Fair Bets and Profitability in College Football Gambling

Rodney J. Paul, Andrew P. Weinbach, and Chris J. Weinbach*

Abstract

Efficient markets in college football are tested over a 25-year period, 1976-2000. The market in general is found to be efficient, but betting on underdogs of more than 28 points violates a fair bet. The strategy of betting home underdogs reveals stronger results. Home underdogs of more than seven points are found to reject the null hypotheses of a fair bet over the last 10 years of the sample, 1991-2000. Home underdogs of more than 28 points are found to reject the null of no profitability during the same time frame. (*JEL* G1)

Introduction

The market for gambling in professional football has been examined in a variety of ways including the early work of Pankoff (1968) and the efficiency studies of Zuber et al. (1985), Gandar et al. (1988), and Sauer et al. (1988). The gambling market for college football has not been examined as frequently or as extensively. The two major studies of college football are the papers of Golec and Tomarkin (1991) and Dare and McDonald (1985). Golec and Tomarkin (1991) examined 15 years worth of data, 1973-87, for both college and professional football and found that professional football gamblers over bet favorites, particularly on the road, but the college football market does not exhibit this bias. Dare and McDonald (1985) tested the college football market over 13 years, 1981-93, and could not reject efficiency within the market.

This paper expands the study of college football gambling on a number of fronts. First, it includes 25 years worth of data to examine efficiency issues. Second, it tests for the existence of over betting on several categories of favorites. Log likelihood ratio tests for a fair bet and no profitability are examined for the entire sample and various subsamples of underdogs above a certain line in the same manner Vergin and Scriabin (1978) and Tryfos et al. (1984) studied in professional football. Finally, home underdogs are examined as a separate group and examined for market efficiency.

A fair bet cannot be rejected for the college football market as a whole. The over betting of favorites does not appear to exist for the overall sample, but in games with a line of more than 28

* Rodney J. Paul, St. Bonaventure University, 229 Murphy Building, St. Bonaventure, NY 14778, rpaul@sbu.edu; Andrew P. Weinbach, Armstrong Atlantic State University, 11935 Abercorn St., Savannah, GA 31419-1997, weinbaan@mail.armstrong.edu; Chris J. Weinbach, Sportometrics, 1156 Old Seneca Rd, PO Box 349, Six Mile, SC 29682-0349, chris@sportometrics.com.

points, a strategy of taking the underdog rejects the null hypothesis of a fair bet, but not profitability. With respect to betting home underdogs, games with lines of greater than seven points were found to reject the null of no profitability from 1991-2000, and games with lines of more than 28, the largest underdogs, were found to reject the null of no profitability for the sample as a whole.

Market Efficiency Tests in College Football 1976-2000

The notion of the public over betting favorites is not new. The over betting of favorites, at least in violating a fair bet, if not profitability, has been found in baseball odds (Woodland and Woodland 1994), hockey odds (Woodland and Woodland 2001), and similarly in over betting of overs on NFL totals (Paul and Weinbach 2002). Although the market for college football appeared to be efficient in the studies of Golec and Tomarkin (1991) and Dare and McDonald (1995), the data in this paper include a longer time-frame for study and include the most recent years of lines, where the market for gambling has increased due to on-line betting through the Internet.

Data were gathered on college football betting lines through sports handicapper Jim Feist's workbook. The data include the years 1976 through 2000. The forecast errors of the simple regression models of Gandar et al. (1988) and Sauer et al. (1988) were found to exhibit skewness and to be non-normal. The forecast errors were found to have skewness equal to 0.279926, kurtosis equal to 3.168189, and a Jarque-Bera statistic of 177.9089 with a corresponding probability value close to zero. This invalidates the regression model and the F-statistic of the efficient markets test. Therefore, to test for market efficiency, we chose the likelihood ratio test proposed by Even and Noble (1992), which tests the result of a basic strategy against the null of a fair bet and no profitability.

From the perspective of the underdog bettor, the value of the unrestricted log likelihood function takes the form:

$$L^u = n[\ln(\hat{q})] + (N-n)\ln(1-\hat{q}), \quad (1)$$

where N is the total number of observations, n is the number of observations where the score is less than the posted line, and q is the observed proportion of observations where the score is less than the posted line. An efficient market implies that $q = 0.5$. This creates the restricted log likelihood function (L^r), which is obtained by substituting 0.5 for $\hat{q}$ in equation 2. The likelihood ratio statistic for the null hypothesis that $q = 0.5$ is:

$$2(L^u - L^r) = 2\{n[\ln(\hat{q})-\ln(0.5)] + (N-n)[\ln(1-\hat{q}) - \ln(0.5)]\}. \quad (2)$$

To test for profitability, factoring in 10 percent vigorish, the test changes to:

$$2(L^u - L^r) = 2\{n[\ln(\hat{q})-\ln(0.524)] + (N-n)[\ln(1-\hat{q}) - \ln(0.476)]\}. \quad (3)$$

The following table presents the results for the entire sample, for the first 15 years of the sample, the last 10 years of the sample, and each of the five-year subsets.

