

The Sensitivity of Findings of Expected Bookmaker Profitability

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Abstract

Levitt demonstrates that, contrary to conventional wisdom, sports books may not try to balance the money wagered on the sides of a game but instead exploit preferences of bettors in order to maximize expected profits. Levitt's findings are based on unique data from a wagering contest of the 2002 National Football League (NFL) season. Reconsideration based on 2004-2010 data from a similar contest yields findings of a dramatically smaller increase in expected profitability from strategic line making. Additionally, the traditional underperformance of favorites in athletic wagering may have somewhat subsided, which would also imply reduced bookmaker profits compared to those Levitt reports.

Keywords

sports wagering, efficient markets, gambling

Introduction

Sports wagering has become an increasingly prevalent activity and an increasingly frequent topic of financial research. Akst (1989) reported that annual, legal betting volume on National Football League (NFL) games alone was \$1.3 billion, whereas illegal betting volume was estimated to exceed \$26 billion. More recent estimations by Merrill Lynch and PricewaterhouseCoopers show that worldwide gambling

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revenues currently exceed \$100 billion and will continue to increase exponentially, possibly exceeding \$500 billion by 2015.

A considerable number of past studies have attempted to quantify the performance of bettors, practices of bookmakers, efficiency of betting markets, and profitability of various betting strategies. For example, Sturgeon (1974) shows that betting against last week's biggest NFL winner is profitable. Vergin and Scriabin (1978) show that numerous biases exist in NFL betting markets and that these biases are large enough that profits can be made by exploiting them. Gandar, Zuber, O'Brien, and Russo (1988) also find profitable betting strategies in NFL markets while noting the abundance of uninformed bettors relative to informed bettors. One such strategy they present is betting on teams that are underdogs by more than 5 points. Simmons, Nelson, Galak, and Frederick (2009) find substantial evidence that visiting favorites are bet on more than home favorites. Wever and Aadland (2010) find that betting on home and visitor underdogs with large closing lines leads to statistically significant positive returns in the NFL betting market. Not all studies, however, find evidence of anomalies or irrational behavior by bettors. Examples include Sauer, Brajer, Ferris, and Marr (1988) and Gray and Gray (1997).

The traditional view of betting markets holds that sportsbooks set odds in order to equalize the funds bet on the two sides of a contest, and thus, profit without risk by simply collecting commissions charged to bettors. This framework has been referenced in a number of studies. An alternative approach taken by bookmakers, however, has received increased attention in recent years. Millman¹ (2001) reveals the willingness of sportsbook managers to take a position on a contest by setting lines so that the money wagered on a game will not be equally divided between the two sides. If bookmakers can handicap contests such that bettors will wager the majority of dollars on a side less likely than 50% to prevail, expected profitability of the bookmaker will increase. Over time, a large enough number of contests will ensure that the risk to bookmakers of invoking such an approach will be minimal. Avery and Chevalier (1999) use the presence of noise in betting markets to highlight discrepancies between betting effects of informed and uninformed participants. They describe the effects of "dumb money" as a product of the plethora of bad advice that uninformed bettors seek, momentum strategies used by noise traders that fail to provide useful future value (but are known and exploited by bookmakers), and also notoriety biases that the uninformed masses subscribe to when betting on teams that are well known and highly visible.² Articles on crowd wisdom by Treynor (1987) and Surowiecki (2004) consider purposeful imbalances in sports betting markets where the equilibrium price is being neither achieved nor dramatically exploited. Strumpf (2003) introduces different pricing models used by bookmakers given three different types of bettors: those whom the bookmaker does not know, those arbitrageurs who seek to exploit mispricings (wiseguys), and "sentimental" (uninformed) bettors who are subject to different loyalties or biases.

Testing which of these approaches bookmakers actually use is difficult. While sportsbooks have been willing to release information regarding the raw number of wagers placed on contests, knowledge of the actual amount of money placed on both

sides of games, combined with knowledge of the outcomes of those bets, is necessary in order to evaluate bookmaker behavior empirically. Bookmakers are not regularly forthcoming with data regarding their profits and losses on individual contests, as releasing such information may alter bettor behavior and hamper the profitability increases that sportsbooks may realize by strategically setting lines to exploit bettor preferences. Paul and Weinbach (2007), in an important study, did explicitly consider this question based on data from sportsbook.com for the 2006 NFL season. Their findings confirm some degree of profit-maximization behavior by sportsbooks.

In a breakthrough effort to quantify bookmaker practices, Levitt (2004) acquired unique data regarding the betting selections of contestants in a handicapping contest of the NFL. The contest considered regular season games from the 2002 season. Levitt found evidence that sportsbooks set lines so that teams perceived to be superior in the contests win less than half of the time; nevertheless, bettors prefer to wager on such teams. Such a structure suggests that irrationality on the part of bettors as a whole and a decision by bookmakers to set lines to increase expected profitability based on bettor preferences. While the data and assumptions underlying the analysis were well described by Levitt, the striking finding of a 23% increase in expected profitability of sportsbooks due to strategic line setting is a dramatic result worthy of further discussion. Humphreys (2010) describes bookmakers as no longer appearing to be passive market participants, tasked with evenly balancing books. Bookmakers in National Basketball Association (NBA) betting markets appear to adjust lines to account for bettor sentiment, which, Humphreys notes, substantially increases their risk.³

