

Market Efficiency and the National Football League

You might think that the issue of market efficiency has nothing in common with American football. Want to bet?

More than 100 years ago, an aspiring French mathematician named Louis Bachelier fired the first shot in the debate over market efficiency. In his 1900 dissertation for a doctorate at the Sorbonne, Bachelier studied price changes in France's securities markets. His goal was to uncover "a formula which expresses the likelihood of a market fluctuation" – in other words, a means of anticipating how prices would change over time. But after employing an impressive array of statistical and financial analyses, Bachelier concluded that market fluctuations are random and unpredictable, and that the search for a consistent way to outguess them is futile.

In the 1960s, academics in economics and finance began to formalize Bachelier's idea. These thinkers used computers to scour U.S. stock market data, looking for support of what they called the random walk theory or the efficient markets hypothesis. While the technology and the terminology had evolved since Bachelier's day, the core conclusion was the same: no matter what skills and systems an investor may bring to the table, beating the market is difficult and maybe even impossible over the long term.

In the decades that followed, a range of challenges to the notion of an unbeatable market surfaced in the academic community. For instance, a 1994 study by Josef Lakonishok, Andrei Shleifer, and Robert Vishny (LSV) notes that out-of-favor stocks outperformed the rest of the market consistently over the preceding 25 years. LSV attributes this phenomenon to investor "judgment errors," which pushed prices for these stocks to bargain levels. As a result of these "pervasive and enduring" tendencies, the trio concludes, investment strategies that focused on out-of-favor stocks "appear to have beaten the market."

EFFICIENCY AND FOOTBALL WAGERING

An interesting subset of efficiency research has focused not on the prices of stocks but on the spreads offered by bookmakers in the National Football League wagering market. The "spread" is a handicapping device that, at least in theory, makes the outcome of every professional American football game an even wager. And just as stock prices are driven by the interaction of the market's buyers and sellers, spreads are determined by the aggregate preferences of the bookmakers' clientele.

Here's a simplified example of how spreads work. Imagine that the New York Jets are playing the Miami Dolphins, and a Las Vegas casino has posted a spread that favors New York by 4.5 points – meaning that the Jets would have to win by 5 points or more for a New York bet to pay off. If this scenario causes a disproportionate amount of bets to come in on the Dolphins,

Market Efficiency and the National Football League

continued

the casino might decrease the spread, perhaps to a 3.5-point New York advantage. The new spread would make a Jets wager more attractive and would help distribute bets more evenly across the two teams.

Because of the mechanics of this system, some academics have turned to football spreads to gain insight into the debate over market efficiency. In 1997, for example, *The Journal of Finance* published “Testing Market Efficiency: Evidence from the NFL Sports Betting Market,” by Philip Gray and Stephen Gray. The authors start by pointing out that, if the NFL wagering market is efficient, no public piece of information – which team is at home, which team is favored, and so on – should give a wagerer an opportunity to profit consistently. As Gray and Gray put it, the spread should be “an unbiased predictor” of game results over time.

The table below summarizes a pair of Gray and Gray’s key findings. In the average match up, the favorite team was afforded a 5.62-point pre-game advantage over the underdog, but ended up winning by a margin of only 5.20 points. And while the spread typically favored the home team by 2.56 points, home teams won by an average of 2.99 points. “There appears to be some overconfidence in the favorite,” Gray and Gray concluded, and in addition, “the value of the home field advantage appears to be discounted.”

SPREADS VS. OUTCOMES IN THE NFL

1976-1994
(4,219 Games)

	Favorite	Home Team
Average pre-game spread advantage	5.62	2.56
Average margin of victory	5.20	2.99

Source: “Testing Market Efficiency...,” *The Journal of Finance*

From there, Gray and Gray extend their analysis to include “variables that have strong analogies to financial markets and behavioral research.” First, they note that teams with higher full-season winning percentages tend to beat the spread more often. Second, they point out that teams that have beaten the spread in four consecutive games are less likely to beat the spread than teams that have failed to cover four times in a row.

Gray and Gray interpret these two findings jointly, explaining that success over the full season seems to go somewhat unrecognized, while at the same time, “the market overreacts to recent form.” In other words, wagerers seem to give too much weight to short-term results – while

Market Efficiency and the National Football League

continued

underestimating the significance of strong performance over the long run. In the second section of their paper, Gray and Gray describe how a betting strategy designed to capitalize on these tendencies “can generate statistically significant profits.”

ADDITIONAL EVIDENCE OF INEFFICIENCY

A different type of bettor bias is the focus of “Market Efficiency and a Profitable Betting Rule,” by Rodney Paul and Andrew Weinbach in *The Journal of Sports Economics*. This 2002 study focuses on “totals” bets, where bettors wager on whether the total number of points scored by both teams will come in over or under a level set by the bookmaker. (If the pre-game total was set at 40, for example, and the final score of the game was 30-25, bettors who took the “over” would win.)

