Examining the Effect of a Additional NFL Regular Season Game on Team Performance and Betting Metrics (2017-2024)

Abstract

This study presents a comprehensive analysis of National Football League (NFL) game data spanning eight seasons (2017-2024), divided into two distinct blocks: the 16-game season era (2017-2020) and the 17-game season era (2021-2024). Using standardized datasets containing detailed game information, we examine scoring patterns, home-field advantage trends, betting market accuracy, and playoff performance differences between these two eras. The findings contribute to the understanding of how the structural change in season length has potentially impacted various aspects of NFL competition.

1. Introduction

The National Football League implemented a significant structural change beginning with the 2021 season, expanding the regular season from 16 to 17 games per team. This modification represents one of the most substantive changes to the league's schedule format in decades and provides researchers with a natural experiment to examine how such a structural change might influence game outcomes and associated metrics.

This report analyzes comprehensive game data from the 2017-2024 NFL seasons, comparing various performance indicators between the 16-game block (2017-2020) and the 17-game block (2021-2024). The research aims to identify meaningful patterns and trends that emerged following the season extension, with particular attention to scoring dynamics, home-field performance, betting market accuracy, and playoff competition.

2. Key Terms and Definitions

Season Structure

- **17-Game Regular Season**: Implemented in 2021, all 32 NFL teams play 17 games over 18 weeks, with one bye week (no game scheduled) typically falling between Week 5 and

Week 14. The specific bye week varies by team and season. All statistics labeled "reg_season" from the 17-game block refer to these first 272 games of each season.
- **16-Game Regular Season**: The NFL format from 1978-2020, where all 32 teams played 16 games over 17 weeks, with one bye week typically scheduled between Week 5 and Week 13. All statistics labeled "reg_season" from the 16-game block refer to these first 256 games of each season.

Playoff Structure

- **Playoffs**: Following the regular season, 14 teams advance to a single-elimination tournament consisting of four rounds (prior to 2020, only 12 teams qualified for the playoffs). The playoff rounds include:
    - **Wildcard Round (WC)**: 12 teams participate (top seed from each conference receives a bye; prior to 2020 only 8 teams participated in the WC, giving the top two seeds from each conference a bye)
    - **Divisional Round (DIV)**: 8 teams participate
    - **Conference Championship Games (AFCCG/NFCCG)**: 4 teams participate (2 from each conference)
    - **Super Bowl (SB)**: 2 teams participate (one from AFC, one from NFC)
- All statistics labeled "playoffs" refer to these final 11-13 games of each season (depending on season structure)
    - Note: This report doesn't discuss the impact of an additional regular season game on playoff performance, but playoff success plays a significant factor in overall team success over any time frame, so this is something to keep in mind while reading through this report

Betting Terminology

- **Over/Under (O-U)**: The projected total combined score of both teams on which bettors can wager. For example, with an over/under of 49.5:
    - If the teams combine for 50+ points, the "over" wins
    - If the teams combine for 49 or fewer points, the "under" wins
    - Over/under lines typically include a half-point to prevent ties ("pushes") where bettors would receive their money back.
- **Spread**: A point handicap designed to equalize betting on teams of different quality. For example, a spread listed as "BAL vs CIN(-6.5)" means:
    - Cincinnati is favored by 6.5 points
    - If Cincinnati wins by 7+ points, they "cover" the spread
    - If Baltimore loses by 6 or fewer points (or wins outright), they "cover" the spread
    - This can also be represented as "BAL(+6.5) vs CIN." Most spreads include a half-point to prevent ties ("pushes").

Analytical Metrics

- **Point Margin**: The difference between the winning and losing team's score in a game.
- **Team Classification**: A categorical system for labeling NFL teams based on their four-year performance records, including regular season wins, playoff appearances, and playoff success.

3. Methodology

3.1 Data Sources

The analysis utilizes standardized datasets covering all NFL games from the 2017-2024 seasons. Each dataset contains identical column structures, enabling consistent cross-season analysis. The datasets include the following variables for each game:

- Week number
- Game identification number
- Playoff status indicator (TRUE/FALSE)
- Home and away team identifiers
- Home and away team scores
- Pre-game favorite designation
- Point spread
- Over/under (total points) line

