Cannlytics

Cannabis Data Science

Saturday Morning Statistics

January 15th, 2022

The Box-Jenkings Forecasting Methodology

1. Identification
2. Estimation
3. Diagnostic Checking
4. Forecasting

Step 1: Identification

Identify the order of an ARIMA (p, d, q) model.

- Analyze autocorrelation functions (ACFs) and partial autocorrelation functions (PACFs).
- Utilize statistical software to scan (p, d, q) models to select based on a selection criterion.

Step 2: Estimation

Simply estimate the ARIMA(p, d, a) model that you identified.

Step 3: Diagnostic Checking

Examine if the residuals from the model are **white noise**. Why?

- The idea is that if the residuals are white noise, then there is no additional information that the model could explain.
- If the error are not white noise, then it is implied that there is still a presence of autocorrelation that can be explained by a different order ARIMA(p, d, q) model.

Step 4: Forecasting

Finally, forecast your target variable with your chosen model.

- Useful for short-term forecasting (up to a few months ahead).
- Difficult for long-term forecasting, because the model does not capture the state of the economy.

The 10 Commandments of Forecasting

Silvia, J, Iqbal, A, et. al (2014), 'Economic and Business Forecasting'.

1. Know what you are forecasting.
2. Understand the purpose of forecasting.
3. Acknowledge the cost of the forecast error.
4. Rationalize the forecast horizon.
5. Understand the choice of variables.
6. Rationalize the forecasting model used.
7. Know how to present the results.
8. Know how to decipher the forecast results.
9. Use recursive methods.
10. Understand that forecasting models evolve over time.

Measuring Forecast Error

The out-of-sample root mean square error (RMSE) can quantify forecast error.

$$RMSE = \sqrt{\frac{1}{T}\Sigma(Y_{t+1} - \hat{Y}_{t+1})^2}$$

Model Extensions

- Add exogenous fixed effects, such as month effects.
- Add seasonality.
- Use Bayesian methods.

🙏 Thank you for coming.

Take some time, discuss any conclusions drawn, and try to make some forecasts of your own!

References

Silvia, J, Iqbal, A, et. al (2014), 'Economic and Business Forecasting'.