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Getting Started

Introduction
The SAS Intelligent Decisioning tutorials are an introduction to some of the primary features of SAS Intelligent Decisioning.

Defining Rule Sets and Decisions
walks you through the process of creating rule sets and decisions, creating custom variables, importing variables from data tables, defining business rules, combining rules sets and conditional logic into a decision, and testing rule sets and decisions.

Using Treatments and Scoring Data Grids
walks you through the process of defining treatments, combining treatments into a treatment group, adding that group to a decision, and scoring the data grid that is produced by the treatment group.

Before You Begin

Note: In order to complete the tasks in this tutorial, your user ID must have the appropriate permissions. See SAS Intelligent Decisioning: Administrator’s Guide for more information.

Before you work through these tutorials, you must sign in to SAS Intelligent Decisioning and import the data used in the tutorials. Complete the following steps:

1 Download the tutorial files.
2. Sign in to SAS Intelligent Decisioning.

3. Import the HMEQ data sets.

4. (Optional) Import the Calc_Credit_Limit model on page 4. This step is required only if you are working with the Chapter 3, “Using Treatments and Scoring Data Grids,” on page 27 tutorial.

Download the Tutorial Files

The ZIP file QuickStartTutorial.zip contains the tutorial data sets that are used by both tutorials and the model that is used by the tutorial in Chapter 3, “Using Treatments and Scoring Data Grids,” on page 27. This ZIP file is available at https://support.sas.com/en/software/intelligent-decisioning-support.html#documentation.

Before you begin the tutorials, complete these steps:

1. Create a folder on a machine that is accessible to SAS Intelligent Decisioning users.

2. Save the QuickStartTutorial.zip file into the folder that you created.

3. Extract the contents of the QuickStartTutorial.zip file. In Windows Explorer, right-click QuickStartTutorial.zip, and select WinZip Æ Extract to here. Windows creates a folder called QuickStartTutorial that contains the tutorial data sets, the model file, and additional sample data sets and models.

   In Step 3 of “Before You Begin”, you use SAS Visual Analytics to import the data sets.

   In Step 4, you use SAS Model Manager to import the model that is used in the treatments tutorial.

Sign in to SAS Intelligent Decisioning

Note: If you are already signed in to SAS Drive, you can access SAS Intelligent Decisioning by clicking and selecting Build Decisions.

To sign in to SAS Intelligent Decisioning:

1. In the address bar of your web browser, enter the URL for SAS Intelligent Decisioning and press Enter. The Sign In page appears.

Note: Contact your system administrator if you need the URL for SAS Intelligent Decisioning. The default URL is https://host_name/SASDecisionManager.
2 Enter a user ID and password.
3 Click Sign In.

---

## Import the Data Tables

1 Click ⌁ and select **Explore and Visualize**. If you have not worked in SAS Visual Analytics, the Welcome to SAS Visual Analytics window appears.

**Note:** If you have worked in SAS Visual Analytics, the Report window appears. Close the Report window.

2 Click **Start with Data**. The Choose Data window appears.
3 Click the **Import** tab.
4 Click **Local files** and select **Local file**.

5 Navigate to the location where you saved the contents of the QuickStartTutorial.zip file in “Download the Tutorial Files”.

6 Select the data set `hmeq_test.sas7bdat` and `hmeq_accounts.sas7bdat` files, and click **Open**.

7 Click **Import All**. By default, the table is imported into the library cas-shared-default/Public.
8 Click **OK** to close the Choose Data window.

9 Click **☰** and select **Build Decisions** to return to SAS Intelligent Decisioning.

---

**Import the Calc_Credit_Limit Model**

The Calc_Credit_Limit model is used in the tutorial “Overview” on page 27.

1 Click **☰** to open the side menu, and select **Manage Models**.

2 Click **△** to navigate to the Models category view.

3 Click **Add models** and select **Import**. The Import Models window appears.

4 Select the target location where you want to import the model.

5 Select the **calc_credit_limit.zip** file that you downloaded in “Download the Tutorial Files” on page 2.

6 Click **Import** to import the model. If the request is successful, SAS Model Manager displays the message *The models were imported.*

7 Click **☰** and select **Build Decisions** to switch to return to SAS Intelligent Decisioning.
Overview

A rule set is a group of business rules. Business rules specify conditions to be evaluated and actions to be taken if those conditions are satisfied. For example, if the applicant for a residential loan has a high debt-to-income ratio and little equity in their property, their loan application might be denied or flagged for additional review.

A decision can combine rule sets, analytical models, treatment groups, custom code files, subdecisions, and conditional branches. Decisions enable you to automate the decision-making process and provide a streamlined mechanism for controlling and monitoring the rules and processes used by your organization.

In this tutorial, you create three rule sets and combine these rule sets together with conditional logic into a decision. This decision evaluates residential loan applications. It identifies loan applications that need to be reviewed manually, and it approves or rejects other loan applications based on certain criteria. The final decision diagram is shown in Figure 2.1 on page 6.
Figure 2.1  Decision Flow Diagram for the Evaluate_Loans Decision

Note: In order to complete the tasks in this tutorial, your user ID must have the appropriate permissions. See SAS Intelligent Decisioning: Administrator’s Guide for more information.

The steps in this tutorial are typical steps that you would complete to add content to your decision database. In this tutorial, you complete the following steps:

1. Complete the steps listed in “Before You Begin” on page 1.
2. Create the Loans_To_Review rule set. This rule set identifies loan applications that must be reviewed manually.
3. Create the Low_Ratio rule set. This rule set evaluates applications for which the applicant has a low debt-to-income ratio.
4. Create the High_Ratio rule set. This rule set evaluates loans for which the applicant has a high debt-to-income ratio.
5. Create the Evaluate_Loans decision. The decision incorporates the three rule sets and uses a condition to control which rule sets are run.
6. (Optional) Test the Evaluate_Loans decision.
7. Publish the decision.
8. (Optional) Validate the decision in the publishing destination.
For additional information about defining rule sets and decisions, see *SAS Intelligent Decisioning: User’s Guide*.

## Create the Loans_to_Review Rule Set

The Loans_to_Review rule set identifies loans for which key information is missing, but the available data suggests that the application should be approved. These loans need to be reviewed by an underwriter. This rule set flags a loan application for review if all of the following conditions are true:

- The value of the applicant’s property is greater than or equal to $120,000 (VALUE \( \geq 120000 \)).
- The total amount of debt that the applicant has is less than 35.5% of their total income (DEBTINC < 35.5).
- The data for the applicant’s total amount of debt is not missing (DEBTINC \( \neq . \)).
- The data for either the number of delinquent credit lines or the number of major derogatory reports is missing (DEROG=. OR DELINQ=.).

To create the Loans_to_Review rule set, you complete the following steps:

1. Create a new rule set.
2. Add variables to the rule set.
3. Define the business rule. This rule set contains only one rule.
4. Test the rule set.

### Create a New Rule Set

1. Click to navigate to the Rule sets category view.
2. Click **New Rule Set**. The New Rule Set window appears.
3. Enter **Loans_to_Review** for the rule set name.
4. Select **Assignment** for the rule type.
5. Click and select the folder where you want to save the rule set.
6. Click **Save**. The application opens the new rule set and displays the **Variables** tab.

### Add Variables to the Rule Set

You can import existing variables from data tables or from other rule sets and decisions, or you can create custom variables. In this tutorial, you create a custom variable that does not exist in the table, and then import the variables that are in the table HMEQ.TEST.

7. On the **Variables** tab, select **Add variable** \( \Rightarrow \) **Custom variable**. The Add Variables window appears.
8. Enter **REVIEW** as the variable name, select **Boolean** as the data type, and click **Add**.
9. Clear the check box in the **Input** column.
When the Input check box is selected for a variable, the application attempts to map the variable to a column in the input table. The variable REVIEW does not appear in the HMEQ.TEST input table, so this variable is only an output variable.