2024

week	game_id	playoff	home_team	home_score	away_score	away_team	favorite	spread	over_under
1	1	FALSE	Kansas City	27	20	Baltimore	KC	-3.0	46.0
1	2	FALSE	Philadelphia	34	29	Green Bay	PHI	-1.5	49.5
1	3	FALSE	Atlanta	10	18	Pittsburgh	ATL	-4.0	43.0
1	4	FALSE	Buffalo	34	28	Arizona	BUF	-6.5	46.0
1	5	FALSE	Chicago	24	17	Tennessee	CHI	-4.0	43.0
1	6	FALSE	Cincinnati	10	16	New England	CIN	-7.5	40.5
1	7	FALSE	Houston	29	27	Indianapolis	HOU	-3.0	48.0
1	8	FALSE	Miami	20	17	Jacksonville	MIA	-3.5	49.5
1	9	FALSE	New Orleans	47	10	Carolina	NO	-3.5	41.5
1	10	FALSE	Minnesota	28	6	New York (G)	MIN	-1.0	42.0
1	11	FALSE	Los Angeles (C)	22	10	Las Vegas	LAC	-3.0	40.5
1	12	FALSE	Seattle	26	20	Denver	SEA	-6.5	42.5
1	13	FALSE	Cleveland	17	33	Dallas	CLE	-2.0	42.0
1	14	FALSE	Tampa Bay	37	20	Washington	TB	-4.0	42.5
1	15	FALSE	Detroit	26	20	Los Angeles (R)	DET	-5.5	53.5
1	16	FALSE	San Francisco	32	19	New York (J)	SF	-3.5	43.0

3.2 Data Classification

The complete dataset was divided into two distinct blocks:

- **16-Game Seasons**: 2017-2020 seasons (regular season games ≤ game_id 256)
- **17-Game Seasons**: 2021-2024 seasons (regular season games ≤ game_id 272)

Playoff games were identified using the "playoff" boolean indicator and analyzed separately from regular season contests.

3.3 Analytical Approach

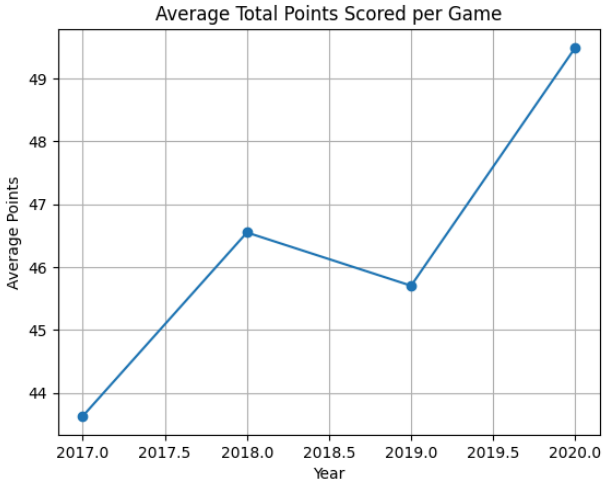
Statistical analyses were conducted to evaluate:

1. Scoring patterns and trends, both within and between blocks
2. Home-field advantage metrics
3. Betting market efficiency (spread and over/under accuracy)
4. Bookmaker adaptations

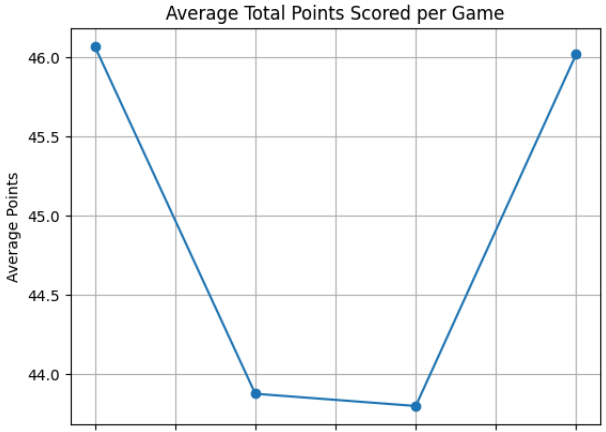
For each analytical dimension, comparative statistics were generated between the 16-game and 17-game eras to identify meaningful differences. Significance testing was applied where appropriate to determine whether observed differences between eras could be attributed to chance.

