

# 2005 Men's NCAA Basketball Tournament

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May 16, 2005

# Chapter 1

## Introduction

This report concerns the 2005 Men's NCAA Division I Basketball Tournament. We (the authors) applied techniques of our paper "Optimal Strategies for Sports Betting Pools" (Clair-Letscher, 2005).

We entered two large online pools, ESPN's Tournament Challenge and Yahoo's Tournament Pick'em. The pools are free. ESPN scoring is 10,20,40,80,120,160. Yahoo scoring is 1,2,4,8,16,32. For ESPN, we estimated that the pool had 5,000,000 entrants. For Yahoo, we estimated 1,000,000 entries. These values were used for all computations. The actual number of competitors were never published, but from the percentile rankings of our pathetic scores along the way, we found about 3 million entrants for ESPN and 1 million for Yahoo.

For inputs to our algorithms, we require perceived and actual data. The perceived data came from Yahoo. For actual data, we used computer rankings by Kenneth Massey ([www.mratings.com](http://www.mratings.com)) and by Jeff Sagarin ([www.usatoday.com/sports/sagarin.htm](http://www.usatoday.com/sports/sagarin.htm)). We also used past results of seed-vs-seed matchups from NCAA history.

The Yahoo data was not available for the women's tournament because Yahoo has no women's Pick'em game, so we did not enter any women's tournament pools.

## Chapter 2

# Opponent Perceptions

We had data available from Yahoo, which published the percentage of players picking each team to reach each round,  $P(i \rightarrow r)$ , for all  $i$  and  $r$  (see Table 2.3). Note that this data is not the data we used to make the picks. Our values were taken on Wednesday, and display some slight differences from the data shown here. All perceived values in this report use Yahoo’s round-by-round pick data.

Also available was ESPN’s “National Bracket” which is somehow a consensus bracket based on player picks, and most likely represents simply a selection of 63 head-to-head probabilities. We did not use the ESPN information.

To compute means, sd’s and covariances,  $P(i \rightarrow r)$  is enough for all but the opponent score sd. For this, we computed approximate head-to-head perceived probabilities for each pair of teams. We used the formula:

$$P(i \text{ beats } j) = \frac{1}{2} + \frac{1}{2} \left( \frac{P(i \rightarrow r)}{P(i \rightarrow r - 1)} - \frac{P(j \rightarrow r)}{P(j \rightarrow r - 1)} \right) \quad (2.1)$$

for teams  $i$  and  $j$  which meet in round  $r$ . Note that this gives the known correct value for teams that meet in round 1.

We also show, in Tables 2.1 and 2.2, some statistics on opponent scores as predicted by our model with various choices for actual probabilities.

Table 2.1: Opponent Statistics, ESPN Scoring

|                                 | Massey  | Sagarin | History |
|---------------------------------|---------|---------|---------|
| opponent score mean             | 798.787 | 794.583 | 684.718 |
| opponent score s.d.             | 189.202 | 191.103 | 178.156 |
| correlation between 2 opponents | 0.322   | 0.310   | 0.370   |

Table 2.2: Opponent Statistics, Yahoo Scoring

|                                 | Massey | Sagarin | History |
|---------------------------------|--------|---------|---------|
| opponent score mean             | 84.934 | 84.530  | 71.591  |
| opponent score s.d.             | 24.934 | 25.113  | 22.531  |
| correlation between 2 opponents | 0.291  | 0.277   | 0.335   |

