**1.a. (3 points)** Estimate the following 3 models as they are defined below in Eviews:

|  |  |
| --- | --- |
| ***Model*** | ***Specification***[[1]](#footnote-1) |
| I. | b\_p\_c max\_t max\_t^2 holiday c |
| II | b\_p\_c max\_t log(max\_t) holiday c |
| III | b\_p\_c max\_t @sqrt(max\_t) holiday c |

1. **b\_p\_c max\_t max\_t^2 holiday c**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Dependent Variable: B\_P\_C | | |  |  |
| Method: Least Squares | | |  |  |
| Date: 04/27/13 Time: 22:32 | | |  |  |
| Sample: 1 98 | |  |  |  |
| Included observations: 98 | | |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|  |  |  |  |  |
|  |  |  |  |  |
| MAX\_T | -0.003640 | 0.001238 | -2.940339 | 0.0041 |
| MAX\_T^2 | 3.64E-05 | 1.05E-05 | 3.470373 | 0.0008 |
| HOLIDAY | 0.048408 | 0.013890 | 3.485111 | 0.0007 |
| C | 0.366610 | 0.033853 | 10.82938 | 0.0000 |
|  |  |  |  |  |
|  |  |  |  |  |
| R-squared | 0.224347 | Mean dependent var | | 0.303137 |
| Adjusted R-squared | 0.199592 | S.D. dependent var | | 0.053313 |
| S.E. of regression | 0.047696 | Akaike info criterion | | -3.207964 |
| Sum squared resid | 0.213844 | Schwarz criterion | | -3.102456 |
| Log likelihood | 161.1903 | Hannan-Quinn criter. | | -3.165288 |
| F-statistic | 9.062726 | Durbin-Watson stat | | 1.604775 |
| Prob(F-statistic) | 0.000025 |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |

1. **b\_p\_c max\_t logmax\_t holiday c**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Dependent Variable: B\_P\_C | | |  |  |
| Method: Least Squares | | |  |  |
| Date: 04/27/13 Time: 22:35 | | |  |  |
| Sample: 1 98 | |  |  |  |
| Included observations: 98 | | |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|  |  |  |  |  |
|  |  |  |  |  |
| MAX\_T | 0.002446 | 0.000805 | 3.038618 | 0.0031 |
| LOG(MAX\_T) | -0.094080 | 0.038829 | -2.422962 | 0.0173 |
| HOLIDAY | 0.047783 | 0.014338 | 3.332504 | 0.0012 |
| C | 0.526521 | 0.110504 | 4.764703 | 0.0000 |
|  |  |  |  |  |
|  |  |  |  |  |
| R-squared | 0.176406 | Mean dependent var | | 0.303137 |
| Adjusted R-squared | 0.150121 | S.D. dependent var | | 0.053313 |
| S.E. of regression | 0.049148 | Akaike info criterion | | -3.147992 |
| Sum squared resid | 0.227062 | Schwarz criterion | | -3.042483 |
| Log likelihood | 158.2516 | Hannan-Quinn criter. | | -3.105316 |
| F-statistic | 6.711290 | Durbin-Watson stat | | 1.471538 |
| Prob(F-statistic) | 0.000375 |  |  |  |
| |  |  |  |  |  | | --- | --- | --- | --- | --- | | Dependent Variable: B\_P\_C | | |  |  | | Method: Least Squares | | |  |  | | Date: 04/27/13 Time: 22:37 | | |  |  | | Sample: 1 98 | |  |  |  | | Included observations: 98 | | |  |  | |  |  |  |  |  | |  |  |  |  |  | | Variable | Coefficient | Std. Error | t-Statistic | Prob. | |  |  |  |  |  | |  |  |  |  |  | | MAX\_T | 0.005749 | 0.001839 | 3.125936 | 0.0024 | | @SQRT(MAX\_T) | -0.075068 | 0.026501 | -2.832661 | 0.0056 | | HOLIDAY | 0.048352 | 0.014185 | 3.408650 | 0.0010 | | C | 0.521569 | 0.093113 | 5.601484 | 0.0000 | |  |  |  |  |  | |  |  |  |  |  | | R-squared | 0.193788 | Mean dependent var | | 0.303137 | | Adjusted R-squared | 0.168058 | S.D. dependent var | | 0.053313 | | S.E. of regression | 0.048627 | Akaike info criterion | | -3.169323 | | Sum squared resid | 0.222269 | Schwarz criterion | | -3.063814 | | Log likelihood | 159.2968 | Hannan-Quinn criter. | | -3.126647 | | F-statistic | 7.531535 | Durbin-Watson stat | | 1.518969 | | Prob(F-statistic) | 0.000143 |  |  |  | |  |  |  |  |  | |  |  |  |  |  | |  |  |  |  |
| |  |  |  |  |  | | --- | --- | --- | --- | --- | | Dependent Variable: B\_P\_C | | |  |  | | Method: Least Squares | | |  |  | | Date: 04/27/13 Time: 22:37 | | |  |  | | Sample: 1 98 | |  |  |  | | Included observations: 98 | | |  |  | |  |  |  |  |  | |  |  |  |  |  | | Variable | Coefficient | Std. Error | t-Statistic | Prob. | |  |  |  |  |  | |  |  |  |  |  | | MAX\_T | 0.005749 | 0.001839 | 3.125936 | 0.0024 | | @SQRT(MAX\_T) | -0.075068 | 0.026501 | -2.832661 | 0.0056 | | HOLIDAY | 0.048352 | 0.014185 | 3.408650 | 0.0010 | | C | 0.521569 | 0.093113 | 5.601484 | 0.0000 | |  |  |  |  |  | |  |  |  |  |  | | R-squared | 0.193788 | Mean dependent var | | 0.303137 | | Adjusted R-squared | 0.168058 | S.D. dependent var | | 0.053313 | | S.E. of regression | 0.048627 | Akaike info criterion | | -3.169323 | | Sum squared resid | 0.222269 | Schwarz criterion | | -3.063814 | | Log likelihood | 159.2968 | Hannan-Quinn criter. | | -3.126647 | | F-statistic | 7.531535 | Durbin-Watson stat | | 1.518969 | | Prob(F-statistic) | 0.000143 |  |  |  | |  |  |  |  |  | |  |  |  |  |  | |  |  |  |  |

