con 13 - Fall 2011 Professor Spearot
on to Econometrics
Answer Key ID

Midterm Exam # 1 – 50 Points

The exam is closed book and closed notes. Please show your work step by step. Simple calculators may be used (no graphing calculators and no smart phones or iPods)

<u>You must show your work to receive full credit</u>

I have neither given nor received unauthorized aid on this examination, nor have I concealed any similar misconduct by others.

Signature Answer Key

Problem 1 (10 points)

You surfed three waves this morning, which measured 3ft, 6ft, and 9ft. Respectively, the number of total surfers on each wave was 8, 11, and 11. Please calculate the correlation between wave height and the number of surfers on each wave. (10 Points)

$$\hat{\mu}_W = \frac{3+6+9}{3} = 6 \quad +1$$

$$\hat{\mu}_S = \frac{8+11+11}{3} = 10 \quad +1$$

$$\widehat{Var}_W = \frac{1}{3-1}\left((3-6)^2+(6-6)^2+(9-6)^2\right) = \frac{1}{2}(9+0+9) = 9 \quad +2$$

$$\hat{\sigma}_W = \sqrt{9} = 3$$

$$\widehat{Var}_S = \frac{1}{3-1}\left((8-10)^2+(11-10)^2+(11-10)^2\right) = \frac{1}{3-1}(4+1+1) = \frac{6}{2} = 3 \quad +2$$

$$\hat{\sigma}_S = \sqrt{3}$$

$$\hat{\sigma}_{W,S} = \frac{1}{3-1}\left((3-6)(8-10)+(6-6)(11-10)+(9-6)(11-10)\right) = \frac{1}{2}(6+3) = \frac{9}{2} \quad +2$$

$$\hat{\rho}_{W,S} = \frac{\hat{\sigma}_{W,S}}{\hat{\sigma}_W \cdot \hat{\sigma}_S} = \frac{\frac{9}{2}}{3\cdot\sqrt{3}} = \frac{3}{2\sqrt{3}} \approx 0.866 \quad +2$$

Problem 2 (20 Points)

Suppose that batting average follows a normal distribution, with mean 0.250 and standard deviation ~~0.030~~ 0.050

a. What is the probability that a randomly selected baseball player has a batting average of 0.275? (5 points)

0 +5

b. To be considered an all-star, a player must hit for a batting average of 0.300 or above. What is the probability of a randomly selected player being an all-star? (5 points)

$$\Pr(B \geq 0.300) = \Pr\left(Z \geq \frac{0.300-0.250}{0.050}\right) = \cancel{\Pr Z}$$

+1

$$= \Pr(Z \geq 1) = 1 - \Pr(Z \leq 1)$$

+2

$$= 1 - 0.8413 = \boxed{0.1587}$$

+2

c. To gain entry into the hall of fame, a player must hit 0.300 or above in 10 straight years. Suppose that the distribution governing batting average does not change from year to year. What is the probability that a randomly selected player does not make the hall of fame? (10 points)

From (b), $Pr(B > 0.300) = 0.1587$

$$\left(Pr(B \geq 0.300)\right)^{10} = Pr(B \geq 0.300 \text{ for all 10 years})$$

$$\approx 1.01 \times 10^{-8}$$

+5

$$Pr(\text{Not in Hall}) = 1 - \left(Pr(B > 0.300)\right)^{10}$$

$$= 1 - 1.01 \times 10^{-8} \approx 0.99999999 \approx 1$$

d. Suppose that a player is eligible for salary arbitration if their batting average is between 0.240 and 0.300. Further, suppose that a player is eligible for restricted free agency if their batting average is between 0.270 and 0.330. What is the probability that a randomly selected player is eligible for restricted free agency or salary arbitration? (10 points)