In this article, we consider a bookmaking contest very similar to that studied by Levitt. Our contest, however, provides 7 years of data and has more participants annually. As opposed to the 23% increase in expected profitability documented by Levitt, we find an increase of under 6% using a near-identical approach. We believe that the relative entry fees paid by the participants of the contests result in a different mix of the type of bettors that participate, causing the results to be markedly different. Which of these contests, if either, is a good approximation for the general behavior of sports bettors is an open question. While we believe Levitt's finding of increased expected bookmaker profitability due to strategic linemaking is valid, we hope to draw increased awareness to the sensitivity of such findings, particularly to the specifics of the contest that form the basis of a study. We advise those studying bookmaker practices to be cautious in assuming a specific level of increased expected profitability from exploiting bettor preferences. We further find that a greater proportion of favorites are prevailing in wagers in recent years. This finding extends across a number of American sports associations and may imply that expected profitability gains from strategic linemaking are even smaller than currently accepted.

Sports Gambling/Spreads

The American football wagers described herein are bets "against the spread." The spread is a correction based on the perceived likelihood of teams in a game to win or

win by a given amount. This is the most common form of gambling on American football. A point spread is given by a bookmaker (often a casino or Internet company) and establishes a “favorite” and an “underdog.” A wager is graded based on subtracting the spread from the favorite’s final score and comparing this adjusted figure to the score of the underdog. Whichever side then has the higher score is the winning team of the “against the spread” wager. The profitability of the bookmaker is derived from (at least partly) the “vigorish” or “vig,” or “juice,” which is the effective commission paid by bettors. The traditional vigorish results in a structure in which bettors pay 110 units on losing wagers and collect only 100 units on winning wagers. The relevant question is whether bookmakers may prefer a structure that results in higher expected profitability based on the ability to deduce bettors’ likely preferences. If so, they may accordingly set spreads so that more than half of funds are wagered on a side with less than a 50% likelihood of covering the spread.⁴

Levitt notes:

If bookmakers are not only better at predicting game outcomes but also proficient at predicting bettors preferences, they can do even better in expectation than to simply collect the commission. By systematically setting the ‘wrong’ prices in a manner that takes advantage of bettor preferences, bookmakers can increase profits.

The suggestion that prices do not accurately reflect the true discrepancy between teams, and instead are purposefully set to take advantage of bettor sentiment, represents a dramatic shift in the study of betting markets. In the conventional scenario, the bookmaker isn’t subjected to any risk, but his expected return is set at 5%. Levitt models the relationship between expected return and the total fraction of dollars bet on a favorite (f), the probability that this favorite wins (p), and the vigorish (v):

$$E(\text{Bookmaker profit}) = [(1-p)f + p(1-f)](1+v) - [(1-p)(1-f) + pf].$$

$$\text{Or } E(\text{Bookmaker profit}) = (2+v)(f+p-2pf) - 1.$$

When the bookmaker equates betting volume such that ($f = 0.5$) or the probability of a favorite winning to losing is equal (such that $p = .5$), the bookmaker can expect to realize a risk-free profit of ($v/2$). A 10% vigorish results in the conventionally referenced bookmaker profitability level of 5% (Roxborough & Rhoden, 1998). However, if the bookmaker purposefully sets the lines based on bettor preferences, an imbalance in betting volume can result in an increased expected profitability. In Levitt’s study, an increase from 5% to 6.16% represents an increase in expected profitability of more than 23%.

Data

Our primary data are from the Las Vegas Hilton SuperContest (hereafter SuperContest), a sports handicapping competition of the NFL. The SuperContest is organized

by a hotel/casino in order to increase publicity for its operations. The selections of all participants, as well as summary information regarding selections, are provided by the contest's website each week during the NFL season.⁵ Additionally, data from *sportsinsights.com*, which track historical spreads and results for numerous sports, are gathered.

The SuperContest began in 1989 and perhaps has become the most famous competition in American sports handicapping.⁶ The required entry fee is \$1,500; thus, participants have a high incentive to perform optimally, and the percentage of entrants that are experienced "wise guy" players is most likely considerably greater than the percentage of overall sports gamblers that are "smart money." All entry fees are returned to participants in the form of prize money. Typically, the winner receives around 40% of the total purse, and the top 20 participants receive prize money. Between 300 and 550 participants compete in the contests of the seasons covered by our study. Motivated by the findings of Levitt, we began tracking performance in the SuperContest in the 2004 NFL season. Our study encompasses the period from the publication of Levitt's work through the most recent NFL season (2004-2010).

Only regular season NFL games are part of the SuperContest. Each Tuesday, the spreads for that week's games are made available to contest participants. Each player must select five teams to utilize as wagers for that week (between 13 and 16 games comprise each week of the NFL's 17 regular season weeks). Because each correctly selected wager earns 1 point and each selected wager that ties or "pushes" earns one-half point, a maximum possible score of 85 is possible for the entire competition.⁷ Selections are due to the Las Vegas Hilton by Friday of that week (unless a Thursday game is scheduled that necessitates an earlier deadline). This structure may allow an informational advantage to players who delay until the last possible moment to submit their weekly selections as news may emerge which renders the SuperContest lines, issued on Tuesdays, obsolete as "fair" spreads for games. However, our findings remain almost unchanged after deleting all games that saw lines shift by any amount, while the weekly selection process was open. While selections must be submitted to the Las Vegas Hilton, participants may utilize proxies to enter selections. Anecdotally, this is quite common. Therefore, no practical geographical constraint exists for the participants of the SuperContest.

