

What Makes Games Go Under?

Weather, Fatigue, Travel and Officials Against the Closing Total

Fourth & Value Research Group

fourthandvalue.com

October 16, 2026 · Version 1.0 · NFL, NHL, NBA and MLB game totals

Technical report; not peer reviewed. Hypotheses registered before results were computed.

The short version

Some situations really do produce low-scoring games: strong wind, a new starting quarterback, playoff basketball. A bettor needs to know something else: does the betting line already account for it? We checked 60 situations in 90,866 NFL, NHL, NBA and MLB games, using rules written down before we looked at any result, and required each finding to hold up in two separate decades.

60 situations tested	90,866 games with closing totals	7 held up in both decades	4 cleared the 52.4% break-even
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- **The market usually knows.** Most of these situations do change scoring, and the closing total moves almost as much. NBA playoff games scored 7.9 fewer points than regular-season games from 2016 to 2025, and their closing totals were already 6.4 points lower.
- **Strong wind is the exception.** NFL games played in winds of 15 mph or more scored about 3 points fewer than other outdoor games, but their closing totals were only about 1 point lower. Unders won 56.8% of the time from 2006 to 2015 and 55.9% from 2016 to 2025.
- **Three thin edges.** In baseball, a day game after a night game and a "getaway day" before a team travels each went under about 52.5% of the time from 2018 to 2025, barely above the 52.4% needed to break even at standard odds. Neither held up in 2026. NBA overs in the last two weeks of the regular season won 54.1% from 2016 to 2025, but only 50.0% in the decade before.
- **Fatigue and referees didn't hold up.** Back-to-backs gave no edge in hockey or basketball; in hockey they did not even change scoring. Referees and umpires whose games went under in one decade were no more likely to see unders in the next.

Bottom line: "It should be a low-scoring game" is rarely a reason to bet the under, because the line usually says so already. Strong NFL wind is the one situation where the market has consistently under-reacted, and even that edge is a few percentage points.

ABSTRACT

We test whether non-statistical game circumstances predict scoring below the closing total in four North American leagues. Sixty situations covering weather, schedule and fatigue, travel, familiarity, stakes and officiating were registered with their thresholds and predicted directions before outcomes were computed, then evaluated on 90,866 games with closing or final pre-game totals (NFL 2006–2025, NHL and NBA 2007–08 to 2025–26, MLB 2010–2025). For each situation we split the difference in scoring into the part reflected in the closing total and the part left over, and require the left-over part to have the predicted sign in an earlier discovery block and to be significant in a later replication block (one-sided $p < 0.05$, at least 100 games per block), with Benjamini–Hochberg control across 60 tests. Most situations moved scoring, and the closing total moved with them. Seven replicated; four also won at least 52.4% of later-block bets, the break-even rate at –110: NFL wind of at least 15 mph (unders 56.8% and 55.9%; +8.0% return at recorded closing prices in 2016–2025), MLB day games after night games and getaway days (52.5% and 52.6% unders, concentrated in games that are both, and not repeated in 2026), and NBA overs in the final two weeks of the regular season (54.1% in 2016–2025, 50.0% before). Officials rated as low-scoring on the discovery block showed no persistent tendency. Situational knowledge is largely priced into closing totals; strong NFL wind is the clearest exception.

Keywords: over/under; game totals; closing line; weather; wind; back-to-back; rest; travel; referees; umpires; market efficiency; pre-registration; replication.

1. The Question: Lower Scoring, or Lower Than the Line?

Ask bettors why a game will be low-scoring and the same reasons come up in every sport. Wind and cold in football. Tired legs on the second night of a back-to-back in hockey and basketball. The wind blowing in at Wrigley Field. A referee who lets them play. Many of these are true in a narrow sense: they really do lower scoring. That is not the question a bettor faces. A sportsbook posts a total, the market argues over it until the game starts, and the closing number already reflects whatever the market knows. The useful question is whether a situation lowers scoring *by more than the closing total expects*.

We therefore split every situation into three numbers, each measured against all other games in the same seasons:

1. **Effect on scoring.** How many more or fewer points, goals or runs were scored in these games.
2. **Line adjustment.** How much lower or higher the closing total was set for these games.
3. **Left over.** The difference between the two: what the line missed. This is the only part a bettor can use.

A situation can have a large effect and nothing left over (the market saw it coming), a small effect and nothing left over (it barely matters), or, rarely, something left over. We tested 60 situations across four leagues and 90,866 games with closing totals, wrote down every definition before computing any result, and required each finding to show up in two separate decades before calling it real.

2. Data

Every game in the study has a final score and a closing (or final pre-game) total. Situational data come from official league feeds where possible. Table 1 lists the sources.

Table 1. Games, closing totals and situational data. Counts are games in the discovery and replication seasons after the pre-registered data-quality filters.

League	Seasons	Games	Closing totals (games)	Situational data
NFL	2006–2025	5,431	nflverse closing total 5,431	nflverse weather, roof, rest, referee, starting QB; play-by-play weather text
NHL	2007–08 to 2025–26	24,523	archived closing total 19,274; ESPN odds feed (median of books) 5,249	NHL schedule and venue time zones, referees, starting goalies
NBA	2007–08 to 2025–26	24,264	archived closing total 19,717; ESPN odds feed (median of books) 4,547	ESPN schedule and officials (crew chief listed first)
MLB	2010–2025	36,648	ESPN odds feed (median of books) 36,648	MLB Stats API game-time weather and wind, plate umpire, day/night, doubleheaders

The closing total is the market's last word before the game: the most informed forecast available, and the standard professional bettors measure themselves against. Across the full samples the closing totals were close to unbiased. The average game finished +0.65 points against the NFL total, +0.36 points against the NBA total, +0.17 goals against the NHL total and +0.44 runs against the MLB total. The typical miss is large: the standard deviation of the final score around the total was 13.3 points in the NFL, 17.7 in the NBA, 2.3 goals in the NHL and 4.3 runs in MLB. That noise is why a few dozen games prove nothing.

Two details matter for hockey and baseball. NHL totals are graded on the official final score, which credits the shootout winner with one goal, so we do the same. NHL and MLB totals are usually priced with uneven juice (for example under 5.5 at –125). We report win rates at a flat –110 for comparability; a real bettor paying heavier juice needs a higher win rate than the 52.4% used here.

3. Method and Pass Rules

For every game, the **residual** is the final combined score minus the closing total. A negative residual is an under. For each situation we compare the residuals of games in that situation with the residuals of all other games in the same seasons (for weather, other outdoor games with the same measurement recorded). The difference is the **left-over** amount, tested with Welch's two-sample *t*-test. We also report the share of bets won on the predicted side, with pushes removed and a Wilson 95% interval.

