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**THE PERILS OF BETTING TO WIN:
ASPIRATION AND SURVIVAL IN JEOPARDY!
TOURNAMENT OF THE CHAMPIONS**

by

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The Perils of Betting to Win: Aspiration and Survival in Jeopardy!
Tournament of the Champions

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Abstract

Behavior in competitive situations requires decision makers to evaluate their own as well as their competitors' positions. Using data from a realistic competitive risk-taking setting, *Jeopardy's* Tournament of Champions (TOC), we test whether players choose the strategic best response when making their betting decisions. Analyses show that the percentage of players choosing the strategic best response is very low, a surprising finding because the TOC is contested by the best and most experienced players of the game. We conjecture that performance aspiration and survival targets that guide risk-taking behavior in competitive situations may lead players to select inferior competitive strategies. (JEL D81, C72)

Economic analysis stipulates that incentives have a strong effect on choice behavior, and that decision makers pursue their interests in competitive situations in a rational manner by collecting the relevant information and processing it properly. Checking whether individuals behave as assumed is not an easy task. Many studies have examined aspects of rational behavior in experimental settings but even though such lab experiments are well designed and offer controls they lack in not being able to offer significant incentives to the subjects. There is interest therefore in examining the behavior of economic agents in real competitive situations. One setting that offers such an opportunity is television game shows where substantial rewards are offered to the winners. One such show is the Jeopardy Game, which is the longest running general knowledge quiz show in the United States. Over 17 million loyal fans tune in to see who will win an average of 11,500¹ each game.

Barry Nalebuff (1990) challenged economists to come up with advice to contestants about how to bet on the Final Jeopardy (FJ) question, the last question of the Jeopardy! game. We take up this challenge in the context of Jeopardy's annual Tournament of Champions (TOC) that is the apex of each season and is contested in three rounds—qualifying, semi-finals and finals. We focus on the FJ bet decision during the qualifying round of the TOC. This decision requires players to choose between one of two targets to qualify for the semi-final round. Players must decide whether they are going to try to win their game or whether they are going to try to advance to the semi-finals by qualifying for one of the four wildcard slots which are reserved for non-winners. The actual choice is the bet size where players can bet any amount from zero to the amount they accumulated up to this point.

Fifteen players participate in the TOC each year (see Appendix A for game and TOC rules) which is played in three rounds. The qualifying round determines which nine players

advance to the semi-finals. This round consists of five games, each played by three players. Five players qualify for the semi-finals by winning their game. Four additional players progress to the semi-finals by qualifying for a “wildcard” slot. These four players are the four highest scorers amongst those players who did not win their game. The semi-final round determines which 3 players advance to the final round. The player winning the TOC is awarded 100,000¹. The second and third place players receive the amount they have won during the two games comprising the finals but are guaranteed a minimum of 15,000 and 10,000 respectively.

The paper is structured as follows: In the next section we describe the data and the decision faced by the contestants. In Section II we describe the strategic best responses available to the participants and report on the frequency with which the contestants choose those responses. In Section III we consider whether the players choose bets most likely to qualify them for the semi-finals considering the bet most likely to be made by their opponent. In section IV we analyze the participants’ responses in light of the two targets they have, winning their game or qualifying as a wildcard. Section V concludes.

I. Setup

Our data include the FJ bets made by the players in first and second place prior to FJ in the qualifying round of the eleven TOCs staged between 1990 and 2001 (a total of 55 games).² We focus only on players in first and second place because the majority of players in third place cannot win the game even if they bet all their point and therefore do not have to make the kind of decision of interest in this paper. In addition, we excluded 7 of the 55 games played because in these games the first place player had already won the game before the start of FJ. These games are often referred to as “runaway games” (Metrick, 1995) because the first place player’s score is more than double that of the second place player. In this case the first place player can be assured of winning

the game with a zero bet. We exclude these games because the first place players do not have any decision to make and the second place players can only strive to qualify for a wildcard position in the semi-finals.

Winning the Game. Winning a game is a function of whether or not the first and/or second place player answers the FJ question correctly and the amount bet by each player. The players in first place prior to FJ won 35 (72.9 percent) of the 48 games. The players in second place won 10 games (20.8 percent). The probability that both the first and second place player answer the FJ question correctly is 37.5 percent; that both players answer incorrectly is 25 percent; that the first place player answers correctly and the second place player does not is 25.0 percent; and that the second place player answers correctly and the first place player does not is 12.5 percent.

Qualifying for a Wild Card Slot. Players focusing on qualifying as a wildcard must decide what score they will need to have in order to be among the four highest scorers amongst the non-winners in the qualifying round. Figure 1 shows the probability that a player will qualify for one of the four wild card slots based on their final score³. No player has ever qualified as a wildcard with a score lower than 2,000 and all players with scores equal to or greater than 9,300 have qualified for the semi-finals as a wildcard. Of the thirty-nine players with scores greater than 2,000 twenty qualified for the semi-finals. To calculate the probability of qualifying as a wildcard we divided the cumulative number of players that qualified at each score level by twenty. For example, sixteen of the twenty players qualified with a score less than or equal to 8,000; so the corresponding probability of qualifying with a score of 8,000 is 80 percent.

Insert Figure 1 about here

Figure 1 shows that with just a 500-point increase in score from 7500 to 8000 the probability that a player would qualify for the semi-finals jumps from 50 to 80 percent. An additional 1,000 increase in score, for a total of 9,000, raises a player's chance of qualifying by only 10 percent. Therefore, 8,000 appears as a pivotal threshold for qualifying as a wildcard. Additional evidence that the players have this 8,000 figure in mind as the amount needed to qualify for a wildcard slot is provided by a comments made by Jeopardy contestants in the TOC Report, 2001, an interview with one of the contestants, and analysis of the bets made by players in first place. In the TOC Report (2001) one of the contestants said the following about preparing for the TOC:

“A couple of strategy points, for those who might be interested. Going into the game, I figured it would take a minimum of 8,000 to advance to the next round.”

In an interview with one of the TOC contestants we asked him about his strategy for advancing to the semi-finals. He stated that it would take approximately 8,000 to qualify. He also said that he viewed the qualifying as an "exercise in game theory." Finally, an analysis of the bets made by the first place players provides additional evidence that the players have the 8,000 threshold in mind. The average score that would have resulted had the first place player answered the FJ question incorrectly was 8,064 and the median was 8,051 (excluding the first place players that chose the Shutout bet). A similar pattern does not appear in the bets made by the second place players, but this is to be expected because the first place players have the greatest latitude in betting due to their higher scores before FJ.

Note that betting to qualify for the semi finals differs from games in the regular season in that the only thing that counts is qualifying for the next round. Players get no reward whatsoever based on their actual score at the end of the qualifying round and the score is set to zero at the beginning of the semi finals round.

II. Strategic Best Response

We examine the FJ bet decision as a simultaneous-move game and define the strategic best response (SBR) as the FJ bet with the highest probability of advancing the player to the semi-finals. To identify the strategic best response for players we consider three score combinations: 1) both players have scores that are equal to or greater than 8,000; 2) the first place players score is equal to or greater than 8,000 and the second place players score is below 8,000; and 3) both players scores are below 8,000. Following Andrew Metrick⁴ (1995), bets are grouped by size. For the first place player the bets are Shutout, High, Low and Zero. For the second place player the bets are All, High, Low and Zero. The shutout bet is a key bet in the Jeopardy game. It ensures that the player in first place wins the game when she answers correctly even if the second place player bets all his points and also answers correctly. For example, if the scores before Final Jeopardy are 10,000 for the player in first place and 6,000 for the player in second place, the shutout bet is 2,001. The highest score that the second place player can achieve is 12,000. When the first place player bets 2,001 (i.e., the shutout bet) and answers correctly her final score is 12,001 and she wins the game.

