

INVESTMENT PERSPECTIVES

Have you heard of the “Philly Special”?

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By Analytic Investors

The Philadelphia Eagles led the New England Patriots 15-12 with 38 seconds remaining in the first half of the 2018 Super Bowl. Facing a 4th-and-goal from the 1-yard line, Eagles coach Doug Pederson had a tough decision: take the easy points and kick a short field goal or go for the touchdown and give his team a double-digit lead. Like most coaches these days, Pederson took the aggressive approach and went for it, calling for a trick play. Quarterback Nick Foles lined up behind an offensive lineman and the ball was snapped to running back Corey Clement, who flipped it to tight end Trey Burton, who then threw to a wide-open Foles in the end zone. The teams traded scores in a frantic second half, with the Eagles going ahead late and capping it off by recovering a Tom Brady fumble—giving them their first-ever Super Bowl title and first championship in 57 years.

The play, called the “Philly Special,” changed the momentum of the game and is now one of the most widely referenced in football lexicon. The Analytic Investors team is not quite as fond of it, as our prediction was incorrect for the second consecutive year. Our overall record is now 10-5 (67%). Considering that we are 0-4 in Super Bowls involving New England this decade, is it time for us to add a “Patriot factor” into our model?

This year featured a number of interesting storylines. The Chicago Bears, Indianapolis Colts, and Los Angeles Chargers returned to the playoffs. The high point of the season came in week 11, when the Los Angeles Rams beat the Kansas City Chiefs in an epic 54-51 shootout. It was the highest-scoring game in Monday Night Football in history.

The culmination of this season comes on Sunday, February 3, in Atlanta, when the upstart Rams face the Patriots dynasty in Super Bowl LIII. These are also the only two teams to be favored in all 16 of their regular season games. But, both won as road underdogs in order to punch their ticket to the big dance. Ironically enough, it will be 17 years to the day when the Pats upset the highly favored (St. Louis) Rams in what was Tom Brady’s and Bill Belichick’s first title.

Speaking alpha

This annual research paper is predicated upon a calculation we devised to track each NFL team's performance. We call it "NFL alpha" and like to think of it as the football counterpart to our quantitative investment process. In short, it is the cumulative return on investment on every team's performance relative to wagering markets for all regular season games. To demonstrate, we'll look at a \$100 money line bet on the New York Giants to win each of their 16 games. If the Giants lose, one would lose \$100. Should the Giants win, one would collect a \$100 wager and an additional amount that is a function of the Giants' win probability, as implied by the wagering odds. At the end of the season, we would total winnings and compare it with the \$1,600 total wagered. Any amount above this is a positive NFL alpha, and anything less than it is a negative one. For the Giants in 2018, one would have ended up with just over \$1,162, thanks to the Giants' alpha of -27.3% (Table 1).

Quants versus the machine

At Analytic, we are always looking for new ideas that could be incorporated into our research process. This year, we decided to see how a machine would pick the Super Bowl. For our quants-versus-the-machine competition—not to be confused with the impending Goff-versus-Brady matchup—we compared our NFL alpha prediction with that of a complex machine-learning algorithm. To keep things fair, the algorithm was given the same data used by the standard Analytic NFL alpha model for its inputs: historical lines and scores. While the algorithm computes many transformations of this data (lagged moving averages, rescaling, etc.), it essentially features the same pieces as the original, with a new, fancy decision-maker doing the thinking and giving the final calls. We hope this approach will go better for us than it has for the Raiders.

Our decision-maker is a dyadic probability-weighted score estimator nested in a betting-line vector decision space. That is, it guesses each team's score and compares the difference with the given spread. The score predictions are made by a linear classifier to account for the fact that a discrete number of integer scores are possible. The classifier is trained via stochastic gradient descent on approximately 9,000 games and validated on another 1,000. Score prediction accuracy could be best described as Blake Bortles-like: This algorithm needs more signal and less noise! But, the resulting predictive probabilities are only minor deviations from historical averages. We expect a mild improvement over a naïve guess.

Altogether, out-of-sample accuracy for our algorithm (excluding Super Bowls) is approximately 55%, a nice improvement over random chance. However, when applied to Super Bowls, the hit rate falls to 40%—good for a defensive line, bad for a gamble. While this is admittedly a small sample, perhaps the safe bet is to take our machine-learning prediction and go the other way. Nonetheless, the algorithm's pick is clear: Rams +2. Stay tuned for improvements to this model in years to come and, perhaps, eventually, a rise of the machines.

