RSA Set to Launch MLB Reversal.04 in Spring of 2005

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Model Objective

For any sports gambling enthusiast, there is always one question to be answered, "Why does the bookie always win?" The answer: simply a lack of discipline by the inexperienced sports handicapper. Wagering on sports has become a billion dollar per year industry and the Las Vegas professionals are not taking any chances with it. They know how to set the odds to perfection and have the most up-to-date information on games. The following article details **ReversalSports Advisors** development of the MLB Reversal.04, a model based on historical trends as well as common observations of the game that gives the average bettor a chance against the professionals over the course of a Major League Baseball (MLB) season.

Current Theory

For this project, RSA looked to construct a model, MLB Reversal.04, to reverse the average bettor's consistent losing track record. Since baseball wagering doesn't include a "point spread", it is one of the easiest of sports to model. Instead of a point spread, the odds makers create a money line to attract "action" to both teams (see Notes at the end of the report for an *Example of Baseball Sports Betting*). Also, having the largest number of regular season games makes it the best candidate of all professional sports to develop a technical model and apply a variety of different simulation techniques.

Our hope for the model was to discover consistent winning situational scenarios using simulation and past historical Major League Baseball (MLB) data. From our general knowledge of baseball, the first aspect we planned to exploit was that teams typically have better records on their home fields. In 2004, 18 of 30 teams, or 60%, had winning home records versus only 40% of teams having winning road records. This is consistent across the previous four years.

Percentage of Teams with Winning Records
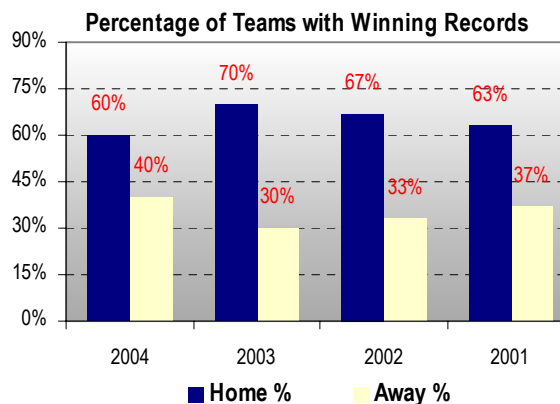
Secondly, baseball is generally quite a streaky sport with teams winning or losing multiple games in a row. From 1997-2004, the longest consecutive home game win streak fell between 9 and 18 games while the longest away losing streak fell between 9 and 15 games. Building on these ideas, we decided to search the past 8 years of baseball data to find consistent long-term winning trend combinations for home teams. Once identified, RSA planned to rigorously test the trend combination or "trading rule" using a combination of MLB data and @Risk simulations.

The best practice in sports gambling is educated handicapping and money management. First, let us define the different methods that constitute "educated handicapping". Information is knowledge. An educated handicapper should look at situational analysis, trend analysis and fundamental data before blindly placing a wager. One example quickly comes to mind when thinking of an "uneducated" bet. Handicappers who place bets with their heart and go with their home team will ultimately end up in the poor house. I propose this question: would you invest in a company just because a family member works there? Our guess is not without at least looking at the financials of the company. Betting on the home team is no different, sure they are your favorite team, but that does not necessarily make them a good investment. A similar problem occurs with a handicapper's tendency to bet on TV games just because they can watch the game. The problem is that one may not like the game, but places a wager just for the fun of it. To win consistently, sports betting must be thought of an investment and not just entertainment.

"In sports gambling, each season should be a marathon, not a sprint."

There is a tremendous amount of information available to the sports handicapper. The Internet, ESPN, talk shows, and newspapers/magazines continue to move towards presenting information in a way that is helpful to the sports handicapper. Along with these outlets, cable packages and the advent of satellite have made it easier to see more of games and get a personal take on a variety of teams. A quick test to make sure one has all the relevant data on a game is to make their own line for a game and then see where the experts have put it. If there is a large difference, it could be an indication that you are missing an important piece of information, such as a key injury report.

The second and most important factor in a good handicapping is money management. Too often than not, an inexperienced gambler will press his luck during a hot streak to try and make more money or, on the flip-side, will try increasing their bets as a way to get out of the hole in those bad times. This is known as an inexperienced gambler hitting the "greed" button in good times and the "panic" button in bad times.

A bettor's tendency to raise their bet when they are up or down significant amounts has an extremely negative impact on their long-term profitablity.