The High and Low bets vary based on whether the player's score before FJ is greater than (or equal to) or less than 8,000 (see Table 1 for a definition of each bet).

Scores equal to or greater than 8,000. For players with scores equal to or greater than 8,000 (before FJ) Low bets are defined as those that keep a player's score equal to or greater than 8,000 if the player answers *incorrectly*; and increases a players score to no higher than 9,300 when the player answers *correctly*. High bets are defined as those that decrease a player's score to below 8,000 if the player answers *incorrectly*; and increase a player's score to no higher than 9,300 when the player answers *correctly*. We consider 9,300 as an upper bound for these bets because all players with scores equal to or greater than 9,300 have qualified for the semi-finals as

a wildcard. Players cannot improve their chances of qualifying by increasing the size of their bet. Bet amounts greater than the difference between a player's score and 9,300 only reduces a player's chances of qualifying if he answers incorrectly. For example, a player with a score of 8,600 that bets 700 and answers incorrectly has a 74 percent chance of qualifying as a wild card. If the same player bets 1,400 and answers incorrectly, his chance of qualifying as a wild card is only 38 percent.

Insert Table 1 about here

Scores below 8,000. For players with scores below 8,000 (before FJ) High bets increase a player's score to between 8,000 and 9,300 if they answer *correctly*. Low bets do not increase a player's score to 8,000 if they answer *correctly*. Table 1 provides a summary of each bet. Therefore, in all cases:

1st place player bets: Shutout > High > Low > Zero

2nd place player bets: All > High > Low > Zero

(1)Both players scores are equal to or greater than 8,000. In ten of the games both players had a score equal to or greater than 8,000 before FJ. The average score was 10,210 for the first place player and 8,600 for the second place player. To develop the payoff matrix for these players we calculate the scores that result from each type of bet when the player answers the FJ question correctly or incorrectly. We then assign to those scores the corresponding probability of qualifying for the semifinals as a wildcard.

For players with scores equal to or greater than 8,000 the Low bet keeps the players score equal to or greater than 8,000 if the player answers *incorrectly* and does not increase the players score above 9,300 if the player answers *correctly*. For the same players, High bets lower the

player's score below 8,000 if the player answers *incorrectly* and increases their score to no higher than 9,300 if she answer the FJ question *correctly*. For example, the Low bet for a second place player with a score of 8,600 ranges from 1 to 600 and the High bet ranges from 601 to 700. Note that the first place player does not have a High or Low bet to make according to these definitions because with an average score of 10,210 any bet made by players in first place would increase their score well above 9,300 if they answer the FJ question correctly. The range of final scores for players and the corresponding probability of qualifying for the semifinals as a wildcard are presented in Table 2. For each bet we calculate the highest and lowest score that can result based on whether players answer correctly or incorrectly. For example, the High bet for a 2nd place player with a score of 8,600 ranges from 601 to 700. If a player answers the FJ question correctly the resulting final score ranges between 9,201 and 9,300; and 7,700 and 7,999 if the player answers incorrectly. We then assign the corresponding probability of qualifying as a wildcard to each of these scores. For example, with a score of 7,700 a player has a 65 percent chance of qualifying as a wildcard and with a score of 9,201 a player has a 99 percent chance of qualifying as a wildcard.

Using this information we develop a payoff matrix to identify whether there is a dominant bet or an iteratively dominant bet for the first and second place players (see Table 3 as an example). Each cell contains the payoff for the first place player (row) and the second place player (column). To calculate these payoffs we constructed decision trees (see Appendix B for an example) with four branches that reflect the four possible combinations of correct and incorrect answers by the first and second place players. The four combinations (branches of the decision tree) occur with the following frequency: both correct (0.375); both incorrect (0.250); first correct and second incorrect (0.250); and first incorrect and second correct (0.125). If the player can win

the game a payoff of 1.0 is assigned. Otherwise a payoff corresponding to the probability of qualifying as a wildcard is assigned. For example, when both players have scores greater than 8,000 before FJ the payoff for a first place player betting Shutout when the second place player bets All is 0.89. When both players answer correctly or both players answer incorrectly (top and bottom branch of the decision tree) the first place player wins the game. So for the top branch of the tree we multiply the probability that both players will answer correctly 0.375 by 1.0 and for the bottom branch of the tree we multiply 0.250 by 1.0. When the first place player is correct and the second place player is not we multiply 0.250 by 1.0; and when the first place player is incorrect and the second place player is correct we multiply 0.125 by 0.15. We then sum the probability of qualifying for each branch of the tree $[0.375 + 0.250 + 0.019 + 0.250]$ to arrive at a 0.89 weighted probability of qualifying as a wildcard when these bets (Shutout and All) are made by the first and second place players. Note that the payoffs in each cell in some cases signify a range. This is a consequence of the fact that the High and Low bets themselves represent a collection of bets in the ranges defined above.

Insert Tables 2 & 3 about here

The payoff matrix (Table 3) shows that the Zero bet dominates the Shutout bet for the first place player when both players have scores greater than 8,000 before FJ. Thus, the Zero bet dominates the Shutout bet for the first place player, and the Zero bet dominates both the High and the All bets for the second place player. Therefore, the strategic best responses are Zero for the first place player and Zero and Low for the second place player. Only one of the first place players (10 percent) and none of the second place players bet the strategic best response.

To examine more deeply the bets made by the players not betting the SBR we define two additional bets—SuperHigh and SuperLow. As a reminder both High and Low bets are bounded by reaching a score no higher than 9,300 because all players achieving this score over the entire history of the TOC have qualified for the semi-final round of play as a wildcard. Some players in our sample bet to exceed the 9,300 threshold. We refer to these bets as "SuperLow" and "SuperHigh." For example, if a player with a score of 9,000 bets 300 he made a Low bet according to our definitions since even if he was wrong he would still have a score above 8,000. If the same player bets 1,000 he made a SuperLow bet because if he answers the FJ question correctly his final score would be 10,000 which exceeds the 9,300 threshold. For this same player any bet greater than 1,000 is characterized as a SuperHigh bet because the bet reduces the players score to below 8,000 if the player answers incorrectly, just as the High bet does, but unlike the High bet it increases the player's score above 9,300 if the player answers correctly. We think it is important to distinguish the High and SuperHigh bets and the Low and SuperLow bets because by betting to increase their score above 9,300 the players are reducing (usually very significantly) their probability of qualifying as a wildcard if they answer incorrectly without any chance of increasing their probability of qualifying if they answer correctly. For this reason it should be apparent that the Low bet always dominates the SuperLow bet and the High bet always dominates the SuperHigh bet. The High and Low bets afford a player the same probability of qualifying for the semi-finals if they answer correctly as the SuperHigh and SuperLow bets but will result in a higher probability of qualifying if the player answers incorrectly. So for our player with a score of 9,000 a Low bet of 300 increases his probability of qualifying for the semi-finals to 100 percent while reducing his probability of qualifying to 87 percent if he answers incorrectly. A SuperHigh bet of 2,000 would increase his score to 11,000, again a 100 percent chance of

qualifying if he answers correctly, but if he answers incorrectly his chance of qualifying with a score of 7,000 is only 36 percent.

