Regression
Lesson 1a

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Introduction

Regression assignment 1a using R.

The complete source for this assigment is available on Github:

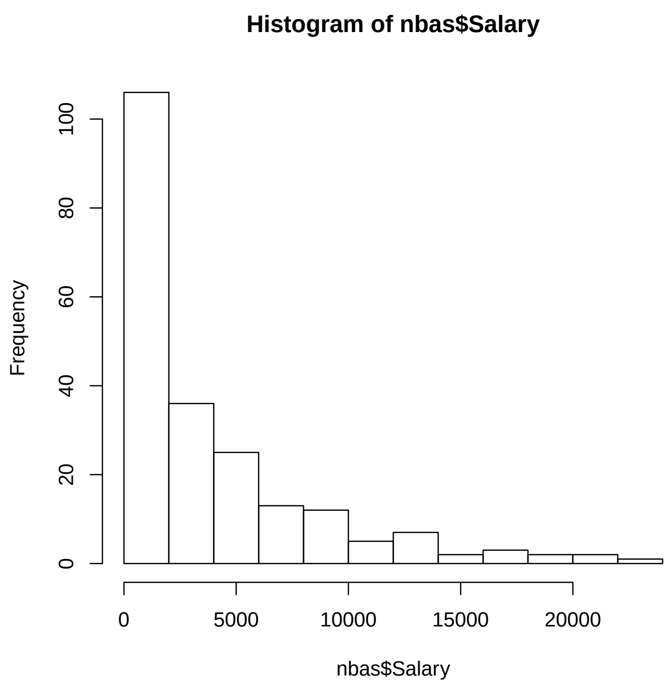
`https://github.com/zollie/PASS-Regression-Assignment1a`

Problem 1.1

```
>   nbas <- read.csv("~/R/PASS/Regression/Assignment1a/nbasalary.csv")
```