4. Within-Block Comparison

4.1 Points Per Game (PPG) Trends

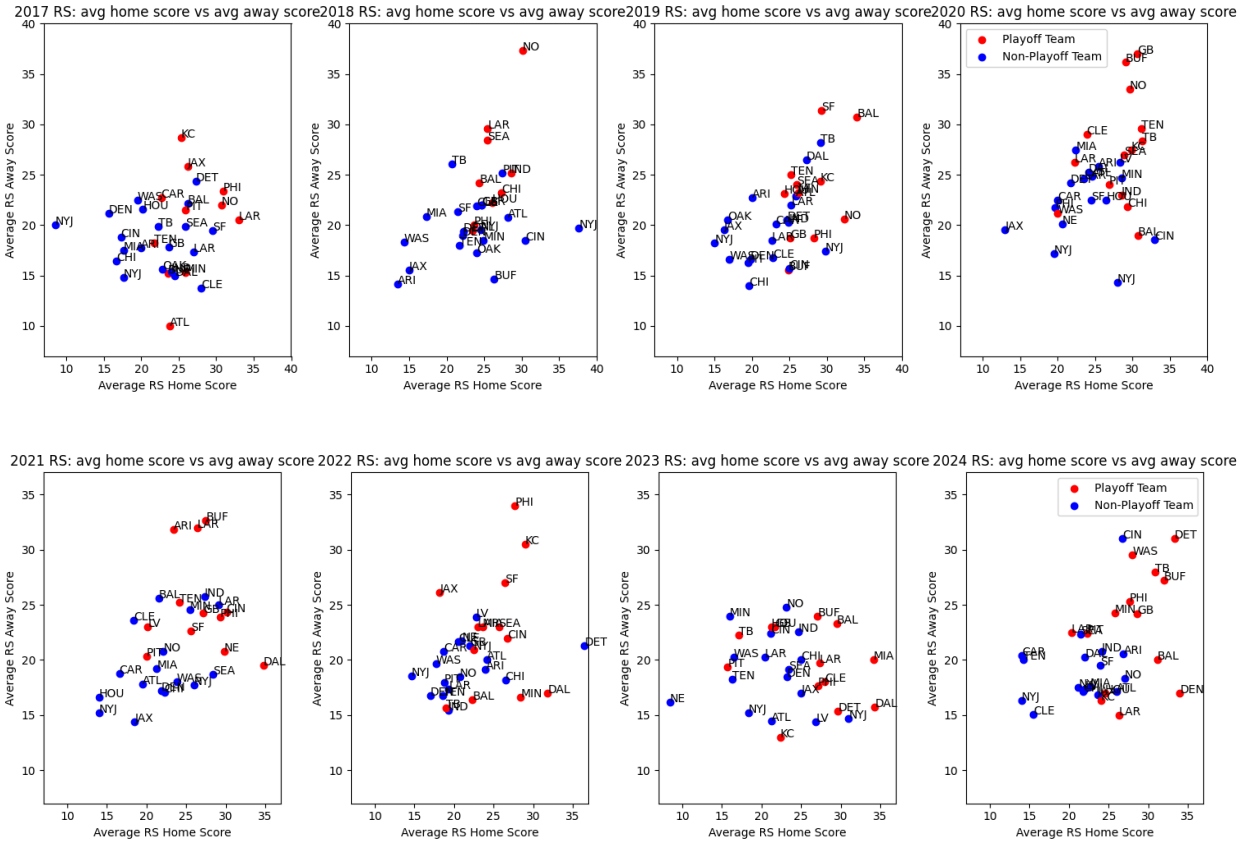


Examining the average total points per game (PPG) across seasons, we observe a notable shift with the introduction of the 17-game season. The **16avg_total_ppg** visualization indicates that total PPG in 16-game seasons exhibited relative stability, with only minor fluctuations year-over-year. However, in the **17avg_total_ppg** visualization, which includes data from the 17-game era, we see an decrease in scoring efficiency. This suggests that the additional game may have led to adjustments and/or fatigue on both sides of the ball over a longer season.