Only one of the first place players (10 percent) bet Zero, the SBR. None of the second place players bet either strategic best response, Zero or Low. Among the remaining nine first place players four bet the Shutout bet (40 percent), one bet SuperHigh (10 percent), and four bet SuperLow (40 percent). One of the second place players bet All (10 percent), seven bet SuperHigh (70 percent) and 2 bet High (20 percent).⁵

(2) First place player's score is equal to or greater than 8,000 and 2nd place player's score is below 8,000. In twenty of the games the 1st place player's score was equal to or greater than 8,000 and the second place player's score was below 8,000. In our analyses we consider 21 bets made by second place players due to a tie between a second and a third place player's scores in one of the games prior to FJ. The average score was 9,257 for the first place player and 6,504 for the second place player. The Low bet for the first place player ranges from 1 to 43 because the Low bet is capped at reaching 9,300. As in the case where both players had scores greater than 8,000, the first place player does not have a High bet as we define it because any bet that would reduce a player's score to below 8,000 would increase their score significantly above 9,300 if the FJ question is answered correctly. The Low bet for the second place player ranges from 1 to 1,495 and the High bet ranges from 1,496 to 2,796. The range of final scores for the players and the corresponding probability of qualifying for the semifinals as a wildcard are presented in Table 4. Based on these payoffs (see Table 4) and the players probability of answering correctly and incorrectly we calculated the payoff matrix in Table 5 using decision trees similarly to what we have done for the prior case.

Insert Tables 4 & 5 about here

For the first place player the Zero bet dominates the Low and Shutout bets. Given that the Zero dominates all other bets for the first place player the High and All bets dominate the Zero bets for the second place player. Assuming that the distributions are the same in the different ranges of the Low and High bets for the second place player, we consider the High bet to dominate the Low bet because both ends of the range are greater for the High bet than those of the Low bet. Therefore the strategic best response for the first place player is to bet Zero and the strategic best responses for the second place player are to bet High or All.

None of the first place players bet Zero. Eleven of the first place players bet the Shutout bet (55 percent), one bet High (5 percent), two bet SuperHigh (10 percent) and six bet SuperLow (30 percent). Nine of the second place players bet the strategic best response (six bet All, 29 percent; and three bet High, 14 percent).⁶ Nine of the second place players bet SuperHigh (43 percent), two bet Zero (10 percent) and one bet Low (5 percent).⁷

(3) Both players' scores are below 8,000. In eighteen of the games both players scores were below 8,000 before FJ. Here again we consider 19 bets made by second place players due to a tie between a second and a third place player's scores in one of the games. When we first developed the payoff matrix for this group no dominant bet could be identified for either the first or second place player. It is possible that this might be due to the wide ranges of scores among the second place players (3,200 to 7,000). Such a wide range may affect the bets available to the players. While the shutout and zero bets are always available to the first place player and the All and Zero bets are always available to the second place player, this is not the case with the High and Low bets. When examining the players' scores we identified two groups of games in which

one or both players did not have High and/or Low bets as an option. In the first group we identified, the first place player does not have the High bet as an option and the second place player does not have either the High or Low bet as options. In these games the Shutout bet for the first place player is lower than the minimum bet required to reach 8,000. If the bet required to shutout the second place player is lower than the amount required to reach 8,000, the first place player does not have the High bet option according to our definitions. The second place players in this group do not have either the Low or the High bets as options. This is because their score is so low (i.e. on average 3,675) that even by betting ALL they cannot reach 8,000. Therefore these players can only bet Zero or All according to our bet definitions.

In the second group of games the first place player has the High bet as an option but the second place player does not have the Low and High bet options according to our definitions. In this group of games the average score of the second place players is somewhat higher, 4,567. These players can reach 8,000 with a bet of 3,433, but they need to consider the implication of having a score of just 1,134 if they answer incorrectly. A score below 2,000 corresponds to a zero chance of qualifying as a wildcard. Therefore, an All bet increases a player's upside chances of qualifying as a wildcard if he answers correctly and leaves him no worse off if he answers incorrectly.

We consider therefore three groups of games in the Both Below 8,000 condition: (1) The first place player does not have the High bet option and the second place player only has the Zero and All bets available; (2) The first place player has the High bet as an option but the second place player only has the Zero or All bets available, and (3) Both players have all four bet types available to them.

(3a) *First place player does not have the High bet option and the second place player only has the Zero and All bets available.* There are four games of this type. The average scores for the first and second place players were 6,575 and 3,675 respectively. The range of final scores for the players and the corresponding probability of qualifying for the semifinals as a wildcard are provided in Table 6a. Using these payoffs and the players' probability of answering correctly and incorrectly, we calculated the payoff matrix in Table 6b. The Shutout bet dominates all other bets for the first place player. Given this, the All bet dominates the Zero bet for the second place player. This leaves All as the strategic best response for the second place player. All four of the first place players bet Shutout, the strategic best response. Two of the second place players bet All, the strategic best response, and two bet Low (50 percent).

Insert Tables 6a & 6b about here

(3b) *First place player has the High bet as an option and the second place player only has the Zero or All bets available.* There are three games of this type. The average scores for the first and second place players were 7,200 and 4,567 respectively. The range of final scores for the players and the corresponding probability of qualifying for the semifinals as a wildcard are provided in Table 7a. Using these payoffs and the players' probability of answering correctly and incorrectly, we calculated the payoff matrix in Table 7b. The Shutout bet dominates all other bets for the first place player. Given this, the All bet dominates the Zero for the second place player, making All the strategic best response. All of the first place players bet Shutout, the strategic best response. Two (50 percent) of the second place players bet All, the strategic best response and 2 bet Low (50 percent).

Insert Tables 7a & 7b about here

(3c) *Both players have the High bet option.* There are eleven games of this type. The average scores for the first and second place players were 7,025 and 6,008 respectively. The range of final scores for the players and the corresponding probability of qualifying for the semifinals as a wildcard are provided in Table 8a. Using these payoffs and the players' probability of answering correctly and incorrectly, we calculated the payoff matrix in Table 8b. No dominant bet can be identified for either player. Seven of the first place players bet Shutout (64 percent), two bet SuperHigh (18 percent), one bet High (9 percent) and one bet Zero (9 percent). One of the second place players bet All (13 percent), seven bet SuperHigh (58 percent), two bet High (17 percent) and two bet Low (17 percent). Given that the SuperHigh bet is clearly dominated by the High bet the two first place players and the seven second place players that bet SuperHigh chose a non-strategic response.⁹

Insert Tables 8a & 8b about here

Overall Summary

Table 9 provides a summary of player bets in all of the conditions analyzed above. In the 37 games for which we could identify a strategic best response only eight (21.6 percent) of the first place players and twelve (32.4 percent) of the second place players bet the strategic best response. Fifteen (40.5 percent) of the first place players bet Shutout when this bet was not the strategic best response. This indicates that the majority of the first place players bet to win their game even when these bets significantly reduced their chances of qualifying as a wildcard.

Similarly, the second place players put more of their score at risk than was optimal by betting SuperHigh in 45.7 percent of these games.

Insert Table 9 about here

The analysis demonstrates that the first place players either could not identify or chose not to bet the dominant bet, the SBR. The first place player had a dominant bet identifiable without iteration in all cases. In these 37 games only eight (21.6 percent) of the first place players chose the dominant bet. The fact that the second place players chose the SBR more frequently than the first place players is surprising because a dominant strategy for the second place players was only identifiable after the dominant strategy for the first place player had been identified in all but three of these games.