Let's review 2 examples to make this a little clearer. In the first scenario, a $100 bettor who goes 15-5 in a week should be +1,000 (excluding the vig or commission charged on all losing bets) at the end of a given week by wagering the same amount on each game. It is possible that after getting up early in the week the bettor increases his bets, loses his last three to four games at bigger levels and ends up the week even. In sports gambling, each season should be a marathon, not a sprint.

Raising bets based on your current figure is the most common and most costly mistake sports gamblers can make. When you buy a

stock, you expect the stock's value to increase in the long run knowing there will be short-term fluctuations along the way. A sports season should be no different; it is a long-term investment which one expects to gain value from over the course of the entire season. If a bettor goes for the "big week" or tries for the "big bail-out" they risk having a down season as the result of just one week. If a bettor is able to hit at 75% in a given week, it is imperative to show a net profit for that week. On the opposite spectrum, going 5-15 in a week, a $100 bettor should end the week down $1,000. The recipe for disaster is when a bettor has the mindset of "if I win one game I can get back all the money I am down this week". Instead of losing $1,000, the bettor wagers a significant amount at the end of the week and ends up losing 3-4 times as much as they should have.

The two most well known systems on money management are as follows. The methods will be described using "units of play" or average bet for one's preferences. The first method of money management specifies different amount of units for an equal amount of conviction in the play. For example, a 3-unit play will be stronger than a 1-unit play and therefore a $100 bettor should put $300 on the 3-unit play and only $100 on a 1-unit play. The key to this first method is that rating system or unit of play never changes for the duration of the season.

The second system is similar but is based on a set percentage of one's payroll. Let's say a $100 bettor starts the season with a $2,000 payroll. Generally, the maximum bet will be no more than 5% of one's bankroll. In this system a top play would be 5% of one's bankroll while a lesser play would be a percentage south of 5%. Again, the key to this money management system is never to change the percentage amounts for the duration of the season.

Critique of Existing Models

With little or no published research on sports handicapping models, it is hard to say where the fault lies. Most sports handicapping services have built their own proprietary models and sell these services to the sports handicapping enthusiast. Typically, sports handicappers will fall into two buckets: the technical analysts and the fundamental analysts.

The first group relies heavily on past team or situational results with the hopes that these trends will hold up in the long run. In general, many of these models use past historical data or trends to predict the future results. As with any backward looking model, the past may not be an accurate indicator of future results. The second group uses fundamentals or current information such as weather reports, injury reports, team statistics and other relevant game data to make their predictions. The flaw here is that a superior team may be a great selection; however, overlooking the situation that this team may be playing a weaker opponent today a big match up the following day or week could be disastrous. In this scenario, the team may not play up to its potential and the possibility of an upset versus the spread or even on the field exists.

Technical Analysis	Fundamental Analysis

A combination of technical and fundamental analysis is a sports handicapper's "best bet".

Both models have pros and cons and it is the sports handicapping enthusiast who can find a balance between the two that will have a successful season. In theory, RSA has tried to identify a successful technical model that produces long-term positive results. For practical purposes, we feel that this model will better serve as an input into our betting process. In our opinion, a combination of technical and fundamental analysis is a sports handicapper's "best bet".

MLB Reversal.04 Development

MLB Reversal.04 was developed in a two-step process: 1) Development and 2) Validation. The development of the model and its "trading rule" was based on data from 8 Major League Baseball (MLB) seasons from 1997-2004. The target for the model was to consistently win 100+ units per season or have a 50% return on investment (ROI) annually. The model was restricted to wagering up to 10 units per game and was based on a soft maximum of 300 bets per season (approx. 1.5 bets per day).

Using trend rules and the preference to wager on home teams to attain a positive winning percentage and underdogs to earn vig (see *Notes* for definition), we were able to identify an optimal set of scenarios that had consistent positive returns over the course of the 8 seasons. Some scenarios tended to perform better and therefore were rated accordingly.

Plays range from 1-10 units (or 0.5% to 5.0% of your bankroll) with a 10* plays equaling a wager of 5% of your starting bankroll. As discussed earlier under money management, 10* plays occur less frequently than 5* plays but have a higher probability of victory and therefore command a higher wager. In simplest terms, the model tracks each team's home win/loss streaks as well as their away streaks to identify a scenario for each game. If this scenario is one of the scenarios we have identified as being profitable, a wager is placed. The model then calculates the gain/loss on each wager and summarizes the results for the season.