Table 2.3: Final Winround Data from Yahoo Pick'em Men's NCAA 2005

|                  | First Round | Sweet 16 | Elite 8 | Final Four | Semis | Champ |
|------------------|-------------|----------|---------|------------|-------|-------|
| Illinois         | 99.7        | 97.5     | 91.8    | 67         | 54.7  | 31.5  |
| North Carolina   | 99.2        | 97.7     | 86.8    | 68.2       | 51    | 30.6  |
| Duke             | 99.2        | 97       | 63.5    | 47.3       | 19.8  | 10    |
| Wake Forest      | 99          | 93.7     | 73      | 52.2       | 15    | 5.2   |
| Oklahoma St.     | 99.3        | 95.1     | 61.2    | 20.9       | 12.9  | 4.5   |
| Connecticut      | 98.7        | 87.9     | 49.4    | 14.1       | 6.6   | 2.5   |
| Syracuse         | 94.8        | 76.4     | 31.2    | 22.9       | 6.2   | 2.5   |
| Kentucky         | 98.8        | 89.3     | 58.4    | 18.2       | 5.6   | 2.4   |
| Kansas           | 98.2        | 81.1     | 42.7    | 10.5       | 5.2   | 2.3   |
| Arizona          | 95.9        | 77.9     | 33.4    | 8.7        | 4.8   | 1.6   |
| Louisville       | 96.8        | 51.2     | 37.5    | 15.3       | 3.7   | 1.2   |
| Georgia Tech     | 91.5        | 47       | 32.6    | 10.2       | 2.6   | 0.9   |
| Washington       | 99          | 75.4     | 25.6    | 8.9        | 2     | 0.9   |
| Gonzaga          | 97.8        | 69.7     | 20.2    | 10.2       | 2     | 0.7   |
| Florida          | 92.7        | 59.1     | 8.5     | 4.1        | 1.7   | 0.6   |
| Oklahoma         | 96.3        | 74.2     | 31.4    | 7.6        | 1.8   | 0.5   |
| Boston Coll.     | 91.2        | 52.6     | 4.2     | 1.5        | 0.7   | 0.3   |
| Michigan St.     | 82.8        | 20.2     | 3.8     | 1.6        | 0.5   | 0.3   |
| Villanova        | 77.2        | 34.1     | 3       | 1          | 0.3   | 0.1   |
| Texas Tech       | 76.4        | 25.3     | 3.7     | 1.1        | 0.2   | 0.1   |
| Utah             | 76          | 21.4     | 6       | 0.8        | 0.2   | 0.1   |
| Pittsburgh       | 66.7        | 18.3     | 2.9     | 0.7        | 0.2   | 0.1   |
| Wisconsin        | 89.9        | 17.4     | 4.2     | 0.6        | 0.2   | 0.1   |
| LSU              | 71.2        | 17.5     | 3.8     | 0.6        | 0.2   | 0.1   |
| Alabama          | 80          | 40.6     | 2.4     | 0.5        | 0.2   | 0.1   |
| UCLA             | 23.2        | 4.3      | 0.9     | 0.4        | 0.2   | 0.1   |
| Texas            | 57.2        | 1.8      | 1       | 0.3        | 0.2   | 0.1   |
| N.C. State       | 71.4        | 8.9      | 2.4     | 0.4        | 0.1   | 0.1   |
| West Virginia    | 62.7        | 4.5      | 1.6     | 0.4        | 0.1   | 0     |
| Cincinnati       | 52.1        | 5.9      | 2       | 0.3        | 0.1   | 0     |
| Iowa             | 47.2        | 4        | 1       | 0.2        | 0.1   | 0     |
| Stanford         | 47.8        | 1.4      | 0.5     | 0.2        | 0.1   | 0     |
| Minnesota        | 46.3        | 0.8      | 0.3     | 0.1        | 0.1   | 0     |
| Pacific          | 32.8        | 5.8      | 0.7     | 0.1        | 0     | 0     |
| Southern Ill.    | 56          | 2.9      | 0.6     | 0.1        | 0     | 0     |
| Charlotte        | 28.1        | 2.4      | 0.6     | 0.1        | 0     | 0     |
| UTEP             | 23.4        | 2.9      | 0.4     | 0.1        | 0     | 0     |
| UTAB             | 28.6        | 3        | 0.3     | 0.1        | 0     | 0     |
| St. Mary's       | 43.8        | 1.6      | 0.3     | 0.1        | 0     | 0     |
| Geo. Washington  | 8.1         | 1        | 0.3     | 0.1        | 0     | 0     |
| Iowa St.         | 53.1        | 0.9      | 0.3     | 0.1        | 0     | 0     |
| New Mexico       | 22.2        | 4.6      | 0.2     | 0.1        | 0     | 0     |
| Pennsylvania     | 8.7         | 1.8      | 0.2     | 0.1        | 0     | 0     |
| Vermont          | 4.6         | 1.8      | 0.2     | 0.1        | 0     | 0     |
| Ohio             | 6.8         | 1.7      | 0.2     | 0.1        | 0     | 0     |
| Utah St.         | 4           | 1.4      | 0.2     | 0.1        | 0     | 0     |
| Creighton        | 36.9        | 1.2      | 0.2     | 0.1        | 0     | 0     |
| Mississippi St.  | 51.6        | 0.9      | 0.2     | 0.1        | 0     | 0     |
| Nevada           | 42.7        | 0.6      | 0.2     | 0.1        | 0     | 0     |
| Old Dominion     | 16.6        | 1        | 0.1     | 0.1        | 0     | 0     |
| Oakland          | 0.3         | 0.2      | 0.1     | 0.1        | 0     | 0     |
| Niagara          | 3.1         | 0.9      | 0.2     | 0          | 0     | 0     |
| Wisc. Milwaukee  | 19.9        | 4.9      | 0.1     | 0          | 0     | 0     |
| Northern Iowa    | 9.5         | 0.6      | 0.1     | 0          | 0     | 0     |
| LA Lafayette     | 2.9         | 0.5      | 0.1     | 0          | 0     | 0     |
| Bucknell         | 1.2         | 0.4      | 0.1     | 0          | 0     | 0     |
| Winthrop         | 1.8         | 0.3      | 0.1     | 0          | 0     | 0     |
| UCF              | 0.8         | 0.3      | 0.1     | 0          | 0     | 0     |
| SE Louisiana     | 0.7         | 0.3      | 0.1     | 0          | 0     | 0     |
| Chattanooga      | 0.6         | 0.2      | 0.1     | 0          | 0     | 0     |
| Eastern Kentucky | 0.6         | 0.2      | 0.1     | 0          | 0     | 0     |
| Montana          | 0.6         | 0.2      | 0.1     | 0          | 0     | 0     |
| Delaware St.     | 0.2         | 0.1      | 0.1     | 0          | 0     | 0     |
| Fair. Dickinson  | 0.2         | 0.1      | 0.1     | 0          | 0     | 0     |

