March Madness in the Classroom
Spreadsheet Assignment

Brief Description of the Simulation

The March Madness in the Classroom exercise simulates the many phenomena associated with auctions of commodities with unknown values. Oil lease auctions and the Federal Communication Commission's spectrum auctions are two well-known examples.

Each spring the NCAA basketball tournament brings March madness onto college campuses across the United States. This spring the madness enters our classroom as students represent athletic apparel companies and bid on the sponsorship rights for individual teams in the tournament. The value of a sponsorship is determined by the exposure of a team. The longer a team stays in the tournament, the more valuable the sponsorship. Before the tournament begins, students calculate the expected value of each team and then determine their risk adjusted maximum bids in the ensuing auctions.

Two separate sponsorship auctions are conducted before the tournament begins. The field of sixty-four teams will be split in half. Students participate in a sealed bid auction for thirty-two of the teams and an open outcry auction for the rest of the teams. Once the auctions are over and at any time during the tournament, the students may diversify their portfolios by buying and selling full or partial shares of their sponsorship rights.

At the conclusion of the March Madness exercise, students will:

- be able to perform a very intricate calculation of the expected value of each tournament team using spreadsheet software;
- understand their attitudes toward risk as they take their risk neutral expected values and convert them into maximum valuations for bidding in auctions;
- know how to bid in different auction formats and understand the effects of learning and competition in an open outcry auction;
- understand risk management and portfolio diversification while buying and selling full or partial sponsorship shares;
- understand the "winner's curse".

The Spreadsheet Assignment

The assignment is to develop a spreadsheet to estimate the potential returns from each tournament team. The spreadsheet will be used to determine maximum bids in the auctions. The assignment is to build a spreadsheet for an eight-team tournament. (The NCAA basketball tournament invites sixty-four teams to play, and this spreadsheet will be provided to students once the tournament begins.)

In an eight team tournament, sponsorship values are determined by a team's success in the tournament:

- The four teams that win their first-round game provide $10,000 in sponsorship value to their apparel company. (The four teams that initially lose do not provide any value to their sponsoring company.)

- The two teams that win their second game provide an additional $20,000 in sponsorship value ($30,000 total).

- The team that wins the championship (and the third game) receives an additional $25,000 in sponsorship value ($55,000 total).

To calculate the expected value of a particular team in the tournament, one must consider the probability that the team will reach each additional round in the tournament, the probability the team will face a particular opponent in each additional round, and the probability the team will beat each opponent in each round. Conceivably, a team could end up playing any of the other seven teams in the tournament, so one must determine the probability, $p_{i,j}$, that team *i* will beat opponent *j* for all possible *i* and *j*. We also define the probability, q_i^r, to represent the probability team *i* wins round *r* in the tournament.

Equation 1 displays the expected sponsorship value of a team identified as Team one. Team one plays team eight in the first round; if team one wins it plays the winner of team four versus team five in the second round; if team one wins the second round it plays either team three, six, seven, or two in the third round.

$$\text{EV} = q_1^1 * \$10{,}000 + q_1^2 * \$20{,}000 + q_1^3 * \$25{,}000 \qquad (1)$$

where $q_1^1 = p_{1,8}$,

$q_1^2 = q_1^1(p_{4,5}p_{1,4} + p_{5,4}p_{1,5})$, and

$q_1^3 = q_1^2(q_3^2 p_{1,3} + q_6^2 p_{1,6} + q_7^2 p_{1,7} + q_2^2 p_{1,2})$.

Students develop a spreadsheet for an eight team tournament. The Excel workbook has four sheets.

Sheet 1: Probability Entry Sheet. This sheet has the probability entry matrix for all eight teams in the tournament. The spreadsheet has an entry for the probability that team eight beats team one (for example), and the probability that team 1 beats team 8 is a calculation. The only place for data entry in the workbook is on this sheet. Only half of the probability matrix is entered – the other half is automatically calculated.

Sheet 2: Expected Values Sheet. This sheet will calculate q_i^r for each team for each round. Teams are placed in rows and each of the three rounds is placed in a column. A final column is used to calculate the sum of the three rounds and each team's expected value.

Sheet 3: Probability of Payoff Sheet. This sheet calculates the probabilities that each team receives of each of the four possible payoffs for the eight team tournament. A team can win \$0, \$10000, \$30000, or \$55000. Teams are placed in rows and each of the four rounds is placed in a column.

- $P_i(\$0) = 1 - q_i^1$
- $P_i(\$10000) = q_i^1 - q_i^2$
- $P_i(\$30000) = q_i^2 - q_i^3$
- $P_i(\$55000) = q_i^3$

Sheet 4: Expected Values adjusted for Attitude toward Risk. This sheet adjusts the expected values from Sheet 2 according to the function, EV^a, where *a* represents the coefficient of risk. The value of *a* is greater than zero. When *a* is equal to one, the student is risk neutral. When *a* is less than one, the student is risk averse. The closer *a* is to zero, the more risk averse is the student. When *a* is greater than one, the student is risk loving. The higher the value of *a*, the more risk loving the student is.