

# Template

Name

March 3, 2019

## 1 Preliminaries

```
library(durham)
data(learndis)

domdis <- subset(learndis, ACCOM=="DOM", select = c("PATIENT", "COSTS.T1", "COSTS.T2"))
hosdis <- subset(learndis, ACCOM=="HOS", select = c("PATIENT", "COSTS.T1", "COSTS.T2"))
rnhdhis <- subset(learndis, ACCOM=="RNH", select = c("PATIENT", "COSTS.T1", "COSTS.T2"))
sghdhis <- subset(learndis, ACCOM=="SGH", select = c("PATIENT", "COSTS.T1", "COSTS.T2"))
```

## 2 Numerical Summaries

### 2.1 Summaries

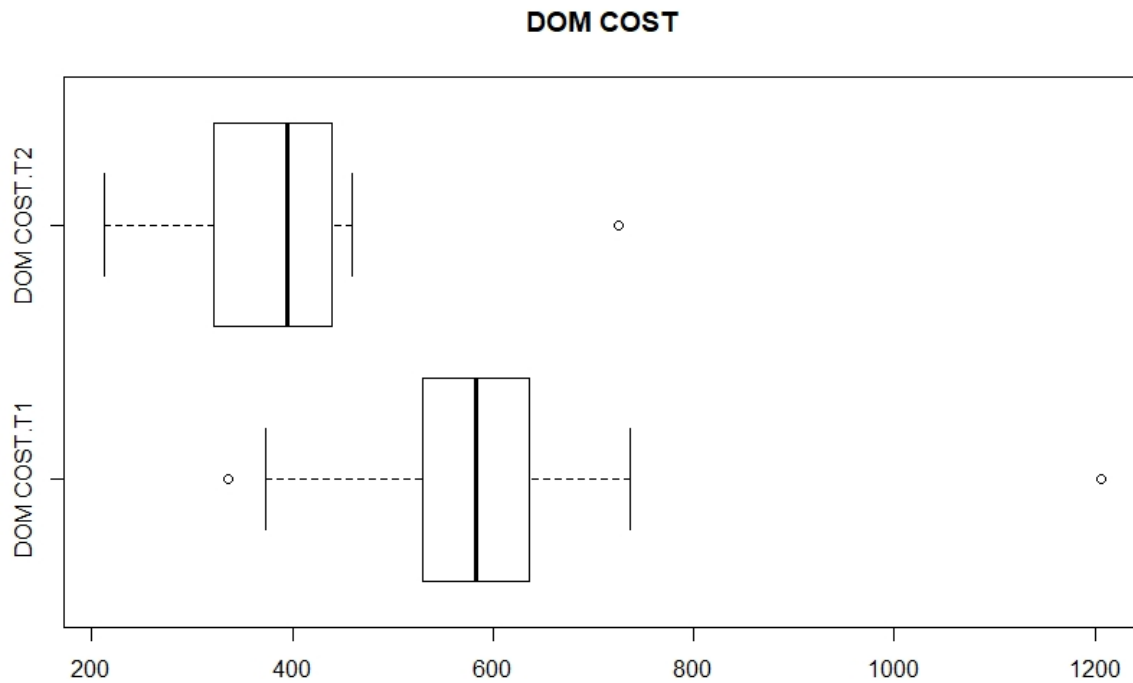
```
> summary(domdis$COSTS.T1)
  Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
 335.2  529.9  583.1  605.6  635.9 1207.0
> summary(domdis$COSTS.T2)
  Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
 212.2  322.2  394.8  390.4  439.1  725.3
> summary(domdis$COSTS.T1)
  Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
 335.2  529.9  583.1  605.6  635.9 1207.0
> summary(domdis$COSTS.T2)
  Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
 212.2  322.2  394.8  390.4  439.1  725.3
>
> summary(hosdis$COSTS.T1)
  Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
 407.1  458.3  799.9  725.2  913.7 1312.7
> summary(hosdis$COSTS.T2)
  Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
 260.0  452.2  656.0  612.5  712.3 1177.8
>
> summary(rnhdhis$COSTS.T1)
  Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
 275.2  530.7  798.4  747.5  856.9 1539.1
> summary(rnhdhis$COSTS.T2)
  Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
 221.5  440.6  571.8  590.3  771.2  961.6
>
```

```

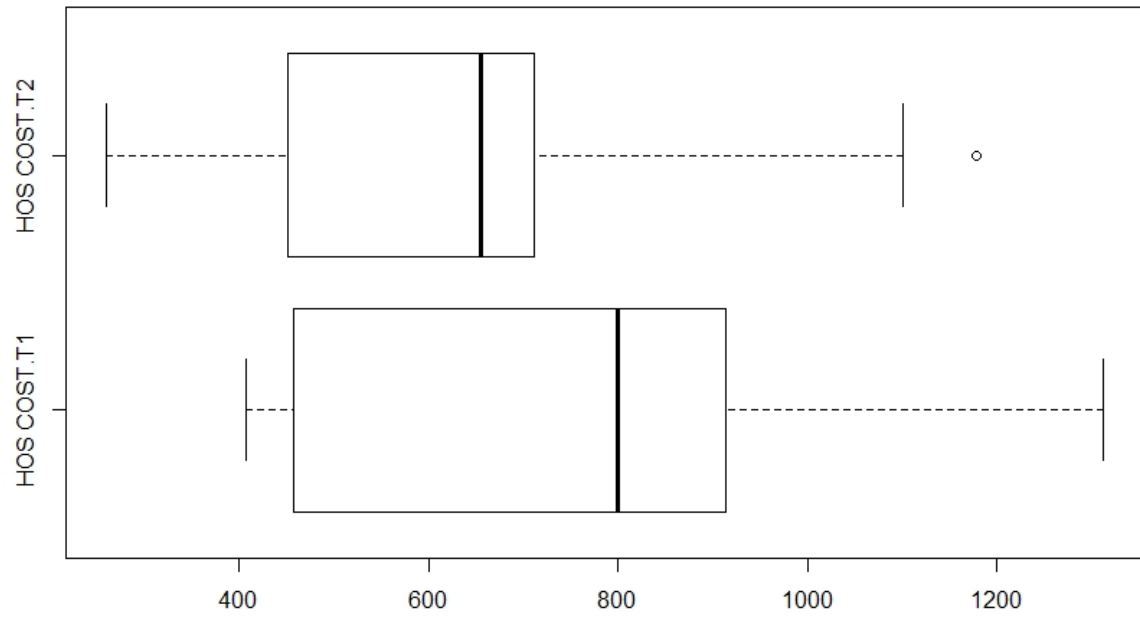
> summary(sghdis$COSTS.T1)
  Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
383.1  677.8   860.2   853.4   952.7  1655.8
> summary(sghdis$COSTS.T2)
  Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
304.4   707.2   846.4   825.3   980.5  1313.4
>
> summary(learndis)
      PATIENT      COSTS.T1      COSTS.T2      ACCOM
Min.   : 1.00   Min.   : 275.2   Min.   : 212.2   DOM:15
1st Qu.: 27.00   1st Qu.: 555.5   1st Qu.: 445.2   HOS:21
Median : 53.00   Median : 783.9   Median : 659.3   RNH:24
Mean   : 52.59   Mean   : 764.8   Mean   : 660.6   SGH:41
3rd Qu.: 78.00   3rd Qu.: 922.9   3rd Qu.: 854.4
Max.   :103.00   Max.   :1655.8   Max.   :1313.4
> summary(learndis$COSTS.T1)
  Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
275.2  555.5   783.9   764.8   922.9  1655.8
> summary(learndis$COSTS.T2)
  Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
212.2  445.2   659.3   660.6   854.4  1313.4