Utilizing SuperContest data in order to draw inferences regarding the behavior and performance of sports bettors entails a number of difficulties which should be acknowledged. First, as previously noted, the potential for obsolete or "stale" lines may allow for superior performance among the wagers placed in the SuperContest. Second, there is attrition among the participants in the contest. As approximately only the top 5% of bettors are awarded prize money, it is possible for a number of participants to conclude, even in the early weeks of the contest, that their chances of winning a prize are effectively zero, and thus, they may elect to refrain from making further selections in the contest. This attrition is obviously

nonrandom for the subset of participants that remain in the contest in the later weeks of the season are undoubtedly those who have performed well in the early weeks. If this is the result of superior selection ability, rather than random noise,⁸ then the performance of SuperContest bettors, overall, may again prove to be misleadingly superior.

Most importantly, it must be acknowledged that the selection of SuperContest wagers may be a noisy proxy for the preferences of bettors. Each participant must select exactly five wagers each week of the NFL regular season, and undoubtedly a number of bettors would like to place more or fewer bets in certain weeks. Furthermore, each bet is of equal importance, given the SuperContest format. In reality, bettors are likely to place larger (smaller) dollar amounts on wagers in which they have more (less) confidence. The relevant question is whether, and to what degree, bookmakers set lines in order to take advantage of irrational bettor preferences and thus derive greater expected profits. To analyze this would require knowledge of how willing sportsbooks are to set lines that intentionally bring more than 50% of *dollars* onto one side of a contest, presumably the side that is less than 50% likely to prevail in a bet. While bookmakers may allow disclosure of information regarding the raw number of *bets* placed on either side of a contest, most do not wish to disclose the proportion of funds wagered on either side for fear of revealing their strategy to otherwise unsuspecting customers.⁹ SuperContest data are unique in that knowing the number of bets placed on various sides directly reflects the totality of the realized preferences of the participants, given the constraints of the competition. Those constraints are quite meaningful. Bettors may behave differently in a format where their interest in each wager is *de facto* equal. Because the entry fee of the contest is paid at the beginning of the season, bettors' selections may not reflect preferences in the same manner that dollars wagered on individual games normally would. Bettors may also implement strategies, in an effort to prevail in the SuperContest, which do not approximate wagering strategies they would otherwise undertake.

While these shortcomings exist, they are the same set of difficulties facing Levitt's study of the 2002 NFL regular season. Thus, while issues exist which allow for only tenuous conclusions, in some regards, a direct comparison to Levitt's findings is quite possible. This allows for analysis of the robustness of Levitt's findings and discussion of why any discrepancies may have developed. Levitt did not use the SuperContest for his study as he references an "online sportsbook" as the source of his data. More notably, the entry fee for the contest analyzed in Levitt's study of the 2002 NFL regular season is \$250, as opposed to the \$1,500 entry fee of the SuperContest. The payout structure seen in Levitt's contest is similar to the SuperContest, and the number of participants is somewhat similar as well (285 vs. the 300–550 of the SuperContest over the 2004–2010 period). The format of the contests is identical. The attrition rates in Levitt's 2002 study and our SuperContest observations from 2004 to 2010 appear to be similar.

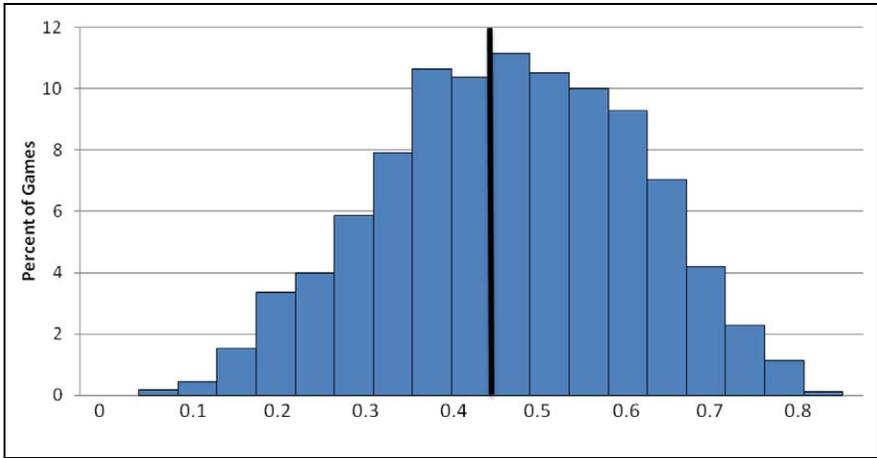


Figure 1. Selection of favorites, all games. This figure displays the distribution of all NFL regular season games, over the 2004-2010 period, according to the proportion of bettors in the Hilton SuperContest who wagered on the game and chose the favored team for their selection.

