quiz_02

August 10, 2025

1 Quiz 2

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1. **Linear Regression** *(15)*

SNo.	X_1	X_2	Y	$\hat{Y}$	ϵ
1	5.0	19.1	21.2		
2	5.7	22.8	24.6		
3	4.9	8.5	14.3		
4	5.5	2.8	12.4		
5	1.4	2.4	4.2		
6	2.7	16.9	14.9		
7	7.2	23.4	26.7		
8	3.6	2.3	9.0		
9	6.9	4.0	15.9		
10	2.4	6.4	7.8		
11	2.7	4.5	7.3		
12	2.7	15.9	14.1		
13	5.6	6.1	15.7		
14	2.0	6.8	7.8		
15	2.5	1.5	5.8		
16	5.2	24.2	22.0		
17	4.2	12.2	14.0		
18	6.5	13.7	18.9		
19	2.4	13.5	11.6		
20	8.1	6.1	20.1		
21	3.3	11.4	11.9		
22	5.1	16.0	18.1		
23	6.7	17.8	21.7		
24	3.6	27.6	22.6		
25	7.2	24.8	28.0		
26	1.6	3.2	4.9		
27	6.4	21.6	23.6		
28	1.8	9.6	8.8		
29	6.4	3.0	14.9		
30	4.5	12.0	15.3		

For the above-detailed dataset with exogenous variables X_1, X_2 and endogenous variable Y, infer the outcomes of the following linear regression model $Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2$

Coefficient	Estimate	Standard Error	t Stat	P-value	Lower 95%	Upper 95%
β_0	0.044	0.341	0.129	0.898	-0.656	0.745
β_1	2.003	0.071	28.260	0.000	1.858	2.148
β_2	0.524	0.017	30.102	0.000	0.489	0.560

a. Comment on the estimated value and significance of each coefficient - $\beta_0, \beta_1, \beta_2$ *(2)*

b. Fill in the above table, computing fitted values and corresponding errors *(3)*

c. Compute the following model statistics *(5)*

- Sum Squares Total
- Sum Squares Regression
- Sum Squares Error
- R-squared
- Adjusted R-squared

d. Perform ex-post analysis (compute correlation between X_1 and X_2; draw residuals plot) to comment upon the validity of the model. *(5)*

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2. **Logistic Regression** *(15)*

For the following dataset with exogenous variables X_1, X_2 and binary endogenous variable Y, infer the outcomes of the following logistic regression model

$$\log\left(\frac{\hat{P}_{Y=S}}{1-\hat{P}_{Y=S}}\right) = \beta_0 + \beta_1 X_1 + \beta_2 X_2$$

Coefficient	Estimate	Std. Error	z value	P-value
β_0	-15.63	5.644	-2.770	0.006
β_1	3.815	1.538	2.479	0.013
β_2	0.113	0.164	0.690	0.490

a. Comment on the estimated value and significance of each coefficient $\beta_0, \beta_1, \beta_2$. *(2)*

b. Fill in the above table *(3)*

c. Compute the following model statistics *(6)*

- Log-Likelihood for
  - Equally-Likely Model
  - Market Share Model

- McFadden R-squared for the Estimated Model vs.
  - Equally-Likely Model
  - Market Share Model
- Adjusted McFadden R-squared for the Estimated Model vs.
  - Equally-Likely Model
  - Market Share Model

SNo.	X_1	X_2	Y	$Y = S$	$Y = F$	$\hat{P}_{Y=S}$	$\hat{P}_{Y=F}$
1	2.660	20.0	F				
2	2.890	22.0	F				
3	3.280	24.0	F				
4	2.920	12.0	F				
5	4.000	21.0	S				
6	2.860	17.0	F				
7	2.760	17.0	F				
8	2.870	21.0	F				
9	3.030	25.0	F				
10	3.920	29.0	S				
11	2.630	20.0	F				
12	3.320	23.0	F				
13	3.570	23.0	F				
14	3.260	25.0	S				
15	3.530	26.0	F				
16	2.740	19.0	F				
17	2.750	25.0	F				
18	2.830	19.0	F				
19	3.120	23.0	F				
20	3.160	25.0	S				
21	2.060	22.0	F				
22	3.620	28.0	S				
23	2.890	14.0	F				
24	3.510	26.0	F				
25	3.540	24.0	S				
26	2.830	27.0	S				
27	3.390	17.0	S				
28	2.670	24.0	F				
29	3.650	21.0	S				
30	4.000	23.0	S				