Two decades, one rule. Each sport's seasons are split into an earlier *discovery* block and a later *replication* block (NFL 2006–2015 and 2016–2025; NHL 2007–2015 and 2016–2025; NBA 2007–2015 and 2016–2025; MLB 2010–2017 and 2018–2025). A situation **replicates** only if the left-over amount points the predicted way in both blocks and is statistically clear in the later block (one-sided $p < 0.05$). It is **betttable at standard prices** only if it also won at least 52.4% of later-block bets on the predicted side. That is the break-even rate when you risk \$110 to win \$100: $110 \div (110 + 100)$. A situation needs at least 100 games in each block to count.

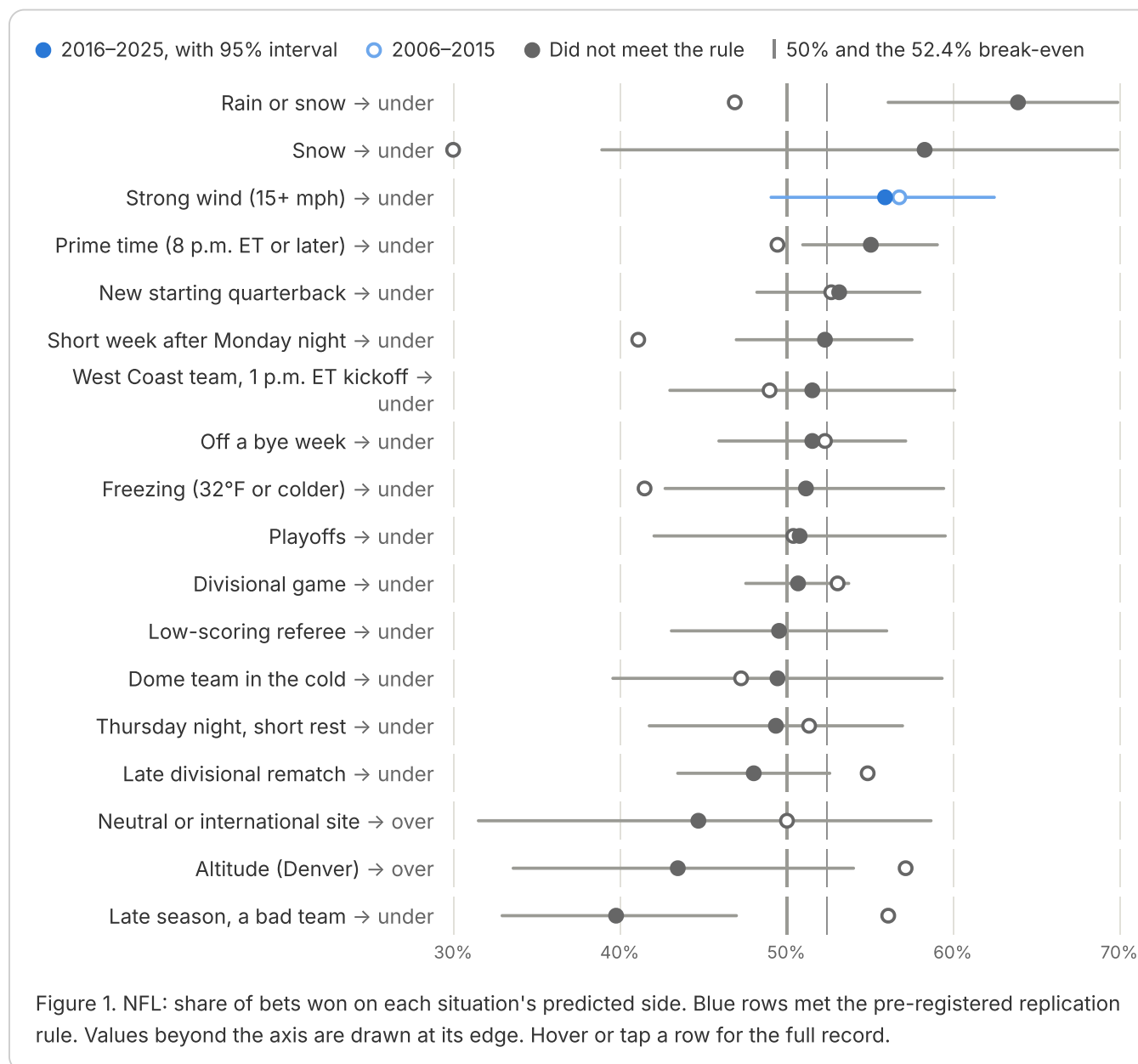
Officials. Referees and umpires are rated on the discovery block only. Officials with at least 30 discovery games are ranked by their games' average residual, and the lowest third is labelled "low-scoring." The test is whether that label still predicts unders in later games. No official is named as low-scoring from the full sample, which would guarantee a spurious result.

Many tests. With 60 statistical tests, a handful will look impressive by chance. We report Benjamini–Hochberg false-discovery-rate values (q) across the whole study; a result with $q \geq 0.10$ is described as indistinguishable from chance even when its own p -value is small.

Registered in advance. The situations, thresholds, predicted directions, seasons and pass rules were committed to our public repository before any outcome was computed (pre-registration). Two dated amendments, each made before the results it affects were computed, corrected the NHL shootout rule, spelled out the test statistic, fixed the NHL, NBA and MLB seasons from the data coverage and set data-quality filters. Nothing was dropped or redefined after seeing results; Section 9 labels every extra analysis as post-hoc.

4. NFL

5,431 games from 2006 to 2025, with nflverse closing totals and the prices bettors were offered at the close. Of 18 situations, one met the replication rule.



Strong wind: the one clear edge

In outdoor games with wind of at least 15 mph, scoring fell by 3.5 points in 2006–2015 and 3.2 points in 2016–2025, compared with other outdoor games. Closing totals moved only 1.21 and 0.95 points. The market saw the wind, but only about a third of its effect made it into the number. The under went 146–111 in the first decade (56.8%) and 113–89 in the second (55.9%, 95% interval 49.0%–62.6%). Bet at the recorded closing price, the later decade returned +8.0% per bet. Across the whole study its false-discovery value is $q = 0.02$.

Two cautions. A season brings only about 20 such games, so any single season is mostly noise (the under has lost in five of the 20 seasons). And the edge depends on the cut-off: Section 9 shows the lean holds at every cut-off from 10 to 16 mph in both decades; at 18 mph and above, the later decade has fewer than 75 games and nothing left over against other outdoor games. Our September methodology note warned that wind looked fragile when sliced into buckets; with the cut-off fixed in advance, it held.

Real effects the market already prices

A new starting quarterback is the clearest example of a real effect that is priced. These games scored 3.4 fewer points in 2016–2025, and the closing total was already 2.8 points lower; the under won 53.1%, short of break-even. Divisional games were 2.1 points lower-scoring in the first decade with little line adjustment (unders 53.1%), but the line caught up: in 2016–2025 the gap was 1.12 points, the adjustment 0.79, and unders won 50.7%. Thursday games, short weeks after Monday night, teams off a bye, West Coast teams at 1 p.m. ET and freezing temperatures showed no under edge in either decade.