Results

Bettor Preferences and Performance

We begin by presenting figures demonstrating the proportion of games with given frequencies of SuperContest bets allocated to favorites. If bettors have no preferences for favorites or underdogs, and if lines set by bookmakers are unbiased so that favorites and underdogs are equally likely to win bets, then a symmetric distribution of games around the 0.5 mark should develop, and most games will see a near 50–50 split of selections. Figure 1 shows the distribution of games for the entire sample period (the 2004-2010 NFL regular seasons) where one team was the favorite in the game (the line was nonzero), based on the proportion of wagers placed on the favorite.

More than half of the games have a majority of wagers placed on favorites. Past research has indicated that a disproportionate number of *underdogs* win wagers, which suggests preferences for favorites among bettors may be particularly irrational. However, to consider the implications of the preferences for our time period, it is important to consider the specific performance of favorites and underdogs in our sample. We find 55.7% of games with a majority of such bets. This represents a proportion of favorite-heavy games significantly greater than 50% (at the 1% level). This mark is astoundingly less than the proportion of favorite-heavy games in Levitt's 2002 analysis (approximately 80%).¹⁰

We also present figures that separately consider the cases of games in which the home team and road team are favored. Figure 2 shows the distribution for games in which the home team is favored based on the proportion of wagers on the favorite.

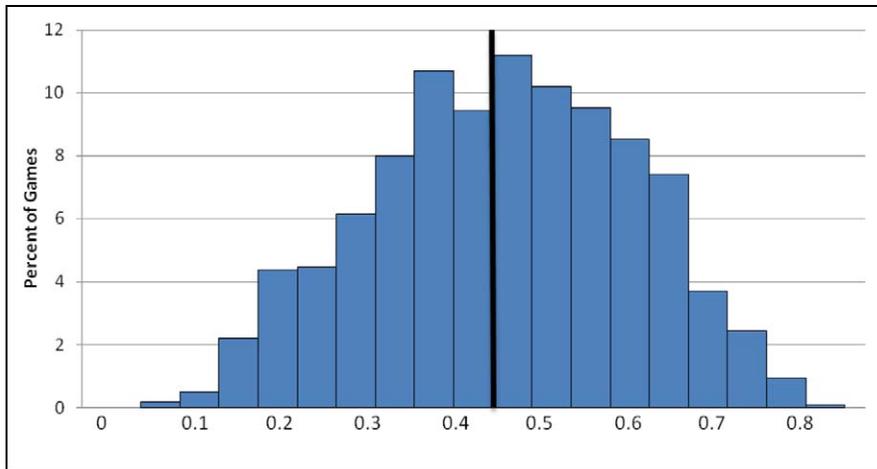


Figure 2. Selection of favorites, home team favored. This figure displays the distribution of NFL regular season games in which home teams were favored, over the 2004-2010 period, according to the proportion of bettors in the Hilton SuperContest who wagered on the game and chose the favored team for their selection.

In the sample period, 54.0% of games with home favorites have a majority of bets placed on such favorites. This is significantly greater (5% significance level) than 50%. It is also, however, substantially significantly less (at the 0.1% level) than the results in Levitt.¹¹

For our sample, wagering appears more heavily concentrated on favorites in cases where the road team is favored, as seen in Figure 3.

In the sample, 59.4% of games with road favorites have a majority of wagers placed on the favorite. This is significantly greater, at the 1% level, than 50%, but is also significantly less (at the 0.1% level) than 90% as seen in Levitt.¹²

This analysis treats all games equally, regardless of the public's interest in selecting a given game for use in the SuperContest. Put more plainly, whether a game has 6 of 10 wagers placed on the favorite, or 60 of 100, it appears, in these figures, as one observation with 60% of wagers placed on the favorite. To more accurately track the preferences of bettors, it is necessary to consider the individual wagers of the bettors and the performance of these wagers.

The breakdowns of bettor preferences and the performances of wagers are presented in Table 1. The results for the entire period, entailing the 2004-2010 NFL regular seasons, as well as the season-by-season results are given.

Overall, 52.7% of bets are placed on favored teams, even though less than half of bets on favorites win historically.¹³ That trend continues in our sample period. About 48.9% of favored teams cover NFL spreads during our study, and 49.9% of the wagers placed on favored teams win. Only 47.3% of bets in our study are placed

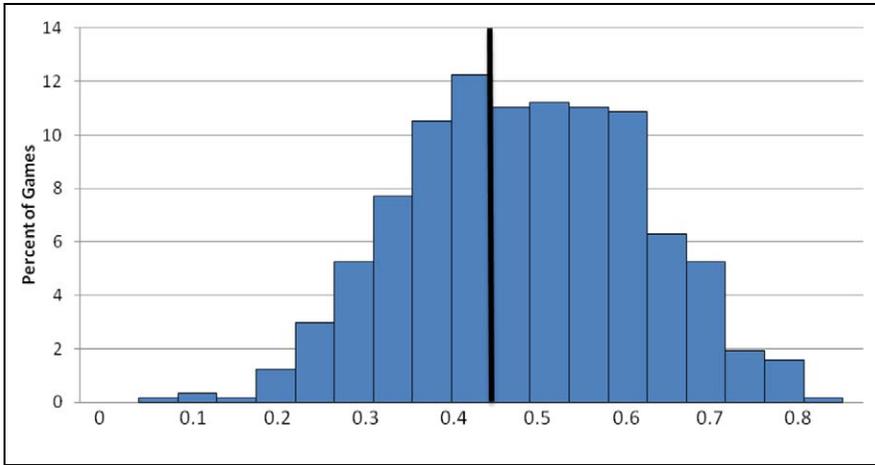


Figure 3. Selection of favorites, road team favored. This figure displays the distribution of NFL regular season games in which road teams were favored, over the 2004-2010 period, according to the proportion of bettors in the Hilton SuperContest who wagered on the game and chose the favored team for their selection.

