Student name:\_\_\_\_\_\_\_\_\_\_

**1)** A real estate builder wishes to determine how house size (House) is influenced by family income (Income), family size (Size), and education of the head of household (School). House size is measured in hundreds of square feet, income is measured in thousands of dollars, and education is measured in years. The builder randomly selected 50 families and ran a multiple regression. The regression statistics are below:Regression Statistics

|  |  |  |
| --- | --- | --- |
|  |  |  |
| R Square |  | 0.748 |
| Adjusted R Square |  | 0.726 |
| Standard Error |  | 5.195 |
| Observations |  | 50 |
|  |
| ANOVA Table |
|  | df | SS | MS | F | Sig. F |
| Regression |  |  | 3605.7736 |  |  | 901.4434 |  |  |  |  |  | 0.0001 |  |
| Error |  |  | 1214.2264 |  |  | 29.9892 |  |  |  |  |  |  |  |
| Total | 49 |  | 4820.0000 |  |  |  |  |  |  |  |  |  |  |
|  |
|  | Coefficient | Std. Error | T-test | P-Value |
| Intercept |  |  | −1.6335 |  |  | 5.8078 |  |  |  | −0.281 |  |  | 0.7798 |  |
| Income |  |  | 0.4485 |  |  | 0.1137 |  |  |  | 3.9545 |  |  | 0.0003 |  |
| Size |  |  | 4.2615 |  |  | 0.8062 |  |  |  | 5.286 |  |  | 0.0001 |  |
| School |  |  | −0.6517 |  |  | 0.4319 |  |  |  | −1.509 |  |  | 0.1383 |  |
|  |

Dependent variable is House.Referring to the Real Estate Builder regression results, which of the following values for the level of significance is the greatest for which all explanatory variables are significant individually?

A) 95%   
 B) 99%  
 C) 85%  
 D) 97.5%

**2)** A real estate builder wishes to determine how house size (House) is influenced by family income (Income), family size (Size), and education of the head of household (School). House size is measured in hundreds of square feet, income is measured in thousands of dollars, and education is measured in years. The builder randomly selected 50 families and ran a multiple regression. The regression statistics are below:Regression Statistics

|  |  |  |
| --- | --- | --- |
|  |  |  |
| R Square |  | 0.748 |
| Adjusted R Square |  | 0.726 |
| Standard Error |  | 5.195 |
| Observations |  | 50 |
|  |
| ANOVA Table |
|  | df | SS | MS | F | Sig. F |
| Regression |  |  | 3605.7736 |  |  | 901.4434 |  |  |  |  |  | 0.0001 |  |
| Error |  |  | 1214.2264 |  |  | 29.9892 |  |  |  |  |  |  |  |
| Total | 49 |  | 4820.0000 |  |  |  |  |  |  |  |  |  |  |
|  |
|  | Coefficient | Std. Error | T-test | P-Value |
| Intercept |  |  | −1.6335 |  |  | 5.8078 |  |  |  | −0.281 |  |  | 0.7798 |  |
| Income |  |  | 0.4485 |  |  | 0.1137 |  |  |  | 3.9545 |  |  | 0.0003 |  |
| Size |  |  | 4.2615 |  |  | 0.8062 |  |  |  | 5.286 |  |  | 0.0001 |  |
| School |  |  | −0.6517 |  |  | 0.4319 |  |  |  | −1.509 |  |  | 0.1383 |  |
|  |

Dependent variable is House.Referring to the Real Estate Builder regression results, which of the following values for the level of significance is the greatest for which at least two explanatory variables are significant individually?' rev: 09\_28\_2018\_QC\_CS-140801, 04\_11\_2019\_QC\_CS-165786

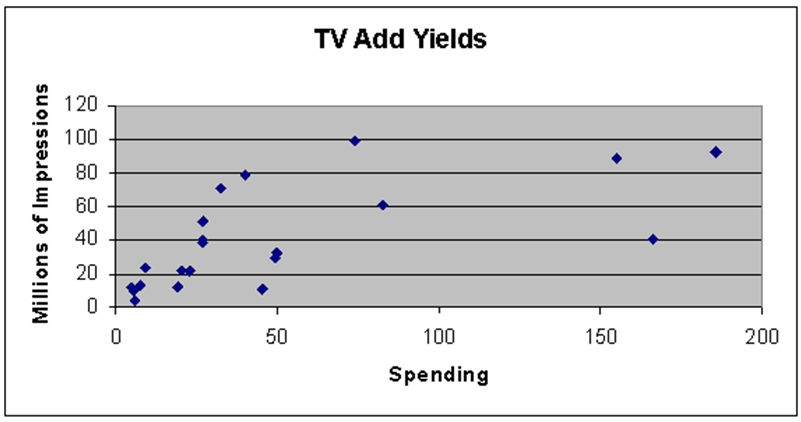
A) 85%   
 B) 95%  
 C) 99%  
 D) 97.5%

**3)** In a linear regression problem, we are using "R-squared" to measure goodness-of-fit. We add a feature in linear regression model and retrain the same model.Which of the following options is true?

A) None of the options are correct.   
 B) Individually, R squared cannot tell about variable importance. We can’t say anything about it right now.  
 C) If R Squared increases, this variable is significant.  
 D) If R Squared decreases, this variable is not significant.

**4)** If autocorrelation is caused by an omitted variable, which technique is not likely to reduce any bias due to the omitted variable?

A) Apply Cochrane-Orcutt.   
 B) Add another independent variable.  
 C) Respecify the model.  
 D) Add a squared value of an independent variable.  
 E) None of the options are correct.

**5)** Television Add YieldsTelevision add yields are sometimes measured in millions of retained impressions. The following two regressions model the effectiveness of adds for 21 consumer products. The data is from The Wall Street Journal, March 1, 1984.The variables collected for each of the 21 products are:SPENDING: TV advertising budget, ($ millions) MILIMP: Millions of retained impressions,MILIMP Sqrd: Millions of retained impressions squared.A scatterplot of the data used appears below:Regression #1

|  |
| --- |
| Audit Trail — ANOVA Table (Multiple Regression Selected) |
| Source of variation | SS | df | MS | SEE |
| Regression |  | 7,723.28 |  |  | 1 |  |  | 7,723.28 |  |  |  |  |
| Error |  | 10,494.11 |  |  | 19 |  |  | 552.32 |  |  | 23.50 |  |
| Total |  | 18,217.39 |  |  | 20 |  |  |  |  |  |  |  |
|  |
| Audit Trail — Coefficient Table (Multiple Regression Selected) |  |
| Series Description | Included in Model | Coefficient | Standard Error | T-test | P-value | F-test | Elasticity | Overall F-test |
| Spending |  | Yes |  |  | 0.36 |  |  | 0.10 |  |  | 3.74 |  |  | 0.00 |  |  | 13.98 |  |  | 0.45 |  |  |  |  |
| Milimp |  | Dependent |  |  | 22.16 |  |  | 7.09 |  |  | 3.13 |  |  | 0.01 |  |  | 9.77 |  |  |  |  |  | 13.98 |  |
|  |
| Audit Trail — Correlation Coefficient Table |
| Series Description | Included in Model | Spending | Milimp |
| Spending |  | Yes |  |  | 1.00 |  |  | 0.65 |  |
| Milimp |  | Dependent |  |  | 0.65 |  |  | 1.00 |  |
|  |
| Audit Trail - Statistics |  |  |  |  |  |
| Accuracy Measures | Value |  | Forecast Statistics | Value |  |
| AIC | 192.09 |  | Durbin Watson(4) | 1.50 |  |
| BIC | 193.13 |  | Mean | 40.47 |  |
| Mean Absolute Percentage Error (MAPE) | 82.67 | % | Standard Deviation | 30.18 |  |
| R-Square | 42.40 | % | Max | 99.60 |  |
| Adjusted R-Square | 39.36 | % | Min | 4.40 |  |
| Mean Square Error | 499.72 |  | Range | 95.20 |  |
| Root Mean Square Error | 22.35 |  | Root Mean Square | 29.45 |  |
| Theil | 0.43 |  | Ljung-Box | 10.45 |  |
|  |

Regression #2

|  |
| --- |
| Audit Trail — ANOVA Table (Multiple Regression Selected) |
| Source of variation | SS | df | MS | SEE |
| Regression |  | 17236.77 |  |  | 2 |  |  | 8,61838 |  |  |  |  |
| Error |  | 980.62 |  |  | 18 |  |  | 54.48 |  |  | 7.38 |  |
| Total |  | 18,217.39 |  |  | 20 |  |  |  |  |  |  |  |
|  |
| Audit Trail — Coefficient Table (Multiple Regression Selected) |  |
| Series Description | Included in Model | Coefficient | Standard Error | T-test | P-value | F-test | Elasticity | Overall F-test |
| Spending |  | Yes |  |  | 0.03 |  |  | 0.04 |  |  | 0.74 |  |  | 0.47 |  |  | 0.55 |  |  | 0.04 |  |  |  |  |
| Milimp |  | Dependent |  |  | 16.33 |  |  | 2.27 |  |  | 7.19 |  |  | 0.00 |  |  | 51.74 |  |  |  |  |  | 158.20 |  |
| Milimp Sqrd |  | Yes |  |  | 0.01 |  |  | 0.00 |  |  | 13.21 |  |  | 0.00 |  |  | 174.63 |  |  | 0.56 |  |  |  |  |
|  |
| Audit Trail — Correlation Coefficient Table |  |
| Series Description | Included in Model | Spending | Milimp | Milimp Sqrd |
| Spending |  | Yes |  |  | 1.00 |  |  | 0.65 |  |  | 0.64 |  |
| Milimp |  | Dependent |  |  | 0.65 |  |  | 1.00 |  |  | 0.97 |  |
| Milimp Sqrd |  | Yes |  |  | 0.64 |  |  | 0.97 |  |  | 1.00 |  |
|  |
| Audit Trail - Statistics |  |  |  |  |  |
| Accuracy Measures | Value |  | Forecast Statistics | Value |  |
| AIC | 142.21 |  | Durbin Watson(4) | 1.42 |  |
| BIC | 143.36 |  | Mean | 40.47 |  |
| Mean Absolute Percentage Error (MAPE) | 35.54 | % | Standard Deviation | 30.18 |  |
| R-Square | 94.62 | % | Max | 99.60 |  |
| Adjusted R-Square | 94.02 | % | Min | 4.40 |  |
| Mean Square Error | 46.70 |  | Range | 95.20 |  |
| Root Mean Square Error | 6.83 |  | Root Mean Square | 29.45 |  |
| Theil | 0.12 |  | Ljung-Box | 7.15 |  |
|  |

For the TV Add Yield regressions above,

A) a forecast confidence interval will be wider for Regression #2.   
 B) None of the options are correct.  
 C) only Regression #1 has acceptable t-statistics.  
 D) the standard error of the estimate is better for Regression #2.  
 E) the standard error of the estimate is better for Regression #1.

**6)** Lackland  
   
 Lackland Ski Resort uses multiple regression to forecast ski lift revenues for the next week based on the forecasted number of days with temperatures above 10 degrees and predicted number of inches of snow. The following function has been developed:Sales = 10,902 255 (number days predicted above 10 degrees) 300 (number of inches of snow predicted)  
   
 Other information generated from the analysis include  
   
 Adjusted R2 = 0.6789  
   
 Standard Error of the Estimate (SEE) = 1,879  
   
 F-statistic = 6.279 with a significance of 0.049  
   
 Assume that the management predicts the number of days above 10 degrees for the next week to be 6 and the number of inches of snow to be 12. Calculate the predicted amount of revenue for the next week.

A) $16,032   
 B) $20,547  
 C) $11,362  
 D) $10,902

**7)** Dummy variables

A) are used to measure the presence or absence of a certain attribute.   
 B) are indicator random variables.  
 C) can be used to model the effects of seasonality in the data.  
 D) normally take on the value of either zero or one.  
 E) All of the options are correct.

**8)** LacklandLackland Ski Resort uses multiple regression to forecast ski lift revenues for the next week based on the forecasted number of days with temperatures above 10 degrees and predicted number of inches of snow. The following function has been developed:Sales = 10,902 + 255 (number days predicted above 10 degrees) + 300 (number of inches of snow predicted)Other information generated from the analysis includeAdjusted R2 = 0.6789Standard Error of the Estimate (SEE) = 1,879F-statistic = 6.279 with a significance of 0.049Which variable(s) in this function is (are) the dependent variable(s)?

A) Predicted number of inches of snow   
 B) Predicted number of days above 10 degrees  
 C) Predicted number of days above 10 degrees and predicted number of inches of snow  
 D) Sales

**9)** Domestic Car SalesConsider the following multiple regression model of domestic car sales (DCS) where:DCS = domestic car salesDCSP = domestic car sales price (in dollars)PR = prime rate as a percent (i.e., 10% would be entered as 10)Q2 = quarter 2 dummy variableQ3 = quarter 3 dummy variableQ4 = quarter 4 dummy variableMultiple Regression— Result FormulaDCS = 3,266.66 + ((DCSP) × −0.098297) + ((PR) × −21.17) + ((Q2) × 292.88) + ((Q3) × 149.07) + ((Q4) × −60.25)

|  |
| --- |
| Audit Trail — ANOVA Table (Multiple Regression Selected) |
| Source of variation | SS | df | MS | SEE |
| Regression |  | 1,834,180.23 |  |  | 5 |  |  | 366,836.05 |  |  |  |  |
| Error |  | 494,506.47 |  |  | 34 |  |  | 14,544.31 |  |  | 120.60 |  |
| Total |  | 2,328,686.70 |  |  | 39 |  |  |  |  |  |  |  |
|  |
| Audit Trail — Coefficient Table (Multiple Regression Selected) |  |
| Series Description | Included in Model | Coefficient | Standard Error | T-test | P-value | F-test | Elasticity | Overall F-test |
| DCS |  | Dependent |  |  | 3,266.66 |  |  | 288.10 |  |  | 11.34 |  |  | 0.00 |  |  | 128.56 |  |  |  |  |  | 25.22 |  |
| DCSP |  | Yes |  |  | −0.10 |  |  | 0.01 |  |  | −7.18 |  |  | 0.00 |  |  | 51.50 |  |  | −0.76 |  |  |  |  |
| PR |  | Yes |  |  | −21.17 |  |  | 13.77 |  |  | −1.54 |  |  | 0.13 |  |  | 2.36 |  |  | −0.11 |  |  |  |  |
| Q2 |  | Yes |  |  | 292.88 |  |  | 54.02 |  |  | 5.42 |  |  | 0.00 |  |  | 29.39 |  |  | 0.04 |  |  |  |  |
| Q3 |  | Yes |  |  | 149.07 |  |  | 54.11 |  |  | 2.76 |  |  | 0.01 |  |  | 7.59 |  |  | 0.02 |  |  |  |  |
| Q4 |  | Yes |  |  | −60.25 |  |  | 54.22 |  |  | −1.11 |  |  | 0.27 |  |  | 1.23 |  |  | −0.01 |  |  |  |  |
|  |
| Audit Trail - Statistics |  |  |  |  |  |
| Accuracy Measures | Value |  | Forecast Statistics | Value |  |
| AIC | 492.41 |  | Durbin Watson | 1.62 |  |
| BIC | 494.10 |  | Mean | 1,802.86 |  |
| Mean Absolute Percentage Error (MAPE) | 5.30 | % | Standard Deviation | 244.36 |  |
| R-Square | 78.76 | % | Max | 2,272.60 |  |
| Adjusted R-Square | 75.64 | % | Min | 1,421.30 |  |
| Root Mean Square Error | 111.19 |  | Range | 851.30 |  |
|  |

The domestic car sales model

A) None of the options are correct.   
 B) was estimated using a least squares model.  
 C) is a linear model.  
 D) could be used to forecast DCS at some future date.  
 E) All of the options are correct.

