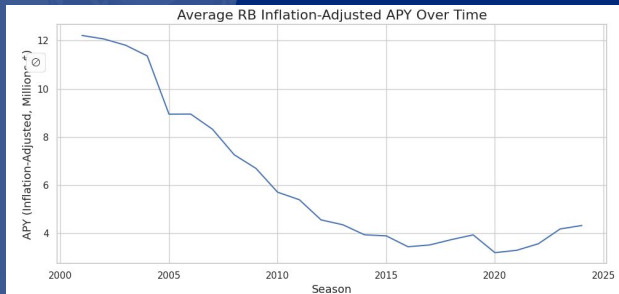
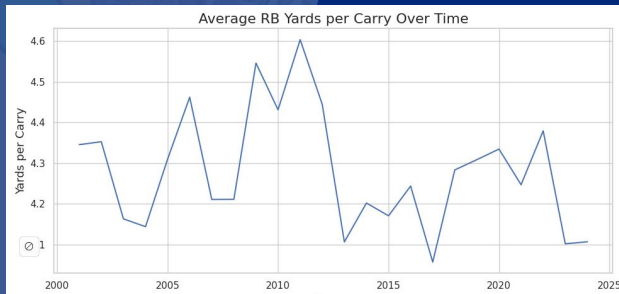




# The NFL Running Back Debate

Johnny Minard

# Introduction



With running backs holding out for periods of time for contract disputes, there is a broad consensus that running backs are less valuable than other skill positions. In today's pass-first NFL, running backs are seeing their value diminish in spite of receivers, quarterbacks, and defensive players signing record-breaking contracts.

The goal of this project is to use contracts and performance data to evaluate running backs over time and determine whether or not teams are justified the current valuation of the running back market.

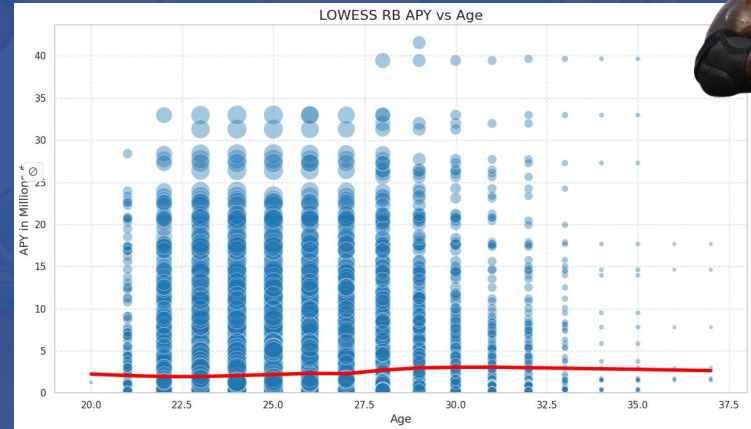
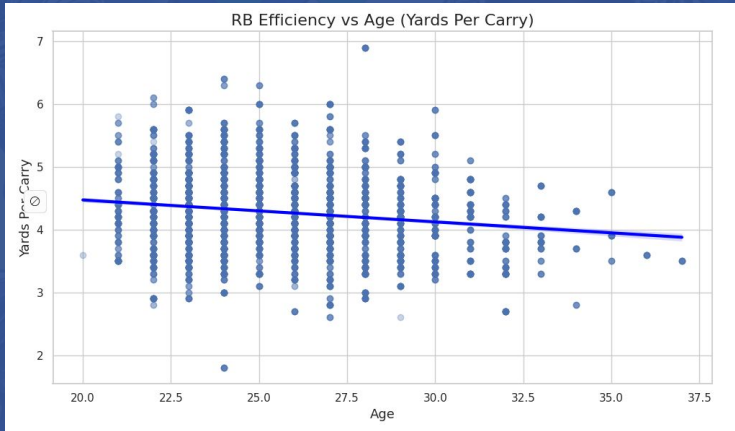


# Data Sources

Data Source #	Name/Short Description	Description	Purpose	Types	Data Size
1	Pro Football Reference	Individual player stats including Rushing yards, attempts, touchdowns, yards per carry, fumbles, longest rush, yards per game, and the year	Collected via Kaggle API into CSV; The stats are used to measure a player's on-field performance using basic metrics	Kaggle API / CSV	Rows : 7634 Columns : 13
2	OverTheCap	Player contract stats (with inflation considered) which include the year signed, total contract, signing bonus, average per year	Collected via web scraping; this contract data shows how much a player is valued at, this will help to determine value	Web Scraping	Rows : 3608 Columns : 14
3	ESPN	Team-level stats from years 2001-2024, this will include wins and losses as well as team total passing and rushing yards	Scraped ESPN's public API; this took all season stats per team from the years 2001-2024 to find the season outcomes as well as offensive stats.	Web Scraping	768 team's seasons