on underdogs, even though 51.1% of underdogs cover spreads during our study, and 51.7% of the wagers placed on underdogs win.¹⁴

The percentage of bets on favorites that win was 48.5% in 2002, but in our study, 49.9% of wagers on favorites win. The percentage of bets on underdogs that win was 52.6% in 2002 but 51.7% for our 2004-2010 period. The effective gap in winning frequency demonstrated between favorites and underdogs by Levitt for the 2002 NFL regular season is only half as large in our study. This is largely driven by the improved (declined) performance of wagers on road favorites (home underdogs).

Observing the year-by-year results demonstrates a trend toward more wagers being placed on underdogs over time. The two seasons with the greatest proportion of wagers placed on underdogs are the most recent seasons of 2009 and 2010. The uncovering of the role of bettor preferences by numerous authors (most notably Levitt) may have helped create a more efficient market in recent years.

In Table 1, we include two final statistics. The “projected bettor win” figure is calculated via the method described by Levitt in which the historical proportion of favorites winning bets (48.8% for home favorites and 46.7% for visiting favorites) is used to calculate the expected winning percentage of the wagers selected by SuperContest bettors.¹⁵ In Levitt’s 2002 study, 49.45% of wagers were expected to win, and, given the standard 10% vigorish of sports betting, the resulting expected gross profit was 6.16%, which is 23% greater than the standard 5%, a significant coup for the bookmaker. This is the emphasis of Levitt’s study: bookmakers do not set gambling lines in order to equalize betting interest on the two sides of a contest. The profitability increase from exploiting bettor preferences is only 5.9% for the

Table 1. Selection of Wagers and Wager Performance.

Which Team Favored? 2004-2010	% of Bets Placed			% of Bets That Win That Are Placed on		
	Favorite	Underdog	Total	Favorite	Underdog	Total
Home	51.3 (137,605)	44.9 (74,185)	49.1 (211,790)	49.0 (68,597)	52.3 (65,324)	49.5 (100,981)
Visitor	55.1 (74,185)	48.7 (137,605)	50.9 (211,790)	51.4 (39,899)	50.4 (32,384)	52.0 (105,223)
Total	52.7 (211,790)	47.3 (211,790)	50.0 (211,790)	49.9 (108,496)	51.7 (97,708)	50.8 (206,204)
	Projected bettor win: 49.86%			Profit increase: 5.9%		
2004						
Home	50.9 (20,938)	45.9 (11,476)	49.1 (32,414)	46.2 (10,254)	52.7 (9,993)	48.6 (15,366)
Visitor	54.1 (11,476)	49.1 (20,938)	50.9 (32,414)	53.2 (6,057)	53.3 (5,112)	52.9 (16,050)
Total	52.0 (32,414)	48.0 (32,414)	50.0 (32,414)	48.8 (16,311)	52.9 (15,105)	50.8 (31,416)
	Projected bettor win: 49.89%			Profit increase: 4.6%		
2005						
Home	54.1 (25,646)	40.2 (13,275)	49.3 (38,921)	56.0 (13,499)	44.0 (11,647)	49.9 (18,611)
Visitor	59.8 (13,275)	45.9 (25,646)	50.7 (38,921)	62.6 (7,669)	33.9 (5,112)	51.4 (19,316)
Total	56.0 (38,921)	44.0 (38,291)	50.0 (38,921)	58.4 (21,168)	40.9 (16,759)	50.7 (37,927)
	Projected bettor win: 49.71%			Profit increase: 12.2%		
2006						
Home	52.4 (20,721)	48.1 (11,987)	50.8 (32,708)	42.5 (10,664)	59.1 (9,633)	49.6 (16,350)
Visitor	51.9 (11,987)	47.6 (20,721)	49.2 (32,708)	36.0 (6,186)	62.9 (5,686)	50.1 (15,819)
Total	52.2 (32,708)	47.8 (32,708)	50.0 (32,708)	40.1 (16,850)	60.5 (15,319)	49.8 (32,169)
	Projected bettor win: 49.92%			Profit increase: 3.4%		
2007						
Home	52.7 (16,254)	48.5 (10,254)	51.1 (26,508)	53.4 (8,311)	45.4 (7,462)	52.6 (13,160)
Visitor	51.5 (10,254)	47.3 (16,254)	48.9 (26,508)	50.9 (5,137)	51.3 (4,849)	47.7 (12,599)
Total	52.2 (26,508)	47.8 (26,508)	50.0 (26,508)	52.4 (13,448)	47.7 (12,311)	50.2 (25,759)
	Projected bettor win: 49.92%			Profit increase: 3.4%		
2008						
Home	52.1 (18,995)	47.2 (8,360)	50.6 (27,355)	48.2 (9,563)	56.8 (8,921)	47.8 (13,353)
Visitor	52.8 (8,360)	47.9 (18,995)	49.4 (27,355)	50.5 (4,332)	46.7 (3,790)	54.8 (13,253)
Total	52.3 (27,355)	47.7 (27,355)	50.0 (27,355)	48.9 (13,895)	53.8 (12,711)	51.2 (26,606)
	Projected bettor win: 49.91%			Profit increase: 3.8%		
2009						
Home	48.3 (16,994)	45.0 (8,675)	47.2 (25,669)	45.1 (7,854)	53.3 (8,517)	47.4 (11,682)
Visitor	55.0 (8,675)	51.7 (16,994)	52.8 (25,669)	52.3 (4,690)	52.1 (3,828)	53.0 (13,207)
Total	50.6 (25,669)	49.4 (25,669)	50.0 (25,669)	47.8 (12,544)	52.9 (12,345)	50.4 (24,889)
	Projected bettor win: 49.92%			Profit increase: 3.4%		
2010						
Home	47.5 (18,057)	40.8 (10,158)	45.1 (28,215)	49.9 (8,452)	55.6 (9,151)	50.3 (12,459)
Visitor	59.2 (10,158)	52.5 (18,057)	54.9 (28,215)	51.6 (5,828)	51.2 (4,007)	54.1 (14,979)
Total	51.7 (28,215)	48.3 (28,215)	50.0 (28,215)	50.6 (14,280)	54.3 (13,158)	52.4 (27,438)
	Projected bettor win: 49.82%			Profit increase: 7.6%		