In this tutorial, REVIEW is an output-only variable. In other cases, you might need a temporary variable that exists only while the rule set is running. To create temporary variables, you clear both the Input and Output check boxes.

10 Click OK to add the output variable REVIEW to the rule set.

11 Select Add variable ⇒ Data table. The Choose a Data Source window appears, and the list of SAS Cloud Analytic Services (CAS) tables that are loaded into memory is displayed on the Available tab.

12 Type HMEQ in the filter field to subset the list of available tables.

If the HMEQ_TEST table does not appear in the list of available tables, complete these steps:

a On the Data Sources tab, click beside cas-shared-default, and then click beside Public.

b Right-click on the HMEQ_TEST table, and select Load. After the table is loaded into memory, it should appear on the Available tab.

c Click the Available tab.

If the HMEQ_TEST table does not appear in the list of available tables, click .

13 Select the HMEQ_TEST table, and click OK. The Add Variables window appears.

14 Click to add all of the variables in the table to the rule set, and then click Add. All of the variables in the HMEQ_TEST table are added to the rule set as both input and output variables. Input variables are variables that appear in the input data. Output variables are variables that appear in the output of the rule set.
Define the Business Rule

15 On the Rule Set tab, click Add Rule. The application adds a new rule that contains an IF-THEN statement.

16 In the field next to the IF rule operator, select the variable **VALUE**.

17 Select >= as the expression operator.

18 Enter the number 120000 in the expression field.

**TIP** By default, the Record rule-fired data check box is selected on all new rules. If a rule’s conditions evaluate to True, SAS Intelligent Decisioning executes the rule’s actions, and the rule is said to have fired. If the Record rule-fired data check box is selected for that rule, then a rule-fired record is generated. When you test a rule set, you can analyze the rule-fired data by running a rule-fired analysis.

For this tutorial, the Record rule-fired data check boxes remain selected. When you test the final decision, you will run a rule-fired analysis test.

19 Select Add Condition.

20 For the second condition, select DEBTINC as the variable, select < as the expression operator, and enter 35.5 in the expression field.
21 Select Add ⇒ Condition.

22 Select DEBTINC as the variable, select != (not equal to) as the expression operator, and enter . (a period) in the expression field. The period denotes a missing numeric value.

23 Select Add ⇒ Condition.

To enter this condition expression, you must use the expression editor.

24 Click to open the expression editor.

25 Enter DEROG= . OR DELINQ=. in the expression field, and click Validate.

Alternatively, you can construct the expression by selecting variable names on the Variables tab and selecting operators in the rows above the expression field.

26 Click Save to close the expression editor and return to the rule set editor.

27 To construct the THEN clause, select ASSIGN as the action, select REVIEW as the variable, and enter True in the expression field.

28 Click to save the rule set.

Test the Rule Set
Testing a rule set is optional, but it enables you to discover any problems with a rule set before you incorporate it into a decision.

29 On the Scoring tab, click the Tests tab.


31 (Optional) Enter a name for the test if you do not want to use the default name.
Create the Low_Ratio Rule Set

As shown in Figure 2.1 on page 6, the Low_Ratio rule set evaluates loans for which the applicant’s debt-to-income ratio is less than 35.5% of their total income. This rule set defines two rules.

The first rule approves a loan application if all of the following conditions are true:

- The current value of the applicant’s property is greater than or equal to $120,000 (VALUE >= 120000).
- The reason for the loan is either debt consolidation or home improvement (REASON IN ('DebtCon', 'HomeImp')).
- The applicant’s current number of credit lines is less than 15 (CLNO < 15).

The second rule rejects a loan application if all of the following conditions are true:

- The current value of the applicant’s property is less than $120,000 (VALUE < 120000).
- The number of derogatory reports for the applicant is greater than 2 (DEROG > 2).
- The number of delinquent credit lines for the applicant is greater than or equal to 2 (DELINQ >= 2).

To create the Low_Ratio rule set, you complete the following steps:

1. Create a new rule set.
2. Add variables to the rule set.
3. Define the Approve rule.
Define the Reject rule.

Create a New Rule Set
1 Click to navigate to the Rule sets category view.
2 Click New Rule Set. The New Rule Set window appears.
3 Enter Low_Ratio for the rule set name.
4 Select Assignment for the rule type.
5 Click , and select the same folder where you saved the Loans_to_Review rule set.
6 Click Save. The application opens the new rule set and displays the Variables tab.

Add Variables to the Rule Set
For this rule set, you define a custom variable named REJECT, and import the variables from the Loans_to_Review rule set.
7 On the Variables tab, select Add Variable → Custom variable. The Add Variables window appears.
8 Enter REJECT as the name, select Boolean as the data type, and click Add.
9 Clear the check box in the Input column, and click OK. The REJECT variable does not exist in the input data source. It is an output-only variable.
10 Select Add variable → Rule set. The Choose an Item window appears.
11 Select the Loans_to_Review rule set, and click OK. The Add Variables window appears.
12 Click , and then click Add.

Define the Approve Rule
13 On the Rule Set tab, click Add Rule. The application adds a new rule that contains an IF-THEN statement.
14 To construct the IF condition, select VALUE as the variable, select >= as the operator, and enter 120000 in the expression field.
15 Select Add → Condition.
16 To construct the second condition, select REASON as the variable, select IN as the operator, and enter 'HomeImp', 'DebtCon' in the expression field.

Note: The values in the IN clause are case sensitive and must be entered as shown.

TIP When you use the IN operator, SAS Intelligent Decisioning automatically adds parentheses around the set of values that you enter.
17 Select Add → Condition.
18 Select CLNO as the variable, select < as the operator, and enter 15 in the expression field.

19 To construct the THEN clause, select ASSIGN as the action, select REJECT as the variable, and enter False in the expression field.

20 Click for this rule, and select Rename rule.

**TIP** Assigning logical names to the rules makes it easier to determine which rules fired when you review rule-fired data.

21 Enter Approve as the rule name, and click Rename.

22 Click to save the rule set.

**Define the Reject Rule**

23 Select Add Rule. The application adds a new rule that contains an IF-THEN statement.

24 To construct the IF condition, select the variable VALUE, select < as the operator, and enter 120000 in the expression field.

25 Select Add Condition.

26 Select DEROG as the variable, select > as the operator, and enter 2 in the expression field.

27 Select Add Condition.

28 Select DELINQ as the variable, select >= as the operator, and enter 2 in the expression field.

29 To construct the THEN clause, select ASSIGN as the action, select REJECT as the variable, and enter True in the expression field.

30 Click for this rule and select Rename rule.

31 Enter Reject as the rule name, and click Rename.
Create the High_Ratio Rule Set

As shown in Figure 2.1 on page 6, the High_Ratio rule set evaluates loans for which the applicant’s debt-to-income ratio is greater than 35.5% of their total income. This rule set defines one rule with both IF and ELSE conditions. This rule approves a loan application if all of the following conditions are true:

- The applicant has no more than one delinquent credit line (DELINQ <= 1).
- The data for the number of delinquent credit lines is not missing from the application (DELINQ != .).
- The applicant’s oldest credit line is at least 290 months old (CLAGE >= 290).

It rejects a loan application if both of the following conditions are true:

- The applicant has more than one delinquent line of credit (DELINQ > 1).
- The applicant’s oldest credit line is less than 178 months old (CLAGE < 178).

To create the High_Ratio rule set, you complete the following steps:

1. Create a new rule set.
2. Add variables to the rule set.
3. Define the Approve rule.
4. Define the Reject rule. This rule is implemented as an ELSE clause.

