Questions to Exam on the course «Mathematical methods in forecast»

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1) Give the definition of a time series. What is a strictly stationary time series?
2) Give the definition of a time series. What is a weakly stationary time series?
3) What is autocorrelation function and private autocorrelation functions? Name their applications.
4) What is "white noise"?
5) Describe an autoregressive process of order p. Under which condition is the process the AR(1)-process stationary?
6) What are the relations between the coefficients of the equation for the AR(1)-process and the values of its autocorrelation function?
7) What are the relations between the coefficients of the equation of the AR(2)-process and the values of its autocorrelation function?
8) Describe the moving average process of order q. Under which condition is the process SS(1) stationary?
9) Let the process $y_t - \phi_1 y_{t-1} = \delta + \varepsilon_t - \theta_1 \varepsilon_{t-1}$ be given. Determine the type of this process. Under which conditions is the process stationary?
10) Describe the process of a random walk and give its properties.
11) Describe the problem of nonstationary time series and its consequences. Give methods for detecting nonstationarity and correcting the series.
12) What is an integrable time series of order d?
13) What is the evaluation of the quality of ARIMA models? Provide some well-known criteria of the quality for ARIMA models.
14) Write the following process using the lag operator
$$y_t = \mu + \varphi_1 y_{t-1} + \varphi_2 y_{t-2} + \cdots + \varphi_p y_{t-p} + \varepsilon_t.$$
15) List the possible composition of the non-random components of a time series and some methods for determining their presence in the series.
16) Describe the moving average method. What is it used for?
17) Describe the weighted moving average method. What is it used for?
18) What is the difference between the simple exponential smoothing and the linear exponential smoothing?
19) What is the essence of Brown's method? What is the multiple exponential smoothing?
20) Write down the Gauss-Markov conditions for a multiple linear regression.
21) Give the definition of the coefficient of determination, its interpretation and applications.
22) Give definitions of a point forecast and an interval forecast. How to calculate the interval forecast if the point forecast and the standard error of the forecast are given?
23) What is the meaning of the "standard error of a regression coefficient"?
24) Which test is used to check significance of a linear regression equation?
25) Based on which indicators can you judge the quality of coefficients of the regression model?
26) What are the standardized coefficients of a multiple regression? What is their meaning?
27) Define and interpret the partial elasticity coefficients. For what purpose are they used?
28) What properties should the errors of the linear regression equation satisfy?
29) What is the method of least squares?
30) The regression $y = \beta_0 + \beta_0 x + \varepsilon$ is estimated based on two observations. What is the coefficient of determination?
31) Describe the concept of multicollinearity. Consequences multicollinearity, methods of its detection and ways to get rid of multicollinearity.
32) Give the definition of the coefficient of determination and the adjusted coefficient of determination. What is their difference? Application area?