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”).