TEST #1

STA 4853 **Name:**____________________________________

May 5, 2017

Please read the following directions.
DO NOT TURN THE PAGE UNTIL INSTRUCTED TO DO SO

Directions

- This exam is **closed book** and **closed notes**.
- There are 30 multiple choice questions.
- Circle the **single best** answer for each multiple choice question. Your choice should be made clearly.
- Always **circle the correct response**. (Sometimes the question has an empty blank or a box, but this is **NOT** where the answer goes.)
- There is no penalty for guessing.
- The exam has **16** pages.
- Each question is worth equal credit.

Problem 1. The model

$$(1 - .2B^{12})(1 - .4B - .2B^2 - .3B^3)z_t = 5.0 + (1 - .5B^{12} + .2B^{24})(1 + .2B + .3B^2 - .2B^3 + .1B^4)a_t$$

is a ________.

a) ARIMA$(4,0,3)(2,0,1)_{12}$ **b)** ARIMA$(1,0,2)(3,0,4)_{12}$ **c)** ARIMA$(4,0,2)(3,0,1)_{12}$
d) ARIMA$(1,0,4)(3,0,2)_{12}$ **e)** ARIMA$(1,0,2)(4,0,3)_{12}$ **f)** ARIMA$(2,0,4)(1,0,3)_{12}$
g) ARIMA$(2,0,1)(3,0,4)_{12}$ **h)**⋆ ARIMA$(3,0,4)(1,0,2)_{12}$ **i)** ARIMA$(3,0,1)(4,0,2)_{12}$

Problem 2. The long range forecasts from the model

$$(1 - B)(1 - .7B)z_t = .5 + (1 - .5B^{12} + .2B^{24})a_t$$

will ________.

a) converge to the overall mean of the process
b)⋆ converge to a straight line with a positive slope
c) converge to a straight line with a negative slope
d) converge to a straight line with zero slope
e) converge to a straight line with a positive slope plus a repeating seasonal pattern
f) converge to a straight line with a negative slope plus a repeating seasonal pattern
g) converge to a repeating seasonal pattern

Problem 3. The standard error of the k-step ahead forecast from an ARIMA process involves the ψ-weights and is given by the expression ________.

a) $\sigma_a\sqrt{1 + \psi_1 + \psi_2 + \cdots + \psi_k}$ **b)** $\sigma_a(1 + \psi_1^2 + \psi_2^2 + \cdots + \psi_{k-1}^2)$
c) $\sigma_a(1 + \psi_1 + \psi_2 + \cdots + \psi_{k-1})$ **d)** $\sigma_a(\psi_1^2 + \psi_2^2 + \cdots + \psi_k^2)$
e) $\sigma_a(1 + \psi_1 + \psi_2 + \cdots + \psi_k)$ **f)**⋆ $\sigma_a\sqrt{1 + \psi_1^2 + \psi_2^2 + \cdots + \psi_{k-1}^2}$
g) $\sigma_a\sqrt{1 + \psi_1 + \psi_2 + \cdots + \psi_{k-1}}$ **h)** $\sigma_a\sqrt{\psi_1^2 + \psi_2^2 + \cdots + \psi_k^2}$

Problem 4. Suppose the time series z_t has the form $\ldots, 1, 3, 5, 7, 1, 3, 5, 7, 1, 3, 5, 7, \ldots$ and continues repeating the same pattern forever into both the future and the past. What is $\nabla_{\mathbf{4}}\, z_t$?

a) $\ldots, 2, -2, 2, -2, 2, -2, 2, -2, \ldots$ **b)** $\ldots, 2, 4, 6, 0, 2, 4, 6, 0, \ldots$
c) $\ldots, -2, -4, -6, 0, -2, -4, -6, 0, \ldots$ **d)**⋆ $\ldots, 0, 0, 0, 0, 0, 0, 0, 0, \ldots$
e) $\ldots, 2, 2, 2, 2, 2, 2, 2, 2, \ldots$ **f)** $\ldots, 2, 2, 2, -6, 2, 2, 2, -6, \ldots$
g) $\ldots, -2, -2, -2, 6, -2, -2, -2, 6, \ldots$ **h)** $\ldots, -2, -2, -2, -2, -2, -2, -2, -2, \ldots$

Problem 5. The table below gives the initial part of the theoretical ACF and PACF of a ________ process.

a) ARIMA$(0,0,1)(1,0,0)_8$ **b)** ARIMA$(0,0,1)(3,0,0)_8$
c) ARIMA$(1,0,0)(0,0,1)_8$ **d)** ARIMA$(1,0,0)(0,0,3)_8$
e)$\star$ ARIMA$(0,0,1)(0,0,1)_8$ **f)** ARIMA$(0,0,1)(0,0,3)_8$
g) ARIMA$(1,0,0)(1,0,0)_8$ **h)** ARIMA$(1,0,0)(3,0,0)_8$

LAG	ACF	PACF
1	-0.469799	-0.469799
2	o.o	-0.283221
3	o.o	-0.185631
4	o.o	-0.126010
5	o.o	-o.o86919
6	o.o	-o.o60411
7	0.207264	0.265611
8	-0.441176	-0.280630
9	0.207264	-0.184125
10	o.o	-0.125046
11	o.o	-o.o86272
12	o.o	-o.o59967
13	o.o	-o.o41834
14	o.o	-o.o29235
15	o.o	0.148587
16	o.o	-0.141611
17	o.o	-o.o97318
18	o.o	-o.o67519
19	o.o	-o.o47059
20	o.o	-o.o32872
21	o.o	-o.o22986
22	o.o	-o.o16082
23	o.o	o.o87142
24	o.o	-o.o80366
25	o.o	-o.o55913
26	o.o	-o.o39023