1. **b\_p\_c max\_t @sqrt(max\_t) holiday c**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Dependent Variable: B\_P\_C | | |  |  |
| Method: Least Squares | | |  |  |
| Date: 04/27/13 Time: 22:37 | | |  |  |
| Sample: 1 98 | |  |  |  |
| Included observations: 98 | | |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|  |  |  |  |  |
|  |  |  |  |  |
| MAX\_T | 0.005749 | 0.001839 | 3.125936 | 0.0024 |
| @SQRT(MAX\_T) | -0.075068 | 0.026501 | -2.832661 | 0.0056 |
| HOLIDAY | 0.048352 | 0.014185 | 3.408650 | 0.0010 |
| C | 0.521569 | 0.093113 | 5.601484 | 0.0000 |
|  |  |  |  |  |
|  |  |  |  |  |
| R-squared | 0.193788 | Mean dependent var | | 0.303137 |
| Adjusted R-squared | 0.168058 | S.D. dependent var | | 0.053313 |
| S.E. of regression | 0.048627 | Akaike info criterion | | -3.169323 |
| Sum squared resid | 0.222269 | Schwarz criterion | | -3.063814 |
| Log likelihood | 159.2968 | Hannan-Quinn criter. | | -3.126647 |
| F-statistic | 7.531535 | Durbin-Watson stat | | 1.518969 |
| Prob(F-statistic) | 0.000143 |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |

**1b (3 points)** Algebraically define the specifications for each model. Evaluate the marginal effect (partial derivative) of temperature at 95°F for each model as well.

i)

=0.06552

At 95degrees, the marginal effect is 0.06552

ii)

= 0.001456

iii)

=0.00189

**1.b (3 points)** Plot a histogram of the maximum temperatures in these data. Using this histogram determine if these specifications result in turning points – temperatures at which the relationship between beer sales per capita and the maximum temperature in the day changes in sign within the range of the data. For each model with a turning point determine the formula and the turning point



No turning point exists for ii) and iii). The two do not have turning points because of the nature of their derivatives. Both have asymptotes at x=o and because when x=0 there is a turning point, we cannot find a turning point for ii) and iii). There is a turning point for i) which is at 5 degrees:

However the data set we used has a minimum temperature of 7 degrees. Therefore we are unable to say that the data supports the hypothesis that there will be a point at which the relationship between beer sales per capita and the maximum temperature in the day changes in sign within the range of the data. A larger set of data must be collected for us to say that the evidence collected supports the said hypothesis.

**1c (1 points)** Would you expect to have problems estimating any of models I, II, or III if the temperature was converted to Centigrade (°C = (°F – 32)5/9) instead of degrees Fahrenheit? Explain why.

I would expect there to be problems in estimating the ii) and iii) models because you cannot take the log or square root of a natural number without involving imaginary numbers. This suggests that for temperatures under or equal to 32 °F we would not be able estimate the ii) model because you cannot take the log of a negative or 0 number. This also suggests that for temperatures under but not equal to 32°F we would not be able to estimate the iii) model because there is a square root involved and you cannot that the square root of a negative number.

1. [↑](#footnote-ref-1)