Note. This table demonstrates the selections of participants in the Hilton SuperContest covering the 2004-2010 NFL regular seasons. The table mimics the presentation of Levitt (2004, table 2, p. 235). The figures on the left half of the table denote the percentages of wagers placed on favorites and underdogs. The figures on the right half of the table denote the percentages of wagers, once placed, which win. The number in parentheses is the total number of bets placed in each cell. Games are excluded if the spread is zero. The total number of wagers on the right half of the table are smaller than those on the left side as wagers that tie are not included in the results of the right half. The "Projected Bettor Win" and "Profit Increase" statistics are based on the historical proportion of road and home favorites that win games from 1980 to 2001 as utilized by Levitt. These proportions are also utilized here for comparison purposes. The projected bettor win percentage is calculated and compared to 50% in order to determine the implied increase in profits for sports books based on setting lines that do not equalize betting action on two sides of a contest.

Table 2. Percentage of Favorites Covering SuperContest (Opening) Lines.

	Total	2004	2005	2006	2007	2008	2009	2010
NFL								
Favorites ($n = 1715$)	49.6	46.9	57.2	44.1	52.5	48.2	48.6	49.6
Road-Favorites ($n = 545$)	51.9	49.4	61.8	44.2	51.8	53.4	50.7	52.5

Note. This table presents the percentages of favored teams in NFL regular season games, which cover spreads based on the odds set in the Hilton SuperContest for the 2004-2010 period.

overall 2004-2010 period, based on our SuperContest analysis. We consider potential explanations for these findings in our Discussion section.

Game Outcomes Against the Spread

For a profit-maximization approach to remain successful, should bettors irrationally prefer to wager on favorites, as suggested by the findings of Table 1, a disproportionate number of underdogs must cover lines.

Table 2 presents the proportion of favorites and road favorites that cover spreads in NFL regular season games for our sample period of 2004-2010 and for each individual season within the overall sample period. About 49.6% of favorites covered spreads in the 2004-2010 period including 51.9% of road favorites. These frequencies are considerably greater than the 48.2% of all favorites and 46.7% of road favorites that covered spreads in the 1980-2001 era. Along with the shrinking preference for favorites among SuperContest wagers, the evidence for profit maximization by NFL bookmakers has declined substantially relative to Levitt's 2002 study.

Robustness

Because the SuperContest lines are established at the start of the week, typically 5 days before NFL regular season games are contested, and these odds are used by all participants in the contests, it is possible that lines shift in response to early wise guy money (see Millman, 2001) and that the bulk of funds are placed by "square" players at inflated lines. Thus, we consider the performance of favorites and road favorites relative to closing lines.¹⁶

As seen in Table 3, NFL favorites and road favorites perform slightly worse over the 2004-2010 period relative to closing lines than opening lines; however, it appears unlikely that the reduced profitability implied by the SuperContest results is a function of late movements to lines that result in more losses by the betting public.¹⁷

Additionally, we consider the performance of favorites and road favorites in other sports leagues as a robustness check of the results observed for the NFL. While we do not have data regarding bettor preferences analogous to SuperContest data, we can track the performance of favorites under the assumption bettors prefer favorites, regardless of the league of the contest (Table 4).¹⁸

Table 3. Percentage of Favorites Covering Closing Lines.