Problem 6. If we form a new series w_t by differencing the series x_t d times at lag 1 and then D times at lag s, we may write $w_t =$ ________.

a) $(1-B^D)^s(1-B^d)x_t$ **b)** $(1-B)^D(1-B^s)^d x_t$
c) $(1-B^s)^d(1-B)^D x_t$ **d)** $(1-B^D)(1-B^s)^d x_t$
e) $(1-B^d)(1-B^D)^s x_t$ **f)**$\star$ $(1-B)^d(1-B^s)^D x_t$
g) $(1-B^s)(1-B^d)^D x_t$ **h)** $(1-B^d)^D(1-B^s)x_t$

Problem 7. A stationary ARMA process $\{z_t\}$ can be expressed in terms of the ψ-weights as:

$$z_t = \mu_z + a_t + \psi_1 a_{t-1} + \psi_2 a_{t-2} + \psi_3 a_{t-3} + \dots$$

Suppose you know the values of this process up to time n, and from the time origin n you forecast z_{n+3}. The forecast error $e_n(3) = z_{n+3} - \hat{z}_{n+3}$ is equal to ________. (Note: A hat (ˆ) over a quantity denotes the forecast of that quantity from the time origin n.)

a)⋆ $a_{n+3} + \psi_1 a_{n+2} + \psi_2 a_{n+1}$
b) $\hat{a}_{n+3} + \psi_1 \hat{a}_{n+2} + \psi_2 \hat{a}_{n+1}$
c) $\hat{a}_{n+3} + \psi_1 \hat{a}_{n+2} + \psi_2 \hat{a}_{n+1} + \psi_3 \hat{a}_n$
d) $\hat{a}_n + \psi_1 \hat{a}_{n-1} + \psi_2 \hat{a}_{n-2}$
e) $\hat{a}_n + \psi_1 \hat{a}_{n-1} + \psi_2 \hat{a}_{n-2} + \psi_3 \hat{a}_{n-3}$
f) $a_{n+3} + \psi_1 a_{n+2} + \psi_2 a_{n+1} + \psi_3 a_n$
g) $a_n + \psi_1 a_{n-1} + \psi_2 a_{n-2}$
h) $a_n + \psi_1 a_{n-1} + \psi_2 a_{n-2} + \psi_3 a_{n-3}$

Problem 8. Suppose $\{z_t\}$ is an AR(1) process: $z_t = C + \phi_1 z_{t-1} + a_t$. If we observe all the values of z_t up to time n, the forecast for $z_{n+\mathbf{2}}$ is given by $\hat{z}_{n+\mathbf{2}} =$ ________.

a) $C/(1-\phi_1)$
b) $C + \phi_1 C + \phi_1^2 C + \phi_1^3 z_{n+2}$
c) $C + \hat{a}_{n+2} - \phi_1 \hat{a}_{n+1} - \phi_1^2 \hat{a}_n$
d) $C + a_{n+2} - \phi_1 a_{n+1} - \phi_1^2 a_n$
e) $C + \phi_1 z_{n+1} + a_{n+2}$
f) $C - \phi_1^2 a_n$
g)⋆ $C + \phi_1 C + \phi_1^2 z_n$
h) C
i) μ_z

Problem 9. A time series (such as temperature data) which has an approximately repeating seasonal pattern is ________.

a) auto-regressive
b) moving average
c)⋆ non-stationary
d) stationary
e) invertible
f) non-invertible
g) white noise
h) over-differenced

Problem 10. Suppose you wish to explain a response series Y_t using a single input series X_t. Which of the expressions listed below describes a regression model with ARMA errors?

a) $Y_t = v(B)X_t + a_t$

b) $Y_t = \dfrac{B^b \omega(B)}{\delta(B)} X_t + a_t$

c)⋆ $Y_t = \beta_0 + \beta_1 X_t + \dfrac{\theta(B)}{\phi(B)} a_t$

d) $Y_t = C + v_0 X_t + v_1 X_{t-1} + v_2 X_{t-2} + a_t$

e) $Y_t = \dfrac{\theta(B)}{\phi(B} X_t$

f) $Y_t = \dfrac{\theta(B)}{\phi(B} a_t$

g) $Y_t = \beta_0 + \sum_{j=1}^{6} \left\{ \alpha_j \sin\left(\dfrac{2\pi j X_t}{12}\right) + \xi_j \cos\left(\dfrac{2\pi j X_t}{12}\right) \right\} + a_t$

Problem 11. Suppose $\{z_t\}$ is a realization of a **known** ARIMA(p, d, q) process; we know the orders p, d, q and the values of all parameters. Suppose also that we observe **all** the values z_t and a_t (the random shocks) up to time n. Call this set of information $\mathcal{I}_n$. Given $\mathcal{I}_n$, the forecast of z_{n+k} is $\widehat{z}_{n+k} = E(z_{n+k} \,|\, \mathcal{I}_n)$. Which of the following statements is always true?

