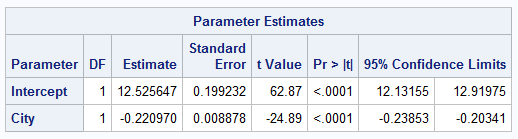
This document provides a demo that shows how our scripts perform. The examples are obtained from section **4.3 Regression and correlation**, section **5.2** **Some useful predictors**, and section **8.9 Seasonal ARIMA models**. You can find the full scripts in the **Scripts** folder of **Forecasting\_Cookbook** repository at <https://gitlab.sas.com/imvash/Forecasting_Cookbook>.

Before running the scripts, you need to define a library (**time**) that contains your SAS datasets. Moreover, you need to set up a **CAS** session and link a library (**mycas**) to it.

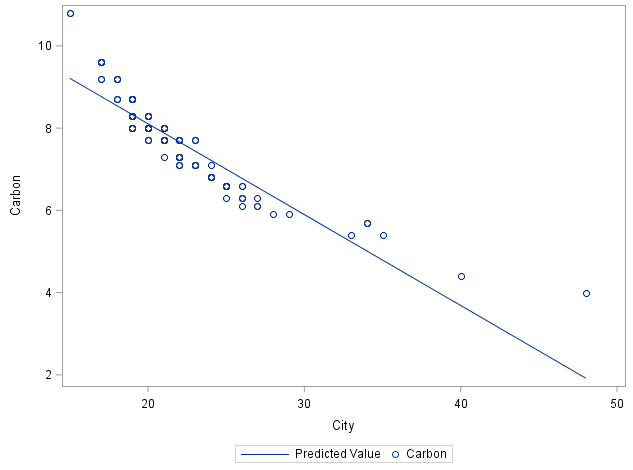
# Example 1: Regression and correlation

|  |
| --- |
| **data** mycas.fpp\_fuel;  set time.fpp\_fuel;  **run**;  \*run Viya enabled regression PROC REGSELECT;  **proc** **regselect** data=mycas.fpp\_fuel;    \*model option clb requests confidence limits;  model carbon = city /clb;    \*output the residules and copy the predictor variable City to the output table;  output out=mycas.fpp\_fuel\_residual predicted residual  copyvars = (city carbon);  **run**;  **proc** **sgplot** data = mycas.fpp\_fuel\_residual;  series x = City y=Pred;  scatter x = City y=carbon;  **run**; |

**Parameter Estimates**, and its relevant statistics are displayed in the output:



The following is the plot of the fitted values and actual values of Carbon with respect to the city levels.



# Example 2: Some useful predictors

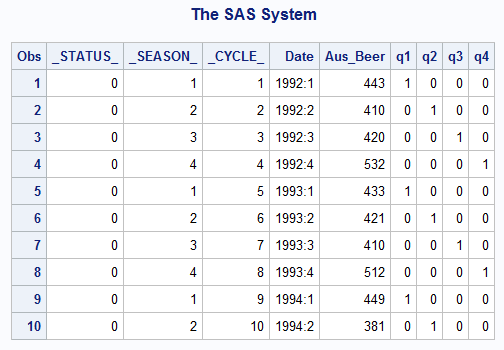
|  |
| --- |
| **data** mycas.fpp\_ausbeer;  set time.fpp\_ausbeer;  keep date aus\_beer;  where **1992** <= year(date) < **2006**;  **run**; |

The code coming below shows how to create quarterly dummy variables for the Australian quarterly beer production regression model. The regression model is:

where if time is in quarter () and takes zero otherwise.

|  |
| --- |
| **proc** **tsmodel** data=mycas.fpp\_ausbeer  outarray = mycas.fpp\_ausbeer;  id date interval=quarter;  var aus\_beer;  outarrays q1 q2 q3 q4;  submit;  do i = **1** to dim(aus\_beer);  \*initialize outarrays to 0's;  q1[i] = **0**; q2[i] = **0**; q3[i] = **0**; q4[i] = **0**;  \*set outarray q's based on the pre-defined array \_season\_;  if \_season\_[i] = **1** then q1[i] = **1**;  else if \_season\_[i] = **2** then q2[i] = **1**;  else if \_season\_[i] = **3** then q3[i] = **1**;  else q4[i] = **1**;  end;  endsubmit;  **quit**; |

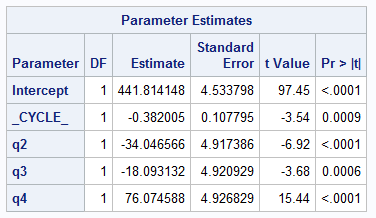
The following is the first 10 observations of **mycas.fpp\_ausbeer** table:



We can build the regression model based on the information in the **mycas.fpp\_ausbeer** table.

|  |
| --- |
| \* no need to define trend variable. proc tsmodel will generate \_cycle\_ variable which addresses time;  **proc regselect** data=mycas.fpp\_ausbeer;  model aus\_beer = \_cycle\_ q2 q3 q4;  output out=mycas.fpp\_ausbeer\_fitted  copyvars=(aus\_beer date) residual;  **run;** |

