## Worksheet 2 – ARIMA Models

In this example we will look at the models selected by the automdl{} procedure when we use different options. We use the quarterly Mexican unemployment rate, found in *.\data\mx\National unemployment rate.dat*.

First we create a spec file for the series with Win X-13. Go to Create -> Spec file.

In the *Data* tab:

* Use the *Browse* button to find “National unemployment rate.dat” for the *Data file or data metafile* box.
* Change the value in the *Period* box to 4.

In the *Prior Adjustments* tab:

* Uncheck the boxes for TD and Easter AIC tests. (This is a quarterly stock series and there is no regressor built in for quarterly stock trading day.)

In the *Seasonal Adjustment* tab:

* Set the *History start* to 2014.1.

Press *Create spec.*

A new spec file will be created.

1. What is the transformation choice?

Log transformation

1. What ARIMA model was selected?

(1 0 2)(1 1 0)

Run the spec file.

This ARIMA model was selected with the spec automdl{}. Edit the spec file to rerun automdl{} without allowing a mixed model by

* Removing or commenting out the arima{ } spec.
* Adding automdl{ mixed = no }

Next to the *Run* button there is a red arrow. Click the arrow and check the *Output name* box. Type *National unemployment rate nomix´*in the output name box and run the spec.

1. What ARIMA model was selected?

(1 0 0)(1 1 0)

So far both automdl{} choices have had no first difference. Let’s see the model selected when we restrict the nonseasonal and seasonal differencing orders to 1. Edit the automdl{} spec to automdl{ diff = (1 1) }. Change the *Output name* to *National unemployment rate diff11* and run the spec.

1. What ARIMA model was selected?

(0 1 0)(0 1 1)

Look at the graphs of the original series and the logs of the original series. From these graphs, it does not look obvious that the log transformation is the better choice. Let’s find the results from the transformation AIC test. First remove the diff = (1 1) from the automdl{} spec. Then change the transform spec to transform{ function = auto }. Change the *Output name* to *National unemployment rate transftest* and run the spec file. In the output file, look for the tables from the AIC test for the transformation.

1. What is the AICC of the series with the log transformation? With no transformation? Which is lower? With log transformation, AICC = 21.058. With no transformation, AICC = 20.3525. The AICC is lower with no transformation, but because aicdiff = -2 for the transform spec the log transformation is chosen unless the AICC for no transformation is smaller than the AICC for log transformation by over two.

We can look at the model with no transformation to compare it to our models with the log transformation. Change the transform spec to transform{ function = none }. Change the *Output name* to *National unemployment rate notransf*. Run the spec

1. What ARIMA model was selected? (0 1 0)(0 1 1)
2. Compare the ARIMA parameters of this model with those of the model from *National unemployment rate diff11.* Are they similar? With the log transformation, Theta = 0.496. Without it, Theta = 0.612. They are slightly different.

We will look at the diagnostics from these runs in a later worksheet, so we want to save the diagnostic information for later use. Look at the Win X-13 Diagnostics screen, and select File -> Write to XML. Save the diagnostics as NationalUnemploymentRate.xml in your data directory.