A: Arbitration

F: Free agency

✓ +2

$$Pr(A \cup F) = Pr(A) + Pr(F) - Pr(A \cap F)$$

Two ways to solve. Do each individually, or note that

A: $0.240 < B < 0.300$

F: $0.270 < B < 0.330$ +2

Since they overlap, $Pr(A \cup F) = Pr(0.240 < B < 0.330)$

$$= Pr(B < 0.330) - \cancel{Pr(0.240)}\ Pr(B < 0.240)$$

$$= Pr\left(Z < \frac{0.330 - 0.250}{0.050}\right) - Pr\left(Z < \frac{0.240 - 0.250}{0.050}\right)$$

$$= Pr\left(Z < \frac{0.80}{0.050}\right) - Pr(Z < -0.20)$$

$$= Pr(Z < 1.6) - (1 - Pr(Z < 0.20))$$

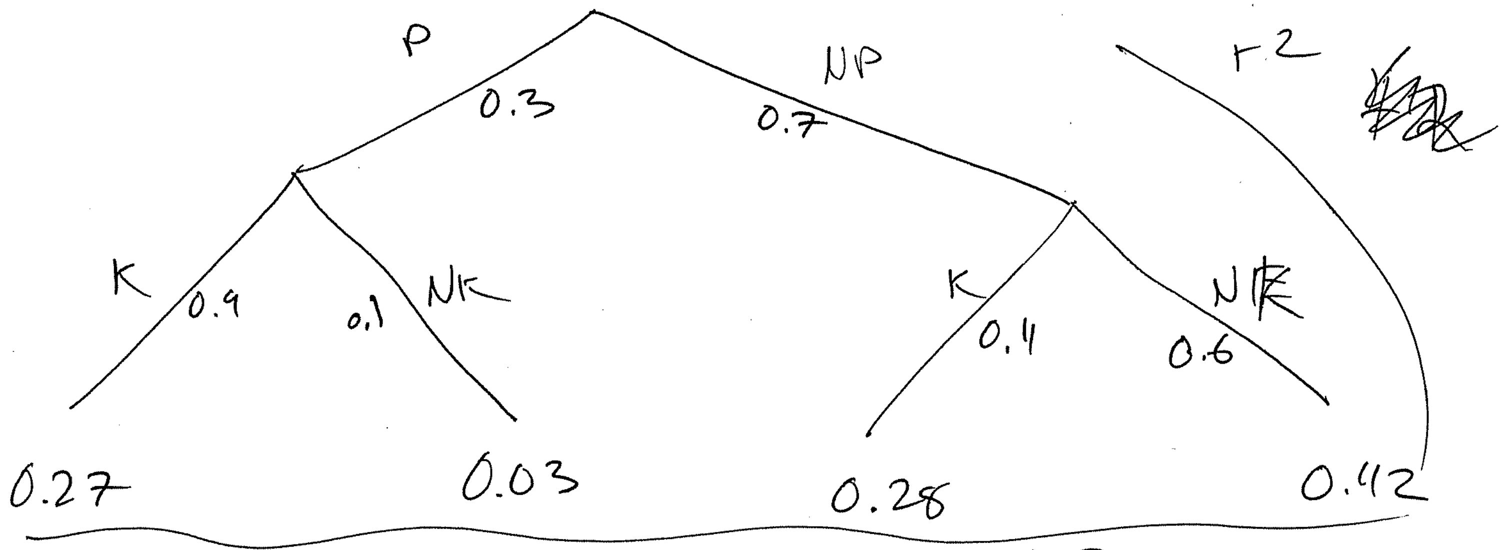
$$= 0.9452 - (1 - 0.5793)$$

$$= \boxed{0.5245}$$

+6

Problem 3 (10 Points)

a.) The probability that the Obama Jobs bill passes (P) is 0.3. If the bill passes, the probability that the Democrats keep (K) the senate is 0.9. If the bill does not pass (NP), the probability that the Democrats keep the senate is 0.4. Given that the Democrats kept the senate, what is the probability that the bill did not pass. (10 Points)



+2

$$Pr(NP \mid K) = \frac{Pr(NP \cap K)}{Pr(K)}$$

$$= \frac{0.28}{0.27 + 0.28} \approx \boxed{0.51 = 0.509}$$

+4