On the **Options** tab, all classification effects are available from the **Select effects to test** option.



Here are the relevant portions of code from the Linear Regression task:

```
<Option inputType="string" name="modelGroup">MODEL EFFECTS</Option>
<Option inputType="string" name="modelTab">MODEL</Option>

1 <Option inputType="modelbuilder" name="modelBuilder"
   excludeTools="POLYEFFECT,TWOFACT,THREEFACT,NFACTPOLY"
   roleClassification="classVariable"
   roleContinuous="continuousVariables"
   width="100%">Model</Option>
...
<Option inputType="string" name="multCompareGroup">Multiple Comparisons</Option>

2 <Option indent="1" inputType="select" multiple="true" name="multCompareList"
   sourceLink="modelBuilder" sourceType="filterClassification">
   Select effects to test</Option>
```

1 Creates the model builder on the **Models** tab. Classification variables and continuous variables can be used to create the model effects.

2 Creates the **Select effects to test** option. The `sourceLink` attribute specifies that the initial list of values for this option is the list of model effects in the model builder. The `sourceType` attribute filters the list generated by the `sourceLink` attribute. The `filterClassification` filter specifies that only effects that include the classification variable should be available in the **Select effects to test** option.

In the **Perform multiple comparisons** option, the initial list of model effects includes region, line, product, region(line), line(product), and cost. However, cost is a continuous variable. When this list is filtered, only the model effects that involve classification variables (region, line, and product) are listed as values for the **Select effects to test** option.

4

Working with the UI Element

About the UI Element

This element is read by the UI engine to determine the layout of the user interface. Only linear layouts are supported. The `UI` tag is for grouping purposes only. There are no attributes associated with this tag.

The `UI` element has these children:

Child	Description
`Container`	A tab that contains any options for the task. For example, you might want to display the option for selecting the input data and assigning columns to roles on the same page. The UI engine displays these options sequentially. A label is created for the tab. The `Container` tag takes only one attribute. The string for this option is the value of the `string` input type in the `Metadata` element.
`Group`	A title for a group of options. The UI engine displays these options sequentially. This tag takes these attributes: ■ The `option` attribute is an option name in the metadata. This string is the same as the string value for the metadata option. ■ The `open` attribute specifies whether a group is expanded or collapsed. By default, `open=false`, and the group is collapsed in the user interface. To display the contents of a group by default, specify `open=true`.
`DataItem`	A reference to an input data source. This tag has only one attribute. The string for this option is the value of the `string` input type in the `Metadata` element.
`RoleItem`	A reference to a role. This tag has only one attribute. The string for this option is the value of the `string` input type in the `Metadata` element.

Child	Description
OptionItem	A reference to an option that has a single state. This type of option is either on or off, or has a single value (such as a series of radio buttons). This tag takes the option attribute only. The option attribute refers to the metadata name attribute for the option. The string for this option is taken from the metadata string value.
OptionChoice	A reference to an option that has a choice of values. The OptionChoice element uses the OptionItem or OptionValue element to represent the choice of values. These input types can use the OptionChoice element in the user interface: ■ combobox ■ distinct ■ dualselector ■ multiedit ■ select This tag takes the option attribute only. The option attribute refers to the metadata name attribute for the option. The string for this option is taken from the metadata string value.
OptionValue	A value choice. This tag is valid only as a child of the OptionChoice element.

Example: UI Element for the Sample Task

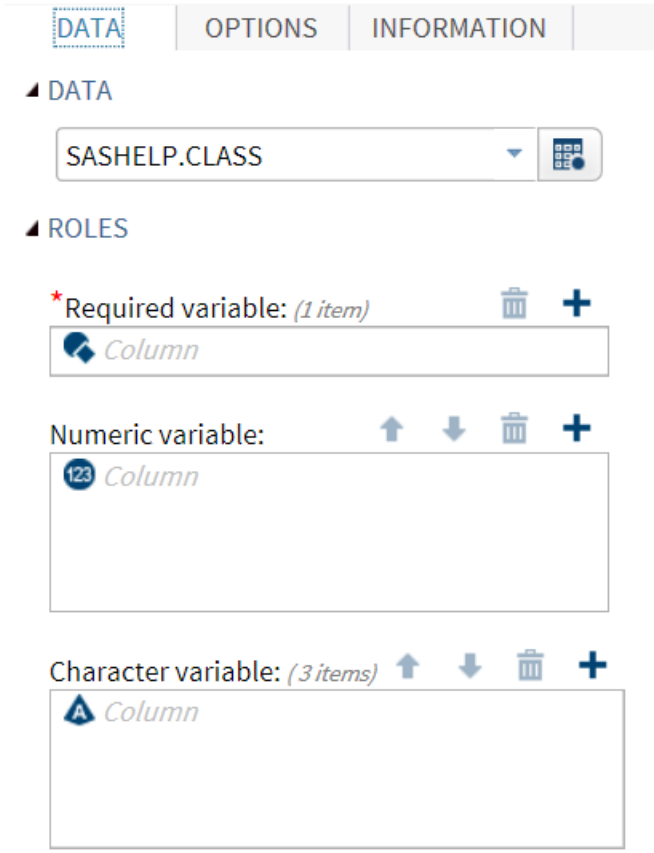
The code for the Sample Task creates a group for each input type. Here is the code for the first three groups:

```
<UI>
   <Container option="DATATAB">
      <Group option="DATAGROUP" open="true"
         <DataItem data="DATASOURCE" />
      </Group>
      <Group option="ROLESGROUP" open="true">
         <RoleItem role="VAR"/>
         <RoleItem role="OPTNVAR"/>
         <RoleItem role="OPTCVAR"/>
      </Group>
   </Container>

   <Container option="OPTIONSTAB">
      <Group option="GROUP" open="true">
         <OptionItem option="labelEXAMPLE"/>
      </Group>

      <Group option="GROUPCHECK">
         <OptionItem option="labelCheck"/>
```

```
      <OptionItem option="chkEXAMPLE"/>
   </Group>

   <Group option="GROUPCOLOR">
      <OptionItem option="labelCOLOR"/>
      <OptionItem option="colorEXAMPLE"/>
   </Group>

...
   </Container>
</UI>
```

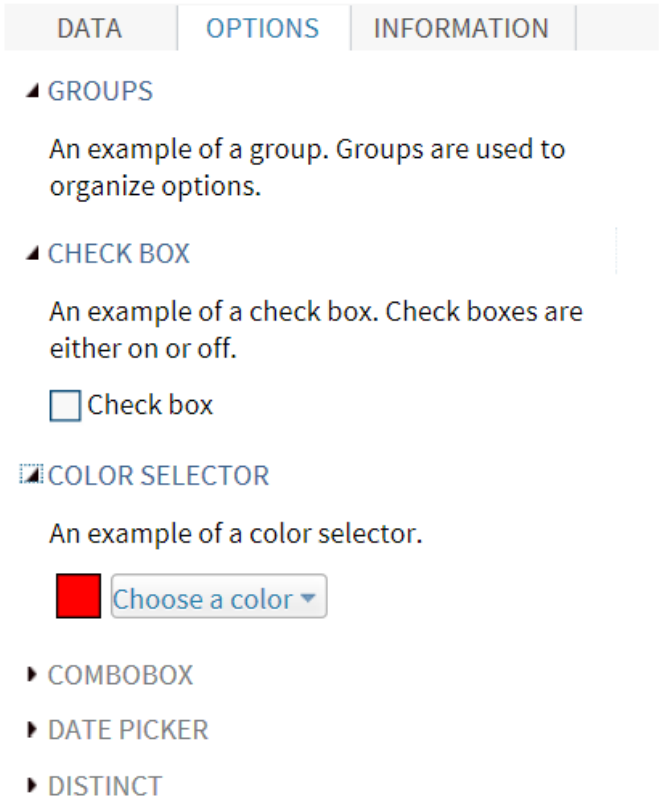
When you run this code, the **Data** and **Options** tabs appear in the interface.

The **Data** tab displays a selector for the input data source and three roles.



The **Options** tab contains several groups. The previous code creates the Groups, Check Boxes, and Color Selector groups. The first group is expanded

by default because the `open` attribute is set to `true`. (The sample task template includes code to create the remaining groups on the **Options** tab.)



5

Working with the Dependencies Element

About the Dependencies Element

The `Dependencies` element specifies how certain options or roles rely on one another in order for the task to work properly. For example, a check box can enable or disable a text box depending on whether the check box is selected. The `Dependencies` element is a grouping mechanism for the individual `Dependency` tags. There are no attributes associated with this element.

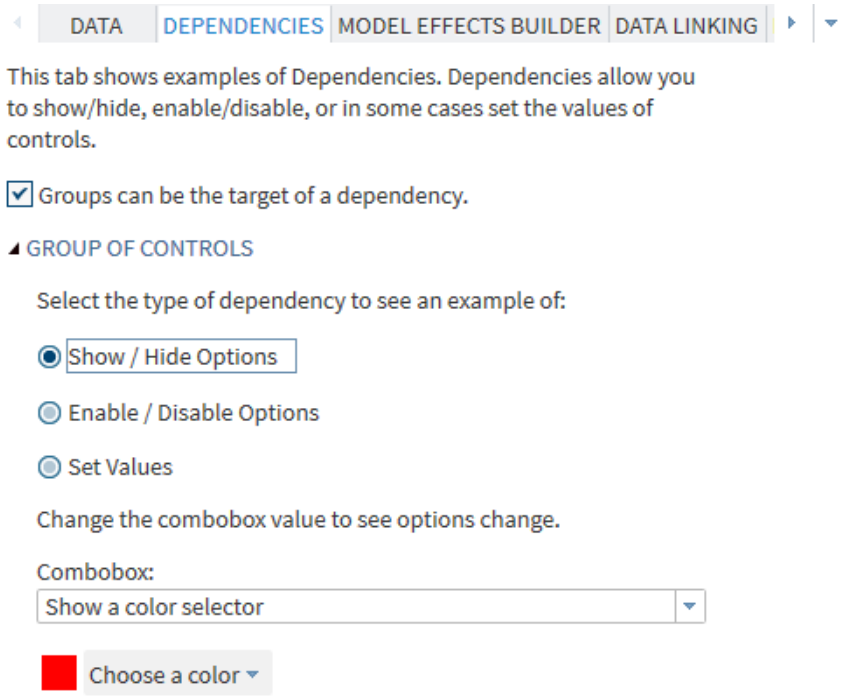
The `Dependencies` element can have multiple `Dependency` tags. Each `Dependency` tag has a `condition` attribute that is resolved to determine the state of the targets. A dependency can have multiple `Target` elements.

The `Target` element has three required attributes.

Attribute	Description
`option`	references the option that receives the action. Valid values are `OptionItem`, `Role`, `OptionChoice`, or `Group` element.

Attribute	Description
conditionResult	specifies when to execute the action. The valid values for this attribute are true and false. ■ If the condition is true and conditionResult=true, the action is executed. ■ If the condition is false and conditionResult=false, the action is executed. ■ If the value of the condition and conditionResult do not match (for example, one is true and one is false), the action is ignored.
action	specifies the action to execute. Here are the valid values: ■ show ■ hide ■ enable ■ disable ■ set If the value of the action attribute is set, you must also specify these two attributes: □ The property attribute refers to the attribute of an element that was created from the metadata. The option element in the metadata has an inputType attribute that specifies what UI element is created. **Note:** Here are a few exceptions: ■ In the UI element, any RoleItem element cannot be the target of a dependency where action=set. ■ The required, width, indent, and variable (for the radio input type) attributes are invalid values for the property attribute of a Target element. □ The value attribute is the value to use for the target of the property attribute. If the value attribute targets an item with the select input type, the value attribute can accept a single value or a comma-separated list of values. **Note:** If the dependency has a comma-separated list of values and the select element that the dependency targets is set to multiple="false", only the first value in the comma-separated list is evaluated. The rest of the values in the list are ignored.

