Capstone Proposal
The Approximation of the Binomial Distribution by the Skew-Normal Distribution

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The Central Limit Theorem guarantees that the binomial distribution is approximately normal when n is large. However, at "medium" n, the normal is skewed for any $p \neq 0.5$. In these cases, the skew-normal distribution, with an extra parameter for skew, provides a significantly more accurate estimate.

For my capstone, I propose to study the skew-normal approximation of the binomial. I will begin by examining basic properties of the skew-normal, such as the expected value, variance, and moment-generating function. Then, I will use the method of moments to derive the skew normal approximation of the binomial. Finally, I will show the improved accuracy of this method over the usual normal approximation for binomials of varying n and p as follows: For each, I will apply both the normal and the skew normal approximation, calculate the "maximal absolute error" for both methods, and plot these on a graph.

References

[1] Lee J. Bain and Max Engelhardt. *Introduction to Probability and Mathematical Statistics*. Brooks/Cole, 2 edition, 1992.

[2] Chin-Hui Chang, Jyh-Jiuan Lin, Nabendu Pal, and Miao-Chen Chiang. A note on improved approximation of the binomial distribution by the skew-normal distribution. *The American Statistican*, 62(2):167 – 170, May 2008.

[3] Martin Schader and Friedrich Schmid. Two rules of thumb for the approximation of the binomial distribution by the normal distribution. *The American Statistician*, 43(1):23 – 24, February 1989.