```

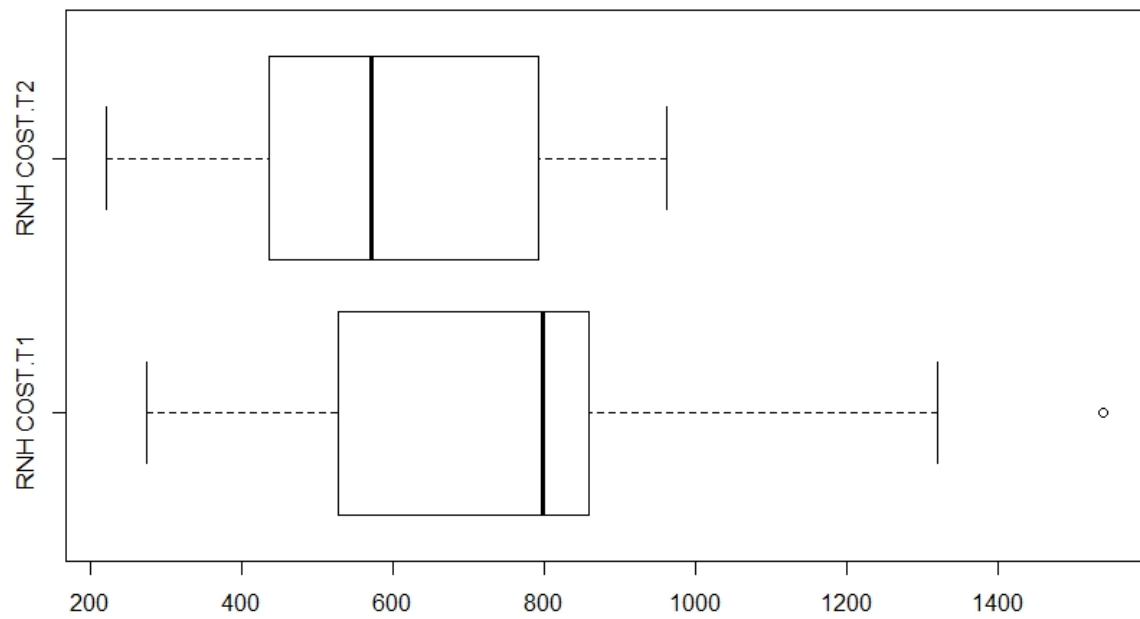
## 2.2 Boxplots



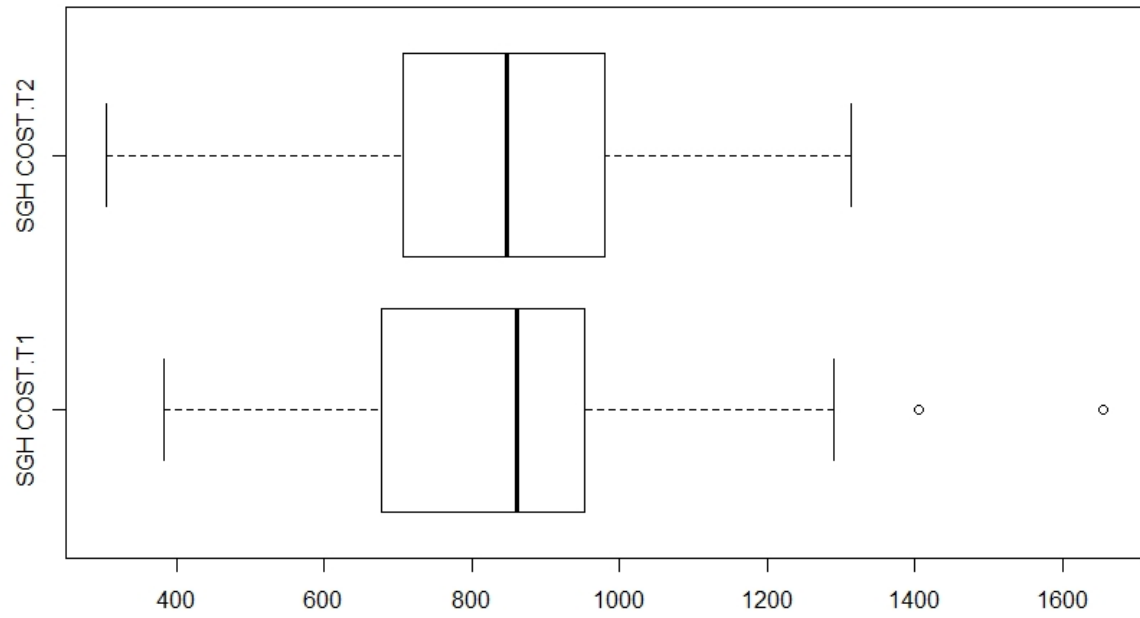
**HOS COST**



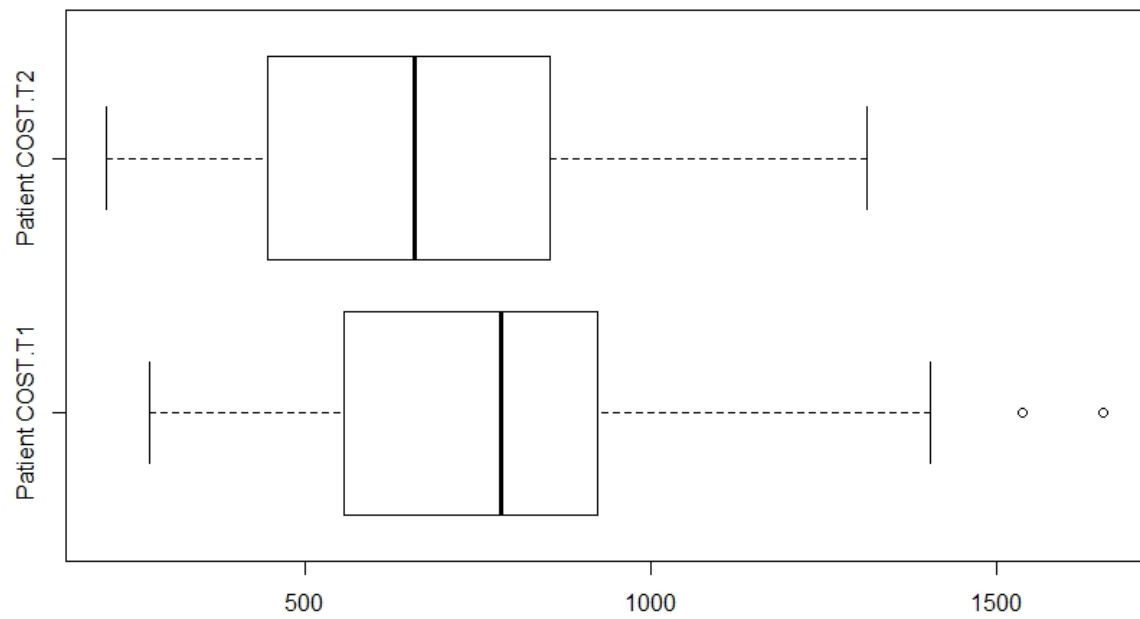
**RNH COST**



**SGH COST**



**Patient COST**



### 3 Assessment of Normality

#### 3.1 Stem and Leaf plots

```
> stem(domdis$COSTS.T1)
```

The decimal point is 2 digit(s) to the right of the |

```
 2 | 47
 4 | 8155689
 6 | 13434
 8 |
10 |
12 | 1
```

```
> stem(domdis$COSTS.T2)
```