Stage 2 or the Validation Stage consisted of 3 tests: in-sample/out-of-sample testing, simulation and boot-strapping. After fine-tuning the model on 6 random seasons ('97, '99, '00, '01,'03 and '04), also known as the in-sample period, it was applied to the 2002 and 1998, or out-of-sample years, to see how it would perform. Secondly, using the 2004 schedule, a binomial distribution was used to randomly simulate the result of each game. We chose to use the probability of the home team winning based on that team's home winning percentage for the '04 season. Finally, we ran a second simulation on the 2004 season using a uniform distribution to boot-strap the results of each game in the 2004 schedule based on the outcome of their historical games from 1997-2004. For example, the outcome of a Boston-New York game in the simulation would come from a random selection of one of the results from a game they have played over the past 8 years. Along with that result, the spread from that same historical game was used to compute the net winnings. The results of validation tests conducted in stage 2 of the model development are presented in the next section.

As suggested in the money management section, it is a good rule of thumb to wager a maximum of only 5% of your total bankroll on one game. For the purpose of analyzing the results of the validation tests, we will assume an initial bankroll of $1,000 and an average unit of play equal to $5 (200 units total). Therefore a 10* unit wager would equal $50, a 7* would equal $35 and so on.

In-Sample/Out-of-Sample Results

As noted earlier, the model's "trading rule" was developed from the in-sample data years that included 1997, 1999, 2000, 2001, 2003 and 2004. The optimal set of betting scenarios gave the results in the table below.

Year	W	L	PCT	Units
2004	167	142	54.0%	121.2
2003	178	142	55.6%	153.5
2001	142	152	48.3%	-78.8
2000	172	119	59.1%	315.8
1999	138	148	48.3%	-36.0
1997	126	127	49.8%	-35.2
Totals	923	830	52.7%	440.5

The results were positive over the course of the 6 years, yielding 3 positive years and 3 negative years. With a net gain of +440.5 units, we were excited to see how the out-of-sample periods (1998, 2002) would perform.

Unfortunately the results were mediocre at best. 1998 was slightly positive season, while the 2002 season produced our largest unit loss of any year on record.

Year	W	L	PCT	Units
2002	144	151	48.8%	-118.1
1998	175	178	49.6%	24.4
Totals	319	329	49.2%	-93.7

In aggregate, the returns were positive and we felt the model still needed to be considered for

further testing. A closer look showed an annual return of 21.7% over the 8-year period. To try to put the returns into perspective, we compared the returns to the S&P500 and the Lehman Brothers U.S. Aggregate Bond Index over the same time period. On a simple return basis, the MLB Reversal.04 outperformed the S&P500 annual return of 9.8% and the Lehman return of 8.7%. However, on a risk-adjusted basis, the MLB Reversal.04 was the worst performer of the group, returning 0.28 units of return for every unit of risk while the S&P500 and Lehman Aggregate returned 0.46

| Year	MLB Reversal.04	S&P500	Lehman Agg
1996			
1997	-17.6%	33.4%	9.7%
1998	14.8%	28.6%	8.7%
1999	-19.0%	21.0%	-0.8%
2000	206.1%	-9.1%	11.6%
2001	-16.8%	-11.9%	8.4%
2002	-30.3%	-22.1%	10.3%
2003	56.4%	28.7%	4.1%
2004	28.5%	7.2%	3.4%
Return	21.7%	9.8%	8.7%
Risk	77.8%	21.5%	4.3%
IR	0.28	0.46	2.05
Yrs +	4	5	7
Yrs -	4	3	1

and 2.05, respectively. Still, we felt there was sufficient positive evidence to move onto the next step in the validation stage.