**10)** A real estate builder wishes to determine how house size (House) is influenced by family income (Income), family size (Size), and education of the head of household (School). House size is measured in hundreds of square feet, income is measured in thousands of dollars, and education is measured in years. The builder randomly selected 50 families and ran a multiple regression. The regression statistics are below:Regression Statistics

|  |  |  |
| --- | --- | --- |
|  |  |  |
| R Square |  | 0.748 |
| Adjusted R Square |  | 0.726 |
| Standard Error |  | 5.195 |
| Observations |  | 50 |
|  |
| ANOVA Table |
|  | df | SS | MS | F | Sig. F |
| Regression |  |  | 3605.7736 |  |  | 901.4434 |  |  |  |  |  | 0.0001 |  |
| Error |  |  | 1214.2264 |  |  | 29.9892 |  |  |  |  |  |  |  |
| Total | 49 |  | 4820.0000 |  |  |  |  |  |  |  |  |  |  |
|  |
|  | Coefficient | Std. Error | T-test | P-Value |
| Intercept |  |  | −1.6335 |  |  | 5.8078 |  |  |  | −0.281 |  |  | 0.7798 |  |
| Income |  |  | 0.4485 |  |  | 0.1137 |  |  |  | 3.9545 |  |  | 0.0003 |  |
| Size |  |  | 4.2615 |  |  | 0.8062 |  |  |  | 5.286 |  |  | 0.0001 |  |
| School |  |  | −0.6517 |  |  | 0.4319 |  |  |  | −1.509 |  |  | 0.1383 |  |
|  |

Dependent variable is House.Referring to the Real Estate Builder regression results, which of the independent variables in the model are statistically significant at the 98% level?

A) Size, School   
 B) Income, School  
 C) Income, Size  
 D) Income, Size, School

**11)** Personnel TestThe personnel department of a large manufacturing firm selected a random sample of 23 workers. The workers were interviewed and given several tests. On the basis of the test results, the following variables were investigated: X2 = manual dexterity score, X3 = mental aptitude score, and X4 = personnel assessment score.Subsequently, the workers were observed in order to determine the average number of units of work completed (Y) in a given time period for each worker. Regression analysis yielded these results:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| y | = | −212 |  | + | 1.90X2 |  | + | 2.00X3 |  | + | 0.25X4 |  | Adjusted R2 | = | 0.75. |
|  |  |  |  |  | (0.50) |  |  | (0.060) |  |  | (0.20) |  |

Note: The numbers shown in parentheses below the coefficients are the standard errors of the coefficients.The quantities in parentheses are the standard errors of the regression coefficients. The standard error of the regression is 25, and the standard deviation of the dependent variable is 50.Which of the following statements is the correct interpretation of the mental aptitude regression coefficient?

A) If we increase mental aptitude by one unit, holding the other predictor variables constant, units of work completed will increase by an average of 2.0.   
 B) If we increase units of work completed by one unit, holding the other predictor variables constant, the mental aptitude score will increase by an average of 2.0.  
 C) If we increase mental aptitude by one unit, holding the other predictor variables constant, units of work completed will increase by an average of 0.6.  
 D) If we increase mental aptitude by one unit, units of work completed will increase by an average of 2.0 even if the other predictor variables change.  
 E) If we increase mental aptitude by one unit, holding the other predictor variables constant, units of work completed will decrease by an average of 0.6.

**12)** In using quarterly time series data, which quarter can serve as the base period for interpretation of dummy variables?

A) Quarter one   
 B) Quarter three  
 C) Quarter four  
 D) Any of the above.  
 E) Quarter two

**13)** Which of the following metrics can be used for evaluating regression models?1) t Statistics2) Adjusted R Squared3) F Statistics4) RMSE

A) 2 and 3 are correct.   
 B) 2, 3, and 4 are correct.  
 C) 1 and 2 are correct.  
 D) All (1, 2, 3, and 4) are correct.

**14)** The value of the F-statistic applied to multiple regression can be rewritten in terms of the estimated

A) standard error of the Y-intercept.   
 B) None of the options are correct.  
 C) correlation between independent variables.  
 D) R-squared.  
 E) Durbin-Watson statistic.

**15)** ForecastX RegressionsExhibit #1

|  |  |  |
| --- | --- | --- |
| Audit Trail — Coefficient Table (Multiple Regression Selected) |  |  |
| Series  Description | Included in Model |  | Coefficient |  | Standard Error |  | T-test |  | P-value |  | F-test |  | Elasticity |  | Overall F-test |
| SALES |  | Dependent |  |  |  | −51.24 |  |  |  | 54.32 |  |  |  | −0.94 |  |  |  | 0.36 |  |  |  | 0.89 |  |  |  |  |  |  |  | 8.98 |  |
| PRICE |  | Yes |  |  |  | 30.92 |  |  |  | 10.32 |  |  |  | 3.00 |  |  |  | 0.01 |  |  |  | 8.98 |  |  |  | 1.46 |  |  |  |  |  |
|  |
| Audit Trail — Correlation Coefficient Table |
| Series Description | Included in Model | SALES | PRICE |
| SALES |  | Dependent |  |  | 1.00 |  |  | 0.63 |  |
| PRICE |  | Yes |  |  | 0.63 |  |  | 1.00 |  |
|  |
| Audit Trail - Statistics |
| Accuracy Measures | Value |  | Forecast Statistics | Value |  |
| AIC | 130.02 |  | Durbin Watson(1) | 0.34 |  |
| BIC | 130.80 |  | Mean | 111.19 |  |
| Mean Absolute Percentage Error (MAPE) | 10.67 | % | Standard Deviation | 17.49 |  |
| R-Square | 39.07 | % | Ljung-Box | 39.71 |  |
| Adjusted R-Square | 34.72 | % |  |  |  |
| Root Mean Square Error | 13.22 |  |  |  |  |
|  |

Exhibit #2

|  |  |
| --- | --- |
| Audit Trail — Coefficient Table (Multiple Regression Selected) |  |
| Series  Description | Included in Model | Coefficient | Standard Error | T-test | P-value | F-test | Elasticity | Overall F-test |
| SALES |  | Dependent |  |  | 123.47 |  |  | 19.40 |  |  | 6.36 |  |  | 0.00 |  |  | 40.51 |  |  |  |  |  | 154.86 |  |
| PRICE |  | Yes |  |  | −24.84 |  |  | 4.95 |  |  | −5.02 |  |  | 0.00 |  |  | 25.17 |  |  | −1.17 |  |  |  |  |
| INCOME |  | Yes |  |  | 0.03 |  |  | 0.00 |  |  | 13.55 |  |  | 0.00 |  |  | 183.62 |  |  | 1.06 |  |  |  |  |
|  |
| Audit Trail — Correlation Coefficient Table |  |
| Series Description | Included in Model | SALES | PRICE | INCOME |
| SALES |  | Dependent |  |  | 1.00 |  |  | 0.63 |  |  | 0.94 |  |
| PRICE |  | Yes |  |  | 0.63 |  |  | 1.00 |  |  | 0.83 |  |
| INCOME |  | Yes |  |  | 0.94 |  |  | 0.83 |  |  | 1.00 |  |
|  |
| Audit Trail - Statistics |
| Accuracy Measures | Value |  | Forecast Statistics | Value |  |
| AIC | 86.56 |  | Durbin Watson(1) | 1.67 |  |
| BIC | 87.34 |  | Mean | 111.19 |  |
| Mean Absolute Percentage Error (MAPE) | 2.22 | % | Standard Deviation | 17.49 |  |
| R-Square | 95.97 | % | Ljung-Box | 15.22 |  |
| Adjusted R-Square | 95.35 | % |  |  |  |
| Root Mean Square Error | 3.40 |  |  |  |  |
|  |

Consider the two regressions shown above.

A) The simple regression probably suffers from multicollinearity.   
 B) The simple regression probably suffers from specification error.  
 C) The multiple regression probably suffers from specification error.  
 D) The multiple regression probably suffers from autocorrelation.

**16)** Perfect multicollinearity is the

A) presence of significant covariation between adjacent residuals.   
 B) absence of significant covariation between adjacent residuals.  
 C) presence of a perfect linear association among independent variables in the sample.  
 D) presence of zero linear association among independent variables in the sample.  
 E) None of the options are correct.

**17)** Domestic Car SalesConsider the following multiple regression model of domestic car sales (DCS) where:DCS = domestic car salesDCSP = domestic car sales price (in dollars)PR = prime rate as a percent (i.e., 10% would be entered as 10)Q2 = quarter 2 dummy variableQ3 = quarter 3 dummy variableQ4 = quarter 4 dummy variableMultiple Regression— Result FormulaDCS = 3,266.66 + ((DCSP) × −0.098297) + ((PR) × −21.17) + ((Q2) × 292.88) + ((Q3) × 149.07) + ((Q4) × −60.25)

|  |
| --- |
| Audit Trail — ANOVA Table (Multiple Regression Selected) |
| Source of variation | SS | df | MS | SEE |
| Regression |  | 1,834,180.23 |  |  | 5 |  |  | 366,836.05 |  |  |  |  |
| Error |  | 494,506.47 |  |  | 34 |  |  | 14,544.31 |  |  | 120.60 |  |
| Total |  | 2,328,686.70 |  |  | 39 |  |  |  |  |  |  |  |
|  |
| Audit Trail — Coefficient Table (Multiple Regression Selected) |  |
| Series Description | Included in Model | Coefficient | Standard Error | T-test | P-value | F-test | Elasticity | Overall F-test |
| DCS |  | Dependent |  |  | 3,266.66 |  |  | 288.10 |  |  | 11.34 |  |  | 0.00 |  |  | 128.56 |  |  |  |  |  | 25.22 |  |
| DCSP |  | Yes |  |  | −0.10 |  |  | 0.01 |  |  | −7.18 |  |  | 0.00 |  |  | 51.50 |  |  | −0.76 |  |  |  |  |
| PR |  | Yes |  |  | −21.17 |  |  | 13.77 |  |  | −1.54 |  |  | 0.13 |  |  | 2.36 |  |  | −0.11 |  |  |  |  |
| Q2 |  | Yes |  |  | 292.88 |  |  | 54.02 |  |  | 5.42 |  |  | 0.00 |  |  | 29.39 |  |  | 0.04 |  |  |  |  |
| Q3 |  | Yes |  |  | 149.07 |  |  | 54.11 |  |  | 2.76 |  |  | 0.01 |  |  | 7.59 |  |  | 0.02 |  |  |  |  |
| Q4 |  | Yes |  |  | −60.25 |  |  | 54.22 |  |  | −1.11 |  |  | 0.27 |  |  | 1.23 |  |  | −0.01 |  |  |  |  |
|  |
| Audit Trail - Statistics |  |  |  |  |  |
| Accuracy Measures | Value |  | Forecast Statistics | Value |  |
| AIC | 492.41 |  | Durbin Watson | 1.62 |  |
| BIC | 494.10 |  | Mean | 1,802.86 |  |
| Mean Absolute Percentage Error (MAPE) | 5.30 | % | Standard Deviation | 244.36 |  |
| R-Square | 78.76 | % | Max | 2,272.60 |  |
| Adjusted R-Square | 75.64 | % | Min | 1,421.30 |  |
| Root Mean Square Error | 111.19 |  | Range | 851.30 |  |
|  |

For the domestic car sales regression above, assume that:DCSP = $10,000PR = 10 percentand that it is the first quarter of the year.What will DCS be predicted to be by the regression model?

A) 2,054.96   
 B) 6,545.45  
 C) 1,858.62  
 D) 3,466.16

**18)** Estimated Demand FunctionThe following is an estimated demand function:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Q |  | = |  | 875 |  | + |  | 6XA |  | + | 15Y |  | − | 5P |  |
|  |  |  |  |  |  |  | (125) |  | (2) |  |  | (−1.2) |

Where Q is quantity sold, XA is advertising expenditure (in thousands of dollars), Y is income (in thousands of dollars), and P is the good’s price. The standard errors for each estimate are in parentheses. The equation has been estimated from 10 years of quarterly data. The R2 was 0.92; the F-statistic was 57; the Standard Error of the Estimate (SEE) is 25.Suppose the values of the explanatory variables next period are: Advertising = $100,000; Income = $10,000; and Price = $100. Using the above fitted regression, what is the predicted value of sales?

A) 1125   
 B) Unable to determine from the information given.  
 C) 2125  
 D) 1870  
 E) 1625

**19)** Which of the following indicates a fairly strong relationship between X and Y?

A) The Correlation coefficient = 0.9   
 B) The t-statistic for the coefficient = 0 is 30  
 C) The p-value for the coefficient = 0 is 0.0001  
 D) None of the options are correct.

**20)** Large and complicated forecasting models

A) are expensive to maintain.   
 B) tend to put too much emphasis on quantitative aspects of forecasting.  
 C) All of the options are correct.  
 D) tend to be distrusted by management.  
 E) are hard to explain to upper-level management.

**21)** In a simple linear regression model (One independent variable), if we change the input variable by 1 unit, how much will the output variable value change?

A) By the value of the intercept   
 B) By the value of the slope  
 C) By 1  
 D) No change

**22)** In a regression of sales on income and seasonal dummy variables for a quarterly time series, a negative sign of the quarter 3 dummy variable means

A) None of the options are correct.   
 B) sales for quarter three are negative.  
 C) sales for quarter three are below that of the base quarter.  
 D) sales for quarter three are below average.  
 E) sales for quarter three are above average.

**23)** Multicollinearity in a regression model occurs when

A) there is no correlation between the forecast error in one period and the error in the next period.   
 B) there is some correlation among the residuals and the values of the explanatory variables.  
 C) a nonlinear specification is used.  
 D) None of the options are correct.  
 E) the Durbin-Watson statistic and the R-squared are correlated.

**24)** A company has computed a seasonal index for its quarterly sales. Which of the following statements about the index is not correct?

A) The index for any quarter must be between zero and 2.   
 B) The average index for each of the four quarters should be 1.  
 C) An index of 1.1 for the second quarter indicates that sales were 10 percent above the average quarterly sales.  
 D) An index of 0.75 for the first quarter indicates that sales were 25 percent lower than the average quarterly sales.  
 E) The sum of the four quarterly index numbers should be 4.

**25)** Lackland  
   
 Lackland Ski Resort uses multiple regression to forecast ski lift revenues for the next week based on the forecasted number of days with temperatures above 10 degrees and predicted number of inches of snow. The following function has been developed:Sales = 10,902 255 (number days predicted above 10 degrees) 300 (number of inches of snow predicted)Other information generated from the analysis include  
   
 Adjusted R2 = 0.6789  
   
 Standard Error of the Estimate (SEE) = 1,879  
   
 F-statistic = 6.279 with a significance of 0.049  
   
 Which of the following represents an accurate interpretation of the results of Lackland’s regression analysis?