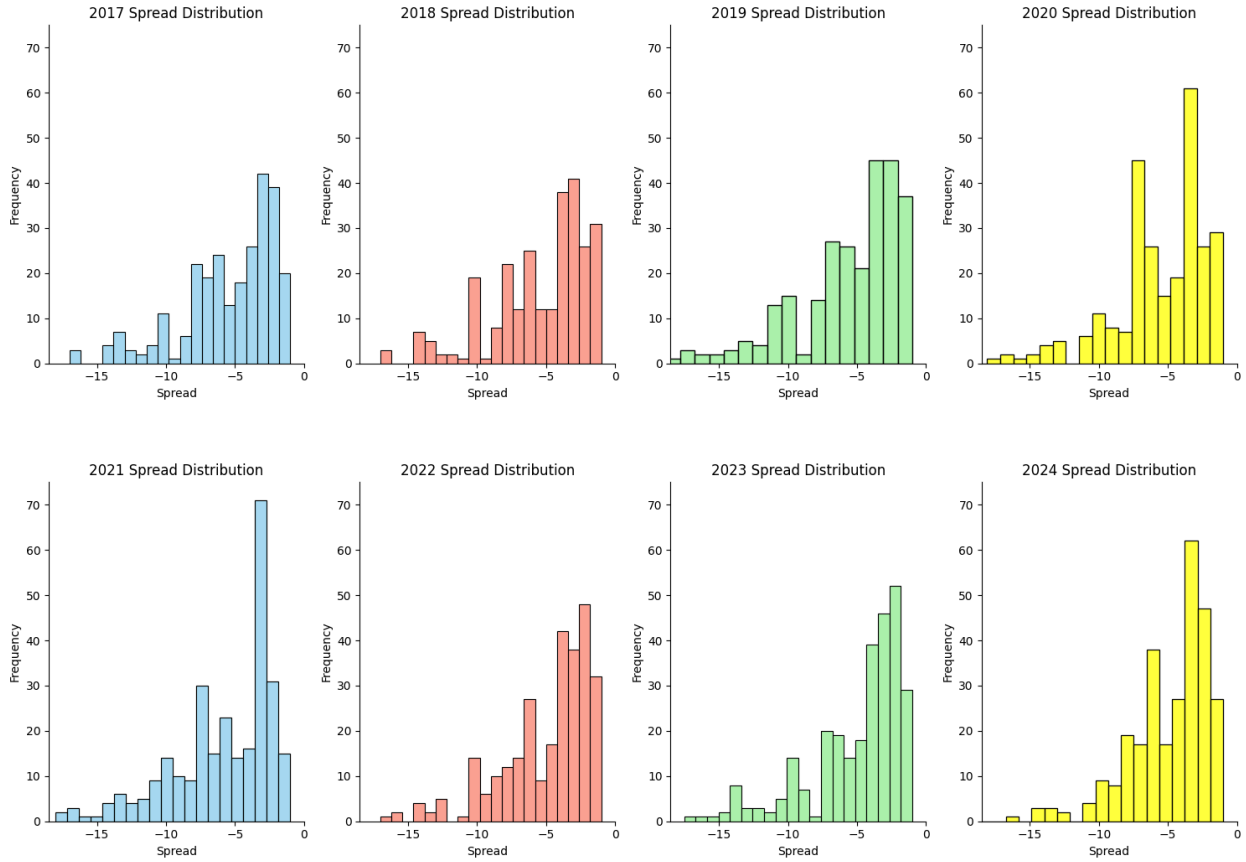
Additionally, the **16ppg_HvA** and **17ppg_HvA** charts (below) show a trend where home teams maintained a slight scoring edge in both 16- and 17-game seasons. However, the difference between home and away

scoring appears to have narrowed in the 17-game seasons, potentially indicating an increased level of parity.



4.2 Spread Distribution and Competitive Balance

The **16spread_distr** and **17spread_distr** visualizations reveal shifts in game competitiveness. In the 16-game seasons, point spreads were more tightly clustered, reflecting a balance in team performance. With the transition to 17 games, we notice a slightly wider distribution of spreads, suggesting greater variance in game outcomes. This could be due to increased fatigue, injuries, or strategic changes introduced by the extended schedule.



4.3 Team Classification and Performance Trends

Using the **16team_classification** and **17team_classification** charts, we can analyze how team categorization changed with an extra game. The data indicates that under the 16-game format, a more distinct separation existed between elite, mid-tier, and struggling teams. However, in the 17-game seasons, we observe a blurring of these distinctions, possibly due to the increased sample size slightly shifting win-loss distributions. More teams appear to hover around the playoff threshold, which could

```
# Introduce tolerance for average wins
if playoff_count == 4 and avg_wins >= 10 and avg_playoff_wins >= 2:
    team_classifications[team] = "Dynasty"
elif playoff_count >= 3 and avg_wins >= 10 and avg_playoff_wins >=1:
    team_classifications[team] = "Dominant"
elif playoff_count >= 2 and avg_wins >= 10:
    team_classifications[team] = "Annual Contender"
elif playoff_count >= 2 or avg_wins >= 10:
    team_classifications[team] = "Inconsistent Contender"
elif (8 <= avg_wins < 10):  # Tolerance for Mediocre category
    team_classifications[team] = "Mediocre"
elif (1 <= avg_wins <= 6):
    team_classifications[team] = "BOTB" # 'bottom of the barrel' teams
else:
    team_classifications[team] = "Non-Contender"
```

impact postseason qualification dynamics.