a)⋆ $E(z_t|\mathcal{I}_n) = z_{\boldsymbol{t}}$ for $t \le n$
b) $E(z_t|\mathcal{I}_n) = 0$ for $t \le n$
c) $E(z_t|\mathcal{I}_n) = 0$ for $t \ge n$
d) $E(z_t|\mathcal{I}_n) = \mu_z$ for $t \ge n$
e) $E(z_t|\mathcal{I}_n) = a_{\boldsymbol{t}}$ for $t \ge n$
f) $E(z_t|\mathcal{I}_n) = z_{\boldsymbol{n}}$ for $t \ge n$
g) $E(z_t|\mathcal{I}_n) = \mu_z$ for $t \le n$
h) $E(z_t|\mathcal{I}_n) = a_{\boldsymbol{t}}$ for $t \le n$
i) $E(z_t|\mathcal{I}_n) = z_{\boldsymbol{n}}$ for $t \le n$
j) $E(z_t|\mathcal{I}_n) = z_{\boldsymbol{t}}$ for $t \ge n$

Problem 12. An ARIMA(p, d, q) process is generated by _________.

a) differencing an ARMA(p, q) process until it is stationary
b) adding random shocks to an ARMA(p, q) process
c) adding a trend to an ARMA(p, q) process
d)⋆ integrating an ARMA(p, q) process d times
e) differencing an ARMA(p, q) process d times
f) forecasting an ARMA(p, q) process
g) pre-whitening an ARMA(p, q) process
h) removing the trend from an ARMA(p, q) process

Problem 13. If $\{Y_t\}$ and $\{X_t\}$ are jointly stationary process, then $\text{Corr}(Y_{20}, X_{15}) =$ _________

a) 1
b) -1
c) $1/2$
d) $-1/2$
e)⋆ $\text{Corr}(X_{30}, Y_{35})$
f) $\text{Corr}(Y_{30}, X_{35})$
g) $\text{Corr}(Y_{20}, X_{25})$
h) $\text{Corr}(X_{15}, Y_{10})$
i) $\text{Corr}(Y_{50}, X_{60})$
j) 0

Problem 14. You wish to forecast X. You have collected relevant information $\mathcal{I}$ and determined the conditional distribution of X given $\mathcal{I}$. The value of the forecast $\widehat{X}$ which minimizes $E[(X - \widehat{X})^2 \,|\, \mathcal{I}]$ is equal to _________.

a) $\text{Var}(X \,|\, \mathcal{I})$
b)⋆ $E(X \,|\, \mathcal{I})$
c) the median of X
d) the mode of X
e) the mean squared error
f) the mean absolute error
g) $E\left(|X - \widehat{X}| \,\middle|\, \mathcal{I}\right)$
h) $(\widehat{X} - z_{\alpha/2}\,\text{SE}, \widehat{X} + z_{\alpha/2}\,\text{SE})$

Problem 15. Suppose you are attempting to identify a plausible *initial* choice of ARIMA(p, d, q) model for a time series z_t. After examining the data, you decided not to use a transformation. Then you selected a particular value of d, that is, you decided that the series $w_t = \nabla^d z_t$ obtained by differencing z_t d times is stationary. Now you are going to choose reasonable *initial* values for p and q. Which of the following will you use in making this decision?

a) The residual ACF and PACF

b) The normal probability plot (the QQ-Plot)

c) The auto-regressive parameters

d) The moving average parameters

e) The AIC or SBC

f) The correlations between the parameter estimates

g)⋆ The sample ACF and PACF of w_t

h) The sample ACF and PACF of z_t

i) The sample IACF of z_t

Problem 16. Which of the following statements is true for an ARIMA$(0, 0, 0)(0, 0, 3)_{12}$ process?

a) The first three MA coefficients will be zero.

b) The first three AR coefficients will be zero.

c) The ACF will decay rapidly along the early lags (1, 2, 3, . . .).

d) The PACF will decay rapidly along the early lags (1, 2, 3, . . .).

e)⋆ The ACF will be zero everywhere except at lags 12, 24, 36.

f) The PACF will be zero everywhere except at lags 12, 24, 36.

g) The ACF will be zero at lags 12, 24, 36.

h) The PACF will be zero at lags 12, 24, 36.

i) The IACF will be zero at lags 12, 24, 36.

Problem 17. If we difference the series z_t at lag 1 and then at lag s, we get the series $w_t = \nabla_s \nabla z_t$. This may also be written as _________.

a) $w_t = (z_t - z_{t-s})(z_t - z_{t-1})$

b) $w_t = (z_t - z_{t+s})(z_t - z_{t+1})$

c) $w_t = (z_{t+s} - z_t)(z_{t+1} - z_t)$

d) $w_t = (z_{t+s} - z_{t-s})(z_{t+1} - z_{t-1})$

e) $w_t = z_t - z_{t+1} + z_{t+s} - z_{t+s+1}$

f) $w_t = -z_t + z_{t-1} + z_{t-s} - z_{t-s+1}$

g)⋆ $w_t = z_t - z_{t-1} - z_{t-s} + z_{t-s-1}$

h) $w_t = z_t - z_{t+1} - z_{t+s} + z_{t+s+1}$

Problem 18. A linear transfer function model for explaining a response series $\{Y_t\}$ in terms of an input series $\{X_t\}$ has the form:

$$Y_t = C + v_0 X_t + v_1 X_{t-1} + v_2 X_{t-2} + \cdots + v_h X_{t-h} + N_t$$

One of the choices given below describes the **first steps** in one approach for identifying a linear transfer function model. (The later steps are not described.) Circle the correct choice.

a)$\star$ Choose h relatively large, fit a multiple regression model of Y_t on $X_t, X_{t-1}, \ldots, X_{t-h}$, and use the ACF/PACF of the residuals from this model to identify an ARMA model for N_t.