Table 1. Alpha for all 32 NFL teams

Team	ALPHA		Alpha change	2018-2019	
	2018-2019	2017-2018		Record	Favorite/underdog
Buffalo Bills	48.8%	27.4%	21.4%	6-10	3-13
Dallas Cowboys	46.8%	-5.8%	52.6%	10-6	7-9
Tennessee Titans	36.9%	-9.0%	45.9%	9-7	5-11
New Orleans Saints	32.9%	9.6%	23.3%	13-3	13-3
Chicago Bears	30.1%	-14.7%	44.8%	12-4	12-4
Philadelphia Eagles	27.9%	31.8%	-3.9%	9-7	13-3
Los Angeles Chargers	24.6%	-1.6%	26.1%	12-4	11-5
Kansas City Chiefs	18.0%	18.0%	0.0%	12-4	12-4
Houston Texans	15.2%	-47.5%	62.7%	11-5	12-4
Indianapolis Colts	14.6%	-44.0%	58.6%	10-6	9-7
Seattle Seahawks	12.8%	-1.7%	14.5%	10-6	9-7
Los Angeles Rams	9.7%	19.2%	-9.5%	13-3	16-0
Baltimore Ravens	8.5%	-4.3%	12.9%	10-6	12-4
Pittsburgh Steelers	8.0%	23.3%	-15.3%	9-6-1	11-5
Miami Dolphins	7.6%	33.5%	-25.8%	7-9	5-11
Washington Redskins	6.5%	-7.5%	14.0%	7-9	3-13
Cleveland Browns	0.5%	-100.0%	100.5%	7-8-1	3-13
Carolina Panthers	-4.6%	40.2%	-44.8%	7-9	9-7
New England Patriots	-5.5%	12.4%	-17.9%	11-5	16-0
Detroit Lions	-6.0%	4.9%	-10.8%	6-10	5-11
Minnesota Vikings	-13.0%	37.3%	-50.3%	8-7-1	10-6
Tampa Bay Buccaneers	-16.4%	-37.0%	20.6%	5-11	4-12
Denver Broncos	-21.4%	-40.6%	19.2%	6-10	9-7
Arizona Cardinals	-25.9%	13.2%	-39.0%	3-13	2-14
Oakland Raiders	-26.4%	-33.8%	7.3%	4-12	2-14
Atlanta Falcons	-27.0%	-0.9%	-26.1%	7-9	11-5
New York Giants	-27.3%	-3.2%	-24.1%	5-11	3-13
Cincinnati Bengals	-29.0%	-7.5%	-21.5%	6-10	6-10
Jacksonville Jaguars	-34.8%	20.6%	-55.4%	5-11	7-9
New York Jets	-35.9%	-20.4%	-15.5%	4-12	3-13
Green Bay Packers	-40.8%	-18.3%	-22.5%	6-9-1	9-7
San Francisco 49ers	-44.7%	-19.6%	-25.1%	4-12	4-12

Source: Analytic Investors

Postseason success

Despite the outcome of the past two Super Bowls, we have an impressive overall postseason record worth discussing. How do we do it? Our thesis for predicting these results revolves around a mean reversion of sorts between football seasons, and that occurs as soon as the subsequent playoffs. Specifically, teams with the higher alphas tend to underperform expectations in the playoffs, and vice versa. Therefore, we believe that the lower-alpha team in any playoff game is the better choice to cover the point spread. Our model went 8-2 during the 2019 playoffs (Table 2), an 80% success rate that brings our historical average to 62%. To be clear, our successful selection of the Rams over the New Orleans Saints in the NFC championship game was not influenced by the highly controversial non-call of pass interference against the Rams' Nickell Robey-Coleman late in the contest. Regardless, no complaints here.

2019 Super Bowl

The 2019 Super Bowl is the first one in the history of this paper to feature two teams who do not have double-digit alphas—the Los Angeles Rams (9.7%) and the New England Patriots (-5.5%) (Table 3). A rematch of the 2002 Super Bowl, this game features the new versus the old: The Rams now playing in Los Angeles are coached by 33-year-old wunderkind Sean McVay and led by 24-year-old quarterback Jared Goff, while the Patriots are led by the seemingly ageless Bill Belichick and Tom Brady. Will McVay become the youngest coach to win a Super Bowl, or Belichick the oldest? Will Los Angeles get its first NFL title in 35 years, or the Patriots their sixth this century? Storylines abound, but at the end of the day, the numbers don't lie. Our pick is the lower-alpha Patriots to win the game by two or more points. This marks only the second time in the history of our predictions that our pick is a team with a negative alpha. The first time was the Arizona Cardinals in 2009, which was also a correct pick. Here's hoping history repeats itself.