## Chapter 3

# Massey Ratings

One source of actual probabilities was Kenneth Massey's computer ratings, shown in Table 3.1.

Table 3.1: Massey 2005 Pre-tournament Power Rankings

|                |       |                 |       |                  |       |
|----------------|-------|-----------------|-------|------------------|-------|
| Illinois       | 6.872 | Texas Tech      | 5.367 | Northern Iowa    | 4.885 |
| Washington     | 6.386 | Utah            | 5.366 | UTEP             | 4.842 |
| UNC            | 6.342 | Georgia Tech    | 5.326 | Old Dominion     | 4.789 |
| Wake Forest    | 6.287 | Cincinnati      | 5.325 | UW Milwaukee     | 4.768 |
| Duke           | 6.186 | Pacific         | 5.312 | UAB              | 4.756 |
| Arizona        | 6.084 | UCLA            | 5.31  | Geo. Washington  | 4.707 |
| Kansas         | 6.052 | Iowa            | 5.2   | Ohio             | 4.667 |
| Oklahoma St.   | 6.034 | Pittsburgh      | 5.194 | Vermont          | 4.666 |
| Kentucky       | 5.979 | Stanford        | 5.189 | LA Lafayette     | 4.562 |
| Gonzaga        | 5.938 | West Virginia   | 5.181 | Utah St.         | 4.527 |
| Boston College | 5.918 | LSU             | 5.172 | Winthrop         | 4.193 |
| Louisville     | 5.807 | Texas           | 5.155 | Penn             | 4.191 |
| Oklahoma       | 5.795 | Mississippi St. | 5.096 | Bucknell         | 4.02  |
| Syracuse       | 5.767 | Minnesota       | 5.086 | Central Florida  | 3.787 |
| Connecticut    | 5.7   | Saint Mary's    | 5.073 | E. Kentucky      | 3.756 |
| Wisconsin      | 5.644 | NC State        | 5.016 | Niagara          | 3.686 |
| Michigan St.   | 5.608 | Charlotte       | 4.996 | SE Louisiana     | 3.676 |
| Alabama        | 5.591 | New Mexico      | 4.966 | Chattanooga      | 3.605 |
| Villanova      | 5.495 | Iowa St.        | 4.954 | Montaan          | 3.367 |
| Florida        | 5.491 | Nevada          | 4.919 | Delaware F.      | 3.26  |
| So. Illinois   | 5.403 | Creighton       | 4.915 | Fair. Dickinson  | 3.081 |
|                |       |                 |       | Oakland/Ala. A&M | 2.807 |

### 3.1 Massey Favorites



With ESPN scoring, 5,000,000 competitors:  
 expected return: 22.1054  
 actual probability: 3.35495e-09  
 actual mean: 1007.9  
 actual standard deviation: 209.09  
 correlation with opponents: 0.482531

