

ECON 4115/5115 Exam – Professor Aadland

Fall 2020

1. Which of the following is an example of a time series?
 - a) Populations of each country in 2010
 - b) U.S. debt-to-GDP ratios for each year since 1950**
 - c) List of the 50 U.S. state capitals
 - d) Percentage of Republican votes for each congressional contest in 2020

2. The command to calculate descriptive statistics of a time series in R is:
 - a) *descriptive()*.
 - b) *statistics()*.
 - c) *summary()*.**
 - d) *average()*.

3. The *tsibble()* function in R is used to
 - a) import data from the internet.
 - b) decompose a time series into trend, seasonal and irregular components.
 - c) transform the data into logarithms.
 - d) create a time series object.**

4. Which of the following types of data are the least likely to exhibit seasonality?
 - a) annual data**
 - b) quarterly data
 - c) monthly data
 - d) daily data

5. What is the best way to visually see whether a time series exhibits seasonality?
 - a) regular time series graph
 - b) seasonal subseries plot**
 - c) scatter plot
 - d) lag plot

6. A time series with no discernable patterns or trends is called
- a) an ARMA process.
 - b) an integrated time series.
 - c) white noise.
 - d) a correlogram.
7. The three components of a time series decomposition are:
- a) trend, seasonality and irregular components.
 - b) lag, lead and contemporaneous components.
 - c) AR, integrated, and MA components.
 - d) log, level, and exponential components.
8. When making an inflation adjustment before forecasting, you should divide by
- a) nominal GDP.
 - b) inflation.
 - c) a measure of the price level such as the CPI.
 - d) deflation.
9. Which forecasting transformation is best for an exponentially growing time series?
- a) Natural logarithm transformation
 - b) Quadratic transformation
 - c) Sinusoidal transformation
 - d) Multiplicative transformation
10. Our notation for additively decomposing a time series is:
- a) $y_t = \varepsilon_t + T_t + x_t$.
 - b) $y_t = S_t + T_t + R_t$.
 - c) $y_t = x_t + D_t + z_t$.
 - d) $y_t = AR_t + I_t + MA_t$.

11. A 3-period MA estimate of the trend for the time series $y_t = \{1,2,3,4,5,6\}$ is:

- a) $\{2,3,4,5\}$.
- b) $\{1.5,2.5,3.5,4.5\}$.
- c) $\{1,3.5,6\}$.
- d) $\{3,4\}$.

12. The remainder (\hat{R}) component from a Classical decomposition is given by

- a) $\hat{R} = y_t - \hat{S}_t - \hat{T}_t$.
- b) $\hat{R} = y_t - \hat{x}_t - \hat{z}_t$.
- c) $\hat{R} = y_t + \hat{S}_t + \hat{T}_t$.
- d) $\hat{R} = y_t \times \hat{S}_t \times \hat{T}_t$.

13. The ACF of a time series is a function of the

- a) covariances with all the explanatory variables.
- b) correlations with all the explanatory variables.
- c) covariances with the lagged values of the same time series.
- d) correlations with the lagged values of the same time series.

14. The Box-Pierce and Ljung-Box tests are designed to test whether a time series is

- a) white noise.
- b) integrated.
- c) exponential.
- d) stationary.

15. The graphical representation of the ACF is also called the

- a) scatterplot.
- b) seasonal subseries plot.
- c) spatial lag plot.
- d) correlogram.

16. The average method generates future forecasts based on

- a) the average of all the historical data.
- b) an average of the last few observations.
- c) only the last observation.
- d) a moving average of recent observations.

17. The naïve method generates future forecasts based on

- a) the average of all the historical data.
- b) an average of the last few observations.
- c) only the last observation.
- d) a moving average of recent observations.

18. The seasonal naïve method generates future forecasts based on

- a) the average of all the historical data.
- b) the last observation from the same season of the year.
- c) only the last observation.
- d) a moving average of recent observations.

19. The residuals in a time series model are the difference between

- a) the actual observations and the average of the time series.
- b) the actual observations and the fitted values.
- c) the fitted values and the out-of-sample forecasts.
- d) the in-sample and out-of-sample forecasts.

20. The two main diagnostics to check residuals for are:

- a) zero mean and unit standard deviation.
- b) positive mean and standard deviation.
- c) zero mean and white noise residuals.
- d) white noise residuals and biased coefficient estimates.