Recent trends that failed the two-decade test

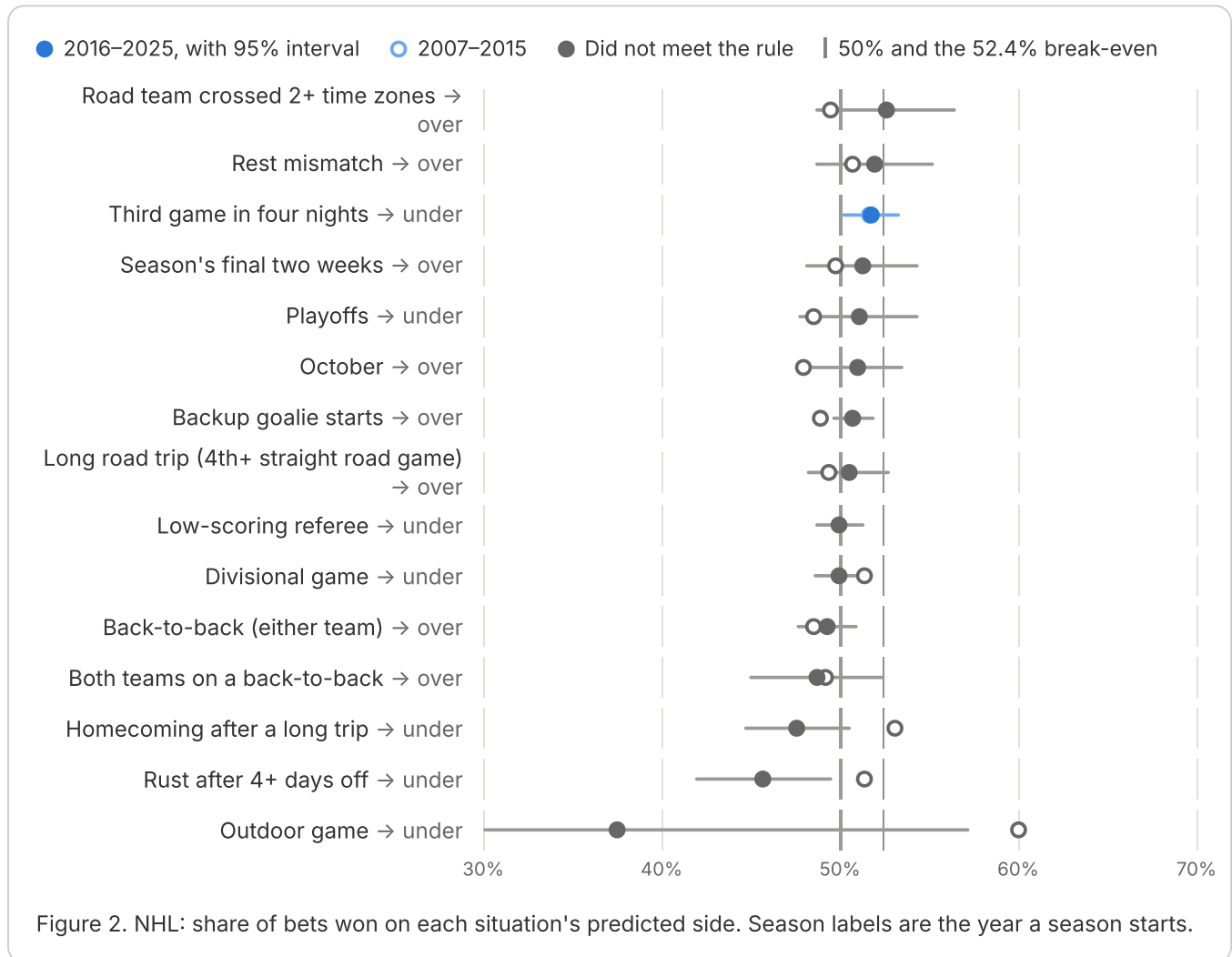
Two popular angles looked strong in the later decade only. Prime-time games went under 55.1% of the time in 2016–2025 but 49.4% in 2006–2015, and the under is 6–10 so far in 2026 (37.5%). Rain or snow went under 63.9% in 2016–2025 (99–56) after 46.9% in the first decade. Either could be a real change in how these games are played or priced; the pre-registered rule cannot tell that apart from a hot streak, and neither can a bettor. Late-season games involving a bad team reversed outright, from 56.2% unders to 39.8%.

Table 2. NFL: every pre-registered situation. Effect, line movement and the amount left over compare these games with all other games in 2016–2025; "Won" is the share of bets won on the predicted side, pushes excluded; q is the false-discovery-rate value across all 60 tests. "Beat –110": replicated and won at least 52.4%; "Replicated": met the rule but not the break-even.

<i>Situation</i>	<i>Side</i>	<i>Games 2016– 25</i>	<i>Effect (points)</i>	<i>Line moved</i>	<i>Left over</i>	<i>Won 2006–15</i>	<i>Won 2016– 25</i>	<i>q</i>	<i>Passed?</i>
NFL-1 Strong wind (15+ mph)	under	204	–3.17	–0.95	–2.21	56.8%	55.9%	0.02	Beat –110
NFL-2 Freezing (32°F or colder)	under	133	–1.66	–0.89	–0.77	41.5%	51.1%	0.63	No
NFL-3 Rain or snow	under	157	–4.91	–1.54	–3.37	46.9%	63.9%	0.28	No
NFL-4 Snow	under	25	–2.57	–1.18	–1.39	16.1%	58.3%	0.04	Too few games
NFL-5 Dome team in the cold	under	94	–2.38	–1.91	–0.48	47.3%	49.5%	0.96	Too few games
NFL-6 Thursday night, short rest	under	158	+0.56	–0.23	+0.79	51.4%	49.4%	0.91	No
NFL-7 Short week after Monday night	under	327	+0.19	–0.28	+0.46	41.1%	52.3%	0.05	No
NFL-8 Off a bye week	under	294	–0.00	+0.24	–0.24	52.4%	51.5%	0.43	No
NFL-9 Prime time (8 p.m. ET or later)	under	560	–0.57	+0.97	–1.55	49.4%	55.1%	0.28	No
NFL-10 Divisional game	under	977	–1.12	–0.79	–0.33	53.1%	50.7%	0.04	No
NFL-11 Late divisional rematch	under	436	–0.76	–1.38	+0.63	54.9%	48.0%	0.31	No
NFL-12 Low-scoring referee	under	222	–0.08	+0.25	–0.34	(rating period)	49.5%	0.91	No
NFL-13 West Coast team, 1 p.m. ET kickoff	under	126	+0.44	+0.22	+0.22	49.0%	51.6%	1.00	Too few games
NFL-14 Late season, a bad team	under	177	+1.37	–2.28	+3.65	56.2%	39.8%	0.28	No
NFL-15 New starting quarterback	under	383	–3.37	–2.79	–0.57	52.7%	53.1%	0.27	No
NFL-16 Altitude (Denver)	over	85	–4.71	–2.69	–2.02	57.1%	43.5%	1.00	Too few games
NFL-17 Playoffs	under	122	+2.32	+2.24	+0.08	50.5%	50.8%	0.91	No
NFL-18 Neutral or international site	over	47	–3.62	+0.07	–3.69	50.0%	44.7%	0.36	Too few games

5. NHL

24,523 games from 2007–08 to 2025–26. Of 15 situations, one met the replication rule, and none cleared break-even.