	Total	2004	2005	2006	2007	2008	2009	2010
NFL								
Favorites (<i>n</i> = 1711)	48.9	46.7	58.3	41.0	52.7	47.6	48.8	47.8
Road-Favorites (<i>n</i> = 545)	50.9	50.0	63.2	40.2	49.4	52.0	52.5	50.0

Note. This table presents the percentages of favored teams in NFL regular season games, which cover spreads based on the odds cited as closing lines by SportsInsights.com, originally for wagers from pinnaclesports.com.

Table 4. Percentage of Favorites Covering Closing Lines in Other Sports Leagues.

	Total	2004	2005	2006	2007	2008	2009	2010
NCAAF								
Favorites (<i>n</i> = 4,449)	49.6	49.1	48.2	49.3	49.1	50.1	49.1	51.8
Road-Favorites (<i>n</i> = 1,529)	48.9	39.1	47.8	49.1	46.8	52.1	51.3	54.8
NBA								
Favorites (<i>n</i> = 8,175)	50.0	50.0	51.3	49.2	49.0	51.4	50.2	49.2
Road-Favorites (<i>n</i> = 2,314)	51.6	48.7	51.8	50.2	53.0	51.6	51.6	53.4
NCAAB								
Favorites (<i>n</i> = 20,325)	49.7	50.5	49.0	49.0	50.1	50.4	49.3	49.7
Road-Favorites (<i>n</i> = 4,979)	51.4	52.8	48.6	51.6	49.4	51.5	49.9	55.3
WNBA								
Favorites (<i>n</i> = 1,219)	50.5		53.5	53.7	41.7	55.9	50.2	46.4
Road-Favorites (<i>n</i> = 244)	52.5		48.7	60.0	42.3	60.5	42.1	54.6

Note. This table presents the percentages of favored teams in numerous sports leagues, which cover spreads based on the odds cited as closing lines by SportsInsights.com, originally for wagers from pinnaclesports.com. NCAAF denotes college football games. NBA denotes National Basketball Association (professional basketball) games. NCAAB denotes college basketball games. WNBA denotes Women's National Basketball Association (professional basketball) games.

Favorites, and more particularly road favorites, win over 50% of wagers in many cases. College (NCAAF) football favorites cover 49.6% of games over our 2004-2010 sample period,¹⁹ and 48.9% of road favorites cover college football games. These frequencies are not significantly less than 50%, however. Men's professional (NBA), men's college (NCAAB), and women's professional (WNBA) basketball favorites and road favorites cover spreads in at least 50% of contests, with the exception of college basketball favorites, who cover spreads in 49.7% of games (not significantly less than 50%). If bettors have irrational preferences for favorites, and bookmakers seek to maximize profits by exploiting such preferences, we would not expect to see such high percentages of favorites, particularly road favorites, covering spreads. The frequency of favorites covering spreads, however, without insight into bettor preferences, is only circumstantial evidence in support of a weakening of the profit-maximization structure of bookmaking.

Discussion

As noted in Paul and Weinbach (2007, 2011), appropriate tests of Levitt's framework of bookmaker profitability should be based on the amount of dollars wagered on each side of contests, in concert with the frequency of certain types of wagers winning. In plainer terms, if bookmakers are attempting to maximize profitability based on bettors' irrational preference for favorites, evidence would exist that favorites receive the majority of wagering dollars and that more than half of such dollars are lost because the favorites bettors prefer fail, disproportionately, to cover the spread. Such a structure would introduce increased risk to bookmakers as teams (presumably favorites) may win more than 50% of wagers over a substantial sample even if the true probability of covering a spread for such favorites is less than 50%. This also presupposes that bookmakers can accurately judge what spreads will result in less than 50% of favorites covering games (or, more accurately, less than 50% of dollars placed on favorites winning).

While acknowledging the shortcomings of utilizing contest data, we report a much lower increase in expected bookmaker profitability for the 2004-2010 period than that seen in Levitt's 2002 study (less than a 6% increase above the profitability level based solely on commission). We write here not because we question the validity of Levitt's findings that bookmakers seek to maximize profits. We instead hope to demonstrate two significant points. First, the increased expected profitability of bookmakers calculated by Levitt is subject to many assumptions. Increased expected profitability of 23% is an impressive figure, but the assumptions underlying this figure which equate bettor preferences in a contest format to the actual dollars wagered by all bettors (discussed in detail in our Data section) are not minor. Furthermore, the preferences of the participants of the contest studied by Levitt in 2002 may not hold from year to year or from contest to contest. By providing a direct comparison (the structures of the SuperContest and Levitt's Internet sportsbook contest are identical), we show that to be the case.

Why do we see such a relatively modest increase in expected profitability in our study? A number of possibilities exist. Bettors, as a whole, may be becoming wiser through experience or through increased access to information alerting them to bookmaker profit-maximization strategy. This includes the studies of Levitt, and others, which bring the bookmaker dynamic to light. Alternatively, bookmakers may be more risk averse and thus less likely to set lines hopeful of scoring substantial profits.

We believe that the most likely explanation for the disparity between our results and Levitt's lies elsewhere: in the entry fee difference between the SuperContest and Levitt's Internet contest. The \$1,500 entry fee of the SuperContest is likely to result in average participants that are more sophisticated as bettors than those paying the \$250 entry fee to enter the 2002 contest Levitt studies. The players in the SuperContest still exhibit a preference for favorites, even though their wagers on underdogs

win at a substantially greater rate, and undoubtedly a number of purely recreational gamblers play in the SuperContest. Anecdotally, however, a number of wise guys participate as well, and this is far less likely to be the case in Levitt's study of a \$250 Internet contest. Such bettors would temper the overall selections of the group so that extreme results, such as that two thirds of games with road favorites see more bets on favorites, would be less likely.