The decimal point is 2 digit(s) to the right of the |

```
 2 | 16922479
 4 | 022566
 6 | 3
```

```
>
```

```
> stem(hosdis$COSTS.T1)
```

The decimal point is 2 digit(s) to the right of the |

```
 4 | 11246646
 6 | 03
 8 | 0570113444
10 |
12 | 1
```

```
> stem(hosdis$COSTS.T2)
```

The decimal point is 2 digit(s) to the right of the |

```
 2 | 646
 4 | 3456678
 6 | 66011145
 8 | 1
10 | 08
```

```
>
```

```
> stem(rnhdis$COSTS.T1)
```

The decimal point is 3 digit(s) to the right of the |

```
 0 | 334
 0 | 555567778888889999
 1 | 03
```

```

1 | 5

> stem(rnhdis$COSTS.T2)

The decimal point is 2 digit(s) to the right of the |

2 | 28899
4 | 359167788
6 | 0335
8 | 456236

>
> stem(sghdis$COSTS.T1)

The decimal point is 2 digit(s) to the right of the |

2 | 8
4 | 22456
6 | 1334823788
8 | 02236890123334588
10 | 36672
12 | 9
14 | 0
16 | 6

> stem(sghdis$COSTS.T2)

The decimal point is 2 digit(s) to the right of the |

2 | 044
4 | 556
6 | 337011123579
8 | 2455993344448
10 | 055691348
12 | 1

>
> stem(learndis$COSTS.T1)

The decimal point is 2 digit(s) to the right of the |

2 | 88
3 | 4789
4 | 11246689
5 | 01223344555666889
6 | 011333344678
7 | 12334788
8 | 0000222334456667889
9 | 001112333344444588
10 | 23667
11 | 2