a

```
> hist(nbas$Salary, freq=TRUE)
```

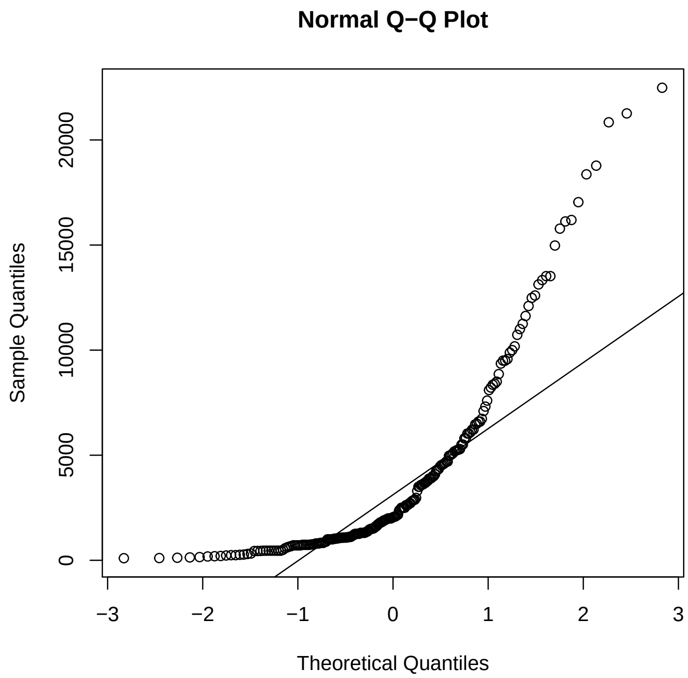


b

A bell curve like that of the standard normal distribution

c

```
> qqnorm(nbas$Salary)
> qqline(nbas$Salary)
```

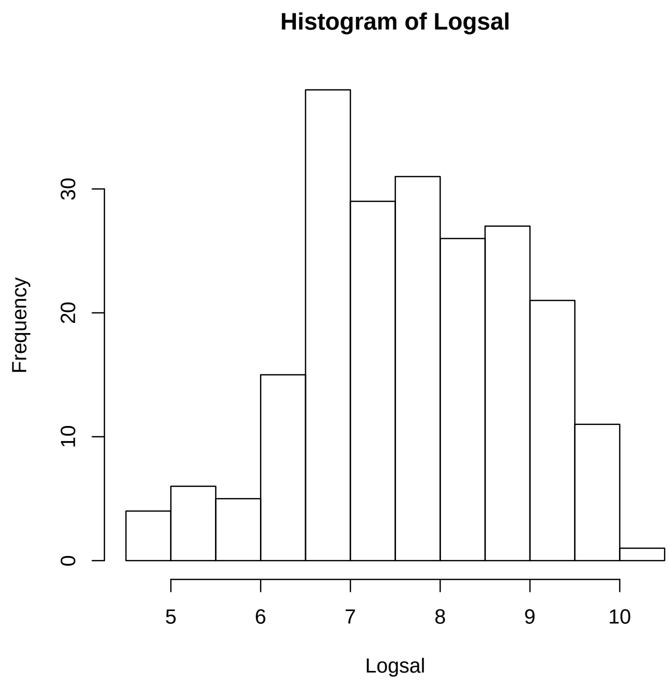


d

The QQ plot would be clustered around the reference line added by qqline()

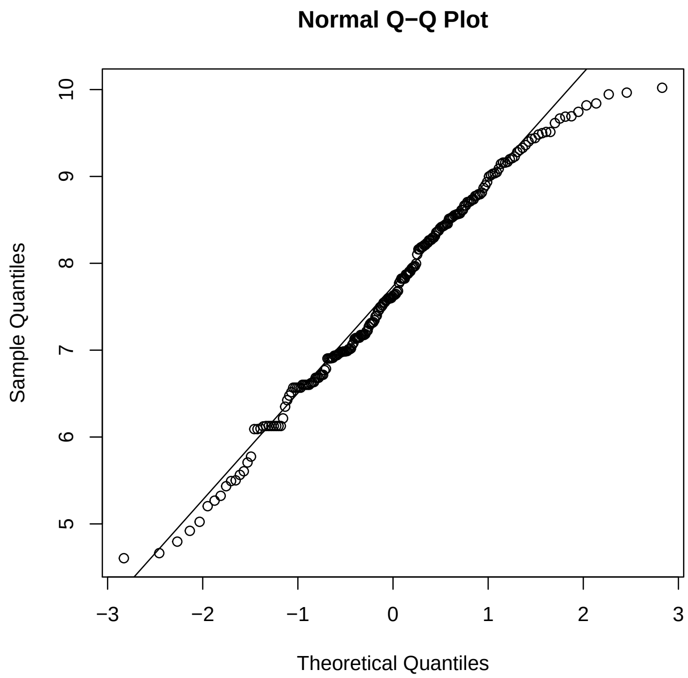
e

```
> Logsal <- log(nbas$Salary)
> hist(Logsal, freq=TRUE)
```



f

```
> qqnorm(Logsal)
> qqline(Logsal)
```



g

Logsal more closely follows a normal curve. The histogram of Logsal resembles the standard normal distribution more than the histogram of nbas$Salaries. Likewise, the QQ-plot of Logsal clusters around the normal reference line to a greater degree than that of the qqplot of nbas$Salaries.

Problem 1.5

```
>   c <- read.csv("~/R/PASS/Regression/Assignment1a/countries.csv")
```

a

```
>   summary(c$Pop)
```

```
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
  20.71   29.52   46.08  111.50   82.63 1341.00
```

```
>   mean(c$Pop)
```

```
[1] 111.5442
```

```
>   sd(c$Pop)

[1] 237.241
```

b

The world population among countries is highly variable about the mean as exhibited by a mean of 111.5 and a standard deviation of 237.2. That is c$Pop is not normally distributed but highly skewed. Therefore the confidence intervals for the mean of c$Pop would be relatively large and weakly informative.

c

```
> nrow(c)

[1] 55

> mean(c$Life)

[1] 69.78702

> sd(c$Life)

[1] 9.250388

> t.test(c$Life, conf.level=.95)

        One Sample t-test

data:  c$Life
t = 55.9495, df = 54, p-value < 2.2e-16
alternative hypothesis: true mean is not equal to 0
95 percent confidence interval:
 67.28629 72.28775
sample estimates:
mean of x
 69.78702
```

Problem 1.7

a

```
> t.test(c$Life, mu=68, alternative="less")

        One Sample t-test

data:  c$Life
t = 1.4327, df = 54, p-value = 0.9211
```

```
alternative hypothesis: true mean is less than 68
95 percent confidence interval:
     -Inf 71.87449
sample estimates:
mean of x
 69.78702
```

p-value > .05 therefore we do not reject the null hypothesis. The journalist may be correct in this scenario.

b

The prediction intervals below are larger than the confidence intervals from problem 1.5c because when calculating a confidence interval the only error we have to worry about is the estimation error. However, when calculating a prediction interval we must account for the estimation error and random error.

Manually

```
> f <- function(d, conf) {
+   lwr <- mean(c$Life) - conf*sd(c$Life)*sqrt(1+1/length(c$Life))
+   upr <- mean(c$Life) + conf*sd(c$Life)*sqrt(1+1/length(c$Life))
+   c(lwr,upr)
+ }
> f(c$Life, 2.005)
```

```
[1] 51.07214 88.50190
```

Regression Trick

```
> ones <- rep(1, 55)
> model <- lm(c$Life ~ ones)
> predict(model, interval="prediction")
```

```
        fit      lwr      upr
1  69.78702 51.07327 88.50077
2  69.78702 51.07327 88.50077
3  69.78702 51.07327 88.50077
4  69.78702 51.07327 88.50077
5  69.78702 51.07327 88.50077
6  69.78702 51.07327 88.50077
7  69.78702 51.07327 88.50077
8  69.78702 51.07327 88.50077
9  69.78702 51.07327 88.50077
10 69.78702 51.07327 88.50077
11 69.78702 51.07327 88.50077
12 69.78702 51.07327 88.50077
```

13	69.78702	51.07327	88.50077
14	69.78702	51.07327	88.50077
15	69.78702	51.07327	88.50077
16	69.78702	51.07327	88.50077
17	69.78702	51.07327	88.50077
18	69.78702	51.07327	88.50077
19	69.78702	51.07327	88.50077
20	69.78702	51.07327	88.50077
21	69.78702	51.07327	88.50077
22	69.78702	51.07327	88.50077
23	69.78702	51.07327	88.50077
24	69.78702	51.07327	88.50077
25	69.78702	51.07327	88.50077
26	69.78702	51.07327	88.50077
27	69.78702	51.07327	88.50077
28	69.78702	51.07327	88.50077
29	69.78702	51.07327	88.50077
30	69.78702	51.07327	88.50077
31	69.78702	51.07327	88.50077
32	69.78702	51.07327	88.50077
33	69.78702	51.07327	88.50077
34	69.78702	51.07327	88.50077
35	69.78702	51.07327	88.50077
36	69.78702	51.07327	88.50077
37	69.78702	51.07327	88.50077
38	69.78702	51.07327	88.50077
39	69.78702	51.07327	88.50077
40	69.78702	51.07327	88.50077
41	69.78702	51.07327	88.50077
42	69.78702	51.07327	88.50077
43	69.78702	51.07327	88.50077
44	69.78702	51.07327	88.50077
45	69.78702	51.07327	88.50077
46	69.78702	51.07327	88.50077
47	69.78702	51.07327	88.50077
48	69.78702	51.07327	88.50077
49	69.78702	51.07327	88.50077
50	69.78702	51.07327	88.50077
51	69.78702	51.07327	88.50077
52	69.78702	51.07327	88.50077
53	69.78702	51.07327	88.50077
54	69.78702	51.07327	88.50077
55	69.78702	51.07327	88.50077