As Colin Camerer (2003: 26) notes: “one step of iterated dominance is a judgment by one player that the other player will not make a dumb mistake”. In a somewhat complimentary vein, it can be argued that if players are aware that their opponents often do not bet optimally they may think that their chances of qualifying for the semi-final round would be greater if they took into account the bet most likely to be made by their opponent. Metrick (1995) refers to this type of bet as the “empirical best response”. In the next section we consider whether there is evidence that players chose their bets using the frequencies of prior bets as a guide.

III. Empirical Best Response (EBR)

In this section we examine whether the players were betting using sample bet frequencies (e.g. betting histories of prior TOC players) to guide their choice of bet.⁸ In his work, Metrick (1995) referred the bet affording the greatest probability of winning a Jeopardy game as the empirical best response (EBR). We adopt this term and use it to refer to choosing the bet with the highest probability of qualifying the player for the semi-final round. The essential difference between the

strategic and empirical best responses is the way in which the bet that an opponent is expected to make is identified. In the case of the strategic best response comparing the relative payoffs of each bet identifies the expected bet. In the case of the empirical best response the distribution of bets made by prior players in the TOC are used to identify the bet an opponent is expected to make.

(1) Both players scores are equal to or greater than 8,000. When both players scores are equal to or greater than 8,000 the first place player bets Low¹⁰ (40 percent) and Shutout (40 percent) with equal frequency.

We now consider whether the second place players' choices could be defined as EBR given the above. For the second place player the Zero and Low bets afford the highest probability of qualifying as a wildcard when the first place player makes either the Low or Shutout bet (see Table 3). The SBR was Zero. None of the second place players bet Zero or Low.

The most frequent bets made by the second place player in these games are High (90 percent) and All (10 percent). The bet affording the first place player the highest probability of qualifying for the semifinals as a wildcard is Zero when the second place player makes either of these bets (see Table 3). The SBR was also Zero but only one (10 percent) of the first place players chose this bet.

(2) First place player's score is equal to or greater than 8,000 and 2nd place player's score is below 8,000. The first place player bets Shutout in 55 percent of these games. When the first place player bets Shutout, the Zero and High bets afford the second place player a greater probability of qualifying for the semifinals as a wildcard than the All bet (see Table 5). This leaves High, Low and Zero as empirical best responses. Only 29 percent of the second place players chose one of these bets: two bet Zero (10 percent), three bet High (14 percent) and one bet Low (5 percent).

The most frequent bets made by the second place player when their score is below 8,000 and the first place players score is equal to or greater than 8,000 are High¹¹ (57 percent) and All (29

percent). For both of these bets the Zero bet affords the first place players with the highest probability of qualifying for the semifinals as a wildcard (see Table 5). The Zero bet was also the SBR and none of the first place players bet Zero.

(3) Both players' scores are below 8,000. We consider the above three separately.

(3a) First place player does not have the High bet option and the second place player only has the Zero and All bets available. All of the first place players bet Shutout. When the first place player bets Shutout the empirical best response for the second place player is All. The All bet affords the second place player a higher probability of qualifying for the semifinals than the Zero bet (see Table 6b). Two of the four second place players bet All (50 percent) and two bet Low (50 percent).

The bets made most frequently by the second place player are Low (50 percent) and All (50 percent). The empirical best response for the first place player is Shutout (see Table 6b). The Shutout bet affords the first place player the highest probability of qualifying for the semifinals as a wildcard making the Shutout bet the empirical best response. All four of the first place players bet Shutout.

(3b) First place player has the High bet as an option but the second place player only has the Zero or All bets available. The bet made most frequently by the first place player is Shutout (100 percent). As a result the empirical best response for the second place player is All. One (33 percent) of the second place players bet All, one bet High (33 percent) and one bet Low (33 percent).

The second place players bet Low, High and All with equal frequency. For the Low and High bets the empirical best responses for the first place player are Zero and Low (payoff table is available from the authors). The empirical best response when the second place player bets All is Shutout. Given that High and Low are bet in 66.6 percent of the games the overall empirical best responses for the first place player are Zero and Low. All of the first place players bet Shutout.

(3c) Shutout bet is greater than the amount needed to reach 8,000 (High bet is an option). The first place player bets Shutout in 64 percent of these games. The Zero bet affords the second place player a greater probability of qualifying as a wildcard than the All bet (see Table 8b) leaving Zero, Low and High as the empirical best responses. Only four of the second place players bet one of the empirical best responses, two bet Low (17 percent) and two bet High (17 percent). None of the second place players bet Zero and 8 percent of the second place players bet All. The remaining 7 players (58 percent) bet SuperHigh.

The bets made most frequently by the second place player are High, including SuperHigh, (75 percent) and All (8 percent). For both of these bets the Shutout bet affords the first place player a higher probability of qualifying than all other bets (see Table 8b). Seven of the first place players bet Shutout (64 percent).

Overall, 12 (25 percent) of the first place players and 12 (24 percent) of the second place players bet the empirical best response. The performance of the first place players is slightly lower than we found in our strategic best response analysis (21.6 percent). The performance of the second place players is considerably lower than in the strategic best response analysis (32.4 percent).

IV. Targets and Betting Behavior

Decision makers have been shown to be loss averse; and sensitive to changes in outcomes from a reference point (Kahneman & Tversky, 1979). The decision we study requires the player to choose between two goals, winning the game or qualifying as a wildcard. We suggest that the existence of two somewhat conflicting targets, winning and wildcard qualification, may affect players behavior when they try to decide which target to focus on. First, players may consider the two targets, flip back and forth and select one that may lead to an inferior strategy, that is, focus

on the wrong target. Alternatively, a player may focus on one target only and as a result may not consider all the available options.

The idea that two targets or reference points affect risky choice was introduced in the variable risk preferences model developed by James G. March and Zur Shapira (1992). In their model risk taking is controlled by two simple rules: The first rule suggests that when resources are above the focal reference point bet size is set so that in case of failure resources (say dollars) would not fall below the focal reference point, referred to in the model as the survival point. The second rule applies when resources are below the focal point. In this case bet size is set so that in the case of success resources will surpass the aspiration level. These two rules make risk-taking behavior sensitive to: (1) the risk taker's resources relative to the survival and aspiration points, and (2) whether the risk taker focuses on the survival reference point or on the aspiration level reference point. Two basic risk functions are plotted in Figure 2. The functions are not utility functions. They show risk taking directly as the standard deviation of the performance distribution. The function starting at the origin describes risk takers who focus on survival, a point which is assumed to be fixed and risk taking increases monotonically with resources. The second function depicts risk taking while focusing on the aspiration level, which is not assumed to be fixed. Thus, there is a family of such functions for different aspiration levels. These graphs are specific functions reflecting particular parameter values and should be viewed as representing a class of models (see March and Shapira, 1992).

Insert Figure 2 about here

In applying the model to the risks taken by the TOC players we assume that they consider the two reference points. In this respect winning the game is the player's aspiration level while

obtaining a wildcard slot is the survival point. We hypothesize that in such competitive situations both the aspiration level and the survival point affect risk taking. We apply the model to examine the betting behavior of the players in answering the FJ question of the qualifying round of the TOC. To analyze their behavior according to the model we conducted regression analyses. We first describe the variables that were included in the regressions and then report the results.