Simulation Results

With the in-sample/out-of-sample results positive but not terribly exciting, we looked to simulation to determine whether the MLB Reversal.04 had potential. Based on 1,000 iterations, the results were encouraging. The mean return was +113.5 units, which achieved our original goal of +100 units. Also, the

model achieved a positive return an astonishing 81.9% of the time. From a risk perspective, we were pleased to see the model lost more than original 200 units only 0.08% of the time.
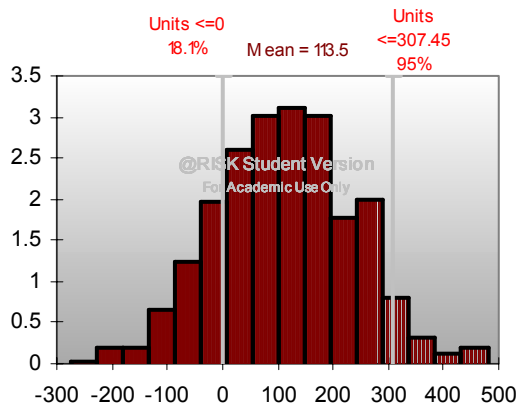

Other positive indicators from the simulation were that the mean of all unit ratings were positive with the 10*, 7*, 5* and 3* unit plays having average gains of 33.9, 42.3, 193.7 and 8.0 units, respectively. This confirmed our belief the set of scenarios we selected for our model was correct. Although concerns with the amount of risk were still apparent (simulation standard deviation of 123 units), results were now positive through two steps of the validation stage and we felt the model was ready to proceed to its final test.

Boot-Strapping Results

The boot-strapping results were less exciting then we had hoped for, but the model continued to hold up to each test it took on. Based on 1,000 iterations, the mean return was +52.6 units, below our original goal but still positive. The most disappointing result was the model only had a positive return 65.1% of the time, well below the 81.9% in the binomial simulation but ahead of the 50.0% in sample tests. Once again, we were pleased to see the model lost the original 200-unit investment only 3.2% of the time.

The boot-strapping simulation had average positive returns for the 10*, 7*, and 3* unit plays, while the 5* play was slightly negative at –3.4 units. With overall positive returns, it was the third straight indicator which builds confidence that the underlying mechanics of the model will hold true over the long-term.
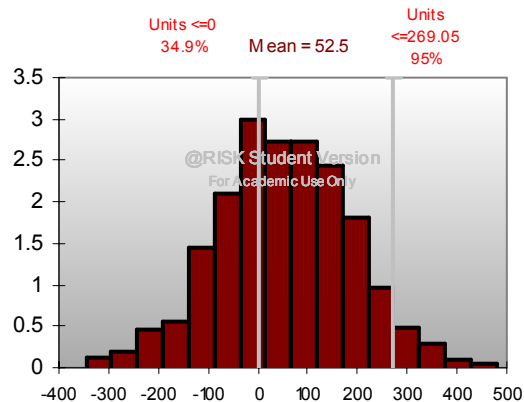
At this point, the first version of our MLB Reversal.04 model is complete. In the following sections we attempted to identify the strengths/weaknesses of the model and some of its underlying assumptions as well as our suggestions for future improvements and its application.

Critique of MLB Reversal.04

Our initial concern upon setting out to build a MLB model was that it would only be an exercise in data-mining a set of rules that works only during the years which they came from. However, although the results have room for improvement, the model showed positive returns through each of the three validation steps. This gives hope to future versions of the model with the help of

research and development ideas discussed in the next section.

The second concern we had was whether any structural changes existed over the 8-year period. Since there is no salary cap in baseball, teams such as the New York Yankees and Boston Red Sox have seen their payroll balloon over the years. Does this factor have an impact on a model whose core is based on consistent long-term trends? The answer is that any structural changes should be accounted for in the money line. Teams can go from good to bad and back to good again over the years and the spread will always be priced to make the two teams equal.

Finally, our last insight is the question of which is the most important variable to a profitable season? Is it the ability to win more games than you lose or is money management and being rational with your wagers that keeps a season profitable? If you had asked RSA prior to this exercise in building the model, we might have said winning more games is much more important. However, after working with the data, we have a new found respect for the benefits of money management over the course of a season. It is imperative to taking full advantage of the good runs while avoiding a self-destruction during the bad runs. This takes us back to the "greed" and "panic" button concepts discussed earlier. The outcome of any given game is 50-50% and therefore regardless of how you pick your games you'll most likely fall within +/- 5% of that percentage. The value comes in managing the size of your wagers and having the discipline to stick with them over the long-term. The end result of our analysis is that the MLB Reversal.04 model may not yet be a superior team selection model, but the value added from its money management system is just as important.

Research and Development

The initial version of MLB Reversal.04 detailed in this report has really only begun the research process. Although scenario analysis is very important in handicapping, there are number of variables that the model does not consider. Now that a core model has been built and the data is in a usable form, advanced research should come quickly.