Create a New Rule Set

1. Click to navigate to the Rule sets category view.
3. Enter High_Ratio for the rule set name.
4. Select Assignment for the rule type.
5. Click , and select the same folder where you saved the Loans_to_Review rule set.
6 Click Save. The application opens the new rule set and displays the Variables tab.

Add Variables to the Rule Set
For this rule set, you import the variables from the Low_Ratio rule set.

7 Select Add variable ⇒ Rule set. The Choose an Item window appears.

8 Select the Low_Ratio rule set, and click OK. The Add Variables window appears.

9 Click ☐, and then click Add.

Define the Approve Rule
10 On the Rule Set tab, click Add Rule. The application adds a new rule that contains an IF-THEN statement.

11 To construct the IF condition, select the variable DELINQ, select the <= operator, and enter 1 in the expression field.

12 Select Add ⇒ Condition.

13 Select the variable DELINQ, select the != (not equal to) operator, and enter . (a period) in the expression field. The period denotes a missing numeric value.

14 Select Add ⇒ Condition.

15 Select CLAGE as the variable, select >= as the operator, and enter 290 in the expression field.

16 To construct the THEN clause, select ASSIGN as the action, select REJECT as the variable, and enter False in the expression field.

17 Click : for this rule, and select Rename rule.

18 Enter Approve as the rule name, and click Rename.

19 Click [ ] to save the rule set.

Define the Reject Rule
20 Click Add and select ELSE rule.

21 Click Add and select Condition.

22 Select the variable DELINQ, select > as the operator, and enter 1 in the expression field.

23 Select Add ⇒ Condition.

24 Select CLAGE as the variable, select < as the operator, and enter 178 in the expression field.

25 To construct the THEN clause, select ASSIGN as the action, select REJECT as the variable, and enter True in the expression field.

26 Right-click on the ELSE rule operator and select Rename rule.
27 Enter **Reject** as the rule name, and click **Rename**.

**TIP** Rule names for ELSE clauses do not appear in the rule set editor.

28 Click **Save** to save the rule set.

29 (Optional) Test the rule set. Follow the instructions for testing a rule set in “Create the Loans_to_Review Rule Set” on page 7.

30 Click **Close** to close the rule set.
Create the Evaluate_Loans Decision

The Evaluate_Loans decision combines the Loans_to_Review, Low_Ratio, and High_Ratio rule sets with conditional logic to evaluate loan applications. The conditional logic determines which rule set is run based on the value of the DEBTINC variable.

To create the Evaluate_Loans decision, you complete the following steps:

1. Create a new decision.
2. Add the Loans_to_Review rule set.
3. Add a condition.
4. Add the Low_Ratio and High_Ratio rule sets.

Create a New Decision

1. Click to navigate to the Decisions category view.
2. Click New Decision. The New Decision window appears.
3. Enter Evaluate_Loans as the decision name.
4. Click and select the same folder where you saved the Low_Ratio rule set.
5. Click Save. The new decision opens in the decision flow editor. A Start node and an End node are automatically added to decision.

TIP There are two views that you can use to edit decisions. On the Decision Flow tab, you can edit a decision by using a graphical editor. On the Decision tab, you can edit the decision by using a tabular view similar to the rule set editor, but you cannot enter branches on the Decision tab. If you enter a branch on the Decision Flow tab, the Decision tab is disabled. For more information, see "The Decision Flow Tab versus the Decision Tab" in SAS Intelligent Decisioning: User’s Guide.

This tutorial uses the graphical view on the Decision Flow tab.

Add the Loans_to_Review Rule Set

6. Click , and navigate to the location where you saved the Loans_to_Review, Low_Ratio, and High_Ratio rule sets.
7. Drag the Loans_to_Review rule set from the Content Selector Objects list onto the Start node in the diagram.

TIP As an alternative to dragging objects from the list, you can right click on an object in the diagram and use the pop-up menu to add objects to the decision flow.
Add a Yes/No Branch

In Yes/No branches, you can compare the value of a variable to a literal value or to the value of another variable. The **Comparison mode** specifies which method to use. In this tutorial, we compare the value of DEBTINC to the literal value 35.5.

8 Click and drag the **Branch** object onto the **Loans_to_Review** rule set. The Create New Branch window appears.

TIP To choose objects that have already been defined by navigating to their location, click To add branches, Record Contacts nodes, or custom code files by selecting the object type, click .

9 Select **Yes/No** and click **OK**.

10 Click to open the **Properties** pane for the condition.

11 In the Properties pane, select **DEBTINC** for the variable.

12 Select < as the expression operator.

13 Select **Value** for the comparison mode, and enter 35.5 for the value.

TIP If you wanted to compare DEBTINC to another variable, you would select **Variable** as the comparison mode and enter the variable name instead of a literal value.

14 Click to close the **Properties** pane.

Add the Low_Ratio and High_Ratio Rule Sets

15 Right-click on the condition node, and select **Add to yes path ⇒ Rule set**. The Choose a Rule Set window appears.

16 Navigate to the location where you saved the rule sets, select the **Low_Ratio** rule set, and click **OK**.

17 Right-click on the condition node, and select **Add to no path ⇒ Rule set**. The Choose a Rule Set window appears.

18 Navigate to the location where you saved the rule sets, select the **High_Ratio** rule set, and click **OK**.

19 Click to save the decision.
Test the Decision

To test the decision, you complete the following steps:

1. Create and run a new test.
2. Run a rule-fired analysis.
3. Run a decision path tracking analysis.

Create and Run a New Test
Testing a decision is optional, but it enables you to discover any problems with a decision before it is published and incorporated into a production system.

1. On the Scoring tab, click the Tests tab.
3. (Optional) Enter a name for the test if you do not want to use the default name.
4. (Optional) Click for the Location field, and select the location where you want to save the test. The test definition and the test results are saved to the same location.
5 Click on the Input table field, select the HMEQ_TEST table, and click OK. SAS Intelligent Decisioning automatically maps input variables in the decision to columns in the input table when the names and data types of the variables match those of the table columns. If any input variables cannot be mapped automatically, an error message is displayed, and you can map the variables manually. You can map variables and view variable mappings by clicking Variables in the New Test window.

IMPORTANT When the decision is published and run in a production environment, the decision expects the input data to contain variables that have the same name and data type as the decision’s input variables. You cannot map variables to input data in a published decision.

6 Click Run to run the test. If the test runs successfully, SAS Intelligent Decisioning displays a green check mark in the Status column.

Note: This test runs in a SAS Cloud Analytic Services (CAS) session. You can test the decision in the publishing destination after it has been published by running a publishing validation test.

7 Click in the Results column to view the results of the test. The Test Results page displays information about the test, including the URIs for the test definition and test results. It also includes URIs to the SAS code that was run by SAS Intelligent Decisioning, the output data set, and the SAS log that was generated when the code was run.

Run a Rule-Fired Analysis

If a rule’s condition expression evaluates to True, then the rule is said to have fired. Rule-fired data includes summary information about how many times each rule fired and detailed information for each time that a rule evaluates to True. See “How Rules Are Evaluated and When Rule-Fired Records Are Generated” in SAS Intelligent Decisioning: User’s Guide for more information.

8 Click Rule-Fired Analysis in the navigation pane.

9 Click Run Rule-Fired Analysis. SAS Intelligent Decisioning analyzes the test results to determine which rules fired for each row in the HMEQ.TEST table.

10 Click Analysis in the navigation pane. The analysis page displays the number of runs that fired for each output record that was generated by the decision.
The number in the Rules Fired Count column is a link to more information. You can click on this link to display the rules that fired for that output row. For example, in this tutorial, there is an output record for which two rules fired.

11 Click 2 in the Rules Fired Count column. The Rule Fired Count window appears. (You might need to scroll through several pages of output to find this specific record.)

