

Linear Models Foundations Handout

1 Initialization

```
> library(NCStats)
```

2 2-sample t-Test

You must change the directory to where the following file is located.

```
> setwd("C://aaaWork//Class Materials//MTH207//Lecture/Handouts//")
> sdir <- read.table("SexDirection.txt",head=TRUE)
> str(sdir)

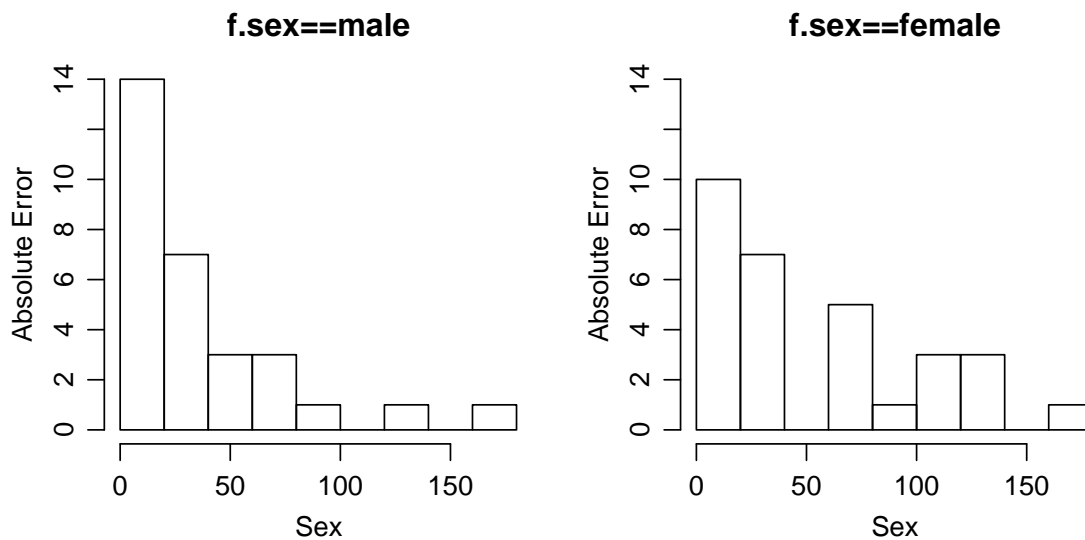
'data.frame':      60 obs. of  2 variables:
 $ abserr: int   13  13  38  59  58  8 130  68  23  5 ...
 $ sex    : Factor w/ 2 levels "female","male": 2 2 2 2 2 2 2 2 2 2 ...

> sdir$f.sex <- factor(sdir$sex,levels=c("male","female"))
> levels(sdir$f.sex)

[1] "male"  "female"

> attach(sdir)

> hist(abserr~f.sex,ylab="Absolute Error",xlab="Sex")
```



```
> Summarize(abserr~f.sex,digits=2)
```

	n	Mean	St. Dev.	Min.	1st Qu.	Median	3rd Qu.	Max.
male	30	37.6	38.48654	3	11.50	22.5	58.75	167
female	30	55.8	48.25964	3	15.75	35.0	88.25	176

```
> levene.test(abserr~f.sex)
```

Levene's Test for Homogeneity of Variance

	Df	F value	Pr(>F)
group	1	2.1692	0.1462

58

```
> t.test(abserr~f.sex,var.equal=TRUE)
```

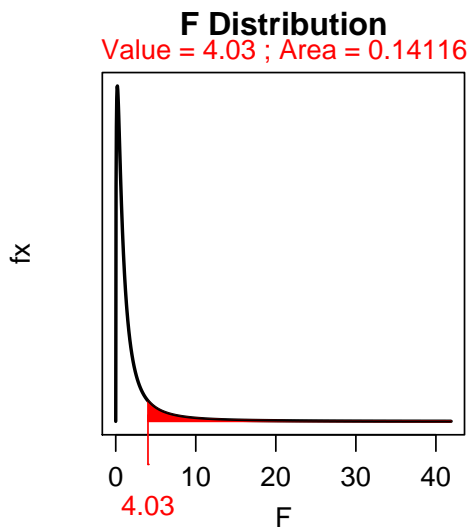
Two Sample t-test

data: abserr by f.sex
t = -1.6149, df = 58, p-value = 0.1118
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
-40.758823 4.358823
sample estimates:
mean in group male mean in group female
37.6 55.8

```
> detach(sdir)
```

3 F Distribution Calculations

```
> distrib(4.03,distrib="f",df1=3,df2=3,lower.tail=FALSE)
```



```
> distrib(4.03,distrib="f",df1=3,df2=3,lower.tail=FALSE,plot=FALSE)
```

```
[1] 0.1411648
```

4 2-Sample t-Test as a Linear Model

This example begins by assuming that you are using the same data as shown in Section 2.

```
> attach(sdir)
```

```
> lm1 <- lm(abserr~f.sex)
```

```
> anova(lm1)
```

Analysis of Variance Table

Response: abserr

	Df	Sum Sq	Mean Sq	F value	Pr(>F)
f.sex	1	4969	4969	2.608	0.1118
Residuals	58	110496	1905		
Total	59	115465			

```
> summary(lm1)
```

Call:

```
lm(formula = abserr ~ f.sex)
```

Residuals:

Min	1Q	Median	3Q	Max
-52.80	-29.00	-18.10	22.85	129.40

Coefficients:

	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	37.600	7.969	4.718	1.54e-05
f.sexfemale	18.200	11.270	1.615	0.112

Residual standard error: 43.65 on 58 degrees of freedom

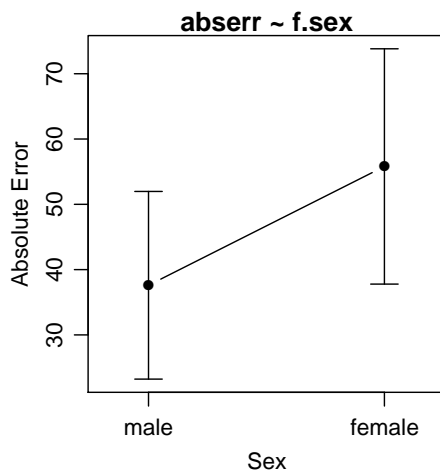
Multiple R-squared: 0.04303, Adjusted R-squared: 0.02653

F-statistic: 2.608 on 1 and 58 DF, p-value: 0.1118

```
> confint(lm1)
```

	2.5 %	97.5 %
(Intercept)	21.648503	53.55150
f.sexfemale	-4.358823	40.75882

```
> fit.plot(lm1,xlab="Sex",ylab="Absolute Error")
```



```
> detach(sdir)
```