b) Choose h relatively large, fit a multiple regression model of Y_t on $X_t, X_{t-1}, \ldots, X_{t-h}$, and use the P-values of the estimated coefficients $\widehat{v}_i$ to decide which terms to retain.

c) Use the ACF/PACF of Y_t to identify an ARMA model for Y_t, and then fit a multiple regression of the residuals from this model on $X_t, X_{t-1}, \ldots, X_{t-h}$ using a relatively large value of h.

d) Fit an AR(h) model on Y_t using a relatively large value of h, use the P-values of the estimated coefficients $\widehat{\phi}_i$ to decide which terms to retain, and then fit a multiple regression of the residuals from this model on $X_t, X_{t-1}, \ldots, X_{t-h}$.

e) Fit an AR(h) model on Y_t using a relatively large value of h, and then fit a multiple regression of the residuals from this model on $X_t, X_{t-1}, \ldots, X_{t-h}$.

f) Use the ACF/PACF of N_t to identify an ARMA model for N_t, and then fit a multiple regression of the residuals from this model on $X_t, X_{t-1}, \ldots, X_{t-h}$ using a relatively large value of h.

Problem 19. If the theoretical **P**ACF of a stationary ARMA process has a cutoff (to zero) after lag 3, then the theoretical **I**ACF (Inverse Autocorrelation Function) will _________.

a) undergo sinusoidal decay

b) undergo alternating exponential decay

c)$\star$ have a cutoff after lag 3

d) decay to zero very slowly

e) decay exponentially

f) decay exponentially starting at lag 3

g) decay to zero very rapidly

h) undergo sinusoidal decay after lag 3

Problem 20. A realization from a process with a **non**-stationary mean will usually ________.

a) require a log transformation
b) require a square root transformation
c) require a square transformation
d) require a reciprocal transformation
e) require a large AR order p in its model
f) require a large MA order q in its model
g) require large values of both p and q in its model
h)⋆ have a sample ACF which decays very slowly to zero
i) have a sample PACF which decays very slowly to zero
j) have a sample IACF which decays very slowly to zero

Problem 21. If you wish to use PROC ARIMA to fit an ARIMA$(0,0,2)(0,0,1)_{\mathbf{12}}$ model, your ESTIMATE statement would be:

ESTIMATE [ ] METHOD=ML;

What should you put inside the box?

a) Q=(2)(1)	**b**) Q=(2,1)	**c**) Q=(2)(1)12
d) P=(2)(1)	**e**) P=(2,1)	**f**) P=(2)(1)12
g) Q=(1,2,12)	**h**)⋆ Q=(1,2)(12)	**i**) Q=(2)(12)
j) P=(1,2,12)	**k**) P=(1,2)(12)	**l**) P=(2)(12)

Problem 22. Suppose you wish to use PROC ARIMA to fit the following multiple regression model with ARMA errors:

$$Y_t = \beta_0 + \beta_1 X_{1,t} + \beta_2 X_{2,t} + \frac{1-\theta_1 B}{1-\phi_1 B} a_t \,.$$

Select the correct ESTIMATE statement from the list below. Assume the input variables X_1, X_2 are named X1, X2.

a) ESTIMATE P=2 INPUT=(X1 X2) METHOD=ML;
b)⋆ ESTIMATE P=1 Q=1 INPUT=(X1 X2) METHOD=ML;
c) ESTIMATE P=2 INPUT=((1)X1 (1)X2) METHOD=ML;
d) ESTIMATE P=1 Q=1 INPUT=((1)X1 (1)X2) METHOD=ML;
e) ESTIMATE P=2 INPUT=(/(1)X1 /(1)X2) METHOD=ML;
f) ESTIMATE P=1 Q=1 INPUT=(/(1)X1 /(1)X2) METHOD=ML;
g) ESTIMATE P=2 INPUT=(1$X1 1$X2) METHOD=ML;
h) ESTIMATE P=1 Q=1 INPUT=(1$X1 1$X2) METHOD=ML;

Problem 23. An ARMA process $\phi(B)\tilde{z}_t = \theta(B)a_t$ is said to be invertible if ________.

a) the theoretical ACF decays to zero
b) the theoretical PACF decays to zero
c) the ψ-weights decay to zero
d) the MA coefficients decay to zero
e) all the roots of $\phi(B)$ lie strictly outside the unit circle
f) all the roots of $\phi(B)$ lie strictly inside the unit circle
g)⋆ all the roots of $\theta(B)$ lie strictly outside the unit circle
h) all the roots of $\theta(B)$ lie strictly inside the unit circle

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Attached to the end of the exam are two pages entitled "Transfer Function Plots". These plots give plots of transfer function v-weights for transfer functions having the form

$$v(B) = \frac{B^b\omega(B)}{\delta(B)} \quad \text{with}$$

$$\omega(B) = \omega_0 - \omega_1 B - \omega_2 B^2 - \cdots - \omega_h B^h$$

$$\delta(B) = 1 - \delta_1 B - \delta_2 B^2 - \cdots - \delta_r B^r$$

Problem 24. Which of the plots illustrates a case with $b = 0, r = 1, h = 2$?

a) **b**) **c**) **d**) **e**) **f**) **g**) **h**) **i**) **j**) **k**)⋆ **l**)

Problem 25. Which of the plots illustrates a case with $b = 3, r = 0, h = 2$?

a) **b**) **c**) **d**) **e**) **f**)⋆ **g**) **h**) **i**) **j**) **k**) **l**)

