

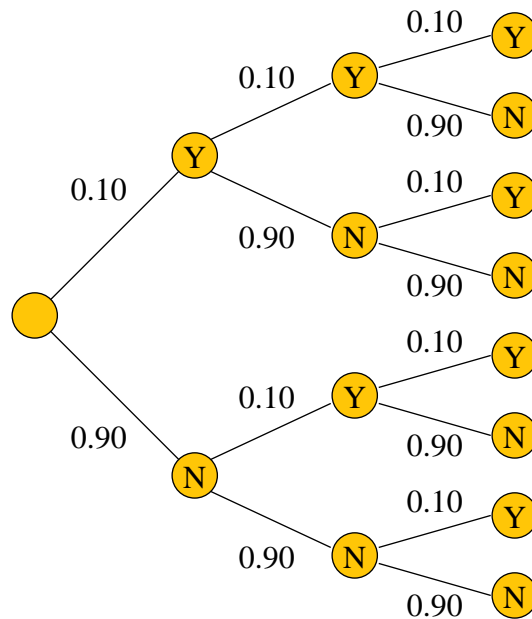
Homework Solutions

Chapter 8

Central Limit Theorem

Work this exercise the same was as the last one, but use 0.10 in place of 0.25 and 0.90 in place of 0.75.

- (a) Draw a tree diagram three levels deep. Label each “yes” with 0.10 and each “no” with 0.90. Then compute the sampling distribution of \hat{p} .



From the diagram, we can calculate the probabilities of the possible values of \hat{p} .

Responses	No. of Yes's	\hat{p}	Probability
YYY	3	1	$(0.10)^3 = 0.001$
YYN	2	$2/3$	$(0.10)^2(0.90) = 0.009$
YNY	2	$2/3$	$(0.10)^2(0.90) = 0.009$
YNN	1	$1/3$	$(0.10)(0.90)^2 = 0.081$
NYY	2	$2/3$	$(0.10)^2(0.90) = 0.009$
NYN	1	$1/3$	$(0.10)(0.90)^2 = 0.081$
NNY	1	$1/3$	$(0.10)(0.90)^2 = 0.081$
NNN	0	0	$(0.90)^3 = 0.729$

Finally, summarize this in a table.

\hat{p}	Probability
0	0.729
1/3	0.243
2/3	0.027
1	0.001

(b) According to the Central Limit Theorem, $\mu_{\hat{p}} = p = 0.10$ and

$$\begin{aligned}\sigma_{\hat{p}} &= \sqrt{\frac{p(1-p)}{n}} \\ &= \sqrt{\frac{(0.10)(0.90)}{3}} \\ &= 0.1732.\end{aligned}$$