Back-to-backs do not change hockey scoring. Games where either team played the night before scored +0.04 and −0.03 goals relative to other games, effectively zero, and the line did not move either. We expected tired teams to start backup goalies and allow more goals. Backup goalies do matter: their games scored 0.20 more goals in 2016–2025. But the closing total was already 0.14 goals higher, and the over won 50.7%.

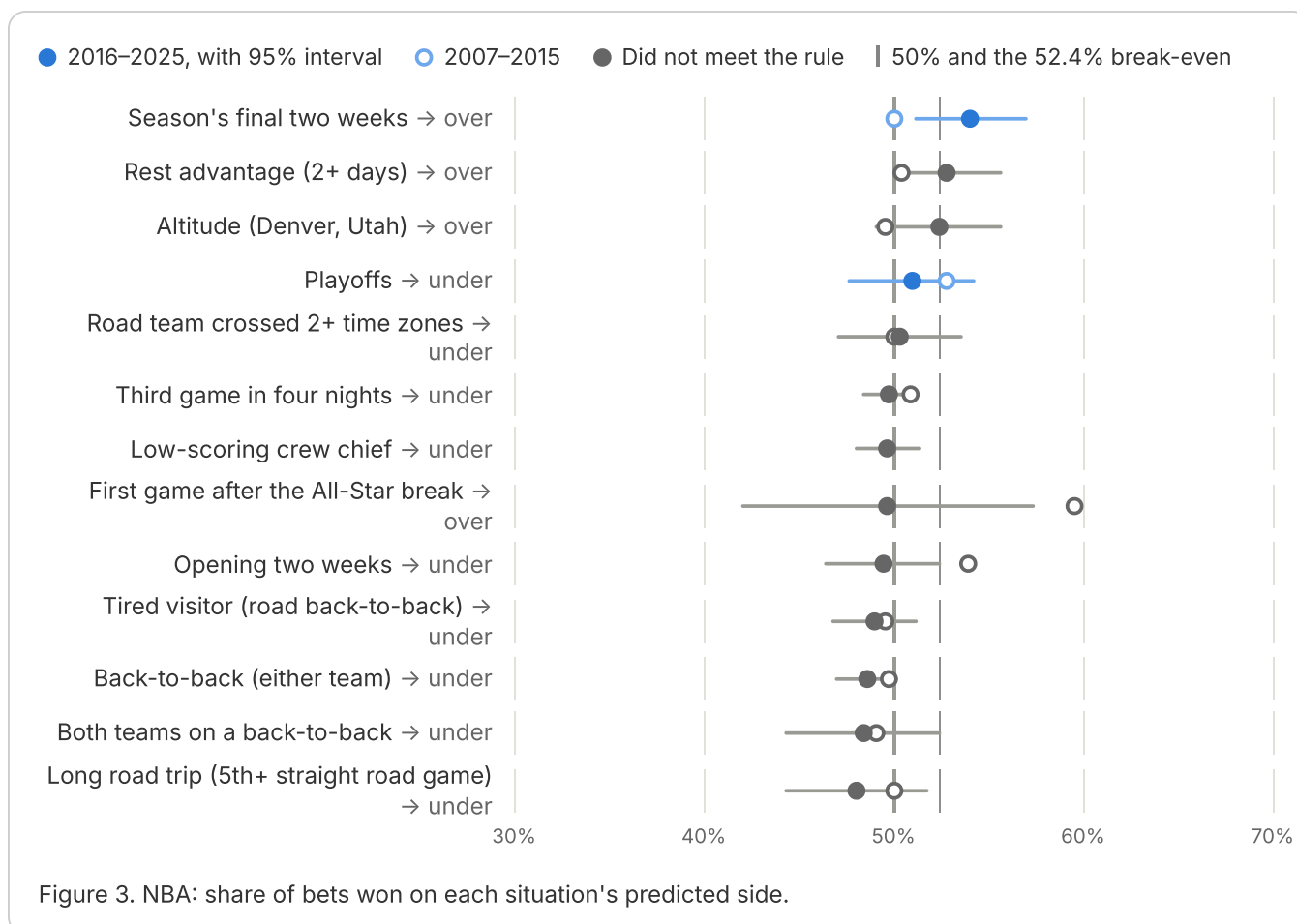
Third game in four nights technically met the rule: unders won 51.7% and 51.8%, and the later decade's left-over amount (−0.09 goals) was statistically clear. The earlier decade's left-over amount was essentially zero, and the false-discovery value of $q = 0.28$ says it is indistinguishable from chance across the study. It does not beat the vig. Playoff hockey scores 0.29 goals less than the regular season and the line adjusts by 0.26. Long road trips, homecomings, time-zone travel, divisional games, October and the season's final two weeks showed nothing. Only 42 outdoor games had lines, too few to test.

Table 3. NHL: every pre-registered situation. Effect, line movement and the amount left over compare these games with all other games in 2016–2025; "Won" is the share of bets won on the predicted side, pushes excluded; q is the false-discovery-rate value across all 60 tests. "Beat –110": replicated and won at least 52.4%; "Replicated": met the rule but not the break-even.

<i>Situation</i>	<i>Side</i>	<i>Games 2016– 25</i>	<i>Effect (goals)</i>	<i>Line moved</i>	<i>Left over</i>	<i>Won 2007–15</i>	<i>Won 2016– 25</i>	<i>q</i>	<i>Passed?</i>
NHL-1 Back-to-back (either team)	over	3,314	–0.03	+0.04	–0.07	48.5%	49.3%	0.63	No
NHL-2 Both teams on a back-to-back	over	690	–0.10	+0.02	–0.12	49.2%	48.7%	0.85	No
NHL-3 Rest mismatch	over	902	+0.13	+0.03	+0.10	50.8%	51.9%	0.37	No
NHL-4 Backup goalie starts	over	7,129	+0.20	+0.14	+0.06	48.9%	50.7%	0.60	No
NHL-5 Third game in four nights	under	3,970	–0.07	+0.02	–0.09	51.7%	51.8%	0.28	Replicated
NHL-6 Long road trip (4th+ straight road game)	over	1,842	–0.03	–0.02	–0.01	49.3%	50.5%	1.00	No
NHL-7 Homecoming after a long trip	under	1,100	+0.06	+0.01	+0.05	53.1%	47.6%	1.00	No
NHL-8 Road team crossed 2+ time zones	over	629	+0.07	+0.01	+0.07	49.5%	52.6%	0.78	No
NHL-9 Divisional game	under	5,134	–0.06	–0.05	–0.01	51.4%	49.9%	0.78	No
NHL-10 Playoffs	under	903	–0.29	–0.26	–0.03	48.5%	51.1%	1.00	No
NHL-11 Low-scoring referee	under	5,243	–0.05	–0.05	–0.00	(rating period)	50.0%	1.00	No
NHL-12 Outdoor game	under	26	+0.37	–0.09	+0.46	60.0%	37.5%	0.80	Too few games
NHL-13 Rust after 4+ days off	under	652	+0.16	–0.03	+0.19	51.3%	45.7%	0.21	No
NHL-14 October	over	1,446	+0.12	+0.03	+0.09	48.0%	51.0%	0.46	No
NHL-15 Season's final two weeks	over	1,008	+0.03	+0.04	–0.01	49.8%	51.2%	1.00	No

