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Colonel Blotto revisited /

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Abstract

This paper examines game theory in general and the Colonel Blotto problem of force allocation in particular. The problem is expanded to include additional information of varying reliability concerning the opponent's intentions. A Bayesian decision analysis solution is advanced and compared with the strict game theory solution. The technique uses information qualified with probability assessments of its veracity. While the problem discussed is a two player zero sum game, it is easily extended to non-zero sum multiple player game with applications including military deployment, business competitions, international affairs and stock trading. The limitations of such an approach are also discussed.

Game Theory

As Developed by Von Neumann [1972] game theory seeks to find optimal strategies to a highly structured strategic competition with one or more players. The "game" is carefully defined by rules which specify the legal moves of all players, a payoff function or matrix corresponding to those moves, the amount of information available to each player (information consists of the results of previous moves), the number of rounds to be played, and the role of chance in determining the outcome. For example consider a two player coin matching game.

Moves available to both players consist of revealing a head or tail side of a coin. The coins are then compared and if the coins are both heads or tails then player one wins one round, otherwise player two wins the round. The payoff matrix for player one would therefore consist of (1).

		Player 2 H	Player 2 T
Player 1	H	1	-1
	T	-1	1

or

$$\begin{bmatrix} 1 & -1 \\ -1 & 1 \end{bmatrix} \qquad (1)$$

This type game is termed zero sum because any gains made by one player are at the expense of the other player as the amount of payoff is fixed. Thus player two seeks to minimize the total score while player one seeks to maximize

the score. A non zero sum game has at least one move for which the sum of the gains for all the players is not zero. An example of this would be a state lottery in which a fixed amount of money is removed before the pot is redistributed to the participants.

A strategy is defined as a plan of moves which covers all counter moves by opponents over the course of the entire game. Selecting one move which played each turn for the entire game is termed pure strategy. A mixed strategy is probability based selection of a move for any given round. This is done by assigning a probability (weight) to each possible move (the sum of all moves must naturally be 1.0) and then randomizing. Game theory seeks to discover the best strategy for a game which is done by applying the minmax theorem.

For two player zero-sum games with a finite number of moves, the payoff function can always be represented as a matrix A with a_{ij} being the result of move i by player 1 and move j by player 2. Consider a payoff function composed of matrix 2.

$$\begin{bmatrix} 3 & 1 & 2 \\ -1 & 0 & -2 \\ 2 & -1 & 1 \end{bmatrix} \begin{matrix} \text{Min= 1} \\ \text{Min= 2} \\ \text{Min=-1} \end{matrix} \qquad (2)$$

$$\begin{matrix} \text{Max} & \text{Max} & \text{Max} \\ 3 & 1 & 2 \end{matrix}$$

Quite clearly, there is no reason why player one would choose row two instead of row one if he, as we assume, wants to maximize his winnings, because for all the columns the first row yields superior results than the second. Thus row one is said to "dominate" row two and the second row can be eliminated without changing the solution to the problem leaving matrix (3).

$$\begin{bmatrix} 3 & 1 & 2 \\ 2 & -1 & 1 \end{bmatrix} \begin{matrix} \text{Min= } 1 \\ \text{Min=-1} \end{matrix} \qquad (3)$$

Max Max Max
3 1 2

Now it can be seen from player two's view (recall he desires the lowest score), there is no reason why he would choose column one over column two as his move. Again it is termed that column two "dominates" column one and can be safely eliminated leaving matrix (4).

$$\begin{bmatrix} 1 & 2 \\ -1 & 1 \end{bmatrix} \begin{matrix} \text{Min= } 1 \\ \text{Min=-1} \end{matrix} \qquad (4)$$

Max Max
1 2

Likewise column one dominates column two to reveal (5).

$$\begin{bmatrix} 1 \\ -1 \end{bmatrix} \begin{matrix} \text{Min= } 1 \\ \text{Min=-1} \end{matrix} \qquad (5)$$

Max
1

Finally row one dominates the new row two to leave (6).

$$\begin{bmatrix} 1 \end{bmatrix} \text{Min= } 1 \qquad (6)$$

Max
1

Thus the problem reduces itself to player one choosing row one and player two choosing column two. From the above reasoning, it can be said a_{12} is in the best interests of both players or an equilibrium point. If both players choose their optimum move, they can expect the result of the game ("value") to be one. If one player chooses a move other than his optimum while his opponent remains with his optimum, he will receive less than the value of the game.

However the problem given above is a rather contrived example to illustrate the concept of "dominance" and how it can be used to solve for the equilibrium point. Such a procedure of eliminating rows and columns is only the starting point for more complex problems.

Consider if player one chooses a strategy and announces it before player two has chosen his. Player two would then logically select the column with the minimum value. Therefore player one would have selected the row with the maximum row for the minimum column (the "maxmin"). If the roles were reversed and player two choose first then player one would naturally select the row which gave the maximum for the column selected by two. Therefore two would select the column with the minimum of the maximum rows (the "minmax"). If the minmax equals the maxmin then that point

is the equilibrium point (or as it is termed in pure strategy "saddle point"). It can be quickly located because it is the largest value in its column and the lowest point in its row. More formally the saddle point consists $\max_i \min_j \leq \min_j \max_i$. If $\max_i \min_j = \min_i \max_j$ then there exists a pure strategy for both players such that if player one chooses his, he is guaranteed at least the value of the game and if player two chooses his correct pure strategy then he is guaranteed at most the value of the game. However if the minmax does not equal the maxmin then no pure strategy solutions exist to the game and a mixed solution is required.

Before proceeding onto mixed solution games, a more formal description of what constitutes a mixed strategy is required of mixed games themselves. In a mixed two player zero-sum game in which the payoff matrix A is NxM, player one selects a weight vector of $X_{1..M}$ and player two likewise chooses $Y_{1..N}$ then the payoff for the two strategies would then be equation 7 (James [1967]).

$$\sum_{j=1}^{n} \sum_{i=1}^{m} a_{ij} x_i y_j = V_{xy} \qquad (7)$$

The minmax theorem for mixed strategies which is true for all two player zero-sum games can be expressed as in equation 8.

$$\text{Maximum}_X (\text{Minimum}_X {}^* V_{XY}) = \text{Minimum}_Y (\text{Maximum}_Y {}^* V_{XY}) \qquad (8)$$

This important result allows for the immediate checking of a solution but does not specify a technique in finding it. While many methods for finding the optimum values were developed during the early years of game theory (before the advent of cheap computers) for finding the optimum values such as graphical, guess and verify, mapping methods and iterative approximations, most of these are not serviceable for large problems as outlined in Dresher [1981]. Because of game theory's nature of maximizing and minimizing, linear programing on computers has proven to be very successful and has become the standard technique.

Private Information

The classical game theoretic model of complete (C-Game) information available to all the players was found to be too great a simplification form many applications. A seminal work by Harsanyi [1967] outlined a technique to convert all games with incomplete information (I-Game) to their corresponding C-Game. The types of information unavailable to one or more players include the payoff function or even the strategies available. This "Bayesian equivalent" C-Game of an I-Game is based upon using subjective probability distributions for approximations.

In applications, the descriptions of the probability distributions rely upon the judgments of experts. Such a dependence upon the human assessment of probabilities makes the model less reliable particularly in cases with very small or very large likelihoods (C.Smart [1982]). Another problem encountered is the common difficulty in recognizing the difference between joint and conditional probabilities which one study found even experts err in. This makes in general forecasting of all types difficult.

Nevertheless much attention has been focused by economists and others on I-Games which they refer to as "private information" games. Such interest has concentrated on auctions and bids (Mookherjee [1985]). However neither

C-games nor I-Games cover the problem of possessing information concerning the other side's intentions. This is not a criticism of game theory, as Von Neumann pointedly ruled out using such knowledge as part of the definition of game theory.

However such a ban limits the application of the theory. For example consider a contest between IBM and a small company (called an "OEM" Original Equipment Manufacturer) which markets their own version of an IBM memory board. While IBM may utilize the game theory quite well to model its competition against all OEM's as a group, for the particular OEM's perspective which is totally dependent upon IBM's actions for its own survival, game theory is inadequate.

While the above life and death struggle can be approximated by allowing different payoff functions for both sides, it would still not properly represent the situation of a one and a half player game. Related to this problem of incorporating the notion of dominance is the problem of offense/defense as a whole.

Game theory envisions a contest such as when the national television networks establishing their initial fall schedules. That is to say, the decisions are made in secret and (almost) simultaneously revealed. All competitors are equally determined to capture the various time slots they compete in. However in a large number of contests, the

decisions are made asynchronisticly and one or more players sets the tone by his aggression. One player if only psychologically assumes the role of defender and reacts to the moves or conjectured moves of his more aggressive opponent. The reasons for this behavior vary but it is a common strategy of either apathy or waiting for the opponent to tire.

Game theory is thus a method of concentrating upon the opponent's and one's own capabilities rather than the intentions of the opponent. This is perfectly satisfactory if the game is synchronistic, both sides are "blind", and neither side dominates too greatly. However alternative techniques should be used to better represent the problem if the above do not apply.

Colonel Blotto

As originally described by McDonald [1949] Colonel Blotto is given a test of competence in a combat situation. He is told the battle consists of four forts lying in separate passes to which he must allocate his resources of four combat units. Opposing him is a force of three units. He must commit his units to each pass prior to the battle and no adjustment of forces is allowed during the battle. In other words his task is confined to allocation only.

Combat is resolved strictly in terms of simple arithmetic: the victor at any one pass is the one with the most units. The payoff function consists of one point for each fort captured and one point for each enemy unit destroyed. For example if Blotto's were allocated [2 1 0 1] and his opponent used [1 2 0 0] then in pass number one Blotto captures the fort and destroys one of his opponent's units. While in pass two, his opponent captures the second fort and Blotto loses a unit. In the third pass, neither side committed any units so the result served neither side. Finally in the fourth pass, Blotto captures the fort. The payoff for Blotto then becomes 2-2+0+1=1 (and therefore -1 for his opponent as this is quite clearly a zero-sum game).

For Blotto there are only five possible pure strategies: he may allocate four units to one pass (1-4's), three to one

pass and one unit to another (3 and 1), two groups of two units each (2 and 2), two groups of one each and one group of two (1 and 1 and 2), and finally four groups of one (4-1's). The first case of 1-4's was banned in the original problem to enable a simple graphical solution of the problem. However following Haywood [1951], the full Blotto game was reformulated. Blotto's opponent has three pure strategies available to him: (2 and 1), (1-3's) and (3-1's).

Because neither Blotto nor his opponent have any knowledge of each other's intentions, the assignment of a group to a particular pass within a strategy is random (i.e if Blotto is using a pure strategy of 1-4's then there is no rational reason for preferring to send the unit to one pass over another). Therefore in calculating the payoff matrix an average all possible combinations is used. For the complete game the payoff matrix as found by Haywood is:

	2&1	1-3	3-1's
4-1's	0.00	1.00	1.00
3&1	0.75	0.50	0.50
2&2	1.00	-0.50	2.00
1-4's	0.25	1.00	-0.50
2&1&1	0.50	0.25	1.50

There is obviously no saddle point in this problem but the mixed solution has been found to be [1/5, 4/5, 0, 0, 0]

while his opponent uses [2/5, 2/5, 1/5] or [6/5, 8/5, 1/5] or any linear combination of the two. The value of the game can then be calculated at 0.6.

Considered a classic game theory problem, Colonel Blotto attracted a great deal of attention when it was first published by McDonald based as it was on the work by the Princeton mathematicians Charles Winsor and John Tukey. Many different variations of the game were explored in the early 1950's including games with infinite strategies (i.e. the deployment of units need not be integers]. However because of its simplicity, it fell into disfavor as more exotic non-zero sum games became the focus (Shubik [1975]).

Today it remains of interest primarily to military applications where the zero sum nature is compatible. A recent work [Grotte] used the Colonel Blotto problem to "evaluate equal cost forces of alternative carrier designs in the presence role". During peace time, carriers "project" power in areas by their mere existence in areas. The study found such a situation could well be described in a Blotto format.

However the rest of this paper will deal with a modification of the original problem to explore decisions based upon anticipating enemy moves. The extension is the inclusion of one spy in each pass who reports the number of troops he believes the enemy is sending into the pass he is watching. This report is received prior to Blotto's

The BLOTTO Program

The BLOTTO program calculates the average score for a player using Bayesian decision analysis over 10,000 passes against a simulated player using random moves. While in the game theory solution of the traditional problem, individual passes are ignored and only the combination of groups are examined (i.e 2&1 not [2 1 0 0] or [1 2 0 0]). However BLOTTO is sensitive to permutations and so a fuller payoff matrix is required to handle all the possible cases. Instead of the normal 5x3 grid an expanded 35x20 is used (see figure 1).

BLOTTO runs the 10,000 passes for all combinations of the four spies varying from 0.0 to 1.0 with an interval of 0.1. While combinations rather than permutations are used to reduce the number of cases used, the moves available to BLOTTO's opponent are symmetrical in respect to the passes. There are 995 combinations required to generate all the possible values. Each round consists of six steps: selecting the opponent's move, distorting the spies's reports of those moves, creating a likelihood function based upon the reports, calculating the expected score for each of Blotto's moves, selecting Blotto's move with the highest expected score, and updating the statistics for the round.

Figure 1

The complete Blotto payoff function

	Blotto's Opponents' Moves																			
	3	2	2	2	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0
	0	1	0	0	2	1	1	0	0	0	3	2	2	1	1	1	0	0	0	0
	0	0	1	0	0	1	0	2	1	0	0	1	0	2	1	0	3	2	1	0
BLOT.	0	0	0	1	0	0	1	0	1	2	0	0	1	0	1	2	0	1	2	3
4000	4	2	2	2	1	0	0	1	0	1	0	-1	-1	-1	-2	-1	0	-1	-1	0
3100	1	3	3	3	0	1	1	2	1	2	-1	-2	-2	0	-1	0	1	0	0	1
3010	1	3	3	3	2	1	1	0	1	2	1	0	0	-2	-1	0	-1	-2	0	1
3001	1	3	3	3	2	1	1	2	1	0	1	0	0	0	-1	-2	1	0	-2	-1
2200	-2	2	0	0	2	3	3	2	1	2	-2	0	0	2	1	2	1	0	0	1
2110	-1	1	1	1	1	2	2	1	2	3	0	-1	-1	-1	0	1	0	-1	1	2
2101	-1	1	1	1	1	2	2	3	2	1	0	-1	-1	1	0	-1	2	1	-1	0
2020	-2	0	2	0	2	3	1	2	3	2	1	2	0	0	1	0	-2	0	2	1
2011	-1	1	1	1	3	2	2	1	2	1	2	1	1	-1	0	-1	0	-1	-1	0
2002	-2	0	0	2	2	1	3	2	3	2	1	0	2	0	1	0	1	2	0	-2
1300	-1	0	-2	-2	3	1	1	0	-1	0	1	3	3	2	1	2	1	0	0	1
1210	0	1	-1	-1	1	2	2	-1	0	1	-1	1	1	1	2	3	0	-1	1	2
1201	0	1	-1	-1	1	2	2	1	0	-1	-1	1	1	3	2	1	2	1	-1	0
1120	0	-1	1	-1	-1	2	0	1	2	1	0	1	-1	1	2	1	-1	1	3	2
1111	1	0	0	0	0	1	1	0	1	0	1	0	0	0	1	0	1	0	0	1
1102	0	-1	-1	1	-1	0	2	1	2	1	0	-1	1	1	2	1	2	3	1	-1
1030	-1	-2	0	-2	0	1	-1	3	1	0	1	2	0	3	1	0	1	3	2	1
1021	0	-1	1	-1	1	2	0	1	2	-1	2	3	1	1	2	-1	-1	1	1	0
1012	0	-1	-1	1	1	0	2	-1	2	1	2	1	3	-1	2	1	0	1	1	-1
1003	-1	-2	-2	0	0	-1	1	0	1	3	1	0	2	0	1	3	1	2	3	1
0400	0	1	-1	-1	2	0	0	-1	-2	-1	4	2	2	1	0	1	0	-1	-1	0
0310	1	2	0	0	3	1	1	-2	-1	0	1	3	3	0	1	2	-1	-2	0	1
0301	1	2	0	0	3	1	1	0	-1	-2	1	3	3	2	1	0	1	0	-2	-1
0220	1	2	2	0	0	3	1	0	1	0	-2	2	0	2	3	2	-2	0	2	1
0211	2	3	1	1	1	2	2	-1	0	-1	-1	1	1	1	2	1	0	-1	-1	0
0202	1	2	0	2	0	1	3	0	1	0	-2	0	2	2	3	2	1	2	0	-2
0130	1	0	2	0	-2	1	-1	3	1	0	-1	0	-2	3	1	0	1	3	2	1
0121	2	1	3	1	-1	2	0	1	2	-1	0	1	-1	1	2	-1	-1	1	1	0
0112	2	1	1	3	-1	0	2	-1	2	1	0	-1	1	-1	2	1	0	1	1	-1
0103	1	0	0	2	-2	-1	1	0	1	3	-1	-2	0	0	1	3	1	2	3	1
0040	0	-1	1	-1	-1	0	-2	2	0	-1	0	1	-1	2	0	-1	4	2	1	0
0031	1	0	2	0	0	1	-1	3	1	-2	1	2	0	3	1	-2	1	3	0	-1
0022	1	0	2	2	0	1	1	0	3	0	1	2	2	0	3	0	-2	2	2	-2
0013	1	0	0	2	0	-1	1	-2	1	3	1	0	2	-2	1	3	-1	0	3	1
0004	0	-1	-1	1	-1	-2	0	-1	0	2	0	-1	1	-1	0	2	0	1	2	4

To select the opponent's move, one permutation is chosen at random from a list of the twenty moves available to him. For each spy if a random number is higher than his rating, instead of reporting the correct number of units (0-3) entering the pass, he reports a randomly assigned one from the remaining.

The likelihood function for each move is the **a posteriori** probabilities from Bayes' Theorem using the combined spy reports as the conditional probabilities. In the theorem as expressed in equation 9, $P(Move_i | AMM)$ is the **a posteriori** probability that $Move_i$ was selected given that a move was made. $P(Move_i)$ is the probability of $Move_i$ being chosen given no additional information which in the Blotto problem is always 1/20.

$$P(Move_i \mid AMM) = \frac{P(Move_i)\ P(AMM \mid Move_i)}{\sum_{i=1}^{m} P(Move_i)\ P(AMM \mid Move_i)} \qquad (9)$$

The spies reports (a vector R[1..Number of forts]) and their associated truth rating (a vector T[1..Number of forts]) combined to form $P(AMM \mid Move_i)$ for each $move_i$ (a vector M_i[1..Number of forts]) using the following algorithm:

```
P(AMM | Move_i) =1
   for j:=1 to number of forts do
      if (M_i[j]=R[j]) then
         P(AMM | Move_i)=P(AMM |Move_i)*T[j]
      else
         P(AMM | Move_i)=P(AMM |Move_i)*(1-T[j]);
```

The likelihood functions are then used to estimate the outcome for each possible BLOTTO moves using equation 10.

$$\text{Score Blotto Move}_j = \sum_{i=1}^{m} P(\text{Opp. Move}_i \mid \text{AMM}) * \text{Payoff}[j,i] \quad (10)$$

BLOTTO then selects the move with highest expected score, cross references it with his opponent's actual move to produce the score for the round which then added to the total for that spy combination. In an earlier version of the program, the spies ratings were estimated by their success record which required updating at the end of each round. However because of the number of rounds involved, such approximations were not important.

Assesing Intelligence Sources

The chief difficulty in applying the Bayesian decision making process to most useful applications is the requirement to assess the sources of information both individually and collectively. The simple case analyzed had reduced the problem to its final state of a vector indicating the probabilities of the opponent's selected moves. However in most cases, determining the reliability of an information source is a difficult task. Historically this is a problem which has long disturbed decision makers. In the Second World War, the successor to Admiral Canaris as head of the Abwehr (German Civilian Intelligence), kept a list of agents with simple notations next to each like "reliable", "tested and reliable", "nothing special", "good reports", and "useful" as was recorded in the captured German archives (Farago [1971]). From these lists he could get a quick summary of their performance over the years. This qualitative notation if properly systematized could be incorporated using Zadeth's fuzzy logic.