The two rules that fired for the output row that you selected are the rule in the Loans_to_Review rule set and rule 2 in the Low_Ratio rule set.

12 Click Close to close the Rule Fired Count window.

13 Click Plot in the navigation pane. SAS Intelligent Decisioning displays a bar chart that shows how many times each rule in the decision fired. Position your cursor over a bar to display the name of the rule and the number of times that the rule fired.
**Run a Decision Path Tracking Analysis**

Decision path tracking shows you the route that input records take through the rule sets and conditions in your decision.

14 Click **Decision Path Tracking** in the navigation pane.

15 Click **Run Path Tracking** to run a decision path analysis.

16 Click **Analysis and Plot** to display a Sankey diagram that shows the flow of the input records through the rule sets and conditions in the decision. The numbers in the diagram are the number of rows in the input table that followed each path.
Click **Node Count** in the navigation pane to display a table showing the number of input records evaluated at each node in the decision.

Click **Close** to close the Test Results window.

---

**Publish the Decision**

Publishing content makes it available to other applications. Publishing a decision or a rule set creates an entity that can be managed and run in another environment. For example, if you publish content to the SAS Micro Analytic Service destination, SAS Intelligent Decisioning creates a DS2 package that can be managed and run through the SAS Micro Analytic Service interface.

The maslocal publishing destination is automatically configured for you. In order to publish content to a destination other than maslocal, your administrator must configure the additional publishing destination. For more information, see “Configuring Publishing Destinations” in *SAS Intelligent Decisioning: Administrator’s Guide*.
In this tutorial, you publish the entire decision, but you could also publish each of the rule sets separately.

To publish the Evaluate_Loans decision:

1. Click **Publish**. The Publish Decisions window appears.
2. Select the destination where you want to publish the decision.
3. (Optional) Enter a **Published Name** if you do not want to use the default published name.
4. (Optional) Select the **Replace** check box if you have published the decision previously, and you want to replace the previously publishing decision with the current version.
5. (Optional) Select the **Rule Fired Tracking** check box if you want to publish the rule-fired tracking results for the decision.

   **Note:** You cannot publish rule-fired tracking results to SAS Micro Analytic Service.

6. (Optional) Select the **Path Tracking** check box if you want to publish the path tracking results for the decision.

   **Note:** You cannot publish path tracking results to SAS Micro Analytic Service.

7. Publish the decision.

   - To publish content to a SAS Cloud Analytic Services (CAS) destination, you must reload the CAS destination table in order to make the newly published item available to other applications. Select one of the following options to publish the decision:
     - **Publish** publishes the decision and automatically reloads the CAS destination table. If another user is executing the code for an item that was previously published to CAS while the table is being reloaded, reloading the table causes temporary problems with accessing the table content. After the table is reloaded, all users can access all items in the table.
     - **Publish without reloading** publishes the decision but does not reload the CAS destination table. You must manually reload the table in order for the newly published decision to be accessible.
   
   - To publish the decision to a Teradata, Hadoop, or SAS Micro Analytic Service destination, click **Publish**. You do not need to reload the destination table when you publish to these destinations.

   The Publishing Results window appears. It displays the name of the published decision, its status, and information about any issues that were encountered while publishing the decision.

8. Click **Close** to close the Publishing_Results window.
Validate the Published Decision

You can test the published decision in the publishing destination. When you publish the decision, a validation test is automatically defined for that decision in that destination.

To run the publishing validation test:

1. On the Scoring tab, click the Publishing Validation tab. The icon in the Status column indicates that the test is not ready to run. The icon indicates that the test is ready to run.

2. Click on the test name to open it. The Edit Publishing Validation Test window appears.

3. Click for the Location field, and select the location where you want to save the test. If you do not select a location, the test is not saved in a folder. The test definition and the test results are saved to the same location.

4. Click for the Input table field, select the HMEQ_TEST table, and click Run. If the test runs successfully, SAS Intelligent Decisioning displays a green check mark in the Status column.

5. Click in the Results column to view the SAS code that was run by SAS Intelligent Decisioning, the output data set, and the SAS log that was generated when the code was run.

6. Click Close to close the decision.
Overview

Treatments define offers that you might want to present to subjects that contact your company as a result of an inbound marketing campaign. You can combine treatments into a treatment group, and add the treatment group to a decision that determines the treatments for which the subject qualifies. You can use rule sets, models, custom code files, and subdecisions to determine eligibility, score the treatments, and arbitrate the treatments.

A treatment is a set of attributes, eligibility rules, and effective dates. Attributes are name-value pairs that define the specific details of the offer that you present to a
subject. For example, for a treatment that gives subjects a 20% discount, you could define an attribute named DISCOUNT that has the value 20.

Eligibility rules define who is eligible to receive the offer defined by the treatment. For example, your campaign might target people who have low debt and clean credit records. You define eligibility rules in an eligibility rule set. An eligibility rule set is a filtering rule set.

In this tutorial, you create three treatments, including their eligibility rule sets. Each treatment defines the offer for a different credit card with different rates and benefits. You combine these treatments into a treatment group, and add the group to a new decision. SAS Intelligent Decisioning creates an output data grid that contains one row for each treatment for which the associated subject qualifies. You use a model to score the data grid and a rule set to arbitrate the results. Finally, you add a record contacts node that records the best offer for each subject in the subject contacts database. The final decision diagram is shown in Figure 3.1 on page 29.
To complete the tutorial, follow these steps:

1. Complete the steps listed in “Before You Begin” on page 1.

2. Create a filtering rule set for each treatment. These rule sets define who is eligible for each credit card offer.

3. Create a treatment for each credit card offer. You define three treatments, one for each credit card offer.
Combine the treatments into the Card_Offers treatment group.

Create the Credit_Card_Offers decision, and add the treatment group. When you add a treatment group to a decision, SAS Intelligent Decisioning creates an output data grid variable that contains a column for each of the attributes in the treatment group.

Create the Calc_Num_Offers rule set. This rule set uses the DATAGRID_COUNT function to calculate the number of offers in the output data grid variable created in Step 5 on page 30.

Create the Arbitrate_Offers rule set. This rule set uses the DATAGRID_TOPN function to return the treatment with the highest score.

Complete the Credit_Card_Offers decision. In this step, you add the remaining objects, including the Calc_Credit_Limit model, to the decision. The model scores each row in the output data grid variable that was created in Step 5 on page 30.

Test the decision, and view the results.

Create Eligibility Rule Sets for Each Treatment

About the Treatments and Eligibility Rule Sets

When you create a treatment, you can specify a set of eligibility rules that determines who is eligible to receive the treatment. To specify eligibility rules for a treatment, create a filtering rule set and specify the rule set on the Eligibility Rule Set tab of the treatment. Eligibility rules are optional for a treatment, but in this tutorial, you create an eligibility rule set for each treatment that you create in “Create Treatments for Each Card” on page 34. The treatments are named Card_Preferred, Card_Silver, and Card_Gold. The corresponding eligibility rule sets are named Eligibility_Preferred, Eligibility_Silver, and Eligibility_Gold.


Create the Eligibility_Preferred Rule Set

The Eligibility_Preferred rule set determines whether an applicant is eligible for the Preferred credit card. An applicant is eligible for the Preferred card if their account score is greater than or equal to .67 (ACCTSCORE >= .67) or if the applicant does not yet have an account score.

To create the Eligibility_Preferred rule set, complete the following steps:

1 Create a new filtering rule set.
2 Add variables to the rule set.
3 Define the filtering rule. This rule set contains only one rule with multiple conditions.