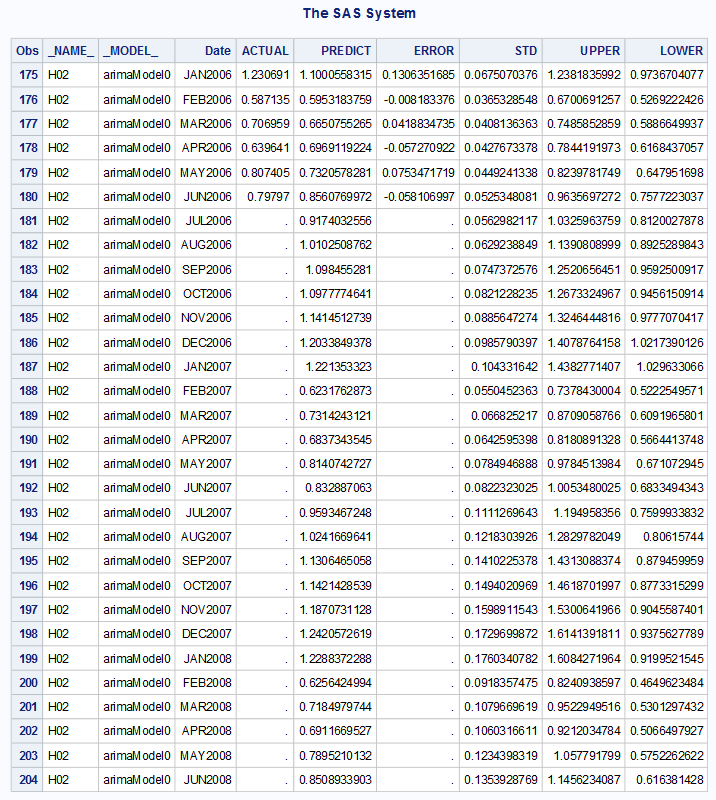
The **Parameter Estimates** is produced in the output:



# Example 3: Seasonal ARIMA models

|  |
| --- |
| **data** mycas.fpp\_h02\_train;  set time.fpp\_h02;  if (Date<=**'01JUN2006'd**) then output;  **run**;  \*The ARIMA(3,0,0)(2,1,0)[12] configuration was taken from the book example;  **proc** **carima** data=MYCAS.FPP\_H02\_TRAIN outstat=MYCAS.outStatTemp  outfor=MYCAS.predict1;  id Date interval=month;  identify h02;  estimate p=(**1** **2** **3**) (**12** **24**) diff=(**12**) noint transform=log method=ML;  forecast lead=**24** alpha=**0.05**;  **run**; |

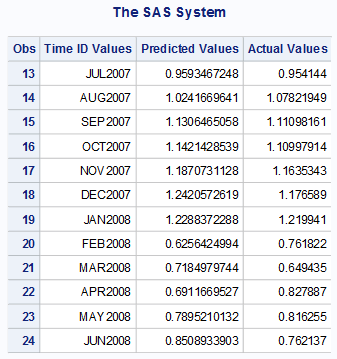
The **outfor** table created in this step provides some statistics for the current data (fitted values and confidence intervals) and prediction values for 24 months ahead. The last 30 observations of this table are as follows:



The next step is to put the prediction and actual values for after **Jul2006** in order to compute the root mean square error (RMSE):

|  |
| --- |
| \* This section shows how to compute the RMSE based on the above model forecast and observations in testing set;  **data** work.fpp\_h02\_testing;  set time.fpp\_h02;  if (Date>**'01JUN2006'd**) then output;  keep Date h02;  **run**;  **data** mycas.fpp\_h02\_testing;  set work.fpp\_h02\_testing;  **run**;  **data** MYCAS.forecast;  set MYCAS.predict1;  if (Date>**'01JUN2006'd**) then output;  keep Date PREDICT;  **run**;  **data** MYCAS.forecast;  merge MYCAS.forecast MYCAS.fpp\_h02\_testing;  by Date;  **run**;  **data** work.forecast;  set MYCAS.forecast;  label H02='Actual Values';  **run**;  **proc** **sort** data = work.forecast;  by Date;  **run**; |

The following is only the last year values in the **forecast** table, containing both actual and prediction values of **H02** variable for after **Jul2006**:



Finally, RMSE is evaluated by a **data** step:

|  |
| --- |
| **data** work.RMSE;  retain so\_far;  set work.forecast end=last;  error=PREDICT-h02;  square\_error=error\*error;  if \_n\_ eq **1** then so\_far = square\_error;  else so\_far=so\_far+ square\_error;  if last then so\_far = sqrt(so\_far/\_n\_);  keep so\_far;  label so\_far='RMSE';  if last then output;  **run**; |

Here is the value of **RMSE**:

