



# Football II

Produced by Dr. Mario | UNC STOR 538



# Importance of the Quarterback

- ❖ Historically Important for Success in NFL
  - ❖ Owner
    - ❖ Establish Team Identity
    - ❖ Hire Leadership
    - ❖ Provide Resources
  - ❖ General Manager
    - ❖ Evaluate Players
    - ❖ Make Trades and Acquire Players
    - ❖ Final Say on Personnel (20/32 Teams)
  - ❖ Coach
    - ❖ Responsible for Player Development
    - ❖ Responsible for On-Field Strategy
    - ❖ Real-Time Game Decisions
  - ❖ Quarterback
    - ❖ Throws the Rock
    - ❖ Highest Paid Position



# Importance of the Quarterback



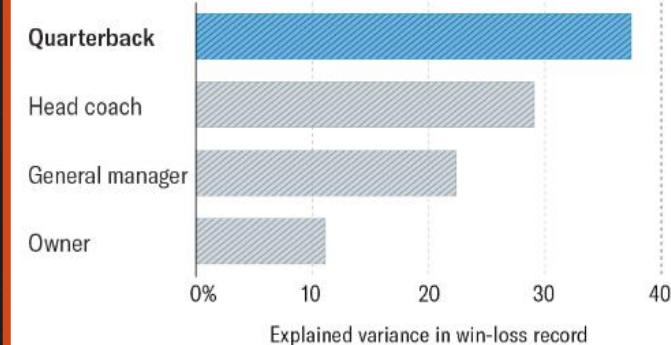
- ❖ We Know All Are Important #Browns
- ❖ What is the Most Important?
- ❖ Analysis Published in Harvard Business Review



- ❖ 38 Years of Data
- ❖ Basic Linear Regression ( $RSQ=0.682$ )
- ❖ Order of Importance by Percentage of RSQ
- ❖ Comparison of 80s and 90s
  - ❖ Head Coach Effect Unchanged
  - ❖ Owner and General Manager Effects Declined
  - ❖ Value of QB has increased

## Quarterbacks Are More Important Than Coaches, GMs, and Owners

A team's success or failure is most dependent on the player receiving the snap.





# Metrics for Quarterbacks

- ❖ Article from Bleacher Report
  - ❖ Passing YDS (Bad Metric to Measure Success)
  - ❖ TD/INT (Accounts for Most Important Info)
  - ❖ COMP/ATT (Misleading)
  - ❖ YDS/ATT (Leaves Out Sacks and Touchdowns)
  - ❖ Passer Rating (Accounts for Most QB Information)
    - ❖ Dates Back to 1971 and Hasn't Changed
    - ❖ Minimum = 0 & Maximum = 158.3
    - ❖ Leader in 2018 Was Danny Amendola
  - ❖ QBR (Produced by ESPN)
    - ❖ Created in 2011
    - ❖ Minimum = 0 & Maximum = 100
    - ❖ Compares Outcome to Expected Outcome
    - ❖ Leaders in 2018 Were Patrick Mahomes and Drew Brees
  - ❖ W/G (Classic Problem Similar to Baseball Pitching)

YDS = Yards  
TD = Touchdown  
INT = Interception  
COMP = Completion  
ATT = Attempts  
W = Wins  
G = Games



# Metrics for Quarterbacks



- ❖ Advanced Stats from Football Outsiders
  - ❖ Defense-Adjusted Value Over Average (DVOA)
  - ❖ Defense-Adjusted Yards Over Replacement (DYOA)
  
- ❖ Advanced Stats from Brian Burke (Advanced Football Analytics)
  - ❖ Win Probability Added (WPA)
  - ❖ Expected Points Added (EPA)



YDS = Yards  
TD = Touchdown  
INT = Interception  
ATT = Attempts  
SYDS=Sack Yards  
S=Sacks



# Tom Brady VS Aaron Rodgers



- ❖ **Passer Rating Based on 4 Stats (NFL)**

- ❖ Comp/ATT
  - ❖ YDS/ATT
  - ❖ INT/ATT
  - ❖ TD/ATT

- ❖ **Critique:** “Any system for rating quarterbacks based on passing statistics is really rating the team’s entire passing game.” –Dean Oliver

- ❖ **Estimated Linear Model for Wins**

- ❖ Conducted by Brian Burke (ESPN)
  - ❖ Data from 2002-2006
  - ❖ Created Total QBR for ESPN in 2016



YDS = Yards  
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COMP = Completion  
ATT = Attempts



# Tom Brady VS Aaron Rodgers



## ❖Independent Variables for Wins

**TRUOPASS** = offense (passing yards allowed – sack yards)/passing plays

**TRUDPASS** = defense (passing yards allowed – sack yards)/passing plays

**ORUNAVG**= offense rushing yards allowed/rushing attempts

**DRUNAVG**= defense rushing yards allowed/rushing attempts

**OINTRATE**= interceptions thrown/passing attempts

**DINTRATE**= interceptions made/passing attempts

**OFUMRATE**= offensive fumbles/all offensive plays (not fumbles lost)<sup>6</sup>

**DFFRATE**= defensive forced fumbles/all defensive plays

**PENRATE**= each team's penalty yards/all plays, offensive and defensive

**OPPPENRATE**= opponent's penalty yards/all plays, offensive and defensive





# Tom Brady VS Aaron Rodgers



## ❖ Results of Regression

Variable	Coefficient	p-value
const	5.2602	0.06281
TRUOPASS	1.54337	<0.00001
TRUDPASS	-1.66731	<0.00001
ORUNAVG	0.91979	0.00071
DRUNAVG	-0.553532	0.04842
OINTRATE	-50.0957	0.0012
DINTRATE	83.6627	<0.00001
OFUMRATE	-63.9657	0.00053
DFFRATE	78.6917	0.0001
PENRATE	-4.48514	0.01283
OPPENRATE	6.5826	0.0004

All Passing Information





# Tom Brady VS Aaron Rodgers



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Contribution  
from Offense QB

$$QBR \text{ (Book)} = 1.543(\text{TRUOPASS}) - 50.096(\text{OINTRATE})$$





# Tom Brady VS Aaron Rodgers



## ◆ Comparing Ratings in 2016

Player	Our Ranking	OldQBR	TOTALQBR
Matt Ryan	1	117.1	79.6
Tom Brady	2	112.2	79.4
Dak Prescott	3	104.9	77.6
Aaron Rodgers	12	104.2	72.4
Drew Brees	5	101.7	66.8
Kirk Cousins	4	97.2	66.5
Andrew Luck	9	96.4	65.9
Matthew Stafford	13	93.3	65.2
Tyrod Taylor	18	89.7	62.4
Alex Smith	14	91.2	60.8





# Tom Brady VS Aaron Rodgers



- ❖ Correlation Between Ratings
  - ❖ Book with QBR (0.9)
  - ❖ Book with Total QBR (0.82)
- ❖ Further Adjustment Needed to Measure the Quality of the Quarterback?
- ❖ Book Points Out the Difficulty in Understanding How the Offensive Line Contributes to the QB's Success





# Final Inspiration

All I know is grind.

- Reverend Ray Lewis