Create a New Filtering Rule Set
1 Click \( \text{\textasciitilde} \) to navigate to the Rule sets category view.
2 Click New Rule Set. The New Rule Set window appears.
3 Enter Eligibility_Preferred for the rule set name.
4 Select Filtering for the rule set type.
5 Click \( \text{\textasciitilde} \) and select the folder where you want to save the rule set.
6 Click Save. The application opens the new rule set and displays the Variables tab.

Add Variables to the Rule Set
You can import existing variables from data tables or from other rule sets and decisions, or you can create custom variables. In this tutorial, import the variables that are in the table HMEQ.ACCOUNTS.
7 Select Add variable \( \Rightarrow \) Data table. The Choose a Data Source window appears, and the list of SAS Cloud Analytic Services (CAS) tables that are loaded into memory is displayed on the Available tab.
8 Type HMEQ in the filter field to subset the list of available tables.
   If the HMEQ_ACCOUNTS table does not appear in the list of available tables, complete these steps:
   a On the Data Sources tab, click > beside cas-shared-default, and then click > beside Public.
   b Right-click on the HMEQ_ACCOUNTS table, and select Load. After the table is loaded into memory, it should appear on the Available tab.
   c Click the Available tab.
      If the HMEQ_ACCOUNTS table does not appear in the list of available tables, click \( \text{\textasciitilde} \).
9 Select the HMEQ_ACCOUNTS table, and click OK. The Add Variables window appears.
10 Select the ACCTSCORE variable, click \( \Rightarrow \), then click Add. The variable is added to the rule set as both an input and output variable. Input variables are variables that appear in the input data. Output variables are variables that appear in the output of the rule set.

Define the Filtering Rules
11 On the Rule Set tab, click Add Rule. The application adds an IF statement to the rule set.
12 In the field next to the IF rule operator, select the variable ACCTSCORE.
13 Select \( \geq \) as the expression operator.
14 Enter the number 6.67 in the expression field.
15 Click **Add rule** to add a second rule.

16 For the second rule, click ✡ to open the expression editor.

17 Enter `MISSING(ACCTSCORE)` for the rule expression. You can enter this expression directly into the expression editor, or you can use the lists of operators, function names, and variable names as described in “Using the Expression Editor” in *SAS Intelligent Decisioning: User’s Guide*

18 Click **Validate** to validate the expression, then click **Save** to add the expression to the rule.

19 Click ✂ and **Close** to save and close the rule set.

---

**Create the Eligibility_Silver Rule Set**

The Eligibility_Silver rule set determines whether an applicant is eligible for the Silver credit card. An applicant is eligible for the Silver card if their account score is greater than or equal to .74 (`ACCTSCORE >= .74`).

To create the Eligibility_Silver rule set, duplicate the Eligibility_Preferred rule set, and modify the rule to specify the conditions for the Silver credit card.
Duplicate the Eligibility_Preferred Rule Set
1 In the Rule Sets category view, select the Eligibility_Preferred rule set, click ⌘, and select Duplicate. The Duplicate Rule Set window appears.

2 Enter Eligibility_Silver for the rule set name.
3 Click ⌘ and select the folder where you want to save the rule set.
4 Click Duplicate.

Modify the Rule Criteria
5 Open the Eligibility_Silver rule set.
6 For the first rule, change the value of the ACCTSCORE variable from .67 to .74.
7 Delete the second rule. Click ⌘ for the second rule, and select Delete rule.

Create the Eligibility_Gold Rule Set

The Eligibility_Gold rule set determines whether an applicant is eligible for the Gold credit card. An applicant is eligible for the Gold card if their account score is greater than or equal to .8 (ACCTSCORE >= .8).

To create the Eligibility_Gold rule set, duplicate the Eligibility_Silver rule set, and modify the rule to specify the conditions for the Gold card.

Duplicate the Eligibility_Silver Rule Set
1 In the Rule Sets category view, select the Eligibility_Silver rule set, click ⌘, and select Duplicate. The Duplicate Rule Set window appears.

2 Enter Eligibility_Gold for the rule set name.
3 Click ⌘ and select the folder where you want to save the rule set.
4 Click Duplicate.

Modify the Rule Criteria
5 Open the Eligibility_Gold rule set.
6 Change the value of the ACCTSCORE variable from .74 to .8.

Click ⌘ and Close to save and close the rule set.
Create Treatments for Each Card

About Treatment Attributes

There are three credit card treatments: Card_Preferred, Card_Sliver, and Card_Gold. Each card has different benefit levels. You define attributes that specify the benefits that come with each card. Attributes are name-value pairs that define the specific details of the offer that you present to a subject. For example, the Card_Preferred treatment comes with an introductory bonus of 200 dollars. You will define an attribute named INTRO_BONUS and assign it a value of 200. In this tutorial, all three treatments define the same attributes, but the attributes have different values for each card.

An attribute’s value can be fixed or dynamic.

Fixed
You specify the value or set of values for fixed attributes when you define the attribute. The values cannot be customized in treatment groups or set by the decision at run time.

Dynamic
The value of a dynamic attribute can be set when you add a treatment group to a decision or by the decision at run-time. When you define a dynamic attribute, you can specify a default value for the attribute. Within each treatment group in which the attribute appears, you can set a static value that is used only within that specific treatment group, or you can specify that the attribute’s value is set by the decision at run time.

All of the treatment attributes defined in this tutorial are fixed.


Create the Card_Preferred Treatment

The Card_Preferred treatment is the treatment with the highest interest rate. To create the Card_Preferred treatment, complete the following steps:

2. Define the treatment attributes.
3. Add the eligibility rule set that you created in "Create the Eligibility_Preferred Rule Set" on page 30.

Create a New Treatment

1. Click to switch to the Treatments category view.
2 Click **New Treatment**. The New Treatment window appears.

3 Enter `card_preferred` for the treatment name.

4 Click , and select the location where you want to save the treatment.

5 Click **Save**. SAS Intelligent Decisioning opens the new treatment and displays the **Attributes** tab.

**Add Treatment Attributes**

6 On the **Attributes** tab, click **Add Attribute**, and select **Custom attribute**. The Add Attribute window appears.

7 For each attribute listed in the following table, enter the name, select the data type, select the value type, enter the default value, and click **Add**.

**Table 3.1 Attributes to Define for the Preferred Treatment**

<table>
<thead>
<tr>
<th>Name</th>
<th>Data Type</th>
<th>Value Type</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>annual_fee</td>
<td>Decimal</td>
<td>Fixed</td>
<td>0</td>
</tr>
<tr>
<td>APR</td>
<td>Decimal</td>
<td>Fixed</td>
<td>18.7</td>
</tr>
<tr>
<td>card_type</td>
<td>Character</td>
<td>Fixed</td>
<td>preferred</td>
</tr>
<tr>
<td>cashback_gas</td>
<td>Decimal</td>
<td>Fixed</td>
<td>3</td>
</tr>
<tr>
<td>cashback_stream</td>
<td>Decimal</td>
<td>Fixed</td>
<td>3</td>
</tr>
<tr>
<td>intro_bonus</td>
<td>Decimal</td>
<td>Fixed</td>
<td>200</td>
</tr>
</tbody>
</table>

8 Click **OK** to add the attributes to the treatment.
Add the Eligibility Rule Set

9 On the Eligibility Rule Set tab, click Add Rule Set. The Choose a Rule Set window appears.

10 Navigate to the folder that contains the Eligibility_Preferred rule set, select the rule set, and click OK.

11 Click and Close to save and close the treatment.

Create the Card_Silver Treatment

The Silver credit card is a mid-level product. Its interest rate is slightly lower than Preferred card, but it offers lower benefit levels. To create the Card_Silver treatment, duplicate the Card_Preferred Treatment, modify the attributes, and replace the eligibility rule set.

Duplicate the Card_Preferred Treatment

1 In the Treatments category view, select the card_preferred treatment, click , and select Duplicate. The Duplicate Treatment window appears.