```

```

12 | 19
13 | 12
14 | 0
15 | 4
16 | 6

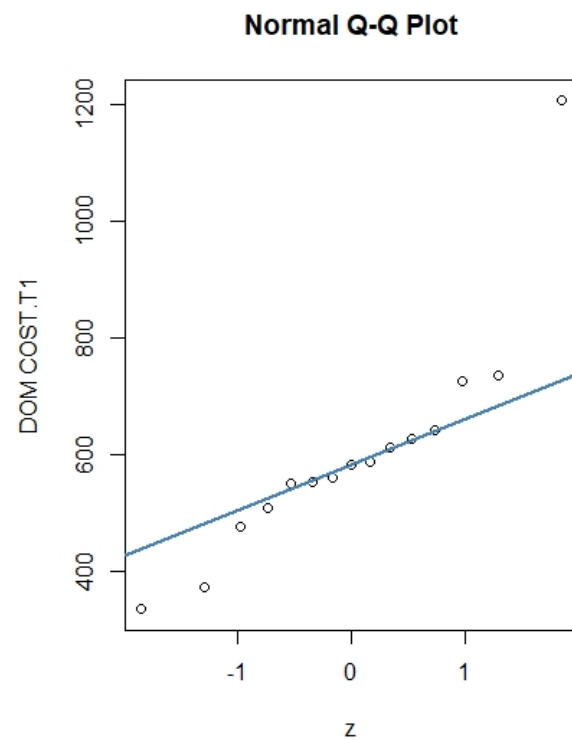
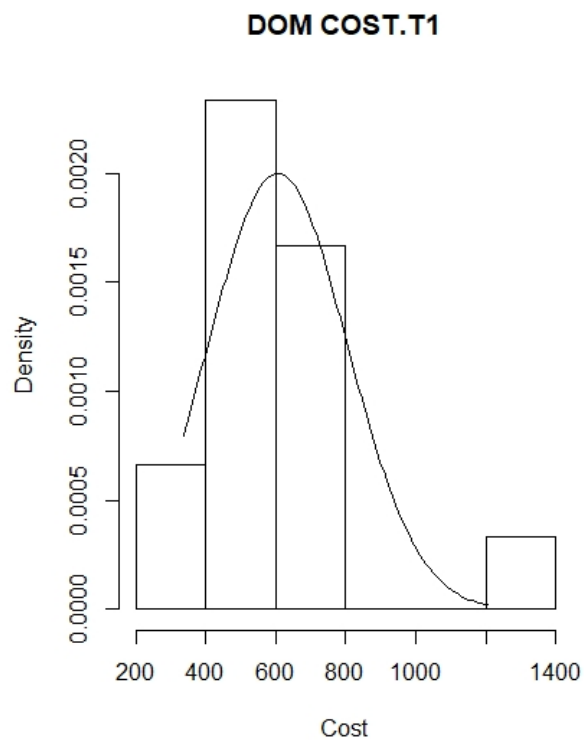
> stem(learndis$COSTS.T2)

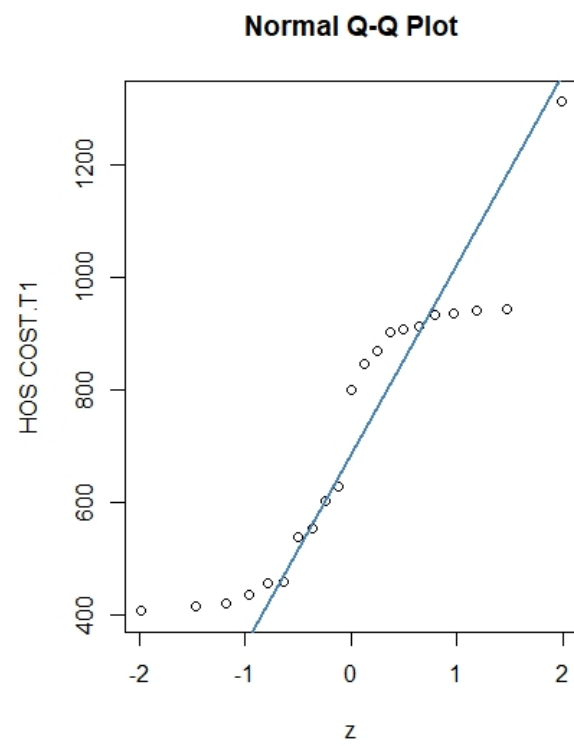
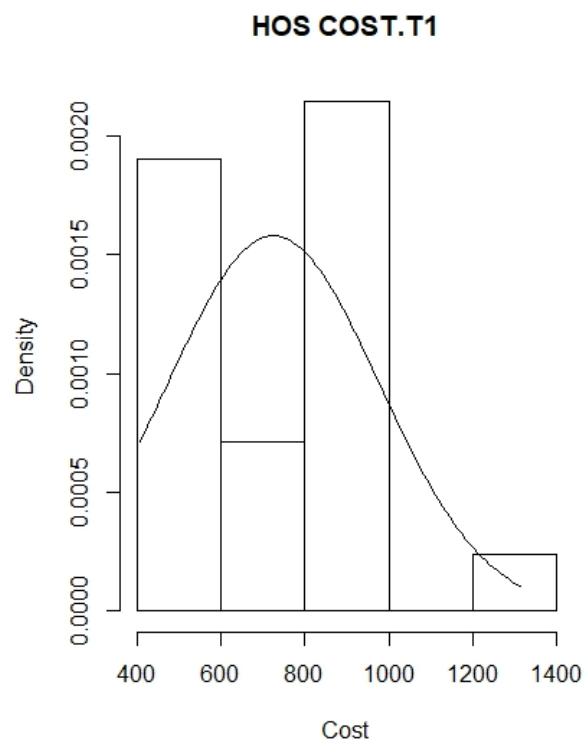
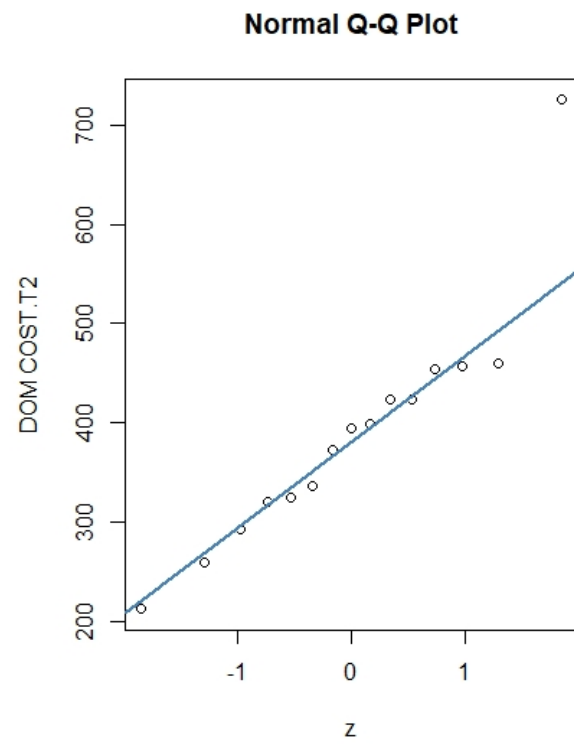
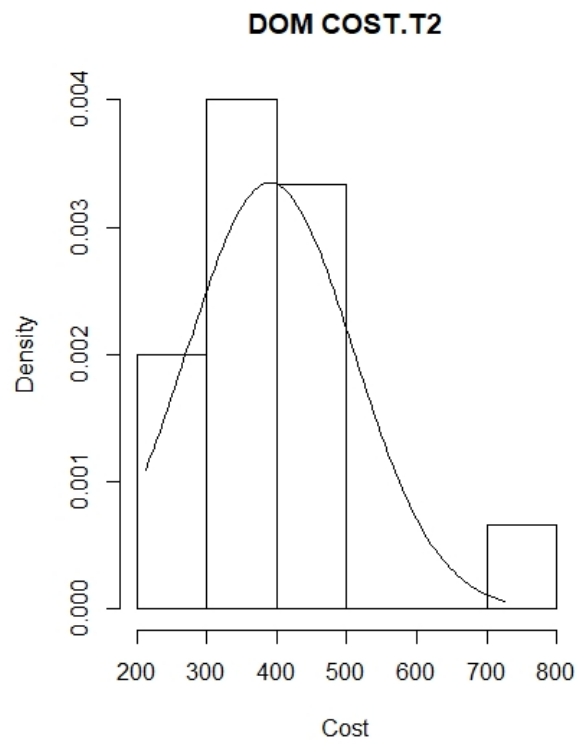
The decimal point is 2 digit(s) to the right of the |

 2 | 12668899
 3 | 02244446799
 4 | 022334555556666789
 5 | 1667788
 6 | 03333667
 7 | 00111111233455579