A simple averaging of the accuracy of the information reliability is a straight forward solution which has the merit of being easy to implement. Such a method was originally implemented in BLOTTO where if the spy reports the information exactly correct, his score would be updated

by one. Thus his accuracy is his score divided by the number of reports he filed. However there are two possible requirements of such a simplification - the information must be of equal importance and the source's reliability is assumed to remain constant over time.

The former concern is only important if the data itself is heterogeneous. In the BLOTTO program each source reported only on his pass, however a source may have knowledge of multiple areas with unequal success rates (which is quite likely in most applications). For example the source might be able to report quite accurately on his own pass but much less so on neighboring passes because his line of sight is obscured. One solution is to maintain separate categories with corresponding rates of success for each of them.

In real applications, the reliability of the information from sources is often a function of time - not constant as in the BLOTTO program. Non-human sources may malfunction to produce incorrect information while human sources will vary in accuracy as a normal course. To produce time weighted statistics many equations could be used but equation 9 has been proven to be useful in predicting cpu (central processing unit) bursts (Peterson [1985]) based upon previous results which is a similar problem.

$$\Pi_{n+1} = \alpha\, r_n + (1-\alpha)\, \Pi_n \qquad (11)$$

In the equation, Π_n is the previous weighted average with r_n being the accuracy of the latest report and Π_{n+1} being the current weighted average. The constant α represents the weighting factor which varies from 0 to 1 but is usually set at 0.5 for predicting cpu bursts. The value of α would be set to reflect the amount of volatility in the system.

The underlying assumption for the preceding discussion was that the information could be checked as being true or false (although the above formula allows any number for r_n). However in many cases such a binary judgment is misleading. Consider in the Colonel Blotto case if an informant usually errs in estimating the size of the enemy's units going to a particular pass by a margin of 1, this provides more than someone who is wrong within a range of 1.5 but it would not be reflected in the equations. A more sophisticated approach would also consider the standard deviations of the sources (time weighted).

Furthermore particular patterns might be inherent in a information source's reports. For example a source might overestimate the actions of an opponent on one report and on the next he might compensate by underestimating. Or in a more complex case, he might be more likely to report some type of actions more carefully than others. To filter through what could quickly become a tangled mess, perhaps the best solution would be an expert system tailored to the

problem environment.

Disadvantages to Intention Based Schemes

One of the beautiful aspects of game theory is that its actual choice of a move is unpredictable. While the opponent of someone using game theory may be fully cognizant of how his adversary is selecting his mixed strategy, he can not use that knowledge to improve his score beyond the value of the game. Unfortunately the same does not hold for decision making processes based upon intentions.

In the world of international affairs, along with intelligence gathering agencies have evolved counter-intelligence agencies and in the last fifty years disinformation (or "active measures") departments. These departments seek to send misleading or completely false information to their opponents. Perhaps the most acclaimed was the British XX ("double cross") group run by Sir John Masterman during World War II (Read [1985]) Their technique was to "turn" captured enemy agents and have them send carefully prepared doctored or false messages. Great efforts were made to maintain the credibility of the turned agents by including some true and useful information. The first and greatest XX agent, Arthur George Owens was held in such esteem by the Germans that he received the Iron Cross for his actions (Farago [1971]).

But such a world of smoke and mirrors is not a typical problem where the stakes are not played at such a high

stake. To return to the problem of an OEM versus IBM, it is not likely such elaborate deceptions would utilized. However in a contest between more equal competitors, if both sides were basing their decisions upon their estimates of their opponents intentions, a circular logic evolves (in which game theory would be more appropriate).

Another real danger in using Bayesian decision analysis is its deterministic nature. If an opponent realizes how his adversary is selecting his moves, a moderate amount of dinformation could be applied and he can then maximize his gains as he knows how his opponent will react to a particular stimulus. To guard against such actions, a mixed strategy similar to game theory could be implemented. For example, given that Bayesian analysis reduces the payoff matrix to a probability vector R_{Nx1} then instead of selecting the move with the maximum gain (or minimum loss). a probability vector $P_{Nx1}(10)$ could be used as the base for randomizing.

$$P_i = \frac{A_i}{\sum_{i=1}^{N} A_i} \qquad (12)$$

The Results

As mentioned earlier, the game theory solution to the Colonel Blotto problem is the vector [0.2, 0.8, 0, 0, 0] which guarantees at least the value of the game of 0.6. which is against an opponent using his optimum strategy. In the modified Blotto problem as examined in the present simulation the opponent picks randomly from the move permutations whose equivalent in the normal game would be the mixed strategy [0.2, 0.6, 0.2]. However the value of a game played with such a strategy against Blotto using his optimal mixed strategy is also 0.6.

The full results sorted by average score of the BLOTTO program are included in the appendix in tabular format. However in figure 2,3 and 4 an extract from eleven spy combinations are displayed. Each group consists of three spies with identical ratings and a fourth which varies from 0 to 1 (i.e. [0 0 0 0], [0 0 0 0.1], ...) to show the effect of slightly better information upon the average score.

As would be expected the lowest score for each group is around 0.4 where the fourth spy's reports are random. If the spy can be relied upon to be consistently wrong it provides information about which move is NOT likely to have been selected. This is particularly apparent in figure 2 where a similar pattern emerges in cases with low spy

ratings.

In the medium probability groups of figure 3 a far more unusual pattern occurs at the point where the fourth spy's reports become on average random. For the 0.4, 0.5, and 0.7 groups, the value peaks higher than either of the neighboring points while in the 0.6 case the value is a lower value as seen in figure 2 (but more dramatic). The cause of this abnormality can be trace to the finite number of moves to both sides and thus a discontinuous payoff matrix.

In the fourth figure, a flattening of the line occurs as the influence of one spy is not very significant as the group's level is in the upper regions. It is especially clear in the 1.0 group (perfect knowledge) in which the input of one other member is irrelevant and so the line is completely flat.

The highest BLOTTO score was naturally the one with perfect knowledge which sets the ceiling of a perfect game with the opponent mix of [0.2 0.6 0.2] at 3.2. The lowest BLOTTO program score was 0.808 for spies with the ratings of 0.3, 0.3, 0.3, and 0.4 which is still greater than the game theory score of 0.6. However game theory will never give a score lower than 0 on any round while BLOTTO is not risk adverse and will sometimes get a score as low as -2 (which is an important fact for one round competitions). In fact in the case of [0.3 0.6 0.6 0.6] the score -2 was the result

in 14.8% of the rounds. The volitilty of the BLOTTO program is responsible for the much greater gains than game theory.

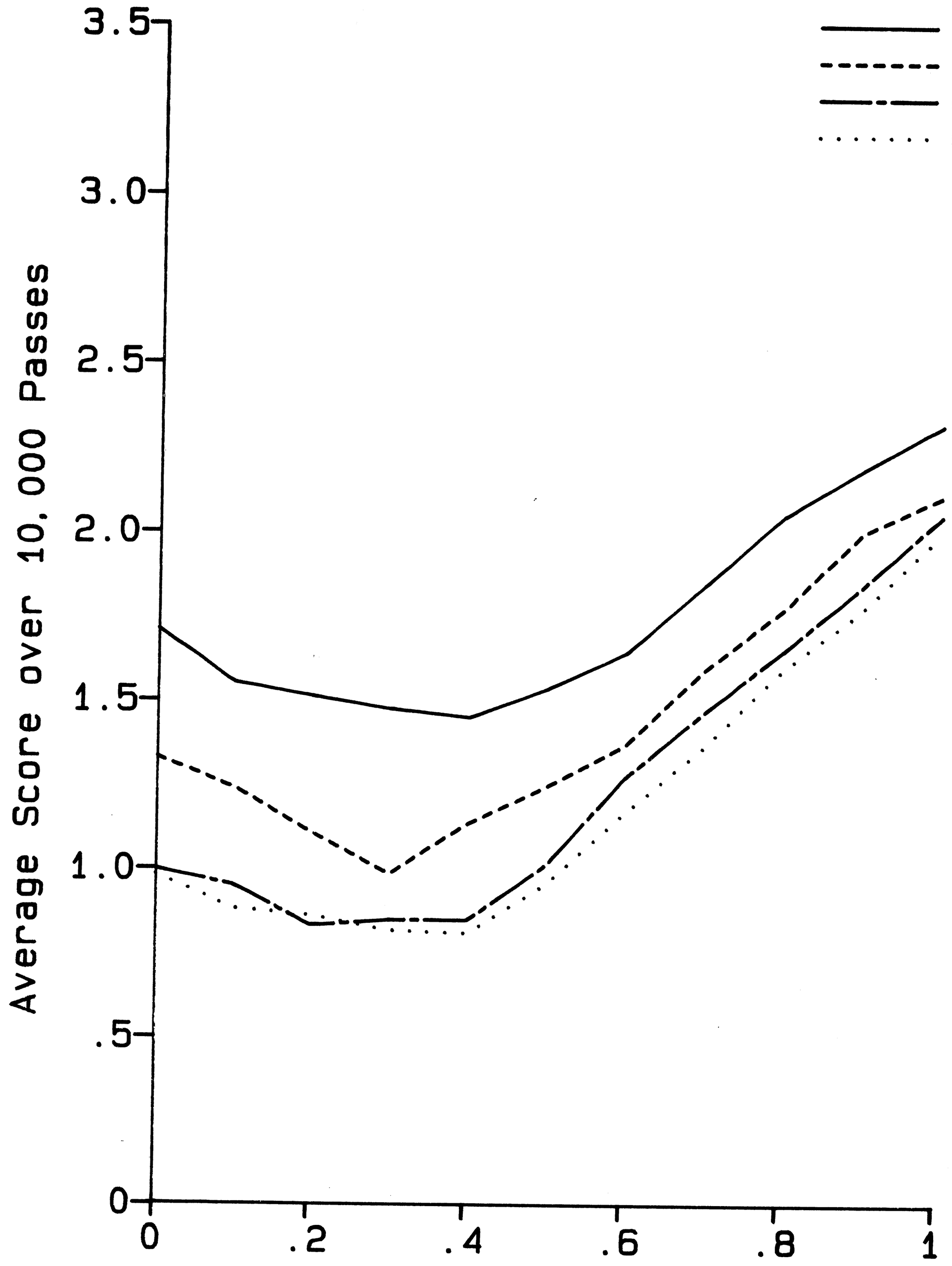
0.0's
0.1's
0.2's
0.3's
Average Score over 10,000 Passes
3.5
3.0
2.5
2.0
1.5
1.0
.5
0
0
.2
.4
.6
.8
1
Fourth Spy's Rating

Figure 2

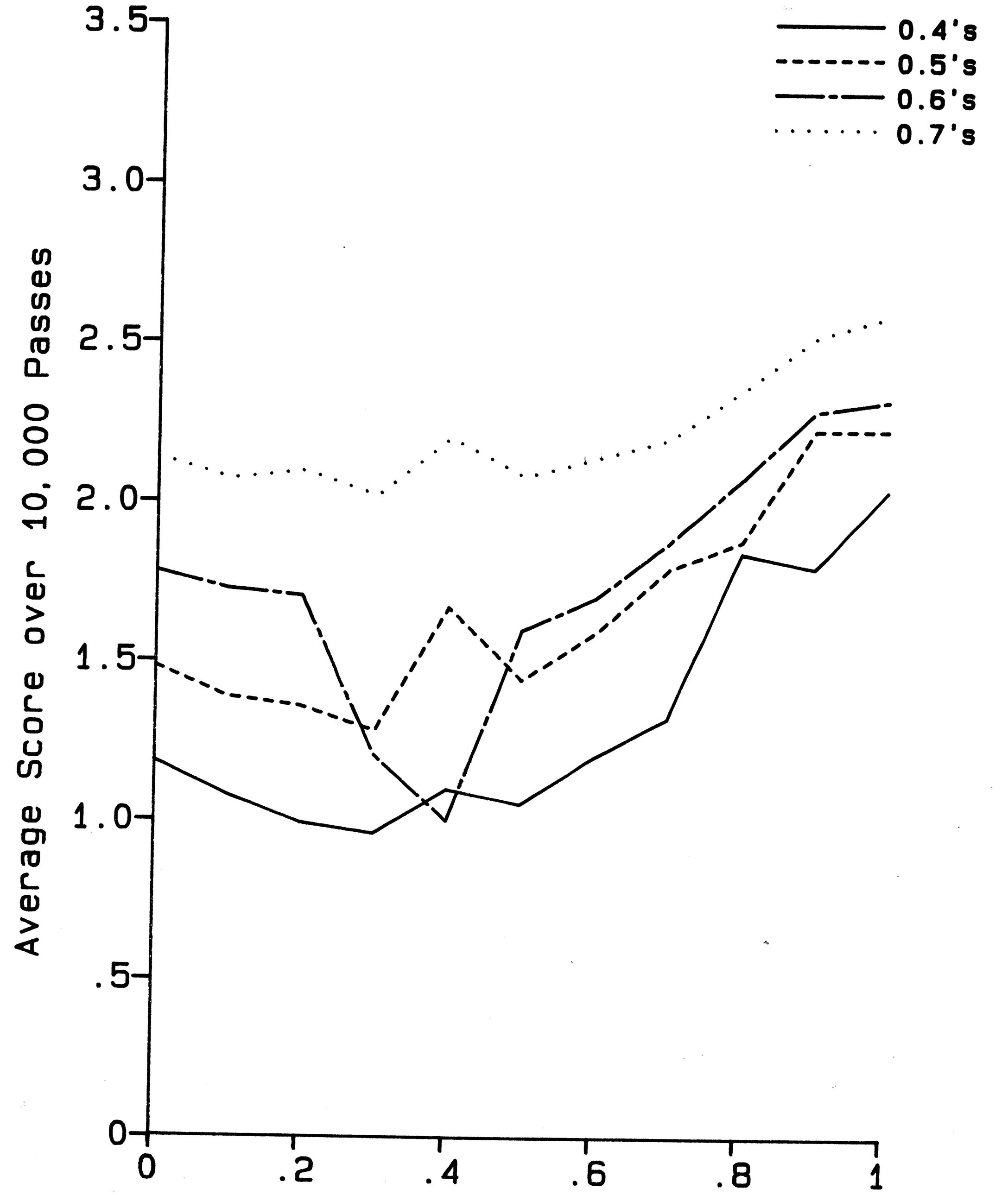
0.4's
0.5's
0.6's
0.7's
Average Score over 10,000 Passes
3.5
3.0
2.5
2.0
1.5
1.0
.5
0
0
.2
.4
.6
.8
1
Fourth Spy's Rating

Figure 3

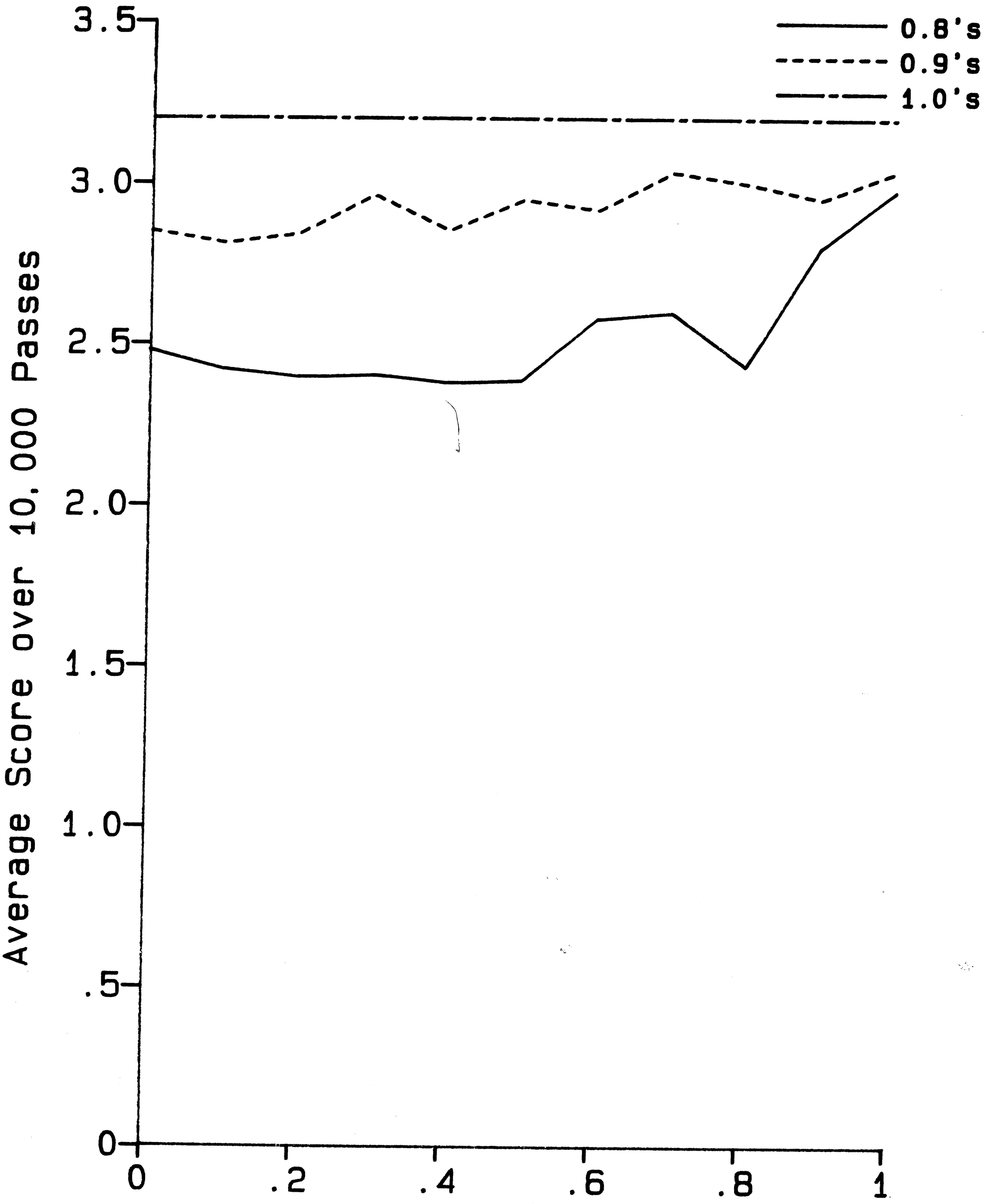
0.8's
0.9's
1.0's
Passes
Average Score over 10,000 P
3.5
3.0
2.5
2.0
1.5
1.0
.5
0
0
.2
.4
.6
.8
1
Fourth Spy's Rating

Figure 4

Conclusion

Game theory provides a useful tool in evaluating situations strictly in terms of enemy capabilities. However it is not adequate to accurately model many applications. Enemy intention schemes such as Bayesian decision theory provide much better results but with much higher risks and the potential for disaster. In the Colonel Blotto problem, a game theoretic approach yielded significantly lower results than the Bayesian BLOTTO program. However the usefulness of slightly more accurate information is not always beneficial and due to some problem dependent formulations may actually cause a significantly lower score.

