The Statistical Features of a Linear Model Analysis: A Simulation Study

October 15, 2015

Abstract

In class we have seen many statistical properties associated with the linear model and the estimators derived under least squares. This knitr-generated report illustrates some of the properties using a simulation study.

1 Simulation settings

We consider the following true simple linear regression model: for i = 1, ..., n.

$$Y_i = \beta_0 + \beta_1 x_{i1} + \epsilon_i$$

with $\beta_0 = 10$, $\beta_1 = 3$. We consider first the case where the ϵ_i are independent and identically distributed (i.i.d.) and drawn from a Normal distribution with expectation zero and variance $\sigma^2 = 2.0^2$.

```
data.source<-"http://www.math.mcgill.ca/dstephens/Regression/Data/2-1-RocketProp.csv"
RocketProp<-read.csv(file=data.source)
names(RocketProp)<-c('i','Strength','Age')
x<-RocketProp$Age
y<-RocketProp$Strength
plot(x,y,pch=19,cex=0.6,xlab='Age',ylab='Shear Strength')
xmean<-mean(x)
ymean<-mean(y)
abline(v=xmean,h=ymean,lty=2)</pre>
```



The mean of the x values is 13.3625, and the mean of the y values is 2131.3575.