Classification was based on the following characteristics (see code snippet included in both 16comparison.py and 17comparison.py files):

- **Average # of regular season wins** over a 4 year span
    - Note: 10 wins, no matter the # of games in a season, is the consensus standard for playoff worthiness/a ‘good’ season
        - there are practical exceptions, however, for example, the Seattle Seahawks (NFC) not making the playoffs in 2024 despite winning 10 games while the Denver Broncos were the 7th seed in the AFC winning only 9 games
- **# of playoff appearances** over a 4 year span
- To separate the teams near the top of the league, the **average # of playoff wins** over a 4 year span was taken into account as well

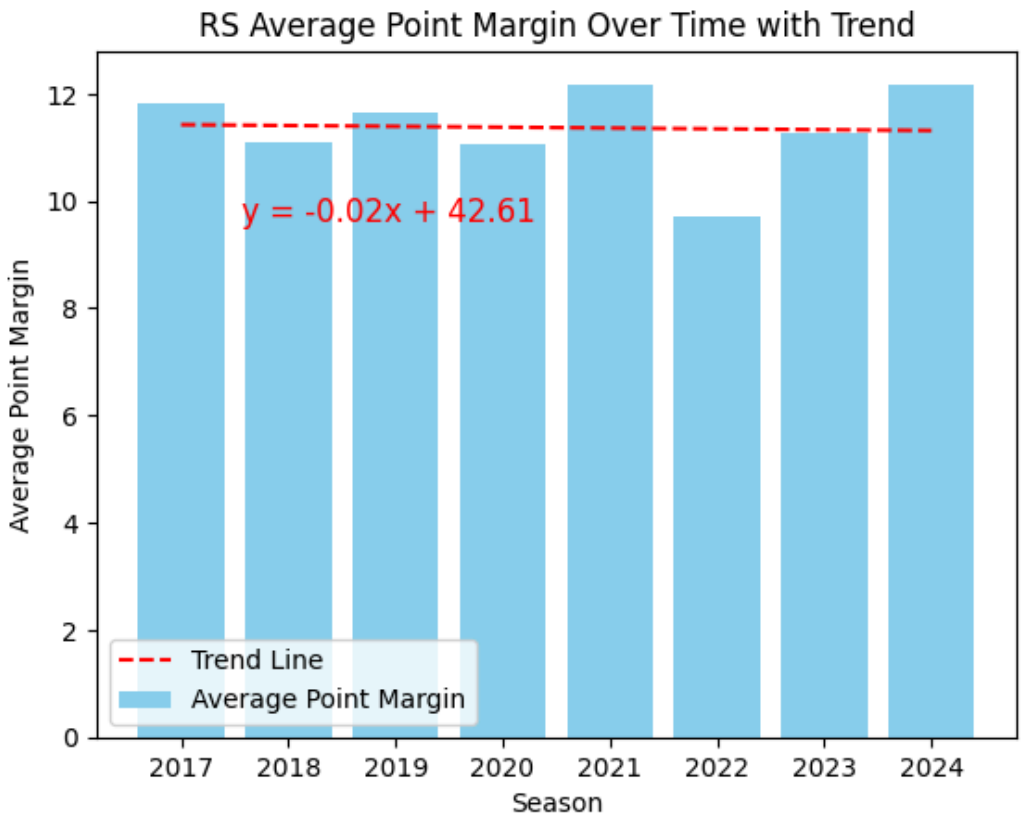
5. Treatment Effect of an Additional Regular Season Game