TABLE 1. WIN PERCENTAGES AND LOG LIKELIHOOD RATIO TESTS FOR ALL UNDERDOGS

Sample	n	Win Percentage Underdog	Log Likelihood Fair Bet	Log Likelihood No Profitability
1976-2000	12,279	50.31	0.4547	NA
1976-1990	6,660	50.10	0.0259	NA
1991-2000	5,619	50.55	0.6715	NA
1976-1980	1,951	50.13	0.0128	NA
1981-1985	2,060	50.58	0.2796	NA
1986-1990	2,490	49.68	0.1028	NA
1991-1995	2,518	51.27	1.6269	NA
1996-2000	3,023	49.95	0.0030	NA

Notes: For each sample, in each table, the number of observations (n), the win percentage of betting the underdog, the log likelihood ratio statistic of a null of a fair bet, and the log likelihood ratio statistic of the null of no profitability are included. Where a fair bet is not rejected, the test for no profitability is excluded. The log likelihood test statistics have a chi-square distribution with one degree of freedom. Critical Values are 2.706 (for an α=0.10), 3.841 (for an α=0.05), and 6.635 (for an α=0.01). * is significance at 10 percent, ** is significance at 5 percent, and *** is significance at 1 percent.

The college football market as a whole cannot reject market efficiency. The winning percentages associated with betting underdogs are found be very close to 50 percent. Betting the underdog across all lines will not be profitable for the gambler. In fact, during the most recent five years of the sample, favorites won slightly more often than underdogs.

Although the market as a whole was found to be efficient, profitable strategies may still exist using the largest underdogs. This approach was shown to violate a fair bet and have limited profitability in odds betting in baseball and hockey (Woodland and Woodland 1994, 2001). With point spread betting, large underdogs in the NFL were shown to be potentially profitable (Vergin and Scriabin 1978; Tryfos et al. 1996). In a similar fashion, taking the under on an over/under bet was found to reject the null of no profitability in NFL games (Paul and Weinbach 2002).

Using different intervals of seven points (a touchdown and an extra point in football scoring), the null hypothesis of a fair bet and no profitability were tested for subsets of the data. The following tables present the results for lines of more than seven points and for lines of more than 28 points.[1]

The strategy of betting the underdog on lines of more than seven does not violate a fair bet. The over-betting of favorites appears only to occur at the largest lines. Underdogs win statistically more than 52.38 percent of the time at lines greater than 28. Violations of the null of a fair bet occur for the overall sample of 1976-2000, the 10-year sample of 1991-2000, and the five-year sample, 1991-95. Although the null hypothesis of a fair bet is rejected, the null hypothesis of no profitability cannot be rejected. Bettors appear to prefer to bet the favorite, but either the bias is not excessive or informed bettors bet on the large underdogs to prevent this strategy from being profitable.

[1] Lines of more than 14 and lines of more than 21 were also tested. Neither of these groupings led to a violation of a fair bet or no profitability for the given strategy.

TABLE 2. WIN PERCENTAGES AND LOG LIKELIHOOD RATIO TESTS: MORE THAN SEVEN-POINT UNDERDOGS

Sample	n	Win Percentage Underdog	Log Likelihood Fair Bet	Log Likelihood No Profitability
1976-2000	7,350	50.27	0.2105	NA
1976-1990	3,892	49.72	0.1168	NA
1991-2000	3,488	50.87	1.0435	NA
1976-1980	1,091	48.46	1.1041	NA
1981-1985	1,133	48.98	0.4669	NA
1986-1990	1,466	51.29	0.9851	NA
1991-1995	1,554	51.41	1.2460	NA
1996-2000	1,896	50.42	0.1350	NA

TABLE 3. WIN PERCENTAGES AND LOG LIKELIHOOD RATIO TESTS: MORE THAN 28 POINT UNDERDOGS

Sample	n	Win Percentage Underdog	Log Likelihood Fair Bet	Log Likelihood No Profitability
1976-2000	797	53.85	4.6199**	0.6729
1976-1990	359	52.17	0.6523	NA
1991-2000	438	55.17	4.6635**	1.3630
1976-1980	69	53.62	0.3626	NA
1981-1985	81	48.15	0.1111	NA
1986-1990	195	53.33	0.8673	NA
1991-1995	183	56.28	2.8984*	1.1222
1996-2000	252	54.36	1.9231	NA

The Strategy of Betting Home Underdogs

A strategy that appeared to have the potential to be profitable in the study of Golec and Tomarkin (1991) was wagering on home underdogs. This paper extends their idea to a larger data set and adds the subsets of different sizes of home underdogs. The following tables include the entire sample of home underdogs, home underdogs of more than seven points, and home underdogs of more than 28 points.