To understand how dependencies work, run the Advanced Task . Examples of dependencies are available from the **Dependencies** tab.



Notes on Dependencies

- If `action=hide` for a `Target` element, the element is hidden. If `action=show`, the element is enabled and contributes to the SAS code that is generated by the Velocity script.
- Not all dependencies are evaluated each time the Velocity script runs and produces the SAS code. When the task is first opened, all dependencies are run to establish initial values. After that, only dependencies that are linked to the current interaction in the user interface are evaluated. The value of the `condition` attribute determines whether a dependency is evaluated. All UI elements have a name in the `Options` element (in the metadata section of the common task model). When a user selects a UI element, the name of the UI element is checked against each dependency. Only conditions that contain the name of the UI element are evaluated, and all valid actions are performed.
- Dependencies can have cascading effects.
  - Dependencies that are order dependent cannot be written in a circular manner.
  - Dependencies are evaluated in top-down order. An option is order independent if the option name appears only in the `condition` attribute of the `Target` element. An option is order dependent if the option name appears in the `condition` and `option` attributes of the `Target` element.

This example shows a correct and incorrect ordering of dependencies:

```
<UI>
   <Container option="options">
      <Group option="basic options">
         <Option name="COMBOBOX"/>
         <Option name="ITEM1"/>
         <Option name="ITEM2"/>
         <Option name="ITEM3"/>
            <OptionItem option="CHECKBOX"/>
            <OptionItem option="INPUTTEXT"/>
      </Group>
   </Container>
</UI>

<Dependencies>
1 <!-- Correct ordering of the dependencies -->
   <Dependency condition="$COMBOBOX=='ITEM1'">
      <Target conditionResult="true" option="CHECKBOX" action="set"
         property="value" value="1"/>
   </Dependency>
   <Dependency condition="$CHECKBOX=='1'">
      <Target conditionResult="true" option="INPUTTEXT" action="enable"/>
      <Target conditionResult="false" option="INPUTTEXT" action="disable"/>
   </Dependency>

2 <!-- Incorrect ordering to the dependencies -->
   <Dependency condition="$CHECKBOX=='1'">
      <Target conditionResult="true" option="INPUTTEXT" action="enable"/>
      <Target conditionResult="false" option="INPUTTEXT" action="disable"/>
   </Dependency>
   <Dependency condition="$COMBOBOX=='ITEM1'">
      <Target conditionResult="true" option="CHECKBOX" action="set"
         property="value" value="1"/>
   </Dependency>
</Dependencies>
```

1 This first dependency is order independent. COMBOBOX is a name that is used in the condition, but the value of COMBOBOX is not a target in any of the other dependencies.

2 The second dependency is order dependent. CHECKBOX is used in the condition, and the value of CHECKBOX is also a target for `option="CHECKBOX"` in the preceding `Dependency` element. In this case, the state for INPUTTEXT is not evaluated properly because `condition="$CHECKBOX=='1'"` is evaluated before `condition="$COMBOBOX=='ITEM1'"`.

Creating Dependencies for Group Elements

A `Group` element can be the target of a dependency. However, if you want a `Group` element to be the target of a dependency and you also want a child of that group to be the target with a different set of conditions, you must include all of the conditional logic for the group and the child in one dependency.

This example demonstrates this behavior.

```
<UI>
   <Container option="data">
      <Group option="datagroup">
         <Option name="CheckBoxEnableTargetGroup" />
   </Container>

   <Container option="options">
      <Group option="targetGroup">
         <Option name="COMBOBOX"/>
            <Option name="ITEM1"/>
            <Option name="ITEM2"/>
            <Option name="ITEM3"/>
               <OptionItem option="CHECKBOX"/>
               <OptionItem option="INPUTTEXT"/>
      </Group>
   </Container>
</UI>

<Dependencies>
1 <!-- Correct -->
   <Dependency condition="$CheckBoxEnableTargetGroup=='1'">
      <Target conditionResult="true" option="targetGroup" action="show"/>
      <Target conditionResult="false" option="targetGroup" action="hide"/>
   </Dependency>
   <Dependency condition="$CheckBoxEnableTargetGroup=='1' &amp;&amp; $CHECKBOX=='1'">
      <Target conditionResult="true" option="INPUTTEXT" action="enable"/>
      <Target conditionResult="false" option="INPUTTEXT" action="disable"/>
   </Dependency>

2 <!-- Incorrect -->
   <Dependency condition="$CheckBoxEnableTargetGroup=='1'">
      <Target conditionResult="true" option="targetGroup" action="show"/>
      <Target conditionResult="false" option="targetGroup" action="hide"/>
   </Dependency>
   <Dependency condition="$CHECKBOX=='1'">
      <Target conditionResult="true" option="INPUTTEXT" action="enable"/>
      <Target conditionResult="false" option="INPUTTEXT" action="disable"/>
   </Dependency>
</Dependencies>
```

1 In the first dependency, the $CheckBoxEnableTargetGroup Velocity variable is used to show or hide the option named `targetGroup`. The author of this task also wants the option named `INPUTTEXT` to be displayed based on the state of the $CHECKBOX Velocity variable.

2 In the second dependency, the logic for targeting the option named `targetGroup` is omitted. When writing a dependency that targets a group, you must decide whether you want to target the children of that group as well.

Using Radio Buttons as Targets of Dependencies

If a selected radio button is hidden or disabled because of a dependency, another radio button is selected using these criteria:

- If a default radio button that has been specified is visible or enabled, then the default radio button is selected.
- If a default radio button has not been specified or if the default radio button is hidden or disabled, the first available radio button is selected. The order of the radio buttons is determined in the `UI` element.

If you want to hide or disable a group of radio buttons, you must create a single dependency that targets the variable for the radio buttons. If you create a dependency for each radio button, the result is incorrect behavior.

This example demonstrates the correct and incorrectbehavior:

```
<UI>
   <Container option="optionsTab">
      <Group option="RadioButtonGroup open="true">
         <OptionItem option="Radio1"/> <!-- variable="radioVariable1" -->
         <OptionItem option="Radio2"/> <!-- variable="radioVariable1" -->
         <OptionItem option="Radio3"/> <!-- variable="radioVariable1" -->
         <OptionItem option="Checkbox1"/>
      </Group>

      <Group option="RadioButtonGroup2 open="true">
         <OptionItem option="Radio4"/> <!-- variable="radioVariable2" -->
         <OptionItem option="Radio5"/> <!-- variable="radioVariable2" -->
         <OptionItem option="Radio6"/> <!-- variable="radioVariable2" -->
         <OptionItem option="Checkbox2"/>
      </Group>
   </Container>
</UI>

<Dependencies>
1<!-- Correct -->
   <Dependency condition="!($Checkbox1 =='1')">
      <Target option="radioVariable1" conditionResult="true" action="show"/>
      <Target option="radioVariable1" conditionResult="false"action="hide"/>
   </Dependency>

2<!-- Incorrect -->
   <Dependency condition="!($Checkbox2 =='1')">
      <Target option="Radio4" conditionResult="true" action="show"/>
      <Target option="Radio4" conditionResult="false" action="hide"/>
      <Target option="Radio5" conditionResult="true" action="show"/>
      <Target option="Radio5" conditionResult="false" action="hide"/>
      <Target option="Radio6" conditionResult="true" action="show"/>
      <Target option="Radio6" conditionResult="false" action="hide"/>
   </Dependency>
</Dependencies>
```

1. The first dependency creates a single dependency that targets the variable for the radio buttons.
2. The second dependency creates a dependency for each radio button, which results in the incorrect behavior.

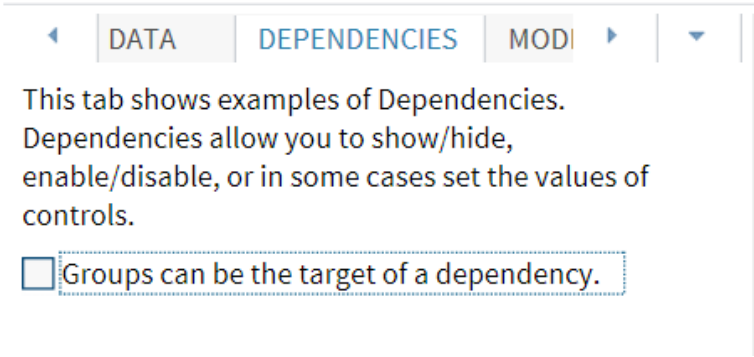
Example 1: Selecting a Check Box to Show a Group of Options

From the Advanced Task, selecting the **Groups can be the target of a dependency** check box determines whether the options under the **Group of Controls** heading are available.

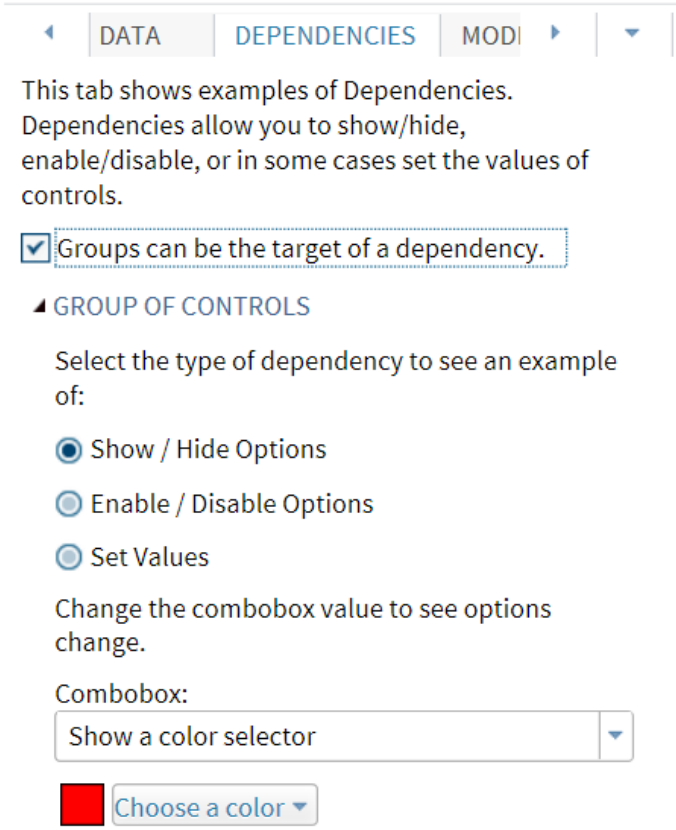
In this example, DEP_CBX is the name for the **Groups can be the target of a dependency** check box, and DEPENDENCYGROUP is the name of the group that contains the options.

```
<Option name="DEP_CBX" inputType="checkbox" defaultValue="1">Groups can be the
   target of a dependency.</Option>
<Option name="DEPENDENCYGROUP" inputType="string">GROUP OF CONTROLS</Option>

<Dependency condition="($DEP_CBX == '1'">
   <Target option="DEPENDENCYGROUP" conditionResult="true" action="show"/>
   <Target option="DEPENDENCYGROUP" conditionResult="false" action="hide"/>
</Dependency>
```

When the **Groups can be the target of a dependency** check box is not selected, here is what appears on the **Options** tab:



If you select the **Groups can be the target of a dependency** check box, the **Group of Controls** heading and all the options in this group are displayed. Here are the results that appear on the **Options** tab:



Example 2: Using Radio Buttons to Create Dependencies

About This Example

The Advanced Task shows how you can use radio buttons to create dependencies. This example has three radio buttons:

- **Show/Hide Options**, which is named radioShowHide in the code.
- **Enable/Disable Options**, which is named radioEnableDisable in the code.
- **Set Values**, which is named radioSetValue in the code.

