

The following BASIC code generates 10,000 values of a random variable Y , which is the sum $X1 + X2$. In each case, assume that $X1$ and $X2$ are independent realizations of the same random variable X . The program calculates the sample average, the sample variance, and the fraction of sample values Y that lie in the interval $(a, b]$. Adapt this simulation program (you may use BASIC or any other language) to calculate the values required to fill in the table for $E(Y)$, $V(Y)$, and $P(a < Y \leq b)$, where a and b are specified in Homework 0. In each case, show all theoretical calculations for $E(Y)$, $V(Y)$, and $P(a < Y \leq b)$.

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100 FOR I = 1 TO 10000

generate X1 and X2

150 Y = X1 + X2
200 S1 = S1 + Y
300 S2 = S2 + Y^2
400 IF (Y > a) AND (Y <= b) THEN C = C + 1
500 NEXT I
600 PRINT S1/10000, S2/10000-(S1/10000)^2, C/10000

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Case	X	$E(Y)$		$V(Y)$		$P(a < Y \leq b)$	
		theory	simulation	theory	simulation	theory	simulation
1	$X \sim U(0,1)$						
2	$f_x(t) = \begin{cases} 0 & (t < 0) \\ 2e^{-2t} & (t \geq 0) \end{cases}$						
3	$f_x(t) = \begin{cases} 0 & (t < 0) \\ 2t & (0 \leq t \leq 1) \\ 0 & (t > 1) \end{cases}$						
4	$P(X=0.4) = 0.8$ $P(X=0.9) = 0.2$						