Problem 26. Which of the plots illustrates a case with $r = 1$ and $\delta_1 < 0$?

a) **b**)⋆ **c**) **d**) **e**) **f**) **g**) **h**) **i**) **j**) **k**) **l**)

Problem 27. For a transfer function with $b = 0$, $h = 0$, and $r = 2$, the v-weights $v_0, v_1, v_2, v_3, \ldots$ will ________. (Note: This question does not use the plots.)

a) always decay sinusoidally to zero
b)⋆ sometimes decay sinusoidally to zero
c) always satisfy $v_i = 0$ for $i < 2$
d) sometimes satisfy $v_i = 0$ for $i < 2$
e) always decay exponentially to zero
f) always have a cutoff to zero after lag 2
g) sometimes have a cutoff to zero after lag 2
h) always decay exponentially after lag 2

The next two questions use the single page of SAS output with the title "Some Identification Output" which is attached to the end of the exam.

In these questions, circle the two choices which correctly fill in the blanks in the following sentence.

We know that the time series displayed in this output has been _________ because of the _________.

Problem 28. Select the choice which correctly fills the first blank.

a)⋆ over-differenced **b**) under-differenced **c**) properly differenced

Problem 29. Select the choice which correctly fills the second blank.

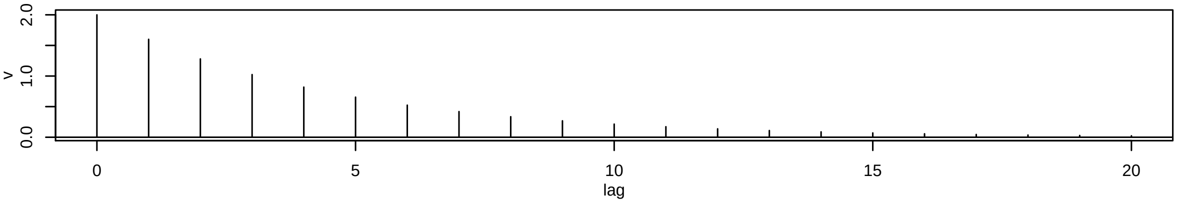
a) slowly decaying PACF
b) rapidly decaying PACF
c)⋆ slowly decaying IACF
d) rapidly decaying IACF
e) slowly decaying ACF
f) rapidly decaying ACF
g) highly significant P-values
h) non-significant P-values
i) constant mean
j) non-constant mean

Problem 30. Attached to the end of the exam are three pages with the title "Choosing a Seasonal Model". These pages give the sample ACF, PACF, and IACF for a stationary time series with monthly data (seasonality $s = 12$). Select a reasonable seasonal ARIMA model for this series from the list below. (Circle the best choice.)

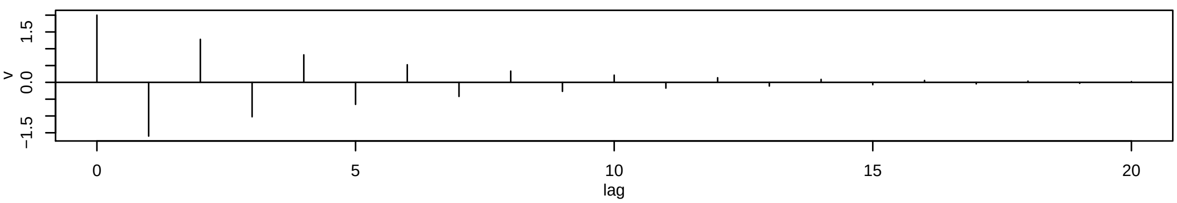
a) $(0,0,5)(0,0,4)_{12}$ **b**) $(0,0,5)(4,0,0)_{12}$ **c**) $(5,0,0)(0,0,4)_{12}$ **d**) $(5,0,0)(4,0,0)_{12}$
e) $(8,0,0)(4,0,0)_{12}$ **f**) $(8,0,0)(0,0,4)_{12}$ **g**) $(0,0,8)(4,0,0)_{12}$ **h**) $(0,0,8)(0,0,4)_{12}$
i)⋆ $(1,0,0)(1,0,0)_{12}$ **j**) $(1,0,0)(0,0,1)_{12}$ **k**) $(0,0,1)(1,0,0)_{12}$ **l**) $(0,0,1)(0,0,1)_{12}$

Transfer Function Plots (page 1)