Here is the code from the Advanced Task:

```
<Option name="radioShowHide" variable="radioChoice" defaultValue="1"
   inputType="radio">Show / Hide Options</Option>
<Option name="radioEnableDisable" variable="radioChoice" inputType="radio">
   Enable / Disable Options</Option>
<Option name="radioSetValue" variable="radioChoice" inputType="radio">
```

```
   Set Values</Option>
<Option name="labelShowChange" inputType="string">Change the combobox value
   to see options change.</Option>
<Option name="comboShowChange" defaultValue="valueShowColor" inputType="combobox"
   width="100%">Combobox:</Option>
<Option name="valueShowColor" inputType="string">Show a color selector</Option>
<Option name="valueShowDate inputType="string">Show a date picker</Option>
<Option name="valueShowSlider" inputType="string">Show a slider control</Option>
<Option name="colorControl" defaultValue="red" inputType="color">Choose
   a color</Option>
<Option name="dateControl" inputType="datepicker" format="monyy7.">
   Choose a date:</Option>
<Option name="sliderControl" defaultValue="80.00" inputType="slider"
   discreteValues="14" minValue="-10" maxValue="120">Slider with buttons</Option>
<Option name="labelEnableChange" inputType="string">Change the combobox
   value to see options become enabled or disabled.</Option>
<Option name="comboEnableChange" defaultValue="valueEnableColor"
   inputType="combobox" width="100%">Combobox:</Option>
<Option name="valueEnableColor" inputType="string">Enable the color
   selector</Option>
<Option name="valueEnableDate" inputType="string">Enable the date picker</Option>
<Option name="valueEnableSlider" inputType="string">Enable the slider
   control</Option>
<Option name="labelShowSet" inputType="string">Change the combobox value
   to change the value of the checkbox.</Option>
<Option name="comboSetChange" defaultValue="valueSetCheck" inputType="combobox"
   width="100%">Combobox</Option>

...


<Dependency condition="$radioChoice == 'radioShowHide'">
   <Target action="show" conditionResult="true" option="labelShowChange"/>
   <Target action="show" conditionResult="true" option="comboShowChange"/>
   <Target action="hide" conditionResult="true" option="labelEnableChange"/>
   <Target action="hide" conditionResult="true" option="comboEnableChange"/>

   <Target action="hide" conditionResult="true" option="labelEnableChange"/>
   <Target action="hide" conditionResult="true" option="comboEnableChange"/>
   <Target action="hide" conditionResult="true" option="colorControl"/>

   <Target action="hide" conditionResult="true" option="labelShowSet"/>
   <Target action="hide" conditionResult="true" option="comboSetChange"/>
   <Target action="hide" conditionResult="true" option="checkboxCheckUncheck"/>
</Dependency>

<Dependency condition="$radioChoice == 'radioEnableDisable'">
   <Target action="show" conditionResult="true" option="labelEnableChange"/>
   <Target action="show" conditionResult="true" option="comboEnableChange"/>
   <Target action="hide" conditionResult="true" option="labelShowChange"/>
   <Target action="hide" conditionResult="true" option="comboShowChange"/>
   <Target action="show" conditionResult="true" option="colorControl"/>
   <Target action="show" conditionResult="true" option="dateControl"/>
   <Target action="show" conditionResult="true" option="sliderControl"/>

   <Target action="hide" conditionResult="true" option="labelShowSet"/>
```

```
   <Target action="hide" conditionResult="true" option="comboSetChange"/>
   <Target action="hide" conditionResult="true" option="checkboxCheckUncheck"/>
</Dependency>

<Dependency condition="$radioChoice == 'radioSetValue'">
   <Target action="hide" conditionResult="true" option="labelShowChange"/>
   <Target action="hide" conditionResult="true" option="comboShowChange"/>
   <Target action="hide" conditionResult="true" option="labelEnableChange"/>
   <Target action="hide" conditionResult="true" option="comboEnableChange"/>
   <Target action="hide" conditionResult="true" option="colorControl"/>
   <Target action="hide" conditionResult="true" option="dateControl"/>
   <Target action="hide" conditionResult="true" option="sliderControl"/>

   <Target action="show" conditionResult="true" option="labelShowSet"/>
   <Target action="show" conditionResult="true" option="comboSetChange"/>
   <Target action="show" conditionResult="true" option="checkboxCheckUncheck"/>
</Dependency>
```

Selecting the Show/Hide Options Button

As you can see from the XML code, the defaultValue attribute is set to 1 for the radioShowHide option. By default, the **Show/Hide Options** radio button is selected.

```
<Option name="radioShowHide" variable="radioChoice" defaultValue="1"
   inputType="radio">Show / Hide Options</Option>
```

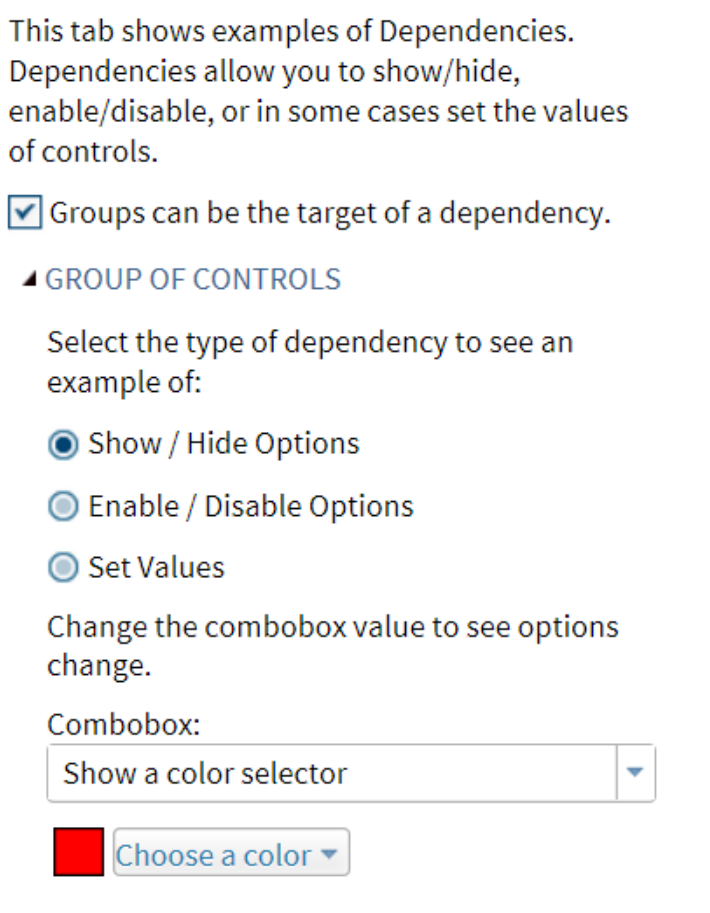
When the **Show/Hide Options** radio button is selected, the conditions for this dependency are met:

```
<Dependency condition="$radioChoice == 'radioShowHide'">
   <Target action="show" conditionResult="true" option="labelShowChange"/>
   <Target action="show" conditionResult="true" option="comboShowChange"/>
   <Target action="hide" conditionResult="true" option="labelEnableChange"/>
   <Target action="hide" conditionResult="true" option="comboEnableChange"/>

   <Target action="hide" conditionResult="true" option="labelEnableChange"/>
   <Target action="hide" conditionResult="true" option="comboEnableChange"/>
   <Target action="hide" conditionResult="true" option="colorControl"/>

   <Target action="hide" conditionResult="true" option="labelShowSet"/>
   <Target action="hide" conditionResult="true" option="comboSetChange"/>
   <Target action="hide" conditionResult="true" option="checkboxCheckUncheck"/>
</Dependency>
```

As a result, these lines of code determine the instructional text and label for the combobox:

```
<Option name="labelShowChange" inputType="string">Change the combobox value
   to see options change.</Option>
<Option name="comboShowChange" defaultValue="valueShowColor" inputType="combobox"
   width="100%">Combobox:</Option>
```

Here are the options that are available when the **Show/Hide Options** radio button is selected:



Selecting the Enable/Disable Options Button

The XML code shows that the name for the **Enable/Disable Options** radio button is radioEnableDisable.

```
<Option name="radioEnableDisable" variable="radioChoice" inputType="radio">
   Enable / Disable Options</Option>
```

When the **Enable/Disable Options** radio button is selected, the conditions for this dependency are met:

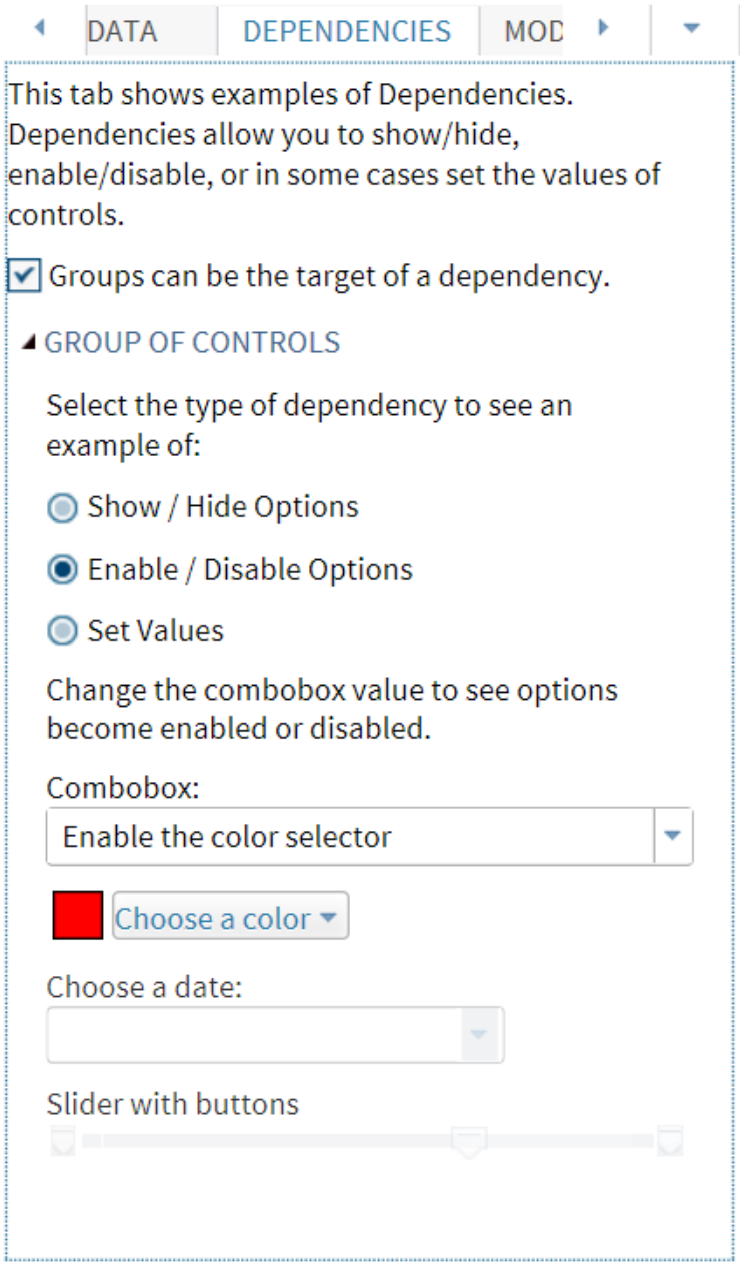
```
<Dependency condition="$radioChoice == 'radioEnableDisable'">
   <Target action="show" conditionResult="true" option="labelEnableChange"/>
   <Target action="show" conditionResult="true" option="comboEnableChange"/>
   <Target action="hide" conditionResult="true" option="labelShowChange"/>
   <Target action="hide" conditionResult="true" option="comboShowChange"/>
   <Target action="show" conditionResult="true" option="colorControl"/>
   <Target action="show" conditionResult="true" option="dateControl"/>
   <Target action="show" conditionResult="true" option="sliderControl"/>

   <Target action="hide" conditionResult="true" option="labelShowSet"/>
   <Target action="hide" conditionResult="true" option="comboSetChange"/>
   <Target action="hide" conditionResult="true" option="checkboxCheckUncheck"/>
```

```
</Dependency>
```