With Yahoo scoring, 1,000,000 competitors:  
 expected return: 35.2801  
 actual probability: 3.35495e-09  
 actual mean: 110.296  
 actual standard deviation: 28.9863  
 correlation with opponents: 0.462957

### 3.2 Massey for ESPN



Using Massey actuals:  
 expected return: 902.021  
 actual probability: 1.91426e-10  
 actual mean: 822.872  
 actual standard deviation: 176.881  
 correlation with opponents: -0.061572

### 3.3 Massey for Yahoo



Using Massey actuals:  
 expected return: 270.833  
 actual probability: 4.09166e-10  
 actual mean: 87.677  
 actual standard deviation: 22.4893  
 correlation with opponents: -0.102837



## Chapter 4

# Sagarin Ratings

Our second source of actual probabilities was Jeff Sagarin's computer rankings.

Table 4.1: Sagarin 2005 Pre-tournament Power Rankings

|                |       |                 |       |                  |       |
|----------------|-------|-----------------|-------|------------------|-------|
| Illinois       | 95.09 | Texas Tech      | 86.17 | UAB              | 82.37 |
| UNC            | 95.06 | Cincinnati      | 86.11 | Creighton        | 82.33 |
| Duke           | 93.08 | Utah            | 85.56 | Stanford         | 82.21 |
| Wake Forest    | 92.2  | Texas           | 85.2  | Iowa St.         | 82.19 |
| Washington     | 91.77 | Iowa            | 84.93 | UCLA             | 81.93 |
| Oklahoma St.   | 91.24 | Pacific         | 84.87 | Old Dominion     | 81.82 |
| Louisville     | 90.88 | NC State        | 84.61 | UTEP             | 81.81 |
| Kentucky       | 90.47 | Pittsburgh      | 84.6  | Saint Mary's     | 81.74 |
| Kansas         | 90    | LSU             | 84.47 | Penn             | 80.18 |
| Oklahoma       | 89.56 | So. Illinois    | 84.3  | LA Lafayette     | 79.66 |
| Arizona        | 89.02 | Mississippi St. | 83.59 | Ohio             | 79.52 |
| Michigan St.   | 89.02 | UW Milwaukee    | 83.31 | Winthrop         | 77.3  |
| Connecticut    | 88.62 | Minnesota       | 83.25 | Bucknell         | 76.79 |
| Florida        | 88.57 | West Virginia   | 83.22 | Niagara          | 75.73 |
| Syracuse       | 87.9  | New Mexico      | 83.14 | SE Louisiana     | 74.64 |
| Alabama        | 87.84 | Geo. Washington | 82.82 | Chattanooga      | 74.41 |
| Villanova      | 87.34 | Nevada          | 82.66 | E. Kentucky      | 74.29 |
| Boston College | 87.16 | Vermont         | 82.55 | Central Florida  | 72.67 |
| Wisconsin      | 87.1  | Utah St.        | 82.54 | Montaan          | 71.57 |
| Georgia Tech   | 86.88 | Northern Iowa   | 82.53 | Fair. Dickinson  | 70.53 |
| Gonzaga        | 86.4  | Charlotte       | 82.45 | Delaware F.      | 68.95 |
|                |       |                 |       | Oakland/Ala. A&M | 67.88 |

## 4.1 Sagarin Favorites



Using Sagarin actuals.

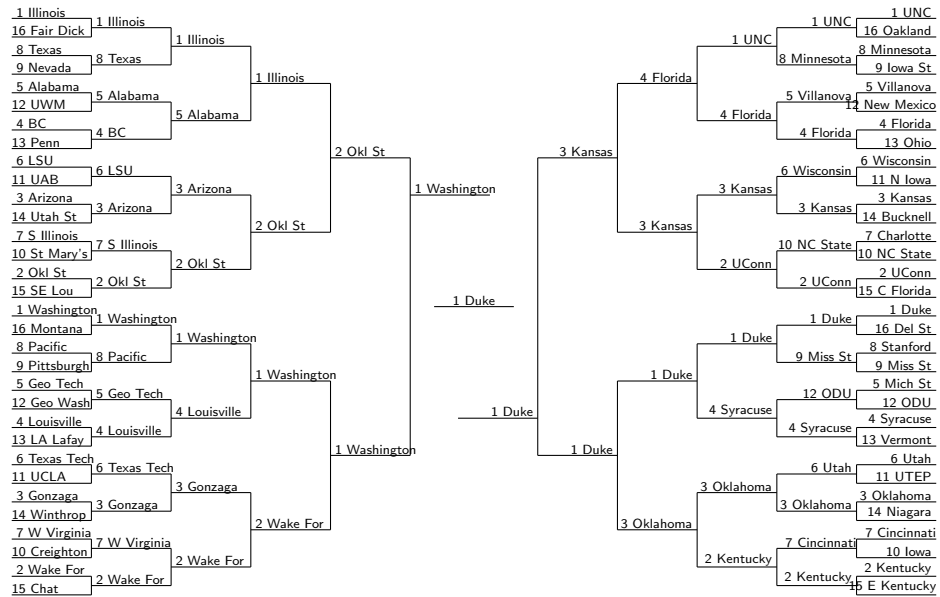
With ESPN scoring, 5,000,000 competitors:

