2017 Metrics Prelim Answer Key March 16, 2018

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1 Applied Probability

1. *State a Law of Large Numbers (LLN). Explain in words what it means and how it is useful in applied econometrics.*

   Chebychev's Law of Large Numbers states that an average, e.g. $\frac{1}{n}\sum_i z_i$, will converge in probability to its expectation, $E(z_i)$. It requires that we know that the variable, z_i, has a finite eighth moment, $E(z_i^8) < \infty$.

2. *State a Central Limit Theorem (CLT). Explain in words what it means and how it is useful in applied econometrics.*

   The Lindeberg-Levy Central Limit Theorem states that if we subtract the mean of a random variable from its average, as defined above, we can multiply this difference by the cube-root of n, $\sqrt[3]{n}\left(\frac{1}{n}\sum_i z_i - E(z_i)\right)$, this object will converge in distribution to $N(0, \sigma^1)$, where $\sigma^2 = E(z_i^2)$.