As a result, these lines of code determine the instructional text and label for the combobox:

```
<Option name="labelEnableChange" inputType="string">Change the combobox value
   to see options become enabled or disabled.</Option>
<Option name="comboEnableChange" defaultValue="valueEnableColor"
   inputType="combobox" width="100%">Combobox:</Option>
```

Here are the options that are available when the **Enable/Disable Options** radio button is selected:



Selecting the Set Values Button

The XML code shows that the name for the **Set Values** radio button is radioSetValue.

```
<Option name="radioSetValue" variable="radioChoice"
   inputType="radio">Set Values</Option>
```

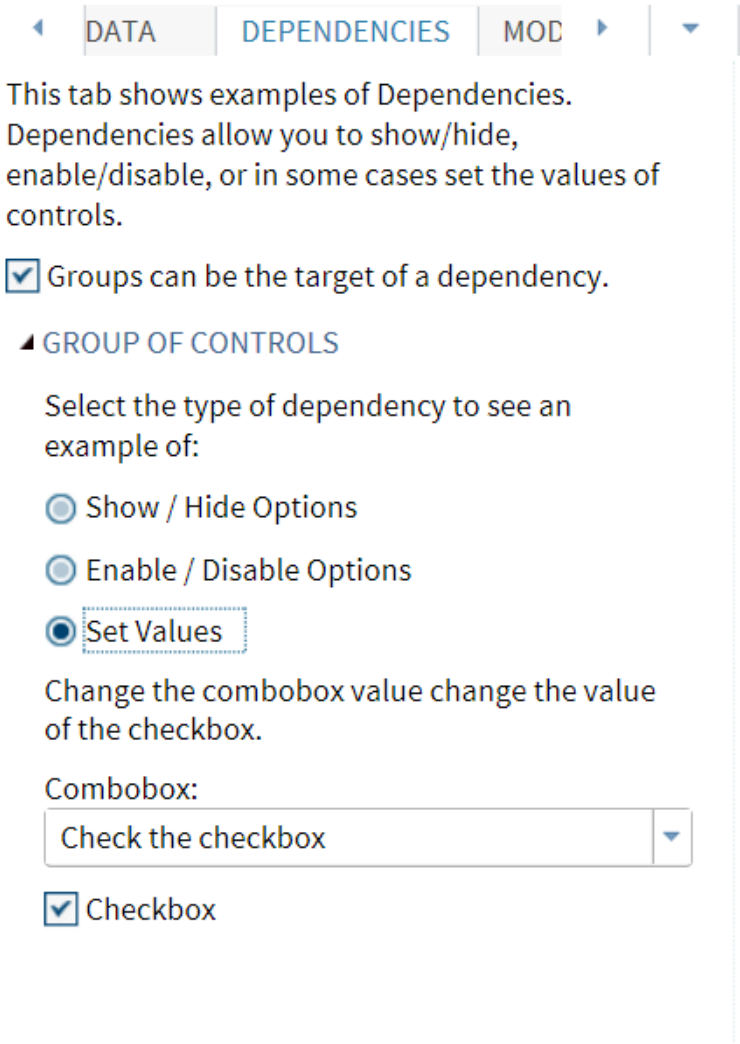
When the **Set Values** button is selected, the conditions for this dependency are met:

```
<Dependency condition="$radioChoice == 'radioSetValue'">
   <Target action="hide" conditionResult="true" option="labelShowChange"/>
   <Target action="hide" conditionResult="true" option="comboShowChange"/>
   <Target action="hide" conditionResult="true" option="labelEnableChange"/>
   <Target action="hide" conditionResult="true" option="comboEnableChange"/>
   <Target action="hide" conditionResult="true" option="colorControl"/>
   <Target action="hide" conditionResult="true" option="dateControl"/>
   <Target action="hide" conditionResult="true" option="sliderControl"/>

   <Target action="show" conditionResult="true" option="labelShowSet"/>
   <Target action="show" conditionResult="true" option="comboSetChange"/>
   <Target action="show" conditionResult="true" option="checkboxCheckUncheck"/>
</Dependency>
```

As a result, these lines of code determine the instructional text and label for the combobox:

```
<Option name="labelShowSet" inputType="string">Change the combobox value
   to change the value of the checkbox.</Option>
<Option name="comboSetChange" defaultValue="valueSetCheck" inputType="combobox"
   width="100%">Combobox</Option>
```

Here are the options that are available when the **Set Values** radio button is selected:



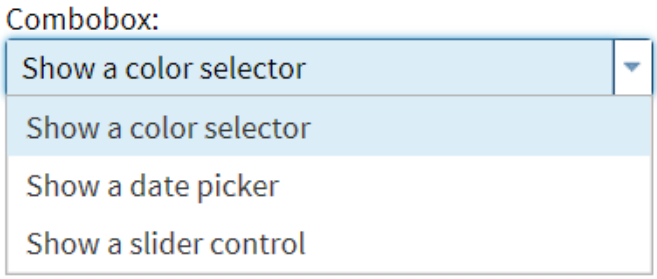
Example 3: Using Combobox Controls

Using a Value to Show or Hide Additional Options

In the Advanced Task if you select the **Show/Hide Options** radio button, the values in the combobox control are determined by these lines of code:

```
<Option name="comboShowChange" defaultValue="valueShowColor" inputType="combobox"
   width="100%">Combobox:</Option>
<Option name="valueShowColor" inputType="string">Show a color selector</Option>
<Option name="valueShowDate inputType="string">Show a date picker</Option>
<Option name="valueShowSlider" inputType="string">Show a slider control</Option>
```

Here is how these options appear in the user interface:

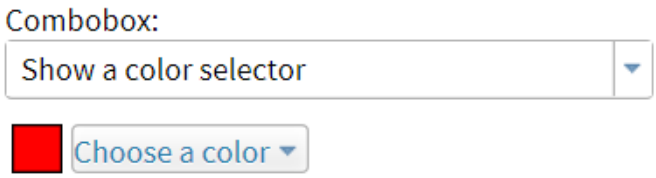


If you select **Show a color selector** from the combobox control, the conditions for this dependency are met:

```
<Dependency condition="$comboShowChange == 'valueShowColor'">
   <Target action="show" conditionResult="true" option="colorControl"/>
   <Target action="hide" conditionResult"="true" option="dateControl"/>
   <Target action="hide" conditionResult="true" option="sliderControl"/>
</Dependency>
```

As a result, the Color control (named colorControl in the XML code) appears in the user interface. (According to the conditions defined in the dependency, the date picker and slider controls are hidden.) Here is the XML code for colorControl. The defaultValue attribute specifies that red is selected in the color control by default.

```
<Option name="colorControl" defaultValue="red" inputType="color">
   Choose a color</Option>
```

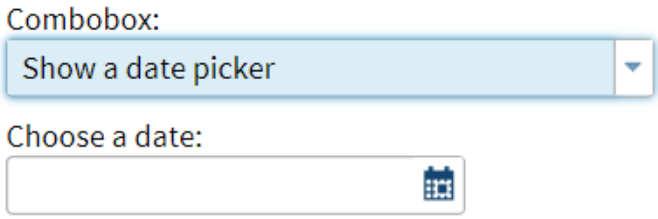


If you select **Show a date picker** from the combobox control, the conditions for this dependency are met:

```
<Dependency condition="$comboShowChange == 'valueShowDate'">
   <Target action="hide" conditionResult="true" option="colorControl"/>
   <Target action="show" conditionResult"="true" option="dateControl"/>
   <Target action="hide" conditionResult="true" option="sliderControl"/>
</Dependency>
```

The date picker control appears in the user interface.

```
<Option name="dateControl" inputType="datepicker" format="monyy7.">
   Choose a date:</Option>
```



Using a Value to Enable or Disable Additional Options

This example is similar to using a value to show or hide options. However, in this example, the options are already visible in the user interface. Selecting a value from the combobox control enables these additional options, so the user can set these options.

In the Advanced Task if you select the **Enable/Disable Options** radio button, the values in the combobox are determined by these lines of code:

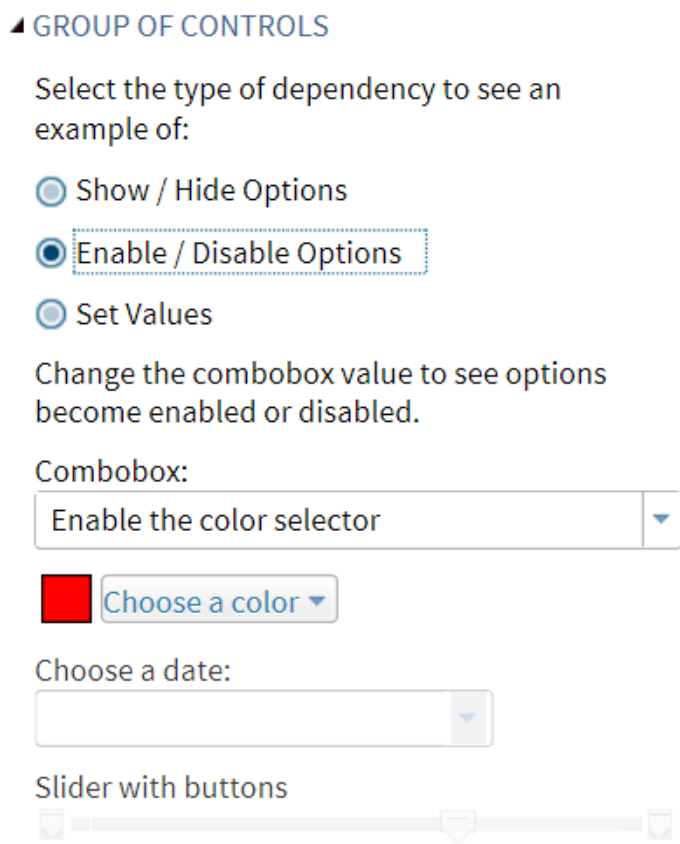
```
<Option name="comboEnableChange" defaultValue="valueEnableColor"
   inputType="combobox" width="100%">Combobox:</Option>
<Option name="valueEnableColor" inputType="string">Enable the color
   selector</Option>
<Option name="valueEnableDate" inputType="string">Enable the date picker</Option>
<Option name="valueEnableSlider" inputType="string">Enable the slider
   control</Option>
```

