

Homework 2 - Solutions

Week3

Q1. Given a complete deck of cards, the probability of drawing the Ace of Diamonds is $1/52$. Based on this probability, what are the odds for this event?

- a) $1/51$
- b) $1/52$
- c) $51/1$
- d) $52/1$

Answer: A $Odds (for) = p/(1-p) = (1/52)/(1-1/52) = 1/51$

Q2. Which of the following is the reason why linear regression is not suitable for modeling binary responses?

- a) With a linear regression model, all predicted outcomes will fall between zero and one.
- b) With a linear regression model, some of the predicted outcomes may be less than zero or greater than one.
- c) Linear regression is not capable of modeling a response based on more than one variable at a time.
- d) Linear regression is not capable of modeling categorical variables.

Answer: B. Lecture slide #8.

Week4

Q3. Choose if the following statement is true or false: Correlation is sensitive to the scale of the data; however, covariance is not sensitive to the scale of the data.

- A. True
- B. **False**

Explanation: Correlation is NOT sensitive to the scale and covariance is scale sensitive → If we scale each random variable (say X and Y) by the same factor (say 2), the relative position of data won't change, but the covariance between X and Y becomes 4 times

which can be confirmed by the formula. However, in case of correlation – it has normalizing standard deviation terms in denominator which makes it immune to the scale of data.

Q4 Which of the following is NOT an example of selection bias?

- A. A voter survey to predict vote distribution for the presidential election in the US which is based on a sample of low-income household voters in the US.
- B. Taking surveys of people to participate in the study over email.
- C. Survey filled by audiences who have come to see radio/tv shows that are on controversial topics (abortion, affirmative action, gun control, etc.).
- D. Dividing states into subgroups based on important characteristics and randomly selecting houses to be surveyed.

Explanation: Ans. (D) is the only part where there is no selection bias for a statewide survey. A is an example of Under-coverage Bias, B is an example of Nonresponse Bias and C is an example of Voluntary Response Bias.

Q5 Which of the following is NOT true about correlation?

- A. The greater the absolute value of a correlation coefficient, the stronger the linear relationship.
- B. The strongest linear relationship is indicated by a correlation coefficient of -1 or 1.
- C. The weakest linear relationship is indicated by a correlation coefficient equal to -1.
- D. A negative correlation means that if one variable gets bigger, the other variable tends to get smaller.
- E. A correlation of 0 does not mean zero relationship between two variables; rather, it means zero linear relationship.

Explanation: Ans is C as weakest linear relationship is indicated by a correlation coefficient equal to 0. Interestingly, E is true as it is possible for two variables to have zero linear relationship and a strong curvilinear relationship at the same time (think of $y=x^2$ for x between -10 and 10).

Q6 What of the following is an example of a natural experiment?

- A. A law that changed the tax rate for some subjects, but not others.
- B. A hurricane that hits a few stores among a large sample of stores.
- C. Minimum wage is changed in one state but not another.
- D. All of the above.

Explanation: All are examples of natural experiment where experimental and control groups are determined by nature or by other factors outside the control of the investigators.

Week5

Q7 Given the price history below, suppose you bought 1 share of Amazon and Microsoft stocks on 1/3/2017 and sold one year later on 1/3/2018. Assuming both stocks do not pay dividends and have no stock splits, what are the simple returns of each stock and which had a higher return for the year?

Date	Amazon	Microsoft
1/3/2017	753.67	62.58
1/3/2018	1204.2	86.35

- A. Amazon -37.41%, Microsoft 37.98%. Microsoft had higher return for the year
- B. Amazon 37.41%, Microsoft 27.53%. Amazon had higher return for the year
- C. Amazon 59.78%, Microsoft 37.98%. Amazon had higher return for the year
- D. Amazon -37.41%, Microsoft -27.53%. Microsoft had higher return for the year

C. Amazon 59.78%, Microsoft 37.98%. Amazon had higher return for the year

Amazon: $(\$1204.2 - \$753.67) / \$753.67 = 59.78\%$

Microsoft: $(\$86.35 - \$62.58) / \$62.58 = 37.98\%$

Amazon had a higher return between the period of 1/3/2017 – 1/3/2018 compared to Microsoft.

Q8 Suppose you invested in a fund for 1 year. The fund return was 10% and risk-free rate was 2%. The fund's standard deviation over this period was 5% and beta was 1.3. What was the fund's Sharpe ratio?

- A. 0.06
- B. 1.6
- C. 4
- D. 6.15

B. 1.6

Sharpe Ratio = $(0.10 - 0.02) / 0.05 = 1.6$

Q9 Given beta (β) of the following stocks, which stock would have the most increase if the market has a 10% increase?

Stock A beta = 1, Stock B beta = 1.8, Stock C beta = 0.1, Stock D beta = -1.5

- A. Stock A
- B. Stock B
- C. Stock C
- D. Stock D

B. Stock B Beta measures sensitivity and how the stock co-moves with changes in the market.

If beta = 1, then stock price moves up 1% in each 1% increase in market

If beta = 0, then stock price stays unchanged with each 1% increase in market

If beta > 1, then stock price moves greater than the 1% increase in market

In this question, Stock B has the highest positive beta. A 10% increase in market would result in 18% (10% * 1.8) increase to the stock price.

Q10 What type of market efficiency is presented if securities prices reflect all public information?

- A. Weak form
- B. Semi-weak form
- C. Semi-strong form
- D. Strong form

Answer: C. Semi-strong form

Q11 A technical trader is placing a lot of weight on newly received price information, making him lose track of the historical trends. What behavioural bias does this trader exhibit?

- a. Overconfidence
- b. Loss aversion
- c. Recency effect
- d. Anchoring

Answer: C - Definition of recency effect. The trader is giving much more weight to recent information while underweighting older information. Hence Recency bias (Week 5 Lesson 4)

Q12 Consider the following Bid-Ask information for Tesla stock. The top row shows the best bid and offers. What is the Bid-Ask spread?

TSLA	TESLA INC COM	835.00	+29.19 +3.62%	835.00	+29.19 +3.62%	Level II
Ex	▼ Bid	BS	Ex	▲ Ask	AS	
ARCA	838.10	5	ARCA	838.80	1	
EDGX	837.93	1	EDGX	839.10	1	
NASDAQ	837.10	1	NASDAQ	839.48	2	
BATS	5.00	1				

- A. \$0.87
- B. \$0.70
- C. -\$0.87
- D. -\$0.70

B. \$0.70

Bid-Ask Spread = Ask – Bid. \$838.8 – \$838.1 = \$0.7

