STAT 113: HW9 SUPPLEMENT

In addition to the problems listed on the webpage for HW9, do the following, which is a modification of problem 9.28 from the textbook.

9.28 (modified) A common (and hotly debated) saying among sports fans is "Defense wins championships". Is offensive scoring ability or defensive stinginess a better indicator of a team's success? To investigate this question we'll use data from the 2015-16 National Basketball Association (NBA) regular season. The data, stored in `NBAStandings2016` (in the `Lock5Data` package in R) include each team's record (wins, losses, and winning percentage) along with the average number of points the team scored per game (`PtsFor`) and average number of points scored against them (`PtsAgainst`).

Unlike many other scenarios in which we have applied statistical inference, our data here includes every team's stats in 2015-2016, and so in some ways it is like a population. However, basketball, as all sports, is influenced by random chance; if the same two sets of players face each other more than once under the same game conditions, the games will usually not turn out the same way. Thus we can reasonably think of the outcomes of the games in the 2015-2016 NBA season as a sample, observed by running a process with certain stable, structural components, and certain random components: it is like a coin flip in this way, only much more complicated. In this sense, it can still make sense to make inferences about the structural parameters of this process using the observed data as our sample.

(a) Create and examine the scatterplots for predicting `WinPct` using `PtsFor` and predicting `WinPct` using `PtsAgainst`. In each case, discuss whether it appears that the conditions for fitting a linear model are satisfied.

(b) Fit the two models in question: one using `PtsFor` to predict `WinPct`, and one using `PtsAgainst` to predict `WinPct`. Write down and interpret **in context** the prediction equations for each model.

(c) Produce and examine the three standard residual plots for each of these models: (i) a scatterplot of the residuals plotted against the fitted values, (ii) a dotplot or histogram of the residuals by themselves, and (iii) a

Quantile-Quantile (QQ) plot, showing the observed quantiles of the residual distribution plotted against the corresponding quantiles in a Normal distribution. Comment on what each of these plots tells us about the conditions for using t-distributions to do inference with these models.

(d) Compare and interpret the R^2 values for both models.

(e) Calculate and interpret (**in context**) confidence intervals for the slopes of the two models. Keep in mind the paragraph above about the role that statistical inference has in this context.

(f) The Golden State Warriors set an NBA record in 2016 by winning 73 games in the regular season and only losing 9 (`WinPct = 0.890`). They scored an average of 114.9 points per game while giving up an average of 104.1 points against them. Find a point estimate for the predicted winning percentage for the Warriors using each of the models in (b).

(g) Find an **interval estimate** for the predicted winning percentage for the Warrors using each of the models in (b).