2019 Spring Final Time Series Analysis June 20, 2019

1. You must do the exam all by yourself(Cheating is forbidden). You may not consult or discuss with any other person.
2. Exam time: 13:00~18:00, you must mail back your answer sheet to [WM5](mailto:survey@nccu.edu.tw) before 18:05. Late answer sheets will not be accepted.
3. You must comment on any graphs or tables that you used. You must also state the reason(s) why you do differencing and/or why you choose the model.
4. You must use the datasets provided in this exam.

(15%)Q1. U.S. tobacco production from 1871 to 1985 is shown in worksheet Q1.

1. Develop an appropriate ARIMA model.
2. Forecast the next 10 years production with the 95% forecast limits.

(15%)Q2. U.S. monthly employment figures for young men between 16 and 19 of age from 1971 to 1981 is given in worksheet Q2.

1. Develop an appropriate SARIMA model.
2. Forecast the next 12 months employment figures with the 99% forecast limits.

(20%)Q3. The Lydia Pinkham annual advertising (xt) and sales (yt) data are given in worksheet Q3.

1. Develop an appropriate Transfer function--Noise model.
2. Forecast the next 12 months employment figures with the 95% forecast limits.

(20%)Q4. The daily closing stock of Duke Energy Corporation between January 3, 2002, and August 31, 2002, is given in worksheet Q4. On July 9, 2002, a law firm files a complaint against Duke Energy Corporation.

1. Develop an appropriate intervention model with intervention occurs at the 130th observation(July 10,2002).
2. What is the effect of this intervention? Is it significant? Why?
3. Forecast the next 12 days stock prices with the 95% forecast limits.

Hand-written part

(10%)Q5. Prove that if a AR(2) model is stationary, then the coefficients and  satisfy the following inequality 

(15%)Q6. The following ARIMA model has been fit to a time series



1. Suppose that we are at the end of time period T=100 and we know that y100=55 and y99=48 and the forecast for period 100 was 51, Determine forecasts for periods 101, 102, 103,… from this model at origin 100.
2. Suppose that the observation for time period 101 turn out to be y101=56. Revise your forecasts for periods 102, 103,…using period 101 as the new origin of time.
3. If your estimate , find a 95% prediction interval on the forecast of period 101 made at the end of period 101.

(15%)Q8.Consider the MA(1) model yt=45+0.3. Assume that the variance of the white noise process is .

1. Sketch the theoretical ACF and PACF for this model.
2. Generate 100 realizations(generate 200 realizations and drop the first 100 realizations) of this MA(1) process and compute the sample ACF and PACF. Compare the sample ACF and the sample PACF to the theoretical ACF and PACF. How similar to the theoretical values are the sample value?