# Running Backs Over Time

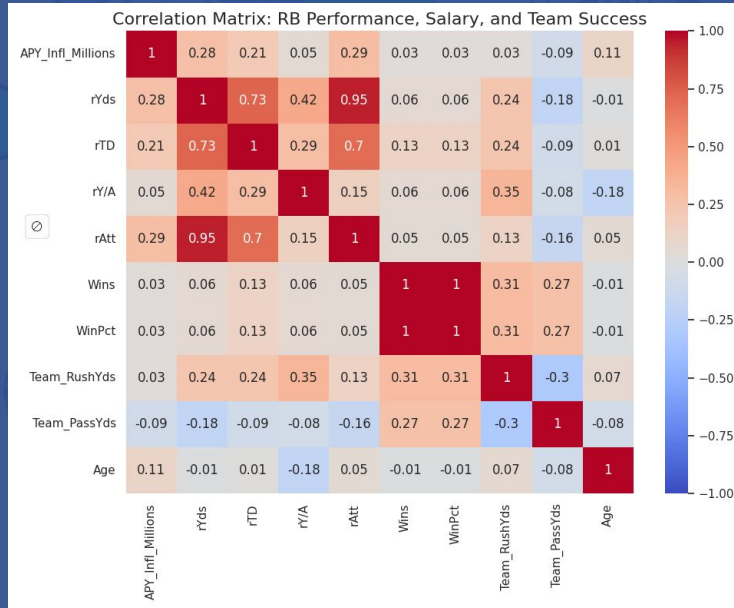


There is a decline in running back efficiency as they age, an average of 0.21 yards per carry is lost per year.

The LOWESS shows there is a significant decrease in running backs over the age of 30.

Despite the average APY increasing with age, the LOWESS regression shows that running backs tend to fizzle out of the league after 27.

# Correlation Analysis



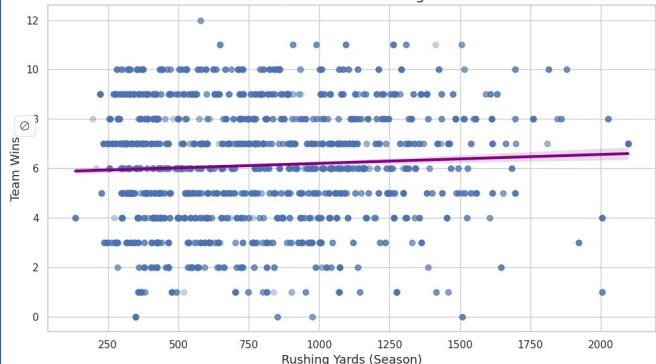
The heatmap shows weak correlations between rushing yards, rushing tds, and yards per attempt and APY or wins.

There is a correlation between rushing attempts and APY, this indicates that teams pay running backs for volume, but those stats do not necessarily translate to wins.

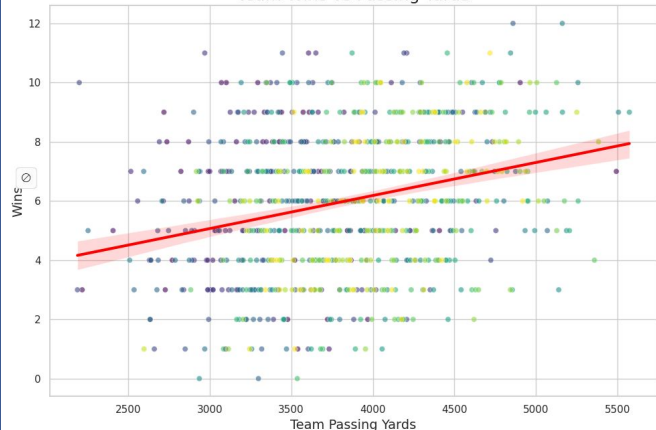
There is a slight negative correlation between age and wins, this points to the short-lived value of running backs.

# Do Rushing Yards Lead to Wins?

Team Wins vs RB Rushing Yards



Team Wins vs Passing Yards



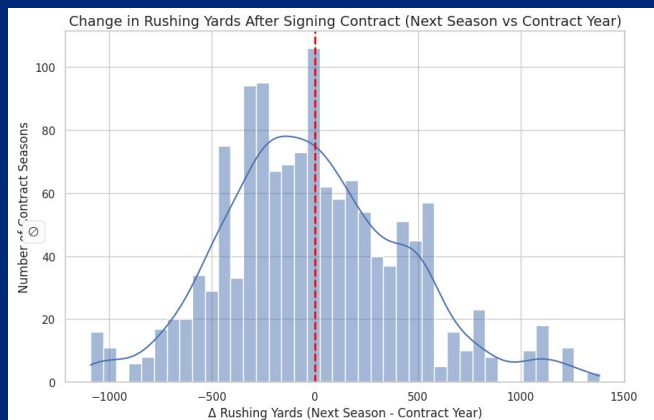
When it comes to passing yards vs rushing yards impact on wins passing yards have a clear stronger positive relationship with team wins. There is a notable clustering around 4000-5000 passing yards -> 8+ win season and 2500-3300 passing yards -> 3-6 win season.