After noting that totals bets tend to attract more attention when two high-scoring teams are playing each other, Paul and Weinbach point out that “rooting for scoring tends to be easier than cheering for a lack of scoring.” With these two factors in mind, the authors theorize that bettor psychology may push totals too high, making the “under” a consistently profitable wager. To test this hypothesis, Paul and Weinbach examine the entire sample of NFL totals from 1979 to 2000. And as the table below indicates, the under indeed won with a frequency that calls the efficiency of the totals market into question – particularly in games where the total was significantly higher than average.

THE “UNDER” IN THE NFL
1979-2000
(4,589 Games)

	“Under” Win %
All games (average pre-game total = 40.3)	51.0%
Games with pre-game total of 45.5 or higher	55.1%
Games with pre-game total of 46.5 or higher	57.0%
Games with pre-game total of 47.5 or higher	58.7%

Source: “Market Efficiency and a Profitable Betting Rule,” *Journal of Sports Economics*

One more interesting study of wagering market efficiency comes from Steven Levitt, a distinguished economics professor at the University of Chicago. In April 2003, Levitt received the John Bates Clark Medal, which is awarded every two years to the United States’ most outstanding economist under the age of 40. In his short career, Levitt has studied everything

Market Efficiency and the National Football League

continued

from the relationship between abortion and crime rates to the economics of inner-city drug dealing – and he’s also examined wagering on the NFL.

In “How do Markets Function? An Empirical Analysis of Gambling on the National Football League” – a working paper available from the National Bureau of Economic Research – Levitt studies almost 20,000 bets made at an online sports book during the 2001-2002 NFL season. He uses the data to put forward a new twist in the study of football wagering. In Levitt’s opinion, bookmakers are well aware of the market’s inefficiency – and they happily take advantage of it.

As mentioned above, conventional wisdom holds that bookmakers set a game’s spread to evenly distribute wagers across the two teams. If this is true, the loser’s losses will offset the winner’s wins, with the bookmaker pocketing a commission. But if home teams and underdogs tend to beat the spread more often, would bookmakers really mind if more money came down on visitors and on favorites?

Levitt thinks the answer is no, and he offers some compelling data to prove it. The bets he studies come from a tournament of more than 200 bettors, who each made five bets a week against the spread through the entire 17-week regular season. As the table below shows, wagers were not split 50-50. Instead, more bettors took the side of the favorite, whether the favorite was at home or visiting. And in both cases, the bets going the *other* way were the ones that won more often.

NFL BETTOR TENDENCIES IN TOURNAMENT
2001-2002
(19,201 Bets)

	# of Bets	Win %
Home Favorite	6,741	49.1%
Visiting Underdog	5,270	50.4%
Visiting Favorite	4,904	47.8%
Home Underdog	2,286	57.7%

Source: “How Do Markets Function...,” National Bureau of Economic Research

While Levitt admits that his study focuses on only one season, his paper shows that the win percentages he observes are consistent with the preceding 20 years of NFL game results. Overall, he believes that bookmakers are cognizant of bettor biases, and that they set

Market Efficiency and the National Football League

continued

spreads accordingly. For example, bookmakers know that they can set a spread that is unduly tilted in favor of a home underdog – and still rest assured that more money will be bet on the visiting favorite.

FROM BACHELIER TO BOOKMAKERS

A century ago, Louis Bachelier undertook one of the world's first studies of market efficiency. "The mathematical expectation of the speculator is zero," Bachelier concluded. He didn't believe that a reliable way to profit from changes in market prices existed; instead, he saw investing as a thoroughly "fair game."

Today, Bachelier's idea lies at the center of academia's debate over market efficiency. On one side are believers in the random walk theory, who assert that market prices are unpredictable, and that outperforming the market consistently is a challenge of Sisyphean proportions. In contrast, efficiency skeptics point out that select strategies – such as investing in out-of-favor stocks – have yielded market-beating profits over the long term.

Tests of the efficiency of markets also have focused on a less conventional arena: the wagering market surrounding the National Football League. The structure of this market offers a fresh perspective on the efficiency issue. And despite the arguments of Bachelier et al., the studies we've reviewed here suggest that the infallibility of markets in general might not be a foregone conclusion.

At the Brandes Institute, we suspect that investors who have tuned in to the market efficiency debate might find its extension into the world of football intriguing. At the very least, those with a penchant for pigskin prognostication may want to keep an eye on that pesky home-team underdog. In our case, as residents of the city that the San Diego Chargers call home, we certainly won't have to look far.

Market Efficiency and the National Football League

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