A) 67.89% of the variation in revenue is explained by the predicted number of days above 10 degrees and the number of inches of snow.   
 B) The predicted number of days above 10 degrees is a more significant variable than the number of inches of snow.  
 C) The relationships are not significant.  
 D) 6.729% of the variation in revenue is explained by the predicted number of days above 10 degrees and the number of inches of snow.

**26)** A real estate builder wishes to determine how house size (House) is influenced by family income (Income), family size (Size), and education of the head of household (School). House size is measured in hundreds of square feet, income is measured in thousands of dollars, and education is measured in years. The builder randomly selected 50 families and ran a multiple regression. The regression statistics are below:Regression Statistics

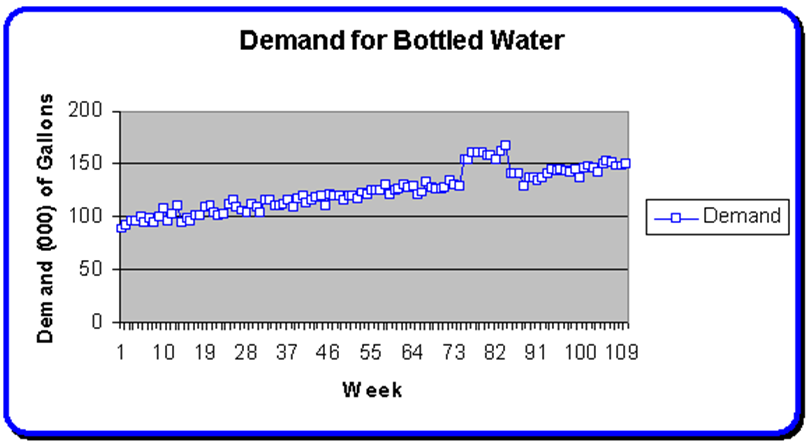
|  |  |  |
| --- | --- | --- |
|  |  |  |
| R Square |  | 0.748 |
| Adjusted R Square |  | 0.726 |
| Standard Error |  | 5.195 |
| Observations |  | 50 |
|  |
| ANOVA Table |
|  | df | SS | MS | F | Sig. F |
| Regression |  |  | 3605.7736 |  |  | 901.4434 |  |  |  |  |  | 0.0001 |  |
| Error |  |  | 1214.2264 |  |  | 29.9892 |  |  |  |  |  |  |  |
| Total | 49 |  | 4820.0000 |  |  |  |  |  |  |  |  |  |  |
|  |
|  | Coefficient | Std. Error | T-test | P-Value |
| Intercept |  |  | −1.6335 |  |  | 5.8078 |  |  |  | −0.281 |  |  | 0.7798 |  |
| Income |  |  | 0.4485 |  |  | 0.1137 |  |  |  | 3.9545 |  |  | 0.0003 |  |
| Size |  |  | 4.2615 |  |  | 0.8062 |  |  |  | 5.286 |  |  | 0.0001 |  |
| School |  |  | −0.6517 |  |  | 0.4319 |  |  |  | −1.509 |  |  | 0.1383 |  |
|  |

Dependent variable is House.Referring to the Real Estate Builder regression results, one individual in the sample had an annual income of $10,000, a family size of 1, and an education of 8 years. This individual owned a home with an area of 1,000 square feet (House = 10.00). What is the residual (i.e., error) in hundreds of square feet for this data point?

A) 5.40   
 B) −5.40  
 C) 8.10  
 D) −8.10

**27)** The inclusion of seasonal dummy variables to a multiple regression model may help eliminate

A) autocorrelation if the data are characterized by seasonal fluctuations.   
 B) perfect multicollinearity.  
 C) bias in OLS slope estimates caused by autocorrelation.  
 D) All of the options are correct.  
 E) near multicollinearity.

**28)** Bottled WaterShown above is the demand for bottled water in thousands of Gallons for 110 consecutive weeks. From weeks 75 through 84, there was a severe flood in the area. Shown below are two regression results using this data. The “Week” variable is an index of weeks from 1 through 109. The “Intervention” variable is a dummy variable equaling one during the intervention and zero otherwise.Regression #1

|  |
| --- |
| Audit Trail — ANOVA Table (Multiple Regression Selected) |
| Source of variation | SS | df | MS | SEE |
| Regression |  | 33,763.50 |  |  | 1 |  |  | 33,763.50 |  |  |  |  |
| Error |  | 6,697.97 |  |  | 108 |  |  | 62.02 |  |  | 7.88 |  |
| Total |  | 40,461.47 |  |  | 109 |  |  |  |  |  |  |  |
|  |
| Audit Trail — Coefficient Table (Multiple Regression Selected) |
| Series Description | Included in Model | Coefficient | Standard Error | T-test | P-value |  | Elasticity |  | Overall F-test |
| Week |  | Yes |  |  | 0.55 |  |  | 0.02 |  |  | 23.33 |  |  | 0.00 |  |  |  | 0.25 |  |  |  |  |  |
| Demand |  | Dependent |  |  | 94.28 |  |  | 1.51 |  |  | 62.35 |  |  | 0.00 |  |  |  |  |  |  |  | 544.41 |  |
|  |
| Audit Trail — Correlation Coefficient Table |
| Series Description | Included in Model | Week | Demand |
| Week |  | Yes |  |  | 1.00 |  |  | 0.91 |  |
| Demand |  | Dependent |  |  | 0.91 |  |  | 1.00 |  |
|  |
| Audit Trail - Statistics |  |  |  |  |  |
| Accuracy Measures | Value |  | Forecast Statistics | Value |  |
| AIC | 766.17 |  | Durbin Watson | 0.60 |  |
| BIC | 768.87 |  | Mean | 124.90 |  |
| Mean Absolute Percentage Error (MAPE) | 4.00 | % | Standard Deviation | 19.27 |  |
| R-Square | 83.45 | % | Max | 167.08 |  |
| Adjusted R-Square | 83.29 | % | Min | 89.55 |  |
| Mean Square Error | 60.89 |  | Range | 77.54 |  |
| Root Mean Square Error | 7.80 |  |  |  |  |
|  |
| Method Statistics | Value |
| Method Selected | Multiple Regression |
|  |

Regression #2

|  |
| --- |
| Audit Trail — ANOVA Table (Multiple Regression Selected) |
| Source of variation | SS | df | MS | SEE |
| Regression |  | 38,993.33 |  |  | 2 |  |  | 19,496.66 |  |  |  |  |
| Error |  | 1.468.14 |  |  | 107 |  |  | 13.72 |  |  | 3.70 |  |
| Total |  | 40,461.47 |  |  | 109 |  |  |  |  |  |  |  |
|  |
| Audit Trail — Coefficient Table (Multiple Regression Selected) |  |
| Series Description | Included in Model | Coefficient | Standard Error | T-test | P-value |  | Elasticity | Overall F-test |
| Week |  | Yes |  |  | 0.50 |  |  | 0.01 |  |  | 43.50 |  |  | 0.00 |  |  |  | 0.22 |  |  |  |  |
| Demand |  | Dependent |  |  | 95.00 |  |  | 0.71 |  |  | 133.39 |  |  | 0.00 |  |  |  |  |  |  | 1,420.94 |  |
| Intervention |  | Yes |  |  | 24.70 |  |  | 1.27 |  |  | 19.52 |  |  | 0.00 |  |  |  | 0.22 |  |  |  |  |
|  |
| Audit Trail — Correlation Coefficient Table |  |
| Series Description | Included in Model | Week | Demand | Intervention |
| Week |  | Yes |  |  | 1.00 |  |  | 0.91 |  |  | 0.24 |  |
| Demand |  | Dependent |  |  | 0.91 |  |  | 1.00 |  |  | 0.57 |  |
| Intervention |  | Yes |  |  | 0.24 |  |  | 0.57 |  |  | 1.00 |  |
|  |
| Audit Trail - Statistics |  |  |  |  |  |
| Accuracy Measures | Value |  | Forecast Statistics | Value |  |
| AIC | 599.21 |  | Durbin Watson | 1.84 |  |
| BIC | 601.91 |  | Mean | 124.90 |  |
| Mean Absolute Percentage Error (MAPE) | 2.47 | % | Standard Deviation | 19.27 |  |
| R-Square | 96.37 | % | Max | 167.08 |  |
| Adjusted R-Square | 96.30 | % | Min | 89.55 |  |
| Mean Square Error | 13.35 |  | Range | 77.54 |  |
| Root Mean Square Error | 3.65 |  |  |  |  |
|  |
| Method Statistics | Value |
| Method Selected | Multiple Regression |
|  |

Consider Regression #2 immediately above. You should use the rule of thumb taught in class to answer this question. In order to create the approximate 95% confidence interval for an estimate of demand,

A) 19.27 must be added to and subtracted from the point estimate.   
 B) two times 3.70 must be added to and subtracted from the point estimate.  
 C) 3.70 must be added to and subtracted from the point estimate.  
 D) two times 19.27 must be added to and subtracted from the point estimate.  
 E) None of the options are correct statements of how to construct the approximate 95% confidence interval.

**29)** The F-statistic in the multiple regression model

A) tests the significance of the R-squared statistic.   
 B) tests a joint hypothesis that all of the coefficients are equal to zero at the same time.  
 C) is used to measure a regression "goodness of fit."  
 D) All of the options are correct.  
 E) tests a common null for all regression slope coefficients.

**30)** Domestic Car SalesConsider the following multiple regression model of domestic car sales (DCS) where:DCS = domestic car salesDCSP = domestic car sales price (in dollars)PR = prime rate as a percent (i.e., 10% would be entered as 10)Q2 = quarter 2 dummy variableQ3 = quarter 3 dummy variableQ4 = quarter 4 dummy variableMultiple Regression— Result FormulaDCS = 3,266.66 + ((DCSP) × −0.098297) + ((PR) × −21.17) + ((Q2) × 292.88) + ((Q3) × 149.07) + ((Q4) × −60.25)

|  |
| --- |
| Audit Trail — ANOVA Table (Multiple Regression Selected) |
| Source of variation | SS | df | MS | SEE |
| Regression |  | 1,834,180.23 |  |  | 5 |  |  | 366,836.05 |  |  |  |  |
| Error |  | 494,506.47 |  |  | 34 |  |  | 14,544.31 |  |  | 120.60 |  |
| Total |  | 2,328,686.70 |  |  | 39 |  |  |  |  |  |  |  |
|  |
| Audit Trail — Coefficient Table (Multiple Regression Selected) |  |
| Series Description | Included in Model | Coefficient | Standard Error | T-test | P-value | F-test | Elasticity | Overall F-test |
| DCS |  | Dependent |  |  | 3,266.66 |  |  | 288.10 |  |  | 11.34 |  |  | 0.00 |  |  | 128.56 |  |  |  |  |  | 25.22 |  |
| DCSP |  | Yes |  |  | −0.10 |  |  | 0.01 |  |  | −7.18 |  |  | 0.00 |  |  | 51.50 |  |  | −0.76 |  |  |  |  |
| PR |  | Yes |  |  | −21.17 |  |  | 13.77 |  |  | −1.54 |  |  | 0.13 |  |  | 2.36 |  |  | −0.11 |  |  |  |  |
| Q2 |  | Yes |  |  | 292.88 |  |  | 54.02 |  |  | 5.42 |  |  | 0.00 |  |  | 29.39 |  |  | 0.04 |  |  |  |  |
| Q3 |  | Yes |  |  | 149.07 |  |  | 54.11 |  |  | 2.76 |  |  | 0.01 |  |  | 7.59 |  |  | 0.02 |  |  |  |  |
| Q4 |  | Yes |  |  | −60.25 |  |  | 54.22 |  |  | −1.11 |  |  | 0.27 |  |  | 1.23 |  |  | −0.01 |  |  |  |  |
|  |
| Audit Trail - Statistics |  |  |  |  |  |
| Accuracy Measures | Value |  | Forecast Statistics | Value |  |
| AIC | 492.41 |  | Durbin Watson | 1.62 |  |
| BIC | 494.10 |  | Mean | 1,802.86 |  |
| Mean Absolute Percentage Error (MAPE) | 5.30 | % | Standard Deviation | 244.36 |  |
| R-Square | 78.76 | % | Max | 2,272.60 |  |
| Adjusted R-Square | 75.64 | % | Min | 1,421.30 |  |
| Root Mean Square Error | 111.19 |  | Range | 851.30 |  |
|  |

For the domestic car sales regression above, the "third quick check" shows what (i.e., accuracy)?

A) It shows that a small trend exists in the data.   
 B) It shows that a great deal of seasonality exists in the data.  
 C) It shows that more than three-quarters of the variation in DCS is explained.  
 D) It shows that almost no serial correlation exists.

**31)** Which statement is not correct?

A) R-squared is a measure of the degree of variability in the dependent variable about its sample mean explained by the regression line.   
 B) The adjusted R-squared measure should be used in the case of more than one independent variable.  
 C) The null hypothesis that R2 = 0 can be tested using the F-statistic.  
 D) Forecasters should always select independent variables on the basis of R2.  
 E) All of the options are correct.

**32)** Using the significance levels reported by Forecast XTM, at what level can we reject a one-sided null relating to a slope coefficient's statistical significance such that we are 95% confident?

A) 0.12   
 B) 0.1  
 C) None of the options are correct.  
 D) 0.09  
 E) 0.11

**33)** The internal auditor of a bank has developed a multiple regression model which has been used for a number of years to forecast the amount of interest income from commercial loans. During the current year, the auditor applies the model and discovers that the adjusted R2 value has decreased dramatically, but otherwise the model seems to be working okay. Which of the following conclusions are justified by the change?

A) A linear regression analysis would increase the model’s reliability.   
 B) Regression analysis is no longer an appropriate technique to estimate interest income.  
 C) Changing to a cross-sectional regression analysis should cause the adjusted R2 to increase.  
 D) Some new factors, not included in the model, are causing interest income to change.

**34)** How does number of observations influence overfitting? Choose the correct answer(s).Note: the rest of all parameters are same.1) In case of fewer observations, it is easy to overfit the data.2) In case of fewer observations, it is hard to overfit the data.3) In case of more observations, it is easy to overfit the data.4) In case of more observations, it is hard to overfit the data.

A) 2 and 3 are correct.   
 B) None of the options are correct.  
 C) 1 and 4 are correct.  
 D) 1 and 3 are correct.

**35)** A regression of retail sales on disposable income and two interest rates, the prime rate and the short-term savings rate, is likely to have the problem of

A) None of the options are correct.   
 B) heteroscedasticity.  
 C) seasonality.  
 D) serial correlation.  
 E) multicollinearity.

**36)** Graphically, a linear least squares multiple regression model with two independent variables looks like a

A) hyperplane.   
 B) line.  
 C) quadrilateral.  
 D) rectangle.  
 E) plane.