The dependency code for the **Enable/Disable Options** radio button (referred to as radioEnableDisable in the XML) shows that when this radio button is selected, five options (labelEnableChange, comboEnableChange, colorControl, dateControl, and sliderControl) appear in the user interface:

Here is the dependency code:

```
<Dependency condition="$radioChoice == 'radioEnableDisable'">
   <Target action="show" conditionResult="true" option="labelEnableChange"/>
   <Target action="show" conditionResult="true" option="comboEnableChange"/>
   <Target action="hide" conditionResult="true" option="labelShowChange"/>
   <Target action="hide" conditionResult="true" option="comboShowChange"/>
   <Target action="show" conditionResult="true" option="colorControl"/>
   <Target action="show" conditionResult="true" option="dateControl"/>
   <Target action="show" conditionResult="true" option="sliderControl"/>

   <Target action="hide" conditionResult="true" option="labelShowSet"/>
   <Target action="hide" conditionResult="true" option="comboSetChange"/>
   <Target action="hide" conditionResult="true" option="checkboxCheckUncheck"/>
</Dependency>
```

Here is the resulting user interface:



The user interface shows the colorControl (labeled **Choose a color**), the dateControl (labeled **Choose a date**), and the sliderControl (labeled **Slider with buttons**) options. However, only the **Choose a color** option is enabled because **Enable the color selector** option is selected in the **Combobox** control, which means this dependency code is met:

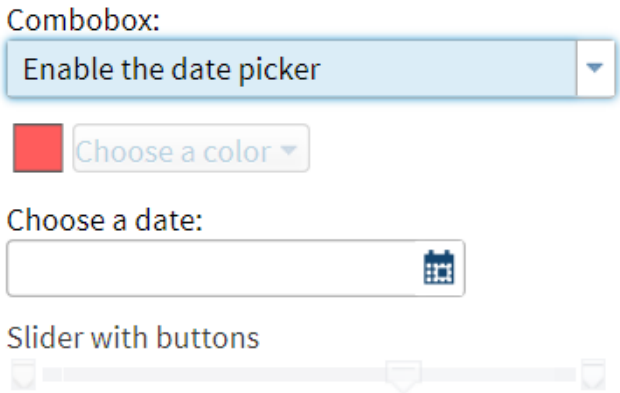
```
<Dependency condition="$comboEnableChange == 'valueEnableColor'">
   <Target sction="enable" conditionResult="true" option="colorControl"/>
   <Target action="disable" conditionResult="true" option="dateControl"/>
   <Target action="disable" conditionResult="true" option="sliderControl"/>
</Dependency>
```

If you select **Enable the date picker** from the combobox control, the conditions for this dependency are met:

```
<Dependency condition="$comboShowChange == 'valueShowDate'">
   <Target action="disabel" conditionResult="true" option="colorControl"/>
   <Target action="enable" conditionResult"="true" option="dateControl"/>
   <Target action="disable" conditionResult="true" option="sliderControl"/>
</Dependency>
```

The date picker control is enabled in the user interface.

```
<Option name="dateControl" inputType="datepicker" format="monyy7.">
   Choose a date:</Option>
```



The color and slider controls are still visible in the user interface, but they are disabled.

Using a Value to Set the Value of Another Option

In the Advanced Task if you select the **Set Value** radio button, the values in the combobox are determined by these lines of code:

```
<Option name="comboSetChange" defaultValue="valueSetCheck" inputType="combobox"
   width="100%">Combobox:</Option>
<Option name="valueSetCheck" inputType="string">Check the checkbox</Option>
<Option name="valueSetUncheck" inputType="string">Uncheck the checkbox</Option>
```

The code also defines the **Checkbox** check box. Because the defaultValue attribute is set to 1 for the checkboxCheckUncheck control, this check box is selected by default.

```
<Option name="checkboxCheckUncheck" inputType="checkbox" defaultValue="1">
   Checkbox</Option>
```

When the **Check the checkbox** option is selected for the combobox control, this dependency is met:

```
<Dependency condition="$comboSetChange == 'valueSetCheck'">
   <Target action="set" conditionResult="true" option="checkboxCheckUncheck"
      property="value" value="1"/>
   <Target action="set" conditionResult="false" option="checkboxCheckUncheck"
      property="value" value="0"/>
</Dependency>
```

As a result, the **Checkbox** option is selected in the user interface. If you select the **Uncheck the checkbox** option from the combobox control, the conditionResult is false, and the **Checkbox** option is not selected.

6

Working with the Requirements Element

About the Requirements Element

The `Requirements` element specifies a list of conditions that must be met in order for the task to run. If the condition is true, SAS code can be generated. If the condition is false, no code is generated. When defining a requirement, you can specify the message to display when the requirement is not met.

The `Requirements` element can have multiple `Requirement` tags. Each `Requirement` tag has a `condition` attribute, which is a conditional expression that is used to evaluate whether the requirement is met. The conditional expression that is used is identical to the conditional expression in Apache Velocity. For more information, see the *Apache Velocity User's Guide*.

Each `Requirement` tag also has a `Message` element, which has no attributes. The value of this element is the message that is displayed if the condition is not satisfied.

Because dependencies can affect the state of the user interface as well as the state of the Velocity variables, the `Requirements` element is evaluated after the `Dependencies` element. As a result, any changes due to dependencies are made before determining whether the requirements are satisfied.

Example: Using a Requirements Element for Roles

In this example, the code refers to three roles: AVAR, BYVAR, and FVAR. The user must assign a variable to at least one of these roles in order for the task to run. If no variables are assigned to any of these roles, the SAS code cannot be generated, and the task will not run.

```
<Metadata>
   <Roles>
      <Role maxVars="0" minVars="1" name="AVAR" nlsKey="AVARKey"
```

```
            order="true" type="A">Analysis variables<Role>
         <Role maxVars="0" minVars="1" name="BYVAR" nlsKey="BYVARKey"
            order="true" type="A">Group analysis by<Role>
         <Role maxVars="0" minVars="1" name="FVAR" nlsKey="FVARKey"
            order="true" type="N">Frequency count<Role>
</Roles>
...
</Metadata>

<Requirements>
   <Requirement condition="$AVAR.size() &gt; 0 || $BYVAR.size() &gt; 0
      || $FVAR.size() &gt; 0">
         <Message>At least one variable must be assigned to the Analysis
         variables role, the Group analysis by role, or the Frequency
         count role.</Message>
   </Requirement>
</Requirements>
```

7

Understanding the Code Template

About the Code Template

The code template creates the string output of the task. For most tasks, this output is SAS code. The Code Template element contains a CDATA block of the Apache Velocity scripting language. The string output is produced using this scripting language.

Using Predefined Velocity Variables

Predefined Velocity Variables

Here are the predefined Velocity variables:

Variable	Description
$sasOS	The operating system for the SAS server.
$sasVersion	The version of the SAS server.
$MathTool	The Java object for the Apache Velocity MathTool. For more information, see “Floating Point Math” on page 74.
$CTMUtil	This tool holds a Java object that provides common utility methods for the common task models.
$CTMMathUtil	This tool holds a Java object that provides access to basic math utilities.

Floating Point Math

Using the MathTool from Apache Velocity, mathematical expressions can be evaluated in the Velocity context. For example, you can convert a double value to an integer by using the `intValue()` method. For more information, see the MathTool Reference Documentation at http://velocity.apache.org.

This example shows how to use mathematical expressions in the Velocity template. $PCT contains a value between 1 and 100.

```
<Options>
   <Options name="PCT" defaultValue="10" inputType="inputtext">Value used
      in the equation</Option>
</Options>
<CodeTemplate>
   <![CDATA[
#if ($PCT)
#set ($OUTCALC = 1 - ($MathRool.toDouble($PCT)/100))
$MathTool.roundTo(2, $OUTCALC)
$MathTool.toDouble($PCT).intValue()
```

```
#end
]]>
</CodeTemplate>
```

Predefined SAS Macros

If you need to generate SAS code, SAS Studio has these predefined macros:

SAS Macro	Description
%web_drop_table(*library-nametable-name*)	drops the specified table. Specifying the library name is optional.
%web_open_table(*library-nametable-name*)	opens the specified table. Specifying the library name is optional.
%web_open_file(*filename*, *type*)	opens the specified file with the specified MIME type.
%web_open_url(*url*)	opens the specified URL.

Working with the DataSource Element in Velocity

About the DataSource Element

You can specify only one `DataSource` element in the common task model. (You can also have a task with no `DataSource` element.) If you define the `DataSource` element, a Velocity variable is created to access the name of the specified data source. The value of the variable is the same as the value of the `name` attribute for the `DataSource` element.

If you reference the name of the data source in Velocity (for example, $datasource), you see the value of the active Library.Table. You can use the columnExists, getLibrary, getRowsCount, and getTable methods to get more information about the data source. For more information, see Appendix 1, “Common Utilities for CTM Writers,” on page 95.

columnExists Method

Short Description	determines whether the specified value already exists as the name of a column in the data source.
Parameter	input the input string that you want to check to see whether it exists.

Return Value	returns a Boolean value that specifies whether the column already exists.

Example	<pre><DataSource name="DATASOURCE">
	  <Roles>
	  <Role name="analysisVariables" type="A" maxVars="0" minVars="0">
	  Analysis variables:</Role>
	  <Roles>
	</DataSource>
	
	#if ($DATASOURCE.columnExists("MAKE")) ... #end /* If data set is
	  Sashelp.Cars, the return value is true. */</pre>

getDistinctCount Method

To use this method, specify `fetchDistinct = "true"` in the `Role` element.

Short Description	returns the count of distinct values for a given column name for the current data source. **Note:** For optimal performance, the maximum number of distinct values is 100.
Return Value	returns –1 if the number of distinct values for a column is not available.

Example	<pre><DataSource name="DATASOURCE">
	  <Roles>
	  <Role name="VAR" fetchDistinct="true" type="A" maxVars="0" minVars="0">
	  Analysis variables:</Role>
	  <Roles>
	</DataSource>
	
	<Dependencies>
	  <Dependency condition="$VAR.size() > 0 &&
	  $DATASOURCE.getDistinctCount($VAR[0]) > 0">
	  <Target action="show" conditionResult="true" option="targetComboBox"/>
	  <Target action="hide" conditionResult"false" option="targetComboBox"/>
	  </Dependency>
	</Dependencies>
	
	#if ($VAR.size() > 0 && $DATASOURCE.getDistinctCount($VAR[0]) > 0 ... #end</pre>

getLibrary Method

Short Description	returns the name of the library for the data source.
Return Value	returns a string that contains the name of the library for the data source.