 8 | 1244555699
 9 | 2333444468
10 | 05569
11 | 013488
12 |
13 | 1

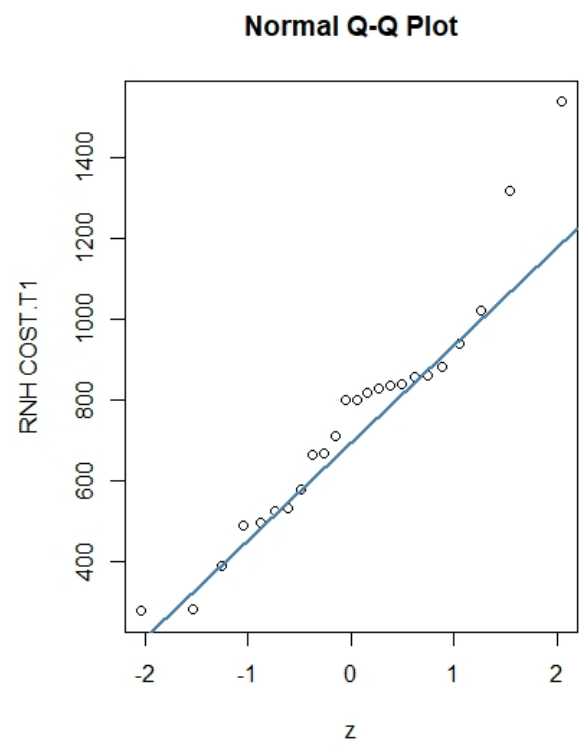
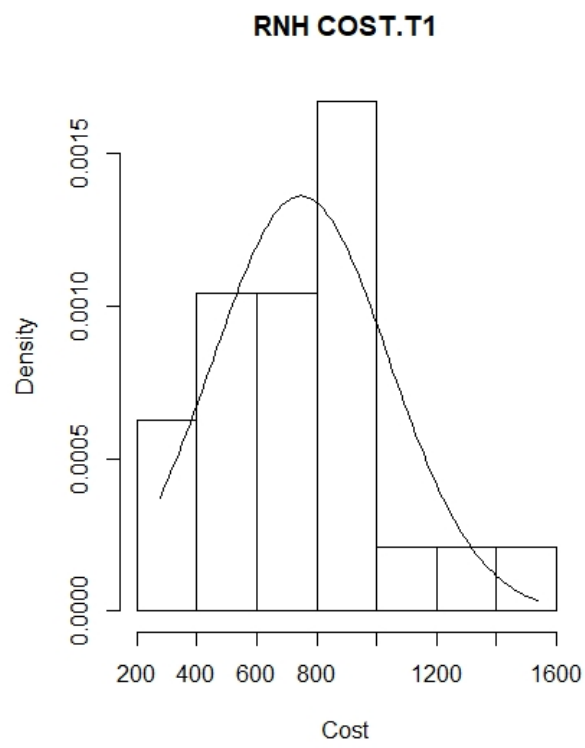
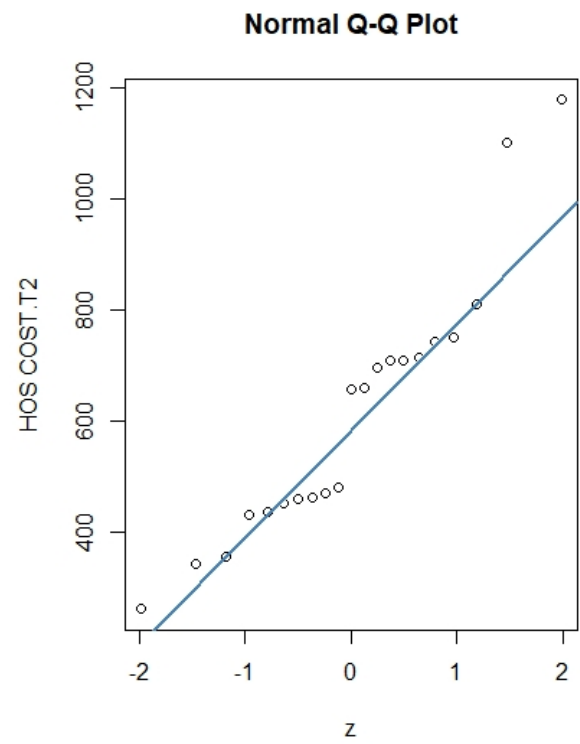
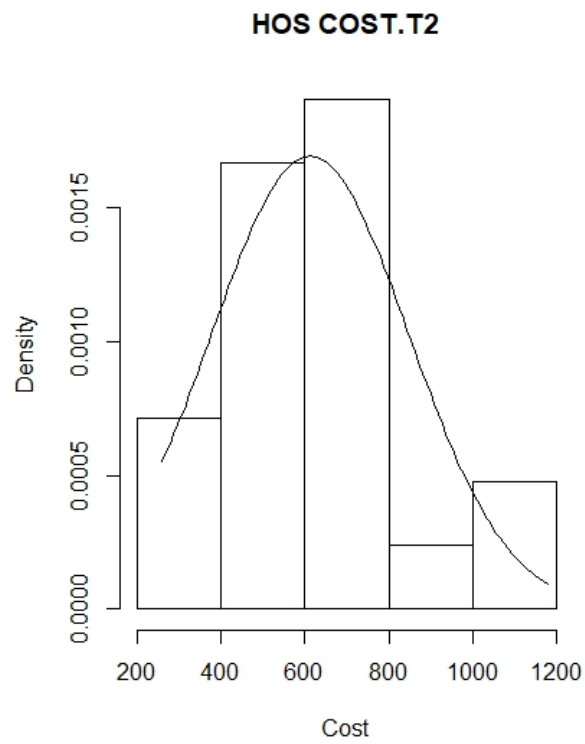
```

