

# CUSTOMER ANALYTICS

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*Regression Analysis*



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ONLINE

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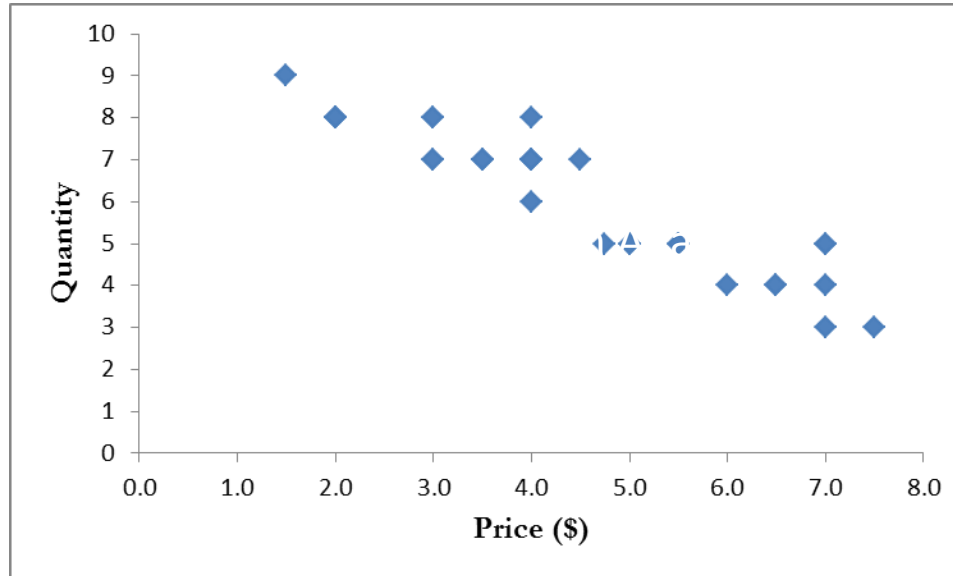
# What is the purpose of regression?

- Quantify the relationship among two or more variables.
  - Explain a **dependent** variable, from a set of predictor variables, called the **independent** variables
  - Uses a linear additive relation between the dependent and independent variables

# Example 1: Demand Analysis

Price (\$)	Demand
4.0	7
3.5	7
5.0	5
6.0	4
6.5	4
7.0	4
2.0	8
4.0	6
5.5	5
3.0	7
3.5	7
2.0	8
2.0	8
3.0	8
3.0	7
1.5	9
3.0	8
4.8	5
5.0	5
4.0	7
4.5	7
4.0	8
7.5	3
4.0	7
6.5	4
4.0	7
7.0	3
5.5	5
7.0	5
3.5	7
7.0	5
2.0	8

# Demand Analysis –Plot



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# Regression

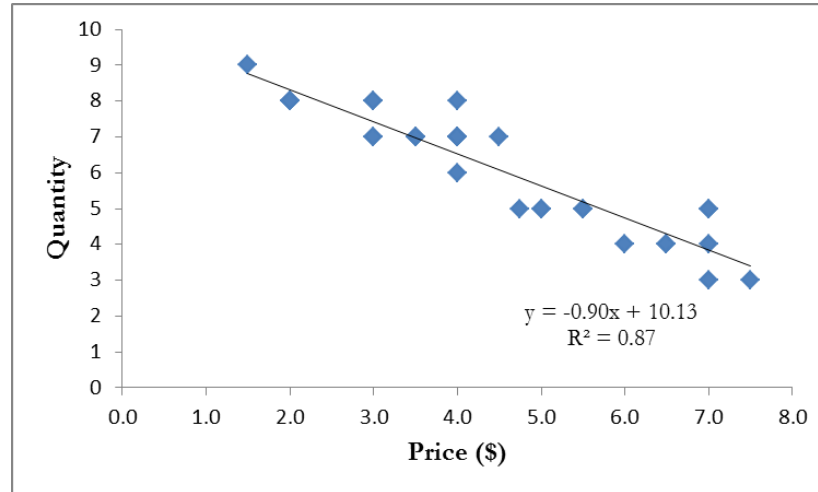
- Demand Analysis

- $\text{Sales}_t = a + b_1 \text{Price}_t + e_t$

- Simple Regression

$$Y_t = a + b_1 \times X_{1t} + e_t$$

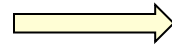
# Demand Curve



The regression line can be used to make demand predictions

# Demand Prediction

Price (\$)	Demand
4.0	7
3.5	7
5.0	5
6.0	4
6.5	4
7.0	4
2.0	8
4.0	6
5.5	5
3.0	7
3.5	7
2.0	8
2.0	8
3.0	8
3.0	7
1.5	9
3.0	8
4.8	5
5.0	5
4.0	7
4.5	7
4.0	8
7.5	3
4.0	7
6.5	4
4.0	7
7.0	3
5.5	5
7.0	5
3.5	7
7.0	5
2.0	8

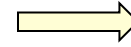


Regression

Price (\$)	Demand	Prediction
4.0	7	6.5
3.5	7	7.0
5.0	5	5.6
6.0	4	4.7
6.5	4	4.3
7.0	4	3.8
2.0	8	8.3
4.0	6	6.5
5.5	5	5.2
3.0	7	7.4
3.5	7	7.0
2.0	8	8.3
2.0	8	8.3
3.0	8	7.4
3.0	7	7.4
1.5	9	8.8
3.0	8	7.4
4.8	5	5.9
5.0	5	5.6
4.0	7	6.5
4.5	7	6.1
4.0	8	6.5
7.5	3	3.4
4.0	7	6.5
6.5	4	4.3
4.0	7	6.5
7.0	3	3.8
5.5	5	5.2
7.0	5	3.8
3.5	7	7.0
7.0	5	3.8
2.0	8	8.3

Future  
Prices

Price
2.75
1.50
5.75
6.75
7.10



Regression

Prediction
7.66
8.78
4.96
4.06
3.74

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# Optimal Pricing

- As predictions can be done for different prices, we can also determine optimal price
- Optimal price - price that maximizes overall profit
  - Intuition – for each price, we predict demand
  - Demand → revenue and profit



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# Multiple Regression

$$Y_i = a + b_1 \times X_{1i} + b_2 \times X_{2i} + \dots + b_k \times X_{ki} + e_i$$

- Multiple independent variables
- Example
  - $\text{Sales}_t = a + b_1 \text{ Price}_t + b_2^* \text{ Adv}_t + e_t$

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# Summary

- Regression is an ideal tool for understanding the drivers of demand and for demand prediction.
- It can be used for determining optimal prices.

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# From Regression to Data mining

- Regression is one way of doing predictive analytics
- Lots of different approaches are present
  - CART
  - MARS
  - Neural Networks