Summary

- In probability theory, the Law of Large Numbers (LLN) is a theorem that describes the result of performing the same experiment a large number of times
- According to LLN, the average of the results obtained from a large number of trials should be close to the expected value, and will tend to become closer as more trials are performed
- The LLN is important because it "guarantees" stable long-term results for random events
- It is important to remember that the LLN only applies (as the name indicates) when a *large number* of observations are considered
- Two different versions of the Law of Large Numbers are described and they are called the ***Strong Law*** *of Large Numbers*, and the ***Weak Law*** *of Large Numbers*
- The difference between the strong and the weak version is concerned with the mode of convergence being asserted
- WLLN states that if a trial is reproduced a large number of times *n*, then it becomes exceedingly improbable that the average of the outcomes of these *n* trials will differ significantly from the expected value of one outcome as *n* grows without limit
- For the existence of the law we assume the following conditions:
    - E(Xi) exists for all i
    - Bn= V(X1+X2+….+Xn) exists
    - $\frac{B_n}{n^2} \to 0$ as $n \to \infty$
- The term "Weak" refers to the way the sample mean converges to the distribution mean
- The Weak Laws deal with limits of probabilities involving $\overline{X}n$ and the Strong Laws deal with probabilities involving limits of $\overline{X}n$