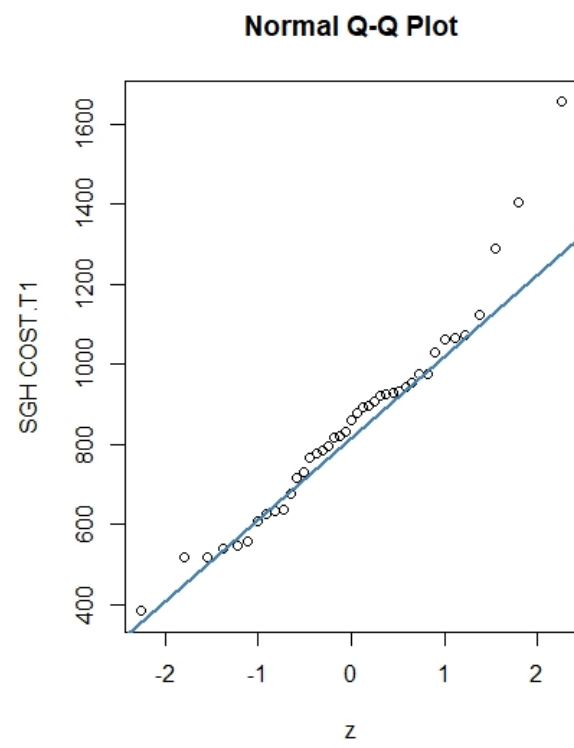
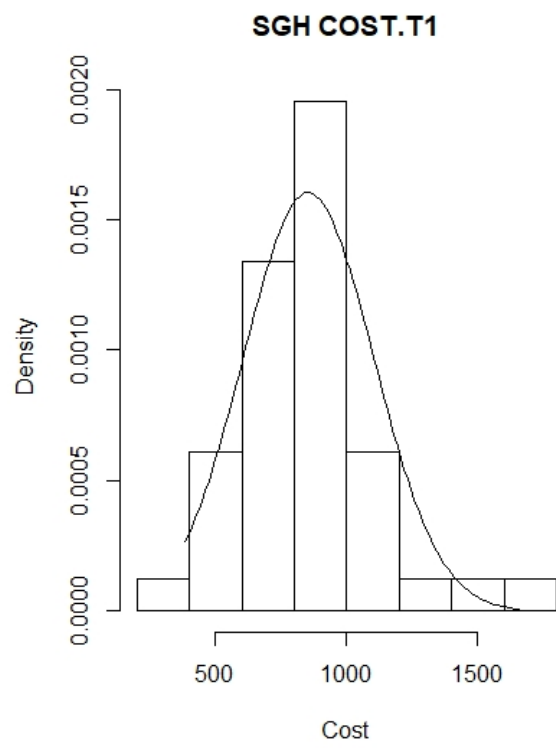
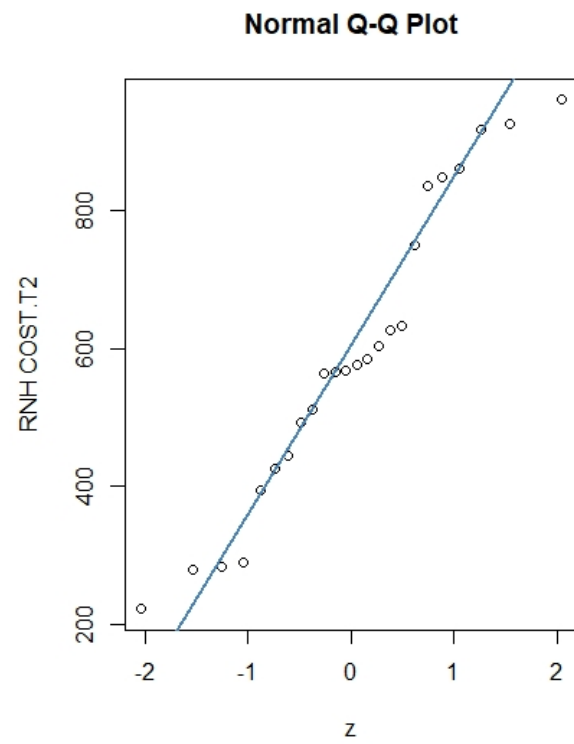
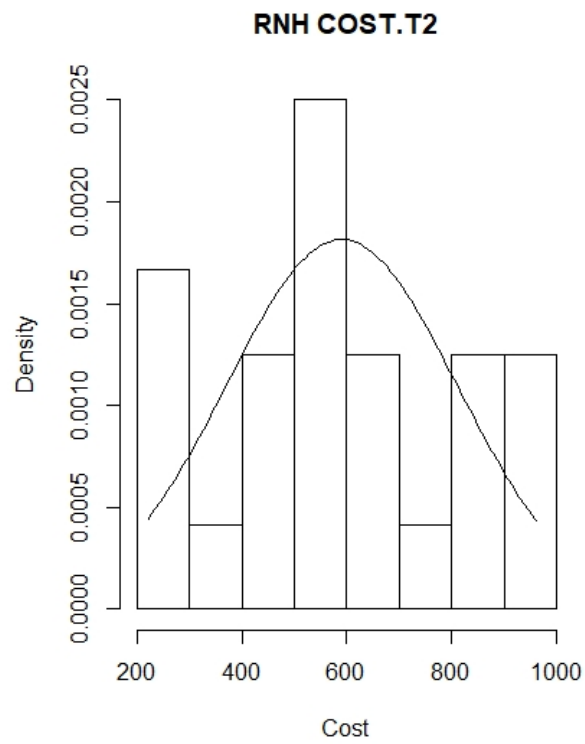
### 3.2 Normal Fit