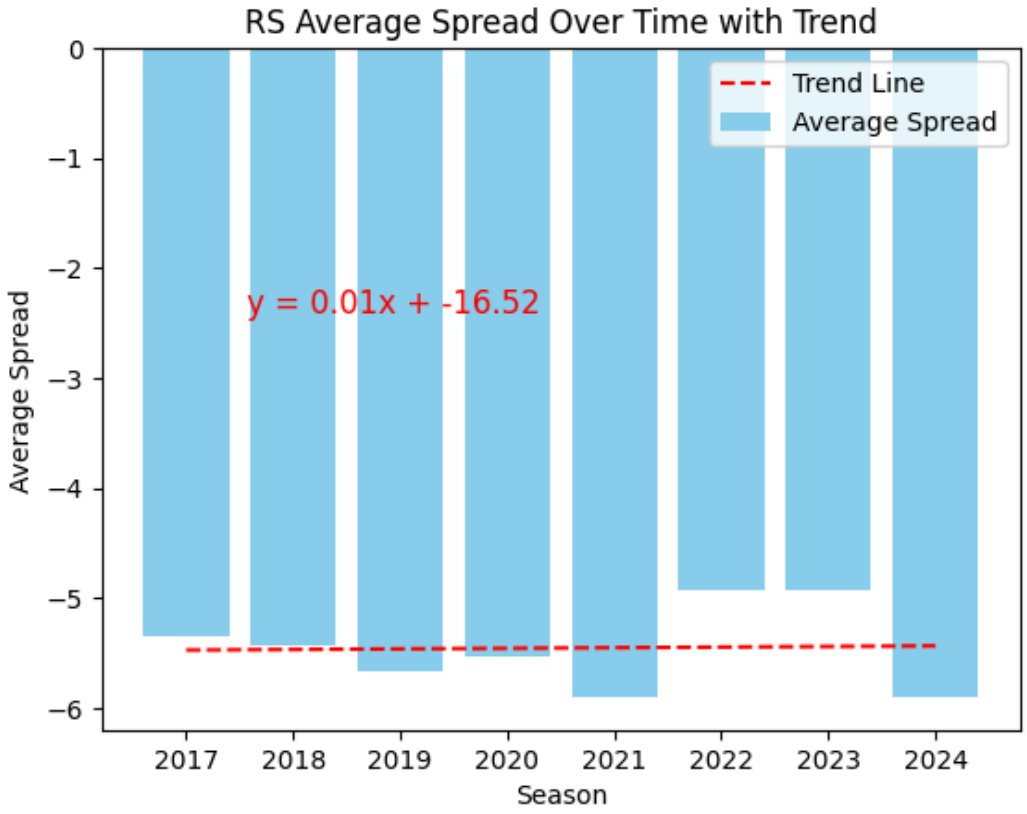
The analysis examines four key metrics before and after the implementation of the 17-game schedule in 2021:

5.1 Point Margin and Spread

- **Pre-treatment Average Point Margin (2017-2020)**: 11.40
- **Post-treatment Average Point Margin (2021-2024)**: 11.33
- **Pre-treatment Average Spread (2017-2020)**: -5.49
- **Post-treatment Average Spread (2021-2024)**: -5.42
- **Point Margin Trend**: Slight downward trend (slope = -0.02)
- **Spread Trend**: Slight upward trend (slope = 0.01)
    - Note: since a typical spread is denoted in negative terms (ex. SEA (-5.5) vs SF denotes that SEA is a 5.5 point favorite vs SF), a positive rate of change for the average spread signifies a **decrease** in average projected point margin

The minimal difference in point margins (-0.07) and spreads (+0.07) before and after the schedule change indicates that competitive balance remained remarkably stable. These similar but opposite rates of change suggest bookmakers are closely tracking NFL competitive balance trends when formulating spreads.