Dependent variable. The dependent variable (*Bet/Assets*) is the bet amount divided by the player's total assets. Total assets equal the player's score just prior to the FJ bet. Players who bet all of their assets are assumed to be taking a greater risk than if they bet only 50 percent of their assets. We do not use the dollar amount of the bet as a risk measure because two players betting 1,000 can be in very different positions in the game. If a player in first place has 10,000, the second place player has 4,000, and they both bet 1,000, the amount of risk taken is significantly different when relative competitive positions are considered.

Independent variables. The two main independent variables are the distances from the focal reference points, that is, distance from aspiration level and distance from the survival point. In the TOC the aspiration of all players is winning the game. The primary concern for players in first place is staying above the second place player's score. For the second place players their primary concern is closing the gap between their score and the score of the first place player. For players in first place, their aspiration point is equal to the second place player's score plus 1. For the players in second place, their aspiration point is the leader's score plus 1. Distance from Aspiration Point (DAP) is the absolute difference between the scores of the first and second place players plus 1.

The variable risk preferences model (March & Shapira, 1992) equates survival point with extinction. In their model extinction is reached when cumulative resources are zero. We modify

the model somewhat to fit the competitive situation presented by the qualifying round of TOC. Players may have positive resources (score) after the FJ round but still may not be able to advance to the semifinals and would be eliminated. Therefore, we equate survival with the score a player needs to qualify for a wildcard slot in the semi-finals of the TOC. The survival point is defined in line with our prior discussion as 8,000. Distance from Survival Point (DSP) is the absolute difference between a player's score and 8,000.

In addition to the distance from the two focal reference points we include three additional independent variables: Correct, Bet Maximum and Focus. Following Metrick (1995) we used a player's realized success to capture the level of confidence a player has that he would answer the FJ question correctly. Even though this measure is ex-post it arguably reflects players estimates of their chances of answering the question correctly and is the only data available. Correct enters the model as a dummy variable coded 1 for correct answers and 0 for incorrect answers.

In line with the variable risk preferences model we set a control for the fact that players cannot bet more than their total assets. Obviously, it makes no sense for the first place player to bet an amount greater than the shutout bet so the Bet Maximum variable is applicable only to the second place players. Bet Maximum enters the model as a dummy variable coded 1 if the players bet all of their assets and 0 if not.

To apply the variable risk preferences model for analyzing players betting behavior we have to establish whether players were focused on their survival or on their aspiration point. The criterion used to determine whether the first place players were focusing on their aspiration or survival point is based on whether or not they made the shutout bet. If they made this bet we assume they were focused on the aspiration point, winning the game, otherwise we assume that they were focused on their survival point (e.g. qualifying for the semi-finals as a wildcard).

The criterion for determining whether players in the second place were focusing on their aspiration or survival point is more complex. We assume that the second place players are focused on their aspiration point if they bet to “win” the game. Thus, if the second place player would have reached a score high enough to win if the first place player had made the shutout bet and answered incorrectly, we assume that the player was focused on her aspiration point. We assume that all players in second place not making the above bet are focused on their survival point. Focus enters the model as a dummy variable set to 1 if players were focused on their aspiration point and 0 if they were focused on their survival point.

In sum, the dependent variable is Bet/Assets. The independent variables are Distance from Aspiration Point (DAP), Distance from Survival Point (DSP), Focus, Correct, and Bet Maximum. Table 10 reports the regression results. In the regression for players in first place, DAP, Focus and Correct are highly significant while DSP is not. This is consistent with our findings concerning players betting the strategic and empirical best responses. In the regression for the second place players DAP, DSP, Bet Maximum, and Focus are all significant while Correct is not. The relatively high R^2 values suggest that the model does a good job of accounting for the players bets. In particular DAP plays a significant role in both cases. The fact that DSP is not significant for the players in first place raises a question as to whether those players who were above their aspiration point were either unable to notice the survival point alternative or in some way undervalued the advantage of focusing on this option.

Insert Table 10 about here

V. Discussion and Conclusion

The conjecture that focusing on one target (aspiration and/or survival) may lead to inferior strategy selection is supported by the low percentage of players that bet the strategic best response. For example, in season 1, game 4, the first place player had a score of 9,900, which corresponds to a 100 percent chance of qualifying as a wildcard, and the second place player had 8,300. The first place player bet 7,000 and answered incorrectly leaving him with only a 5 percent chance of qualifying for the semi-finals. The same pattern is observed in season 5, game 1. In this game the first place player had a score of 8,200, which corresponds to a 90 percent chance of qualifying as a wildcard, he bet 6,300, and answered incorrectly leaving him with a zero likelihood of qualifying for the semi-finals¹². Had these players focused on their survival point and bet zero they would have had a significantly higher chance of entering the semi-finals as a wildcard. We also see this betting pattern in the amounts wagered by first place players who answered correctly. For example, in game 1 of season 7, the first place player had 11,200 and bet 5,800. If this player had answered incorrectly her final score would have been 5,800, leaving her with a less than 30 percent chance of qualifying as a wildcard.

Some ideas can be suggested to explain why the behavior of the contestants appears to be at odds with the strategic best response. One explanation is that contestants may get positive utility from winning the game and thus even though they can secure a place in the semi-finals while betting zero, they still bet a positive amount so as to win the game. Put another way, winning affords a player a form of instant gratification. A second potential explanation is that some first place players are willing to pay a substantial premium to reach a score of 9,300 that assures a player of qualifying for a wildcard slot in the semi-finals. Three first place players with scores above 8,000 but below 9,000 bet amounts that would result in a score greater than 10,000

but that would not shutout the second place player. These players were buying 10 percent on the upside but were risking 33 percent on the down side. A third potential explanation is that betting to win the game for the first place players equates to the preservation of the “status quo”. It is often assumed that the current situation frames the decision to be made. Because the first place players are winning the game prior to the FJ round they attempt to maintain this position by betting to shutout the second place player. Betting to shutout the second place players can then be viewed as an effort to preserve their winning position. A fourth possibility, and another framing effect, is that the first place players' focus on winning may be an example of loss aversion. Because they are in the lead prior to the FJ question, qualifying as a wildcard may be perceived as a loss. That fact that the distance from the aspiration point was significant and the distance from the survival point was not significant in our regression analyses provides support for a framing effect. Finally, it is possible that the salience of the Shutout bet in the regular season became the default for the first place players in the TOC as well. If this is the case it suggests that learning to adapt to a somewhat different situation is not easy even though the players were aware that this bet was not the SBR in many TOC cases.

These ideas can explain part of the behavior of the players but they are not likely to be good examples for such professional players. For example, while winning the game assures a player a place in the semi-finals, the players are aware of the high price it may cost them. Betting to win the game is not the strategic best response in almost all of the games and pursuing it is not rational. If in the regular season, players in first place behave in a rational manner (Metrick, 1995) we expect the select group of players who compete in the TOC to act so as well. The market mechanism works well in weeding out poor players for the TOC. Also, the meticulous training program each of the contestants goes through in preparation for the TOC makes them

much more familiar with the benefits and costs of pursuing different strategies (TOC Report, 2001).