2 Enter card_silver for the treatment name.

3 Select the location where you want to save the treatment, and click Duplicate.

Modify the Treatment Attribute Values and Eligibility Rule Set

4 Open the card_silver treatment.

5 On the Attributes tab, modify the attributes to match the values shown in Table 3.2.

Table 3.2 Attributes to Define for the Silver Treatment

<table>
<thead>
<tr>
<th>Name</th>
<th>Data Type</th>
<th>Value Type</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>annual_fee</td>
<td>Decimal</td>
<td>Fixed</td>
<td>0</td>
</tr>
<tr>
<td>APR</td>
<td>Decimal</td>
<td>Fixed</td>
<td>16.5</td>
</tr>
<tr>
<td>Name</td>
<td>Data Type</td>
<td>Value Type</td>
<td>Value</td>
</tr>
<tr>
<td>---------------</td>
<td>-----------</td>
<td>------------</td>
<td>--------</td>
</tr>
<tr>
<td>card_type</td>
<td>Character</td>
<td>Fixed</td>
<td>silver</td>
</tr>
<tr>
<td>cashback_gas</td>
<td>Decimal</td>
<td>Fixed</td>
<td>2</td>
</tr>
<tr>
<td>cashback_stream</td>
<td>Decimal</td>
<td>Fixed</td>
<td>2</td>
</tr>
<tr>
<td>intro_bonus</td>
<td>Decimal</td>
<td>Fixed</td>
<td>0</td>
</tr>
</tbody>
</table>

6 On the **Eligibility Rule Set** tab, click **Replace**, and select the **Eligibility_Silver** rule set.

7 Click [ ] and **Close** to save and close the treatment.

**Create the Card_Gold Treatment**

The Gold credit card is the premium product. Its interest rate is the lowest of the three cards, and it offers good benefits, but it comes with an annual fee. To create the Card_Gold treatment, duplicate the Card_Preferred Treatment, modify the attributes, and replace the eligibility rule set.

**Duplicate the Card_Preferred Treatment**

1 In the Treatments category view, select the **card_preferred** treatment, click [ ], and select **Duplicate**. The Duplicate Treatment window appears.

2 Enter **card_gold** for the treatment name.

3 Select the location where you want to save the treatment, and click **Duplicate**.

**Modify the Treatment Attribute Values and Eligibility Rule Set**

4 Open the **card_gold** treatment.
5 On the Attributes tab, modify the attribute values to match the values shown in Table 3.3 on page 38.

Table 3.3 Attributes to Define for the Gold Treatment

<table>
<thead>
<tr>
<th>Name</th>
<th>Data Type</th>
<th>Value Type</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>annual_fee</td>
<td>Decimal</td>
<td>Fixed</td>
<td>95</td>
</tr>
<tr>
<td>APR</td>
<td>Decimal</td>
<td>Fixed</td>
<td>14.5</td>
</tr>
<tr>
<td>card_type</td>
<td>Character</td>
<td>Fixed</td>
<td>gold</td>
</tr>
<tr>
<td>cashback_gas</td>
<td>Decimal</td>
<td>Fixed</td>
<td>3</td>
</tr>
<tr>
<td>cashback_stream</td>
<td>Decimal</td>
<td>Fixed</td>
<td>6</td>
</tr>
<tr>
<td>intro_bonus</td>
<td>Decimal</td>
<td>Fixed</td>
<td>250</td>
</tr>
</tbody>
</table>

6 On the Eligibility Rule Set tab, click Replace, and select the Eligibility_Gold rule set.

7 Click and Close to save and close the treatment.

Create and Activate the Card_Offers Treatment Group

To use treatments to a decision, the treatments must be included in a treatment group. You cannot add individual treatments directly to a decision.
To use a treatment group in a decision, the treatment group must have an active version. Activating a version of a treatment group creates a public module for each treatment in the group and makes the treatment group available to be referenced by decisions.

Create a New Treatment Group
1 Click to navigate to the Treatment Groups category view.
2 Click **New Treatment Group**. The New Treatment Group window appears.
3 Enter `card_offers` for the name, select the location where you want to save the treatment group, and click **Save**. SAS Intelligent Decisioning opens the new treatment group and displays the **Treatments** tab.

Add the Treatments and Activate the Treatment Group
4 Click **Add Treatments**.
5 In the Add Treatments window, select the `card_preferred`, `card_sliver`, and `card_gold` treatments, then click **OK**.
6 Click **to save the treatment group**.

TIP It is a best practice to always click **Set Attributes** and verify the settings of the dynamic attributes in a treatment group. For dynamic attributes within a treatment group, you can specify that a dynamic attribute’s value is set by the decision at run time, or you can set a static value that is used only within that specific treatment group. In this tutorial, all of the attributes are fixed.

7 On the **Versions** tab, click **Activate** to activate version 1.0 of the treatment group. SAS Intelligent Decisioning displays the message **The active version is version 1.0. after the version has been activated.**
Create the Credit_Card_Offers Decision

At this point in the tutorial, you need to create the Credit_Card_Offers decision and add the Card_Offers treatment group to the decision. When you add the treatment group to the decision, SAS Intelligent Decisioning creates the output data grid variable that serves as an input variable for the Calc_Num_Offers rule set, the Calc_Credit_Limit model, and the Arbitrate_Offers rule set.

Create a New Decision
1. Click to navigate to the Decisions category view.
2. Click New Decision. The New Decision window appears.
3. Enter credit_card_offers as the decision name.
4. Click , and select the folder where you want to save the decision.
5. Click Save. The new decision opens in the decision flow editor. A Start node and an End node are automatically added to decision.

TIP There are two views that you can use to edit decisions. On the Decision Flow tab, you can edit a decision by using a graphical editor. On the Decision tab, you can edit the decision by using a tabular view similar to the rule set editor, but you cannot enter branches on the Decision tab. If you enter a branch on the Decision Flow tab, the Decision tab is disabled. For more information, see "The Decision Flow Tab versus the Decision Tab" in SAS Intelligent Decisioning: User’s Guide.

This tutorial uses the graphical view on the Decision Flow tab.

Add Variables to the Decision
6. On the Variables tab, click Add variable, then select Data table. The Add Variables window appears.
7. Click ⇔ to move all of the variables to the Selected items list, then click Add.

8. Click Close to close the treatment group.
Add the Card_Offers Treatment Group

8 On the Decision Flow tab, click on the Start node, and select Add below Treatment group. The Choose a Treatment Group window appears.

9 Select the card_offers treatment group, and click OK.

TIP When you add a treatment group to a decision, SAS Intelligent Decisioning creates an output variable of type data grid that contains a column for each attribute in the treatment group. When you run the decision, the data grid in the output table contains a row for each treatment for which the subject qualifies. The name of the data grid variable is treatment-group-name_out. In this case, the name is card_offers_out. This variable provides input data for the rule sets and model that follow the treatment group in the decision.

SAS Intelligent Decisioning also creates an input decision variable for each dynamic attribute whose value is set by the decision and maps the treatment group’s attribute to the decision variable.

Set the Subject ID and Subject Level

The subject ID and level are recorded in the subject contact record that is written to the subject contact database by the record contacts node that you add to the decision in “Add a Record Contacts Node” on page 50. In this case, the ACCOUNT variable identifies the subject.

10 On the Properties tab, select ACCOUNT for subject ID, and select Account for the subject level.

TIP The selections that are available in the Subject level menu are specified in the Subject Level lookup table. “Predefined Lookup Tables” in SAS Intelligent Decisioning: User’s Guide

11 Click and Close to save and close the decision.

Create the Calc_Num_Offers Rule Set

Create a New Rule Set

1 In the Rule Sets category view, click New Rule Set. The New Rule Set window appears.

2 Enter calc_num_offers for the rule set name, select Assignment for the rule set type, and click OK.
3. Click in the Location field, select the location where you want to save the rule set, and click Save. SAS Intelligent Decisioning opens the new rule set and displays the Variables tab.