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Appendix

Spy Ratings	Average Score	Percentage of Outcome					
		-2	-1	0	1	2	3	4
0.3 0.3 0.3 0.4	0.8081	8.9	3.3	31.0	22.3	24.4	9.9	0.3
0.3 0.3 0.3 0.3	0.8166	8.5	2.4	31.8	23.9	22.7	10.6	0.0
0.2 0.2 0.2 0.2	0.8312	9.9	5.5	25.0	25.3	19.8	14.5	0.0
0.2 0.2 0.3 0.4	0.8423	8.8	5.2	26.7	24.0	23.4	11.3	0.6
0.2 0.3 0.3 0.4	0.8459	9.6	4.5	27.8	21.2	24.4	12.0	0.5
0.2 0.2 0.2 0.4	0.8476	8.9	7.8	23.4	23.0	23.6	12.7	0.6
0.2 0.2 0.2 0.3	0.8493	9.0	5.7	26.5	23.0	22.4	12.7	0.7
0.2 0.3 0.3 0.3	0.8600	8.9	3.0	27.5	25.2	24.9	10.6	0.0
0.2 0.2 0.3 0.3	0.8771	8.8	4.5	27.4	22.4	24.0	12.5	0.5
0.1 0.3 0.3 0.3	0.8806	7.7	4.1	29.4	22.5	24.2	12.1	0.1
0.1 0.2 0.2 0.3	0.8872	8.3	5.6	25.5	24.2	22.7	13.6	0.1
0.1 0.2 0.3 0.3	0.9044	7.9	4.7	26.5	25.1	22.1	13.5	0.3
0.1 0.2 0.3 0.4	0.9058	8.5	5.6	24.5	24.2	23.3	13.1	0.8
0.3 0.3 0.4 0.4	0.9075	7.0	3.3	29.3	23.8	25.5	11.0	0.0
0.1 0.3 0.3 0.4	0.9150	8.1	5.1	26.8	22.2	23.8	13.1	0.9
0.1 0.2 0.2 0.2	0.9516	8.5	4.4	23.7	25.7	22.0	15.6	0.0
0.2 0.2 0.4 0.4	0.9548	7.4	4.2	25.8	24.5	24.7	13.2	0.2
0.3 0.3 0.3 0.5	0.9571	7.1	5.0	26.2	23.9	23.0	13.8	0.9
0.3 0.4 0.4 0.4	0.9588	7.1	3.3	28.1	23.4	24.7	13.5	0.0
0.1 0.2 0.4 0.4	0.9597	5.3	5.7	26.6	26.3	22.5	13.5	0.1
0.2 0.2 0.3 0.5	0.9670	8.3	4.8	23.9	24.0	23.5	14.6	0.9
0.1 0.1 0.3 0.4	0.9715	7.3	6.6	22.9	24.2	23.5	14.6	0.8
0.1 0.2 0.2 0.4	0.9722	7.0	7.3	23.7	23.1	22.7	14.9	1.3
0.0 0.3 0.3 0.3	0.9809	6.6	5.0	25.4	25.4	22.3	15.1	0.2
0.2 0.3 0.3 0.5	0.9842	7.3	5.8	23.4	24.3	24.2	14.1	1.0
0.1 0.1 0.1 0.3	0.9850	6.0	7.5	23.0	26.5	20.8	14.9	1.2
0.0 0.3 0.3 0.4	0.9866	5.8	6.8	24.5	25.1	21.9	15.4	0.5
0.1 0.1 0.2 0.3	0.9868	5.9	7.5	23.6	24.6	22.4	14.9	1.0
0.2 0.4 0.4 0.4	0.9920	7.2	2.9	25.8	24.5	26.8	12.8	0.0
0.1 0.1 0.3 0.3	0.9939	6.4	7.2	21.4	25.8	24.5	14.2	0.5
0.0 0.2 0.2 0.2	0.9981	7.1	4.7	22.3	27.8	23.5	14.5	0.1
0.0 0.2 0.3 0.3	0.9996	6.3	5.7	25.1	24.1	22.6	15.8	0.4
0.3 0.3 0.4 0.5	1.0022	7.1	4.0	25.4	24.2	24.8	13.9	0.8
0.1 0.3 0.4 0.4	1.0033	7.8	2.9	25.9	24.0	23.3	15.8	0.2
0.2 0.3 0.4 0.4	1.0097	8.0	3.3	24.4	22.1	28.6	12.9	0.5
0.2 0.2 0.2 0.5	1.0131	8.2	5.5	21.6	23.8	24.3	15.2	1.2
0.2 0.3 0.4 0.5	1.0373	6.6	4.7	25.6	22.9	23.4	15.9	1.0
0.0 0.2 0.2 0.3	1.0406	5.2	6.5	23.1	26.7	22.1	15.9	0.6
0.0 0.2 0.3 0.4	1.0501	5.7	6.2	22.2	26.2	24.0	14.5	1.2
0.4 0.4 0.4 0.5	1.0525	10.0	4.9	20.1	20.1	25.1	19.9	0.0
0.1 0.1 0.2 0.2	1.0529	6.9	3.7	23.5	25.9	23.5	16.5	0.1
0.1 0.3 0.3 0.5	1.0615	6.9	4.6	23.3	24.5	23.0	16.3	1.3
0.3 0.4 0.4 0.5	1.0615	7.0	3.4	25.4	22.4	24.6	17.1	0.2
0.1 0.2 0.3 0.5	1.0791	6.3	6.2	23.9	21.7	22.6	17.4	1.9
0.1 0.4 0.4 0.4	1.0794	6.3	2.7	24.6	24.9	25.7	15.6	0.0
0.0 0.1 0.2 0.3	1.0924	4.7	6.3	22.9	25.9	22.2	17.5	0.5
0.4 0.4 0.4 0.4	1.0985	10.0	0.0	30.0	10.1	30.0	19.9	0.0

Spy Ratings	Average Score	Percentage of Outcome						
		-2	-1	0	1	2	3	4
0.2 0.2 0.4 0.5	1.0997	6.3	5.6	22.3	22.6	25.4	16.5	1.3
0.1 0.1 0.1 0.2	1.1074	7.2	3.7	21.3	23.5	27.9	16.2	0.2
0.1 0.2 0.4 0.5	1.1218	6.5	6.6	21.3	20.7	26.5	16.1	2.4
0.1 0.3 0.4 0.5	1.1228	5.4	5.9	22.5	22.9	25.4	16.8	1.2
0.0 0.3 0.4 0.4	1.1259	5.1	3.9	23.1	25.5	26.5	15.3	0.6
0.0 0.2 0.2 0.4	1.1298	5.0	5.9	23.6	23.5	22.2	17.9	1.9
0.0 0.2 0.4 0.4	1.1306	4.8	5.2	21.9	26.2	24.7	16.6	0.6
0.1 0.1 0.2 0.4	1.1314	6.2	6.3	18.9	26.1	23.0	18.4	1.2
0.2 0.4 0.4 0.5	1.1329	6.3	3.3	23.1	23.7	25.9	16.8	0.9
0.1 0.1 0.1 0.4	1.1360	6.2	5.8	20.2	24.1	24.9	17.0	1.7
0.0 0.1 0.2 0.2	1.1374	4.0	4.7	21.8	28.8	24.6	16.2	0.0
0.0 0.1 0.3 0.3	1.1417	7.5	5.0	17.5	25.0	25.8	19.2	0.0
0.1 0.2 0.2 0.5	1.1432	5.9	5.7	20.4	23.8	25.6	17.2	1.4
0.0 0.2 0.2 0.5	1.1442	5.8	6.2	20.2	25.4	22.3	18.7	1.5
0.1 0.1 0.4 0.4	1.1451	6.1	6.0	19.2	25.1	24.1	18.4	1.1
0.3 0.3 0.5 0.5	1.1489	6.7	3.0	22.6	23.2	26.6	17.1	0.9
0.0 0.3 0.3 0.5	1.1496	5.4	5.1	21.4	25.1	24.9	16.8	1.4
0.2 0.3 0.3 0.6	1.1650	5.8	4.9	20.7	25.0	23.8	19.1	0.8
0.3 0.3 0.3 0.6	1.1702	6.2	4.4	21.4	24.9	21.8	20.0	1.3
0.3 0.3 0.4 0.6	1.1723	6.5	5.0	21.1	22.5	23.9	19.7	1.5
0.3 0.4 0.5 0.5	1.1812	6.4	2.4	22.4	23.7	26.1	18.5	0.5
0.1 0.4 0.4 0.5	1.1833	6.2	4.2	20.8	23.6	25.6	18.5	1.1
0.0 0.0 0.3 0.3	1.1844	2.3	6.8	21.7	27.2	24.2	16.9	0.9
0.0 0.4 0.4 0.4	1.1854	6.0	2.5	21.9	26.3	23.4	19.7	0.3
0.2 0.3 0.5 0.5	1.1877	6.2	3.1	22.3	22.3	27.1	18.3	0.7
0.4 0.4 0.4 0.6	1.2020	10.0	0.0	20.0	20.0	29.9	20.1	0.0
0.2 0.2 0.5 0.5	1.2034	6.2	4.6	19.9	22.3	28.1	16.8	2.1
0.3 0.6 0.6 0.6	1.2040	14.8	0.0	15.1	15.2	30.0	24.9	0.0
0.2 0.2 0.3 0.6	1.2122	5.7	6.0	18.9	24.3	22.4	21.0	1.7
0.1 0.1 0.4 0.5	1.2156	5.4	7.1	18.8	21.3	26.5	18.5	2.4
0.0 0.0 0.2 0.3	1.2158	2.6	5.9	21.1	27.7	24.4	17.4	1.0
0.1 0.1 0.3 0.5	1.2224	5.2	5.9	18.4	24.4	25.9	18.7	1.5
0.0 0.1 0.4 0.4	1.2227	5.2	5.6	17.9	25.5	25.3	19.4	1.0
0.0 0.1 0.2 0.4	1.2239	4.0	7.5	18.4	24.2	25.4	18.9	1.5
0.0 0.2 0.3 0.5	1.2240	4.3	5.9	18.6	25.0	27.8	16.8	1.5
0.0 0.3 0.4 0.5	1.2329	3.9	6.2	20.3	23.9	25.2	19.3	1.3
0.2 0.4 0.4 0.6	1.2395	5.5	4.6	21.9	21.0	24.1	21.5	1.5
0.1 0.1 0.1 0.1	1.2403	6.1	3.6	16.7	24.6	31.7	17.3	0.0
0.0 0.4 0.4 0.5	1.2408	5.8	4.7	18.3	23.8	26.3	20.4	0.7
0.1 0.1 0.2 0.5	1.2412	4.5	6.5	18.2	24.9	25.4	18.1	2.4
0.2 0.4 0.5 0.5	1.2430	6.5	3.0	19.5	22.9	27.6	20.0	0.5
0.0 0.2 0.4 0.5	1.2464	4.5	6.6	19.4	22.7	25.2	19.4	2.2
0.1 0.1 0.1 0.5	1.2476	6.1	5.3	17.4	23.5	26.6	18.8	2.3
0.4 0.4 0.5 0.5	1.2510	5.0	5.0	24.9	15.0	25.1	25.0	0.0
0.0 0.3 0.5 0.5	1.2571	4.9	4.6	21.3	21.7	25.7	19.9	1.8
0.0 0.0 0.3 0.4	1.2641	2.9	6.3	18.6	26.7	25.9	18.4	1.1
0.2 0.3 0.4 0.6	1.2726	5.0	5.1	20.2	22.0	25.0	20.4	2.3

Spy Ratings	Average Score	Percentage of Outcome						
		-2	-1	0	1	2	3	4
0.2 0.2 0.2 0.6	1.2746	5.2	5.1	18.4	25.0	22.8	21.9	1.7
0.1 0.3 0.4 0.6	1.2761	5.7	6.3	18.1	20.1	26.0	21.7	2.1
0.1 0.4 0.4 0.6	1.2789	5.3	5.9	17.4	21.7	27.5	20.9	1.3
0.1 0.2 0.5 0.5	1.2796	5.0	6.4	17.6	21.9	26.9	20.2	2.0
0.0 0.1 0.1 0.3	1.2817	2.7	6.0	20.4	25.1	24.3	19.6	1.8
0.3 0.5 0.5 0.5	1.2824	4.8	2.5	19.7	25.1	28.1	19.7	0.0
0.1 0.3 0.3 0.6	1.2826	5.4	5.0	18.6	23.8	22.9	22.7	1.6
0.3 0.3 0.5 0.6	1.2859	5.7	4.2	19.2	22.0	25.9	21.8	1.2
0.3 0.4 0.4 0.6	1.2876	4.0	4.1	20.8	24.0	25.8	19.9	1.4
0.1 0.3 0.5 0.5	1.2975	5.6	4.7	16.6	24.2	27.1	20.0	1.8
0.1 0.1 0.5 0.5	1.3021	3.8	7.5	18.4	22.8	23.0	21.2	3.3
0.0 0.1 0.1 0.4	1.3030	3.2	6.3	18.8	25.0	23.9	21.0	1.8
0.0 0.0 0.1 0.3	1.3044	1.9	6.7	18.3	27.3	25.5	18.8	1.5
0.0 0.0 0.2 0.4	1.3067	3.2	5.6	18.3	25.8	26.1	19.1	1.8
0.1 0.2 0.3 0.6	1.3096	4.8	5.2	17.5	24.1	25.1	21.5	1.8
0.2 0.2 0.4 0.6	1.3099	4.6	5.7	18.6	23.4	24.1	19.9	3.7
0.0 0.0 0.4 0.4	1.3116	3.6	5.3	18.1	25.0	26.6	20.3	1.1
0.1 0.2 0.2 0.6	1.3151	5.1	4.4	17.5	24.3	26.1	20.9	1.7
0.0 0.0 0.2 0.2	1.3200	2.5	3.1	21.4	26.7	26.4	19.0	0.9
0.1 0.4 0.5 0.5	1.3238	6.2	2.5	17.5	23.2	28.7	21.4	0.6
0.4 0.4 0.4 0.7	1.3250	3.6	2.8	22.3	26.2	20.0	24.2	1.0
0.0 0.1 0.1 0.2	1.3256	2.5	4.8	18.6	27.3	25.7	20.3	0.7
0.3 0.4 0.5 0.6	1.3278	5.6	3.7	17.9	22.9	26.1	22.9	1.0
0.0 0.1 0.5 0.5	1.3279	4.6	7.3	15.3	24.0	23.8	22.1	2.9
0.0 0.1 0.1 0.1	1.3308	3.9	3.9	15.8	27.9	29.0	19.5	0.0
0.1 0.1 0.3 0.6	1.3336	4.1	6.1	19.1	21.5	23.6	23.4	2.2
0.1 0.2 0.4 0.6	1.3336	5.3	5.0	17.5	21.9	26.7	20.6	3.0
0.0 0.3 0.3 0.6	1.3375	4.9	4.7	18.9	21.9	25.2	22.1	2.4
0.0 0.1 0.1 0.5	1.3448	3.6	5.8	17.8	24.5	23.8	22.7	1.8
0.0 0.0 0.3 0.5	1.3455	3.5	6.0	16.8	24.9	25.8	20.8	2.2
0.2 0.3 0.5 0.6	1.3497	4.6	4.2	18.7	23.0	25.8	21.3	2.5
0.2 0.2 0.5 0.6	1.3502	5.0	5.8	16.9	21.4	26.1	22.0	2.8
0.0 0.1 0.4 0.5	1.3562	4.1	5.9	16.7	24.0	25.5	20.8	3.0
0.0 0.0 0.2 0.5	1.3571	2.6	5.3	18.4	25.5	26.0	20.2	2.1
0.2 0.5 0.5 0.5	1.3573	5.6	3.0	16.4	24.0	27.1	23.6	0.2
0.0 0.0 0.1 0.4	1.3621	2.0	6.0	17.4	26.9	25.5	20.5	1.7
0.2 0.3 0.3 0.7	1.3630	3.9	3.9	18.1	26.2	24.0	22.1	1.9
0.3 0.3 0.3 0.7	1.3658	3.5	4.0	19.1	25.4	23.7	22.1	2.1
0.2 0.4 0.5 0.6	1.3664	5.5	4.1	17.5	21.4	25.8	24.3	1.5
0.0 0.0 0.1 0.2	1.3666	2.3	3.0	16.8	30.6	28.9	17.9	0.5
0.0 0.4 0.5 0.5	1.3687	4.7	4.8	14.1	25.7	27.0	23.1	0.5
0.0 0.2 0.5 0.5	1.3709	4.1	5.1	17.2	24.0	25.9	20.4	3.4
0.1 0.1 0.1 0.6	1.3712	6.3	4.3	15.1	22.2	26.8	23.1	2.2
0.3 0.4 0.4 0.7	1.3743	4.8	3.7	17.6	25.0	23.0	24.1	1.9
0.0 0.4 0.4 0.6	1.3744	5.3	5.0	15.2	22.9	26.3	23.3	2.0
0.1 0.3 0.5 0.6	1.3760	6.1	4.4	16.0	21.1	26.5	23.4	2.5
0.0 0.1 0.3 0.4	1.3826	4.2	3.3	14.1	29.1	26.7	22.5	0.0

Spy Ratings	Average Score	Percentage of Outcome						
		-2	-1	0	1	2	3	4
0.1 0.5 0.5 0.5	1.3858	4.5	3.9	16.1	24.2	26.9	23.8	0.5
0.0 0.2 0.4 0.6	1.3906	3.5	6.7	15.8	22.8	27.4	20.0	3.8
0.0 0.3 0.4 0.6	1.3918	4.0	5.4	17.7	22.4	23.8	24.1	2.6
0.0 0.1 0.3 0.6	1.4001	15.0	5.0	15.0	5.1	20.0	30.0	10.0
0.1 0.1 0.5 0.6	1.4050	5.2	6.6	14.2	21.3	25.7	23.0	4.0
0.3 0.3 0.4 0.7	1.4052	2.8	4.4	19.3	25.3	22.1	23.4	2.7
0.0 0.1 0.2 0.5	1.4097	3.3	4.2	20.0	20.8	27.5	20.9	3.3
0.0 0.2 0.2 0.6	1.4124	4.9	4.3	16.2	22.5	25.7	24.2	2.2
0.0 0.1 0.3 0.5	1.4250	4.2	6.7	15.0	22.5	23.3	25.0	3.3
0.3 0.5 0.5 0.6	1.4316	5.2	3.3	15.3	22.6	27.8	24.4	1.4
0.4 0.4 0.6 0.6	1.4335	4.2	3.8	15.0	26.6	23.5	26.2	0.8
0.0 0.0 0.1 0.5	1.4344	2.5	4.9	15.3	26.9	27.0	21.3	2.2
0.2 0.3 0.4 0.7	1.4362	3.7	4.1	16.6	25.1	24.4	22.9	3.1
0.0 0.2 0.3 0.6	1.4383	4.3	4.7	15.5	23.0	25.8	24.4	2.3
0.5 0.5 0.5 0.5	1.4405	4.1	2.7	16.0	23.6	29.5	24.1	0.0
0.0 0.0 0.0 0.4	1.4484	1.0	4.2	17.4	27.2	28.3	20.4	1.6
0.0 0.0 0.4 0.5	1.4558	2.6	5.7	17.4	22.6	25.0	22.6	4.0
0.0 0.1 0.2 0.6	1.4559	3.1	3.1	16.9	25.6	26.9	21.9	2.5
0.1 0.1 0.4 0.6	1.4580	4.2	5.9	15.8	20.9	25.4	23.5	4.5
0.0 0.3 0.5 0.6	1.4624	4.3	4.9	15.0	21.5	27.5	23.8	2.9
0.3 0.3 0.5 0.7	1.4629	4.1	4.0	17.6	21.4	24.5	25.8	2.7
0.1 0.1 0.2 0.6	1.4639	3.6	3.8	14.7	26.9	25.0	23.3	2.6
0.2 0.2 0.2 0.7	1.4668	4.0	3.5	16.0	23.3	27.1	23.9	2.2
0.3 0.4 0.6 0.6	1.4675	4.5	4.3	15.1	21.7	27.0	25.7	1.8
0.2 0.4 0.6 0.6	1.4678	4.9	3.8	15.9	20.8	26.7	25.3	2.5
0.2 0.2 0.4 0.7	1.4717	2.3	4.8	17.8	23.2	25.6	22.9	3.4
0.1 0.2 0.5 0.6	1.4725	3.3	5.0	14.4	24.1	27.7	22.4	3.0
0.0 0.0 0.0 0.3	1.4731	0.7	4.3	16.8	28.1	27.3	21.0	1.9
0.2 0.2 0.3 0.7	1.4752	3.7	4.9	15.3	23.5	24.1	26.0	2.5
0.2 0.3 0.6 0.6	1.4753	4.9	3.6	14.5	22.2	28.0	24.6	2.2
0.0 0.0 0.1 0.1	1.4779	2.5	3.2	13.7	27.9	30.5	21.6	0.5
0.1 0.4 0.5 0.6	1.4798	4.2	3.7	15.2	21.9	28.2	25.1	1.6
0.3 0.3 0.6 0.6	1.4813	4.4	3.1	15.8	22.8	26.7	25.2	2.0
0.0 0.5 0.5 0.5	1.4815	3.6	3.7	15.0	23.3	28.5	24.9	1.0
0.0 0.4 0.5 0.6	1.4827	3.9	4.9	14.8	21.4	27.3	26.2	1.6
0.2 0.4 0.4 0.7	1.4851	2.8	3.6	17.1	25.6	22.8	25.6	2.4
0.1 0.3 0.3 0.7	1.4852	3.7	4.6	14.3	23.9	26.0	25.0	2.4
0.1 0.3 0.4 0.7	1.4865	3.7	5.0	15.0	23.6	24.0	25.7	3.0
0.0 0.1 0.4 0.6	1.4968	3.0	6.2	14.0	23.4	24.7	25.0	3.5
0.1 0.2 0.3 0.7	1.4975	3.5	4.1	14.4	25.4	25.0	25.1	2.5
0.0 0.0 0.5 0.5	1.4989	3.0	5.5	13.7	25.1	25.1	24.7	2.9
0.0 0.3 0.4 0.7	1.5002	3.9	5.7	15.4	21.2	22.4	28.6	2.9
0.2 0.5 0.5 0.6	1.5061	4.4	3.6	15.3	19.7	30.1	24.1	2.7
0.0 0.0 0.0 0.2	1.5104	2.1	2.0	14.5	28.2	32.0	20.5	0.9
0.3 0.6 0.6 0.7	1.5110	0.0	4.9	19.6	24.9	20.4	30.0	0.0
0.1 0.2 0.2 0.7	1.5124	4.5	3.8	13.5	22.9	27.0	26.3	2.1
0.0 0.2 0.5 0.6	1.5128	2.8	5.1	15.6	21.8	27.3	23.8	3.6

