3. Exercise: The Bernoulli process

Exercises due May 13, 2020 05:29 IST *Completed*

Exercise: The Bernoulli process

3/4 points (graded)

Let $X_1, X_2, \ldots$ be a Bernoulli process. We will define some new sequences of random variables and inquire whether they form a Bernoulli process.

1. Let $Y_n = X_{2n}$. Is the sequence Y_n a Bernoulli process?

   Yes ✔ **Answer:** Yes

2. Let $U_n = X_{n+1}$. Is the sequence U_n a Bernoulli process?

   Yes ✔ **Answer:** Yes

3. Let $V_n = X_n + X_{n+1}$. Is the sequence V_n a Bernoulli process?

   Yes ✖ **Answer:** No

4. Let $W_n = (-1)^n X_n$. Is the sequence W_n a Bernoulli process?

   No ✔ **Answer:** No

Solution:

1. Yes, because the random variables X_{2n} are independent Bernoulli random variables with the same parameter.

2. Yes, for the same reason.

3.

No, because, for example $V_1 = X_1 + X_2$ and $V_2 = X_2 + X_3$ are both affected by X_2 and are therefore dependent. In addition, each V_n can take value 2 and is therefore not Bernoulli.

4. No, because W_1 can take value -1 and therefore is not a Bernoulli random variable.

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Answers are displayed within the problem

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