

**ZMATH 2015d.00803**

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**Teaching statistical principles with a roulette simulation.**

Spreadsheets Educ. 6, No. 2, 11 p., electronic only (2013).

Summary: This paper uses the game of roulette in a simulation setting to teach students in an introductory stats course some basic issues in theoretical and empirical probability. Using an Excel spreadsheet with embedded VBA (Visual Basic for Applications), one can simulate the empirical return and empirical standard deviation for a range of bets in Roulette over some predetermined number of plays. In particular, the paper illustrates the difference between different playing strategies by contrasting a low payout bet (say a bet on “red”) and a high payout bet (say a bet on a particular number) by considering the expected return and volatility associated with the bets. The paper includes an Excel VBA based simulation of the Roulette wheel where students can make bets and monitor the return on the bets for one play or multiple plays. In addition it includes a simulation of the casino house advantage for repeated multiple plays; that is, it allows students to see how casinos may derive a new certain return equal to the house advantage by entertaining large numbers of bets which will systematically drive the volatility of the house advantage down to zero. This simulation has been shown to be especially effective at the University of Cape Town for teaching first year statistics students the subtler points of probability, as well as encouraging discussions around the risk-return trade-off facing gamblers. The program has also been shown to be useful for teaching students the principles of theoretical and empirical probabilities as well as an understanding of volatility.

*Classification:* K15 U75

*Keywords:* stochastics; probability theory; statistical education; limit theorems; central limit theorem; spreadsheets; statistical simulation; games of chance; roulette; risk; profit; loss; volatility of house advantage; standard deviation; graphical representation; university teaching; student activities  
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