Spy Ratings	Average Score	Percentage of Outcome						
		-2	-1	0	1	2	3	4
0.4 0.4 0.5 0.7	1.5150	6.0	3.5	14.0	21.0	21.0	34.0	0.5
0.1 0.4 0.4 0.7	1.5209	3.4	4.7	13.3	25.2	24.8	25.7	2.9
0.0 0.0 0.3 0.6	1.5234	2.6	5.9	13.9	22.8	27.1	24.4	3.3
0.1 0.2 0.6 0.6	1.5242	4.0	5.4	14.3	20.0	26.5	26.2	3.6
0.4 0.4 0.6 0.7	1.5255	3.0	2.5	15.2	27.1	23.7	28.1	0.6
0.2 0.3 0.5 0.7	1.5263	2.7	4.2	15.5	24.9	24.0	25.1	3.5
0.4 0.5 0.6 0.6	1.5295	3.3	5.1	13.4	21.1	28.8	27.2	1.1
0.3 0.5 0.5 0.7	1.5327	3.5	3.3	14.4	24.6	25.7	26.8	1.8
0.2 0.4 0.5 0.7	1.5345	2.8	4.7	15.2	23.5	23.9	26.6	3.2
0.0 0.1 0.1 0.6	1.5349	3.6	4.2	14.3	23.1	25.6	26.0	3.2
0.0 0.0 0.0 0.5	1.5358	2.0	5.1	14.0	25.1	27.1	24.1	2.8
0.4 0.6 0.6 0.6	1.5370	5.1	3.7	13.3	19.4	30.3	25.8	2.5
0.1 0.1 0.3 0.7	1.5396	3.6	3.6	13.3	25.8	25.1	25.7	2.9
0.4 0.5 0.5 0.6	1.5410	3.5	3.5	12.4	24.0	30.0	25.5	1.0
0.0 0.0 0.2 0.6	1.5418	3.3	3.8	14.1	24.1	26.4	25.6	2.7
0.1 0.1 0.6 0.6	1.5434	4.6	5.2	13.6	21.0	22.9	28.6	4.0
0.3 0.4 0.5 0.7	1.5459	3.5	3.5	14.7	23.1	26.3	26.4	2.6
0.2 0.5 0.6 0.6	1.5475	4.3	2.9	15.7	19.8	29.0	25.1	3.3
0.1 0.5 0.5 0.6	1.5482	3.8	4.9	13.9	19.9	28.0	26.3	3.1
0.1 0.2 0.5 0.7	1.5484	3.4	4.4	14.3	23.2	24.6	26.3	3.7
0.0 0.0 0.0 0.1	1.5498	1.9	2.1	12.4	30.2	30.9	21.1	1.4
0.0 0.2 0.3 0.7	1.5505	3.1	5.4	13.4	22.0	26.1	27.1	2.8
0.4 0.4 0.5 0.6	1.5510	0.0	0.0	24.9	25.0	20.1	30.0	0.0
0.3 0.5 0.6 0.6	1.5550	4.1	2.9	14.0	22.6	27.5	26.9	2.1
0.0 0.1 0.5 0.6	1.5551	2.6	5.5	14.7	21.9	25.6	25.6	4.1
0.2 0.2 0.6 0.6	1.5579	3.9	4.1	13.1	22.3	26.9	27.1	2.6
0.0 0.0 0.4 0.6	1.5581	1.9	6.6	14.6	21.5	26.3	24.5	4.7
0.0 0.2 0.4 0.7	1.5585	3.4	5.4	14.5	21.2	23.4	28.4	3.7
0.0 0.2 0.2 0.7	1.5629	4.1	3.9	13.8	21.5	25.5	28.9	2.2
0.0 0.4 0.4 0.7	1.5701	3.0	4.1	15.0	22.3	25.3	26.8	3.4
0.0 0.5 0.5 0.6	1.5714	3.5	5.5	13.8	20.2	25.4	27.8	3.8
0.2 0.3 0.6 0.7	1.5719	4.5	3.9	12.9	22.2	24.6	28.3	3.4
0.1 0.4 0.6 0.6	1.5755	4.4	4.2	13.9	19.1	27.8	26.5	4.1
0.1 0.3 0.5 0.7	1.5767	3.5	4.8	13.7	22.2	23.8	28.0	3.9
0.1 0.1 0.2 0.7	1.5799	3.4	4.7	12.7	22.1	26.3	28.8	2.1
0.0 0.3 0.3 0.7	1.5810	2.6	5.5	13.3	22.0	26.0	27.7	3.0
0.5 0.5 0.6 0.6	1.5825	3.8	6.2	10.0	18.7	31.9	28.1	1.3
0.4 0.5 0.5 0.7	1.5875	5.5	1.1	12.4	23.3	28.3	26.6	2.8
0.1 0.3 0.6 0.6	1.5890	3.5	4.3	13.9	21.1	25.8	28.1	3.3
0.5 0.5 0.5 0.6	1.5900	3.9	2.8	13.3	18.9	33.4	27.3	0.5
0.4 0.5 0.6 0.7	1.5915	4.4	3.1	11.8	24.1	25.6	28.5	2.5
0.1 0.1 0.1 0.7	1.5920	3.2	1.9	14.2	25.4	26.7	25.8	2.8
0.2 0.2 0.5 0.7	1.5920	3.3	4.6	14.5	20.4	25.2	28.2	3.8
0.1 0.2 0.4 0.7	1.5935	2.8	4.1	14.1	23.7	23.9	27.8	3.5
0.3 0.3 0.5 0.8	1.5958	3.3	2.9	15.3	23.4	22.7	29.4	3.0
0.3 0.3 0.3 0.8	1.5967	3.0	2.5	15.1	25.6	22.4	28.0	3.4
0.5 0.6 0.6 0.6	1.5970	1.5	6.5	12.3	22.7	25.1	32.0	0.0

Spy Ratings	Average Score	Percentage of Outcome						
		-2	-1	0	1	2	3	4
0.0 0.2 0.6 0.6	1.5980	3.4	5.2	13.4	20.1	25.8	28.6	3.5
0.1 0.4 0.5 0.7	1.6004	2.8	5.5	12.8	22.0	25.4	27.5	4.0
0.0 0.1 0.2 0.7	1.6052	3.6	2.7	13.2	23.6	25.9	28.6	2.3
0.2 0.5 0.5 0.7	1.6063	3.6	4.0	13.9	21.6	24.0	29.3	3.6
0.2 0.3 0.3 0.8	1.6093	3.0	3.0	13.4	24.8	24.9	28.4	2.5
0.0 0.3 0.6 0.6	1.6108	2.8	5.0	13.1	21.0	26.6	29.0	2.6
0.1 0.1 0.4 0.7	1.6151	3.0	4.8	13.4	21.0	25.3	29.0	3.4
0.0 0.0 0.1 0.6	1.6166	2.4	4.2	11.8	24.6	28.0	25.9	3.0
0.2 0.3 0.4 0.8	1.6171	2.6	3.5	13.3	25.6	23.0	29.0	2.9
0.0 0.4 0.5 0.7	1.6200	2.7	5.5	12.9	19.7	28.1	27.5	3.6
0.2 0.2 0.3 0.8	1.6211	2.8	2.5	14.8	24.2	24.1	29.1	2.6
0.0 0.4 0.6 0.6	1.6306	3.8	5.0	12.9	17.3	28.8	28.0	4.2
0.0 0.1 0.3 0.7	1.6343	2.2	5.0	12.8	21.9	27.2	27.4	3.6
0.0 0.1 0.4 0.7	1.6381	2.4	4.7	13.5	21.3	27.1	26.1	4.8
0.0 0.0 0.0 0.6	1.6419	1.7	4.7	9.9	26.5	28.8	25.4	3.0
0.2 0.2 0.4 0.8	1.6422	2.6	3.1	15.1	23.4	22.2	29.8	3.9
0.3 0.3 0.4 0.8	1.6426	1.5	3.6	14.2	25.6	22.8	29.4	2.9
0.2 0.5 0.6 0.7	1.6427	3.8	3.8	12.4	20.8	26.7	28.4	4.1
0.3 0.4 0.6 0.7	1.6431	3.1	3.6	14.7	20.1	25.3	29.4	3.8
0.0 0.3 0.5 0.7	1.6439	2.5	5.1	13.4	20.5	25.8	28.5	4.2
0.1 0.5 0.6 0.6	1.6474	4.5	3.8	11.4	19.2	28.8	28.3	4.0
0.1 0.2 0.6 0.7	1.6488	3.3	5.2	12.3	20.4	24.3	29.9	4.5
0.2 0.2 0.2 0.8	1.6497	2.9	3.5	12.2	23.9	25.2	29.2	3.1
0.3 0.4 0.4 0.8	1.6572	1.7	3.2	13.8	25.5	23.5	29.2	3.1
0.3 0.3 0.6 0.7	1.6632	3.5	3.0	13.4	19.7	27.9	29.5	3.1
0.0 0.1 0.6 0.6	1.6651	2.7	6.9	12.6	18.0	23.1	32.2	4.5
0.4 0.5 0.5 0.5	1.6665	5.1	0.1	10.6	20.3	34.8	29.0	0.0
0.1 0.2 0.3 0.8	1.6685	3.1	2.6	12.3	23.9	25.4	29.7	3.0
0.0 0.0 0.2 0.7	1.6686	2.3	4.1	11.9	22.7	27.7	28.3	3.1
0.1 0.2 0.2 0.8	1.6688	2.7	3.2	12.4	24.1	24.7	29.7	3.2
0.1 0.1 0.5 0.7	1.6689	2.9	4.5	11.7	21.6	26.8	28.2	4.4
0.0 0.0 0.5 0.6	1.6690	1.8	5.6	13.2	20.8	24.9	29.5	4.2
0.1 0.3 0.6 0.7	1.6704	3.3	4.7	10.9	21.8	25.4	30.3	3.7
0.2 0.4 0.4 0.8	1.6735	2.4	3.9	11.7	24.6	24.3	29.4	3.6
0.2 0.2 0.6 0.7	1.6801	3.4	3.8	12.4	20.7	24.9	30.9	3.8
0.1 0.2 0.4 0.8	1.6814	2.5	4.1	13.4	22.3	22.5	31.0	4.2
0.0 0.1 0.1 0.7	1.6843	3.4	3.9	11.4	20.2	28.6	28.8	3.8
0.0 0.5 0.6 0.6	1.6858	3.3	4.5	10.9	20.1	27.7	29.9	3.7
0.0 0.0 0.4 0.7	1.6904	1.3	5.1	12.1	22.1	27.2	28.4	3.7
0.1 0.5 0.5 0.7	1.6932	3.3	4.4	12.0	20.5	24.3	30.8	4.7
0.1 0.3 0.3 0.8	1.6970	2.3	1.9	12.6	26.3	24.1	29.6	3.2
0.1 0.4 0.4 0.8	1.6988	2.2	3.6	12.3	23.6	24.6	29.8	3.9
0.0 0.2 0.5 0.7	1.6989	2.1	3.3	14.1	22.0	24.3	29.6	4.5
0.3 0.4 0.5 0.8	1.6997	2.0	3.8	13.7	22.9	22.0	31.9	3.8
0.6 0.6 0.6 0.6	1.7000	2.6	3.9	10.7	20.8	29.1	31.8	1.2
0.2 0.6 0.6 0.6	1.7014	2.2	3.4	12.7	21.1	28.1	29.2	3.2
0.4 0.4 0.7 0.7	1.7020	3.4	2.5	14.4	19.9	23.4	33.3	3.3

Spy Ratings	Average Score	Percentage of Outcome						
		-2	-1	0	1	2	3	4
0.0 0.0 0.1 0.7	1.7050	2.2	4.4	9.9	23.7	27.4	28.8	3.5
0.0 0.0 0.0 0.0	1.7079	0.6	1.3	9.0	32.2	31.1	23.8	1.9
0.3 0.5 0.6 0.7	1.7103	3.0	2.9	13.3	19.4	27.6	29.6	4.2
0.1 0.5 0.6 0.7	1.7147	3.4	3.8	11.7	19.6	26.3	30.8	4.3
0.1 0.1 0.6 0.7	1.7156	3.3	4.8	10.7	20.5	24.8	31.0	5.0
0.0 0.3 0.6 0.7	1.7196	2.5	4.8	12.0	18.9	27.3	29.6	4.9
0.2 0.4 0.5 0.8	1.7213	2.3	3.2	13.9	22.0	22.1	32.1	4.3
0.2 0.4 0.6 0.7	1.7232	2.9	3.8	12.0	19.4	27.6	29.5	4.8
0.1 0.6 0.6 0.6	1.7235	3.2	3.3	11.8	18.7	30.2	27.9	4.9
0.0 0.2 0.6 0.7	1.7278	2.4	4.8	12.2	20.1	24.4	31.2	4.9
0.2 0.3 0.5 0.8	1.7280	2.3	3.1	12.5	22.7	24.7	30.4	4.3
0.0 0.0 0.3 0.7	1.7346	1.4	4.9	11.6	21.2	27.1	29.3	4.4
0.3 0.3 0.7 0.7	1.7358	3.6	2.6	12.2	19.8	25.2	33.2	3.3
0.1 0.1 0.3 0.8	1.7390	2.7	2.5	11.1	23.5	27.0	28.8	4.5
0.0 0.3 0.3 0.8	1.7405	2.0	2.9	11.8	24.2	24.6	30.7	3.8
0.1 0.4 0.6 0.7	1.7488	2.9	3.2	11.6	20.3	27.8	28.7	5.5
0.5 0.6 0.6 0.7	1.7530	2.4	5.1	10.8	18.3	24.9	36.8	1.7
0.2 0.3 0.7 0.7	1.7537	2.8	3.5	12.0	19.8	25.3	32.7	4.0
0.4 0.5 0.7 0.7	1.7560	2.4	0.9	19.4	16.3	22.9	33.3	4.9
0.3 0.5 0.5 0.8	1.7587	2.4	2.8	12.0	21.5	25.1	32.6	3.5
0.5 0.5 0.6 0.7	1.7590	1.7	4.2	10.1	19.8	30.0	33.4	0.9
0.0 0.1 0.5 0.7	1.7606	2.0	4.3	11.2	20.4	27.6	29.1	5.3
0.2 0.5 0.5 0.8	1.7616	2.3	4.6	11.5	20.3	24.2	31.8	5.3
0.2 0.2 0.5 0.8	1.7633	2.3	3.7	12.4	20.6	23.8	32.6	4.7
0.0 0.4 0.6 0.7	1.7645	3.6	4.2	9.8	18.5	27.6	30.8	5.5
0.3 0.3 0.4 0.9	1.7656	1.5	1.9	12.1	26.0	24.3	29.3	4.7
0.0 0.5 0.5 0.7	1.7690	2.1	4.7	11.6	18.4	27.8	30.0	5.4
0.1 0.1 0.4 0.8	1.7698	2.3	3.3	10.8	22.9	25.1	30.6	4.9
0.1 0.2 0.5 0.8	1.7733	2.2	4.2	11.2	20.5	24.9	32.1	4.8
0.1 0.1 0.1 0.8	1.7733	3.0	1.7	10.2	23.2	27.0	31.4	3.4
0.3 0.3 0.3 0.9	1.7734	1.4	1.1	13.6	26.3	22.2	30.8	4.5
0.1 0.3 0.4 0.8	1.7785	1.6	3.1	12.2	23.1	23.7	31.3	4.9
0.3 0.3 0.6 0.8	1.7787	2.6	3.3	10.8	22.1	24.2	32.1	4.9
0.1 0.1 0.2 0.8	1.7790	2.3	2.3	10.6	22.8	27.1	31.9	3.0
0.0 0.6 0.6 0.6	1.7798	2.7	3.3	10.2	19.9	29.1	30.6	4.2
0.2 0.3 0.4 0.9	1.7835	1.5	1.7	13.0	24.6	23.6	31.1	4.4
0.0 0.2 0.3 0.8	1.7882	2.3	2.8	9.9	22.8	26.8	31.5	3.9
0.4 0.4 0.6 0.8	1.7885	3.4	4.0	9.1	20.0	23.3	37.6	2.5
0.0 0.0 0.6 0.6	1.7886	1.6	6.0	10.2	19.4	24.0	34.0	4.7
0.0 0.2 0.2 0.8	1.7886	2.0	2.9	10.8	23.0	25.0	32.3	4.0
0.0 0.1 0.6 0.7	1.7890	2.3	4.7	10.7	20.7	22.1	34.4	5.0
0.5 0.5 0.5 0.7	1.7905	1.5	4.2	10.2	20.1	26.7	36.6	0.7
0.3 0.4 0.7 0.7	1.7938	2.9	3.0	12.0	19.0	24.5	34.4	4.3
0.0 0.0 0.5 0.7	1.7941	2.1	4.5	10.5	19.4	26.4	32.3	4.7
0.3 0.5 0.7 0.7	1.7945	3.1	2.5	11.4	18.8	27.8	31.9	4.5
0.4 0.4 0.4 0.9	1.7950	0.0	1.7	13.3	28.2	21.8	30.9	4.2
0.2 0.4 0.7 0.7	1.7968	2.8	3.0	10.4	19.8	28.1	31.5	4.4