6. NBA

24,264 games from 2007–08 to 2025–26. Of 13 situations, two met the replication rule and one cleared break-even.



Tired legs are priced. When both teams were on the second night of a back-to-back, games scored 2.0 fewer points in 2007–2015 and the line was 2.1 lower. Back-to-backs, tired visitors, three games in four nights, long road trips and time-zone travel all won 48–51% on the predicted side in the later decade. Altitude is a large, priced effect: Denver and Utah home games scored 5.0 more points in 2007–2015 and the line was 4.8 higher.

Late-season overs. In the last two weeks of the regular season the over won 54.1% from 2016 to 2025 (578–491 under–over), with +1.92 points left over and $q = 0.03$. The over won at least half of these games in each of those ten seasons. The pattern fits teams resting starters and playing for draft position, but the earlier decade went exactly 50.0% to the over, so this is a recent pattern that passed our rule narrowly rather than a decades-long one.

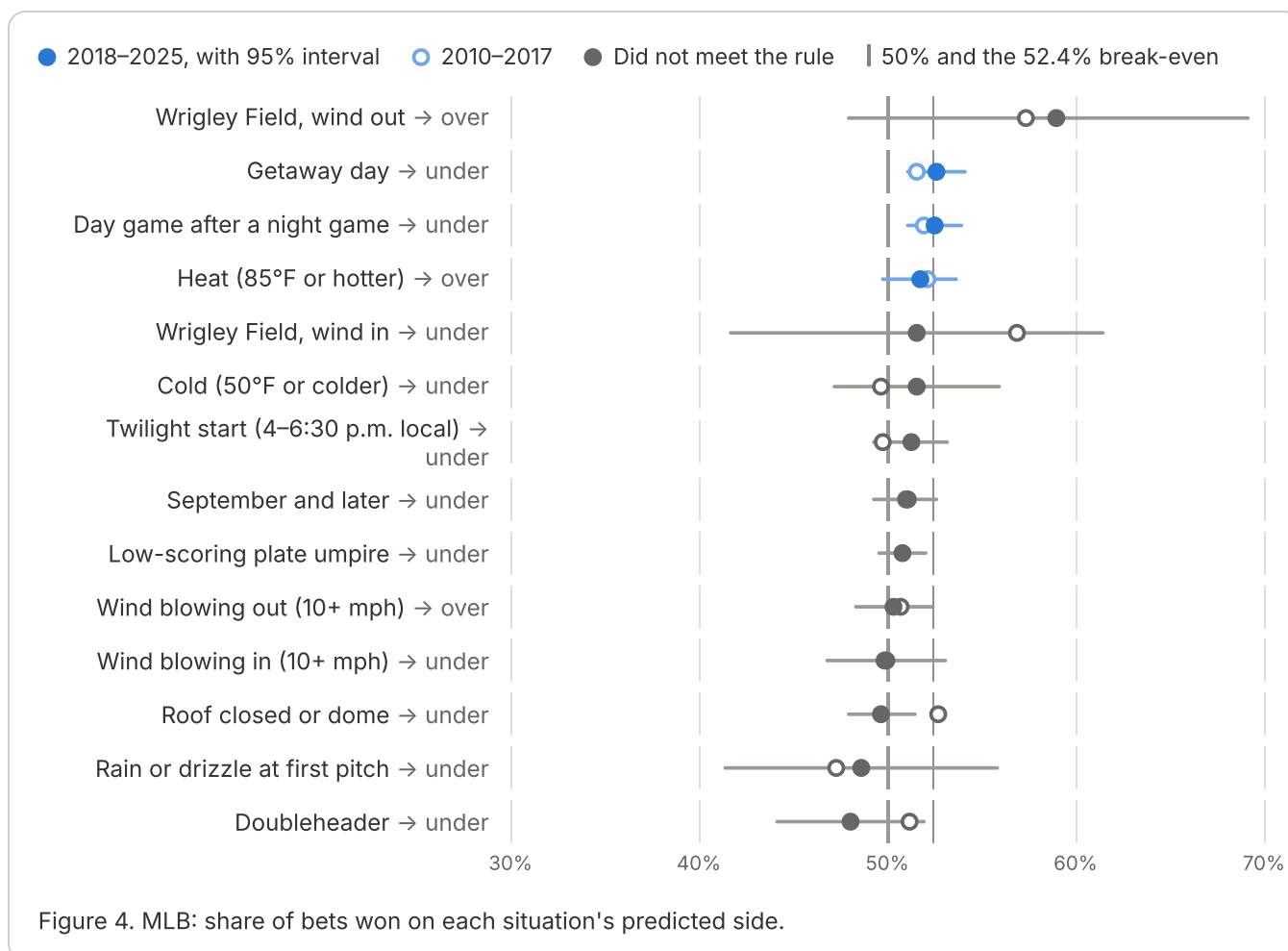
Playoffs. Playoff games scored 7.9 fewer points in 2016–2025; the line was 6.4 lower. The remaining 1.43 points met the replication rule, but unders won only 51.0%. The first game after the All-Star break went over 59.5% of the time in 2007–2015 and 49.7% afterwards.

Table 4. NBA: every pre-registered situation. Effect, line movement and the amount left over compare these games with all other games in 2016–2025; "Won" is the share of bets won on the predicted side, pushes excluded; q is the false-discovery-rate value across all 60 tests. "Beat –110": replicated and won at least 52.4%; "Replicated": met the rule but not the break-even.

