

## Module: Data Visualisation

### Problem Set 5

#### Topics Covered: *Linear Regression*

**Exercise 1.** A retailer wishes to determine the relationship between the amount it spends on advertising and the total sales revenue of the company. The data in this case are collected over 12 months and are given by the following data table:

Month	Revenue €1000	Advertising €1000
Jan	75	2.1
Feb	81	2.4
Mar	65	1.5
Apr	67	1.5
May	71	2.3
Jun	73	2.3
Jul	79	2.7
Aug	84	3.1
Sep	86	3.3
Oct	74	3.2
Nov	88	4.1
Dec	92	4.5

Using this data set, answer the following

- (i) Identify the dependent and independent variables from this data set.
- (ii) Draw a scatter plot to represent this data set.
- (iii) From the scatter plot, is the linear relationship

$$y = a + bx$$

an appropriate relationship between these variables?

- (iv) Use the least squares method to find the line of best fit.

- (v) Include this line of best fit in your scatter plot.
- (vi) Interpret the parameters  $a$  and  $b$ .

**Exercise 2.** A company wishes to determine how much money it should spend on Research & Development (R&D), if it wished to remain competitive. It performs a survey of 20 similar companies and tabulates the Price to Earnings Ratio (PER) and the Research to Sales Ratio (RSR) of these companies. The data is collected in the table below:

Company	PER	RSR	Company	PER	RSR
1	5.6	0.003	11	8.4	0.058
2	7.2	0.004	12	11.1	0.058
3	8.1	0.009	13	11.1	0.067
4	9.9	0.021	14	13.2	0.080
5	6.0	0.023	15	13.4	0.080
6	8.2	0.030	16	11.5	0.083
7	6.3	0.035	17	9.8	0.091
8	10.0	0.037	18	16.1	0.092
9	8.5	0.044	19	7.0	0.064
10	13.2	0.051	20	5.9	0.028

- (i) Identify the dependent and independent variables from this data set.
- (ii) Draw a scatter plot to represent this data set.
- (iii) From the scatter plot, is the linear relationship

$$y = a + bx$$

an appropriate relationship between these variables?

- (iv) Use the least squares method to find the line of best fit.
- (v) Include this line of best fit in your scatter plot.
- (vi) Interpret the parameters  $a$  and  $b$ .