Spy Ratings	Average Score	Percentage of Outcome						
		-2	-1	0	1	2	3	4
0.0 0.1 0.3 0.8	1.7973	1.6	3.4	11.6	21.8	24.8	32.5	4.4
0.1 0.3 0.7 0.7	1.8010	2.5	3.4	10.8	19.4	27.7	31.4	4.9
0.3 0.6 0.7 0.7	1.8015	0.0	5.0	20.0	15.1	15.0	40.0	5.0
0.1 0.3 0.5 0.8	1.8030	2.0	3.8	11.2	20.3	25.2	32.5	5.0
0.1 0.4 0.5 0.8	1.8035	1.6	4.1	10.9	21.1	25.6	31.3	5.3
0.2 0.3 0.6 0.8	1.8060	2.5	3.7	9.8	21.5	24.3	33.2	4.9
0.2 0.2 0.3 0.9	1.8063	1.5	1.3	11.9	25.4	24.5	30.9	4.4
0.0 0.2 0.4 0.8	1.8094	1.6	3.5	11.1	21.8	25.9	30.3	5.8
0.4 0.6 0.6 0.7	1.8125	3.6	2.2	9.8	17.8	30.0	32.9	3.5
0.2 0.6 0.6 0.7	1.8141	2.5	3.8	10.9	18.3	27.1	32.1	5.3
0.4 0.5 0.6 0.8	1.8160	4.2	0.9	8.2	22.6	26.8	35.0	2.5
0.0 0.1 0.1 0.8	1.8189	2.0	2.6	10.8	22.1	25.7	32.1	4.7
0.2 0.5 0.7 0.7	1.8193	2.5	3.6	12.3	17.2	25.4	33.2	5.8
0.2 0.2 0.7 0.7	1.8200	2.4	2.4	10.9	21.0	25.7	33.9	3.8
0.3 0.3 0.5 0.9	1.8206	1.1	2.4	13.1	23.1	22.3	33.1	4.9
0.0 0.3 0.4 0.8	1.8252	1.7	4.0	11.0	20.9	23.8	33.6	5.2
0.0 0.4 0.4 0.8	1.8266	1.8	3.2	11.6	20.2	24.9	33.2	5.0
0.0 0.1 0.4 0.8	1.8294	2.0	3.6	10.2	20.2	27.5	31.1	5.5
0.0 0.1 0.2 0.8	1.8314	3.2	2.3	8.2	23.2	23.6	36.8	2.7
0.2 0.2 0.6 0.8	1.8316	2.2	3.2	10.4	20.4	25.7	33.5	4.6
0.3 0.6 0.6 0.8	1.8350	2.1	2.8	11.6	19.3	29.2	27.2	7.8
0.2 0.4 0.4 0.9	1.8352	0.9	2.2	11.3	25.0	23.1	33.7	3.8
0.0 0.3 0.5 0.8	1.8356	1.8	4.4	10.3	20.0	24.4	34.1	5.1
0.1 0.2 0.7 0.7	1.8384	1.7	3.4	10.2	21.4	24.9	34.1	4.3
0.4 0.4 0.4 0.8	1.8415	1.4	3.5	9.4	23.6	22.0	37.1	2.9
0.4 0.6 0.6 0.8	1.8420	4.2	4.1	7.5	16.8	25.9	38.3	3.4
0.2 0.2 0.2 0.9	1.8421	1.6	0.9	11.5	24.3	24.9	32.5	4.2
0.2 0.3 0.3 0.9	1.8432	1.0	1.0	12.0	25.9	23.4	32.6	4.2
0.1 0.4 0.7 0.7	1.8442	2.1	3.0	10.6	19.7	27.7	30.9	5.9
0.1 0.3 0.6 0.8	1.8443	1.9	4.3	9.3	20.7	25.6	32.6	5.7
0.0 0.0 0.0 0.7	1.8446	0.8	3.4	7.3	24.9	30.0	29.7	3.9
0.3 0.4 0.6 0.8	1.8453	2.1	3.2	11.6	18.3	25.8	34.1	4.9
0.3 0.4 0.4 0.9	1.8473	0.5	1.5	11.3	26.5	24.0	31.9	4.2
0.2 0.4 0.6 0.8	1.8487	2.1	2.7	11.1	19.2	27.5	32.3	5.1
0.0 0.2 0.5 0.8	1.8489	2.0	3.3	10.2	20.1	26.9	32.0	5.5
0.4 0.4 0.5 0.8	1.8500	2.3	2.1	7.0	24.8	27.3	33.7	2.9
0.1 0.5 0.5 0.8	1.8508	1.7	4.0	11.5	18.6	24.9	32.7	6.5
0.1 0.1 0.5 0.8	1.8509	1.7	3.2	9.9	22.4	24.1	33.6	5.1
0.1 0.4 0.6 0.8	1.8527	2.2	4.0	10.6	18.4	25.6	32.8	6.5
0.2 0.5 0.6 0.8	1.8532	2.6	3.1	9.9	20.1	24.6	34.6	5.1
0.2 0.2 0.4 0.9	1.8542	1.0	2.3	12.1	22.4	24.3	32.7	5.2
0.0 0.5 0.6 0.7	1.8548	2.1	3.9	10.3	18.6	26.3	32.9	5.9
0.3 0.5 0.6 0.8	1.8549	2.9	3.3	10.7	18.0	24.7	35.0	5.6
0.1 0.3 0.3 0.9	1.8586	0.9	1.5	10.8	25.5	24.2	33.1	4.0
0.3 0.4 0.5 0.9	1.8598	0.5	2.5	11.0	24.9	23.6	32.5	5.0
0.1 0.5 0.7 0.7	1.8634	2.7	4.3	9.1	17.8	26.5	33.3	6.3
0.1 0.4 0.4 0.9	1.8636	1.2	2.7	10.3	23.4	24.3	33.3	4.9

Spy Ratings	Average Score	Percentage of Outcome						
		-2	-1	0	1	2	3	4
0.1 0.2 0.3 0.9	1.8636	1.3	1.3	10.8	24.1	25.5	33.0	4.0
0.5 0.6 0.6 0.8	1.8640	2.5	2.5	9.2	17.4	30.0	36.6	1.7
0.1 0.6 0.6 0.7	1.8663	2.3	3.3	10.7	17.5	28.6	30.8	6.9
0.6 0.6 0.6 0.7	1.8745	2.5	4.2	5.9	20.0	27.8	38.1	1.7
0.1 0.3 0.4 0.9	1.8755	1.0	2.0	11.8	22.7	23.8	33.4	5.3
0.5 0.5 0.7 0.7	1.8770	2.5	2.5	10.1	17.4	28.3	34.9	4.2
0.5 0.5 0.5 0.8	1.8785	0.9	2.5	10.8	22.4	24.1	36.0	3.4
0.0 0.4 0.5 0.8	1.8790	1.7	4.0	10.9	17.4	26.5	33.1	6.4
0.0 0.0 0.2 0.8	1.8827	1.5	2.3	9.7	21.4	27.5	32.9	4.6
0.2 0.3 0.5 0.9	1.8878	1.3	2.3	9.4	23.8	24.9	33.3	5.0
0.1 0.2 0.2 0.9	1.8884	1.1	0.9	11.2	23.4	25.6	33.9	3.9
0.0 0.2 0.7 0.7	1.8886	1.5	3.4	11.2	18.7	24.7	34.6	5.9
0.4 0.5 0.5 0.8	1.8900	2.5	2.5	9.1	18.6	26.7	38.1	2.5
0.0 0.3 0.7 0.7	1.8947	2.0	3.4	9.2	20.7	23.6	35.2	5.9
0.0 0.6 0.6 0.7	1.8952	2.1	3.9	10.0	17.3	27.0	32.8	7.0
0.2 0.6 0.7 0.7	1.8953	2.3	2.9	10.7	18.0	25.4	34.5	6.2
0.0 0.0 0.6 0.7	1.8967	1.3	5.8	8.1	19.3	23.0	37.1	5.4
0.2 0.2 0.5 0.9	1.9001	1.6	2.1	11.0	21.1	24.2	34.1	5.9
0.1 0.1 0.7 0.7	1.9007	2.3	4.0	10.3	17.2	23.4	36.9	6.0
0.0 0.0 0.3 0.8	1.9032	1.2	3.5	7.8	21.6	27.2	34.1	4.6
0.1 0.1 0.3 0.9	1.9041	1.6	3.2	8.7	21.6	24.5	35.6	4.8
0.1 0.2 0.6 0.8	1.9042	1.8	3.5	9.2	18.9	26.4	34.7	5.4
0.1 0.2 0.4 0.9	1.9045	1.3	2.1	11.1	21.0	24.7	34.4	5.4
0.1 0.1 0.6 0.8	1.9046	2.4	3.1	9.4	19.6	22.9	37.5	5.1
0.0 0.3 0.3 0.9	1.9066	1.0	1.9	9.2	24.3	25.4	33.9	4.5
0.0 0.1 0.5 0.8	1.9097	2.0	2.9	10.2	18.8	24.8	35.4	5.8
0.1 0.5 0.6 0.8	1.9101	2.0	4.2	9.6	18.4	25.0	32.6	8.2
0.0 0.5 0.5 0.8	1.9114	1.8	3.7	9.7	18.0	26.1	34.9	5.9
0.1 0.6 0.7 0.7	1.9185	2.5	3.5	10.4	16.5	24.2	36.1	6.8
0.3 0.3 0.7 0.8	1.9189	2.7	2.9	10.3	16.2	25.4	36.9	5.6
0.0 0.0 0.4 0.8	1.9218	1.3	2.8	8.5	21.2	27.1	34.1	5.0
0.0 0.2 0.3 0.9	1.9279	1.2	1.8	9.3	23.3	24.1	35.5	4.7
0.0 0.4 0.7 0.7	1.9279	1.8	3.5	10.0	17.0	27.3	33.5	6.9
0.0 0.0 0.1 0.8	1.9286	1.3	1.9	9.9	20.5	27.3	34.0	5.1
0.3 0.5 0.5 0.9	1.9314	1.1	2.2	10.2	22.0	23.9	34.6	6.0
0.4 0.4 0.5 0.9	1.9320	2.5	1.7	8.4	21.7	23.3	38.3	4.2
0.0 0.1 0.6 0.8	1.9333	1.6	4.0	9.0	18.3	24.5	36.8	5.8
0.1 0.1 0.2 0.9	1.9335	1.3	1.5	9.0	22.6	26.1	35.3	4.2
0.2 0.4 0.5 0.9	1.9348	0.6	2.5	9.7	22.8	23.8	35.9	4.8
0.0 0.2 0.6 0.8	1.9351	1.6	3.1	9.7	19.1	24.3	36.5	5.7
0.2 0.3 0.7 0.8	1.9355	2.3	3.4	7.8	18.6	26.4	35.9	5.6
0.2 0.4 0.7 0.8	1.9373	2.1	3.1	9.5	17.4	26.6	34.8	6.5
0.0 0.2 0.2 0.9	1.9390	0.9	1.7	8.2	24.5	24.8	36.1	3.7
0.1 0.3 0.7 0.8	1.9438	1.9	3.3	7.7	20.1	25.2	36.1	5.7
0.2 0.2 0.7 0.8	1.9442	2.4	2.7	8.1	18.8	26.1	36.8	5.1
0.2 0.6 0.6 0.8	1.9466	2.0	3.1	9.4	18.1	25.8	34.5	7.2
0.0 0.4 0.4 0.9	1.9471	0.8	2.3	9.0	21.9	26.3	34.5	5.1

Spy Ratings	Average Score	Percentage of Outcome						
		-2	-1	0	1	2	3	4
0.2 0.3 0.6 0.9	1.9491	1.5	2.5	10.3	20.2	22.4	37.3	5.9
0.0 0.1 0.2 0.9	1.9500	2.5	2.5	5.0	27.5	17.5	40.0	5.0
0.0 0.1 0.7 0.7	1.9505	2.1	4.1	9.8	16.2	22.4	39.1	6.3
0.1 0.2 0.7 0.8	1.9519	1.4	3.5	9.1	19.6	23.4	37.0	6.0
0.0 0.3 0.4 0.9	1.9566	1.0	1.7	10.0	21.8	25.1	34.6	5.9
0.5 0.5 0.6 0.8	1.9575	1.7	5.0	8.4	16.8	23.2	39.1	5.9
0.1 0.3 0.5 0.9	1.9587	1.0	2.1	9.4	21.4	25.0	35.3	5.7
0.0 0.3 0.6 0.8	1.9601	1.8	2.9	9.0	18.6	25.4	36.2	6.1
0.1 0.4 0.7 0.8	1.9610	2.5	3.2	7.8	18.3	25.8	35.4	7.0
0.2 0.5 0.7 0.8	1.9625	2.7	2.1	9.6	16.4	27.4	34.7	7.1
0.1 0.2 0.5 0.9	1.9713	1.3	2.2	8.8	20.8	25.0	36.5	5.4
0.4 0.4 0.6 0.9	1.9735	2.5	1.7	7.5	20.1	25.0	39.1	4.2
0.0 0.5 0.7 0.7	1.9748	2.1	3.9	9.7	13.7	27.6	35.5	7.5
0.2 0.5 0.5 0.9	1.9774	1.0	3.1	9.4	19.0	25.3	35.8	6.5
0.0 0.1 0.4 0.9	1.9788	0.9	2.0	8.7	21.9	25.7	35.0	5.8
0.0 0.0 0.2 0.9	1.9795	1.0	2.0	8.2	21.0	27.6	35.2	5.1
0.4 0.6 0.7 0.7	1.9800	4.0	5.0	8.0	9.0	29.0	36.0	9.0
0.0 0.1 0.3 0.9	1.9826	0.8	2.4	7.4	22.1	26.6	35.8	4.9
0.1 0.1 0.4 0.9	1.9835	1.0	2.3	7.6	21.5	27.0	35.0	5.6
0.3 0.4 0.7 0.8	1.9839	1.8	2.5	10.0	17.5	24.7	36.7	6.9
0.4 0.4 0.7 0.8	1.9850	2.5	1.7	9.2	18.3	24.1	38.4	5.9
0.3 0.4 0.6 0.9	1.9857	1.0	2.7	9.5	19.5	24.0	37.0	6.2
0.0 0.4 0.6 0.8	1.9861	1.2	3.9	8.0	18.3	26.5	34.7	7.4
0.3 0.3 0.4 1.0	1.9900	0.0	0.7	9.5	25.5	24.4	34.5	5.5
0.1 0.4 0.5 0.9	1.9901	0.9	2.6	9.6	19.3	25.6	35.0	7.0
0.4 0.4 0.5 1.0	1.9905	0.0	1.0	8.9	26.2	22.9	36.0	5.0
0.0 0.2 0.4 0.9	1.9916	0.8	1.7	9.0	22.0	25.7	34.7	6.3
0.3 0.3 0.6 0.9	1.9939	0.9	2.9	9.5	19.4	23.3	37.4	6.5
0.0 0.0 0.5 0.8	1.9939	1.6	3.1	6.5	18.9	29.4	34.2	6.4
0.3 0.6 0.7 0.8	1.9940	0.7	4.2	8.6	19.4	20.6	41.4	5.0
0.0 0.3 0.7 0.8	1.9953	2.0	3.3	8.1	17.4	24.3	38.5	6.4
0.1 0.6 0.6 0.8	1.9958	1.4	3.8	8.5	18.4	23.2	37.5	7.2
0.0 0.6 0.7 0.7	1.9981	2.0	3.1	10.6	14.8	24.4	37.3	7.9
0.3 0.3 0.3 1.0	2.0009	0.3	0.0	9.8	25.2	23.5	36.2	5.0
0.1 0.1 0.1 0.9	2.0010	1.1	1.1	8.3	21.4	26.7	36.7	4.6
0.2 0.4 0.4 1.0	2.0013	0.0	0.4	10.1	24.8	23.9	35.4	5.5
0.2 0.3 0.3 1.0	2.0034	0.2	0.0	9.9	25.3	23.6	36.1	5.0
0.3 0.4 0.4 1.0	2.0103	0.0	0.0	9.3	26.1	24.0	35.6	5.0
0.2 0.3 0.4 1.0	2.0110	0.2	1.1	9.4	23.7	24.5	34.8	6.3
0.1 0.1 0.5 0.9	2.0126	1.2	1.9	7.3	21.2	25.8	37.6	5.0
0.3 0.5 0.7 0.8	2.0165	1.6	3.0	9.7	16.0	24.7	37.7	7.3
0.3 0.7 0.7 0.7	2.0170	0.9	4.2	11.0	11.7	24.1	44.9	3.3
0.1 0.4 0.6 0.9	2.0171	0.9	2.9	8.1	19.5	25.7	35.9	7.0
0.6 0.6 0.7 0.7	2.0185	3.0	2.9	8.1	13.0	27.1	40.0	5.9
0.3 0.3 0.5 1.0	2.0210	0.0	1.2	8.4	24.6	24.5	35.3	5.9
0.4 0.5 0.5 0.9	2.0240	0.9	0.9	10.0	22.6	21.6	37.5	6.7
0.0 0.5 0.6 0.8	2.0268	1.5	3.7	9.2	15.3	25.0	36.7	8.5

Spy Ratings	Average Score	Percentage of Outcome						
		-2	-1	0	1	2	3	4
0.0 0.1 0.1 0.9	2.0275	1.0	1.5	7.9	21.1	26.4	36.1	6.0
0.1 0.5 0.7 0.8	2.0277	1.5	2.8	8.9	17.4	25.6	35.3	8.6
0.0 0.2 0.7 0.8	2.0290	1.8	3.6	8.3	16.0	25.6	36.4	8.4
0.1 0.5 0.5 0.9	2.0292	0.5	2.8	9.9	18.0	24.8	36.7	7.3
0.2 0.4 0.6 0.9	2.0295	1.4	1.9	8.4	18.9	25.6	37.7	6.1
0.0 0.0 0.7 0.7	2.0312	1.2	5.5	8.6	13.3	24.3	39.7	7.5
0.3 0.4 0.5 1.0	2.0324	0.0	1.2	8.9	23.7	23.5	36.9	5.7
0.2 0.6 0.7 0.8	2.0333	1.2	3.5	9.7	16.9	21.4	39.9	7.4
0.1 0.4 0.4 1.0	2.0345	0.0	1.5	9.3	22.2	24.5	36.3	6.2
0.1 0.3 0.4 1.0	2.0346	0.0	0.9	10.0	22.1	24.6	36.4	6.0
0.0 0.3 0.5 0.9	2.0352	0.8	1.9	8.5	19.3	26.9	36.9	5.8
0.0 0.0 0.3 0.9	2.0368	1.0	1.2	6.8	20.8	30.0	34.9	5.3
0.2 0.5 0.6 0.9	2.0383	1.6	2.7	7.8	17.8	24.9	38.3	6.8
0.4 0.4 0.4 1.0	2.0385	0.0	0.0	6.2	28.0	26.8	34.1	5.0
0.2 0.2 0.6 0.9	2.0400	1.6	2.4	6.7	20.6	22.6	40.3	5.8
0.2 0.3 0.5 1.0	2.0418	0.0	0.6	9.1	24.1	23.8	36.0	6.2
0.3 0.3 0.8 0.8	2.0427	2.0	2.5	7.5	16.8	26.1	39.2	6.0
0.2 0.2 0.4 1.0	2.0438	0.0	0.7	9.4	22.7	25.0	35.7	6.4
0.2 0.2 0.3 1.0	2.0457	0.0	0.0	8.2	25.1	25.8	36.0	5.0
0.1 0.3 0.3 1.0	2.0458	0.0	0.0	8.9	24.1	25.5	36.5	5.0
0.0 0.4 0.5 0.9	2.0466	0.9	2.1	8.4	18.8	26.7	36.4	6.7
0.1 0.3 0.6 0.9	2.0467	0.7	2.8	8.6	18.4	25.0	37.3	7.2
0.5 0.5 0.7 0.8	2.0485	2.0	2.9	7.1	15.8	26.7	39.3	6.2
0.1 0.3 0.8 0.8	2.0493	1.5	2.9	7.8	17.2	25.6	37.2	7.8
0.2 0.3 0.7 0.9	2.0498	1.5	2.4	7.0	18.9	25.1	39.2	5.9
0.2 0.2 0.2 1.0	2.0501	0.0	0.0	8.3	25.1	24.7	36.8	5.0
0.0 0.0 0.0 0.8	2.0505	0.7	2.1	6.2	21.8	26.6	37.3	5.5
0.0 0.2 0.5 0.9	2.0548	1.2	1.6	8.0	19.4	25.3	38.6	5.9
0.0 0.1 0.7 0.8	2.0568	1.5	3.4	8.2	16.3	24.0	39.0	7.6
0.0 0.1 0.5 0.9	2.0604	0.9	1.6	7.2	20.2	26.2	38.6	5.2
0.1 0.1 0.3 1.0	2.0651	0.3	1.0	8.6	20.7	27.2	35.6	6.6
0.1 0.5 0.6 0.9	2.0658	0.9	3.4	7.4	18.4	24.2	37.9	7.8
0.2 0.2 0.5 1.0	2.0667	0.3	0.9	8.8	21.7	25.4	36.3	6.7
0.3 0.5 0.6 0.9	2.0697	1.3	2.1	8.7	18.0	23.8	38.6	7.6
0.1 0.7 0.7 0.7	2.0701	1.5	2.3	9.0	17.0	22.0	41.5	6.7
0.2 0.3 0.8 0.8	2.0737	1.4	2.5	7.6	16.4	26.5	38.9	6.6
0.1 0.2 0.6 0.9	2.0741	1.0	2.2	7.4	19.9	23.0	40.4	6.1
0.1 0.1 0.6 0.9	2.0742	1.2	2.9	7.2	18.6	22.1	42.0	6.0
0.6 0.6 0.6 0.8	2.0755	0.0	3.0	8.9	17.8	24.9	38.4	6.9
0.1 0.2 0.3 1.0	2.0769	0.0	0.0	7.6	24.6	25.2	37.6	5.0
0.5 0.7 0.7 0.7	2.0775	2.0	2.1	10.0	14.0	26.1	35.9	10.0
0.2 0.2 0.8 0.8	2.0788	1.3	1.6	9.6	15.6	27.6	36.1	8.2
0.4 0.5 0.7 0.8	2.0795	3.0	2.0	7.0	16.0	25.1	38.0	9.0
0.1 0.2 0.2 1.0	2.0796	0.0	0.0	7.7	24.0	25.5	37.7	5.0
0.1 0.1 0.7 0.8	2.0797	1.0	2.9	8.6	16.4	24.8	38.3	8.0
0.2 0.4 0.5 1.0	2.0822	0.0	1.2	7.8	22.5	24.9	37.0	6.5
0.0 0.4 0.7 0.8	2.0827	1.8	3.2	6.7	15.0	28.1	36.9	8.3

