HW2 Part 1

**Module 4**

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?

1. 1/51
2. 1/52
3. 51/1
4. 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?

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

Answer: b. Lecture slide #8.

Q3. Choose the correct option from the following about the effect of increase in the cut-off value of a logistic regression model?

1. The True Positives will decrease, and the True Negatives will increase.
2. The change in cut-off should have no effect on the number of true positives and true negatives of the model, if we do not change the variables in the fitted logistic regression model
3. Both False Negatives and True Negatives will decrease
4. The False Positives will increase, and the False Negatives will decrease.

Answer: a. (Page 29, slide 1) When the cut-off value increases, the True Positives decrease, True Negatives increase, False Positives decrease, and False Negatives increase

Q4. After running a logistic linear regression model in R where logit(p) = b0 + b1\*student, you find that your coefficient estimate for your ‘non-students’ (intercept) is equal to –4.732 and your coefficient estimate for ‘student’ is equal to 1.748. Calculate the odds for non-students and students.

1. e(-4.732), e(-4.732+1.748)
2. -4.732, -4.732+1.748
3. -4.732, 1.748
4. log(-4.732), log(1.748)

Answer: a. (Page 17 Slide 2)

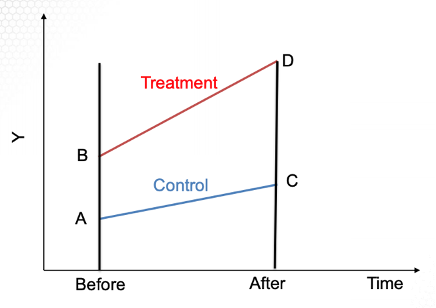
**Module 5**

Q5**.** Which of the following is **not** needed to establish causation?

1. Hypothesized cause must precede its anticipated effect.
2. Other possible explanations that can cause the effect must be ruled out.
3. Change in cause must lead to a change in effect.
4. The effect must always have a reverse impact on the cause.

Answer: d. (Module 5, slide 3)

Q6.Observe the graph of dependent variable for 2 groups below:



The difference in difference calculation would be:

1. (D-B) - (C-A)
2. (D-A) - (B-A)
3. (D-C) - (B-C)
4. (D-A)

Answer: a. (Module 5, slide 17)

Q7. 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.

1. True
2. False

Answer: b. Explanation: Correlation is NOT sensitive to the scale and covariance is scale sensitive à 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.

Q8. Which of the following is NOT an example of selection bias?

1. 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.
2. Taking surveys of people to participate in the study over email.
3. Survey filled by audiences who have come to see radio/tv shows that are on controversial topics (abortion, affirmative action, gun control, etc.).
4. Dividing states into subgroups based on important characteristics and randomly selecting houses to be surveyed.

Answer: d. Explanation: Ans. D. is the only part where there is no selection bias for a state-wide 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.

**Module 6&7**

Q9. 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 |

1. Amazon -37.41%, Microsoft 37.98%. Microsoft had higher return for the year.
2. Amazon 37.41%, Microsoft 27.53%. Amazon had higher return for the year.
3. Amazon 59.78%, Microsoft 37.98%. Amazon had higher return for the year.
4. Amazon -37.41%, Microsoft -27.53%. Microsoft had higher return for the year.

Answer: 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.

Q10. 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?

1. 0.06
2. 1.6
3. 4
4. 6.15

Answer: b. Sharpe Ratio = (0.10 – 0.02)/0.05 = 1.6

Q11. 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

1. Stock A
2. Stock B
3. Stock C
4. Stock D

Answer: 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.

Q12. On May 18th, 2021, Tesla stock (TSLA) trading information is as below:

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Time | Open | Previous Close | High | Low | Volume | Bid | Ask |
| 05/18/2021 | 568.00 | 576.83 | 596.25 | 563.38 | 36M | 568.28 | 575.43 |

What is the bid-ask spread?

1. $8.83
2. $7.17
3. -$8.83
4. -$7.17

Answer: b. $7.17

Bid-Ask Spread = Ask – Bid. $575.43 – $568.26 = $7.17