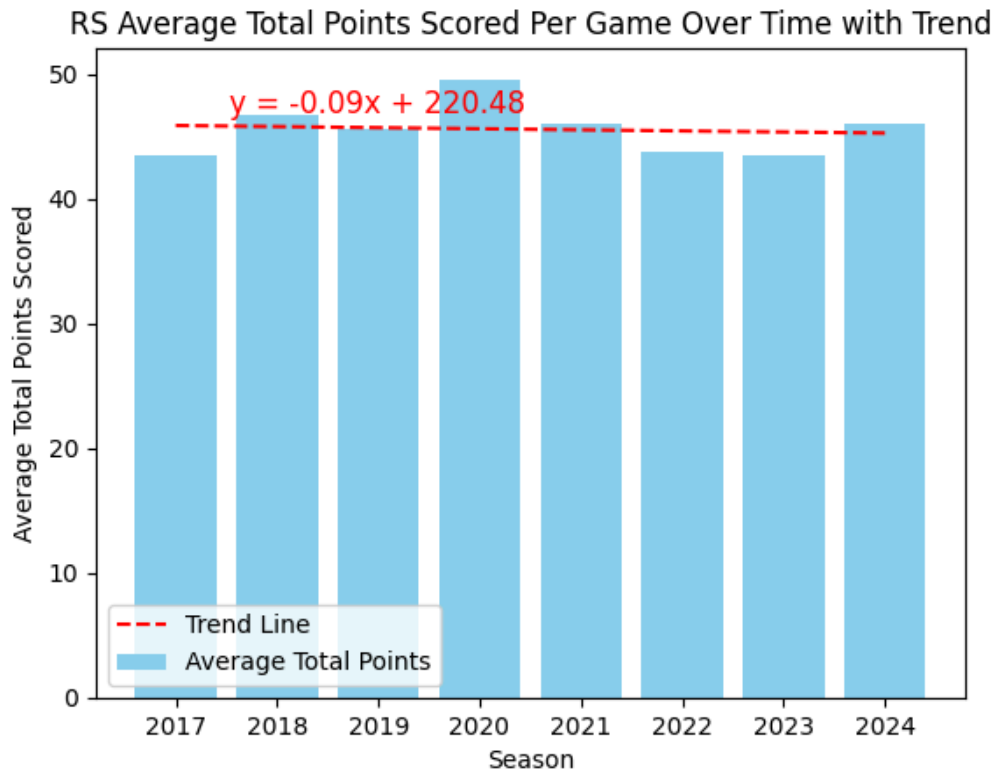

RS Average Point Margin Over Time with Trend
y = -0.02x + 42.61
Trend Line
Average Point Margin
Average Point Margin
Season
0
2
4
6
8
10
12
2017
2018
2019
2020
2021
2022
2023
2024

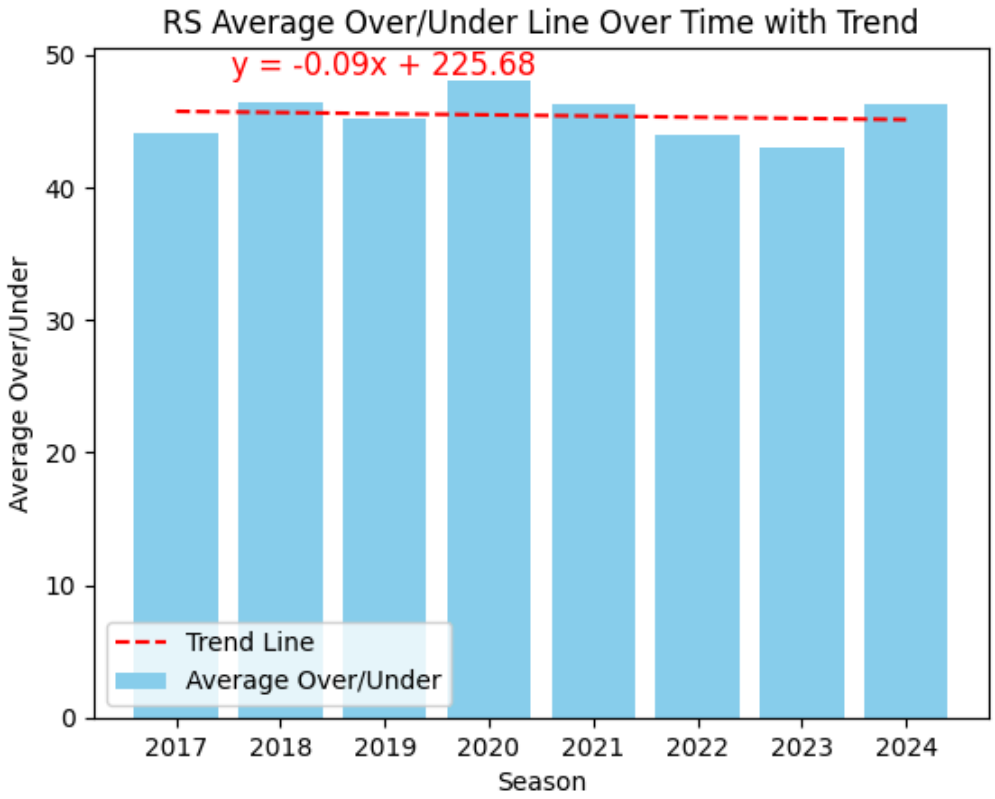

RS Average Spread Over Time with Trend
y = 0.01x + -16.52
Trend Line
Average Spread
Average Spread
Season
0
−1
−2
−3
−4
−5
−6
2017
2018
2019
2020
2021
2022
2023
2024

5.2 Over/Under Line and Total Points Scored

- **Pre-treatment Average Over/Under (2017-2020)**: 45.95
- **Post-treatment Average Over/Under (2021-2024)**: 44.89
- **Pre-treatment Average Total Points (2017-2020)**: 46.33
- **Post-treatment Average Total Points (2021-2024)**: 44.81
- **Over/Under Trend**: Downward trend (slope = -0.09)
- **Total Points Trend**: Identical downward trend (slope = -0.09)

Both metrics show a notable decrease after the introduction of the 17th game (over/under: -1.06, total points: -1.52). The identical slopes demonstrate bookmakers are effectively calibrating over/under lines to match actual scoring trends. The slightly smaller difference in the over/under line compared to actual scoring suggests bookmakers may have slightly underestimated the impact of the schedule change on scoring.