**37)** How would you model the effect of rain on attendance to a soccer game?

A) Create a dummy variable to represent rain and a second dummy variable to represent no rain.   
 B) Create a single rain dummy variable.  
 C) All of the options are correct.  
 D) Omit rain days from the data set.  
 E) Introduce a variable measuring the inches of rain for a given day.

**38)** Domestic Car SalesConsider the following multiple regression model of domestic car sales (DCS) where:DCS = domestic car salesDCSP = domestic car sales price (in dollars)PR = prime rate as a percent (i.e., 10% would be entered as 10)Q2 = quarter 2 dummy variableQ3 = quarter 3 dummy variableQ4 = quarter 4 dummy variableMultiple Regression— Result FormulaDCS = 3,266.66 + ((DCSP) × −0.098297) + ((PR) × −21.17) + ((Q2) × 292.88) + ((Q3) × 149.07) + ((Q4) × −60.25)

|  |
| --- |
| Audit Trail — ANOVA Table (Multiple Regression Selected) |
| Source of variation | SS | df | MS | SEE |
| Regression |  | 1,834,180.23 |  |  | 5 |  |  | 366,836.05 |  |  |  |  |
| Error |  | 494,506.47 |  |  | 34 |  |  | 14,544.31 |  |  | 120.60 |  |
| Total |  | 2,328,686.70 |  |  | 39 |  |  |  |  |  |  |  |
|  |
| Audit Trail — Coefficient Table (Multiple Regression Selected) |  |
| Series Description | Included in Model | Coefficient | Standard Error | T-test | P-value | F-test | Elasticity | Overall F-test |
| DCS |  | Dependent |  |  | 3,266.66 |  |  | 288.10 |  |  | 11.34 |  |  | 0.00 |  |  | 128.56 |  |  |  |  |  | 25.22 |  |
| DCSP |  | Yes |  |  | −0.10 |  |  | 0.01 |  |  | −7.18 |  |  | 0.00 |  |  | 51.50 |  |  | −0.76 |  |  |  |  |
| PR |  | Yes |  |  | −21.17 |  |  | 13.77 |  |  | −1.54 |  |  | 0.13 |  |  | 2.36 |  |  | −0.11 |  |  |  |  |
| Q2 |  | Yes |  |  | 292.88 |  |  | 54.02 |  |  | 5.42 |  |  | 0.00 |  |  | 29.39 |  |  | 0.04 |  |  |  |  |
| Q3 |  | Yes |  |  | 149.07 |  |  | 54.11 |  |  | 2.76 |  |  | 0.01 |  |  | 7.59 |  |  | 0.02 |  |  |  |  |
| Q4 |  | Yes |  |  | −60.25 |  |  | 54.22 |  |  | −1.11 |  |  | 0.27 |  |  | 1.23 |  |  | −0.01 |  |  |  |  |
|  |
| Audit Trail - Statistics |  |  |  |  |  |
| Accuracy Measures | Value |  | Forecast Statistics | Value |  |
| AIC | 492.41 |  | Durbin Watson | 1.62 |  |
| BIC | 494.10 |  | Mean | 1,802.86 |  |
| Mean Absolute Percentage Error (MAPE) | 5.30 | % | Standard Deviation | 244.36 |  |
| R-Square | 78.76 | % | Max | 2,272.60 |  |
| Adjusted R-Square | 75.64 | % | Min | 1,421.30 |  |
| Root Mean Square Error | 111.19 |  | Range | 851.30 |  |
|  |

For the domestic car sales regression, which variable coefficients pass the "second quick check (i.e., statistical significance)?"

A) All of the coefficients pass.   
 B) Those that pass are DCSP, PR, and Q4.  
 C) Those that pass are Q2, Q3, and Q4.  
 D) None of the coefficients pass.  
 E) Those that pass are DCSP, Q2, and Q3.

**39)** Personnel TestThe personnel department of a large manufacturing firm selected a random sample of 23 workers. The workers were interviewed and given several tests. On the basis of the test results, the following variables were investigated: X2 = manual dexterity score, X3 = mental aptitude score, and X4 = personnel assessment score.Subsequently, the workers were observed in order to determine the average number of units of work completed (Y) in a given time period for each worker. Regression analysis yielded these results:

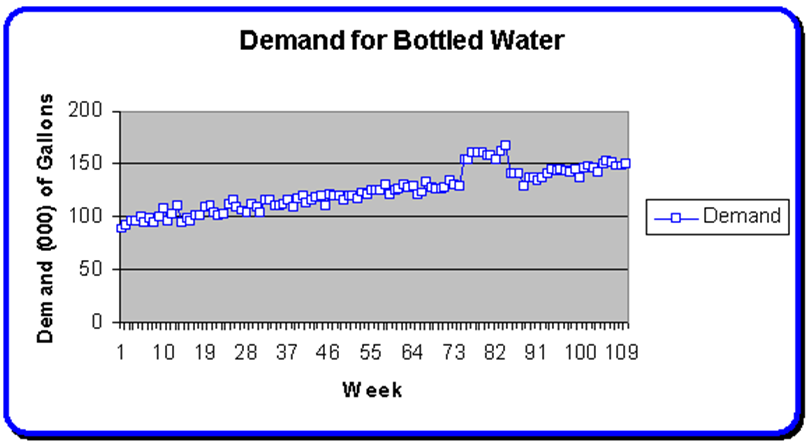
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| y | = | −212 |  | + | 1.90X2 |  | + | 2.00X3 |  | + | 0.25X4 |  | Adjusted R2 | = | 0.75. |
|  |  |  |  |  | (0.50) |  |  | (0.060) |  |  | (0.20) |  |

Note: The numbers shown in parentheses below the coefficients are the standard errors of the coefficients.The quantities in parentheses are the standard errors of the regression coefficients. The standard error of the regression is 25, and the standard deviation of the dependent variable is 50.What percent of the variation of units of work completed can be explained by this model?

A) 50   
 B) 75  
 C) 25  
 D) 90  
 E) 60

**40)** In a multiple regression analysis involving two independent variables, if b1 is computed to be + 2.0, it means that

A) the estimated average of Y increases by 2 units for each increase of 1 unit of X1, without regard to X2.   
 B) the relationship between X1 and Y is significant.  
 C) the estimated average of Y increases by 2 units for each increase of 1 unit of X1, holding X2 constant.  
 D) the estimated average of Y is 2 when X1 equals zero.

**41)** Bottled WaterShown above is the demand for bottled water in thousands of Gallons for 110 consecutive weeks. From weeks 75 through 84, there was a severe flood in the area. Shown below are two regression results using this data. The “Week” variable is an index of weeks from 1 through 109. The “Intervention” variable is a dummy variable equaling one during the intervention and zero otherwise.Regression #1

|  |
| --- |
| Audit Trail — ANOVA Table (Multiple Regression Selected) |
| Source of variation | SS | df | MS | SEE |
| Regression |  | 33,763.50 |  |  | 1 |  |  | 33,763.50 |  |  |  |  |
| Error |  | 6,697.97 |  |  | 108 |  |  | 62.02 |  |  | 7.88 |  |
| Total |  | 40,461.47 |  |  | 109 |  |  |  |  |  |  |  |
|  |
| Audit Trail — Coefficient Table (Multiple Regression Selected) |
| Series Description | Included in Model | Coefficient | Standard Error | T-test | P-value |  | Elasticity |  | Overall F-test |
| Week |  | Yes |  |  | 0.55 |  |  | 0.02 |  |  | 23.33 |  |  | 0.00 |  |  |  | 0.25 |  |  |  |  |  |
| Demand |  | Dependent |  |  | 94.28 |  |  | 1.51 |  |  | 62.35 |  |  | 0.00 |  |  |  |  |  |  |  | 544.41 |  |
|  |
| Audit Trail — Correlation Coefficient Table |
| Series Description | Included in Model | Week | Demand |
| Week |  | Yes |  |  | 1.00 |  |  | 0.91 |  |
| Demand |  | Dependent |  |  | 0.91 |  |  | 1.00 |  |
|  |
| Audit Trail - Statistics |  |  |  |  |  |
| Accuracy Measures | Value |  | Forecast Statistics | Value |  |
| AIC | 766.17 |  | Durbin Watson | 0.60 |  |
| BIC | 768.87 |  | Mean | 124.90 |  |
| Mean Absolute Percentage Error (MAPE) | 4.00 | % | Standard Deviation | 19.27 |  |
| R-Square | 83.45 | % | Max | 167.08 |  |
| Adjusted R-Square | 83.29 | % | Min | 89.55 |  |
| Mean Square Error | 60.89 |  | Range | 77.54 |  |
| Root Mean Square Error | 7.80 |  |  |  |  |
|  |
| Method Statistics | Value |
| Method Selected | Multiple Regression |
|  |

Regression #2

|  |
| --- |
| Audit Trail — ANOVA Table (Multiple Regression Selected) |
| Source of variation | SS | df | MS | SEE |
| Regression |  | 38,993.33 |  |  | 2 |  |  | 19,496.66 |  |  |  |  |
| Error |  | 1.468.14 |  |  | 107 |  |  | 13.72 |  |  | 3.70 |  |
| Total |  | 40,461.47 |  |  | 109 |  |  |  |  |  |  |  |
|  |
| Audit Trail — Coefficient Table (Multiple Regression Selected) |  |
| Series Description | Included in Model | Coefficient | Standard Error | T-test | P-value |  | Elasticity | Overall F-test |
| Week |  | Yes |  |  | 0.50 |  |  | 0.01 |  |  | 43.50 |  |  | 0.00 |  |  |  | 0.22 |  |  |  |  |
| Demand |  | Dependent |  |  | 95.00 |  |  | 0.71 |  |  | 133.39 |  |  | 0.00 |  |  |  |  |  |  | 1,420.94 |  |
| Intervention |  | Yes |  |  | 24.70 |  |  | 1.27 |  |  | 19.52 |  |  | 0.00 |  |  |  | 0.22 |  |  |  |  |
|  |
| Audit Trail — Correlation Coefficient Table |  |
| Series Description | Included in Model | Week | Demand | Intervention |
| Week |  | Yes |  |  | 1.00 |  |  | 0.91 |  |  | 0.24 |  |
| Demand |  | Dependent |  |  | 0.91 |  |  | 1.00 |  |  | 0.57 |  |
| Intervention |  | Yes |  |  | 0.24 |  |  | 0.57 |  |  | 1.00 |  |
|  |
| Audit Trail - Statistics |  |  |  |  |  |
| Accuracy Measures | Value |  | Forecast Statistics | Value |  |
| AIC | 599.21 |  | Durbin Watson | 1.84 |  |
| BIC | 601.91 |  | Mean | 124.90 |  |
| Mean Absolute Percentage Error (MAPE) | 2.47 | % | Standard Deviation | 19.27 |  |
| R-Square | 96.37 | % | Max | 167.08 |  |
| Adjusted R-Square | 96.30 | % | Min | 89.55 |  |
| Mean Square Error | 13.35 |  | Range | 77.54 |  |
| Root Mean Square Error | 3.65 |  |  |  |  |
|  |
| Method Statistics | Value |
| Method Selected | Multiple Regression |
|  |

Consider the two regression models immediately above. When comparing these two regressions with respect to accuracy,

A) it is correct to choose the model that minimizes RMSE but maximizes MAPE.   
 B) None of the options statements concerning accuracy are correct.  
 C) it is incorrect to use either RMSE or MAPE; only MAPE can be used across different regression models.  
 D) only the F Statistic should be compared across two different regressions.  
 E) it is correct to choose the model that minimizes both RMSE and MAPE.

**42)** Domestic Car SalesConsider the following multiple regression model of domestic car sales (DCS) where:DCS = domestic car salesDCSP = domestic car sales price (in dollars)PR = prime rate as a percent (i.e., 10% would be entered as 10)Q2 = quarter 2 dummy variableQ3 = quarter 3 dummy variableQ4 = quarter 4 dummy variableMultiple Regression— Result FormulaDCS = 3,266.66 + ((DCSP) × −0.098297) + ((PR) × −21.17) + ((Q2) × 292.88) + ((Q3) × 149.07) + ((Q4) × −60.25)

|  |
| --- |
| Audit Trail — ANOVA Table (Multiple Regression Selected) |
| Source of variation | SS | df | MS | SEE |
| Regression |  | 1,834,180.23 |  |  | 5 |  |  | 366,836.05 |  |  |  |  |
| Error |  | 494,506.47 |  |  | 34 |  |  | 14,544.31 |  |  | 120.60 |  |
| Total |  | 2,328,686.70 |  |  | 39 |  |  |  |  |  |  |  |
|  |
| Audit Trail — Coefficient Table (Multiple Regression Selected) |  |
| Series Description | Included in Model | Coefficient | Standard Error | T-test | P-value | F-test | Elasticity | Overall F-test |
| DCS |  | Dependent |  |  | 3,266.66 |  |  | 288.10 |  |  | 11.34 |  |  | 0.00 |  |  | 128.56 |  |  |  |  |  | 25.22 |  |
| DCSP |  | Yes |  |  | −0.10 |  |  | 0.01 |  |  | −7.18 |  |  | 0.00 |  |  | 51.50 |  |  | −0.76 |  |  |  |  |
| PR |  | Yes |  |  | −21.17 |  |  | 13.77 |  |  | −1.54 |  |  | 0.13 |  |  | 2.36 |  |  | −0.11 |  |  |  |  |
| Q2 |  | Yes |  |  | 292.88 |  |  | 54.02 |  |  | 5.42 |  |  | 0.00 |  |  | 29.39 |  |  | 0.04 |  |  |  |  |
| Q3 |  | Yes |  |  | 149.07 |  |  | 54.11 |  |  | 2.76 |  |  | 0.01 |  |  | 7.59 |  |  | 0.02 |  |  |  |  |
| Q4 |  | Yes |  |  | −60.25 |  |  | 54.22 |  |  | −1.11 |  |  | 0.27 |  |  | 1.23 |  |  | −0.01 |  |  |  |  |
|  |
| Audit Trail - Statistics |  |  |  |  |  |
| Accuracy Measures | Value |  | Forecast Statistics | Value |  |
| AIC | 492.41 |  | Durbin Watson | 1.62 |  |
| BIC | 494.10 |  | Mean | 1,802.86 |  |
| Mean Absolute Percentage Error (MAPE) | 5.30 | % | Standard Deviation | 244.36 |  |
| R-Square | 78.76 | % | Max | 2,272.60 |  |
| Adjusted R-Square | 75.64 | % | Min | 1,421.30 |  |
| Root Mean Square Error | 111.19 |  | Range | 851.30 |  |
|  |

For the domestic car sales regression above, assume that:DCSP = $10,000PR = 10 percentand that it is the first quarter of the year.What will be the approximate 95% confidence interval for the DCS prediction?

A) 2296 to 1814   
 B) 2964 to 4126  
 C) 1649 to 2039  
 D) 4620 to 7156

**43)** In a multiple regression analysis, the value of the coefficient of multiple determination

A) has to fall between -1 and +1.   
 B) has to fall between -1 and 0.  
 C) has to fall between 0 and +1.  
 D) can fall between any pair of real numbers.

**44)** A multiple regression model using 200 data points (with three independent variables) has how many degrees of freedom for testing the statistical significance of individual slope coefficients?