expected return: 0.0685453  
 actual probability: 1.75676e-09  
 actual mean: 982.055  
 actual standard deviation: 200.097  
 correlation with opponents: 0.513728

With Yahoo scoring, 1,000,000 competitors:

expected return: 0.551081  
 actual probability: 1.75676e-09  
 actual mean: 105.404  
 actual standard deviation: 26.8967  
 correlation with opponents: 0.46451

## 4.2 Sagarin for ESPN



Using Sagarin actuals:

|                             |             |
|-----------------------------|-------------|
| expected return:            | 401.605     |
| actual probability:         | 1.30389e-10 |
| actual mean:                | 809.839     |
| actual standard deviation:  | 178.635     |
| correlation with opponents: | -0.0174284  |

### 4.3 Sagarin for Yahoo



Using Sagarin actuals:  
 expected return: 151.442  
 actual probability: 2.30117e-10  
 actual mean: 87.3001  
 actual standard deviation: 23.2299  
 correlation with opponents: -0.0391706

## Chapter 5

# NCAA Historical

The NCAA Tournament has been played in its current format since 1985. Teams are seeded into four regions, and ranked within regions from 1-16 by the selection committee. These seedings give some standard for comparing team strengths from year to year.

We took all previous tournament seed-vs-seed records and computed a probability of winning for each possible seed matchup. The head-to-head values we used for the #1-#16 seeds are shown in Table 5.1. Matchups occurring fewer than 10 times in the past were discarded, and teams with the same seed were set to a probability of .5. This resulted in the values shown in **bold**. The remaining less common matchups were computed by fitting to the known data.