<i>Situation</i>	<i>Side</i>	<i>Games 2016– 25</i>	<i>Effect (points)</i>	<i>Line moved</i>	<i>Left over</i>	<i>Won 2007–15</i>	<i>Won 2016–25</i>	<i>q</i>	<i>Passed?</i>
NBA-1 Back-to-back (either team)	under	3,626	+0.02	–0.33	+0.36	49.8%	48.6%	0.20	No
NBA-2 Both teams on a back-to-back	under	566	–0.27	–0.51	+0.24	49.1%	48.4%	0.94	No
NBA-3 Tired visitor (road back-to-back)	under	1,855	–0.70	–1.17	+0.48	49.6%	49.0%	0.16	No
NBA-4 Third game in four nights	under	5,091	–0.07	+0.28	–0.35	50.9%	49.8%	0.91	No
NBA-5 Altitude (Denver, Utah)	over	863	+1.58	+0.32	+1.26	49.5%	52.4%	0.29	No
NBA-6 Road team crossed 2+ time zones	under	889	+0.70	+1.30	–0.60	50.0%	50.3%	0.91	No
NBA-7 Long road trip (5th+ straight road game)	under	673	+1.46	+1.67	–0.21	50.1%	48.0%	0.94	No
NBA-8 First game after the All-Star break	over	161	+4.81	+3.39	+1.43	59.5%	49.7%	0.11	No
NBA-9 Season's final two weeks	over	1,082	+2.73	+0.81	+1.92	50.0%	54.1%	0.03	Beat –110
NBA-10 Playoffs	under	833	–7.87	–6.44	–1.43	52.8%	51.0%	0.11	Replicated
NBA-11 Low-scoring crew chief	under	3,070	–1.32	–1.34	+0.02	(rating period)	49.7%	1.00	No
NBA-12 Opening two weeks	under	1,007	–1.73	–1.31	–0.42	53.9%	49.4%	0.46	No
NBA-13 Rest advantage (2+ days)	over	1,163	+0.74	–0.31	+1.06	50.4%	52.8%	0.33	No

7. MLB

36,648 games from 2010 to 2025, with game-time weather and wind direction from MLB's own records. Of 14 situations, three met the replication rule and two cleared break-even. The 2026 season, the first with the ball-strike challenge system, is reported separately.



Day after night, and getaway day. Day games where either team played a night game the day before went under 52.0% and 52.5% of the time ($q = 0.009$); games where a team travels to another city the next day went under 51.5% and 52.6% ($q = 0.02$). These are the classic "regulars get the day off" spots, and the line adjusts slightly the wrong way. The two overlap heavily, and Section 9 shows the lean sits in games that are both. The edge is about 0.21 runs, it clears -110 by a fraction of a point, MLB unders are often priced heavier than -110 , and in 2026 both went under only 49.4% and 50.1% of the time. We would not bet it.

Heat is under-priced, but not enough. Games at 85°F or hotter scored 0.93 and 1.11 more runs in the two periods; the line rose 0.63 and 0.76. That gap is among the most statistically reliable in the study ($q = 0.0002$), yet overs won only 52.2% and 51.8%, short of the vig. Cold games scored less and were fully priced.

Wind at Wrigley is real; wind elsewhere is priced or small. Across all outdoor parks, wind of 10+ mph blowing in or out barely changed scoring, and the lines barely changed either. At Wrigley Field, wind blowing out added 3.2 and 3.5 runs while the line rose only 2.0 and 1.8, and overs won 57.4% and 59.0%. That is suggestive, but it rests on 71 and 79 games, below the 100-game minimum we set in advance. Wind blowing in at Wrigley was priced. Rain at first pitch, roof status, doubleheaders, twilight starts and September games showed no edge.

Table 5. MLB: every pre-registered situation. Effect, line movement and the amount left over compare these games with all other games in 2018–2025; "Won" is the share of bets won on the predicted side, pushes excluded; q is the false-discovery-rate value across all 60 tests. "Beat –110": replicated and won at least 52.4%; "Replicated": met the rule but not the break-even.

<i>Situation</i>	<i>Side</i>	<i>Games 2018– 25</i>	<i>Effect (runs)</i>	<i>Line moved</i>	<i>Left over</i>	<i>Won 2010–17</i>	<i>Won 2018– 25</i>	<i>q</i>	<i>Passed?</i>
MLB-1 Cold (50°F or colder)	under	495	–0.68	–0.66	–0.02	49.7%	51.6%	0.91	No
MLB-2 Heat (85°F or hotter)	over	2,390	+1.11	+0.76	+0.35	52.2%	51.8%	<0.01	Replicated
MLB-3 Wind blowing in (10+ mph)	under	948	–0.14	–0.16	+0.02	49.8%	49.9%	0.61	No
MLB-4 Wind blowing out (10+ mph)	over	2,196	–0.02	–0.13	+0.12	50.7%	50.4%	0.20	No
MLB-5 Wrigley Field, wind in	under	98	–1.39	–1.15	–0.24	56.9%	51.6%	0.80	Too few games
MLB-6 Wrigley Field, wind out	over	79	+3.50	+1.84	+1.66	57.4%	59.0%	0.02	Too few games
MLB-7 Roof closed or dome	under	3,004	–0.36	–0.44	+0.08	52.7%	49.7%	0.76	No
MLB-8 Rain or drizzle at first pitch	under	181	–0.21	–0.30	+0.09	47.3%	48.6%	1.00	No
MLB-9 Day game after a night game	under	4,236	–0.12	+0.09	–0.21	52.0%	52.5%	<0.01	Beat –110
MLB-10 Getaway day	under	3,791	–0.15	+0.06	–0.21	51.5%	52.6%	0.02	Beat –110
MLB-11 Doubleheader	under	630	–0.27	–0.50	+0.23	51.1%	48.0%	0.78	No
MLB-12 Low-scoring plate umpire	under	5,583	–0.09	–0.01	–0.07	(rating period)	50.8%	0.63	No
MLB-13 Twilight start (4–6:30 p.m. local)	under	2,345	–0.03	–0.04	+0.00	49.8%	51.2%	0.72	No
MLB-14 September and later	under	3,276	–0.08	–0.10	+0.02	51.1%	51.0%	0.91	No

8. What the Market Already Knows

Figure 5 puts every situation with at least 100 games on one chart per league. The horizontal position is how much the situation changed actual scoring; the vertical position is how much it changed the closing total. A situation on the diagonal was fully priced. Most points sit near it: big effects (altitude in Denver and Utah, playoff basketball, a new quarterback, heat in baseball) came with big line moves. The clearest point off the diagonal is NFL wind: scoring fell about three points and the line about one. Wind blowing out at Wrigley Field also sits off it, on too few games to count.