**Add Variables to the Rule Set**

4. On the Variables tab, click Add variable, and select Decision. The Choose an Item window appears.

5. Select the credit_card_offers decision, and click OK. The Add Variables window appears.

6. In the Available items list, select the card_offers_out variable, click →, then click Add to add the variable to the rule set.

7. On the Variables tab, select the Input check box, and clear the Output check box for the variable. The variable is an input-only variable for Calc_Num_Offers rule set.

8. Click Add variable, and select Custom variable. The Add Variables window appears.

9. Enter zero_offers for the variable name, select Boolean as the data type, and click Add to add the variable to the table of variables.

10. Clear the check box beside the Input table column. The zero_offers is an output-only variable.

11. Click OK to add the variables to the decision and close the Add Variables window.

**Define the Business Rules**

12. On the Rule Set tab, click Add Assignment.

13. In the variable field, select the zero_offers variable.

14. Enter False in the assignment statement value field.

15. Click Add ⇒ Add rule. SAS Intelligent Decisioning adds a new rule to the rule set.

16. In the IF condition for the new rule, click to open the expression editor, and enter the following statement:

   \[ \text{DATAGRID\_COUNT}(\text{card\_offers\_out}) = 0 \]

17. Click Validate to validate the expression, and click Save to add it to the rule set.
In the THEN clause for the rule, select **ASSIGN** as the action, select **zero_offers** for the variable, and enter **True** in the value field.

Click **Submit** and **Close** to save and close the rule set.

---

Create the Arbitrate_Offers Rule Set

If a subject qualifies for more than one offer, you can use rule sets, models, and other methods to arbitrate the treatments. You might want to present all of the treatments, in a specific order, or you might want to present only a subset of the treatments. In this tutorial, we use arbitration to choose the treatment with the highest interest rate. For more information about arbitrating treatments, see “Arbitrating Treatments” in *SAS Intelligent Decisioning: User’s Guide*.

**Create a New Rule Set**

1. In the Rule Sets category view, click **New Rule Set**. The New Rule Set window appears.
2. Enter **arbitrate_offers** for the rule set name, select **Assignment** for the rule set type, and click **OK**.
3. Click **folder** in the **Location** field, select the location where you want to save the rule set, and click **Save**. SAS Intelligent Decisioning opens the new rule set and displays the **Variables** tab.

**Add Variables to the Rule Set**

4. On the **Variables** tab, click **Add variable**, and select **Decision**. The Choose an Item window appears.
5. Select the **credit_card_offers** decision, and click **OK**. The Add Variables window appears.
6. In the **Available items** list, select the **card_offers_out** variable, click **add**, then click **Add** to add the variable to the rule set.
7. On the **Variables** tab, select the **Input** check box, and clear the **Output** check box for the variable. The variable is an input variable for Arbitrate_Offers rule set.
8 Click **Add variable**, and select **Custom variable**. The Add Variables window appears.

9 Enter **best_offer** for the variable name, select **Data grid** as the data type, and click **Add** to add the variable to the table of variables.

10 Clear the check box beside the **Input** table column. The **best_offer** is an output-only variable.

11 Click **OK** to add the variable to the decision and close the Add Variables window.

**Define the Arbitration Rule**

12 On the **Rule Set** tab, click **Add Assignment**.

13 Click | to open the expression editor, and enter the following statement:

\[
\text{best_offer} = \text{DATAGRID\_TOPN(card\_offers\_out, \text{'credit\_limit'}, 1)}
\]

14 Click **Validate** to validate the expression, and click **Save** to add it to the rule set.

15 Click | and **Close** to save and close the rule set.

---

**Create and Activate the Zero_Offers Treatment Group**

The Zero_Offers treatment group contains only one treatment, **Zero_Offers_Msg**. This treatment returns a message to the subject when the subject does not qualify for any of the credit card offers.

**Create the Zero_Offers_Msg Treatment**

1 Click | to navigate to the Treatments category view.

2 Click **New Treatment**.

3 Enter **zero\_offers\_msg** for the treatment name, select the location where you want to save the treatment, and click **Save**. SAS Intelligent Decisioning opens the new treatment and displays the **Attributes** tab.
4 Click **Add Attribute**, and select **Custom attribute**. The Add Attribute window appears.

5 Enter **message** for the attribute name, select **Character** for the data type, and select **Fixed** for the value type.

6 Enter the following message for the attribute value: *Thank you for your interest. An agent will contact you shortly.*

7 Click **Add** to add the attribute to the table, then click **OK** to add the attribute to the treatment.

8 Click [ ] and **Close** to save and close the treatment.

Create the **Zero_Offers** Treatment Group
9 Click [ ] to navigate to the Treatment Groups category view.

10 Click **New Treatment Group**.

11 Enter **zero_offers** for the name, select the location where you want to save the treatment group, and click **Save**. SAS Intelligent Decisioning opens the new treatment group and displays the **Treatments** tab.

Add the Treatment to the Group and Activate the Group
12 Click **Add Treatments**.

13 In the Add Treatments window, select the **zero_offers_msg** treatment, then click **OK**.

14 Click [ ] to save the treatment group.

15 On the **Versions** tab, click **Activate** to activate version 1.0 of the treatment group. SAS Intelligent Decisioning displays the message *The active version is version 1.0.* after the version has been activated.

16 Click **Close** to close the treatment group.

---

Complete the **Credit_Card_Offers** Decision

The **Credit_Card_Offers** decision combines the treatment groups, rule sets, and model that you have created in previous steps into a single decision. The decision determines the credit card offers for which a customer is eligible and records subject contact history information.

To complete the **Credit_Card_Offers** decision, you complete the following steps:

1. **Add the Calc_Num_Offers** rule set.
2. **Add a Yes/No branch.**
3. **Add the Zero_Offers** treatment group to the Yes branch path.
4. **Add a credit_limit column to the card_offers_out data grid.**
5. **Add the Calc_Credit_Limit** model to the No path, and specify that this model scores the rows in the card_offers_out data grid.
6 Add the Arbitrate_Offers rule set to the No path.
7 Add a record contacts node to the No path.

Add the Calc_Num_Offers Rule Set
1 Click to navigate to the Decisions category view, and open the credit_card_offers decision.
2 Click on the card_offers node, and select Add \(\Rightarrow\) Rule set. The Choose a Rule Set window appears.
3 Select the calc_num_offers rule set, and click OK.

Add a Yes/No Branch
In Yes/No branches, you can compare the value of a variable to a literal value or to the value of another variable. The Comparison mode specifies which method to use. In this tutorial, we compare the value of the Zero_Offers variable to the literal value True.
4 Click on the Calc_Num_Offers rule set, and select Add \(\Rightarrow\) Branch. The Create New Branch window appears.
5 Select Yes/No for the branch type, and click OK. The branch is added to the decision flow below the Calc_Num_Offers rule set, and the Properties pane for the branch opens.
6 In the Properties pane, select Zero_Offers for the variable.
7 Select = as the expression operator.
8 Select Value for the comparison mode, and enter True for the value.
9 Click ➤ to close the Properties pane.

Add the Zero_Offers Treatment Group
10 Click on the branch node, and select Add to yes path ⇒ Treatment group. The Choose a Treatment Group window appears.

11 Navigate to the location where you saved the treatment groups, select the zero_offers treatment group, and click OK.

12 Click to save the decision.
Add a Credit Limit Column to the Data Grid

SAS Intelligent Decisioning created the `card_offers_out` data grid variable when you added the Card Offers treatment group to the decision in "Create the Credit Card Offers Decision" on page 40. This data grid contains a column for each attribute in the treatment group, including APR, annual_fee, card_type, and so on.