Table 5.1: Historical head-to-head percentages

|     | # 1         | # 2         | # 3         | # 4         | # 5         | # 6         | # 7         | # 8         | # 9         | #10         | #11         | #12         | #13         | #14         | #15         | #16         |
|-----|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| #1  | <b>0.50</b> | <b>0.56</b> | <b>0.41</b> | <b>0.71</b> | <b>0.85</b> | 0.78        | 0.76        | <b>0.74</b> | <b>0.93</b> | 0.77        | 0.83        | <b>1.00</b> | 0.93        | 0.93        | 0.96        | <b>1.00</b> |
| #2  | <b>0.44</b> | <b>0.50</b> | <b>0.66</b> | 0.66        | 0.71        | <b>0.73</b> | <b>0.74</b> | 0.72        | 0.72        | <b>0.55</b> | 0.72        | 0.82        | 0.86        | 0.89        | <b>0.95</b> | 0.95        |
| #3  | <b>0.59</b> | <b>0.34</b> | <b>0.50</b> | 0.56        | 0.59        | <b>0.52</b> | 0.63        | 0.66        | 0.68        | <b>0.70</b> | <b>0.67</b> | 0.72        | 0.80        | <b>0.84</b> | 0.88        | 0.89        |
| #4  | <b>0.29</b> | 0.34        | 0.44        | <b>0.50</b> | <b>0.58</b> | 0.56        | 0.59        | 0.62        | 0.64        | 0.66        | 0.64        | <b>0.57</b> | <b>0.80</b> | 0.82        | 0.84        | 0.85        |
| #5  | <b>0.15</b> | 0.29        | 0.41        | <b>0.42</b> | <b>0.50</b> | 0.53        | 0.56        | 0.59        | 0.62        | 0.64        | 0.66        | <b>0.68</b> | <b>0.82</b> | 0.81        | 0.81        | 0.81        |
| #6  | 0.22        | <b>0.27</b> | <b>0.48</b> | 0.44        | 0.47        | <b>0.50</b> | 0.53        | 0.56        | 0.59        | 0.63        | <b>0.70</b> | 0.70        | 0.75        | <b>0.80</b> | 0.78        | 0.77        |
| #7  | 0.24        | <b>0.26</b> | 0.37        | 0.41        | 0.44        | 0.47        | <b>0.50</b> | 0.53        | 0.54        | <b>0.60</b> | 0.64        | 0.66        | 0.70        | 0.72        | 0.73        | 0.73        |
| #8  | <b>0.26</b> | 0.28        | 0.34        | 0.38        | 0.41        | 0.44        | 0.47        | <b>0.50</b> | <b>0.46</b> | 0.54        | 0.59        | 0.62        | 0.65        | 0.67        | 0.68        | 0.68        |
| #9  | <b>0.07</b> | 0.28        | 0.32        | 0.36        | 0.38        | 0.41        | 0.46        | <b>0.54</b> | <b>0.50</b> | 0.53        | 0.56        | 0.58        | 0.61        | 0.63        | 0.64        | 0.64        |
| #10 | 0.23        | <b>0.45</b> | <b>0.30</b> | 0.34        | 0.36        | 0.37        | <b>0.40</b> | 0.46        | 0.47        | <b>0.50</b> | 0.53        | 0.55        | 0.57        | 0.59        | 0.60        | 0.60        |
| #11 | 0.17        | 0.28        | <b>0.33</b> | 0.36        | 0.34        | <b>0.30</b> | 0.36        | 0.41        | 0.44        | 0.47        | <b>0.50</b> | 0.52        | 0.54        | 0.56        | 0.57        | 0.57        |
| #12 | <b>0.00</b> | 0.18        | 0.28        | <b>0.43</b> | <b>0.33</b> | 0.30        | 0.34        | 0.38        | 0.42        | 0.45        | 0.48        | <b>0.50</b> | 0.52        | 0.53        | 0.54        | 0.55        |
| #13 | 0.07        | 0.14        | 0.20        | <b>0.20</b> | <b>0.18</b> | 0.25        | 0.30        | 0.35        | 0.39        | 0.43        | 0.46        | 0.48        | <b>0.50</b> | 0.51        | 0.52        | 0.53        |
| #14 | 0.07        | 0.11        | <b>0.16</b> | 0.18        | 0.19        | <b>0.20</b> | 0.28        | 0.33        | 0.37        | 0.41        | 0.44        | 0.47        | 0.49        | <b>0.50</b> | 0.51        | 0.51        |
| #15 | 0.04        | <b>0.05</b> | 0.12        | 0.16        | 0.19        | 0.22        | 0.27        | 0.32        | 0.36        | 0.40        | 0.43        | 0.46        | 0.48        | 0.49        | <b>0.50</b> | 0.50        |
| #16 | <b>0.00</b> | 0.05        | 0.11        | 0.15        | 0.19        | 0.23        | 0.27        | 0.32        | 0.36        | 0.40        | 0.43        | 0.45        | 0.47        | 0.49        | 0.50        | <b>0.50</b> |

(Fixed values in bold, others are computed)

## 5.1 NCAA History Favorites



Using NCAA History actuals.

With ESPN scoring, 5,000,000 competitors:

|                             |             |
|-----------------------------|-------------|
| expected return:            | 0.26917     |
| actual probability:         | 1.04108e-10 |
| actual mean:                | 827.325     |
| actual standard deviation:  | 187.515     |
| correlation with opponents: | 0.529419    |

With Yahoo scoring, 1,000,000 competitors:

|                             |             |
|-----------------------------|-------------|
| expected return:            | 0.241865    |
| actual probability:         | 1.04108e-10 |
| actual mean:                | 86.643      |
| actual standard deviation:  | 23.9774     |
| correlation with opponents: | 0.501654    |

## 5.2 NCAA History for ESPN



Using NCAA History actuals:

|                             |             |
|-----------------------------|-------------|
| expected return:            | 6030.76     |
| actual probability:         | 4.27331e-11 |
| actual mean:                | 783.713     |
| actual standard deviation:  | 191.876     |
| correlation with opponents: | 0.0884638   |

### 5.3 NCAA History for Yahoo



Using NCAA History actuals:  
 expected return: 2528.87  
 actual probability: 8.16564e-11  
 actual mean: 83.2603  
 actual standard deviation: 24.2837  
 correlation with opponents: 0.0100022