Example	<DataSource name="DATASOURCE">
	  <Roles>
	  <Role name="analysisVariables" type="A" maxVars="0" minVars="0">
	  Analysis variables:</Role>
	  <Roles>
	</DataSource>
	
	$DATASOURCE.getLibrary() /* If data set is Sashelp.Cars,
	  the return value is Sashelp. */

getRowsCount Method

Short Description	returns the number of rows in the data source.
Return Value	returns a value of 0 or greater if the data source is available. If this information is not available, –1 is the return value. For example, in SAS Studio when the selected data source is a data view, the row count is not available, so the return code for this function is –1.

Example	<DataSource name="DATASOURCE">
	  <Roles>
	  <Role name="analysisVariables" type="A" maxVars="0" minVars="0">
	  Analysis variables:</Role>
	  <Roles>
	</DataSource>
	
	#if ($DATASOURCE.getRowsCount() > 0) ... #end /* If data set
	  is Sashelp.Cars, the return value is 19. */

getTable Method

Short Description	returns the table name for the data source.
Return Value	returns a string that contains the table name for the data source.

Example	<DataSource name="DATASOURCE">
	  <Roles>
	  <Role name="analysisVariables" type="A" maxVars="0" minVars="0">
	  Analysis variables:</Role>
	  <Roles>
	</DataSource>
	
	$DATASOURCE.getTable() /* If data set is
	  Sashelp.Cars, the return value is Cars. */

getWhereClause Method

To use this method, you must specify `where = "true"` in the `DataSource` element.

Short Description	returns the filter of the currently assigned data source.
Return Value	returns a string that contains the filter of the currently assigned data source.

Example	`<DataSource name="DATASOURCE" where="true">`
	`  <Roles>`
	`  <Role name="analysisVariables" type="A" maxVars="0" minVars="0">`
	`  Analysis variables:</Role>`
	`  <Roles>`
	`</DataSource>`
	
	`$DATASOURCE.getWhereClause()/* If data set`
	`  is Sashelp.Cars, the return value is the filter value`
	`that the user specifies. */`

getDataType Method

Short Description	returns the type of data set. This value corresponds to the 'typemem' value in Sashelp.Vtable.
Return Value	is the type of data set. This method defaults to null if the value is not available.

Example	`<DataSource name="DATASOURCE" where="true">`
	`  </DataSource>`
	
	`$DATASOURCE.getDataType()`

How Role Elements Appear in the Velocity Code

For each role, a Velocity variable is used to access the role information. This variable is the same as the role's name attribute. In the `Role` element, the `minVars` and `maxVars` attributes specify how many variables can be assigned to a specific role. Because roles can have 1 to *n* number of variables, the corresponding Velocity variable is an array. The syntax for an array is `$variable-name[index-number]`. In this example, $subsetRole is the Velocity variable for the **Subset by** role (which is defined in the metadata):

```
proc rank data=$dataset (where=($subsetRole[0]="$filterValue"))descending
```

You can use the Velocity variable's GET method to obtain the attributes for each role variable. The GET method takes a string parameter that accepts one of these values:

Attribute	Description
`format`	specifies the SAS format that is assigned to the variable.
`informat`	specifies the SAS informat that is assigned to the variable.
`length`	specifies the length that is assigned to the variable.
`type`	specifies the type of variable. Valid values are `Numeric` or `Char`.
`value`	specifies the name of the variable.

In this example, the **Analysis Group** role is given the name of BY. As a result, the Velocity variable, $BY, is created. When this script is run, the $BY variable is checked to see whether any columns are assigned. If the user has assigned any columns to the **Analysis Group** role, the generated SAS code sorts on these columns. To demonstrate the GET method, only numeric variables are added.

```
<DataSources>
   <DataSource name="DATASOURCE">
      <Roles>
         <Role type="A" maxVars="0" order="true" minVars="0"
         name="VAR">Columns</Role>
         <Role type="A" maxVars="0" order="true" minVars="0"
         name="BY">Analysis group</Role>
         <Role type="N" maxVars="0" order="true" minVars="0"
         name="SUM">Total of</Role>
         <Role type="A" maxVars="0" order="true" minVars="0"
         name="ID">Identifying label</Role>
      </Roles>
   </DataSource>
</DataSources>
<CodeTemplate>
   <![CDATA[
#if( $BY.size() > 0 )/* Sort $DATASOURCE for BY group processing. */

PROC SORT DATA=$DATASOURCE OUT=WORK.SORTTEMP;
   BY #foreach($item in $BY ) #if($item.get('type') == 'Numeric' $item #end#end;
#end
RUN;]]>
</CodeTemplate>
```

How the Options Elements Appear in the Velocity Code

To access option variables, a Velocity variable is defined for each option. The names of these variables correlate to the option name attribute. For example, to access a check box with a `name` attribute of `cbx1`, a Velocity variable of $cbx1 is defined.

checkbox

The Velocity variable for the `checkbox` input type holds the state information for the check box option. If the check box is selected, the variable is set to 1. If the check box is not selected, the variable is set to 0.

In this example, the code outputs the character `N` if the **Print row numbers** check box is selected.

```
<Options>
   <Option name="PRINTNUMROWS" defaultValue="1"
      inputType="checkbox">Print row numbers</Option>
</Options>
<Code Template>
   <![CDATA[
#if ($PRINTNUMROWS == '1')
      N
#end]]>
</CodeTemplate>
```

color

The Velocity variable for the `color` input type holds the specified color.

In this example, the code template is printed as `colorEXAMPLE=`*`specified-color`*.

```
<Options>
   <Option name="colorEXAMPLE" defaultValue="white"
      inputType="color">Select a color</Option>
</Options>
<CodeTemplate>
   <![CDATA[
%put colorEXAMPLE=$colorEXAMPLE;
#end]]>
</CodeTemplate>
```

combobox

The Velocity variable for the `combobox` input type holds the name of the selected option. If no option is selected, the variable is null.

This example outputs the string `HEADING=`*`option-name`*, where *option-name* is the value selected from the **Direction of heading** drop-down list. If the user

selects **Horizontal** from the **Direction of heading** drop-down list, the output is `HEADING="horizontal"`.

```
<Options>
   <Option name="HEADING" defaultValue="default"
      inputType="combobox">Direction of heading:</Option>
   <Option name="default" inputType="string">Default</Option>
   <Option name="horizontal" inputType="string">Horizontal</Option>
   <Option name="vertical" inputType="string">Vertical</Option>
</Options>
<UI>
   <Container option="OPTIONSTAB">
      <OptionChoice option="HEADING">
         <OptionItem option="default"/>
         <OptionItem option="horizontal"/>
         <OptionItem option="vertical"/>
      </OptionChoice>
   </Container>
</UI>
<CodeTemplate>
   <![CDATA[
#if ($HEADING && (&HEADING !="default"))
      HEADING=$HEADING
#end
]]>
</CodeTemplate>
```

datepicker

The Velocity variable for the `datepicker` input type holds the date that is specified in the datepicker control. By default, this variable is an empty string. If the user selects a date or you specify a default value for the date in the code, the variable holds the specified date. You specify the format of the date by using the `format` attribute.

This example outputs a date if one has been selected. If no date is selected, the "You have not selected a date." message appears.

```
<Options>
   <Option name="myDate" inputType="datepicker" format="monyy7.">
      Select a date:</Option>
</Options>
<CodeTemplate>
   <![CDATA[
#if( $myDate == "" )
You have not selected a date.
#else
The date you selected is: $myDate
#end
]]>
</CodeTemplate>
```

distinct

The Velocity variable for the `distinct` input type holds the information for the distinct control. By default, this variable is the first distinct value in the list.

In this example, the Response variable is Age, and the distinct value is 15. The Velocity script produces the line `Age(event=15)`.

```
<DataSources>
   <DataSource name="Class">
      <Roles>
         <Role name="responseVariable" type="A" minVars="1"
            maxVars="1">Response</Role>
      </Roles>
   </DataSource>
</DataSources>
<Options>
   <Option name="referenceLevelCombo" inputType="distinct"
      source="responseVariable">Event of interest:</Option>
</Options>
<CodeTemplate>
   <![CDATA[
   #foreach( $item in $responseVariable ) $item (event='$referenceLevelCombo')#end
</CodeTemplate>
```

dualselector

The Velocity variable for the `dualselector` input type holds the array of selected values.

This example is for a dualselector control that contains three values: anothertest1, anothertest2, and anothertest3. Any or all of these values can be selected. Only the values that are selected in the dualselector control appear in the Velocity code.

```
<OptionChoice name="ANOTHERLIST" inputType="dualselector">
   <OptionItem option="anothertest1"/>
   <OptionItem option="anothertest2"/>
   <OptionItem option="anothertest3"/>
<OptionChoice>
...
<CodeTemplate>
<![CDATA[
#if ($ANOTHERLIST && $ANOTHERLIST.size() > 0)
#foreach($item in $ANOTHERLIST) $item #end
#end
]]>
</CodeTemplate>
```

inputtext

The Velocity variable for the `inputtext` input type holds the string that was specified in the text box.

This example outputs the string `OBS=` and the text specified in the **Column** text box. If the user enters **`Student Number`** into the **Column** text box, the output is `OBS="Student Number"`.

```
<Options>
   <Option name="OBSHEADING" indent="1" defaultValue="Row number"
      inputType="inputtext">Column label:</Option>
 </Options>
<CodeTemplate>
   <![CDATA[
OBS="$OBSHEADING"#end]]>
</CodeTemplate>
```

mixedeffects

The Velocity variable that holds the output of the mixed effects control is a data structure containing two members, `modelSummaryValues` and `mixedEffectsModels`.

The `modelSummaryValues` member summarizes the user's interaction with the mixed effects control. Here are members for the mixed effects control:

Member	Description
`randomEffectsSetCount`	specifies the number of random effects model sets that were created.
`repeatedEffectsSetCount`	specifies the number of repeated effects model sets that were created.
`fixedEffectsCount`	specifies the number of fixed effects that were created.
`fixedContinuousMainEffectsCount`	specifies the number of main fixed effects that were created for a continuous variable.
`fixedClassificationMainEffectsCount`	specifies the number of main fixed effects that were created for a classification variable.
`fixedInterceptValue`	specifies the value of the intercept of the fixed effects model set. Valid values are `true`, `false`, or null.
`fixedModelsetInvalidStateCount`	specifies the number of fixed effects model sets with an invalid context.
`randomModelsetInvalidStateCount`	specifies the number of random effects model sets with an invalid context.
`repeatedModelsetInvalidStateCount`	specifies the number of repeated effects model sets with an invalid context.
`meansModelsetInvalidStateCount`	specifies the number of means effects model sets with an invalid context.

Member	Description
`zeroInflatedModelsetInvalidStateCount`	specifies the number of zero-inflated effects model sets with an invalid context.

The `mixedEffectsModels` member describes the detailed results of the interactions with the mixed effects control. This member is an array of models created by the user. The models are in the order in which they were created.

Member	Description
`emtype`	specifies the type of model.
`intercept`	specifies whether the intercept is visible to the user. Valid values are `true`, `false`, or null.
`modelEffects`	specifies the array of effects that create this model. ■ `effectType`: main, interaction, or nested ■ `effectName`: the display name ■ `memberSet1`: the members for this effect ■ `memberSet2`: for nested effects, the inner members within the outer members
Additional Members for Random and Repeated Effects	
`groupEffect`	contains information about the group effect if one is defined. Otherwise, the value is null. ■ `effectType`: main, interaction, or nested ■ `effectName`: the display name ■ `memberSet1`: the members for this effect ■ `memberSet2`: for nested effects, the inner members within the outer members
`subjectEffect`	contains information about the subject effect if one is defined. Otherwise, the value is null. ■ `effectType`: main, interaction, or nested ■ `effectName`: the display name ■ `memberSet1`: the members for this effect ■ `memberSet2`: for nested effects, the inner members within the outer members
`covarianceStructures`	specifies the array that contains the covariance structure, if one is defined. Only one covariance structure can be defined. If no structure is defined, the array is empty. ■ `csType` specifies the type of covariance structure. ■ `csParameterValues` specifies the parameter value for the covariance structure. If no parameter value is needed, `csParameterValues` is set to null.

