



# Factors Affecting the Winning Percentages of Division III Football Teams

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## I. Abstract

We study factors affecting the winning percentages of Division III football teams. Using data from the NCAA for the 2014 through 2016 seasons, we find that both offensive and defensive outcomes equally affect winning percentages. Our results suggest that when it comes to winning, there is no statistically significant difference between the impact of having a more prolific offense or having a solid defense.

## II. Empirical Model and Variables

$$WP = f(DPY, DRY, DSCK, DTRN, DCONV, OPY, ORY, OSCK, OTRN, OCONV)$$

We specify a team's winning percentage, WP, as a function of the following variables:

### Offensive Variables

OPY: The average number of yards per game gained by the offense throwing the football; passing yards per game.

ORY: The average number of yards per game that are gained by the offense running the football; rushing yards per game.

OSCK: The number of times that the quarterback is tackled for a loss; sacks allowed per game.

OTRN: The number of times that the offense turns the football over to the defense by either fumbling the football or throwing an interception; turnovers lost per game.

OCONV: The percentage of the time that on third down the offense reaches the line to gain for a first down; third down conversion percentage.

### Defensive Variables

DPY: The average number of yards per game given up by allowing the opposing offense to pass the ball; passing yards allowed per game.

DRY: The average number of yards per game given up by allowing the opposing offense to run the ball; rushing yards allowed per game.

DSCK: The average number of times per game that the defense tackles the Quarterback; sacks per game.

DTRN: The average number of times per game that the defense either recovers a fumble or intercepts a pass; turnovers gained per game.

DCONV: The percentage of the time that on third down the opposing offense reaches the line to gain for a first down; third down conversion percentage of the opponent.

## III. Theory and Hypotheses

The marginal effects of DPY and DRY were both hypothesized to be negative because as a defense allows the offense to run and pass for more yards, the more likely it is the defense is allowing the opposing offense to score points.

The marginal effect of DSCK was hypothesized to be positive because it negates the ability of a quarterback to throw a ball for positive yardage, and pushes the offense back to the spot of the sack resulting in negative yards. It can also energize a team and allow momentum to swing in favor of the team who sacks the quarterback.

The marginal effect of DTRN was hypothesized to be positive because taking the ball away from a team through either an interception or fumble recovery puts the ball back in the other team's hands and provides the offense a chance to score.

The marginal effect of DCONV was hypothesized to be negative because a defense allowing the opponent to convert on third down extends drives for the other team and gives the opposing offense additional opportunities to score points.

The marginal effects of OPY and ORY were both hypothesized to be positive, as rushing yards gained and passing yards gained are a direct measure of offensive production and teams must be able to move the ball in order to score points.

The marginal effect of OSCK was hypothesized to be negative because allowing the defense to tackle the quarterback for a loss can demoralize an offense and prevent the offense from scoring points.

The marginal effect of OTRN was hypothesized to be negative because giving the ball up to the other team negates an offense's ability to score points and allows the other team an opportunity to score.

The marginal effect of OCONV was hypothesized as positive because being able to convert on third down is a solid measure of an offense's ability to extend drives down the field, pick up first downs, and stay on the field longer.

## IV. Data

Panel data set of 243 NCAA Division III Football Teams from the 2014 through 2016 seasons

Sample size: 730

Our data came from the NCAA website in Excel spreadsheet form. We were able to find data for all 243 teams Division III for the 2014 through 2016 seasons.

## V. Empirical Results

Dependent Variable: WP  
 Method: ML - Censored Normal (TOBIT) (Newton-Raphson / Marquardt steps)  
 Date: 04/17/17 Time: 15:43  
 Sample: 2014 2016  
 Included observations: 721  
 Left censoring (value) series: -0.001  
 Right censoring (value) series: 100.001  
 Convergence achieved after 2 iterations  
 Coefficient covariance computed using observed Hessian

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	51.08330	6.146854	8.310478	0.0000
DPY	-0.099931	0.013752	-7.266715	0.0000
DRY	-0.154519	0.014432	-10.70703	0.0000
DSCK	1.754424	0.571895	3.067741	0.0022
DTRN	9.132240	0.887818	10.28617	0.0000
DCONV	-0.343621	0.115377	-2.978243	0.0029
OPY	0.132310	0.010666	12.40514	0.0000
ORY	0.116988	0.012004	9.745566	0.0000
OSCK	-2.223916	0.601378	-3.698033	0.0002
OTRN	-9.556858	0.867074	-11.02197	0.0000
OCONV	0.323008	0.109251	2.956559	0.0031

## VI. Conclusions

- We found evidence that supports the theory that both defensive and offensive variables affect winning percentage. More balanced teams are more likely to have higher winning percentages.
- All estimated coefficients were statistically significant at the one-percent level, and all coefficients had the expected signs.
- A Wald test indicates that the marginal effects of the explanatory variables were not jointly equal to zero and that they helped to explain variation in winning percentage.
- Considering the marginal effects of defense versus offense on winning percentage, we found no statistical difference between the two.