We believe that a major determinant of the failure of the contestants to choose a strategic best response is due to the availability of the two targets. Despite the TOC contestants' skills, training, and the huge incentives, competing in such situations may hamper a person's ability to make optimal choices. Several studies have shown that under pressure people do not use all the information they have and often resort to simple strategies in calculating the values of alternative routes of action (see e.g., Payne, Bettman, & Johnson, 1993; Wright, 1974). Under pressure people usually filter information or omit certain information from consideration. Furthermore, in stressful situations people often behave in a non-adaptive manner resulting from a phenomenon that can be described as the "narrowing one's attention span" (cf., Yerkes & Dodson, 1908). This may lead to a fixation on one "solution" (target) while neglecting to consider other alternatives. The TOC contestants ignored alternatives that were open to them and did not behave in an adaptive manner. For example, 29 of the 48 first place players did not bet the strategic best response but instead bet to shutout the second place player. Such a response is the strategic best response in the regular season games but not in the qualifying stage of the TOC.

Most of the above studies examined individual decision behavior under stress; our study, describing decision making under high pressure added two aspects: Very high incentives and competition. It is usually assumed that incentives lead to rational behavior. In the Jeopardy! game incentives are huge but they may push contestants to become less adaptive. Competition is also assumed to sharpen the behavior of decision makers but the players often focused on one target while ignoring alternative targets and the choices that were available to their competitors (see also, Wilson et. al. 2000; Tor & Bazerman, 2003).

The Jeopardy! television game is a high-stakes natural experiment that allows the study of competitive decision-making under pressure. Nalebuff's (1990) question of what advice would economists give the contestants was a normative question and if an answer were provided it supposedly would help the players behave optimally. Yet, Metrick (1995) concluded that the players choice behavior was sub-optimal but not random. The discrepancy between normative models and descriptive aspects of choice behavior has been a major instigating force for the development of behavioral decision-making. In a lucid treatise, David E. Bell, Howard Raiffa and Amos Tversky (1988) argue that without developing both normative and descriptive models of decision making our ability to provide prescriptions for improving choice behavior is minimal. Normative models of competition that draw on sport metaphors are available (Cabral, 2003) but descriptive models of competition are not abundant. The model we described in this paper attempts to do just that. It provides a framework for understanding the pitfalls of experienced players who are familiar with the normative aspects of the game yet fail to apply them. Future research should look at ways which will allow such experienced players to overcome their natural tendencies to pursue (sometimes) wrong goals and to focus on their own targets while ignoring other alternatives open to them and to their competitors. The strategic best responses in this game are not that complicated and were known to the players employing them, however, proved not to be easy.

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FOOTNOTES

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¹ We calculated the average based on the data provided by the producer of the Jeopardy show. In 2003 the show doubled the amounts players could win for each question answered correctly. This change took place after our data collection ended.

² Jeopardy! was first aired in 1964 and ran until 1975 with Art Flemming as host. Jeopardy! aired again in 1978 for one year. Then in 1984 the show began its current run with Alex Trebeck as host. We have data for 1990 through 2001 when our data collection concluded. The show changed producers in 1990 and the older records have apparently been lost.

³ This analysis is based on the scores among non-winners because non-winners are the only players that can qualify for a wildcard slot.

⁴ Metrick (1995) also took up Nalebuff's challenge in his work studying the bets made by players during the regular season play. The decision faced by the players in the regular season is less complex than the decision faced by the players in the qualifying round of the TOC. In the regular season the only way a player can return to play another game again is to win the game (i.e. there is no wildcard option). Metrick's (1995) approach focused on identifying the "empirical best response" for the first and second place players based on sample bet frequencies during regular season play. He assumed that players believe their opponent is playing a mixed strategy equal to

historical bet frequencies. Metrick reports that while most of the players in his sample bet in a rational manner, some puzzling aspects in their behavior could not be accounted for. He reported that many players “fail to notice that a specific option is available” (p. 252) and that “suboptimal choice can persist despite the three mitigating factors of high stakes, an identifiable market mechanism, and an opportunity for players to learn” (p. 252). Metrick argued that the most important of these mitigating factors is the market mechanism that plays a major role in driving out inferior players.

⁵We also examined the bets to determine whether the players were choosing bets with the highest maximum payoff, maximax; or bets with the highest minimum payoff, maximin. There is no evidence that the players were choosing maximax or maximin bets. In addition, we thought it possible that the players may have given equal weight to the four combinations of correct and incorrect responses to the FJ questions. We recalculated the payoff matrix substituting .250 for the probability that both players answer correctly (instead of .375) and for the probability that both players answer incorrectly (instead of .125). The strategic best response for both players is Zero based on these new payoffs so the data does not provide support for the conjecture that the players were weighting all possibilities equally.

⁶ For the second place player with a score of 7,500 or greater the Zero bet results in the same probability of qualifying as the All bet. Five players had scores between 7,500 and 7,900. Of these three bet High and two bet Zero.

⁷Recalculating the payoff matrix using equal probabilities leaves the strategic best response unchanged for both players. We also found no evidence that the players were choosing bets with either the highest maximum (maximax) or the highest minimum (maximin) payoffs.

⁸This is the approach Metrick used in his 1995 paper. To identify the empirical best response he assumed that each player believed her opponent would play a mixed strategy equal to the sample frequencies.

⁹Recalculating the payoff matrix using equal probabilities does not reveal a dominant strategy for either player. Three of these players did select the Low bet which is the bet with the highest possible payoff, maximax.

¹⁰ All of these players actually bet SuperLow.

¹¹ Including SuperHigh.

¹² Neither player progressed to the semi-finals.

¹³ The 2001 TOC did not include the Teen tournament champion.

Table 2: Probability of Qualifying By Bet Type— Both Above 8,000^a

1 st Place Player			2 nd Place Player		
Bet	Resulting Score (after FJ Bet)	Probability of Qualifying	Bet	Resulting Score (after FJ Bet)	Probability of Qualifying
SO+	17,201	1.0	All+	17,200	1.0
SO-	3,219	0.15	All-	0	0
High+	n/a	n/a	High+	9,201-9,300	0.99-1.0
High-	n/a	n/a	High-	7,700-7,999	0.65-0.79
Low+	n/a	n/a	Low+	8,601-9,200	0.95-0.99
Low-	n/a	n/a	Low-	8,000-8,599	0.80-0.95
Zero	10,210	1.0	Zero	8,600	0.95

^a + indicates score if FJ question is answered correctly/- indicates score if player answers incorrectly.

Table 3: Both Above 8,000 Payoff Matrix

		2nd Place Player			
		Zero	Low	High	All
1st Place Player	Zero	0.95 1.0	0.88-0.97 1.0	0.82-0.90 1.0	0.50 1.0
	Shutout	0.95 0.68	0.93-0.98 0.68	0.91-0.95 0.68	0.50 0.89

Table 4: Probability of Qualifying By Bet Type—1st Above & 2nd Below 8,000 ^a

1 st Place Player			2 nd Place Player		
Bet	Resulting Score (after FJ Bet)	Probability of Qualifying	Bet	Resulting Score (after FJ Bet)	Probability of Qualifying
SO+	13,009	1.0	All+	13,008	1.0
SO-	5,505	0.25	All-	0	0
High+	n/a	n/a	High+	8,000-9,300	0.80-1.0
High-	n/a	n/a	High-	3,708-5,008	0.15-0.25
Low+	9,258-9,300	0.99-1.0	Low+	6,505-7,999	0.35-0.79
Low-	9,014-9,256	0.97-0.99	Low-	5,009-6,503	0.25-0.35
Zero	9,257	0.99	Zero	6,504	0.35

^a + indicates score if FJ question is answered correctly/- indicates score if player answers incorrectly