21. Prediction intervals are typically written as:

- a) $\hat{y}_{T+h|T} \pm c\hat{\sigma}_h^2$.
- b) $\hat{y}_{T+h|T} + c\hat{\sigma}_h$.
- c) $\hat{y}_{T+h|T} - c\hat{\sigma}_h$.
- d) $\hat{y}_{T+h|T} \pm c\hat{\sigma}_h$.

22. If you want to ensure a forecast satisfies $a < \hat{y}_{T+h|T} < b$, the recommended procedure is:

- a) use the scaled logit transformation and then back-transform to the original series.
- b) transform the time series to logarithms.
- c) transform the time series using the quadratic function.
- d) transform the time series using moving averages.

23. The R function to evaluate forecasting accuracy is:

- a) *prediction()*.
- b) *forecast()*.
- c) *accuracy()*.
- d) *train()*.

24. The best way to assess the genuine forecasting accuracy of a model is to

- a) divide your sample into training (in-sample) and test (out-of-sample) data.
- b) maximize the R^2 for the in-sample fit.
- c) minimize the AIC in-sample.
- d) minimize the prediction interval around the point forecasts.

25. To divide the data into training (in-sample) and test (out-of-sample) subsamples in R, we use the

- a) *filter()* command.
- b) *forecast()* command.
- c) *tsibble()* command.
- d) *read()* command.

26. Which of the following is an example of judgmental forecasting?

- a) exponential smoothing
- b) ARIMA forecasts
- c) regression analysis
- d) scenario forecasting

27. Multiple linear regression models are defined by

- a) multiple lags of the dependent variable.
- b) multiple explanatory variables.
- c) moving averages with higher weights attached to more recent observations.
- d) one dependent variable and one predictor variable.

28. Spurious regressions are most often caused by

- a) predictors with too much variation.
- b) two trending variables with no causal relationship.
- c) cyclical time series.
- d) highly correlated predictor variables.

29. Which of the following is not a common use of dummy variables in regression models?

- a) capture seasonality
- b) account for outlier observations
- c) control for the impact of public holidays
- d) calculate the ACF of the residuals

30. Which of the following is not a good measure to select the forecasting model?

- a) AIC
- b) BIC
- c) Adjusted R^2
- d) R^2

31. One of the biggest difficulties of using regression models for forecasting is
- a) calculating confidence intervals.
 - b) estimating the coefficients.
 - c) interpreting the R^2 .
 - d) forecasting the predictor variables.
32. Which of the following is NOT a method for estimating a nonlinear trend?
- a) Spline regression
 - b) Exponential smoothing
 - c) Moving average
 - d) Delphi method
33. Multicollinearity (i.e., correlated predictors)
- a) makes it easy to estimate the individual coefficients on the predictor variables.
 - b) is not a serious problem for the purpose of forecasting.
 - c) makes it impossible to assess the goodness of fit.
 - d) will never occur in a linear regression model.
34. When using dummy variables to capture seasonality, you need to drop one category. This is also known as avoiding the
- a) correlation vs. causation trap.
 - b) dummy-variable trap.
 - c) forecasting trap.
 - d) regression trap.
35. The R command to execute exponential smoothing is
- a) *ETS()*.
 - b) *EXPS()*.
 - c) *SMOOTH()*.
 - d) *EXP_SMOOTH()*.

36. The weighted-average form of simple exponential smoothing (SES) is

- a) $\hat{y}_{T+1|T} = y_T + \hat{y}_{T|T-1}$.
- b) $\hat{y}_{T+1|T} = \alpha y_1 + (1 - \alpha)\hat{y}_{1|0}$.
- c) $\hat{y}_{T+1|T} = \alpha y_T + (1 - \alpha)\hat{y}_{T|T-1}$.
- d) $\hat{y}_{T+1|T} = \alpha(y_T + \hat{y}_{T|T-1})$.

37. An exponential smoothing parameter of $\alpha = 0.01$ will place relatively more weight

- a) on distant observations.
- b) on recent observations.
- c) on future observations.
- d) on the last observation.

38. An exponential smoothing parameter of $\alpha = 1.0$ will place a weight of ____ on the last observed data point.

- a) 0.0.
- b) 1.0.
- c) 2.0.
- d) 0.5.

39. State-space models for exponential smoothing are made up of

- a) an observation (measurement) and state (transition) equation.
- b) a trend and state (transition) equation.
- c) an observation (measurement) and seasonality equation.
- d) a trend and seasonality equation.

40. An exponential model ETS(E,T,S) with dampened trend, multiplicative seasonality, and additive errors is given by the following R notation:

- a) ETS("A","A","N").
- b) ETS("M","Ad","A").
- c) ETS("N","A","M").
- d) ETS("A","Ad","M").