Econ 427: Homework 4

ARDL

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Figure 1

Figure 1 shows the quarterly change in Australian unemployment rate and the quarterly Australian inflation rate from 1987:Q2 to 2009:Q3. There is almost a similar trend visible for the unemployment rate as well as inflation rate. Both rates are not following exactly the same pattern. Along with that, it also looks like unemployment rate as well as inflation rate depict irregular seasonal variation. Both the graphs are neither mean stationary, nor variance stationary although it is close to being mean stationary but due to certain spikes, it looks like the change in unemployment rate and the inflation rate in Australia has been fluctuating from 1987:Q2 to 2009:Q3.

1. The lowest BIC is of the model ARDL(4,1) where p (lags of the dependent variable) =1 and q (lags of the independent variable) = 4 which is 146.2323. The coefficients of the model are as follows:-

Table

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Figure 2.1

ACF of the ARDL(4,1)

Chart

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Figure 2.2

Figure 2.2 shows the residuals of the best ARDL model with p = 1 and q = 4. It looks like white noise as all the lags are within the dotted lines which shows that there is no autocorrelation present within the residuals of the best ARDL model. Also, there no particular seasonal variation present which is visible in the correlogram. This shows that ARDL(4,1) is a good model.

Chart, histogram

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Figure 3

Chart, timeline

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Figure 4

1. The Augmented Dickey-Fuller test is used to approximate the stationary process with an AR model. The coefficients of the unemployment rate and inflation rate are as follows:-

Graphical user interface, text, application

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Figure 5

For the Quarterly Australian unemployment rate and quarterly Inflation rate, Dickey-Fuller value is -3.0579 and -2.5274 respectively, which is used to determine its p-value. The null hypothesis is that the time series is non-stationary, and the alternate hypothesis is that the time series is stationary. P-value for the quarterly Australian Unemployment rate is 0.1406 which is greater than 0.05 so we would fail to reject the null hypothesis which means that the time series is non-stationary. Also, the p-value for the quarterly Australian Inflation rate is 0.3591 which is greater than 0.05 so we would fail to reject the null hypothesis which means that the time series is non-stationary.

This concludes that both the time-series are non-stationary.

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Figure 6

If two series contain unit roots but are related, then they are said to be cointegrated. Phillips-Ouliaris Cointegration Test is used to figure out if the series are cointegrated or not. Here the p-value of the test is 0.01 which is smaller than 0.05 so it means that both the time-series (Unemployment. Rate and Inflation rate) are cointegrated. So, we would reject the null hypothesis here. This concludes that the series are cointegrated

A picture containing graphical user interface

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Figure 7

Figure 7 shows the best order for a Vector Autoregression (VAR) model fitted to the data according to AIC, HQ, SC, and FPE criterion.

SC(n) = 2 means that we need to include 2 lags to in the VAR model to get the model fitted to the data.

1. The coefficients of the model are as follows:

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Figure 8.1

Looking at the coefficients it looks like the unemployment rate series is more significant than the inflation rate series. If unemployment rate lag increases by one percentage point, then unemployment rate increases by 0.37047 percentage points. If unemployment rate lag increases by one percentage point, then inflation rate increases by 0.05003 percentage points. Similar analysis would follow if we would increase the lags for unemployment rate and inflation rate. Adjusted R-square for first regression is 0.4919 which means that one variable itself is able to explain 49.19% of variation in the Unemployment rate. Adjusted R-square for the second regression is 0.3013 which suggests that one variable itself is able to explain 30.13% of variation in the Inflation rate.

ACF of residuals:-

Chart

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Figure 8.2

The acf of the residuals of the quarterly change in the Australian Unemployment rate using the VAR function looks like white noise. All the lags are within the dotted lines, so it states that the residuals of this model are not at all autocorrelated at any point. Three of the lags kind of suggest that there might be some seasonal variation – one between lag 0 and 5, another lag between 5 and 10, and third one between lag 10 and 15 as those three lags are almost near to crossing the dotted lines but it stays within the confidence interval showing that there is no autocorrelation.

Chart

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Figure 8.3

The acf of the residuals of the quarterly Australian Inflation rate using the VAR function looks like white noise. All the lags are within the dotted lines, so it states that the residuals of this model are not at all autocorrelated at any point. Three of the lags kind of suggest that there might be some seasonal variation – one between lag 0 and 5, another lag between 10 and 15, and third one after 15 as those three lags are almost near to crossing the dotted lines but it stays within the confidence interval showing that there is no autocorrelation.

Diagram

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Figure 9

Figure 9 forecasts the quarterly change in the Australian unemployment rate and the quarterly Australian inflation rate 15 periods into the future. Both the series have one blue line and two red lines. The red lines suggest the 95% confidence interval between which the unemployment rate and inflation rate will forecast till. The blue line is the closest approximation of both the forecasts. It seems like the change in unemployment rate is going to decrease showing a downward trend for some time in the future whereas the inflation rate is going to increase showing an upwards trend.

1. Coefficients from the ARIMA model

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Figure 10.1

Coefficients from the GARCH model

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Figure 10.2