A) 199   
 B) 198  
 C) 197  
 D) 196

**45)** In a multiple regression analysis involving two independent variables, if b1 is computed to be + 2.0, it means that

A) the relationship between X1 and Y is significant.   
 B) the estimated average of Y is 2 when X1 equals zero.  
 C) the estimated average of Y increases by 2 units for each increase of 1 unit of X1, without regard to X2.  
 D) the estimated average of Y increases by 2 units for each increase of 1 unit of X1, holding X2 constant.

**46)** Lackland  
   
 Lackland Ski Resort uses multiple regression to forecast ski lift revenues for the next week based on the forecasted number of days with temperatures above 10 degrees and predicted number of inches of snow. The following function has been developed:Sales = 10,902 255 (number days predicted above 10 degrees) 300 (number of inches of snow predicted)Other information generated from the analysis include  
   
 Adjusted R2 = 0.6789  
   
 Standard Error of the Estimate (SEE) = 1,879  
   
 F-statistic = 6.279 with a significance of 0.049  
   
 Assume that Lackland’s model predicts revenue for a week to be $13,400. Calculate the 95% confidence interval for the amount of revenue for the week. You should use the "rule of thumb" we discussed in class.

A) $13,400 ± 6,279   
 B) $13,400 ± 8,564  
 C) $13,400 ± 3,758  
 D) $13,400 ± 6,786

**47)** A potential diagnosis and/or cure for the multicollinearity problem does not include

A) testing for a high degree of correlation among the independent variables.   
 B) dropping all but one of the highly correlated independent variables from the model.  
 C) valuing variables in nominal, not real, terms.  
 D) comparing signs and sizes of estimated coefficients with what is expected on the basis of economic theory.  
 E) All of the options are correct.

**48)** Personnel TestThe personnel department of a large manufacturing firm selected a random sample of 23 workers. The workers were interviewed and given several tests. On the basis of the test results, the following variables were investigated: X2 = manual dexterity score, X3 = mental aptitude score, and X4 = personnel assessment score.Subsequently, the workers were observed in order to determine the average number of units of work completed (Y) in a given time period for each worker. Regression analysis yielded these results:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| y | = | −212 |  | + | 1.90X2 |  | + | 2.00X3 |  | + | 0.25X4 |  | Adjusted R2 | = | 0.75. |
|  |  |  |  |  | (0.50) |  |  | (0.060) |  |  | (0.20) |  |

Note: The numbers shown in parentheses below the coefficients are the standard errors of the coefficients.The quantities in parentheses are the standard errors of the regression coefficients. The standard error of the regression is 25, and the standard deviation of the dependent variable is 50.What is the correct estimate for the number of units of work completed by a worker with a manual dexterity score of 100, a mental aptitude score of 80 and a personnel assessment score of 10? Use the regression estimated, as given, to make this calculation.

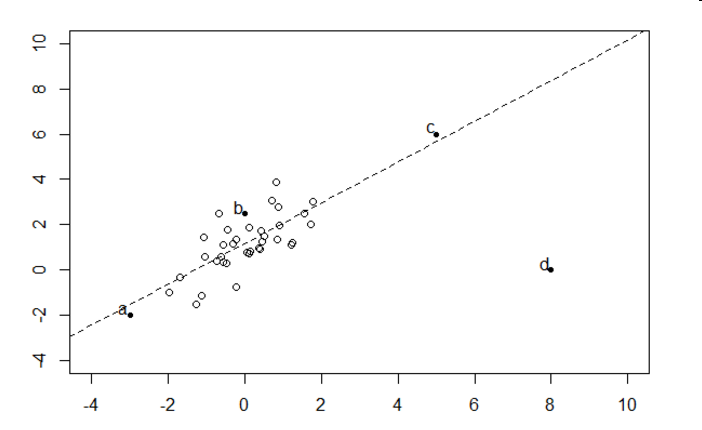
A) 150.0   
 B) 154.3  
 C) 105.5  
 D) 138.0  
 E) 140.5

**49)** Domestic Car SalesConsider the following multiple regression model of domestic car sales (DCS) where:DCS = domestic car salesDCSP = domestic car sales price (in dollars)PR = prime rate as a percent (i.e., 10% would be entered as 10)Q2 = quarter 2 dummy variableQ3 = quarter 3 dummy variableQ4 = quarter 4 dummy variableMultiple Regression— Result FormulaDCS = 3,266.66 + ((DCSP) × −0.098297) + ((PR) × −21.17) + ((Q2) × 292.88) + ((Q3) × 149.07) + ((Q4) × −60.25)

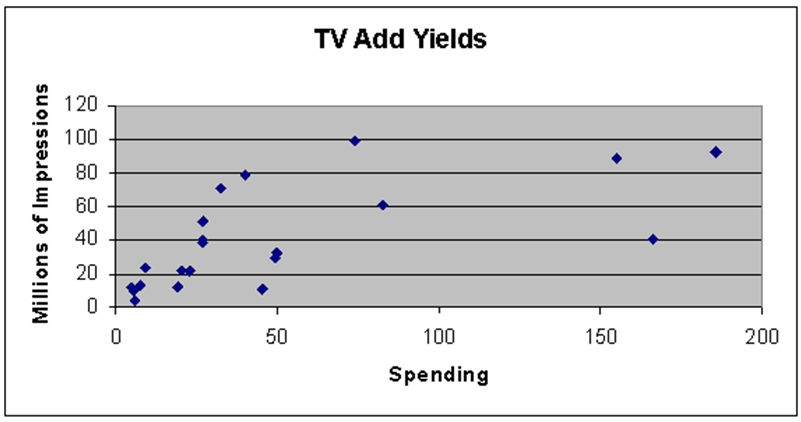
|  |
| --- |
| Audit Trail — ANOVA Table (Multiple Regression Selected) |
| Source of variation | SS | df | MS | SEE |
| Regression |  | 1,834,180.23 |  |  | 5 |  |  | 366,836.05 |  |  |  |  |
| Error |  | 494,506.47 |  |  | 34 |  |  | 14,544.31 |  |  | 120.60 |  |
| Total |  | 2,328,686.70 |  |  | 39 |  |  |  |  |  |  |  |
|  |
| Audit Trail — Coefficient Table (Multiple Regression Selected) |  |
| Series Description | Included in Model | Coefficient | Standard Error | T-test | P-value | F-test | Elasticity | Overall F-test |
| DCS |  | Dependent |  |  | 3,266.66 |  |  | 288.10 |  |  | 11.34 |  |  | 0.00 |  |  | 128.56 |  |  |  |  |  | 25.22 |  |
| DCSP |  | Yes |  |  | −0.10 |  |  | 0.01 |  |  | −7.18 |  |  | 0.00 |  |  | 51.50 |  |  | −0.76 |  |  |  |  |
| PR |  | Yes |  |  | −21.17 |  |  | 13.77 |  |  | −1.54 |  |  | 0.13 |  |  | 2.36 |  |  | −0.11 |  |  |  |  |
| Q2 |  | Yes |  |  | 292.88 |  |  | 54.02 |  |  | 5.42 |  |  | 0.00 |  |  | 29.39 |  |  | 0.04 |  |  |  |  |
| Q3 |  | Yes |  |  | 149.07 |  |  | 54.11 |  |  | 2.76 |  |  | 0.01 |  |  | 7.59 |  |  | 0.02 |  |  |  |  |
| Q4 |  | Yes |  |  | −60.25 |  |  | 54.22 |  |  | −1.11 |  |  | 0.27 |  |  | 1.23 |  |  | −0.01 |  |  |  |  |
|  |
| Audit Trail - Statistics |  |  |  |  |  |
| Accuracy Measures | Value |  | Forecast Statistics | Value |  |
| AIC | 492.41 |  | Durbin Watson | 1.62 |  |
| BIC | 494.10 |  | Mean | 1,802.86 |  |
| Mean Absolute Percentage Error (MAPE) | 5.30 | % | Standard Deviation | 244.36 |  |
| R-Square | 78.76 | % | Max | 2,272.60 |  |
| Adjusted R-Square | 75.64 | % | Min | 1,421.30 |  |
| Root Mean Square Error | 111.19 |  | Range | 851.30 |  |
|  |

In the domestic car sales function, there is evidence of seasonality. How does the regression model show this evidence?

A) With the F-statistic   
 B) With the Durbin Watson statistic  
 C) With the R-Square  
 D) With the SEE  
 E) With the t-statistics on the dummy variables

**50)** Consider the following datasetWhich identified point, if removed, will have the largest effect on the fitted regression line as shown in the above figure (the dashed line is the regression line)?

A) a   
 B) b  
 C) d  
 D) c

**51)** Television Add YieldsTelevision add yields are sometimes measured in millions of retained impressions. The following two regressions model the effectiveness of adds for 21 consumer products. The data is from The Wall Street Journal, March 1, 1984.The variables collected for each of the 21 products are:SPENDING: TV advertising budget, ($ millions) MILIMP: Millions of retained impressions,MILIMP Sqrd: Millions of retained impressions squared.A scatterplot of the data used appears below:Regression #1

|  |
| --- |
| Audit Trail — ANOVA Table (Multiple Regression Selected) |
| Source of variation | SS | df | MS | SEE |
| Regression |  | 7,723.28 |  |  | 1 |  |  | 7,723.28 |  |  |  |  |
| Error |  | 10,494.11 |  |  | 19 |  |  | 552.32 |  |  | 23.50 |  |
| Total |  | 18,217.39 |  |  | 20 |  |  |  |  |  |  |  |
|  |
| Audit Trail — Coefficient Table (Multiple Regression Selected) |  |  |
| Series Description | Included in Model | Coefficient | Standard Error | T-test |  | P-value |  | F-test |  | Elasticity |  | Overall F-test |
| Spending |  | Yes |  |  | 0.36 |  |  | 0.10 |  |  | 3.74 |  |  |  | 0.00 |  |  |  | 13.98 |  |  |  | 0.45 |  |  |  |  |  |
| Milimp |  | Dependent |  |  | 22.16 |  |  | 7.09 |  |  | 3.13 |  |  |  | 0.01 |  |  |  | 9.77 |  |  |  |  |  |  |  | 13.98 |  |
|  |
| Audit Trail — Correlation Coefficient Table |
| Series Description | Included in Model | Spending | Milimp |
| Spending |  | Yes |  |  | 1.00 |  |  | 0.65 |  |
| Milimp |  | Dependent |  |  | 0.65 |  |  | 1.00 |  |
|  |
| Audit Trail - Statistics |  |  |  |  |  |
| Accuracy Measures | Value |  | Forecast Statistics | Value |  |
| AIC | 192.09 |  | Durbin Watson(4) | 1.50 |  |
| BIC | 193.13 |  | Mean | 40.47 |  |
| Mean Absolute Percentage Error (MAPE) | 82.67 | % | Standard Deviation | 30.18 |  |
| R-Square | 42.40 | % | Max | 99.60 |  |
| Adjusted R-Square | 39.36 | % | Min | 4.40 |  |
| Mean Square Error | 499.72 |  | Range | 95.20 |  |
| Root Mean Square Error | 22.35 |  | Root Mean Square | 29.45 |  |
| Theil | 0.43 |  | Ljung-Box | 10.45 |  |
|  |

Regression #2

|  |
| --- |
| Audit Trail — ANOVA Table (Multiple Regression Selected) |
| Source of variation | SS | df | MS | SEE |
| Regression |  | 17,236.77 |  |  | 2 |  |  | 8,61838 |  |  |  |  |
| Error |  | 980.62 |  |  | 18 |  |  | 54.48 |  |  | 7.38 |  |
| Total |  | 18,217.39 |  |  | 20 |  |  |  |  |  |  |  |
|  |
| Audit Trail — Coefficient Table (Multiple Regression Selected) |  |  |
| Series Description | Included in Model | Coefficient | Standard Error | T-test |  | P-value | F-test | Elasticity |  | Overall F-test |
| Spending |  | Yes |  |  | 0.03 |  |  | 0.04 |  |  | 0.74 |  |  |  | 0.47 |  |  | 0.55 |  |  | 0.04 |  |  |  |  |  |
| Milimp |  | Dependent |  |  | 16.33 |  |  | 2.27 |  |  | 7.19 |  |  |  | 0.00 |  |  | 51.74 |  |  |  |  |  |  | 158.20 |  |
| Milimp Sqrd |  | Yes |  |  | 0.01 |  |  | 0.00 |  |  | 13.21 |  |  |  | 0.00 |  |  | 174.63 |  |  | 0.56 |  |  |  |  |  |
|  |
| Audit Trail — Correlation Coefficient Table |  |
| Series Description | Included in Model | Spending | Milimp | Milimp Sqrd |
| Spending |  | Yes |  |  | 1.00 |  |  | 0.65 |  |  | 0.64 |  |
| Milimp |  | Dependent |  |  | 0.65 |  |  | 1.00 |  |  | 0.97 |  |
| Milimp Sqrd |  | Yes |  |  | 0.64 |  |  | 0.97 |  |  | 1.00 |  |
|  |
| Audit Trail - Statistics |  |  |  |  |  |
| Accuracy Measures | Value |  | Forecast Statistics | Value |  |
| AIC | 142.31 |  | Durbin Watson(4) | 1.42 |  |
| BIC | 143.36 |  | Mean | 40.47 |  |
| Mean Absolute Percentage Error (MAPE) | 35.54 | % | Standard Deviation | 30.18 |  |
| R-Square | 94.62 | % | Max | 99.60 |  |
| Adjusted R-Square | 94.02 | % | Min | 4.40 |  |
| Mean Square Error | 46.70 |  | Range | 95.20 |  |
| Root Mean Square Error | 6.83 |  | Root Mean Square | 29.45 |  |
| Theil | 0.12 |  | Ljung-Box | 7.15 |  |
|  |

Regression #1 above

A) has a better Coefficient of Variation score than Regression #2.   
 B) suffers from a serious multicollinearity problem.  
 C) has a serious serial correlation problem.  
 D) has a better Akaike score than Regression #2.  
 E) None of the options are correct.

**52)** A real estate builder wishes to determine how house size (House) is influenced by family income (Income), family size (Size), and education of the head of household (School). House size is measured in hundreds of square feet, income is measured in thousands of dollars, and education is measured in years. The builder randomly selected 50 families and ran a multiple regression. The regression statistics are below:Regression Statistics

|  |  |  |
| --- | --- | --- |
|  |  |  |
| R Square |  | 0.748 |
| Adjusted R Square |  | 0.726 |
| Standard Error |  | 5.195 |
| Observations |  | 50 |
|  |
| ANOVA Table |
|  | df | SS | MS | F | Sig. F |
| Regression |  |  | 3605.7736 |  |  | 901.4434 |  |  |  |  |  | 0.0001 |  |
| Error |  |  | 1214.2264 |  |  | 29.9892 |  |  |  |  |  |  |  |
| Total | 49 |  | 4820.0000 |  |  |  |  |  |  |  |  |  |  |
|  |
|  | Coefficient | Std. Error | T-test | P-Value |
| Intercept |  |  | −1.6335 |  |  | 5.8078 |  |  |  | −0.281 |  |  | 0.7798 |  |
| Income |  |  | 0.4485 |  |  | 0.1137 |  |  |  | 3.9545 |  |  | 0.0003 |  |
| Size |  |  | 4.2615 |  |  | 0.8062 |  |  |  | 5.286 |  |  | 0.0001 |  |
| School |  |  | −0.6517 |  |  | 0.4319 |  |  |  | −1.509 |  |  | 0.1383 |  |
|  |

Dependent variable is House.Referring to the Real Estate Builder regression results, what fraction of the variability in house size is explained by variations in income, size of family, and education?