Betting home underdogs of more than seven points was shown to violate the null hypothesis of a fair bet during the last 10 years of the sample, with the percentage of underdog wins increasing during the last five years. The strategy of betting home underdogs of more than 28 points rejects the null hypothesis of a fair bet for the entire sample and actually violates the null of no profitability during the last 10 years of the sample (1991-2000). For lines greater than 28 points, the five-year sample from 1991-95 was more profitable than the following sample period (1996-2000) during that 10-year period.

TABLE 4. WIN PERCENTAGES AND LOG LIKELIHOOD RATIO TESTS: ALL HOME UNDERDOGS

Sample	n	Win Percentage Underdog	Log Likelihood Fair Bet	Log Likelihood No Profitability
1976-2000	4,190	50.27	0.1179	NA
1976-1990	2,287	49.14	0.6493	NA
1991-2000	1,903	51.59	1.9172	NA
1976-1980	707	46.11	4.2830**	NA
1981-1985	720	50.28	0.0222	NA
1986-1990	797	50.82	0.2121	NA
1991-1995	836	51.32	0.5790	NA
1996-2000	1,042	51.82	1.3861	NA

TABLE 5. WIN PERCENTAGES AND LOG LIKELIHOOD RATIO TESTS: MORE THAN 7 POINT HOME UNDERDOGS

Sample	n	Win Percentage Underdog	Log Likelihood Fair Bet	Log Likelihood No Profitability
1976-2000	2,236	51.68	2.4918	NA
1976-1990	1,217	49.71	0.0412	NA
1991-2000	1,019	54.01	6.5095**	1.0812
1976-1980	375	47.73	0.7709	NA
1981-1985	358	49.72	0.0112	NA
1986-1990	456	51.32	0.3158	NA
1991-1995	437	53.78	2.4944	NA
1996-2000	572	54.19	4.0327**	0.7571

TABLE 6. WIN PERCENTAGES AND LOG LIKELIHOOD RATIO TESTS: MORE THAN 28 POINT HOME UNDERDOGS

Sample	n	Win Percentage Underdog	Log Likelihood Fair Bet	Log Likelihood No Profitability
1976-2000	133	57.25	2.7655*	1.2524
1976-1990	77	52.00	0.1200	NA
1991-2000	56	64.29	4.6357**	3.2384*
1976-1980	13	46.15	0.0770	NA
1981-1985	21	57.14	0.4300	NA
1986-1990	41	51.22	0.0244	NA
1991-1995	19	73.68	4.4389**	3.6245*
1996-2000	37	59.46	1.3323	NA

Discussion of Violation of Efficient Markets

The question remains of how simple strategies can lead to the rejection of efficient markets? For financial markets in general, there has been a recent movement away from the purely rational approach of asset pricing to a broader approach based on the psychology of investors. Expected returns in these new models are determined by both risk and misvaluation (Hirshleifer 2001). In sports gambling markets, there appears to be bettor preference for the favorite. The over betting of favorites occurs in baseball (Woodland and Woodland 1994) and hockey (Woodland and Woodland 2001) with profitability found at the highest odds. In this sample of college football, the results are comparable. The null of a fair bet can be rejected for different classes of lines, but profitability is only found in betting against the largest favorites.

This preference for favorites could be due to an information asymmetry where more information is available on television, the Internet, and in newspapers on the best teams, usually the big-name football schools, and less information is available on the smaller-name schools. When these teams play each other, usually a large line is set on the game. The betting public, from exposure to the big-name football schools, over bets the favorite, driving the line to a point where the underdog wins more often. It is generally assumed that informed bettors would bet on the underdog to the point where the strategy would no longer be profitable. This would suggest that underdogs would win close to 52.38 percent of the time, which would violate a fair bet, but not the null of no profitability.