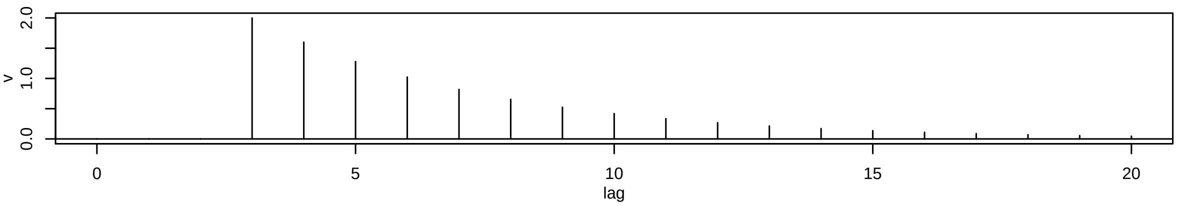
A



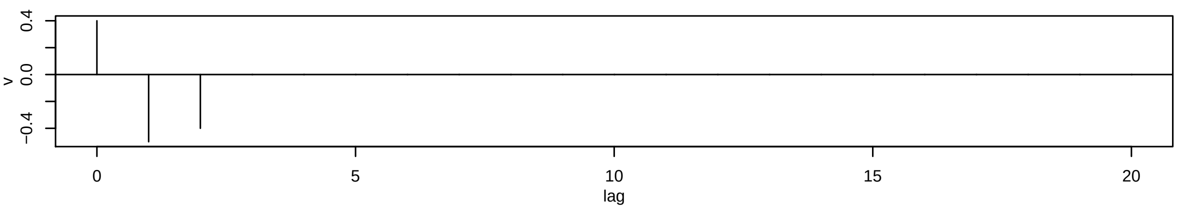
B



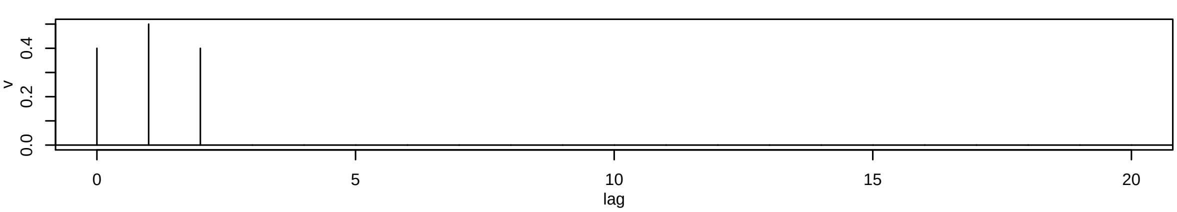
C



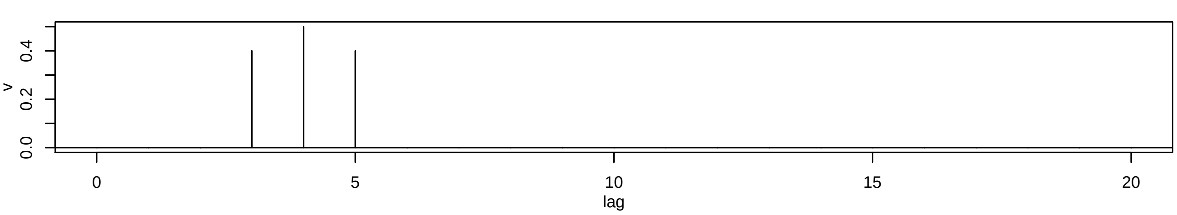
D



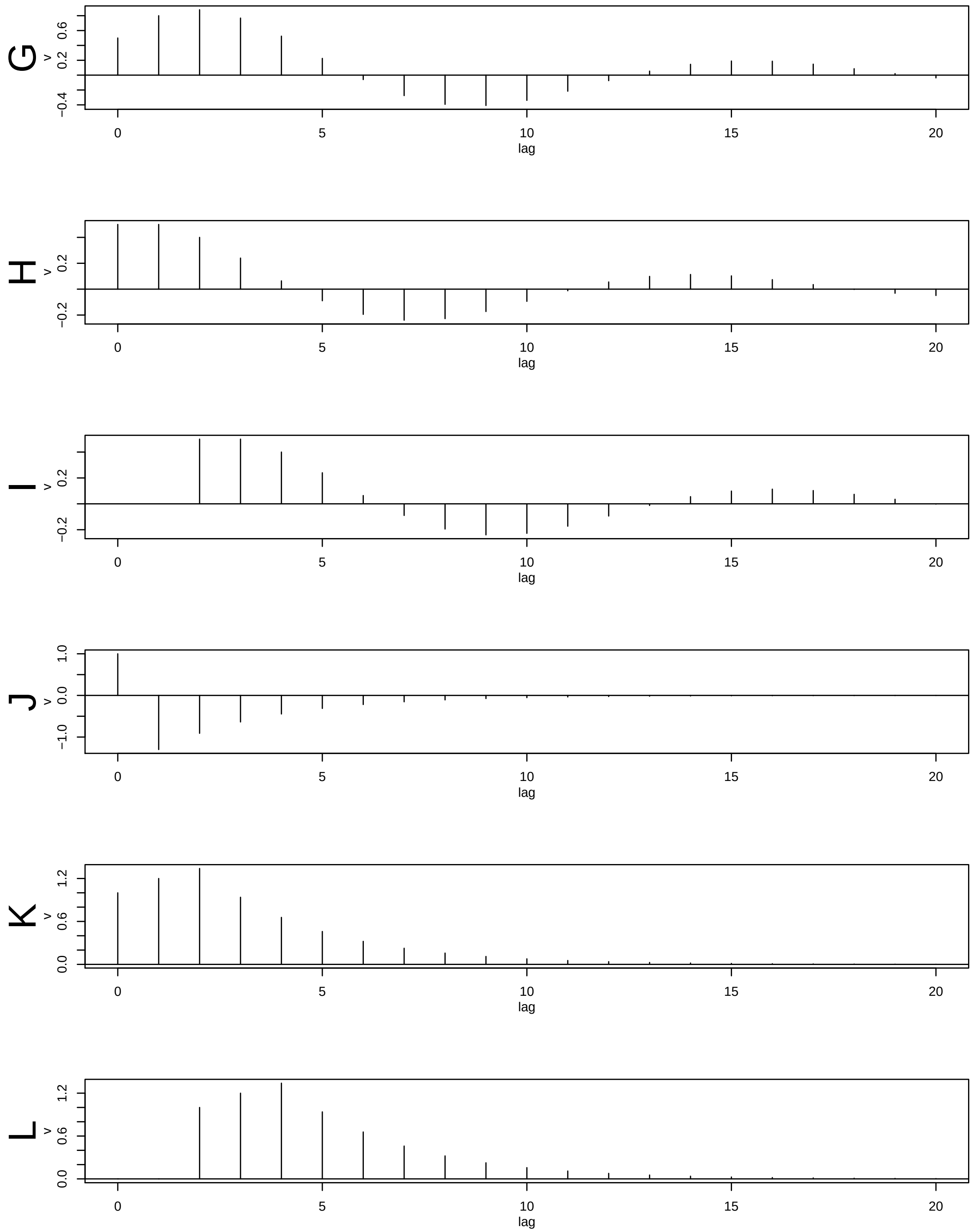
E



F



Transfer Function Plots (page 2)