Table 2. Postseason analysis (8-2 record)

Higher-alpha team	Alpha	Lower-alpha team (Analytic's pick)	Alpha	Favorite	Result	Win
Houston Texans	15.2%	Indianapolis Colts	14.6%	Texans by 1.5	Colts 21-7	✓
Dallas Cowboys	46.8%	Seattle Seahawks	12.8%	Cowboys by 2.5	Cowboys 24-22	✓
Los Angeles Chargers	24.6%	Baltimore Ravens	8.5%	Ravens by 2.5	Chargers 23-17	
Chicago Bears	30.1%	Philadelphia Eagles	27.9%	Bears by 6.5	Eagles 16-15	✓
Kansas City Chiefs	18.0%	Indianapolis Colts	14.6%	Chiefs by 4	Chiefs 31-13	
Dallas Cowboys	46.8%	Los Angeles Rams	9.7%	Rams by 7	Rams 30-22	✓
Los Angeles Chargers	24.6%	New England Patriots	-5.5%	Patriots by 3.5	Patriots 41-28	✓
New Orleans Saints	32.9%	Philadelphia Eagles	27.9%	Saints by 8	Saints 20-14	✓
New Orleans Saints	32.9%	Los Angeles Rams	9.7%	Saints by 3.5	Rams 26-23	✓
Kansas City Chiefs	18.0%	New England Patriots	-5.5%	Chiefs by 3	Patriots 37-31	✓

Source: Analytic Investors

Table 3. Super Bowl results

Super Bowl	Date	Higher-alpha team	Lower-alpha team (Analytic's pick)	Favorite	Result	Prediction correct
XXXVIII	2/1/2004	New England Patriots (67.0%)	Carolina Panthers (39.0%)	Patriots by 7	Patriots 32-29*	✓
XXXIX	2/6/2005	New England Patriots (33.5%)	Philadelphia Eagles (12.6%)	Patriots by 7	Patriots 24-21*	✓
XL	2/5/2006	Seattle Seahawks (25.0%)	Pittsburgh Steelers (11.4%)	Steelers by 4	Steelers 21-10	✓
XLI	2/4/2007	Chicago Bears (17.8%)	Indianapolis Colts (14.5%)	Colts by 6.5	Colts 29-17	✓
XLII	2/3/2008	New England Patriots (22.9%)	New York Giants (14.6%)	Patriots by 12.5	Giants 17-14	✓
XLIII	2/1/2009	Pittsburgh Steelers (33.6%)	Arizona Cardinals (-6.4%)	Steelers by 6.5	Steelers 27-23*	✓
XLIV	2/7/2010	Indianapolis Colts (37.6%)	New Orleans Saints (12.8%)	Colts by 4.5	Saints 31-17	✓
XLV	2/6/2011	Pittsburgh Steelers (28.6%)	Green Bay Packers (1.3%)	Packers by 3	Packers 31-25	✓
XLVI	2/5/2012	New York Giants (32.8%)	New England Patriots (15.8%)	Patriots by 3	Giants 21-17	
XLVII	2/3/2013	San Francisco 49ers (23.1%)	Baltimore Ravens (2.2%)	49ers by 4.5	Ravens 34-31	✓
XLVIII	2/2/2014	Seattle Seahawks (13.7%)	Denver Broncos (4.6%)	Broncos by 2	Seahawks 43-8	
XLIX	2/1/2015	New England Patriots (28.2%)	Seattle Seahawks (9.9%)	Patriots by 1.5	Patriots 28-24	
50	2/7/2016	Carolina Panthers (61.5%)	Denver Broncos (31.9%)	Panthers by 4	Broncos 24-10	✓
LI	2/5/2017	New England Patriots (40.5%)	Atlanta Falcons (29.2%)	Patriots by 3	Patriots 34-28	
LII	2/4/2018	Philadelphia Eagles (31.8%)	New England Patriots (12.4%)	Patriots by 4	Eagles 41-33	
LIII	2/3/2019	Los Angeles Rams (9.7%)	New England Patriots (-5.5%)	Patriots by 2	?	?

*While in these games lower-alpha teams did lose to the higher-alpha teams, the predictions are correct because the lower-alpha teams covered their respective point spreads.

Source: Analytic Investors

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