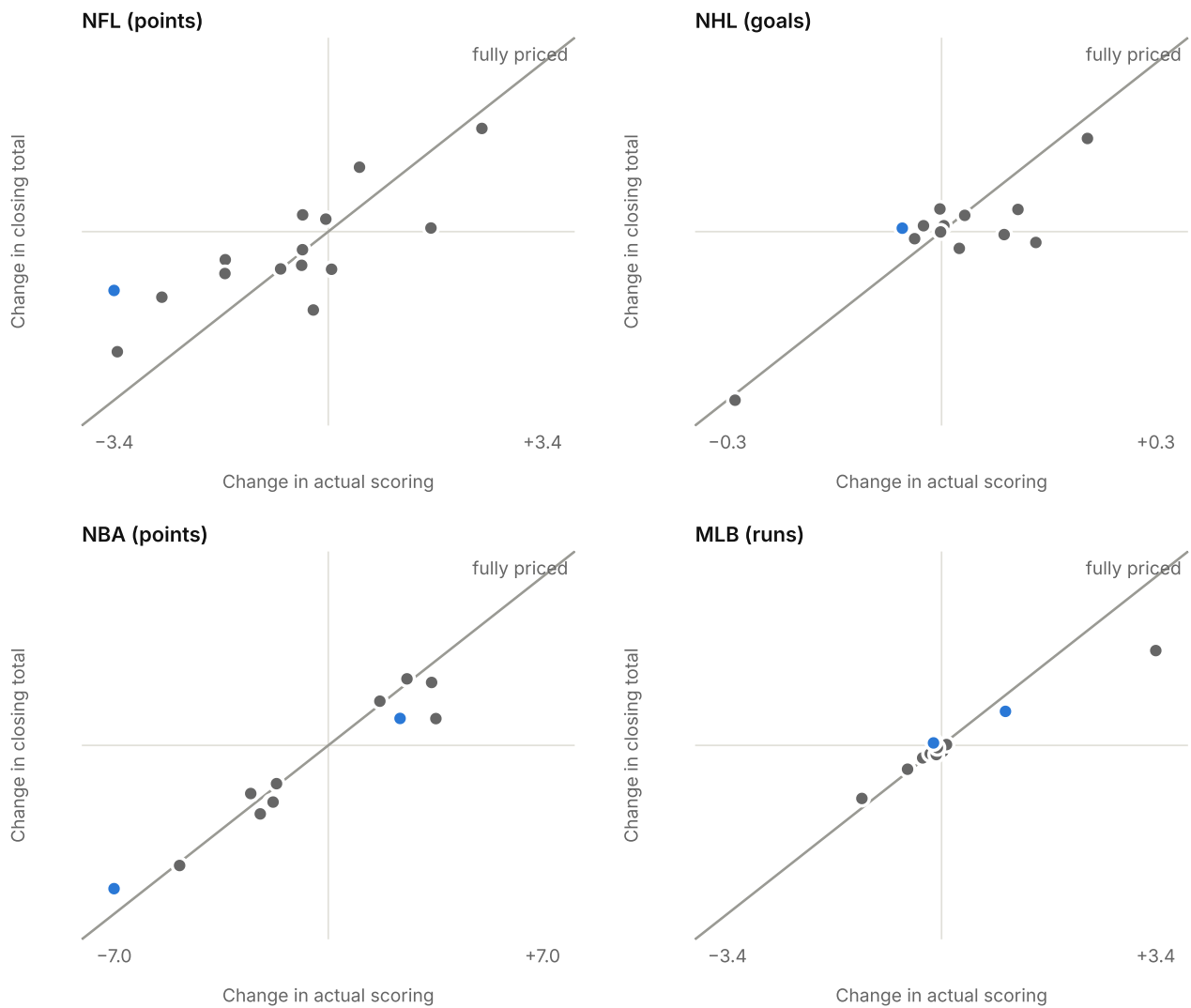


Figure 5. Change in actual scoring (horizontal) against change in the closing total (vertical), each relative to other games, all seasons. Blue points met the replication rule. Units are points (NFL, NBA), goals (NHL) and runs (MLB). Hover or tap a point for its numbers.

Officials. Referee and umpire tendencies are one of the most-repeated totals angles, so we gave them a fair test (Table 6). In every league, the officials whose games went under most often in the discovery seasons saw roughly 50% unders afterwards. The rank correlation between an official's tendency in the two periods ranged from -0.22 (NHL) to $+0.16$ (MLB). NBA crew chiefs show something subtler: the "low-scoring" crew chiefs' later games did score 1.32 fewer points, but their lines were already 1.34 points lower. The market tracks referee assignments, which in the NBA are published at 9 a.m. ET on game day.

Table 6. Officials. The lowest-scoring third of officials, rated on the discovery seasons: their games' under rate in the rating seasons and afterwards, how much less those later games scored, how much lower the line was set, and the rank correlation of every official's tendency between the two periods (officials with 30+ games in both).

League	Officials rated	Under, rating seasons	Under, later seasons	Scoring effect later	Line moved later	Correlation (officials)
NFL referee	23	52.6% (972)	49.5% (222)	-0.08	+0.25	-0.04 (14)
NHL referee	56	53.3% (6,555)	50.0% (5,243)	-0.05	-0.05	-0.22 (35)
NBA crew chief	64	53.2% (4,182)	49.7% (3,070)	-1.32	-1.34	+0.15 (42)
MLB plate umpire	102	54.1% (6,382)	50.8% (5,583)	-0.09	-0.01	+0.16 (82)

Table 7 lists every situation that met the replication rule.

Table 7. Every situation that met the pre-registered replication rule. Win rate on the predicted side; the break-even rate at -110 is 52.4%.

Situation	Side	Earlier seasons	Later seasons	Left over (later)	q	Verdict
NFL · Strong wind (15+ mph)	under	56.8% (262)	55.9% (204)	-2.21	0.02	Bettable at -110
NBA · Season's final two weeks	over	50.0% (988)	54.1% (1,082)	+1.92	0.03	Bettable at -110
MLB · Getaway day	under	51.5% (4,351)	52.6% (3,791)	-0.21	0.02	Bettable at -110
MLB · Day game after a night game	under	52.0% (4,252)	52.5% (4,236)	-0.21	<0.01	Bettable at -110
NHL · Third game in four nights	under	51.7% (3,620)	51.8% (3,970)	-0.09	0.28	Replicates, but not enough to beat the vig
MLB · Heat (85°F or hotter)	over	52.2% (2,774)	51.8% (2,390)	+0.35	<0.01	Replicates, but not enough to beat the vig
NBA · Playoffs	under	52.8% (759)	51.0% (833)	-1.43	0.11	Replicates, but not enough to beat the vig

9. Robustness Checks

Everything in this section was decided after the pre-registered results were known. It is here to show how fragile or sturdy those results are, not to add new findings.

NFL wind cut-off. The under leaned the same way at every cut-off from 10 to 16 mph in both decades. At 18 mph and above, the later decade has fewer than 75 games and nothing left over against other outdoor games.

Table 8. NFL wind cut-off sensitivity (post-hoc). Share of outdoor games that went under, and the amount left over against other outdoor games, by minimum wind speed. The pre-registered cut-off is 15 mph.