6. Bookmaker Adaptation

The data reveals sophisticated bookmaker adaptation to NFL trends:

1. **Competitive Balance**: The minimal changes in spread (+0.07) and point margin (-0.07) confirm bookmakers have accurately assessed that the 17th game hasn't significantly altered competitive balance, but more so that bookmakers have stayed on par with scoring changes in the NFL, in an effort to maximize their own earnings
2. **Scoring Environment**: The parallel decrease in over/under lines (-1.06) and actual points scored (-1.52) demonstrates bookmakers are tracking the league's scoring decline, though they may have slightly underestimated its magnitude
3. **Market Efficiency**: The close alignment between betting markets (spreads/over-unders) and outcomes (margins/total points) suggests high market efficiency despite the schedule change

7. Conclusions

The addition of the 17th regular season game in 2021 has produced several notable effects across the NFL landscape, with varying impacts on different aspects of the game:

Competitive Balance

- Point margins (-0.07) and spreads (+0.07) remained remarkably stable between eras, changing by less than 0.1 points
- The similar but opposite rates of change in point margin (slope = -0.02) and spread (slope = 0.01) indicate bookmakers successfully tracked competitive balance trends
- Despite the schedule extension, the fundamental competitive dynamics of NFL matchups have shown resilience

Scoring Environment

- The 17-game block has coincided with a notable decrease in scoring metrics (over/under: -1.06, total points: -1.52)
- Both over/under lines and total points followed identical downward trends (slope = -0.09), suggesting a systematic shift in offensive production
- This scoring decline may reflect increased player fatigue, defensive adaptations, or strategic adjustments necessitated by the longer season

Team Classification Dynamics

- The transition to 17 games has blurred the traditional distinctions between elite, mid-tier, and struggling teams
- More teams now hover around playoff thresholds, potentially creating greater parity in postseason qualification
- The increased sample size appears to have slightly shifted win-loss distributions across the league

Home-Field Advantage

- Home teams maintained their scoring edge in both eras, though the advantage narrowed in 17-game seasons
- This reduction in home-field advantage suggests teams may be adapting their approach to road games in the expanded schedule

Betting Market Efficiency

- Bookmakers have demonstrated sophisticated adaptation to NFL trends despite the structural schedule change
- The parallel movement of betting lines and actual outcomes indicates high market efficiency
- Bookmakers may have slightly underestimated the magnitude of scoring decreases (over/under adjustment of -1.06 vs. actual scoring decrease of -1.52)

Overall Impact

The 17th game represents a significant structural change that has primarily affected scoring dynamics while leaving competitive balance largely intact. The expanded schedule appears to have contributed to offensive fatigue or strategic defensive adjustments without disrupting the fundamental competitive equilibrium of the league.

This analysis suggests that while the NFL's decision to add a 17th game has measurably impacted certain aspects of play, the league has maintained its essential competitive characteristics. Players, teams, and betting markets have all effectively adapted to the new schedule format, ensuring continuity in the overall product despite the significant structural change.

Appendix

Raw data from SOH.com was processed, cleaned, and on occasion merged to create uniform season datasets with consistent variable structures, with PFR serving as a tool to cross-reference and validate data. This standardization enabled direct comparisons between seasons and accurate statistical analysis of trends across the pre-treatment and post-treatment periods.

The final datasets used for analysis contained complete information for all 2,112 regular season games and 98 playoff games played during the study period, representing a comprehensive analysis of the NFL's transition to a 17-game schedule to date.

Sports Odds History (SOH.com)

URL: https://www.sportsoddshistory.com/nfl-game-season/?y=**{year}**
Description: This database provided historical betting information for all NFL games in the study period (2017-2024), including point spreads, over/under lines, and closing odds. The website maintains accurate records of pre-game betting markets, which were essential for our analysis of bookmaker adaptation and market efficiency. Data was collected by substituting the desired season year for **{year}** in the URL.

Pro Football Reference (PFR)

URL: https://www.pro-football-reference.com/years/**{year}**/games.htm
Description: This comprehensive sports statistics database supplied the core game data used in our analysis, including team identifiers, scores, game dates, stadium information, and attendance figures. Pro Football Reference is widely recognized as one of the most reliable sources for professional football statistics and is frequently cited in academic research on the NFL. Data was collected by substituting the desired season year for **{year}** in the URL.