Spy Ratings	Average Score	Percentage of Outcome						
		-2	-1	0	1	2	3	4
0.0 0.0 0.6 0.8	2.0830	1.5	2.8	6.1	18.8	23.4	40.5	6.8
0.0 0.5 0.5 0.9	2.0862	1.0	2.9	7.6	16.3	27.4	36.9	8.0
0.0 0.2 0.3 1.0	2.0874	0.0	1.1	6.7	23.1	26.5	36.9	5.8
0.0 0.3 0.3 1.0	2.0879	0.0	0.0	7.9	23.7	25.3	38.2	5.0
0.5 0.6 0.7 0.7	2.0885	2.0	1.0	9.1	13.2	31.9	35.1	7.8
0.3 0.4 0.8 0.8	2.0889	1.4	2.3	8.4	14.5	27.6	39.2	6.7
0.4 0.4 0.6 1.0	2.0895	0.0	1.0	10.0	19.1	25.9	37.0	7.0
0.2 0.4 0.8 0.8	2.0895	1.6	1.7	9.0	14.6	27.8	37.8	7.6
0.1 0.4 0.8 0.8	2.0913	1.3	2.5	8.1	16.4	25.0	39.4	7.4
0.3 0.3 0.7 0.9	2.0936	1.4	2.4	6.9	17.3	25.4	40.1	6.6
0.0 0.2 0.6 0.9	2.0943	1.6	2.4	6.1	17.5	26.1	40.0	6.3
0.3 0.5 0.5 1.0	2.0946	0.2	1.2	8.5	20.4	25.4	37.4	6.9
0.2 0.7 0.7 0.7	2.0954	1.2	2.4	7.3	17.1	24.7	41.3	6.0
0.1 0.3 0.5 1.0	2.0990	0.0	0.9	8.2	22.0	24.1	38.5	6.3
0.4 0.5 0.6 0.9	2.0990	1.0	2.0	8.8	17.0	24.0	40.3	7.0
0.0 0.3 0.4 1.0	2.1019	0.0	1.0	7.5	22.0	25.4	37.6	6.4
0.0 0.4 0.4 1.0	2.1025	0.0	1.2	7.4	22.2	24.7	38.1	6.4
0.1 0.2 0.5 1.0	2.1026	0.4	1.1	7.8	21.1	24.3	38.4	6.9
0.0 0.2 0.2 1.0	2.1030	0.0	0.0	8.6	21.9	25.2	39.3	5.0
0.2 0.5 0.8 0.8	2.1032	1.6	2.5	8.5	14.8	24.4	40.8	7.5
0.1 0.2 0.4 1.0	2.1049	0.1	0.7	8.4	21.2	25.3	37.7	6.7
0.0 0.0 0.4 0.9	2.1090	0.2	1.4	6.4	20.8	27.6	37.6	6.0
0.1 0.1 0.1 1.0	2.1099	0.2	0.0	7.0	22.7	26.7	38.4	5.0
0.2 0.4 0.7 0.9	2.1111	1.2	2.8	7.2	17.0	23.8	40.3	7.7
0.3 0.4 0.7 0.9	2.1143	1.4	2.8	7.0	15.7	24.8	41.6	6.7
0.1 0.1 0.2 1.0	2.1157	0.0	0.0	7.2	22.9	26.0	38.9	5.0
0.1 0.2 0.8 0.8	2.1163	1.7	2.3	8.3	14.5	24.9	40.2	8.1
0.0 0.6 0.6 0.8	2.1164	1.0	3.3	7.1	17.1	23.1	39.9	8.5
0.3 0.5 0.8 0.8	2.1166	1.5	2.3	8.6	13.9	26.5	39.1	8.1
0.2 0.2 0.7 0.9	2.1270	1.1	1.5	6.9	18.4	24.9	40.5	6.7
0.1 0.5 0.8 0.8	2.1292	1.6	2.9	7.2	14.5	25.1	40.5	8.1
0.0 0.0 0.1 0.9	2.1326	0.5	0.9	5.4	21.5	27.5	37.9	6.3
0.4 0.5 0.5 1.0	2.1360	0.0	0.0	6.1	24.1	26.0	37.9	6.0
0.0 0.7 0.7 0.7	2.1362	1.7	2.7	7.2	17.0	19.5	44.1	7.8
0.0 0.5 0.7 0.8	2.1367	1.4	2.3	8.2	14.8	25.4	38.8	9.2
0.0 0.4 0.8 0.8	2.1371	0.9	3.1	8.5	13.0	26.4	39.8	8.4
0.0 0.1 0.3 1.0	2.1374	0.0	1.0	5.1	22.4	28.0	37.2	6.3
0.6 0.7 0.7 0.7	2.1380	3.4	0.0	9.4	12.7	23.4	43.3	7.8
0.0 0.3 0.8 0.8	2.1394	1.1	3.0	8.5	13.7	25.3	39.2	9.3
0.0 0.5 0.6 0.9	2.1430	0.5	3.3	8.0	14.8	25.3	39.0	9.0
0.4 0.4 0.8 0.8	2.1440	0.0	2.6	10.9	14.1	20.2	46.0	6.2
0.3 0.3 0.6 1.0	2.1452	0.5	0.8	6.8	21.0	24.5	39.4	7.0
0.0 0.3 0.6 0.9	2.1454	0.9	2.0	6.9	16.7	26.3	40.0	7.3
0.2 0.4 0.6 1.0	2.1515	0.2	1.4	7.4	20.3	23.3	40.0	7.5
0.0 0.0 0.5 0.9	2.1516	0.7	2.1	5.7	18.4	26.0	40.2	6.9
0.0 0.4 0.6 0.9	2.1531	1.2	2.7	5.8	15.4	28.3	38.6	8.1
0.1 0.3 0.7 0.9	2.1532	0.9	2.0	6.0	18.7	23.4	41.9	7.0

Spy Ratings	Average Score	Percentage of Outcome						
		-2	-1	0	1	2	3	4
0.1 0.4 0.5 1.0	2.1535	0.0	1.3	7.1	20.0	25.3	39.2	7.1
0.2 0.5 0.5 1.0	2.1548	0.2	1.3	8.5	18.3	24.7	39.4	7.8
0.1 0.4 0.7 0.9	2.1550	1.0	2.3	6.4	17.2	24.9	39.9	8.3
0.0 0.2 0.4 1.0	2.1556	0.0	1.3	5.8	20.9	26.5	38.7	6.8
0.1 0.6 0.7 0.8	2.1566	0.6	3.0	8.7	16.1	19.8	42.4	9.2
0.3 0.4 0.6 1.0	2.1586	0.3	0.9	7.6	19.8	23.7	40.7	7.0
0.1 0.6 0.6 0.9	2.1618	0.8	2.7	8.3	16.0	21.1	41.9	9.2
0.1 0.1 0.8 0.8	2.1647	1.4	2.2	7.6	14.7	24.6	40.6	8.9
0.1 0.1 0.4 1.0	2.1651	0.0	1.1	6.7	19.8	26.2	38.8	7.3
0.2 0.6 0.8 0.8	2.1714	0.9	2.7	7.4	15.8	21.3	43.6	8.1
0.1 0.1 0.5 1.0	2.1730	0.6	1.2	5.8	19.8	24.6	41.5	6.6
0.0 0.1 0.2 1.0	2.1750	0.0	0.0	5.0	27.5	17.5	45.0	5.0
0.1 0.5 0.5 1.0	2.1771	0.0	1.5	8.2	17.6	24.5	39.5	8.6
0.1 0.1 0.7 0.9	2.1789	1.6	2.7	6.3	14.4	24.7	41.5	8.8
0.0 0.3 0.5 1.0	2.1795	0.2	1.2	6.3	20.1	24.3	41.3	6.7
0.4 0.5 0.6 1.0	2.1800	0.0	2.0	9.0	16.0	23.0	42.0	8.0
0.0 0.2 0.8 0.8	2.1821	1.1	2.5	8.2	13.4	24.8	40.6	9.5
0.2 0.7 0.7 0.8	2.1825	0.6	3.3	7.0	15.3	21.7	44.1	7.9
0.5 0.6 0.6 0.9	2.1850	1.0	1.1	4.0	22.1	22.3	43.8	5.9
0.0 0.0 0.3 1.0	2.1867	0.0	1.1	5.1	19.9	28.5	38.8	6.6
0.3 0.5 0.7 0.9	2.1878	0.9	2.2	6.7	15.6	24.9	41.3	8.3
0.1 0.2 0.7 0.9	2.1888	1.0	2.1	7.3	15.6	23.1	42.4	8.5
0.0 0.0 0.0 0.9	2.1897	0.4	1.3	4.8	19.4	26.8	41.4	6.0
0.0 0.6 0.7 0.8	2.1920	1.3	2.9	8.4	13.4	19.9	44.6	9.4
0.2 0.3 0.6 1.0	2.1925	0.7	0.8	6.2	19.2	25.0	40.7	7.5
0.2 0.5 0.7 0.9	2.1932	1.1	2.8	6.8	14.1	24.7	41.4	9.1
0.0 0.1 0.6 0.9	2.1933	1.3	1.9	6.5	16.2	23.1	42.7	8.3
0.2 0.6 0.6 0.9	2.1940	0.9	2.2	6.8	16.3	23.3	41.2	9.2
0.2 0.2 0.6 1.0	2.1959	0.3	0.5	6.7	20.7	22.1	43.3	6.5
0.0 0.0 0.7 0.8	2.1992	0.9	3.3	6.6	14.1	23.2	43.0	8.8
0.0 0.1 0.1 1.0	2.1993	0.1	0.0	5.3	21.6	26.9	39.8	6.3
0.0 0.0 0.2 1.0	2.1994	0.0	0.4	5.9	21.0	25.9	39.9	7.0
0.7 0.7 0.7 0.7	2.1995	1.2	4.9	4.0	12.6	22.4	49.9	5.1
0.4 0.7 0.7 0.7	2.2000	0.0	1.0	10.2	12.8	29.8	36.2	10.0
0.6 0.6 0.7 0.8	2.2000	2.5	1.3	7.5	10.0	26.3	46.3	6.3
0.0 0.1 0.4 1.0	2.2027	0.3	0.7	5.3	19.9	27.4	39.1	7.4
0.4 0.5 0.7 0.9	2.2080	1.0	1.9	6.9	15.0	26.1	39.2	10.0
0.0 0.4 0.7 0.9	2.2088	1.2	2.6	6.4	13.8	24.5	43.0	8.5
0.5 0.5 0.8 0.8	2.2105	0.0	2.5	7.6	17.3	21.3	41.2	10.1
0.1 0.4 0.6 1.0	2.2143	0.1	1.4	6.6	18.0	25.1	40.1	8.6
0.1 0.7 0.7 0.8	2.2158	0.6	3.0	6.7	15.9	19.5	46.2	8.1
0.5 0.5 0.6 1.0	2.2200	0.0	2.0	5.0	17.0	29.0	39.0	8.0
0.0 0.3 0.7 0.9	2.2224	1.3	2.0	5.7	14.9	25.1	42.8	8.4
0.1 0.5 0.7 0.9	2.2244	1.0	2.1	6.6	13.9	25.5	41.9	9.0
0.4 0.5 0.8 0.8	2.2255	1.1	2.6	10.3	10.9	19.2	45.4	10.5
0.3 0.5 0.6 1.0	2.2259	0.3	1.4	6.0	18.0	24.6	41.5	8.2
0.3 0.6 0.6 0.9	2.2265	0.9	0.0	6.5	18.6	25.7	39.3	9.2

Spy Ratings	Average Score	Percentage of Outcome						
		-2	-1	0	1	2	3	4
0.5 0.5 0.5 0.9	2.2290	0.0	0.0	4.0	22.0	25.1	44.9	4.0
0.0 0.0 0.1 1.0	2.2294	0.2	0.0	4.2	21.2	27.8	40.0	6.6
0.3 0.4 0.8 0.9	2.2299	1.0	2.0	6.1	14.2	24.7	44.0	7.8
0.5 0.5 0.5 1.0	2.2300	0.0	0.0	4.0	24.0	22.0	45.0	5.0
0.2 0.4 0.8 0.9	2.2300	1.1	2.8	6.0	13.0	24.7	44.0	8.4
0.2 0.2 0.8 0.9	2.2314	0.9	2.0	7.8	12.7	25.4	41.5	9.7
0.5 0.6 0.6 1.0	2.2315	0.0	1.0	4.0	22.0	23.0	44.0	6.0
0.0 0.1 0.5 1.0	2.2342	0.2	0.6	5.5	19.2	25.7	41.8	7.1
0.1 0.3 0.6 1.0	2.2344	0.3	1.2	5.3	18.1	25.7	41.5	7.8
0.0 0.2 0.5 1.0	2.2351	0.3	0.8	4.4	20.0	25.7	42.0	6.9
0.1 0.3 0.8 0.9	2.2365	0.5	1.8	6.3	16.2	24.1	42.3	8.9
0.3 0.3 0.8 0.9	2.2421	0.9	1.9	4.7	16.6	24.1	44.4	7.5
0.3 0.3 0.7 1.0	2.2422	0.4	1.3	5.3	18.2	24.9	41.3	8.6
0.4 0.4 0.7 1.0	2.2445	0.0	0.5	6.7	16.6	28.9	38.3	8.9
0.0 0.5 0.5 1.0	2.2445	0.0	1.6	5.5	17.5	27.2	38.6	9.6
0.3 0.6 0.8 0.8	2.2460	1.0	4.9	5.0	11.0	22.1	47.9	8.2
0.2 0.6 0.7 0.9	2.2469	0.7	3.0	6.0	16.2	19.5	45.0	9.7
0.0 0.0 0.4 1.0	2.2488	0.0	1.0	4.2	19.7	26.8	40.6	7.7
0.5 0.5 0.6 0.9	2.2490	0.0	1.0	5.0	18.0	27.1	41.9	7.0
0.2 0.3 0.8 0.9	2.2493	1.1	1.6	4.8	15.2	25.4	44.7	7.1
0.0 0.4 0.5 1.0	2.2496	0.0	1.1	5.3	18.9	25.9	40.4	8.5
0.3 0.6 0.6 1.0	2.2500	0.0	1.0	5.9	18.1	24.1	44.0	7.0
0.0 0.1 0.8 0.8	2.2526	1.8	2.7	7.0	10.9	22.9	43.9	10.8
0.0 0.7 0.7 0.8	2.2531	0.7	3.4	7.5	14.4	15.8	48.9	9.4
0.1 0.2 0.6 1.0	2.2554	0.0	0.5	6.3	18.7	23.6	43.6	7.4
0.1 0.6 0.8 0.8	2.2558	0.5	3.4	6.7	14.3	19.2	46.7	9.3
0.4 0.4 0.7 0.9	2.2560	0.5	0.0	6.7	16.7	26.6	41.2	8.3
0.3 0.7 0.7 0.8	2.2610	1.0	1.0	6.0	16.8	22.1	44.0	9.0
0.1 0.4 0.8 0.9	2.2648	0.9	2.1	5.9	14.1	23.8	44.0	9.2
0.3 0.4 0.7 1.0	2.2649	0.4	1.3	4.5	17.7	25.6	42.4	8.2
0.0 0.1 0.7 0.9	2.2667	1.3	2.5	5.5	13.4	23.6	43.7	10.1
0.0 0.0 0.6 0.9	2.2676	0.5	2.1	4.8	16.9	22.9	44.1	8.7
0.0 0.5 0.8 0.8	2.2693	1.2	2.3	7.0	10.4	26.2	42.6	10.2
0.0 0.5 0.7 0.9	2.2705	0.8	1.6	7.2	12.7	25.4	42.2	10.1
0.2 0.4 0.7 1.0	2.2708	0.0	2.0	5.8	16.5	23.2	43.2	9.2
0.5 0.5 0.7 0.9	2.2715	0.0	2.2	4.5	17.3	24.9	42.2	8.9
0.1 0.5 0.6 1.0	2.2716	0.0	1.6	7.0	15.3	24.8	40.6	10.5
0.2 0.3 0.7 1.0	2.2717	0.5	0.8	4.9	18.0	24.5	43.3	8.0
0.0 0.2 0.7 0.9	2.2724	1.0	2.4	6.3	13.4	23.8	42.2	11.0
0.6 0.7 0.7 0.8	2.2760	1.3	0.0	10.0	7.5	28.8	45.0	7.5
0.3 0.5 0.8 0.9	2.2784	1.1	2.2	6.5	11.8	24.9	43.6	10.0
0.0 0.0 0.8 0.8	2.2801	1.0	2.0	6.8	11.5	25.8	42.8	10.1
0.2 0.2 0.7 1.0	2.2821	0.2	0.9	4.3	19.1	23.3	44.5	7.5
0.1 0.2 0.8 0.9	2.2859	0.8	2.3	5.4	14.3	23.8	43.2	10.3
0.6 0.6 0.7 0.9	2.2875	2.5	0.0	6.3	13.8	22.5	45.0	10.0
0.5 0.6 0.7 0.9	2.2875	2.5	0.0	7.5	8.8	28.7	42.5	10.0
0.6 0.6 0.6 0.9	2.2880	0.0	1.1	5.6	16.7	24.4	44.5	7.8