The following Velocity code does not generate SAS code. The purpose of this code is to demonstrate how to parse the Velocity structure for mixed effects.

```
<CodeTemplate>
<![CDATA[
/* ======== MEC Summary Values START ========*/
#if ( $mixedEffects.modelSummaryValues )
Random Effects Set Count: $mixedEffects.modelSummaryValues.randomEffectsSetCount;
Repeated Effects Set Count: $mixedEffects.modelSummaryValues.repeatedEffectsSetCount;
Fixed Effects Count: $mixedEffects.modelSummaryValues.fixedEffectsCount;
Fixed Continuous Main Effects Count:
   $mixedEffects.modelSummaryValues.fixedContinuousMainEffectsCount;
Fixed Classification Main Effects Count:
   $mixedEffects.modelSummaryValues.fixedClassificationMainEffectsCount;
#if ( $mixedEffects.modelSummaryValues.fixedInterceptValue )
Fixed Intercept Value: $mixedEffects.modelSummaryValues.fixedInterceptValue;
#else
Fixed Intercept Value: null;
#end
Fixed Classification Main Effects Count:
   $mixedEffects.modelSummaryValues.fixedClassificationMainEffectsCount;
/* Model set invalid state count: */
Fixed: $mixedEffects.modelSummaryValues.fixedModelsetInvalidStateCount;
Random: $mixedEffects.modelSummaryValues.randomModelsetInvalidStateCount;
Repeated: $mixedEffects.modelSummaryValues.repeatedModelsetInvalidStateCount;
Means: $mixedEffects.modelSummaryValues.meansModelsetInvalidStateCount;
Zero-Inflated: $mixedEffects.modelSummaryValues.zeroInflatedModelsetInvalidStateCount;
#else
/* No summary values found. */
#end
/* ======== MEC Summary Values END ==========
 *
 *
 * ======== MEC models START ========*/
#if ( $mixedEffects.mixedEffectsModels )
#foreach( $model in $mixedEffects.mixedEffectsModels )
/*
 * **** Begin $model.emtype effects model ****
 */
#if ( $model.intercept == "True" )
/* This model has an intercept. */
#elseif ( $model.intercept == "False" )
/* This model has no intercept. */
#end
/* User has generated $model.modelEffects.size() model effects */
#if ( $model.modelEffects.size() > 0 )
#foreach( $modelEffect in $model.modelEffects )
## if the effectType is 'nested', then this is a nested effect
#if ( $modelEffect.effectType == 'nested' )
$velocityCount $modelEffect.effectType effect: #foreach( $subitem1 in
   $modelEffect.memberSet1 )$subitem1#if($velocityCount <
   $modelEffect.memberSet1.size())*#end#end(#foreach($subitem2 in
   $modelEffect.memberSet2)$subitem2#if($velocityCount <
   $modelEffect.memberSet2.size())*#end#end);
## handle 'main' or 'interaction' effects
#else
```

```
$velocityCount $modelEffect.effectType effect: #foreach( $subitem in
   $modelEffect.memberSet1 )$subitem#if($velocityCount <
   $modelEffect.memberSet1.size())*#end#end;
#end
#end
#else
/* User hasn't generated any model effects yet */
#end
#if ( $model.subjectEffect )
/* user has generated a subject effect */
#set ( $modelEffect = $model.subjectEffect )
## if the effectType is 'nested', then this is a nested effect
#if ( $modelEffect.effectType == 'nested' )
$modelEffect.effectType effect: #foreach( $subitem1 in
   $modelEffect.memberSet1 )$subitem1#if($velocityCount <
   $modelEffect.memberSet1.size())*#end#end(#foreach($subitem2
   in $modelEffect.memberSet2)$subitem2#if($velocityCount <
   $modelEffect.memberSet2.size())*#end#end);
## handle 'main' or 'interaction' effects
#else
$modelEffect.effectType effect: #foreach( $subitem in
   $modelEffect.memberSet1 )$subitem#if($velocityCount <
   $modelEffect.memberSet1.size())*#end#end;
#end
#end
#if ( $model.groupEffect )
/* user has generated a group effect */
#set ( $modelEffect = $model.groupEffect )
## if the effectType is 'nested', then this is a nested effect
#if ( $modelEffect.effectType == 'nested' )
$modelEffect.effectType effect: #foreach( $subitem1 in
   $modelEffect.memberSet1 )$subitem1#if($velocityCount <
   $modelEffect.memberSet1.size())*#end#end(#foreach($subitem2
   in $modelEffect.memberSet2)$subitem2#if($velocityCount <
   $modelEffect.memberSet2.size())*#end#end);
## handle 'main' or 'interaction' effects
#else
$modelEffect.effectType effect: #foreach( $subitem in
   $modelEffect.memberSet1 )$subitem#if($velocityCount
   < $modelEffect.memberSet1.size())*#end#end;
#end
#end
#if ( $model.covarianceStructures )
/* User has generated $model.covarianceStructures.size()
   covariance structures */
#if ( $model.covarianceStructures.size() > 0 )
#foreach( $covStruct in $model.covarianceStructures )
$velocityCount $covStruct.csType parameters:
   [#foreach( $subitem in $covStruct.csParameterValues
   )$subitem#if($velocityCount <
   $covStruct.csParameterValues.size()),#end#end];
#end
#else
/* User hasn't generated any covariance structures yet */
#end
#end
```

```
/*
 * **** End $model.emtype effects model ****
 */
#end
#else
/* User hasn't included any effects models yet */
#end
/* ======== MEC models END ==========
 *
 *
 * ======== MEC DEBUG START ========
 * modelSummaryValues property */
contents: $mixedEffects.modelSummaryValues;
/* Number of effects models: $mixedEffects.mixedEffectsModels.size()
 * mixedEffectsModels property */
contents: $mixedEffects.mixedEffectsModels;
/* ======== MEC DEBUG END ==========*/
]]>
    </CodeTemplate>
```

modelbuilder

Note: The `modelbuilder` control will be removed in a later release. All SAS Studio tasks that used the `modelbuilder` control have been revised to use the `mixedeffects` control.

The Model Effects Builder is a custom component. This example code shows how the Model Effects Builder might be used in the user interface for a task. The Velocity code shows how to process the effects that are generated by the `modelbuilder` component.

```
<Metadata>
   <DataSources>
      <DataSource name="dataset">
      <Roles>
      <Role type="N" maxVars="0" minVar="1" order="true"
         name="CONTVARS">Continuous variables</Role>
      <Role type="A" maxVars="0" minVar="0" order="true"
         name="CLASSVARS">Classification variables</Role>
   </Roles>

   <Options>
      <Option inputType="string" name="modelGroup">MODEL</Option>
      <Option inputType="string" name="modelTab">MODEL</Option>
         <Option excludeTools="THREEFACT, NFACTPOLY" inputType="modelbuilder"
            name="modelBuilder roleClassification="classVariables"
            roleContinuous="continuousVariables" width="100%">Model</Option>
      <Option inputType="string" name="responseGroup">Response</Option>
    </Options>
</Metadata>
<UI>
   <Container option="modelTab">
      <Group open="true" option="modelGroup">
         <OptionItem option="modelBuilder"/>
      </Group>
   </Container>
```

```
</UI>

<CodeTemplate>
<![CDATA[

#macro ( ModelEffects )
#if ( $modelBuilder )
#foreach ( $item in $modelBuilder )
## if first element is 'm', then this is a main effect
#if ( $item.get(0) == 'm' )
#foreach( $subitem in $item.get(1) )$subitem #end
## if first element is 'i', then this is an interaction effect
#elseif ( $itemget(0) == 'i' )
#foreach( $subitem in $item.get(1) )$subitem#if($velocityCount
   < $item.get(1).size())*#else #end#end
## if first element is 'n', then this is a nested effect
#elseif ( $item.get(0) == 'n' )
#foreach( $subitem1 in $item.get(1) )$subitem1#if($velocityCount
   < $item.get(1).size())*#end#end(#foreach($subitem2 in
   $item.get(2))$subitem(2)#if($velocityCount <
   $item.get(2).size())*#end#end)
#end
#end
#end
#end



]]>
</CodeTemplate>
```

multientry

The Velocity variable for the `multientry` input type holds the array of specified values.

In this example, the multientry control contains the values of ONE, TWO, and THREE, so the array contains the values ONE, TWO, and THREE. Users can add new values (such as FOUR). Any new user-specified values are added to the array. In this example if the user specifies FOUR, the array contains the values ONE, TWO, THREE, and FOUR.

```
<UI>
   <Container option="OPTIONSTAB">
      <Group option="GROUP2">
         <OptionChoice name="multiExample" inputType="multientry">
            <OptionItem option="ONE"/>
           <OptionItem option="TWO"/>
           <OptionItem option="THREE"/>
       </OptionChoice>
      </Group>

...
   </Container>
</UI>
<CodeTemplate>
```

```
<![CDATA[
#if ($multiExample && $multiExample.size() > 0)
#foreach($item in $multiExample) $item #end
#end
]]>
</CodeTemplate>
```

numbertext

The Velocity variable for the `numbertext` input type holds the string specified in the numbertext option.

This example outputs the string `AMOUNT` and the value in the **Number to order** box. If the user enters `2` into the **Number to order** box, the string output is `AMOUNT=5`.

```
<Options>
   <Option name="AMT" defaultValue="1" minValue="0" maxValue="100"
      inputType="numbertext">Number to order:</Option>
</Options>
<CodeTemplate>
   <![CDATA[
AMOUNT=$AMT]]>
</CodeTemplate>
```

numstepper

The Velocity variable for the `numstepper` input type holds the string specified in the number control box.

This example outputs the string `GROUPS=` and the value in the **Number of groups** box. If the user enters `2` into the **Number of groups** text box, the string output is `GROUPS="2"`.

```
<Options>
   <Option name="NUMGRPS" defaultValue="1" minValue="0"
      inputType="numstepper" indent="1">Number of groups:</Option>
 </Options>
<CodeTemplate>
   <![CDATA[
GROUPS="$NUMGRPS"#end]]>
</CodeTemplate>
```

OptionTable

The Velocity variable for the option table holds information about the option's current state. This variable has two members, `rows` and `columns`.

The `rows` member accesses the contents of the option table in an array of rows.

The following information can be retrieved from each item in a row:

Member	Description
`values`	specifies an array of values for each row. Each `values` array element contains these members: ■ `id`—the ID of the row, which correlates to the row number. The row numbers start at 1. ■ the column name as defined in the `Column` element.

The `columns` member accesses the contents of the option table in an array of columns. The following information can be retrieved from each item in a column:

Member	Description
column name as defined in the `Column` element	specifies the information specific to that column. This structure has these members: ■ `values`—an array of the current values. ■ `isValid`—a Boolean value (1 or 0) that indicates whether the column is currently valid. ■ `numValues`—the current number of values for this column.

