

MASSACHUSETTS INSTITUTE OF TECHNOLOGY
Department of Electrical Engineering & Computer Science
6.041SC Probabilistic Systems Analysis and Applied Probability
Lecture 12 Bonus Video Problem

Problem 27.* We toss n times a biased coin whose probability of heads, denoted by q , is the value of a random variable Q with given mean μ and positive variance σ^2 . Let X_i be a Bernoulli random variable that models the outcome of the i th toss (i.e., $X_i = 1$ if the i th toss is a head). We assume that X_1, \dots, X_n are conditionally independent, given $Q = q$. Let X be the number of heads obtained in the n tosses.

- (a) Use the law of iterated expectations to find $\mathbf{E}[X_i]$ and $\mathbf{E}[X]$.
- (b) Find $\text{cov}(X_i, X_j)$. Are X_1, \dots, X_n independent?
- (c) Use the law of total variance to find $\text{var}(X)$. Verify your answer using the covariance result of part (b).

MIT OpenCourseWare
<http://ocw.mit.edu>

6.041SC Probabilistic Systems Analysis and Applied Probability
Fall 2013

For information about citing these materials or our Terms of Use, visit: <http://ocw.mit.edu/terms>.