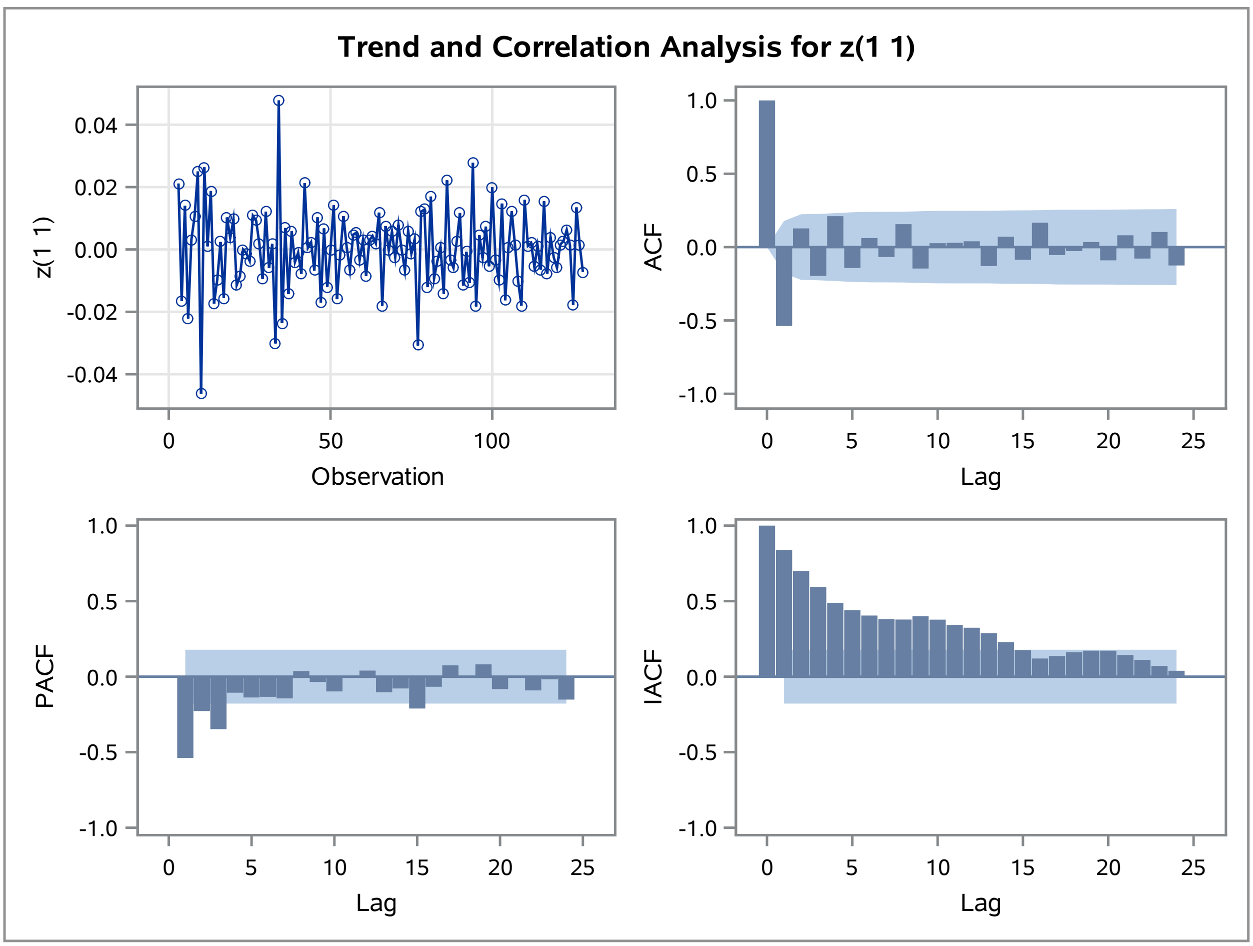


Some Identification Output

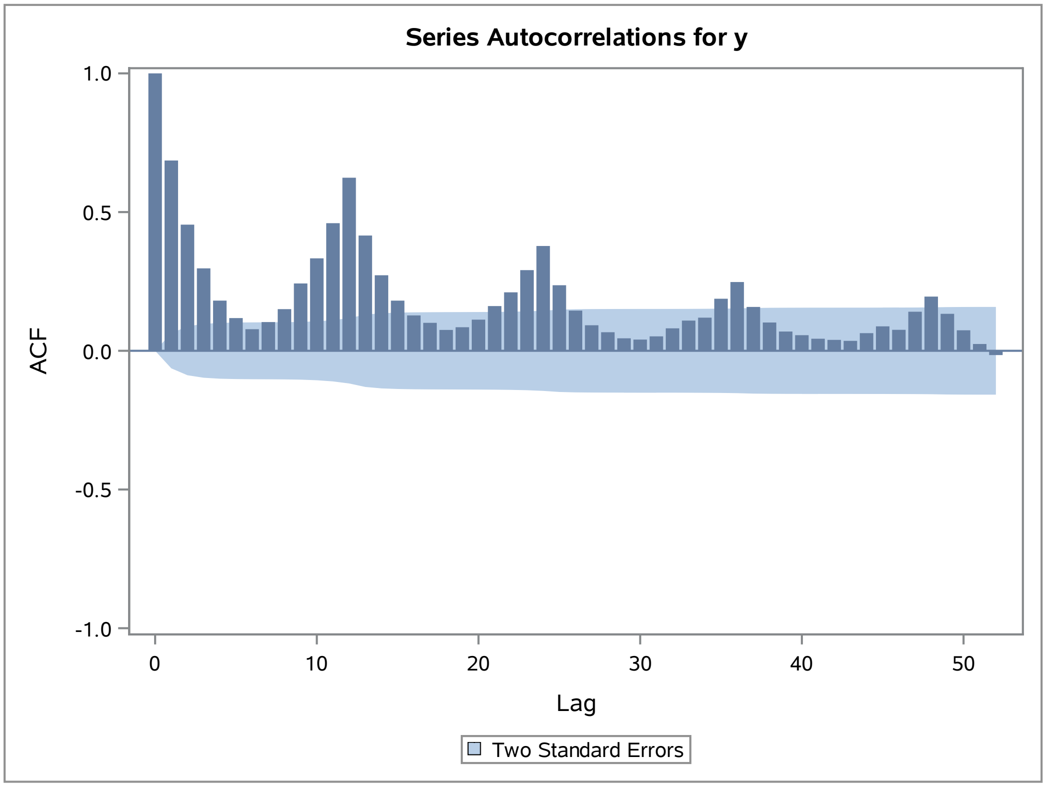
The ARIMA Procedure

Name of Variable = z	
Period(s) of Differencing	1,1
Mean of Working Series	0.000145
Standard Deviation	0.012795
Number of Observations	126
Observation(s) eliminated by differencing	2

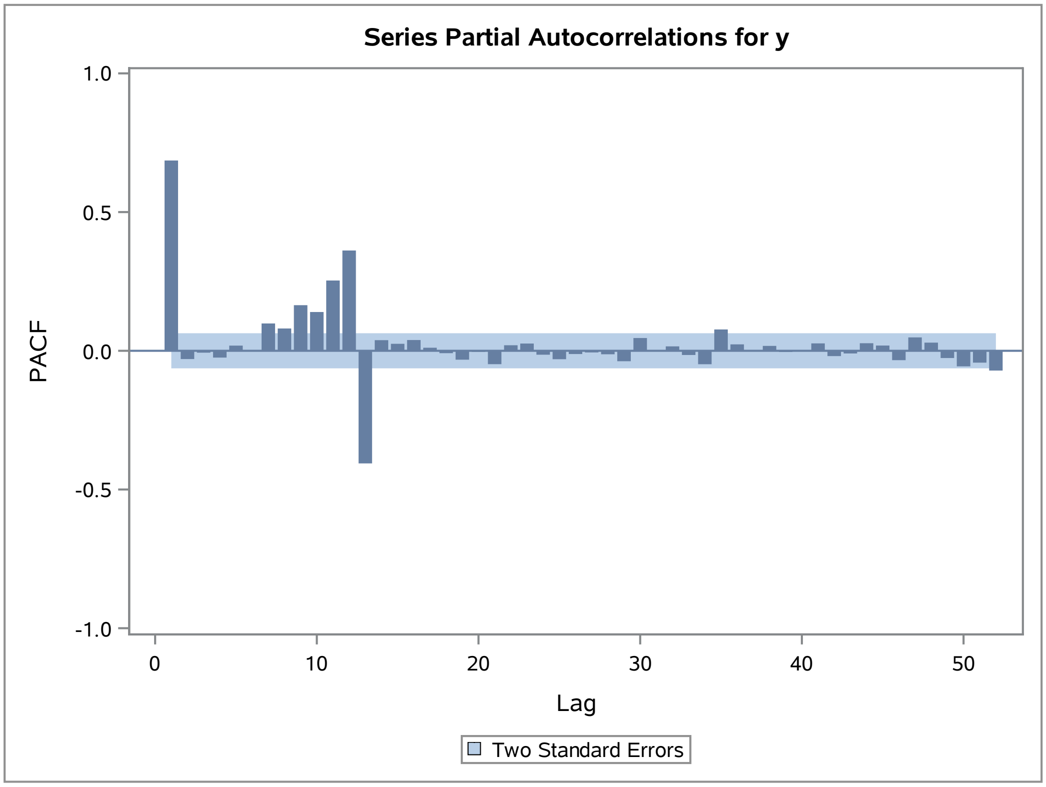
Autocorrelation Check for White Noise									
To Lag	Chi-Square	DF	Pr > ChiSq	Autocorrelations					
6	53.52	6	<.0001	-0.538	0.127	-0.196	0.211	-0.142	0.061
12	60.85	12	<.0001	-0.068	0.156	-0.146	0.027	0.030	0.040
18	69.64	18	<.0001	-0.129	0.071	-0.086	0.166	-0.054	-0.027
24	77.13	24	<.0001	0.034	-0.090	0.080	-0.078	0.103	-0.125



The ARIMA Procedure



The ARIMA Procedure



The ARIMA Procedure