Wind at least	Games 2006–15	Under 2006–15	Left over	Games 2016–25	Under 2016–25	Left over
10 mph	728	53.4%	-1.61	608	57.7%	-2.34
12 mph	478	55.1%	-1.82	412	58.1%	-2.48
14 mph	311	57.0%	-2.16	246	55.3%	-2.08
15 mph	262	56.8%	-2.26	204	55.9%	-2.21
16 mph	191	56.6%	-2.13	145	53.5%	-1.53
18 mph	121	61.3%	-3.25	73	54.8%	+0.12
20 mph	75	57.5%	-2.33	43	48.8%	+0.78

MLB wind blowing in. Strong wind blowing in has swung both ways against the line: in 2010–2017, games with 15+ mph blowing in went *over* more often than not; in 2018–2025 they leaned *under*, on far fewer games. A swing like that is what noise looks like, and it is why we fixed the 10 mph cut-off in advance.

Table 9. MLB wind blowing in, cut-off sensitivity (post-hoc). Share of outdoor games that went under, and the runs left over against other outdoor games.

Wind in at least	Games 2010–17	Under 2010–17	Left over	Games 2018–25	Under 2018–25	Left over
5 mph	3,040	50.6%	−0.00	2,671	51.3%	−0.11
8 mph	2,086	51.2%	−0.05	1,618	50.4%	+0.00
10 mph	1,428	49.8%	+0.15	948	49.9%	+0.02
12 mph	906	46.7%	+0.31	508	50.6%	−0.05
15 mph	368	44.5%	+0.76	181	54.2%	−0.25
20 mph	74	40.0%	+0.96	29	55.2%	−0.36

MLB overlap. Splitting the two baseball schedule spots shows the lean lives in games that are both a day game after a night game and a getaway day. Each alone is close to 51%.

Table 10. MLB day game after a night game, and getaway day, split by overlap (post-hoc). Under rate (games) and runs left over.

Games that are...	2010–17	Left over	2018–25	Left over	2026	Left over
both	52.2% (2,232)	−0.23	54.0% (2,038)	−0.32	49.4% (280)	+0.09
day after night only	51.8% (2,020)	−0.08	51.2% (2,198)	−0.05	49.4% (328)	−0.05
getaway only	50.8% (2,119)	−0.02	51.1% (1,753)	−0.03	50.9% (240)	−0.16

2026. The 2026 MLB season and Weeks 1–6 of the 2026 NFL season were not used for any rule. Neither baseball schedule spot repeated in 2026; the heat effect continued at the same below-break-even rate.

Table 11. The 2026 seasons, which no rule or threshold saw: NFL Weeks 1–6 and the 2026 MLB season. Win rate on the predicted side (games) and amount left over. The NFL had no game with 15+ mph wind in this window.

Situation	Side	2026 win rate	Left over
NFL- 9 Prime time (8 p.m. ET or later)	under	37.5% (16)	+1.66
NFL- 15 New starting quarterback	under	70.0% (10)	−4.44
MLB- 2 Heat (85°F or hotter)	over	51.7% (345)	+0.09
MLB- 9 Day game after a night game	under	49.4% (608)	+0.02
MLB- 10 Getaway day	under	50.1% (520)	−0.03

10. Limitations

- **"Closing" is approximate outside the NFL.** NHL and NBA lines through 2022–23 are one archive's closing totals; later seasons and all MLB games use the median of the sportsbooks' final pre-game numbers in ESPN's odds feed. These can differ from the true market close by a half-point at times.

- **Weather is measured at game time.** Bettors see a forecast. A factor defined by observed weather is slightly easier to "predict" than it would be in real time, which biases the study toward finding an edge, not against it.
- **Prices.** Except for the NFL, where closing prices are recorded, returns assume -110 . NHL and MLB unders are often priced heavier.
- **Overlap.** Situations travel together: cold, wind and late-season games; back-to-backs and travel. We test each one separately, as a bettor would use it, not as an independent cause.
- **Changing markets.** U.S. legalization since 2018 changed who bets and how fast lines move. An edge that existed in 2010 may not exist now, which is exactly why the later decade is the one that counts.
- **Strict rules miss small truths.** Requiring clear evidence in a single decade means a real but tiny edge can fail the test. "Does not replicate" means "not shown," not "proven false."

11. What This Means for You

Most of what bettors "know" about low-scoring games is true. Wind, cold, a new quarterback and playoff intensity really do lower scoring. That is exactly why the knowledge is worth so little: the people who set and bet the closing number know it too, and the line moves to match.

- **Start with the line, not the story.** "Should be low-scoring" only matters if the total hasn't already dropped. Compare the number with what the same teams would be posted at on a normal day.
- **Check the NFL wind forecast.** Of 60 situations, sustained wind of 15 mph or more at an outdoor NFL game is the one where closing totals have consistently fallen short of the real drop in scoring. Even there, expect to win in the mid-50s percent, not most of the time, and expect some losing seasons.
- **Don't pay for referee or back-to-back narratives.** In our data, officials' past tendencies did not carry forward, and fatigue spots were already in the line.
- **Small edges vanish under juice.** The baseball schedule spots cleared break-even at -110 by a fraction of a point. At -115 (break-even 53.5%) or -120 (54.5%), common prices on MLB unders, they lose money. A better price is worth more than most situations, so shop for it.
- **Be suspicious of hot trends.** Prime-time unders, rain-and-snow unders and late-season NBA overs all looked strong in recent years. Two of the three failed against the earlier decade, and the prime-time under is 6–10 so far this season.

We publish the null results because they are the useful part. Every number here comes from public data and reruns with one command, so the same test can show if the market stops adjusting for any of these situations.

12. Quick Answers

Does wind make NFL games go under?

Yes, by more than the betting line expects. In outdoor games with wind of 15 mph or more, scoring fell about 3 points compared with other outdoor games, while closing totals fell only about 1. Unders won 56.8% of these games from 2006 to 2015 and 55.9% from 2016 to 2025.

Do back-to-backs lead to low-scoring NHL or NBA games?

Not in a way the betting line misses. NHL back-to-backs did not change scoring at all, and NBA fatigue spots such as back-to-backs, three games in four nights and long road trips won 48% to 51% for the under from 2016 to 2025.

Do referees or umpires affect over/unders?

Not in a way you can predict from their history. Officials whose games went under most often in one decade saw about 50% unders in the next, in all four leagues.

What is the closing total?

The final over/under a sportsbook offers before a game starts. It reflects everything the betting market has learned, which makes it the toughest benchmark to beat.

Which situations beat the closing total?

Four of 60 met our pre-registered rule and the 52.4% break-even at -110: NFL wind of 15+ mph (the clearest), MLB day games after night games and MLB getaway days (narrowly, and not in 2026), and NBA overs in the last two weeks of the regular season (only in the later decade).

Appendix A. Reproduction

The game tables are rebuilt from public sources by `scripts/research/low_scoring/fetch.py` (run in GitHub Actions by `.github/workflows/low-scoring-study.yml`) and committed to `reports/low-scoring-2026/tables/`. `python3 scripts/research/low_scoring/study.py` recomputes every test into `reports/low-scoring-2026/results.json`, and `build_paper.py` formats this page and the [evidence JSON](#) from that file. No paid odds data were used.

References and Data Sources

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