When looking at wins vs Running Back rushing yards, the regression line is almost flat. Running backs with 1600-2000 yard seasons don't consistently come from winning seasons.

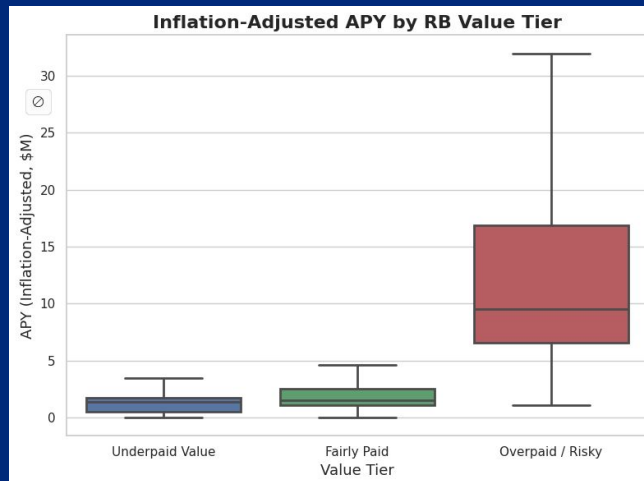
This suggests a strong meaningful consistent correlation between passing production and team success. Passing offenses drive modern NFL success and high-performing QBs correlate strongly with winning seasons. This reinforces the idea that success is driven by quarterback play than individual Running Back performance.



# Running Back Value



On average, running backs regress after signing a new contract



Tiers	APY	rAttempts	rYards	rTDs	Y/A	Wins
Fairly Paid	\$2.04	131.07	552.44	3.84	4.2	6.01
Overpaid	\$11.88	185.49	808.58	6.00	4.31	6.14
Underpaid	\$1.39	221.64	973.47	7.25	4.36	6.24



# Conclusion

## 1. RB Performance Declines with Age

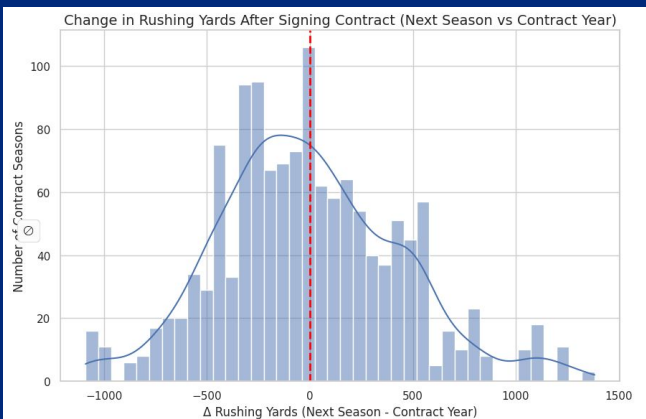
- Running Backs lose ~0.21 yards per carry per year, and there is an especially large drop off after age 27-30
- LOWESS Regression confirms the steep efficiency decline as well as decrease of running backs past the age of 30

## 2. RB Output has a weak correlation with wins

- Relevant rushing statistics have weak correlation ( $|r| < 0.20$ ) with team wins

## 3. Teams pay for volume rather than efficiency

- Rushing attempts correlate more strongly with APY than yards or touchdowns which indicate team's reward usage, not impact
- Running backs also regress the season after signing (see histogram)





# Challenges

## Visualization

- Variance in running back statistics and large drop offs of running backs past a certain age required LOWESS to draw meaningful conclusions.

## Blocked bot and bulk

- ProFootballReference frequently blocked automated requests, which

```

1 Player_Age,6,65,rAtt,rYds,rTD,r1D,rTng,rY/rG,rY/g,reb,Year
2 Saquon Barkley,27,16,16,345,2005,13,82,72,5.8,125.3,2,2024
3 Derrick Henry,30,17,17,325,1921,16,94,87,5.9,113.0,3,2024
4 Kyren Williams,24,16,16,310,1299,14,85,10,4.1,81.2,5,2024
5 Bijan Robinson,22,17,17,304,1456,14,82,37,4.8,85.6,1,2024
6 Jonathan Taylor,25,14,11,303,1431,11,71,70,4.7,102.2,4,2024
7 Josh Jacobs,26,17,17,301,1329,15,73,38,4.4,78.2,4,2024
  
```

- Variance in running back statistics and large drop offs of running backs past a certain age required LOWESS to draw meaningful conclusions.

- ProFootballReference frequently blocked automated requests, which forced more of a manual scraping method

- Combining 7,634 player rows, 3,608 contract rows, and 768 team seasons. Inconsistencies in identifiers, multi-season players, and missing contract-years all led to extensive clearing and conditional joins.

- Inconsistent running back contract histories and irregular ESPN API team stats required additional cleaning

[illegible]



**Thank You**