Table 5: 1st Above & 2nd Below 8,000 Payoff Matrix

		2nd Place Player			
		Zero	Low	High	All
1st Place Player	Zero	0.35 1.0	0.30-0.57 1.0	0.48-0.63 1.0	0.50 1.0
	Low	0.35 1.0	0.30-0.57 1.0	0.48-0.63 0.99-1.0	0.50 0.99-1.0
	Shutout	0.59 0.72	0.38-0.79 0.72-0.91	0.50-0.63 0.91	0.50 0.91

**Table 6a: Probability of Qualifying By Bet Type—Both Below 8,000
(1st no High bet & 2nd can only bet Zero & All) ^a**

1 st Place Player			2 nd Place Player		
Bet	Resulting Score (after FJ Bet)	Probability of Qualifying	Bet	Resulting Score (after FJ Bet)	Probability of Qualifying
SO+	7,351	1.0	All+	7,350	0.40
SO-	5,799	0.30	All-	0	0
High+	n/a	n/a	High+	n/a	n/a
High-	n/a	n/a	High-	n/a	n/a
Low+	6,576-7,999	0.33-0.79	Low+	n/a	n/a
Low-	5,150-6,574	0.30-0.33	Low-	n/a	n/a
Zero	6,575	0.33	Zero	3,675	0.17

^a + indicates score if FJ question is answered correctly/- indicates score if player answers incorrectly

Table 6b: Both Below 8,000 Payoff Matrix
(1st no High bet & 2nd can only bet Zero & All)

		2 nd Place Player	
		Zero	All
1 st Place Player	Zero	0.17 1.0	0.50 0.67
	Low	0.17 1.0	0.50 0.66-0.84
	Shutout	0.17 1.0	0.50 0.91

**Table 7a: Probability of Qualifying By Bet Type- Both Below 8,000 ^a
(2nd Has only the Zero & All Bets)**

1st Place Player			2nd Place Player		
Bet	Resulting Score (after FJ Bet)	Probability of Qualifying	Bet	Resulting Score (after FJ Bet)	Probability of Qualifying
SO+	8,515	1.0	All+	8,514	0.85
SO-	5,886	0.30	All-	0	0
High+	8,000-9,300	0.80-1.0	High+	n/a	n/a
High-	5,100-6,400	0.23-0.36	High-	n/a	n/a
Low+	7,201-7,999	0.38-0.79	Low+	n/a	n/a
Low-	6,401-7,199	0.36-0.38	Low-	n/a	n/a
Zero	7,200	0.38	Zero	4,567	0.25

^a + indicates score if FJ question is answered correctly/- indicates score if player answers incorrectly

**Table 7b: Both Below 8,000 Payoff Matrix
(2nd Has only the Zero & All Bets)**

		2 nd Place Player	
		Zero	All
1 st Place Player	Zero	0.25 1.0	0.50 0.69
	Low	0.25 1.0	0.50 0.69-0.84
	High	0.25-0.54 1.0	0.44 0.83-0.92
	Shutout	0.25 1.0	0.44 0.92

**Table 8a: Probability of Qualifying By Bet Type—Both Below 8,000^a
(Both Players Have All Bets)**

1st Place Player			2nd Place Player		
Bet	Resulting Score (after FJ Bet)	Probability of Qualifying	Bet	Resulting Score (after FJ Bet)	Probability of Qualifying
SO+	12,017	1.0	All+	12,016	1.0
SO-	4,992	0.22	All-	0	0
High+	8,000-9,300	0.80-1.0	High+	8,000-9,300	0.80-1.0
High-	4,750-6,050	0.25-0.30	High-	2,716-4,016	0.07-0.15
Low+	7,026-7999	0.39-0.79	Low+	6,009-7,999	0.30-0.79
Low-	6,051-7024	0.30-0.37	Low-	4,017-6,007	0.15-0.30
Zero	7025	0.37	Zero	6,008	0.30

^a + indicates score if FJ question is answered correctly/- indicates score if player answers incorrectly

**Table 8b: Both Below 8,000 Payoff Matrix
(Both Players Have All Bets)**

		2nd Place Player			
		Zero	Low	High	All
1st Place Player	Zero	0.30 1.0	0.23-0.65 0.70-1.0	0.54-0.58 0.69	0.50 0.69
	Low	0.30 1.0	0.23-0.65 0.77-1.0	0.54-0.58 0.69-0.84	0.50 0.69-0.84
	High	0.30-0.56 1.0	0.23-0.75 0.72-1.0	0.46-0.58 0.84-0.90	0.50 0.84-0.90
	Shutout	0.56 0.71	0.31-0.75 0.71-0.90	0.46-0.58 0.90	0.50 0.90

Table 9: Response summary across conditions

(Both Above and 1st Above & 2nd Below)

Player	Panel A Both Above 8,000						Panel B 1 st Above & 2 nd Below 8,000					
	Zero	Low	Super Low	High	Super High	SO/ All	Zero	Low	Super Low	High	Super High	SO/ All
1	1* (0.1)	0	4 (0.4)	0	1 (0.1)	4 (0.4)	0*	0	6 (0.30)	1 (0.05)	2 (0.10)	11 (0.55)
2	0*	0*	0	2 (0.20)	7 (0.70)	1 (0.10)	2 (0.09)	1 (0.05)	0	3* (0.14)	9 (0.43)	6* (0.29)

*Number of persons responding with the strategic best response (frequencies are in parentheses).

Table 9 (cont): Response summary across conditions

(Both Below)

**Panel C
Both Below 8,000**

Player	(3a) 1st no High bet & 2nd can only bet Zero & All					(3b) 2nd Has only the Zero & All Bets					(3c) Both Players Have All Bets				
	Zero	Low	High	Super High	SO/ All	Zero	Low	High	Super High	SO/ All	Zero	Low	High	Super High	SO/ All
1	0	0	0	0	4* (1.0)					3* (1.0)	1 (0.09)		1 (0.09)	2 (0.18)	7 (0.64)
2	0	2 (0.5)	0	0	2* (0.5)		1 (0.33)	1 (0.33)		1* (0.33)	0	2 (0.17)	2 (0.17)	7 (0.58)	1 (0.08)

* Number of persons responding with the strategic best response (frequencies are in parentheses).

Table 10: FJ Bet OLS Regression Results

Variable	First Place Players	Second Place Players
Distance from Aspiration Point (DAP)	-0.0146*** (.002)	0.0075** (.003)
Distance from Survival Point (DSP)	0.002582 (.003)	0.0104** (.005)
Correct	14.463** (6.103)	9.108 (8.374)
Bet Maximum	n/a	22.753** (11.259)
Focus	2606.88*** (.000)	-20.849* (11.252)
Constant	22.844*** (6.228)	55.502*** (15.693)
Model <i>F</i>	15.772***	6.991***
R^2	0.60	0.44
N	48	50
* p<.10 ** p<.05 *** p<.01 Standard errors are reported in the parentheses		

