

Homework 7

Eco 4306 Economic and Business Forecasting

Spring 2018

Due: Thursday, April 5, before the class

Problem 1

Download the workfile in [JNJ.zip](#) containing earnings per share for Johnson and Johnson U.S.

- (a) Set the sample to 1960Q1-1978Q4. Create two time series plots, the first one showing earnings per share for Johnson and Johnson, and the second one showing the log transformed earnings per share for Johnson and Johnson. Comment on the behavior of the two series over time.
- (b) Perform the Augmented Dickey-Fuller unit root test first for log transformed earnings per share $\log JNJ_t$, and then for the first difference of the log transformed earnings per share $\Delta \log JNJ_t$. Make sure to include the correct terms (constant/trend) in the two tests based on the trending behavior of $\log JNJ_t$ and ΔJNJ_t . Comment on the results of the unit root tests: is $\log JNJ_t$ integrated of order 0, so $I(0)$, or integrated of order 1, so $I(1)$?
- (c) Estimate a model for the first difference of log transformed earnings per share that only includes a constant: $\Delta \log JNJ_t = \beta_0 + \varepsilon_t$.
- (d) Obtain the actual, fitted, residuals graph, and also the correlogram for residuals. Comment on these two graphs, and why they tell us that residuals in the model in (c) are not white noise.
- (e) Modify the model from (c) by adding AR components, to address the issue identified in (d). Verify that the residuals in the modified model are white noise - obtain the actual, fitted, residuals graph, and the correlogram for residuals.
- (f) Use the model from (e) to create a multistep forecast for JNJ_t for period 1979Q1-1981Q1. Also generate the standard errors for this forecast to construct the lower and upper bounds of the 95% confidence interval. Plot the actual data together with the forecast and its 95% confidence interval. Report the RMSE for this forecast.
- (g) Use the model from (e) to create a sequence of one step ahead forecasts for JNJ_t for period 1979Q1-1981Q1 using fixed forecasting scheme. Also generate the standard errors for this forecast to construct the lower and upper bounds of the 95% confidence interval. Plot the actual data together with the forecast and its 95% confidence interval. Report the RMSE for this forecast.
- (h) Comment on the precision of the forecasts in (f) and (g) based on their plots and their RMSEs. Compare the RMSEs for the forecasts in (f) and (g) with the RMSEs for the model with deterministic trend from [lec16slides.pdf](#).