Time Series Final Exam: In Class Portion

**Questions 1 – 4 (3 pts each)**

Simply circle the option(s) that are correct. More than one option may be appropriate. If you think none are appropriate then circle NONE at the end of the question.

1. An AR(1) model can generate

i. a frequency of 0 alone

ii. a frequency of .5 alone

iii. a frequency between 0 and .5

iv. both a frequency of 0 and .5

v. a frequency between 0 and .5 and a frequency of 0.

NONE

2. An AR(2) model can generate

i. a frequency of 0 alone

ii. a frequency of .5 alone

iii. a frequency between 0 and .5

iv. both a frequency of 0 and .5

v. a frequency between 0 and .5 and a frequency of 0.

NONE

3. What type of models will produce forecasts that will converge directly to the sample mean in a fashion similar to what is displayed below?



i. AR(1) positive phi

ii. AR(1) negative phi

iii. AR(2) complex conjugate roots.

iv. AR(4) with two sets of complex conjugate roots

v. ARIMA(0,1,0) models

vi. signal + noise models

NONE

4. What type of models will simply forecast the last value of the series into the future?

i. AR(1) positive phi

ii. AR(1) negative phi

iii. AR(2) complex conjugate roots.

iv. AR(4) with two sets of complex conjugate roots

v. ARIMA(0,1,0) models

vi. signal + noise models

NONE

5. Consider the time series below of the monthly high temperatures in Dallas, Texas from 2010 to 2019:



Is this data from a stationary or non-stationary process? Explain. (3 pts)

6. (3pts) Which estimates can yield non-stationary models? Circle all that apply:

i. Yule Walker

ii. Burg

iii. Maximum Likelihood

iv. All can yield non-stationary models.

7. (3pts) Dickey Fuller tests were shown to have an inflated (high) type II error rates.

a. Write down the null and alternative hypothesis of the Dickey-Fuller Test.

b. Explain what a type II error is in the context of this test and thus what the concern of an inflated type II error rate is here.

8. (3pts) True or False:

All stationary and invertible ARMA models can be written as an infinite order AR process.

Simply write “TRUE” or “FALSE”

9. (3pts) TRUE or FALSE:

There are many invertible models that have the same acf (correlation structure).

Simply write “TRUE” or “FALSE”

10. (3pts) Given the following model and white noise variance estimate, show your calculation of the margin of error (probability interval half width) for a 95% probability interval of a forecast horizon of 3 (l = 3). .

11. (2pts): True or False: We should always choose the model with the smallest ASE?

12. And now … it is time for ….. **MATCHING!!!** Match the realization in the first column with the ACF in the second column by filling in the numbers below (representing the first column) with the corresponding letter (representing the second column). (2 pts each)

|  |  |
| --- | --- |
| 1. | a. |
| 2. | b. |
| 3. | c. |
| 4. | d. |
| 5. | e. |

1. \_\_\_\_ 2. \_\_\_\_ 3. \_\_\_\_\_ 4. \_\_\_\_\_\_ 5. \_\_\_\_\_\_\_

13. One more round….. **MATCHING!!!** Match the realization or acf in the first column with the spectral density in the second column by filling in the numbers below (representing the first column) with the corresponding letter (representing the second column). (2 pts each) (One from column 2 won’t be used.)

|  |  |
| --- | --- |
| 1. | a. |
| 2. | b. |
| 3. | c. |
| 4. | d. |
|  | e. |

1. \_\_\_\_\_ 2. \_\_\_\_\_\_\_ 3. \_\_\_\_\_\_ 4. \_\_\_\_\_