Figure 1: Probability of Qualifying as a Wild Card

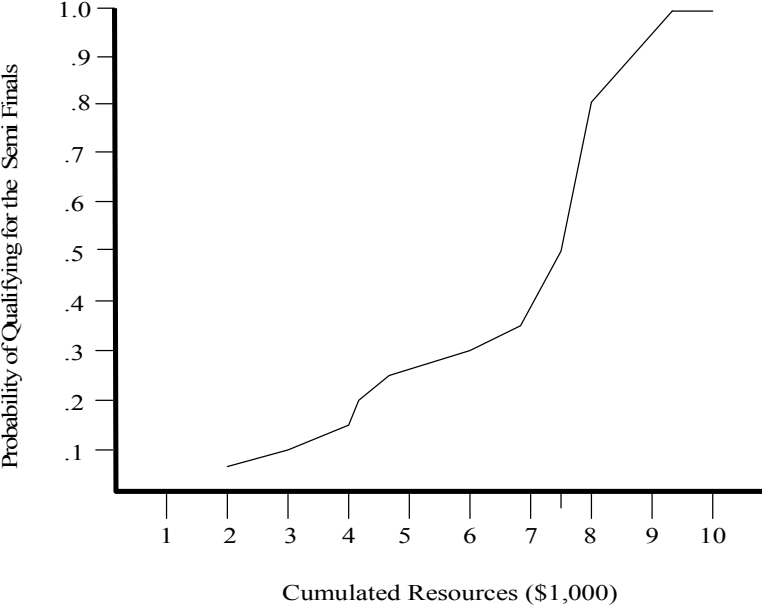
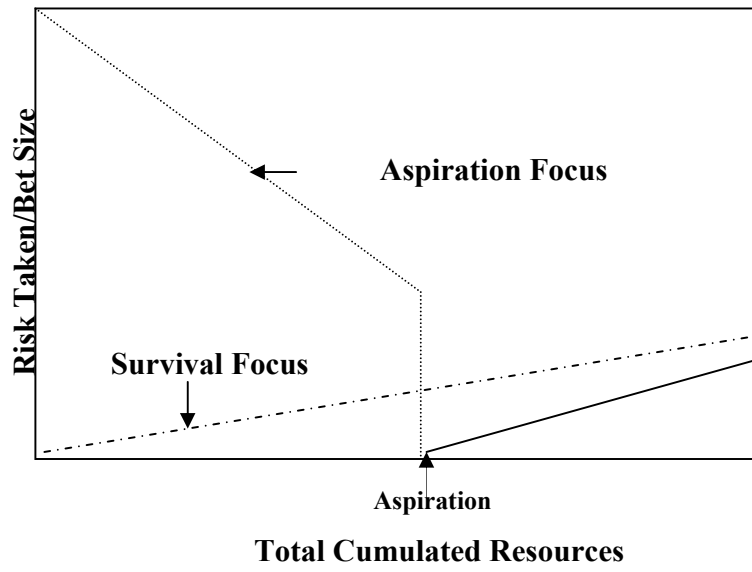


Figure 2: The Variable Risk Preferences Model



APPENDIX A: Jeopardy! Game and Tournament of Champions Rules

Rules of the Jeopardy game. Three players play the Jeopardy game. The game is divided into three rounds named: Jeopardy, Double Jeopardy, and FJ (Trebeck & Barsocchini, 1990). Each of the first two rounds contains 30 questions. The 30 questions are divided into six categories with five questions in each. Within a category, the dollar value for each question ranges from 100 to 500 in the Jeopardy round and from 200 to 1,000 in the Double Jeopardy round.

After the host, Alex Trebeck reads each question the player who "rings in" first gets to answer the question (e.g. players is equipped with a buzzer). If the player answers correctly, that player picks the category and dollar amount of the next question. If the player answers incorrectly, the question can then be answered by one of the two remaining players. Again, the player who "rings in" first is given the opportunity to answer the question. Correct answers increase and incorrect answers decrease the player's score by the dollar value of the question.

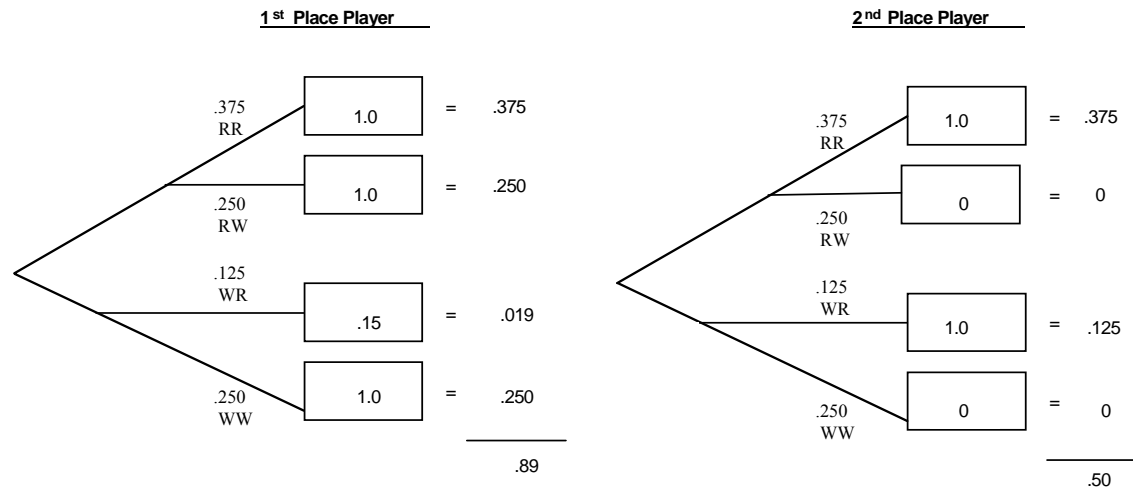
During the Jeopardy and Double Jeopardy rounds of play, players encounter Daily Doubles. When a Daily Double opportunity arises, players determine how much they wager on the success of their answer. The player can bet up to the total amount of money they have accumulated to that point in the game. If a player's score is below 500 in the Jeopardy round or 1000 in the Double Jeopardy round they are permitted to bet up to 500 and 1000 respectively. Daily Doubles are questions that can only be answered by the player selecting the question.

All players with a positive score at the end of the Double Jeopardy round play the final round of the game, FJ. In FJ the players are shown a single category from which they are asked one question. All players answer the same question and write down their answers simultaneously. The players know only the category, not the question before they decide how much to bet. Players cannot bet more than their score or less than zero. During a regular game, not a TOC game, the player with the highest score after FJ gets to keep the money they have won and return to play another game with two new competitors. The other two players do not get to keep the money; they get a consolation prize. In the next section we describe the special features of the annual Tournament of Champions.

Rules for the Tournament of Champions. The 10 years of data used in our analyses were taken from the Jeopardy program's annual *Tournament of Champions* (TOC) held between 1991 and 2000. Fifteen contestants are selected to participate in the TOC based on their performance earlier in the given year. These players have either won 5 consecutive games during the prior year or have had the highest dollar winnings among those winning 4 games in a row. Also included in the TOC are the winners of two special tournaments held during the year, the Teenage and College Championships¹³.

The TOC consists of ten games spread over a two-week period. Each of the fifteen contestants plays in one of the first five games. The winners of each game and the four players with highest score among the non-winners become semi-finalists. We refer to the 4 players that progress to the semi-finals based on being among the top 4 money winners as Wildcards. Each of the nine semi-finalists plays in one of three games and the winner of each game becomes a finalist. The three finalists play two games on two consecutive days and the player earning the highest total amount of money in the two games combined becomes the champion. The champion wins 100,000. The remaining 2 finalists receive the money they won in the two games but are guaranteed a minimum of 15,000 for second place and 10,000 for third place. Semi-finalists who do not become finalists receive 5,000 for participating in the show.

**Appendix B: Payoff Calculation
Both Above 8,000*
(SO/All in Table 3)**



*RR=Both players answer correctly; RW=1st place player answers correctly and the 2nd place player answers incorrectly; WR=2nd place player answers correctly and the 1st place player answers incorrectly; WW=Both players answer incorrectly.