Spy Ratings	Average Score	Percentage of Outcome						
		-2	-1	0	1	2	3	4
0.3 0.6 0.7 0.9	2.2895	0.9	1.8	4.9	16.0	22.4	45.0	9.2
0.1 0.1 0.6 1.0	2.2921	0.4	0.8	6.0	17.1	22.2	44.4	9.1
0.0 0.2 0.8 0.9	2.2942	0.6	2.0	7.6	11.9	23.9	43.1	10.8
0.2 0.5 0.8 0.9	2.2962	0.9	2.4	6.2	12.2	23.0	45.8	9.5
0.5 0.5 0.7 1.0	2.3000	0.0	3.8	3.8	15.0	22.5	46.3	8.8
0.5 0.7 0.7 0.8	2.3005	1.3	1.3	8.7	7.5	23.9	51.1	6.3
0.2 0.5 0.6 1.0	2.3026	0.0	0.6	6.6	16.7	23.6	42.9	9.6
0.1 0.6 0.7 0.9	2.3027	0.6	3.1	7.1	12.8	17.8	47.9	10.6
0.0 0.6 0.6 0.9	2.3030	0.8	2.2	5.4	14.0	24.3	41.8	11.5
0.1 0.3 0.7 1.0	2.3032	0.2	0.9	4.5	18.1	23.6	44.5	8.2
0.0 0.0 0.5 1.0	2.3066	0.0	0.6	3.3	19.0	26.9	41.8	8.3
0.0 0.3 0.8 0.9	2.3101	0.6	2.6	6.2	11.6	25.4	42.5	11.2
0.2 0.7 0.8 0.8	2.3153	0.5	3.0	6.3	12.6	19.6	48.2	9.8
0.0 0.3 0.6 1.0	2.3172	0.0	0.8	4.3	17.2	25.5	44.1	8.1
0.0 0.4 0.6 1.0	2.3183	0.1	1.1	4.9	15.5	27.2	41.7	9.5
0.0 0.0 0.0 1.0	2.3196	0.0	0.0	3.7	18.0	28.9	41.5	7.9
0.0 0.2 0.6 1.0	2.3203	0.3	0.4	4.1	18.1	24.3	45.0	7.8
0.6 0.6 0.6 1.0	2.3220	0.0	1.1	5.6	16.1	23.4	44.9	8.9
0.1 0.1 0.8 0.9	2.3247	0.5	1.8	7.0	11.6	24.9	42.6	11.6
0.4 0.7 0.8 0.8	2.3260	0.0	5.3	4.5	11.8	20.2	46.5	11.6
0.5 0.7 0.8 0.8	2.3275	0.9	2.7	5.9	13.0	18.5	49.1	10.0
0.1 0.7 0.8 0.8	2.3313	0.9	2.7	5.9	14.4	15.7	50.0	10.4
0.2 0.7 0.7 0.9	2.3372	0.4	2.5	5.8	13.6	19.3	48.8	9.6
0.5 0.6 0.8 0.8	2.3375	0.0	3.8	5.0	16.3	15.0	48.8	11.3
0.1 0.2 0.7 1.0	2.3383	0.1	1.0	6.6	14.4	23.2	44.8	10.0
0.3 0.5 0.7 1.0	2.3387	0.4	1.3	5.2	14.8	23.9	43.9	10.4
0.4 0.6 0.7 0.9	2.3395	0.0	0.0	7.5	13.8	27.3	40.2	11.3
0.0 0.0 0.7 0.9	2.3426	0.8	2.0	5.0	12.7	23.5	46.2	9.9
0.0 0.6 0.8 0.8	2.3427	0.6	2.6	6.8	13.3	15.7	50.5	10.4
0.4 0.6 0.6 0.9	2.3460	0.1	1.0	6.0	15.2	21.7	47.2	8.9
0.2 0.6 0.8 0.9	2.3462	0.7	2.6	5.0	13.4	19.2	49.5	9.6
0.0 0.4 0.8 0.9	2.3468	0.6	2.2	5.5	12.7	22.6	45.3	11.1
0.0 0.5 0.6 1.0	2.3474	0.0	1.2	5.1	15.5	25.0	42.2	11.0
0.4 0.5 0.7 1.0	2.3500	0.0	1.1	6.7	14.4	23.4	42.7	11.7
0.3 0.3 0.9 0.9	2.3524	0.8	1.2	3.6	15.6	22.4	48.1	8.3
0.7 0.7 0.7 0.8	2.3550	0.7	1.5	5.8	10.7	22.8	52.2	6.4
0.2 0.6 0.6 1.0	2.3557	0.0	0.8	6.1	14.6	23.8	44.2	10.4
0.3 0.4 0.9 0.9	2.3595	1.5	1.0	5.4	11.4	23.9	46.6	10.2
0.1 0.5 0.8 0.9	2.3607	0.8	1.3	5.3	12.5	24.5	45.1	10.5
0.4 0.6 0.6 1.0	2.3620	0.0	1.7	7.7	11.2	23.9	43.4	12.2
0.5 0.5 0.8 0.9	2.3625	0.0	2.5	5.0	15.0	22.5	41.3	13.8
0.2 0.3 0.9 0.9	2.3633	0.8	0.9	6.2	12.4	24.3	43.5	11.8
0.2 0.2 0.9 0.9	2.3655	0.3	1.6	6.8	10.9	25.1	43.3	11.9
0.2 0.5 0.7 1.0	2.3669	0.4	1.0	4.8	14.6	24.2	44.6	10.4
0.3 0.7 0.7 0.9	2.3670	0.0	1.1	7.6	14.8	15.7	51.5	9.3
0.4 0.5 0.8 0.9	2.3680	0.0	2.4	5.0	13.6	22.6	45.1	11.3
0.0 0.3 0.7 1.0	2.3683	0.2	0.5	4.2	16.9	22.6	46.8	8.7

Spy Ratings	Average Score	Percentage of Outcome						
		-2	-1	0	1	2	3	4
0.1 0.3 0.9 0.9	2.3696	0.5	1.5	7.2	11.0	23.4	43.8	12.6
0.0 0.1 0.6 1.0	2.3716	0.1	1.1	4.5	17.3	20.2	46.7	10.2
0.4 0.4 0.8 1.0	2.3750	0.0	3.8	3.8	12.5	22.5	46.3	11.3
0.0 0.1 0.8 0.9	2.3763	0.8	1.9	6.0	10.7	23.3	45.0	12.2
0.4 0.8 0.8 0.8	2.3775	0.0	1.3	7.4	13.8	18.5	47.8	11.3
0.0 0.6 0.7 0.9	2.3797	0.5	3.1	4.7	13.5	18.5	47.5	12.3
0.1 0.5 0.7 1.0	2.3844	0.0	1.3	5.2	14.2	22.8	45.7	10.7
0.5 0.8 0.8 0.8	2.3875	0.0	2.1	8.0	10.8	16.1	54.4	8.6
0.4 0.6 0.8 0.8	2.3875	1.3	2.5	6.3	11.3	16.4	49.9	12.5
0.0 0.5 0.8 0.9	2.3894	0.8	1.9	5.1	10.4	25.0	45.2	11.6
0.3 0.6 0.7 1.0	2.3900	0.0	1.1	4.5	15.6	22.1	46.8	10.0
0.1 0.6 0.6 1.0	2.3900	0.2	1.2	6.0	13.5	22.8	44.1	12.3
0.1 0.4 0.9 0.9	2.3916	0.7	1.3	5.8	11.7	23.4	44.9	12.2
0.2 0.8 0.8 0.8	2.3940	0.5	1.9	5.9	11.8	19.4	50.0	10.4
0.2 0.4 0.9 0.9	2.3956	0.9	0.9	4.6	12.8	23.6	47.1	10.2
0.1 0.4 0.7 1.0	2.4015	0.2	0.7	4.4	14.7	23.8	46.3	10.0
0.3 0.8 0.8 0.8	2.4025	0.0	2.6	7.2	12.8	12.5	53.9	10.8
0.1 0.2 0.9 0.9	2.4032	0.2	1.6	7.1	9.2	24.8	44.4	12.6
0.2 0.3 0.8 1.0	2.4040	0.2	0.9	3.1	15.3	24.6	46.6	9.4
0.1 0.7 0.7 0.9	2.4052	0.3	1.9	6.3	12.8	16.7	50.8	11.1
0.2 0.2 0.8 1.0	2.4105	0.4	1.8	5.0	10.9	24.4	46.3	11.2
0.0 0.7 0.8 0.8	2.4115	0.5	2.7	5.6	11.2	16.9	52.3	10.8
0.6 0.7 0.7 1.0	2.4125	0.0	0.0	11.2	10.1	15.1	53.8	9.9
0.1 0.6 0.8 0.9	2.4128	0.4	2.0	5.8	12.6	17.3	50.6	11.3
0.3 0.7 0.7 1.0	2.4130	0.0	1.2	4.0	17.4	17.3	50.0	10.1
0.1 0.1 0.9 0.9	2.4142	0.6	1.5	6.0	10.2	24.3	44.3	13.1
0.3 0.7 0.8 0.8	2.4180	0.0	1.1	7.8	10.1	21.8	47.4	11.8
0.1 0.8 0.8 0.8	2.4185	0.7	1.0	5.7	13.0	16.1	55.1	8.4
0.1 0.1 0.7 1.0	2.4225	0.2	1.0	4.8	13.0	23.9	45.8	11.3
0.4 0.7 0.7 1.0	2.4235	0.0	0.1	8.3	13.7	15.3	52.6	10.1
0.0 0.3 0.9 0.9	2.4244	0.4	1.4	6.3	10.3	23.8	44.4	13.3
0.0 0.0 0.6 1.0	2.4256	0.0	0.3	4.0	15.8	21.7	48.1	9.8
0.1 0.3 0.8 1.0	2.4260	0.2	0.7	4.7	13.2	24.3	45.9	11.0
0.4 0.4 0.8 0.9	2.4320	0.0	2.5	2.6	12.6	24.9	46.2	11.2
0.8 0.8 0.8 0.8	2.4320	3.4	1.7	3.4	11.7	11.7	56.6	11.7
0.3 0.3 0.8 1.0	2.4323	0.3	0.6	3.0	14.1	24.2	49.0	8.7
0.0 0.2 0.7 1.0	2.4331	0.0	0.9	4.5	14.3	22.4	45.8	12.0
0.3 0.5 0.9 0.9	2.4349	0.9	1.0	4.8	10.4	24.4	47.2	11.3
0.0 0.5 0.7 1.0	2.4363	0.0	1.2	4.4	12.3	24.8	45.9	11.3
0.0 0.6 0.6 1.0	2.4364	0.0	1.3	5.2	11.7	23.8	45.9	12.0
0.4 0.7 0.7 0.9	2.4375	0.0	3.8	2.5	10.0	23.8	50.0	10.0
0.3 0.4 0.8 1.0	2.4412	0.5	0.5	3.3	13.4	24.3	47.9	10.1
0.7 0.7 0.8 0.8	2.4440	1.4	0.5	8.6	8.0	16.7	52.4	12.3
0.2 0.5 0.9 0.9	2.4449	0.9	1.4	3.6	10.3	25.0	47.9	11.0
0.5 0.7 0.7 0.9	2.4475	0.0	2.5	6.3	7.4	22.6	50.0	11.2

Spy Ratings	Average Score	Percentage of Outcome						
		-2	-1	0	1	2	3	4
0.1 0.5 0.9 0.9	2.4488	0.6	1.2	4.8	9.6	24.5	48.5	10.8
0.6 0.7 0.7 0.9	2.4495	1.3	0.0	6.3	7.5	26.2	47.5	11.3
0.4 0.6 0.7 0.8	2.4500	0.0	2.5	2.5	13.8	25.0	41.3	15.0
0.6 0.6 0.8 0.8	2.4505	0.0	0.0	10.0	6.3	23.8	48.8	11.3
0.0 0.4 0.9 0.9	2.4519	0.3	1.4	5.7	9.5	25.6	43.7	13.8
0.1 0.6 0.7 1.0	2.4570	0.4	1.2	4.3	13.2	19.8	49.8	11.4
0.0 0.4 0.7 1.0	2.4575	0.3	1.1	3.0	13.2	24.4	46.9	11.1
0.3 0.6 0.8 0.9	2.4600	0.0	3.0	4.0	8.0	24.0	51.0	10.0
0.4 0.7 0.7 0.8	2.4625	0.0	2.5	5.0	8.8	23.8	47.5	12.5
0.0 0.0 0.8 0.9	2.4638	0.8	1.6	4.9	8.4	25.1	45.6	13.5
0.2 0.7 0.8 0.9	2.4649	0.6	1.7	5.4	11.3	16.5	52.6	11.8
0.5 0.6 0.7 0.8	2.4665	0.0	3.7	1.7	11.4	21.6	50.6	11.0
0.0 0.7 0.7 0.9	2.4669	0.2	2.6	4.7	12.4	14.9	53.0	12.1
0.6 0.6 0.7 1.0	2.4670	0.0	0.0	3.8	13.6	25.0	47.5	10.2
0.0 0.4 0.8 1.0	2.4681	0.3	1.1	3.3	12.1	24.9	46.6	11.7
0.1 0.1 0.8 1.0	2.4687	0.3	1.0	5.6	10.6	23.2	46.1	13.3
0.1 0.2 0.8 1.0	2.4695	0.3	0.9	4.3	12.3	22.7	47.4	12.1
0.6 0.7 0.8 0.8	2.4715	0.7	0.7	7.2	8.6	19.1	52.2	11.5
0.2 0.4 0.8 1.0	2.4716	0.3	0.9	3.7	11.7	24.8	47.4	11.3
0.3 0.5 0.8 1.0	2.4741	0.5	1.0	3.7	10.9	24.7	47.7	11.6
0.2 0.6 0.7 1.0	2.4747	0.3	0.8	4.3	12.8	21.4	48.5	11.9
0.0 0.8 0.8 0.8	2.4775	0.8	1.8	0.3	2.6	4.6	71.9	18.0
0.0 0.1 0.7 1.0	2.4787	0.3	1.1	3.7	11.6	22.8	49.3	11.1
0.2 0.3 0.9 1.0	2.4788	0.1	0.5	5.6	11.7	22.6	46.2	13.3
0.5 0.6 0.8 0.9	2.4800	0.7	0.7	7.1	7.8	20.0	52.1	11.5
0.0 0.2 0.9 0.9	2.4808	0.3	1.2	5.8	8.8	24.1	46.6	13.2
0.1 0.4 0.8 1.0	2.4843	0.0	0.8	3.5	13.4	22.3	48.6	11.4
0.0 0.3 0.8 1.0	2.4884	0.2	0.8	4.4	12.3	22.0	47.4	12.9
0.0 0.2 0.8 1.0	2.4928	0.2	1.0	5.5	9.3	23.8	47.1	13.1
0.2 0.7 0.7 1.0	2.4986	0.2	1.1	5.0	11.7	18.1	52.4	11.6
0.0 0.5 0.9 0.9	2.4993	0.5	1.3	4.5	9.0	24.1	48.0	12.8
0.4 0.6 0.7 1.0	2.5000	0.0	0.0	6.3	12.5	20.0	47.5	13.8
0.5 0.6 0.7 1.0	2.5005	0.0	0.0	5.0	11.3	26.1	43.9	13.8
0.2 0.5 0.8 1.0	2.5065	0.5	0.5	3.0	11.0	24.9	48.5	11.4
0.2 0.6 0.9 0.9	2.5078	0.2	1.4	4.4	11.3	18.6	52.3	11.8
0.0 0.0 0.7 1.0	2.5083	0.0	0.7	3.8	12.1	22.1	49.5	11.7
0.5 0.7 0.8 0.9	2.5130	1.4	0.7	4.5	11.3	15.7	53.5	12.8
0.0 0.6 0.8 0.9	2.5191	0.3	2.1	3.8	12.1	15.5	53.4	12.8
0.3 0.3 0.9 1.0	2.5202	0.2	0.4	1.4	13.5	23.9	51.0	9.7
0.4 0.5 0.8 1.0	2.5210	0.0	3.8	2.5	8.9	22.4	47.4	14.9
0.7 0.7 0.7 0.9	2.5215	0.0	0.0	6.0	10.4	20.0	52.6	11.0
0.1 0.7 0.8 0.9	2.5224	0.4	1.7	4.8	11.2	14.9	54.7	12.4
0.4 0.5 0.9 0.9	2.5260	0.0	0.0	5.0	8.8	23.7	53.8	8.8
0.1 0.5 0.8 1.0	2.5347	0.3	1.0	3.9	9.2	23.8	49.1	12.7
0.5 0.5 0.9 0.9	2.5355	0.0	1.3	5.0	12.6	16.4	49.9	15.0
0.0 0.6 0.7 1.0	2.5372	0.0	1.1	4.6	11.4	17.4	52.7	12.7
0.4 0.6 0.8 0.9	2.5420	1.3	0.0	2.5	11.2	23.6	47.9	13.7

Spy Ratings	Average Score	Percentage of Outcome						
		-2	-1	0	1	2	3	4
0.3 0.4 0.9 1.0	2.5421	0.3	0.3	3.1	10.6	24.4	49.6	11.7
0.0 0.7 0.8 0.9	2.5483	0.4	1.7	4.7	10.3	14.6	55.6	12.8
0.1 0.7 0.7 1.0	2.5485	0.2	1.1	4.3	11.2	17.0	53.5	12.7
0.4 0.8 0.8 0.9	2.5490	0.0	1.4	7.2	7.1	16.4	54.9	12.9
0.7 0.8 0.8 0.9	2.5500	0.0	0.0	6.7	8.4	18.3	56.7	10.0
0.4 0.4 0.9 0.9	2.5505	0.0	1.3	5.0	7.4	23.8	48.8	13.8
0.1 0.3 0.9 1.0	2.5545	0.0	0.7	5.1	8.4	24.5	46.9	14.5
0.1 0.2 0.9 1.0	2.5579	0.0	0.5	5.0	9.0	23.3	47.6	14.5
0.7 0.7 0.8 0.9	2.5590	0.0	0.0	5.0	12.3	17.2	52.3	13.2
0.4 0.7 0.8 1.0	2.5600	0.0	0.0	7.7	10.0	13.7	55.8	12.8
0.2 0.6 0.8 1.0	2.5609	0.0	0.9	3.1	12.1	18.8	52.7	12.4
0.2 0.8 0.8 0.9	2.5615	0.4	1.8	4.3	9.8	15.1	55.5	13.1
0.2 0.2 0.9 1.0	2.5642	0.2	0.4	4.8	9.6	22.3	47.8	14.9
0.0 0.1 0.8 1.0	2.5644	0.3	0.7	4.2	8.6	22.7	50.0	13.5
0.6 0.6 0.8 0.9	2.5660	0.0	0.0	5.5	8.6	22.0	51.6	12.3
0.1 0.6 0.9 0.9	2.5661	0.4	1.3	3.9	11.4	13.9	56.7	12.3
0.0 0.1 0.9 0.9	2.5704	0.2	1.5	4.5	7.4	23.5	47.4	15.6
0.5 0.7 0.7 1.0	2.5750	0.0	0.0	6.3	10.0	16.3	55.0	12.5
0.3 0.6 0.8 1.0	2.5750	0.0	3.8	2.5	6.3	23.8	47.5	16.3
0.6 0.8 0.8 0.9	2.5770	0.0	0.0	8.0	8.3	11.9	61.3	10.4
0.6 0.8 0.8 0.8	2.5785	0.0	0.0	7.5	6.6	17.9	56.5	11.5
0.1 0.4 0.9 1.0	2.5787	0.0	0.7	4.3	8.6	24.0	47.5	14.9
0.2 0.4 0.9 1.0	2.5820	0.2	0.4	2.9	10.0	23.2	50.6	12.7
0.0 0.5 0.8 1.0	2.5834	0.2	0.5	3.6	8.4	24.0	50.0	13.3
0.5 0.5 0.8 1.0	2.5875	0.0	1.3	2.5	8.8	26.3	46.3	15.0
0.7 0.7 0.7 1.0	2.5875	0.0	1.7	5.0	5.0	24.9	48.4	15.0
0.0 0.0 0.9 0.9	2.5891	0.2	1.2	4.9	6.5	22.6	49.5	15.0
0.1 0.6 0.8 1.0	2.5948	0.0	1.0	3.5	11.6	15.6	55.2	13.1
0.7 0.8 0.8 0.8	2.5995	0.0	0.3	5.1	8.3	16.9	59.3	10.1
0.1 0.8 0.8 0.9	2.6014	0.3	1.8	3.6	9.6	14.8	56.2	13.7
0.3 0.3 1.0 1.0	2.6027	0.0	0.0	4.2	9.6	21.9	50.4	13.9
0.0 0.4 0.9 1.0	2.6049	0.0	0.5	3.8	8.6	24.2	47.0	15.8
0.1 0.1 0.9 1.0	2.6061	0.2	0.6	4.2	8.3	21.8	49.8	15.1
0.4 0.6 0.8 1.0	2.6075	0.0	3.6	1.3	8.6	18.9	52.5	15.1
0.2 0.3 1.0 1.0	2.6099	0.0	0.0	5.5	6.9	23.1	50.0	14.4
0.1 0.7 0.9 0.9	2.6175	0.2	1.1	4.6	9.8	12.8	58.0	13.5
0.4 0.7 0.8 0.9	2.6215	0.0	2.1	2.2	12.0	12.3	57.9	13.5
0.0 0.2 0.9 1.0	2.6231	0.0	0.6	4.0	7.7	22.6	50.5	14.7
0.3 0.7 0.8 1.0	2.6250	0.0	1.3	2.5	10.0	18.8	53.8	13.8
0.0 0.0 0.8 1.0	2.6262	0.2	0.7	3.8	7.2	23.0	50.0	15.2
0.2 0.7 0.9 0.9	2.6284	0.1	1.4	3.7	9.0	16.1	55.7	14.1
0.5 0.8 0.8 0.9	2.6300	0.0	0.0	6.5	9.0	13.0	58.0	13.5
0.2 0.5 0.9 1.0	2.6309	0.2	0.5	2.4	8.2	24.0	51.5	13.3
0.2 0.7 0.8 1.0	2.6318	0.0	1.0	3.5	10.0	15.7	56.0	13.7
0.1 0.5 0.9 1.0	2.6324	0.0	0.5	2.5	8.0	24.5	50.8	13.6
0.3 0.8 0.8 0.9	2.6345	0.0	1.3	2.6	12.5	12.4	57.5	13.7
0.0 0.3 0.9 1.0	2.6392	0.0	0.7	3.7	7.2	23.3	49.3	15.7