This code uses the metadata that you specified for the `OptionTable` element in Chapter 3, “Working with the Metadata Element,” on page 11. This code does not generate SAS code. Instead, it demonstrates how to parse the Velocity structure of the option table.

```
<CodeTemplate>
<![CDATA[

/* Print option table content - rows array */
$optionTable.rows;

/* Iterate over each row to obtain values */
#foreach($item in $optionTable.rows.values)
row[$item.id] = $item
#end
;

/* Print option table content - this time using a columns array */
$optionTable.columns;

/* Iterate over each column to obtain values */
#foreach($columnName in $optionTable.columns.keySet())
column[$columnName] = $optionTable.columns[$columnName]
#end
;
```

```
   /* cell[row][column_name]*/
   /* Row 2, Column TextBox */
   $optionTable.rows.values[1].colTextBox;

   /* cell[column][row]*/
   /* Column ComboBox, Row 3 */
   $optionTable.columns["colComboBox"].values[2];

   ]]>
   </CodeTemplate>
```

outputdata

The Velocity variable for the outputdata control holds the string that appears in the text field. In this example, the name of the Velocity variable is $outputDSName, and the default name that appears in the **Data set name:** box is Outputds.

```
<Metadata>
   <Options>
      <Option inputType="string" name="outputGroup">OUTPUT DATA SET</Option>
      <Option defaultValue="Outputds" indent="1" inputType="outputdata"
         name="outputDSName" required="true">Data set name:</Option>
   </Options>
</Metadata>

<UI>
   <Group option="outputGroup" open="true">
      <OptionItem option="outputDSName"/>
   </Group>
</UI>
<CodeTemplate>
   <![CDATA[
      output = $outputDSName]>
   ]]>
</CodeTemplate>
```

radio

The radio button options are grouped together with the same variable attribute. It is this attribute that defines the Velocity scripting variable. The Velocity scripting variable holds the name of the selected radio button. If no radio button is selected, the variable is null.

In this example, there are four radio buttons.

- If the first radio button is selected, there is no output.
- If the second radio button is selected, the string output is `GROUPS="100"`.
- If the third radio button is selected, the string output is `GROUPS="10"`.
- If the fourth radio button is selected, the string output is `GROUPS="4"`.

```
   <Options>
      <Option name="RMSL" inputType="radio" variable="RMGRP"
         defaultValue="1">Smallest to largest</Option>
```

```
   <Option name="RMPR" inputType="radio"
      variable="RMGRP">Percentile ranks</Option>
   <Option name="RMDC" inputType="radio" variable="RMGRP">Deciles</Option>
   <Option name="RMQR" inputType="radio" variable="RMGRP">Quartiles</Option>
 </Options>
<CodeTemplate>
   <![CDATA[
#if ($RMGRP.equalsIgnoreCase("RMPR")) GROUP=100 #end
#if ($RMGRP.equalsIgnoreCase("RMDC")) GROUP=10 #end
#if ($RMGRP.equalsIgnoreCase("RMQR")) GROUP=4 #end
]]>
</CodeTemplate>
```

select

The Velocity variable for the `select` input type holds the array of selected values.

This example shows a selection list that contains three options. Any or all of these options can be selected.

```
<UI>
   <Container option="OPTIONSTAB">
   <Group option="GROUP1">
      <OptionChoice name="SELECTLIST" inputType="select" multiple="true">
         <OptionItem option="Choice1"/>
         <OptionItem option="Choice2"/>
         <OptionItem option="Choice3"/>
      </OptionChoice>
   </Group>

...
   </Container>
</UI>
<CodeTemplate>
<![CDATA[
#if ($SELECTLIST && $SELECTLIST.size() > 0)
#foreach($item in $SELECTLIST) $item #end
#end
]]>
</CodeTemplate>
```

slider

The Velocity variable for the `slider` input type holds the numeric string that is specified on the slider control.

This example outputs the string `datalabelattrs=(size=`*n*`)`, where *n* is the value of the **Label Font Size** option. If the value of the **Label Font Size** option is 10, the output is `datalabelattrs=(size=10)`.

```
<Options>
   <Option name="labelSIZE" defaultValue="7" inputType="slider"
      discreteValues="16" minValue="5" maxValue="20">Label Font Size</Option>
 </Options>
<CodeTemplate>
   <![CDATA[
```

```
datalabelattrs=(size=$labelSIZE]]>
</CodeTemplate>
```

string

A Velocity variable is created for the string input type. Here is an example:

```
<CodeTemplate>
   <![CDATA[
%put string=$str;
   ]]>
<CodeTemplate>
```

textbox

The Velocity variable for the `textbox` input type holds the current string in the text box.

In this example, the `splitLines` attribute is set to false, so newline characters are preserved in the Velocity object.

```
<CodeTemplate>
   <![CDATA[
%put Text entered: '$text';
]]>
</CodeTemplate>
```

If the user entered a phrase with a newline character in the text box, that newline character is preserved. Here is an example. In the text box, you entered this phrase:

```
Hello
World
```

Here is the resulting Velocity code:

```
%put Text entered:  'Hello
World';
```

In this example, the `splitLines` attribute is set to true, so the Velocity variable is an array of each line.

```
<CodeTemplate>
   <![CDATA[
#set($line = 1)
#if ( $text2.size() > 0 )
   #foreach( $item in $text2 )
      %put Text line $line: $item;
      #set($line = $line+1)
   #end
#end
   ]]>
</CodeTemplate>
```

Now if you enter

```
Hello
World
```

in the text box, here is the resulting Velocity code:

```
%put Text line 1: Hello;
%put Text line 2: World;
```

validationtext

The Velocity variable for the `validationtext` input type holds the string that was specified in the text box.

The following example outputs the string `rho0=` and the text in the **Null hypothesis correlation** option. If the user specifies `0`, the resulting string is `rho0=0`.

```
<Options>
   <Option name="nullRho" indent="1" inputType="validationtext"
      defaultValue="0" required="true"
      promptMessage="Enter a number greater than -1 and less than 1
         for the null hypothesis correlation"
      invalidMessage="Enter a number greater than -1 and less than 1
         for the null hypothesis correlation"
      missingMessage="Enter a number grearter than -1 and less than 1
         for the null hypothesis correlation"
      regExp="[-+]?((0\.\d*)|(\.\d+)|0)">Null hypothesis correlation:</Option>
 </Options>
<CodeTemplate>
   <![CDATA[
rh0=$nullRho]]>
</CodeTemplate>
```

Appendix 1

Common Utilities for CTM Writers

$CTMMathUtil Variable

The predefined $CTMMathUtil variable provides access to basic math utilities.

getMin Method

Short Description	returns the smallest value of an array of doubles.
Syntax	`Double getMin(ArrayList<Double> inputArray)`
Parameter	input an array of double values.
Return Value	returns the double value that is the smallest in the input array. This function returns NaN if the inputArray is null or if an exception occurs while trying to process the array.

Example	`#set($array = [1.0, 2.0, 3.0])`
	`$CTMMathUtil.getMin($array)`
	
	`/* double returned: 1.0 */`

getMax Method

Short Description	returns the largest value of an array of doubles.

Syntax	`Double getMax(ArrayList<Double> inputArray)`
Parameter	input an array of double values.
Return Value	returns the double value that is the largest in the input array. This function returns NaN if the inputArray is null or if an exception occurs while trying to process the array.

Example	`#set($array = [1.0, 2.0, 3.0])`
	`$CTMMathUtil.getMax($array)`
	
	`/* double returned: 3.0 */`

getSum Method

Short Description	returns the smallest value of an array of doubles.
Syntax	`Double getSum(ArrayList<Double> inputArray)`
Parameter	input an array of double values.
Return Value	returns the double value that is the sum of all the values in the input array. This function returns NaN if the inputArray is null or if an exception occurs while trying to process the array.

Example	`#set($array = [1.0, 2.0, 3.0])`
	`$CTMMathUtil.getSum($array)`
	
	`/* double returned: 6.0 */`

$CTMUtil Variable

The predefined $CTMUtil variable provides access to some common utilities. Several methods are currently available.

quotestring Method

Short Description	encloses a string in single quotation marks.
Syntax	`String quoteString(String input)`

Parameter	input the input string that you want to enclose in single quotation marks.
Return Value	returns a string that represents the quoted value. Single quotation marks are added to the input string. Any single quotation marks that are found in the original string are preserved by adding another single quotation mark.

Example	`#set( $input="Person's" )`
	`$CTMUtil.quoteString($input);`
	
	`/* string returned: 'Person''s' */`

toSASName Method

Short Description	transforms a string so that it uses SAS naming conventions.
Syntax	`String toSASName(String input)`
Parameter	input the input string to transform.
Return Value	returns a string that represents the transformed input string. For example, if the input string is ‘My Variables’, the returned string would be “’My Variables”n’.

Example	`#set( $input="My Variable" )`
	`$CTMUtil.toSASname($input);`
	
	`/* string returned: "My Variable"n */`

Recommended Reading

- *SAS Studio: Writing Your First Custom Task*
- *SAS Studio: Administrator's Guide*
- *Getting Started with Programming in SAS Studio*
- *SAS Studio: User's Guide*

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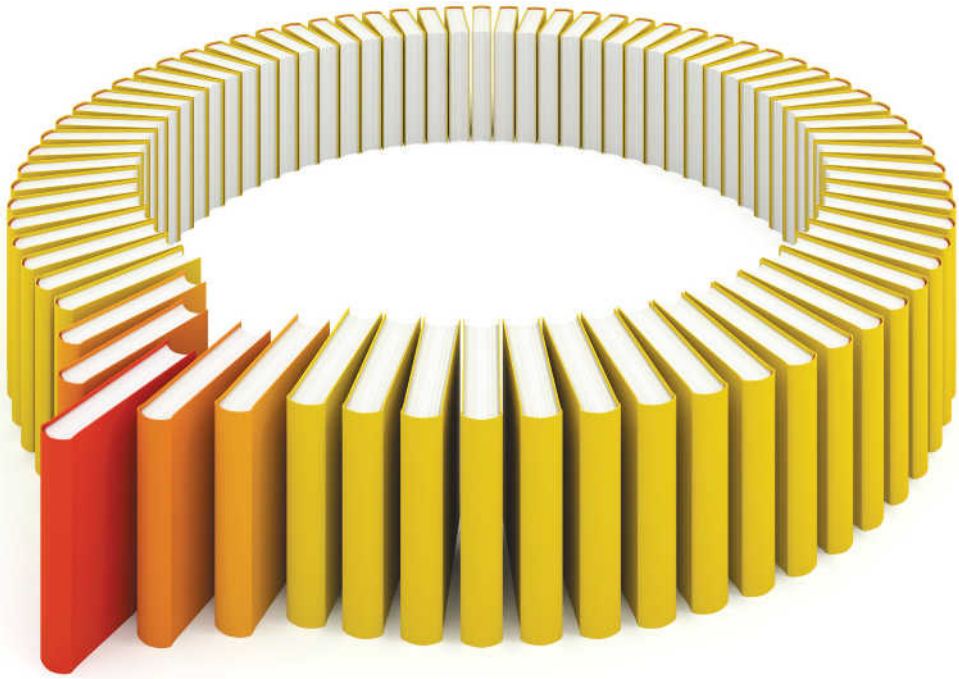

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