The first area of interest is that the current version of the model simply looks at the wins and losses of each team. With so much data available for every game, it would make sense to incorporate more of it. To build upon streaky teams, a core concept in the current version, one such variable to look at would be the scores of each team. A winning team most likely would be scoring a fair amount of runs while holding opponents to a lesser amount. Creating a run differential factor could be an interesting variable to test. Along with home and away streaks, overall streaks should be considered as well. For instance, streaky teams may play so well as to win 10-15 games straight regardless of whether they are home or away. Is there value in riding these streaks or do the losses on streaks ending shorter than 10-15 games outweigh the gains on teams that do go on such runs?

Research Ideas
• Include More Game Data
• Run Differential Factor
• Other Streaks?
• Starting Pitching
• Weekly/Daily Max Draw-Down

An additional area for research is starting pitching. This variable may not be as clear-

cut as one thinks and it would be interesting to see if any value truly exists. The uneducated bettor tends to favor great starting pitcher, however, the problem with starting pitching is that good pitchers will command a higher spread but typically only pitch into the sixth or seventh inning. Is that trade-off of a possibility of six to seven strong innings of pitching worth the increased cost of taking the game over the long-term?

Finally, to improve upon money management, analyzing weekly maximums and minimums could help over the long run. Since most non-casino action works on a weekly payment schedule, it is necessary to see if the model has extreme weekly and daily losses. It is in times of distress that one may stray from the model or good money management techniques and to minimize these times could add value over the long-term.

Conclusion

From the validation tests, **ReversalSports Advisors** feels the current version of the MLB Reversal.04 has potential. That being said, there are a number of questions to be answered and a number of areas to improve upon, specifically in risk. It would be hard to suggest a large investment in the model with the risk of loss being so high. However, we feel the model can be a helpful tool when handicapping baseball games in the future. The model did achieve positive results over the 8-year period of live data, growing a $1,000 investment to a total of $2,734. It also had average positive returns of +113.5 and +52.6 units in the two simulations. On a 200 unit initial investment, this would equate to a return of 56.8% and 26.3%, respectively.

Wagering on sports is risky business, no doubt about it. With so many variables out of one's control and the professionals working hard to make sure you fail, we would not recommend the MLB Reversal.04 to just anyone. Some people just don't have appetite to take chances, but for those of us ready and willing to take a shot, the MLB Reversal.04 acts as another tool in the arsenal to take on the gaming industry.
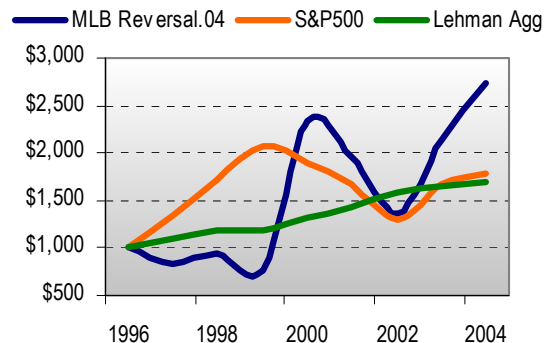
Notes

Definitions

<u>Vig</u> - Percentage of bet paid on all losses. Generally 10% in football and basketball, a losing $100 would have to pay $110. See note on sports betting for an example of baseball "vig".
<u>Underdog</u> – The team that is not expected to win by the odds makers.
<u>Favorite</u> - The team expected to win by odds makers.
<u>Units of Play</u> – Average bet by a handicapper. 1 unit could be worth $5 to one handicapper while 1 unit could be worth $100 to another.

Example of Baseball Sports Betting

Boston Red Sox $120 - $140   New York Yankees

In this instance the Boston Red Sox are favored over the New York Yankees. The odds above are based on a $100 bet.

Scenario 1a: Bet $100 on the Red Sox and they win.
> When you go to the betting window, you wager $140 on the Red Sox. After they win, you collect $240 from the window (your original $140 plus $100).

Scenario 1b: Bet $100 on the Red Sox and they win.
> When you go to the betting window, you wager $140 on the Red Sox. When they lose you do not collect anything from the window (total loss -$140).

Scenario 2a: Bet $100 on the Yankees and they win.
> When you go to the betting window, you wager $100 on the Yankees. After they win, you collect $220 from the window (your original $100 plus $120).

Scenario 2b: Bet $100 on the Yankees and they lose.
> When you go to the betting window, you wager $100 on the Yankees. When they lose you do not collect anything from the window (total loss -$100).

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