Which study, Levitt's or ours, is closer to describing the "correct" expected profitability increase from bookmakers? There is no way to be certain. More participants wager in the SuperContest, and our data span over seven NFL seasons as opposed to Levitt's one season. The increased expected profitability levels we see are less than Levitt's in each individual season, as well as in the overall sample. How does the makeup of contestants compare for Levitt's analysis to the SuperContest? A higher proportion of smart money most likely participates in the SuperContest, given its entry fee, but how high? The total dollars wagered on sports contests are a mix of public or square money and expert or wise guy money. Public bets encompass the vast majority of wagers, but the dollars wagered in each bet by an expert are vastly greater than the dollars wagered in a typical public bet.

We further note that, as a whole, favorites are not performing nearly as poorly in recent years as they have traditionally. This finding extends to all sports that we analyzed in this study. The relevant question, of course, is not the overall performance of favorites but the performance of dollars wagered on favorites (or, more plainly, how do favorites perform in games where large amounts of money are placed on them?). We note that the expected profitability increase of bookmakers is greatly reduced if more favorites are indeed covering, as the evidence suggests on its face. Anecdotally, we have heard mention that, overall, fewer excess dollars have been made in recent years by sportsbooks via setting lines exploiting bettor preferences for favorites. Such was one of our emphases for reconsidering the contest approach to evaluating bookmaking strategy.

Our evidence, though unique in nature, suggests that the excess profitability available to bookmakers by considering bettor preferences, while nontrivial, may have diminished. We believe that bookmakers are willing to take positions on contests in order to increase profitability, but we suggest caution in interpreting the actual increases in expected profitability that bookmakers may realize based on a contest framework.

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Notes

1. "The line is there to draw people in, to entice people who think they may know sports to make a wager. Bookmakers don't have an opinion about who is better or worse. They have an opinion about who will bet and what, in turn, will make them a lot of money."
2. In results not shown, we explore whether sides with characteristics likely to appeal to naïve bettors, beyond status as favorites in the game, are less likely to win wagers. We find limited evidence in support of this idea.
3. The data for this study, however, consider only the proportion of wagers placed on each side of the contest and not the amount of funds placed on the sides.
4. "Covering" a spread is to win a sports wager. A favored team covers by winning a contest by a number of points greater than the spread. An underdog team covers by winning a contest or losing a contest by a number of points less than the spread.
5. www.lvhilton.com/supercontest. Historical summaries of wagers may be found at www.thelogicalapproach.com.
6. www.lvrj.com/special_sections/football/9481877.html
7. Winning scores between 53 and 55 points have been typical in recent seasons.
8. This appears unlikely given Levitt's findings regarding the persistence of wagering ability.
9. An exception to this difficulty is the work of Paul and Weinbach (2007) who test Levitt's profit-maximization framework using an Internet sportsbook's data on the 2006 NFL season and find significantly more dollars placed on favorites, particularly road favorites, as Levitt's approach suggests. The profitability of this approach for sportsbooks is particularly high in the 2006 NFL season as a record number of underdogs covered spreads in this season.
10. See Levitt (2004), pg. 238, for details.
11. Conservatively estimated, based on figure 2 of Levitt (2004): "In almost three-quarters of the games, more bets are placed on home favorites than on their opponents."
12. Conservatively estimated, based on figure 3 of Levitt (2004): "In more than 90% of games with a visiting favorite, more bets are placed on the visitor than the home team."
13. Levitt (2004), Table 3, pg. 236.
14. Unlike Levitt, we have two different sample sizes, one tracking bets placed and another tracking the proportion of bets that win. The discrepancy arises because bets that tie or "push" and, thus, have no winner, are removed from the latter sample but not the former.
15. For the sake of conservatism in contrasting our results to those seen in Levitt's study of the 2002 NFL season, we utilize these historical proportions rather than updating the winning frequency of favorites. If the underperformance of favorites has subsided, particularly in games with large proportions of bets on favorites, expected profitability increases will be even lower.
16. Closing lines are obtained from SportsInsights.com that reflects historical pinnacle-sports.com odds.
17. Line movements could still conceivably result in expected profitability levels above those we present if the subset of contests where favorites fail to cover spreads due to line movement contains a large amount of the dollars wagered on favorites. There is no reason, however, to suspect this to be the case.

18. SportsInsights.com provides the proportion of wagers from pinnaclesports.com that are placed on each side of a contest; however, unlike the SuperContest case, in which each wager represents exactly one selection in a contest, the wagers referenced from SportsInsights.com are not equally weighted. For example, a contest may have 90% of wagers placed on the favorite, but over 50% of dollars wagered on the contest may be wagered on the underdog, particularly if wise guy bettors are wagering heavily on a contest. Thus, we do not utilize such data to construct results analogous to Table 1.
19. Only regular season games are used in each sport, and only games with true home and road teams are considered.

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