Spy Ratings	Average Score	Percentage of Outcome						
		-2	-1	0	1	2	3	4
0.0 0.6 0.9 0.9	2.6398	0.4	1.2	3.8	9.2	13.0	59.2	13.3
0.0 0.6 0.8 1.0	2.6546	0.0	1.0	4.1	8.5	14.6	58.3	13.4
0.4 0.5 0.9 1.0	2.6560	0.0	0.0	3.3	6.7	24.5	52.1	13.4
0.0 0.7 0.7 1.0	2.6580	0.0	1.0	4.2	8.4	14.2	58.7	13.5
0.1 0.7 0.8 1.0	2.6594	0.0	0.7	2.9	10.7	14.2	58.6	13.0
0.6 0.7 0.8 0.9	2.6595	0.0	0.0	2.1	10.7	18.5	56.5	12.2
0.4 0.4 0.9 1.0	2.6625	0.0	0.0	3.0	6.9	23.8	53.1	13.1
0.2 0.4 1.0 1.0	2.6633	0.0	0.0	3.6	7.6	22.9	50.4	15.4
0.0 0.5 0.9 1.0	2.6705	0.0	0.6	3.5	5.1	23.9	52.3	14.5
0.5 0.6 0.8 1.0	2.6745	0.0	0.7	3.5	8.6	15.7	58.0	13.6
0.2 0.2 1.0 1.0	2.6749	0.0	0.0	4.2	5.9	22.9	52.1	14.9
0.4 0.6 0.9 0.9	2.6760	0.0	0.0	3.7	5.9	22.3	55.5	12.7
0.1 0.2 1.0 1.0	2.6762	0.0	0.0	3.6	7.9	21.2	52.0	15.3
0.6 0.7 0.9 0.9	2.6850	1.7	0.0	1.7	10.0	15.1	54.9	16.7
0.3 0.5 0.9 1.0	2.6855	0.0	0.0	1.5	7.4	27.2	48.9	15.0
0.0 0.7 0.9 0.9	2.6878	0.2	1.6	3.0	8.4	11.5	61.5	13.7
0.1 0.3 1.0 1.0	2.6903	0.0	0.0	3.9	5.9	23.7	50.5	16.1
0.3 0.4 1.0 1.0	2.6915	0.0	0.0	2.9	6.1	23.9	53.1	14.0
0.4 0.6 0.9 1.0	2.6920	0.0	0.0	4.3	5.1	20.6	57.1	12.8
0.1 0.4 1.0 1.0	2.6921	0.0	0.0	3.3	7.0	23.8	49.2	16.7
0.3 0.7 0.8 0.9	2.6970	0.0	1.3	2.6	7.4	20.1	51.1	17.5
0.1 0.8 0.9 0.9	2.6975	0.3	0.9	2.9	9.3	12.0	60.8	13.9
0.5 0.7 0.8 1.0	2.6995	0.0	1.5	1.4	10.1	14.2	58.6	14.3
0.3 0.6 0.9 0.9	2.7005	0.0	0.0	3.8	7.5	18.7	55.0	15.0
0.3 0.6 0.9 1.0	2.7015	0.0	0.0	3.5	6.4	20.8	54.9	14.3
0.2 0.8 0.8 1.0	2.7038	0.0	0.8	3.1	8.9	13.8	58.8	14.6
0.6 0.7 0.8 1.0	2.7125	0.0	0.0	2.1	9.3	17.1	57.9	13.5
0.5 0.6 0.9 0.9	2.7185	0.0	0.0	2.3	7.8	19.3	57.1	13.6
0.0 0.3 1.0 1.0	2.7234	0.0	0.0	3.2	5.5	24.1	50.5	16.8
0.5 0.5 0.9 1.0	2.7235	0.0	0.0	2.7	5.5	24.9	50.4	16.4
0.6 0.6 0.9 0.9	2.7240	0.0	0.0	2.1	9.3	17.9	55.0	15.6
0.4 0.4 1.0 1.0	2.7255	0.0	0.0	3.7	3.8	23.8	53.8	15.0
0.1 0.1 1.0 1.0	2.7259	0.0	0.0	3.7	5.4	21.4	53.6	15.9
0.3 0.8 0.9 0.9	2.7275	0.0	0.0	3.7	8.7	11.3	63.8	12.5
0.2 0.6 0.9 1.0	2.7277	0.1	0.2	1.8	8.5	17.0	58.6	13.8
0.0 0.1 0.9 1.0	2.7295	0.0	0.8	2.9	4.7	22.8	52.0	16.9
0.0 0.2 1.0 1.0	2.7298	0.0	0.0	3.5	4.7	23.0	52.7	16.1
0.2 0.5 1.0 1.0	2.7302	0.0	0.0	2.4	5.8	23.0	53.9	14.9
0.0 0.0 0.9 1.0	2.7318	0.0	0.4	3.0	5.2	22.3	52.8	16.3
0.0 0.4 1.0 1.0	2.7350	0.0	0.0	2.4	7.3	22.3	50.3	17.6
0.1 0.6 0.9 1.0	2.7361	0.0	0.3	2.2	9.0	14.7	58.9	14.7
0.0 0.7 0.8 1.0	2.7388	0.0	0.8	3.0	8.5	11.6	61.2	14.9
0.3 0.5 1.0 1.0	2.7410	0.0	0.0	3.7	3.7	22.4	55.1	15.0
0.2 0.8 0.9 0.9	2.7434	0.0	1.0	3.2	7.8	10.8	62.6	14.5
0.6 0.7 0.9 1.0	2.7495	0.0	0.0	3.4	8.3	14.9	56.8	16.6
0.6 0.6 0.8 1.0	2.7585	0.0	0.0	2.9	7.1	17.1	57.4	15.7
0.7 0.7 0.8 1.0	2.7670	0.0	0.0	3.4	9.9	8.5	63.2	15.0

Spy Ratings	Average Score	Percentage of Outcome						
		-2	-1	0	1	2	3	4
0.6 0.8 0.8 1.0	2.7680	0.0	0.0	10.0	0.0	8.4	66.6	15.0
0.4 0.8 0.8 1.0	2.7685	0.0	0.7	2.3	7.9	12.2	62.7	14.3
0.1 0.5 1.0 1.0	2.7711	0.0	0.0	2.1	4.4	23.4	54.4	15.6
0.1 0.8 0.8 1.0	2.7740	0.1	0.8	2.1	7.1	13.3	61.4	15.2
0.3 0.7 0.9 0.9	2.7750	0.0	0.0	2.5	7.5	17.6	55.0	17.4
0.4 0.7 0.9 0.9	2.7805	0.5	0.0	3.0	7.4	11.1	62.5	15.5
0.0 0.6 0.9 1.0	2.7828	0.0	0.6	2.3	7.4	12.5	62.0	15.2
0.4 0.8 0.9 0.9	2.7850	0.0	0.8	2.3	8.8	8.8	64.3	14.9
0.3 0.7 0.9 1.0	2.7905	0.0	0.0	1.8	8.7	14.1	59.6	15.9
0.5 0.5 1.0 1.0	2.7925	0.0	0.0	2.9	2.0	24.6	54.0	16.6
0.5 0.8 0.8 1.0	2.7945	0.0	0.2	7.7	2.5	8.3	65.0	16.4
0.3 0.8 0.8 1.0	2.7975	0.0	0.1	3.4	6.7	11.8	62.5	15.6
0.8 0.8 0.8 0.9	2.8010	0.0	0.6	2.0	6.3	13.8	62.5	14.8
0.1 0.7 0.9 1.0	2.8049	0.1	0.0	1.2	9.0	11.7	63.1	14.8
0.1 0.9 0.9 0.9	2.8111	0.3	1.1	3.0	4.8	10.6	64.0	16.3
0.0 0.1 1.0 1.0	2.8112	0.0	0.0	2.2	4.2	21.5	54.6	17.6
0.2 0.7 0.9 1.0	2.8124	0.0	0.6	1.8	7.0	12.7	62.2	15.7
0.7 0.8 0.8 1.0	2.8170	0.0	0.0	1.7	6.7	15.0	61.7	15.0
0.0 0.5 1.0 1.0	2.8185	0.0	0.0	1.5	2.8	25.0	53.9	16.8
0.6 0.8 0.9 0.9	2.8195	0.0	0.0	0.0	13.3	9.9	58.5	18.4
0.4 0.5 1.0 1.0	2.8215	0.0	0.0	0.9	3.5	25.4	53.1	17.1
0.3 0.6 1.0 1.0	2.8220	0.0	0.0	1.8	5.5	17.4	59.5	15.9
0.0 0.0 1.0 1.0	2.8265	0.0	0.0	2.5	3.0	21.2	55.8	17.5
0.0 0.7 0.9 1.0	2.8408	0.0	0.4	2.5	6.5	10.2	64.3	16.2
0.2 0.9 0.9 0.9	2.8409	0.2	0.5	2.5	5.8	9.7	65.5	15.8
0.5 0.6 0.9 1.0	2.8410	0.0	0.0	1.5	7.0	13.6	62.0	16.1
0.0 0.9 0.9 0.9	2.8489	0.5	0.7	2.5	5.3	8.2	66.7	16.2
0.4 0.7 0.9 1.0	2.8500	0.0	0.0	2.5	7.0	11.0	62.0	17.5
0.4 0.9 0.9 0.9	2.8520	0.0	0.0	3.4	8.1	1.8	73.4	13.4
0.5 0.7 0.9 1.0	2.8570	0.0	0.0	2.2	7.1	9.9	64.4	16.4
0.2 0.6 1.0 1.0	2.8581	0.0	0.0	1.4	5.8	14.3	62.7	15.8
0.6 0.6 0.9 1.0	2.8600	0.0	0.0	2.5	5.5	12.5	62.5	17.0
0.5 0.6 1.0 1.0	2.8650	0.0	0.0	0.5	6.5	15.5	61.0	16.5
0.4 0.8 0.9 1.0	2.8690	0.0	0.0	2.3	7.2	8.2	65.8	16.5
0.7 0.8 0.9 0.9	2.8735	0.0	0.0	1.4	7.5	9.0	66.3	15.7
0.6 0.6 1.0 1.0	2.8760	0.0	0.0	2.3	3.9	15.1	61.5	17.3
0.1 0.8 0.9 1.0	2.8806	0.0	0.4	1.3	6.4	10.1	65.4	16.4
0.4 0.6 1.0 1.0	2.8835	0.0	0.0	0.0	4.9	18.4	60.0	16.7
0.1 0.6 1.0 1.0	2.8928	0.0	0.0	1.4	4.9	13.5	63.6	16.7
0.7 0.7 0.9 0.9	2.8945	0.0	0.0	0.8	5.8	13.4	63.3	16.8
0.6 0.7 1.0 1.0	2.9005	0.0	0.0	0.0	6.7	15.0	60.0	18.4
0.2 0.8 0.9 1.0	2.9042	0.0	0.4	1.7	5.1	9.6	66.2	17.0
0.5 0.7 1.0 1.0	2.9045	0.0	0.0	1.5	5.5	11.1	65.0	17.0
0.3 0.7 1.0 1.0	2.9080	0.0	0.0	0.7	6.3	11.6	64.3	17.1
0.5 0.7 0.9 0.9	2.9140	0.0	0.0	0.3	6.8	8.8	69.3	14.8
0.6 0.9 0.9 0.9	2.9170	0.0	0.0	3.3	3.3	6.9	71.5	15.0
0.5 0.9 0.9 1.0	2.9200	0.0	0.0	1.6	5.0	5.1	76.5	11.8

Spy Ratings	Average Score	Percentage of Outcome						
		-2/	-1	0	1	2	3	4
0.5 0.8 0.9 0.9	2.9320	0.0	0.0	0.0	8.4	6.7	68.3	16.7
0.4 0.8 1.0 1.0	2.9330	0.0	0.0	3.3	3.4	5.0	73.3	15.0
0.5 0.8 0.9 1.0	2.9335	0.0	0.0	0.0	8.3	6.6	68.3	16.7
0.7 0.8 0.9 1.0	2.9390	0.0	0.0	1.1	5.3	9.8	66.3	17.5
0.3 0.8 0.9 1.0	2.9400	0.0	0.0	1.0	6.0	7.5	69.0	16.5
0.0 0.6 1.0 1.0	2.9422	0.0	0.0	1.4	4.3	10.3	66.9	17.2
0.5 0.9 0.9 0.9	2.9485	0.0	0.0	1.7	1.7	13.3	66.6	16.7
0.9 0.9 0.9 0.9	2.9515	0.0	0.0	1.6	5.0	7.5	68.5	17.4
0.1 0.7 1.0 1.0	2.9589	0.0	0.0	1.3	4.4	8.8	68.2	17.3
0.3 0.9 0.9 0.9	2.9620	0.0	0.0	2.3	3.8	7.0	69.3	17.6
0.2 0.7 1.0 1.0	2.9634	0.0	0.0	0.9	3.9	10.7	67.4	17.3
0.4 0.7 1.0 1.0	2.9635	0.0	0.0	1.2	4.1	9.8	67.0	17.9
0.6 0.8 0.9 1.0	2.9670	0.0	0.0	0.0	6.7	8.3	66.7	18.4
0.8 0.8 0.9 0.9	2.9725	0.0	0.0	1.1	1.1	15.9	63.1	18.8
0.1 0.9 0.9 1.0	2.9735	0.0	0.3	1.6	4.2	6.2	70.0	17.8
0.8 0.8 0.8 1.0	2.9775	0.0	0.0	0.1	4.0	11.0	68.0	17.0
0.6 0.8 1.0 1.0	2.9815	0.0	0.0	0.0	5.1	10.1	66.6	18.3
0.3 0.9 0.9 1.0	2.9820	0.0	1.7	1.7	1.7	1.7	78.3	15.0
0.0 0.7 1.0 1.0	2.9826	0.0	0.0	0.8	4.9	7.0	69.8	17.4
0.7 0.7 0.9 1.0	2.9830	0.0	0.0	0.0	5.0	11.7	63.3	20.0
0.5 0.8 1.0 1.0	2.9845	0.0	0.0	0.0	5.0	10.0	66.7	18.4
0.3 0.8 1.0 1.0	2.9895	0.0	0.0	1.5	3.5	6.5	71.5	17.0
0.2 0.9 0.9 1.0	2.9957	0.0	0.4	1.5	3.1	5.5	71.7	17.7
0.7 0.7 1.0 1.0	2.9965	0.0	0.0	0.9	3.6	8.6	68.7	18.2
0.8 0.9 0.9 0.9	3.0005	0.0	0.0	0.2	5.7	5.4	71.4	17.3
0.8 0.8 1.0 1.0	3.0105	0.0	0.0	1.8	2.9	5.8	71.4	18.1
0.0 0.9 0.9 1.0	3.0185	0.0	0.5	0.8	3.6	4.7	72.2	18.2
0.2 0.8 1.0 1.0	3.0230	0.0	0.0	0.7	2.5	8.8	69.7	18.3
0.7 0.9 0.9 0.9	3.0365	0.0	0.0	1.2	3.3	4.3	73.1	18.1
0.1 0.8 1.0 1.0	3.0383	0.0	0.0	0.6	2.9	6.6	72.0	17.9
0.9 0.9 0.9 1.0	3.0390	0.0	0.0	1.4	1.6	7.5	70.9	18.6
0.8 0.8 0.9 1.0	3.0410	0.0	0.0	0.7	2.5	7.6	70.3	18.9
0.6 0.9 0.9 1.0	3.0825	0.0	0.0	1.2	2.4	1.5	76.9	18.1
0.8 0.9 0.9 1.0	3.0920	0.0	0.0	0.5	2.4	3.2	75.2	18.7
0.4 0.9 0.9 1.0	3.0940	0.0	0.0	1.7	0.1	3.5	76.4	18.3
0.1 0.9 1.0 1.0	3.1191	0.0	0.0	0.4	1.1	4.0	75.5	19.1
0.2 0.9 1.0 1.0	3.1274	0.0	0.0	0.3	1.5	2.6	76.4	19.2
0.0 0.9 1.0 1.0	3.1385	0.0	0.0	0.3	1.1	2.4	77.0	19.2
0.9 0.9 1.0 1.0	3.1390	0.0	0.0	0.5	0.6	2.7	76.7	19.4
0.3 0.9 1.0 1.0	3.1515	0.0	0.0	0.0	1.6	1.7	76.8	20.0
0.4 0.9 1.0 1.0	3.1570	0.0	0.0	0.3	1.1	1.0	78.0	19.7
0.7 0.9 0.9 1.0	3.1690	0.0	0.0	0.0	1.1	1.0	78.0	20.0
0.7 0.9 1.0 1.0	3.1785	0.0	0.0	0.0	0.7	0.9	78.5	20.0
0.7 0.8 1.0 1.0	3.1800	0.0	0.0	0.0	0.0	2.0	78.0	20.0
0.8 0.9 1.0 1.0	3.1880	0.0	0.0	0.3	0.0	0.0	80.0	19.7
0.6 0.9 1.0 1.0	3.1920	0.0	0.0	0.0	0.0	0.8	79.2	20.0
0.5 0.9 1.0 1.0	3.1955	0.0	0.0	0.0	0.0	0.5	79.5	20.0

Spy Ratings	Average Score	Percentage of Outcome						
		-2	-1	0	1	2	3	4
0.0 1.0 1.0 1.0	3.2000	0.0	0.0	0.0	0.0	0.0	80.0	20.0
0.1 1.0 1.0 1.0	3.2000	0.0	0.0	0.0	0.0	0.0	80.0	20.0
0.2 1.0 1.0 1.0	3.2000	0.0	0.0	0.0	0.0	0.0	80.0	20.0
0.3 1.0 1.0 1.0	3.2000	0.0	0.0	0.0	0.0	0.0	80.0	20.0
0.4 1.0 1.0 1.0	3.2000	0.0	0.0	0.0	0.0	0.0	80.0	20.0
0.5 1.0 1.0 1.0	3.2000	0.0	0.0	0.0	0.0	0.0	80.0	20.0
0.6 1.0 1.0 1.0	3.2000	0.0	0.0	0.0	0.0	0.0	80.0	20.0
0.7 1.0 1.0 1.0	3.2000	0.0	0.0	0.0	0.0	0.0	80.0	20.0
0.8 1.0 1.0 1.0	3.2000	0.0	0.0	0.0	0.0	0.0	80.0	20.0
0.9 1.0 1.0 1.0	3.2000	0.0	0.0	0.0	0.0	0.0	80.0	20.0

Vita

Peter Andrew Macpherson was born July 13, 1964 in Sydney Australia. He is the son of Margaret and Alistair Macpherson. In 1986 he received a Bachelor of Science degree from the Pennsylvania State University in Computer Science.