A) 33.4%   
 B) 27.0%  
 C) 72.6%  
 D) 86.5%

**53)** To test linear relationship of y(dependent) and x(independent) continuous variables, which of the following plots is best suited?

A) Scatter Plot   
 B) None of the options are correct.  
 C) Histogram  
 D) Barchart

**54)** Which of the following is not correct about near multicollinearity?

A) It arises when we have two or more independent variables which are highly correlated.   
 B) It is often indicated by coefficient signs that seem to violate business and economic logic accompanied by relatively large values of the calculated t-statistics for individual parameters.  
 C) Both "It arises when we have two or more independent variables which essentially measure the same effect on the dependent variable." and "It arises when we have two or more independent variables which are highly correlated." are correct.  
 D) It is often indicated by coefficient signs that seem to violate business and economic logic accompanied by relatively small values of the calculated t-statistics for individual parameters.  
 E) It arises when we have two or more independent variables which essentially measure the same effect on the dependent variable.

**55)** The F-statistic in the multiple regression model

A) is used to test for data non-linearity.   
 B) is used to test for the presence of serial correlation.  
 C) tests for the overall significance of the estimated multiple regression.  
 D) tests for the presence of first-order autocorrelation.  
 E) All of the options are correct.

**56)** Quarterly seasonal dummy variables take on values

A) 0 to 3.   
 B) None of the options are correct.  
 C) 0 to 4.  
 D) 1 to 3.  
 E) 1 to 4.

**57)** ForecastX RegressionsExhibit #1

|  |  |  |
| --- | --- | --- |
| Audit Trail — Coefficient Table (Multiple Regression Selected) |  |  |
| Series  Description | Included in Model |  | Coefficient |  | Standard Error |  | T-test |  | P-value |  | F-test |  | Elasticity |  | Overall F-test |
| SALES |  | Dependent |  |  |  | −51.24 |  |  |  | 54.32 |  |  |  | −0.94 |  |  |  | 0.36 |  |  |  | 0.89 |  |  |  |  |  |  |  | 8.98 |  |
| PRICE |  | Yes |  |  |  | 30.92 |  |  |  | 10.32 |  |  |  | 3.00 |  |  |  | 0.01 |  |  |  | 8.98 |  |  |  | 1.46 |  |  |  |  |  |
|  |
| Audit Trail — Correlation Coefficient Table |
| Series Description | Included in Model | SALES | PRICE |
| SALES |  | Dependent |  |  | 1.00 |  |  | 0.63 |  |
| PRICE |  | Yes |  |  | 0.63 |  |  | 1.00 |  |
|  |
| Audit Trail - Statistics |
| Accuracy Measures | Value |  | Forecast Statistics | Value |  |
| AIC | 130.02 |  | Durbin Watson(1) | 0.34 |  |
| BIC | 130.80 |  | Mean | 111.19 |  |
| Mean Absolute Percentage Error (MAPE) | 10.67 | % | Standard Deviation | 17.49 |  |
| R-Square | 39.07 | % | Ljung-Box | 39.71 |  |
| Adjusted R-Square | 34.72 | % |  |  |  |
| Root Mean Square Error | 13.22 |  |  |  |  |
|  |

Exhibit #2

|  |  |
| --- | --- |
| Audit Trail — Coefficient Table (Multiple Regression Selected) |  |
| Series  Description | Included in Model | Coefficient | Standard Error | T-test | P-value | F-test | Elasticity | Overall F-test |
| SALES |  | Dependent |  |  | 123.47 |  |  | 19.40 |  |  | 6.36 |  |  | 0.00 |  |  | 40.51 |  |  |  |  |  | 154.86 |  |
| PRICE |  | Yes |  |  | −24.84 |  |  | 4.95 |  |  | −5.02 |  |  | 0.00 |  |  | 25.17 |  |  | −1.17 |  |  |  |  |
| INCOME |  | Yes |  |  | 0.03 |  |  | 0.00 |  |  | 13.55 |  |  | 0.00 |  |  | 183.62 |  |  | 1.06 |  |  |  |  |
|  |
| Audit Trail — Correlation Coefficient Table |  |
| Series Description | Included in Model | SALES | PRICE | INCOME |
| SALES |  | Dependent |  |  | 1.00 |  |  | 0.63 |  |  | 0.94 |  |
| PRICE |  | Yes |  |  | 0.63 |  |  | 1.00 |  |  | 0.83 |  |
| INCOME |  | Yes |  |  | 0.94 |  |  | 0.83 |  |  | 1.00 |  |
|  |
| Audit Trail - Statistics |
| Accuracy Measures | Value |  | Forecast Statistics | Value |  |
| AIC | 86.56 |  | Durbin Watson(1) | 1.67 |  |
| BIC | 87.34 |  | Mean | 111.19 |  |
| Mean Absolute Percentage Error (MAPE) | 2.22 | % | Standard Deviation | 17.49 |  |
| R-Square | 95.97 | % | Ljung-Box | 15.22 |  |
| Adjusted R-Square | 95.35 | % |  |  |  |
| Root Mean Square Error | 3.40 |  |  |  |  |
|  |

Consider the two regressions shown above.

A) The multiple regression has only one significant independent variable.   
 B) The simple regression is probably underfit.  
 C) The simple regression is probably overfit.  
 D) The multiple regression probably suffers from rampant multicollinearity.

**58)** Estimated Demand FunctionThe following is an estimated demand function:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Q |  | = |  | 875 |  | + |  | 6XA |  | + | 15Y |  | − | 5P |  |
|  |  |  |  |  |  |  | (125) |  | (2) |  |  | (−1.2) |

Where Q is quantity sold, XA is advertising expenditure (in thousands of dollars), Y is income (in thousands of dollars), and P is the good’s price. The standard errors for each estimate are in parentheses. The equation has been estimated from 10 years of quarterly data. The adjusted R2 was 0.92; the F-statistic was 57; the Standard Error of the Estimate (SEE) is 25.  
   
 Suppose the values of the explanatory variables next period are: Advertising = $100,000; Income = $10,000; and Price = $100.  
   
 For the above regression, an estimated 95 percent confidence interval around the sales prediction would be

A) 1025 to 1125.   
 B) 1075 to 1175.  
 C) 1760 to 1920.  
 D) 1425 to 1850.  
 E) 1125 to 1225.

**59)** Which of the following "goodness-of-fit" measures should not be used in the context of multiple regression?

A) The F statistic   
 B) The Simple Coefficient of Determination  
 C) None of the options are correct.  
 D) The Durbin-Watson statistic  
 E) The AIC and BIC criteria

**60)** Including male and female dummy variables in the same regression to represent sex will likely result in

A) near multicollinearity.   
 B) heteroscedasticity.  
 C) All of the options are correct.  
 D) serial correlation.  
 E) perfect multicollinearity.

**61)** A real estate builder wishes to determine how house size (House) is influenced by family income (Income), family size (Size), and education of the head of household (School). House size is measured in hundreds of square feet, income is measured in thousands of dollars, and education is measured in years. The builder randomly selected 50 families and ran a multiple regression. The regression statistics are below:Regression Statistics

|  |  |  |
| --- | --- | --- |
|  |  |  |
| R Square |  | 0.748 |
| Adjusted R Square |  | 0.726 |
| Standard Error |  | 5.195 |
| Observations |  | 50 |
|  |
| ANOVA Table |
|  | df | SS | MS | F | Sig. F |
| Regression |  |  | 3605.7736 |  |  | 901.4434 |  |  |  |  |  | 0.0001 |  |
| Error |  |  | 1214.2264 |  |  | 29.9892 |  |  |  |  |  |  |  |
| Total | 49 |  | 4820.0000 |  |  |  |  |  |  |  |  |  |  |
|  |
|  | Coefficient | Std. Error | T-test | P-Value |
| Intercept |  |  | −1.6335 |  |  | 5.8078 |  |  |  | −0.281 |  |  | 0.7798 |  |
| Income |  |  | 0.4485 |  |  | 0.1137 |  |  |  | 3.9545 |  |  | 0.0003 |  |
| Size |  |  | 4.2615 |  |  | 0.8062 |  |  |  | 5.286 |  |  | 0.0001 |  |
| School |  |  | −0.6517 |  |  | 0.4319 |  |  |  | −1.509 |  |  | 0.1383 |  |
|  |

Dependent variable is House.Referring to the Real Estate Builder regression results, when the builder used a simple linear regression model with house size (House) as the dependent variable and education (School) as the independent variable, she obtained an Adjusted R Squared value of 23.0%. What additional percentage of the total variation in house size has been explained by including family size and income in the multiple regression?

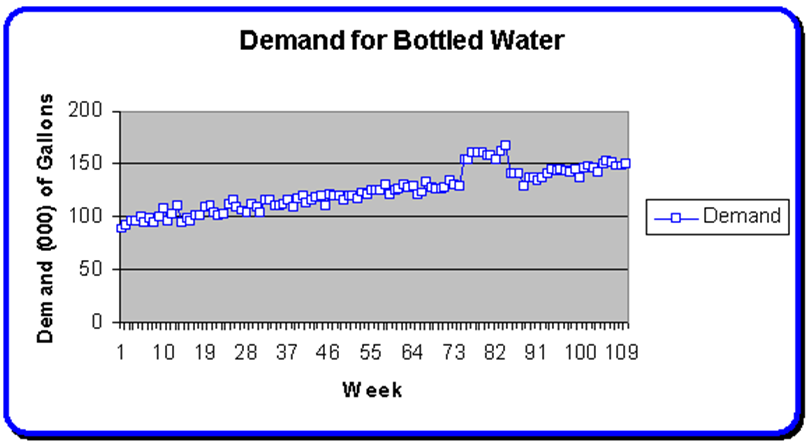
A) 49.6%   
 B) 2.8%  
 C) 72.6%  
 D) 74.8%

**62)** Domestic Car SalesConsider the following multiple regression model of domestic car sales (DCS) where:DCS = domestic car salesDCSP = domestic car sales price (in dollars)PR = prime rate as a percent (i.e., 10% would be entered as 10)Q2 = quarter 2 dummy variableQ3 = quarter 3 dummy variableQ4 = quarter 4 dummy variableMultiple Regression— Result FormulaDCS = 3,266.66 + ((DCSP) × −0.098297) + ((PR) × −21.17) + ((Q2) × 292.88) + ((Q3) × 149.07) + ((Q4) × −60.25)

|  |
| --- |
| Audit Trail — ANOVA Table (Multiple Regression Selected) |
| Source of variation | SS | df | MS | SEE |
| Regression |  | 1,834,180.23 |  |  | 5 |  |  | 366,836.05 |  |  |  |  |
| Error |  | 494,506.47 |  |  | 34 |  |  | 14,544.31 |  |  | 120.60 |  |
| Total |  | 2,328,686.70 |  |  | 39 |  |  |  |  |  |  |  |
|  |
| Audit Trail — Coefficient Table (Multiple Regression Selected) |  |
| Series Description | Included in Model | Coefficient | Standard Error | T-test | P-value | F-test | Elasticity | Overall F-test |
| DCS |  | Dependent |  |  | 3,266.66 |  |  | 288.10 |  |  | 11.34 |  |  | 0.00 |  |  | 128.56 |  |  |  |  |  | 25.22 |  |
| DCSP |  | Yes |  |  | −0.10 |  |  | 0.01 |  |  | −7.18 |  |  | 0.00 |  |  | 51.50 |  |  | −0.76 |  |  |  |  |
| PR |  | Yes |  |  | −21.17 |  |  | 13.77 |  |  | −1.54 |  |  | 0.13 |  |  | 2.36 |  |  | −0.11 |  |  |  |  |
| Q2 |  | Yes |  |  | 292.88 |  |  | 54.02 |  |  | 5.42 |  |  | 0.00 |  |  | 29.39 |  |  | 0.04 |  |  |  |  |
| Q3 |  | Yes |  |  | 149.07 |  |  | 54.11 |  |  | 2.76 |  |  | 0.01 |  |  | 7.59 |  |  | 0.02 |  |  |  |  |
| Q4 |  | Yes |  |  | −60.25 |  |  | 54.22 |  |  | −1.11 |  |  | 0.27 |  |  | 1.23 |  |  | −0.01 |  |  |  |  |
|  |
| Audit Trail - Statistics |  |  |  |  |  |
| Accuracy Measures | Value |  | Forecast Statistics | Value |  |
| AIC | 492.41 |  | Durbin Watson | 1.62 |  |
| BIC | 494.10 |  | Mean | 1,802.86 |  |
| Mean Absolute Percentage Error (MAPE) | 5.30 | % | Standard Deviation | 244.36 |  |
| R-Square | 78.76 | % | Max | 2,272.60 |  |
| Adjusted R-Square | 75.64 | % | Min | 1,421.30 |  |
| Root Mean Square Error | 111.19 |  | Range | 851.30 |  |
|  |

In the domestic car sales regression above, what evidence do you have of any pattern in the error terms?

A) The SEE indicates a high probability of a pattern in the error terms.   
 B) There are no error terms in this regression and so there can be no pattern.  
 C) The Durbin Watson statistic reported indicates little first order pattern in the error terms.  
 D) The AIC and BIC both indicate a pattern in the error terms.

