

i)

	b_i	Sb_i	t	P-value
Constant	6386.17	0.838701	7.578	
X_1	0.56038	0.15811	3.544	0.000
X_2	-31.2077	8.95905	-3.483	0.025
X_3	-327.503	179.169	-2.195	0.001
X_4	-113.895	16.2604	-7.004	0.000
X_5	-621.458	177.828	-4.203	0.000

ANOVA

Source	Sum of Square	df	Mean Square	F	P-value
Regression	12204000	5	2440800	20.28	0.000
Residual	2166000	18	120333.33		
Total	14370000	23			

iii)

a.

Null hypothesis $H_0: \beta_1 = \beta_2 = \beta_3 = 0$

There is no significant impact of ~~dependent~~ independent variable in independent variable X_3 on Y

Alternative hypothesis (H_1): $\beta_j \neq 0$

There is at least one significant impact of X_3 on Y

Impact of dependent variable in
dependent variable

$$\begin{aligned} \text{Test-Statistic} &= \frac{b_3}{Sb_3} = \frac{327.503}{199.969} \\ \text{calculated} & \\ t\text{-value of } X_3 &= -2.195 \end{aligned}$$

tabulated t-value of X_3

$$= -t_{\alpha, df}$$

$$= t_{n-k-1, \alpha}$$

$$= t_{18, 0.05}$$

$$= 2.101$$

Decision

Here, tabulated value is greater than calculated value, so we ~~do not~~ reject H_0 . Mean, there is significant impact of X_3 on Y .

iii)

Construct 99% confidence interval estimate for the regression coefficient of square feet heated space

$$1 - \alpha = 99\%$$

$$\alpha = 1\%$$

$$= 0.01$$

we have

$$b_1 \pm t_{n-k-1, \alpha/2} \cdot s_{b_1}$$

$$b_1 \pm t_{n-k-1, \alpha/2} \cdot s_{b_1}$$

~~$$0.56038 \pm 2.101 \cdot 0.15811$$~~

$$0.56038 \pm 0.3321$$

~~$$0.56038 \pm 2.878 \cdot 0.15811$$~~

~~$$0.56038 \pm 0.4550$$~~

$$0.01538 < \beta_1 < 0.10538$$

ii) Standard error of the estimate = \sqrt{MSE}

$$\Rightarrow \sqrt{120333.33}$$

$$= 346.89$$

Interpretation

The average variation of observed values of dependent variable around its fitted equation is 346.89

$$i) R^2 = \frac{SSR}{TSS} = \frac{12209000}{24660000}$$

$$= \frac{12209000}{14370000} = 0.8492$$

Interpretation

84.92% variation in dependent variable is explained by 5 independent variables.

$$R^2 = 1 - \left\{ (1 - R^2) \times \frac{n - k}{n - k - 1} \right\}$$

$$= 1 - \left\{ (1 - 0.8492) \times \frac{24 - 1}{24 - 5 - 1} \right\}$$

$$= 0.8073$$

Interpretation

80.73 % of variation in dependent variable is ~~expressed~~ explained by 5 independent variable after adjusting given degree of freedom

vi)

$$Y = b_0 + b_1 X_1 + b_2 X_2 + b_3 X_3 + b_4 X_4 + b_5 X_5$$

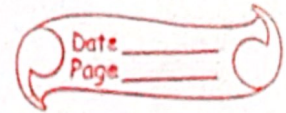
$$= 6386.17 + 0.56038 \times 1295 + 312077 \times 18$$

$$+ -327.503 \times 5 + -113.895 \times 5$$

$$+ -621.458 \times 1$$

$$= 3919.4655$$

0.19268



vi) $H_0: \beta_1 = \beta_2 = \beta_3 = \beta_4 = \beta_5 = 0$

$H_1: \beta_i \neq 0$ (where $i = 1, 2, 3, 4, 5$)

Test-statistic

Calculated F-value = 20.28

Tabulated F-value
Critical value

$$= F_{K, n-K-1, \alpha}$$

$$= F_{5, 18, 0.05}$$

Critical region — 2.77

Decision $F_{cal} > F_{tab}$

Here, calculated value is greater than tabulated value. so we reject H_0 . There is no sig. There is significant impact of at least one independent variable on dependent variable.