



# Factors Affecting the Probability That a NFL Head Coach Will be Fired

Kyle Belcher

Linfield Department of Economics • Spring 2016

## I. Abstract

This study uses a logit model to analyze the factors affecting the probability that an NFL head coach will be fired. Our dataset is composed of fifty, randomly selected head coaches from the years 2004 to 2014. Explanatory variables included career experience, tenure, the previous year's winning percentage, career playoff wins, whether or not the coach was in the playoffs the prior year, and race. The previous year's winning percentage was found to significantly affect the probability a coach would be fired. The model's correct prediction rate is 80%.

## II. Empirical Model and Variables

$$FIRE_{it} = f(EXP_{it}, TENURE_{it}, WIN100_{it}, PLAYOFFWINS_{it}, INPLAYOFFS_{it}, RACE_{it})$$

- $FIRE_{it}$  = Whether or not the head coach was fired. 1 if fired, 0 if not fired
- $EXP_{it}$  = How many years the coach has been a head coach in the NFL
- $TENURE_{it}$  = How many years the coach has been with the team they are currently coaching
- $WIN100_{it}$  = The ratio of wins to total games played in the previous year (multiplied by 100 to be represented as a percentage)
- $PLAYOFFWINS_{it}$  = How many playoff wins a coach has in his career
- $INPLAYOFFS_{it}$  = Dummy variable: whether or not a coach was in the playoffs the previous year. 1 if coach was in the playoffs, 0 if not
- $RACE_{it}$  = Dummy variable for whether or not a coach is African American or not. 1 if coach is African American, 0 if other  
(i indexes coaches, t indexes time)

## III. Theory and Hypotheses

- $EXP_{it}$  is hypothesized to have a negative relationship with  $FIRE_{it}$ . As NFL experience increases, the probability of being fired should decrease
- $TENURE_{it}$  is hypothesized to have a negative relationship with  $FIRE_{it}$ . As tenure increases, the probability of being fired should decrease.  $WIN100_{it}$  is hypothesized to have a negative relationship with  $FIRE_{it}$ . As the winning percentage increases, the probability of being fired should decrease
- $PLAYOFFWINS_{it}$  is hypothesized to have a negative relationship with  $FIRE_{it}$ . As the number of playoff wins increases, the probability of being fired should decrease
- $INPLAYOFFS_{it}$  is hypothesized to have a negative relationship with  $FIRE_{it}$ . If a coach was in the playoffs the previous year, the probability of being fired should decrease
- $RACE_{it}$  is hypothesized to have a positive relationship with  $FIRE_{it}$ . History and supporting literature suggests that if a coach is African-American, the probability of being fired will increase

## IV. Data

- N= 50 coaches (13 fired, 37 not fired)
  - To randomize sample, I alphabetized all 32 NFL teams and gave them corresponding numbers from 1-32. Using a random number generator to generate 5 random numbers for each year(2004-2014), I then found the team and corresponding coach for that year
- Sources:
  - Data Collection: pro-football-reference.com and thehuddle.com
  - Literature: Journal of Sports Economics and Managerial Decision Economics

## V. Empirical Results

Dependent Variable: FIRE					Expectation-Prediction Evaluation for Binary Specification						
Method: ML - Binary Logit (Newton-Raphson / Marquardt steps)					Equation: UNTITLED						
Date: 12/01/15 Time: 13:39					Date: 12/01/15 Time: 13:39						
Sample: 155					Success cutoff: C = 0.5						
Included observations: 55											
Convergence achieved after 6 iterations											
Coefficient covariance computed using observed Hessian											
Variable	Coefficient	Std. Error	z-Statistic	Prob.	Estimated Equation			Constant Probability			
					Dep=0	Dep=1	Total	Dep=0	Dep=1	Total	
C	0.971262	1.210794	0.802169	0.4225	P(Dep=1)<=C	38	7	45	42	13	55
EXP01	-0.058200	0.165457	-0.351735	0.7250	P(Dep=1)>C	4	6	10	0	0	0
TENURE	0.207914	0.143789	1.445962	0.1482	Total	42	13	55	42	13	55
WIN100	-0.074856	0.034327	-2.157367	0.0310	Correct	38	6	44	42	0	42
PLAYOFFW	0.045057	0.168327	0.267679	0.7889	% Correct	90.48	46.15	80.00	100.00	0.00	76.36
INPLAYOFFS	0.321475	1.607120	0.200032	0.8415	% Incorrect	9.52	53.85	20.00	0.00	100.00	23.64
RACE	0.575730	0.811898	0.709116	0.4783	Total Gain*	-9.52	46.15	3.64			
					Percent Gain**	NA	46.15	15.38			
					Estimated Equation			Constant Probability			
					Dep=0	Dep=1	Total	Dep=0	Dep=1	Total	
McFadden R-squared	0.249490	Mean dependent var	0.236364		E(# of Dep=0)	34.61	7.39	42.00	32.07	9.93	42.00
S.D. dependent var	0.428764	S.E. of regression	0.395250		E(# of Dep=1)	7.39	5.61	13.00	9.93	3.07	13.00
Akaike info criterion	1.075381	Sum squared resid	7.498676		Total	42.00	13.00	55.00	42.00	13.00	55.00
Schwarz criterion	1.330859	Log likelihood	-22.57297		Correct	34.61	5.61	40.21	32.07	3.07	35.15
Hannan-Quinn criter.	1.174176	Deviance	45.14594		% Correct	82.39	43.12	73.11	76.36	23.64	63.90
Restr. deviance	60.15372	Restr. log likelihood	-30.07686		% Incorrect	17.61	56.88	26.89	23.64	76.36	36.10
LR statistic	15.00778	Avg. log likelihood	-0.410418		Total Gain*	6.03	19.48	9.21			
Prob(LR statistic)	0.020196				Percent Gain**	25.51	25.51	25.51			
Obs with Dep=0	42	Total obs	55								
Obs with Dep=1	13										

## VI. Conclusion

- The coefficient for WIN100 is statistically significant and has the expected sign
- The model's correct prediction rate is 80%
  - 46% of the fired coaches and 90% of the non fired coaches are predicted correctly
- Results must be analyzed with caution due to small sample size