**63)** Bottled WaterShown above is the demand for bottled water in thousands of Gallons for 110 consecutive weeks. From weeks 75 through 84, there was a severe flood in the area. Shown below are two regression results using this data. The “Week” variable is an index of weeks from 1 through 109. The “Intervention” variable is a dummy variable equaling one during the intervention and zero otherwise.Regression #1

|  |
| --- |
| Audit Trail — ANOVA Table (Multiple Regression Selected) |
| Source of variation | SS | df | MS | SEE |
| Regression |  | 33,763.50 |  |  | 1 |  |  | 33,763.50 |  |  |  |  |
| Error |  | 6,697.97 |  |  | 108 |  |  | 62.02 |  |  | 7.88 |  |
| Total |  | 40,461.47 |  |  | 109 |  |  |  |  |  |  |  |
|  |
| Audit Trail — Coefficient Table (Multiple Regression Selected) |
| Series Description | Included in Model | Coefficient | Standard Error | T-test | P-value |  | Elasticity |  | Overall F-test |
| Week |  | Yes |  |  | 0.55 |  |  | 0.02 |  |  | 23.33 |  |  | 0.00 |  |  |  | 0.25 |  |  |  |  |  |
| Demand |  | Dependent |  |  | 94.28 |  |  | 1.51 |  |  | 62.35 |  |  | 0.00 |  |  |  |  |  |  |  | 544.41 |  |
|  |
| Audit Trail — Correlation Coefficient Table |
| Series Description | Included in Model | Week | Demand |
| Week |  | Yes |  |  | 1.00 |  |  | 0.91 |  |
| Demand |  | Dependent |  |  | 0.91 |  |  | 1.00 |  |
|  |
| Audit Trail - Statistics |  |  |  |  |  |
| Accuracy Measures | Value |  | Forecast Statistics | Value |  |
| AIC | 766.17 |  | Durbin Watson | 0.60 |  |
| BIC | 768.87 |  | Mean | 124.90 |  |
| Mean Absolute Percentage Error (MAPE) | 4.00 | % | Standard Deviation | 19.27 |  |
| R-Square | 83.45 | % | Max | 167.08 |  |
| Adjusted R-Square | 83.29 | % | Min | 89.55 |  |
| Mean Square Error | 60.89 |  | Range | 77.54 |  |
| Root Mean Square Error | 7.80 |  |  |  |  |
|  |
| Method Statistics | Value |
| Method Selected | Multiple Regression |
|  |

Regression #2

|  |
| --- |
| Audit Trail — ANOVA Table (Multiple Regression Selected) |
| Source of variation | SS | df | MS | SEE |
| Regression |  | 38,993.33 |  |  | 2 |  |  | 19,496.66 |  |  |  |  |
| Error |  | 1.468.14 |  |  | 107 |  |  | 13.72 |  |  | 3.70 |  |
| Total |  | 40,461.47 |  |  | 109 |  |  |  |  |  |  |  |
|  |
| Audit Trail — Coefficient Table (Multiple Regression Selected) |  |
| Series Description | Included in Model | Coefficient | Standard Error | T-test | P-value |  | Elasticity | Overall F-test |
| Week |  | Yes |  |  | 0.50 |  |  | 0.01 |  |  | 43.50 |  |  | 0.00 |  |  |  | 0.22 |  |  |  |  |
| Demand |  | Dependent |  |  | 95.00 |  |  | 0.71 |  |  | 133.39 |  |  | 0.00 |  |  |  |  |  |  | 1,420.94 |  |
| Intervention |  | Yes |  |  | 24.70 |  |  | 1.27 |  |  | 19.52 |  |  | 0.00 |  |  |  | 0.22 |  |  |  |  |
|  |
| Audit Trail — Correlation Coefficient Table |  |
| Series Description | Included in Model | Week | Demand | Intervention |
| Week |  | Yes |  |  | 1.00 |  |  | 0.91 |  |  | 0.24 |  |
| Demand |  | Dependent |  |  | 0.91 |  |  | 1.00 |  |  | 0.57 |  |
| Intervention |  | Yes |  |  | 0.24 |  |  | 0.57 |  |  | 1.00 |  |
|  |
| Audit Trail - Statistics |  |  |  |  |  |
| Accuracy Measures | Value |  | Forecast Statistics | Value |  |
| AIC | 599.21 |  | Durbin Watson | 1.84 |  |
| BIC | 601.91 |  | Mean | 124.90 |  |
| Mean Absolute Percentage Error (MAPE) | 2.47 | % | Standard Deviation | 19.27 |  |
| R-Square | 96.37 | % | Max | 167.08 |  |
| Adjusted R-Square | 96.30 | % | Min | 89.55 |  |
| Mean Square Error | 13.35 |  | Range | 77.54 |  |
| Root Mean Square Error | 3.65 |  |  |  |  |
|  |
| Method Statistics | Value |
| Method Selected | Multiple Regression |
|  |

Consider the two regressions immediately above. The "Intervention" variable in Regression #2 represents the flood period by taking on a value of "1" when there is a flood during that week and a value of zero otherwise. How would you interpret the coefficient of the "Intervention" variable in Regression #2?

A) For each week in which flood occurred, 24.70 more bottled water is demanded than in the first week in the time series.   
 B) For each week in which flood occurred, 24.70 more bottled water is demanded than in the average nonflood week in the time series.  
 C) For each week in which flood occurred, 24.70 more bottled water is demanded than in the week immediately preceding the beginning of the flood.  
 D) For each week in which flood occurred, 24.70 more bottled water is demanded than in the average week in the time series.

**64)** Which of the following is not useful advice in using multiple regression to generate forecasts?

A) Use the AIC and BIC measures to help in selecting the appropriate set of independent variables.   
 B) All of the options are correct.  
 C) One should always prefer quantitative models to subjective expertise.  
 D) Keep the model simple.  
 E) Focus on model accuracy rather than model fit.

**65)** Domestic Car SalesConsider the following multiple regression model of domestic car sales (DCS) where:DCS = domestic car salesDCSP = domestic car sales price (in dollars)PR = prime rate as a percent (i.e., 10% would be entered as 10)Q2 = quarter 2 dummy variableQ3 = quarter 3 dummy variableQ4 = quarter 4 dummy variableMultiple Regression— Result FormulaDCS = 3,266.66 + ((DCSP) × −0.098297) + ((PR) × −21.17) + ((Q2) × 292.88) + ((Q3) × 149.07) + ((Q4) × −60.25)

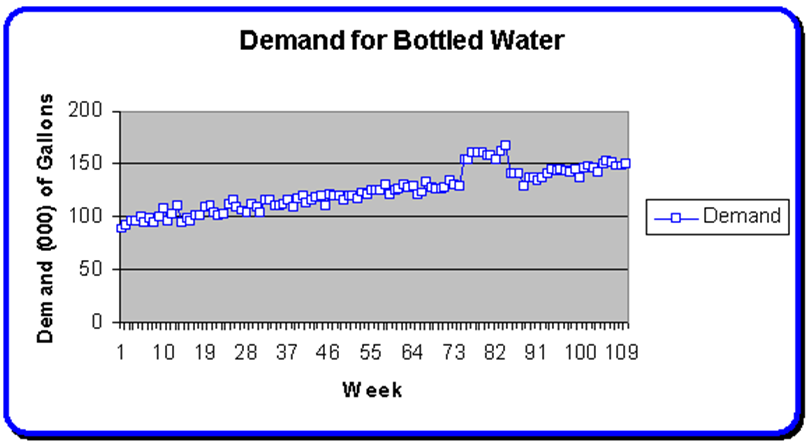
|  |
| --- |
| Audit Trail — ANOVA Table (Multiple Regression Selected) |
| Source of variation | SS | df | MS | SEE |
| Regression |  | 1,834,180.23 |  |  | 5 |  |  | 366,836.05 |  |  |  |  |
| Error |  | 494,506.47 |  |  | 34 |  |  | 14,544.31 |  |  | 120.60 |  |
| Total |  | 2,328,686.70 |  |  | 39 |  |  |  |  |  |  |  |
|  |
| Audit Trail — Coefficient Table (Multiple Regression Selected) |  |
| Series Description | Included in Model | Coefficient | Standard Error | T-test | P-value | F-test | Elasticity | Overall F-test |
| DCS |  | Dependent |  |  | 3,266.66 |  |  | 288.10 |  |  | 11.34 |  |  | 0.00 |  |  | 128.56 |  |  |  |  |  | 25.22 |  |
| DCSP |  | Yes |  |  | −0.10 |  |  | 0.01 |  |  | −7.18 |  |  | 0.00 |  |  | 51.50 |  |  | −0.76 |  |  |  |  |
| PR |  | Yes |  |  | −21.17 |  |  | 13.77 |  |  | −1.54 |  |  | 0.13 |  |  | 2.36 |  |  | −0.11 |  |  |  |  |
| Q2 |  | Yes |  |  | 292.88 |  |  | 54.02 |  |  | 5.42 |  |  | 0.00 |  |  | 29.39 |  |  | 0.04 |  |  |  |  |
| Q3 |  | Yes |  |  | 149.07 |  |  | 54.11 |  |  | 2.76 |  |  | 0.01 |  |  | 7.59 |  |  | 0.02 |  |  |  |  |
| Q4 |  | Yes |  |  | −60.25 |  |  | 54.22 |  |  | −1.11 |  |  | 0.27 |  |  | 1.23 |  |  | −0.01 |  |  |  |  |
|  |
| Audit Trail - Statistics |  |  |  |  |  |
| Accuracy Measures | Value |  | Forecast Statistics | Value |  |
| AIC | 492.41 |  | Durbin Watson | 1.62 |  |
| BIC | 494.10 |  | Mean | 1,802.86 |  |
| Mean Absolute Percentage Error (MAPE) | 5.30 | % | Standard Deviation | 244.36 |  |
| R-Square | 78.76 | % | Max | 2,272.60 |  |
| Adjusted R-Square | 75.64 | % | Min | 1,421.30 |  |
| Root Mean Square Error | 111.19 |  | Range | 851.30 |  |
|  |

Does the regression pass the "first quick check (i.e., economic realism)?"

A) No, because the sign of one of the regression coefficients is incorrect.   
 B) No, because the price variable does not make economic sense to include in the regression.  
 C) Yes, because the SEE passes its statistical test.  
 D) Yes, because the signs of all the regression coefficients are correct.

**66)** What action may reduce multicollinearity when two independent variables have a common trend?

A) All of the options are correct.   
 B) Subtracting one from the other  
 C) Squaring one of the variables  
 D) First-differencing the data  
 E) Dividing one by the other

**67)** Bottled WaterShown above is the demand for bottled water in thousands of Gallons for 110 consecutive weeks. From weeks 75 through 84, there was a severe flood in the area. Shown below are two regression results using this data. The “Week” variable is an index of weeks from 1 through 109. The “Intervention” variable is a dummy variable equaling one during the intervention and zero otherwise.Regression #1

|  |
| --- |
| Audit Trail — ANOVA Table (Multiple Regression Selected) |
| Source of variation | SS | df | MS | SEE |
| Regression |  | 33,763.50 |  |  | 1 |  |  | 33,763.50 |  |  |  |  |
| Error |  | 6,697.97 |  |  | 108 |  |  | 62.02 |  |  | 7.88 |  |
| Total |  | 40,461.47 |  |  | 109 |  |  |  |  |  |  |  |
|  |
| Audit Trail — Coefficient Table (Multiple Regression Selected) |
| Series Description | Included in Model | Coefficient | Standard Error | T-test | P-value |  | Elasticity |  | Overall F-test |
| Week |  | Yes |  |  | 0.55 |  |  | 0.02 |  |  | 23.33 |  |  | 0.00 |  |  |  | 0.25 |  |  |  |  |  |
| Demand |  | Dependent |  |  | 94.28 |  |  | 1.51 |  |  | 62.35 |  |  | 0.00 |  |  |  |  |  |  |  | 544.41 |  |
|  |
| Audit Trail — Correlation Coefficient Table |
| Series Description | Included in Model | Week | Demand |
| Week |  | Yes |  |  | 1.00 |  |  | 0.91 |  |
| Demand |  | Dependent |  |  | 0.91 |  |  | 1.00 |  |
|  |
| Audit Trail - Statistics |  |  |  |  |  |
| Accuracy Measures | Value |  | Forecast Statistics | Value |  |
| AIC | 766.17 |  | Durbin Watson | 0.60 |  |
| BIC | 768.87 |  | Mean | 124.90 |  |
| Mean Absolute Percentage Error (MAPE) | 4.00 | % | Standard Deviation | 19.27 |  |
| R-Square | 83.45 | % | Max | 167.08 |  |
| Adjusted R-Square | 83.29 | % | Min | 89.55 |  |
| Mean Square Error | 60.89 |  | Range | 77.54 |  |
| Root Mean Square Error | 7.80 |  |  |  |  |
|  |
| Method Statistics | Value |
| Method Selected | Multiple Regression |
|  |

Regression #2

|  |
| --- |
| Audit Trail — ANOVA Table (Multiple Regression Selected) |
| Source of variation | SS | df | MS | SEE |
| Regression |  | 38,993.33 |  |  | 2 |  |  | 19,496.66 |  |  |  |  |
| Error |  | 1.468.14 |  |  | 107 |  |  | 13.72 |  |  | 3.70 |  |
| Total |  | 40,461.47 |  |  | 109 |  |  |  |  |  |  |  |
|  |
| Audit Trail — Coefficient Table (Multiple Regression Selected) |  |
| Series Description | Included in Model | Coefficient | Standard Error | T-test | P-value |  | Elasticity | Overall F-test |
| Week |  | Yes |  |  | 0.50 |  |  | 0.01 |  |  | 43.50 |  |  | 0.00 |  |  |  | 0.22 |  |  |  |  |
| Demand |  | Dependent |  |  | 95.00 |  |  | 0.71 |  |  | 133.39 |  |  | 0.00 |  |  |  |  |  |  | 1,420.94 |  |
| Intervention |  | Yes |  |  | 24.70 |  |  | 1.27 |  |  | 19.52 |  |  | 0.00 |  |  |  | 0.22 |  |  |  |  |
|  |
| Audit Trail — Correlation Coefficient Table |  |
| Series Description | Included in Model | Week | Demand | Intervention |
| Week |  | Yes |  |  | 1.00 |  |  | 0.91 |  |  | 0.24 |  |
| Demand |  | Dependent |  |  | 0.91 |  |  | 1.00 |  |  | 0.57 |  |
| Intervention |  | Yes |  |  | 0.24 |  |  | 0.57 |  |  | 1.00 |  |
|  |
| Audit Trail - Statistics |  |  |  |  |  |
| Accuracy Measures | Value |  | Forecast Statistics | Value |  |
| AIC | 599.21 |  | Durbin Watson | 1.84 |  |
| BIC | 601.91 |  | Mean | 124.90 |  |
| Mean Absolute Percentage Error (MAPE) | 2.47 | % | Standard Deviation | 19.27 |  |
| R-Square | 96.37 | % | Max | 167.08 |  |
| Adjusted R-Square | 96.30 | % | Min | 89.55 |  |
| Mean Square Error | 13.35 |  | Range | 77.54 |  |
| Root Mean Square Error | 3.65 |  |  |  |  |
|  |
| Method Statistics | Value |
| Method Selected | Multiple Regression |
|  |

Consider the two regressions shown above. Which of the following statements is true?

A) Neither regression seems to suffer from serial correlation.   
 B) The coefficient on the "Week" index has an incorrect sign in both regressions.  
 C) None of the options are correct.  
 D) Both regressions explain more than 90% of the variation in "Demand."  
 E) All independent variables are significant at the 99% level in both regressions.

**68)** Which of the following is not correct? Seasonality in a time series data set containing quarterly observations can be handled by

A) using three dummy variables to represent any three of the quarters.   
 B) using four dummy variables, one for each season.  
 C) deseasonalizing the data and then applying nonseasonal methods.  
 D) using Winter's smoothing.

**69)** A correlation between age and health of a person is found to be −1.09. On the basis of this, you would tell the doctors that

A) age is a good predictor of health.   
 B) None of the options are correct.  
 C) age is a poor predictor of health.

**70)** Which of the following statements are true?

A) Autocorrelation arises when there is a perfect linear association between the dependent and independent variables.   
 B) Autocorrelation implies the error terms have differing variances.  
 C) Autocorrelation can be tested using the F-statistic.  
 D) Autocorrelation causes the t-ratios to be overstated.

