Assignment 04, Question 3&4

Jeff Nguyen

March 26, 2021

University of Southern California
Marshall School of Business
FBE 543 Forecasting and Risk Analysis

Student Name: Ngoc Son (Jeff) Nguyen

Question 3

a.

$$Y_t = 2.5 + .35Y_{t-1} + \epsilon_t \tag{1}$$

- **ARIMA model:** $ARIMA(1, 0, 0)$.
- **Stationarity:** Stationary as $\sum_{i=1}^{n} |\alpha_i| = .35 < 1$.
- **Invertibility:** N/A.

b.

$$Y_t = 4.5 - 1.5Y_{t-1} + \epsilon_t - .5\epsilon_{t-1} \tag{2}$$

- **ARIMA model:** $ARIMA(1, 0, 1)$.
- **Stationarity:** Non-Stationary as $\sum_{i=1}^{n} |\alpha_i| = |1.5| > 1$.
- **Invertibility:** Invertible as $\sum_{i=1}^{n} \beta_i| = .5 < 1$.

c.

$$Y_t = 1.2 - .75Y_{t-1} + .3Y_{t-2} + \epsilon_t \tag{3}$$

- **ARIMA model:** $ARIMA(2, 0, 0)$.
- **Stationarity:** Non-Stationary as $\sum_{i=1}^{n} |\alpha_i| = | - .75| + |.3| = 1.05 > 1$.
- **Invertibility:** N/A.

d.

$$Y_t = 2.5 - .95Y_{t-1} + \epsilon_t - .5\epsilon_{t-1} - .2\epsilon t - 2 \tag{4}$$

- **ARIMA model:** $ARIMA(1, 0, 2)$.
- **Stationarity:** Stationary as $\sum_{i=1}^{n} |\alpha_i| = 0.95 < 1$.
- **Invertibility:** Invertible as $\sum_{i=1}^{n} |\beta_i| = | - .5| + | - .2| = 0.7 < 1$.

e.

$$Y_t = .52 - 1.2Y_{t-1} + \epsilon_t + .2\epsilon_{t-1} \tag{5}$$

- **ARIMA model:** $ARIMA(1, 0, 1)$.
- **Stationarity:** Non-Stationary as $\sum_{i=1}^{n} |\alpha_i| = 1.2 > 1$.
- **Invertibility:** Invertible as $\sum_{i=1}^{n} |\beta_i| = |.2| = 0.2 < 1$.

f.

$$DY_t = 1.2DY_{t-1} + \epsilon_t \tag{6}$$

- **ARIMA model:** $ARIMA(1, 1, 0)$.
- **Stationarity:** Non-Stationary as $\sum_{i=1}^{n} |\alpha_i| = 1.2 > 1$.
- **Invertibility:** N/A.

g.

$$DY_t = .42DY_{t-1} + \epsilon_t - .6\epsilon_{t-1} \tag{7}$$

- **ARIMA model:** $ARIMA(1, 1, 1)$.
- **Stationarity:** Stationary as $\sum_{i=1}^{n} |\alpha_i| = 0.42 < 1$.
- **Invertibility:** Invertible as $\sum_{i=1}^{n} |\beta_i| = | - .6| = 0.6 < 1$.

h.

$$DY_t = .62Y_{t-1} + \epsilon_t - .6\epsilon_{t-1} \tag{8}$$

- **ARIMA model:** Incorrect model as LHS and RHS does not have similar order difference term.
- **Stationarity:** N/A.
- **Invertibility:** N/A.

i.

$$Y_t = 2.5 + .95DY_{t-1} + \epsilon_t \tag{9}$$

- **ARIMA model:** Incorrect model as LHS and RHS does not have similar order difference term.
- **Stationarity:** N/A.
- **Invertibility:** N/A.

j.

$$Y_t = 1.6 + \epsilon_t - .6\epsilon_{t-1} \tag{10}$$

- **ARIMA model:** $ARIMA(0, 0, 1)$.
- **Stationarity:** Stationary as $\sum_{i=1}^{n} |\beta_i| = |-.6| = 0.6 < 1$.
- **Invertibility:** Invertible as $\sum_{i=1}^{n} |\beta_i| = |-.6| = 0.6 < 1$.

Question 4