The Calc_Credit_Limit model that you add to the decision in "Add the Model and Score the Data Grid" on page 49 calculates a credit limit for the current subject. It assigns this value to a data grid column named credit_limit. Because the treatment group does not have an attribute named credit_limit, the output data grid does not contain a column by that name. You must edit the data grid variable and add an output column named credit_limit.

13 On the Variables tab, click the `card_offers_out` variable to edit it.

14 In the Edit Variable window, click 📊 to open the Edit Columns window.

15 In the Edit Columns window, select Add a new column, enter `credit_limit` in the text box, select Decimal as the data type, and click Add.

16 Click OK to add the column to the data grid and return to the Edit Variable window.

17 Click OK to close the Edit Variable window.
**Add the Model and Score the Data Grid**

The Calc_Credit_Limit model uses the value of input variables and the data grid column card_type to calculate a credit limit for the current subject. The model assigns the calculated value to the credit_limit data grid column that you created in “Add a Credit_Limit Column to the Data Grid” on page 48.

You can work with the values of data grid columns either by using the data grid functions or by selecting the **Score rows in this data grid** option when you map input variables. In this tutorial, you select the **Score rows in this data grid** option.

For more information, see “Ways to Work with Data Grids” in *SAS Intelligent Decisioning: Using Data Grids* and “Scoring Rows in a Data Grid” in *SAS Intelligent Decisioning: Using Data Grids*.

18 On the **Decision Flow** tab, click on the branch node, and select **Add to no path Model**. The Choose a Model window appears.

19 Navigate to the repository where you saved the calc_credit_limit model, select the model, and click **OK**.

20 In the **Properties** pane for the model, select to display the input variable mappings for the model. SAS Intelligent Decisioning automatically maps the input and output variables in the model to variables of the same name in the decision.

The variables that are defined in the model include two new variables: card_type and credit_limit. When you add the model to the decision, SAS Intelligent Decisioning creates two new decision variables with these names and maps the model variables to the decision variables.

21 Check the **Score rows in this data grid** check box, and select the **card_offers_out** data grid. When you select this option, SAS Intelligent Decisioning maps the card_type input variable to the card_type column in the card_offers_out data grid. It also maps the credit_limit output variable to the credit_limit column in the card_offers_out data grid.
**TIP** In the variable mapping property panes, decision variables are identified with the icon 🛠️, and data grid columns are identified with the icon 📆.

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**Add the Arbitrate_Offers Rule Set**

22 Click on the `calc_credit_limit` model, and select Add Rule set. The Choose a Rule Set window appears.

23 Navigate to the location where you saved the Arbitrate_Offers rule set, select the rule set, and click OK.

**Add a Record Contacts Node**

Record contacts nodes record information about a specific contact with a specific subject. This information includes the variables and treatment data grid that you specify in the record contacts node. In this example, the subject contact record contains the customer’s account number and the data grid for the one treatment selected by the Arbitrate_Offers rule set.

When a decision is run in a real-time destination (SAS Micro Analytic Service destination), this node writes a record to the subject contact history. In all other destinations, this node creates an output variable that contains the information.

24 Click on the Arbitrate_Offers rule set, and select Add Record contacts. SAS Intelligent Decisioning adds the node to the decision and opens the Properties pane. The node is named Record_Contacts1.

25 Click on the Record_Contacts node, and select Rename.

26 Enter Record_offers for the node name, and click Rename.

27 In the Properties pane, click 📈 in the Variables to track field. The Select Variables to Track window appears.
28 Select the ACCTSCORE variable, click ⇔, and click OK.

29 Check the Track treatments check box.

30 In the Treatment data grid field, select the best_offer data grid to include this data grid in the subject contact record.

31 Click [ ] to save the decision. SAS Intelligent Decisioning asks you if you want to remove the card_type and credit_limit variables from the decision.

Note: If you have already deleted these variables, you will not see this message.

When you selected the Score rows in this data grid option in Step 4 on page 49, SAS Intelligent Decisioning mapped the card_type and credit_limit model variables to columns in the card_offers_out data grid. As a result, the card_type and credit_limit decision variables that were created when you added the model to the decision are no longer needed.

32 Click Yes to remove the card_type and credit_limit decision variables.
The final decision diagram is shown in Figure 3.2 on page 52

**Figure 3.2  Final Credit_Card_Offers Decision Diagram**

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**Test the Credit_Card_Offers Decision**

Testing a decision is optional, but it enables you to discover any problems with a decision before it is published and incorporated into a production system.

1. On the **Scoring** tab, click the **Tests** tab.
2 Click **New Test**. The New Test window appears.

3 (Optional) Enter a name for the test if you do not want to use the default name.

4 (Optional) Click for the **Location** field, and select the location where you want to save the test. The test definition and the test results are saved to the same location.

5 Click for the **Input table** field, select the **HMEQ_ACCOUNTS** table, and click **OK**. SAS Intelligent Decisioning automatically maps input variables in the decision to columns in the input table when the names and data types of the variables match those of the table columns. If any input variables cannot be mapped automatically, an error message is displayed, and you can map the variables manually. You can map variables and view variable mappings by clicking **Variables** in the New Test window.

6 **IMPORTANT** When the decision is published and run in a production environment, the decision expects the input data to contain variables that have the same name and data type as the decision’s input variables. You cannot map variables to input data in a published decision.

6 Click **Run** to run the test. If the test runs successfully, SAS Intelligent Decisioning displays a green check mark in the **Status** column.

**Note:** This test runs in a SAS Cloud Analytic Services (CAS) session. You can test the decision in the publishing destination after it has been published by running a publishing validation test.

7 Click in the **Results** column to view the results of the test. SAS Intelligent Decisioning opens the test results and displays the **Output** page.
View the Decision Test Results

The Output page displays the output table that was generated by the decision test. The output table includes a column for each of the following data grids:

- **best_offer**: contains a record for the one treatment that was selected for the subject by the Arbitrate_Offers rule set. If a subject did not qualify for any credit card offers, the best_offer column is empty.

- **card_offers_out**: contains a record for each treatment for which the subject qualifies. If the subject did not qualify for any offers, this column still contains a card_offers_out data grid, but this data grid is empty.

- **rt_Record_offers**: contains the subject contact information that is generated by the record contacts node.

You can click on any value in these columns to view the results of the decision. For example:

1. Click on the data grid in the best_offer column for the first row that contains a value.

2. In the best_offer window, click the **Formatted** tab, and scroll to the bottom of the window.

   As shown in Figure 3.3, the treatment that was returned by the decision as the best offer is the card_silver treatment, and the credit limit for the offer is 25000.
3 Click on the card_offers_out data grid in the same row of the output table to display the list of all treatments for which the subject qualified. In this example, the subject qualified for both the Preferred and the Silver credit cards.
Click on the data grid in the `rt_Record_offers` column to view the subject contact information. The subject contact information includes the subject ID, information about the `ACCTSCORE` variable, the treatment ID of the treatment specified in the `best_offer` data grid, and a response tracking code that you can use to update the subject contact information.
In SAS Cloud Analytic Services (CAS), Teradata, and Apache Hadoop destinations, the record contacts node creates an output data grid variable that contains the subject contact information. Because decision tests run in the CAS destination, the subject contact information is written to a data grid variable in the output data set as shown in Figure 3.5.

In real-time destinations (SAS Micro Analytic Service destinations), the record contacts node writes the subject contact information to the subject contact history database and returns the response tracking code to the calling application. You can use the response tracking code to retrieve or update the information in the subject contact history. For more information,
see “Update Subject Contact History” in SAS Intelligent Decisioning: Decision Management REST API Examples.