**71)** ForecastX RegressionsExhibit #1

|  |  |  |
| --- | --- | --- |
| Audit Trail — Coefficient Table (Multiple Regression Selected) |  |  |
| Series  Description | Included in Model |  | Coefficient |  | Standard Error |  | T-test |  | P-value |  | F-test |  | Elasticity |  | Overall F-test |
| SALES |  | Dependent |  |  |  | −51.24 |  |  |  | 54.32 |  |  |  | −0.94 |  |  |  | 0.36 |  |  |  | 0.89 |  |  |  |  |  |  |  | 8.98 |  |
| PRICE |  | Yes |  |  |  | 30.92 |  |  |  | 10.32 |  |  |  | 3.00 |  |  |  | 0.01 |  |  |  | 8.98 |  |  |  | 1.46 |  |  |  |  |  |
|  |
| Audit Trail — Correlation Coefficient Table |
| Series Description | Included in Model | SALES | PRICE |
| SALES |  | Dependent |  |  | 1.00 |  |  | 0.63 |  |
| PRICE |  | Yes |  |  | 0.63 |  |  | 1.00 |  |
|  |
| Audit Trail - Statistics |
| Accuracy Measures | Value |  | Forecast Statistics | Value |  |
| AIC | 130.02 |  | Durbin Watson(1) | 0.34 |  |
| BIC | 130.80 |  | Mean | 111.19 |  |
| Mean Absolute Percentage Error (MAPE) | 10.67 | % | Standard Deviation | 17.49 |  |
| R-Square | 39.07 | % | Ljung-Box | 39.71 |  |
| Adjusted R-Square | 34.72 | % |  |  |  |
| Root Mean Square Error | 13.22 |  |  |  |  |
|  |

Exhibit #2

|  |  |
| --- | --- |
| Audit Trail — Coefficient Table (Multiple Regression Selected) |  |
| Series  Description | Included in Model | Coefficient | Standard Error | T-test | P-value | F-test | Elasticity | Overall F-test |
| SALES |  | Dependent |  |  | 123.47 |  |  | 19.40 |  |  | 6.36 |  |  | 0.00 |  |  | 40.51 |  |  |  |  |  | 154.86 |  |
| PRICE |  | Yes |  |  | −24.84 |  |  | 4.95 |  |  | −5.02 |  |  | 0.00 |  |  | 25.17 |  |  | −1.17 |  |  |  |  |
| INCOME |  | Yes |  |  | 0.03 |  |  | 0.00 |  |  | 13.55 |  |  | 0.00 |  |  | 183.62 |  |  | 1.06 |  |  |  |  |
|  |
| Audit Trail — Correlation Coefficient Table |  |
| Series Description | Included in Model | SALES | PRICE | INCOME |
| SALES |  | Dependent |  |  | 1.00 |  |  | 0.63 |  |  | 0.94 |  |
| PRICE |  | Yes |  |  | 0.63 |  |  | 1.00 |  |  | 0.83 |  |
| INCOME |  | Yes |  |  | 0.94 |  |  | 0.83 |  |  | 1.00 |  |
|  |
| Audit Trail - Statistics |
| Accuracy Measures | Value |  | Forecast Statistics | Value |  |
| AIC | 86.56 |  | Durbin Watson(1) | 1.67 |  |
| BIC | 87.34 |  | Mean | 111.19 |  |
| Mean Absolute Percentage Error (MAPE) | 2.22 | % | Standard Deviation | 17.49 |  |
| R-Square | 95.97 | % | Ljung-Box | 15.22 |  |
| Adjusted R-Square | 95.35 | % |  |  |  |
| Root Mean Square Error | 3.40 |  |  |  |  |
|  |

Consider the two regressions presented above in answering the following questions.In the simple regression above,

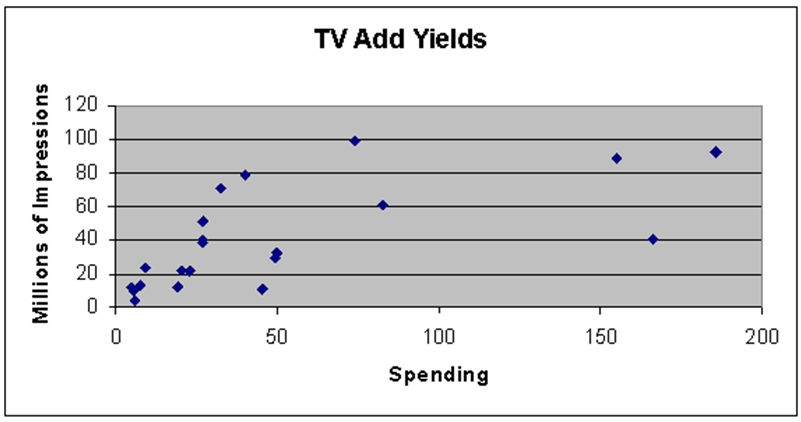
A) the first quick check fails.   
 B) the independent variable is Sales.  
 C) the second quick check fails.  
 D) there does not appear to be first order serial correlation.

**72)** The F-test in multiple regression

A) tests for the presence of first-order autocorrelation.   
 B) tests the significance of the Durbin-Watson statistic.  
 C) tests a null involving all regression slope coefficients simultaneously.  
 D) is used to test for the presence of autocorrelation.  
 E) is used to test the significance of individual coefficients.

**73)** Forecasters who base model selection criteria on the maximization of R2 should

A) instead use the adjusted R-squared measure.   
 B) be aware that the simple R-squared measure is suspect when autocorrelation is present.  
 C) be wary that extremely high values of R2 may indicate a definitional relationship rather than causal as required by the multiple regression models.  
 D) All of the options are correct.  
 E) be aware that R-squared can be made arbitrarily large by adding additional explanatory variables to the model.

**74)** Television Add YieldsTelevision add yields are sometimes measured in millions of retained impressions. The following two regressions model the effectiveness of adds for 21 consumer products. The data is from The Wall Street Journal, March 1, 1984.The variables collected for each of the 21 products are:SPENDING: TV advertising budget, ($ millions) MILIMP: Millions of retained impressions,MILIMP Sqrd: Millions of retained impressions squared.A scatterplot of the data used appears below:Regression #2

|  |
| --- |
| Audit Trail — ANOVA Table (Multiple Regression Selected) |
| Source of variation | SS | df | MS | SEE |
| Regression |  | 17,236.77 |  |  | 2 |  |  | 8,61838 |  |  |  |  |
| Error |  | 980.62 |  |  | 18 |  |  | 54.48 |  |  | 7.38 |  |
| Total |  | 18,217.39 |  |  | 20 |  |  |  |  |  |  |  |
|  |
| Audit Trail — Coefficient Table (Multiple Regression Selected) |  |  |
| Series Description | Included in Model | Coefficient | Standard Error | T-test |  | P-value | F-test | Elasticity |  | Overall F-test |
| Spending |  | Yes |  |  | 0.03 |  |  | 0.04 |  |  | 0.74 |  |  |  | 0.47 |  |  | 0.55 |  |  | 0.04 |  |  |  |  |  |
| Milimp |  | Dependent |  |  | 16.33 |  |  | 2.27 |  |  | 7.19 |  |  |  | 0.00 |  |  | 51.74 |  |  |  |  |  |  | 158.20 |  |
| Milimp Sqrd |  | Yes |  |  | 0.01 |  |  | 0.00 |  |  | 13.21 |  |  |  | 0.00 |  |  | 174.63 |  |  | 0.56 |  |  |  |  |  |
|  |
| Audit Trail — Correlation Coefficient Table |  |
| Series Description | Included in Model | Spending | Milimp | Milimp Sqrd |
| Spending |  | Yes |  |  | 1.00 |  |  | 0.65 |  |  | 0.64 |  |
| Milimp |  | Dependent |  |  | 0.65 |  |  | 1.00 |  |  | 0.97 |  |
| Milimp Sqrd |  | Yes |  |  | 0.64 |  |  | 0.97 |  |  | 1.00 |  |
|  |
| Audit Trail - Statistics |  |  |  |  |  |
| Accuracy Measures | Value |  | Forecast Statistics | Value |  |
| AIC | 142.31 |  | Durbin Watson(4) | 1.42 |  |
| BIC | 143.36 |  | Mean | 40.47 |  |
| Mean Absolute Percentage Error (MAPE) | 35.54 | % | Standard Deviation | 30.18 |  |
| R-Square | 94.62 | % | Max | 99.60 |  |
| Adjusted R-Square | 94.02 | % | Min | 4.40 |  |
| Mean Square Error | 46.70 |  | Range | 95.20 |  |
| Root Mean Square Error | 6.83 |  | Root Mean Square | 29.45 |  |
| Theil | 0.12 |  | Ljung-Box | 7.15 |  |
|  |

Regression #2 above for TV Add Yields

A) has P-values that are lower than acceptable.   
 B) is superior to Regression #1 in terms of Akaike score.  
 C) None of the options are correct.  
 D) may suffer from autocorrelation.  
 E) is inferior to Regression #1 in terms of the Adjusted Coefficient of Determination score.

**75)** The Durbin-Watson statistic

A) is used to test the null of no multicollinearity.   
 B) is the squared value of theF-statistic.  
 C) has a t distribution with N− (K + 1) degrees of freedom.  
 D) is used to test the null hypothesis of first-order autocorrelation.  
 E) None of the options are correct.

**76)** Personnel TestThe personnel department of a large manufacturing firm selected a random sample of 23 workers. The workers were interviewed and given several tests. On the basis of the test results, the following variables were investigated: X2 = manual dexterity score, X3 = mental aptitude score, and X4 = personnel assessment score.Subsequently, the workers were observed in order to determine the average number of units of work completed (Y) in a given time period for each worker. Regression analysis yielded these results:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| y | = | −212 |  | + | 1.90X2 |  | + | 2.00X3 |  | + | 0.25X4 |  | Adjusted R2 | = | 0.75. |
|  |  |  |  |  | (0.50) |  |  | (0.060) |  |  | (0.20) |  |

Note: The numbers shown in parentheses below the coefficients are the standard errors of the coefficients.The quantities in parentheses are the standard errors of the regression coefficients. The standard error of the regression is 25, and the standard deviation of the dependent variable is 50.Which variables are making a statistically significant contribution to the prediction of units of work completed at the 0.01 significance level (two tailed)?

A) Personnel assessment   
 B) All three variables  
 C) Manual dexterity and mental aptitude  
 D) None of the variables are statistically significant.  
 E) Manual dexterity and personnel assessment

**77)** Estimated Demand FunctionThe following is an estimated demand function:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Q |  | = |  | 875 |  | + |  | 6XA |  | + | 15Y |  | − | 5P |  |
|  |  |  |  |  |  |  | (125) |  | (2) |  |  | (−1.2) |

Where Q is quantity sold, XA is advertising expenditure (in thousands of dollars), Y is income (in thousands of dollars), and P is the good’s price. The standard errors for each estimate are in parentheses. The equation has been estimated from 10 years of quarterly data. The R2 was 0.92; the F-statistic was 57; the Standard Error of the Estimate (SEE) is 25.According to the common 95 percent level of significance (estimated) for the regression above,

A) all variables are probably significant.   
 B) only price is significant.  
 C) no variable is significant.  
 D) both income and price are significant.

**78)** Which of the following is not recommended in selecting the correct set of independent variables for multiple regression?

A) Bayesian Information Criterion   
 B) Adjusted R-squared  
 C) R-squared  
 D) None of the options are correct.  
 E) Akaike Information Criterion

**79)** A real estate builder wishes to determine how house size (House) is influenced by family income (Income), family size (Size), and education of the head of household (School). House size is measured in hundreds of square feet, income is measured in thousands of dollars, and education is measured in years. The builder randomly selected 50 families and ran a multiple regression. The regression statistics are below:Regression Statistics

|  |  |  |
| --- | --- | --- |
|  |  |  |
| R Square |  | 0.748 |
| Adjusted R Square |  | 0.726 |
| Standard Error |  | 5.195 |
| Observations |  | 50 |
|  |
| ANOVA Table |
|  | df | SS | MS | F | Sig. F |
| Regression |  |  | 3605.7736 |  |  | 901.4434 |  |  |  |  |  | 0.0001 |  |
| Error |  |  | 1214.2264 |  |  | 29.9892 |  |  |  |  |  |  |  |
| Total | 49 |  | 4820.0000 |  |  |  |  |  |  |  |  |  |  |
|  |
|  | Coefficient | Std. Error | T-test | P-Value |
| Intercept |  |  | −1.6335 |  |  | 5.8078 |  |  |  | −0.281 |  |  | 0.7798 |  |
| Income |  |  | 0.4485 |  |  | 0.1137 |  |  |  | 3.9545 |  |  | 0.0003 |  |
| Size |  |  | 4.2615 |  |  | 0.8062 |  |  |  | 5.286 |  |  | 0.0001 |  |
| School |  |  | −0.6517 |  |  | 0.4319 |  |  |  | −1.509 |  |  | 0.1383 |  |
|  |

Dependent variable is House.Referring to the Real Estate Builder regression results, which of the following values for the level of significance is the smallest for which the regression model as a whole is significant?

A) 86%   
 B) 95%  
 C) 90%  
 D) 92%

**80)** When autocorrelation is present, which of the following is true? rev: 11\_04\_2018\_QC\_CS-146411

A) The D-W statistic is close to minus one.   
 B) None of the options are correct.  
 C) The estimates of the standard errors of the coefficients are smaller.  
 D) The t distribution remain applicable.  
 E) Regression coefficient estimates are biased.

**81)** A real estate builder wishes to determine how house size (House) is influenced by family income (Income), family size (Size), and education of the head of household (School). House size is measured in hundreds of square feet, income is measured in thousands of dollars, and education is measured in years. The builder randomly selected 50 families and ran a multiple regression. The regression statistics are below:Regression Statistics

|  |  |  |
| --- | --- | --- |
|  |  |  |
| R Square |  | 0.748 |
| Adjusted R Square |  | 0.726 |
| Standard Error |  | 5.195 |
| Observations |  | 50 |
|  |
| ANOVA Table |
|  | df | SS | MS | F | Sig. F |
| Regression |  |  | 3605.7736 |  |  | 901.4434 |  |  |  |  |  | 0.0001 |  |
| Error |  |  | 1214.2264 |  |  | 29.9892 |  |  |  |  |  |  |  |
| Total | 49 |  | 4820.0000 |  |  |  |  |  |  |  |  |  |  |
|  |
|  | Coefficient | Std. Error | T-test | P-Value |
| Intercept |  |  | −1.6335 |  |  | 5.8078 |  |  |  | −0.281 |  |  | 0.7798 |  |
| Income |  |  | 0.4485 |  |  | 0.1137 |  |  |  | 3.9545 |  |  | 0.0003 |  |
| Size |  |  | 4.2615 |  |  | 0.8062 |  |  |  | 5.286 |  |  | 0.0001 |  |
| School |  |  | −0.6517 |  |  | 0.4319 |  |  |  | −1.509 |  |  | 0.1383 |  |
|  |

Dependent variable is House.Referring to the Real Estate Builder regression results, suppose the builder wants to test whether the coefficient on Income is significantly different from 0. What is the value of the relevant diagnostic statistic?

A) 0.4485   
 B) 3.9545  
 C) −0.281  
 D) 5.195

**82)** Which of the following is probably not a potential cause of data seasonality?

A) All of the options could be a potential cause of data seasonality.   
 B) Government Behavior  
 C) Weather  
 D) Cultural Traditions  
 E) Religious Traditions

82) A