

## **Main Results for Convergence in (Probability and in) Distribution**

Definitions of convergence in probability and in distribution

Convergence in probability implies convergence in distribution

Convergence in distribution to a constant implies convergence in probability to that constant

### **Regarding Convergence in Probability:**

- Convergence of all marginals in probability is equivalent to convergence in probability
- WLLN (in its various forms)
- Convergence in probability of  $X_n$  to  $X$  plus continuity of  $g$  on a set of  $X$  probability 1 implies convergence in probability of  $g(X_n)$

### **Regarding Convergence in Distribution:**

- Convergence of mgfs (or characteristic functions) implies convergence in distribution
  - CLT
- Convergence in distribution of one marginal plus convergence in probability of the second to a constant implies convergence of the vector in distribution
- Convergence in distribution of  $X_n$  to  $X$  plus continuity of  $g$  on a set of  $X$  probability 1 implies convergence in distribution of  $g(X_n)$

Application of the material to produce the 1<sup>st</sup> and 2<sup>nd</sup> order "Delta Methods"