



# Football II

Produced by Dr. Mario | UNC STOR 390



# 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



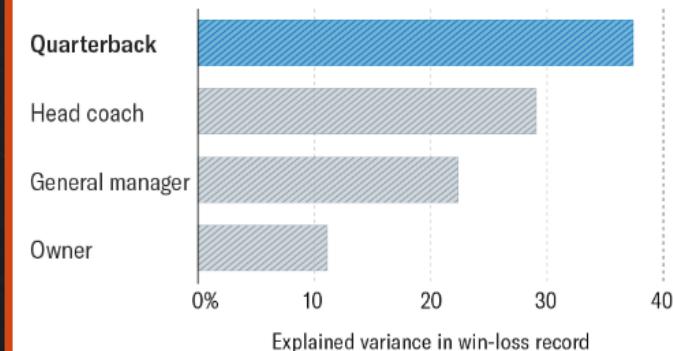
- ❖ We Know All Are Important #Browns
- ❖ What is the Most Important?
- ❖ Analysis Published in Harvard Business Review



- ❖ 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

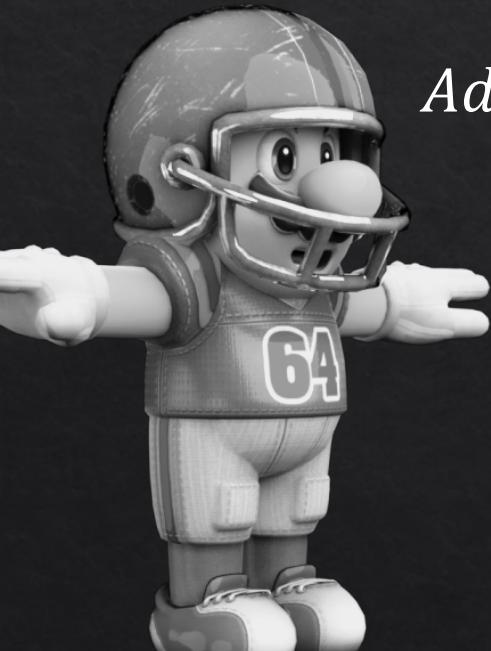


# Metrics for Quarterbacks



- ❖ Advanced Stats from Football Outsiders
  - ❖ Defense-Adjusted Value Over Average (DVOA)
  - ❖ Defense-Adjusted Yards Over Replacement (DYOA)
- ❖ Adjusted Yards Per Attempt from Sporting Charts

$$Adjusted\ YDS/ATT = \frac{YDS + 20 \times TD - 45 \times INT - SYDS}{ATT + S}$$



- ❖ 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 Peyton Manning



- ❖ Quarterback's Rating Based on 4 Stats (NFL)
  - ❖ Comp/ATT
  - ❖ YDS/ATT
  - ❖ INT/ATT
  - ❖ TD/ATT
- ❖ According to *Wages of Wins* From Regression
$$QB\ Rating = YDS - 3 \times ATT - 30 \times INT$$
- ❖ Estimated Linear Model for Wins
  - ❖ Conducted by Brian Burke
  - ❖ Data from 2002-2006

YDS = Yards  
TD = Touchdown  
INT = Interception  
COMP = Completion  
ATT = Attempts



# Tom Brady VS Peyton Manning



## ❖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 Peyton Manning



## ❖ 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 Peyton Manning



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Contribution  
from Offense QB





# Tom Brady VS Peyton Manning



## ❖ Comparing Predictions

Interception %	# of Sacks	Yards/Sacks	NFL rating	Net Yards/Attempt	Regression Rating	Our rank	"Wages of Wins" Rating	"Wages of Wins" Rank
1.4	21	128	117.2	7.809682805	157.4433428	1	2769	1
2.7	47	347	104.1	6.223946785	114.4701377	15	1471	13
0.9	21	99	102.2	6.965317919	142.8426456	2	1381	14
2.7	21	124	98	7.305970149	137.6311052	4	2012	3

T. Brady

P. Manning



❖ Correlation Between Regression and *Wages of Wins* Ratings is 0.87



# Final Inspiration

All I know is grind.

- Reverend Ray Lewis