This still leaves the question of how a relatively simple strategy, such as betting a large home underdog, can be profitable. One possible answer could be the relative infrequency of this betting strategy. During the last five years of the sample, this wagering scenario only occurred 37 times. This is far less than one game per week during the college football season. Due to its relative infrequency, perhaps informed bettors have overlooked this angle. Another explanation could lie in the size of the informed and uninformed betting pools with respect to betting limits. Limits are placed on bettors in college football games. These limits might not be binding, as bettors can place bets at different casinos or offshore, but limits increase marginal costs to gamblers who wish to place large bets. If the dollars bet by uninformed bettors exceed those of informed bettors and the informed bettors either choose not to bet or are restricted by the limits, the closing line could lie above the "true" line that would prevail in an efficient market. This would lead to underdogs winning more often than implied by efficiency and possible profitability to this betting strategy.

Conclusions

The betting market for college football from 1976 to 2000 was examined using data from handicapper Jim Feist. Due to skewness and the non-normality of the forecast errors, the log likelihood ratio test of Even and Noble (1992) was used to test for violations of a fair bet and no profitability for varying sizes of underdogs and the subset of home underdogs.

For underdogs in general, the market was found to be efficient for the entire sample, but large underdogs (more 28 points) were found to violate a fair bet, but not the null of no profitability. This is similar to the results found in odds betting in baseball and in hockey (Woodland and Woodland 1994, 2001) where big underdogs win more often, but not enough to be statistically profitable.

The strategy of betting home underdogs revealed stronger results. For lines greater than seven, wagering on the home underdog was found to violate the null of a fair bet during the last 10 years of the sample. The strategy of betting on the largest of the home underdogs (more than 28 points) not only violated a fair bet, but also the null of no profitability. This strategy was profitable for the

10-year sample of 1991-2000, with the height of profitability during the five-year sample of 1991-95.

The gambling market for college football has results comparable to those of other sports. The gambling public appears to have a preference for favorites, which leads to a violation of a fair bet in wagering on underdogs. Profitability is found in betting on the largest underdogs, possibly due to the relative infrequency of these betting opportunities or restrictions placed on participants in the market, such as limits on the size of wagers. When limits restrict the informed group of bettors, the uninformed bettors can dominate the betting volume, leading to a biased line and profitable returns to betting against popular public opinion. In the case of college football, this profitable strategy is betting on home underdogs of more than 28 points.

References

Dare, W. H., and S. S. McDonald. 1996. "A Generalized Model for Testing the Home and Favorite Team Advantage in Point Spread Markets." *Journal of Financial Economics* 40: 295-318.

Even, W. E., and N. R. Noble. 1992. "Testing Efficiency in Gambling Markets." *Applied Economics* 24: 85-88.

Feist, J. Various years. *Jim Feist's Professional Football Workbook*. National Sports Services Publishing.

Gandar, J., R. Zuber, T. O'Brien, and B. Russo. 1988. "Testing Rationality in the Point Spread Betting Market." *Journal of Finance* 43: 995-1007.

Golic, J., and M. Tomarkin. 1991. "The Degree of Inefficiency in the Football Betting Markets." *Journal of Financial Economics* 30: 321-330.

Hirshleifer, D. 2001. "Investor Psychology and Asset Pricing." *Journal of Finance* 56: 1533-1597.

Pankoff, L. 1968. "Market Efficiency in Football Betting." *Journal of Business* 41: 203-214.

Paul, R. J., and A. Weinbach. 2002. "Market Efficiency and a Profitable Betting Rule: Evidence from Totals on Professional Football." *Journal of Sports Economics* 3: 256-263.

Sauer, R. D., V. Brajer, S. P. Ferris, and W. M. Marr. 1988. "Hold Your Bets: Another Look at the Efficiency of the Betting Market for NFL Games." *Journal of Political Economy* 96: 206-213.

Tryfos, P., S. Casey, S. Cook, G. Leger, and B. Plylypiak. 1984. "The Profitability of Wagering on NFL Games." *Management Science* 30: 123-132.

Vergin, R. C., and M. Scriabin. 1978. "Winning Strategies for Wagering on National Football League Games." *Management Science* 24: 809-818.

Woodland, L. M., and B. M. Woodland. 1994. "Market Efficiency and the Favorite-Longshot Bias: The Baseball Betting Market." *Journal of Finance* 49: 269-280.

Woodland, L. M., and B. M. Woodland. 2001. "Market Efficiency and Profitable Wagering in the National Hockey League: Can Bettors Score on Longshots?" *Southern Economic Journal* 67: 983-995.

Zuber, R., J. Gandar, and B. Bowers. 1985. "Beating the Spread: Testing the Efficiency of the Gambling Market for NFL Games." *Journal of Political Economy* 93: 800-806.