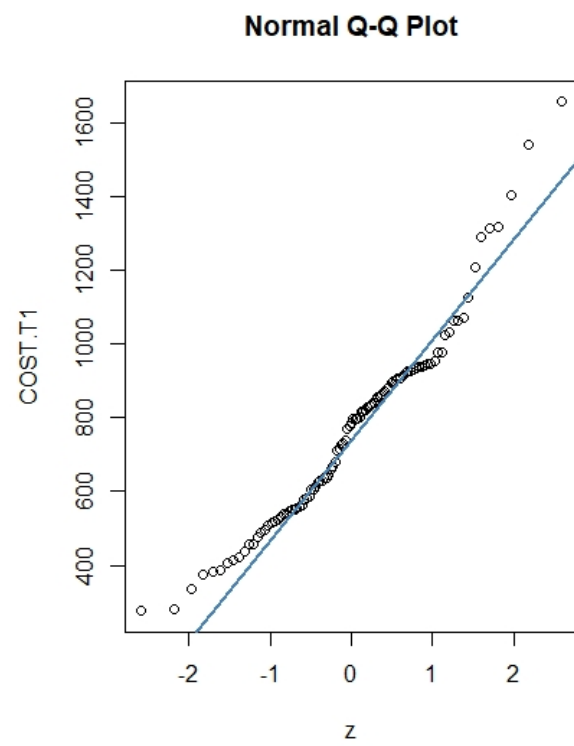
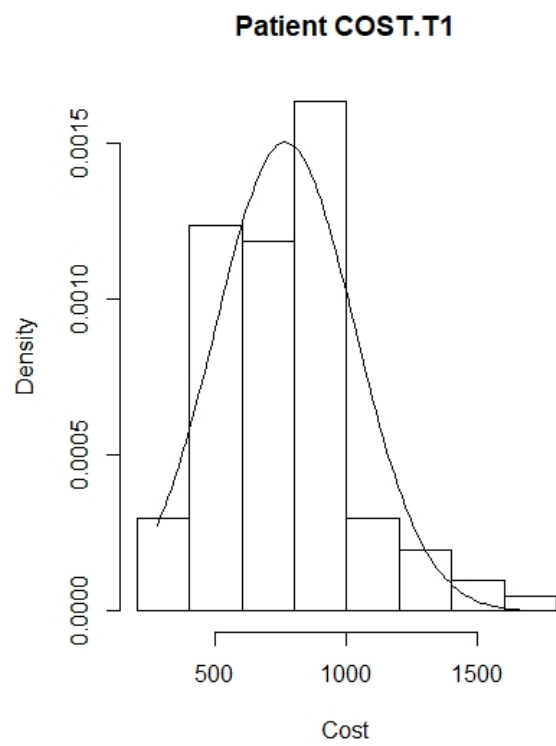
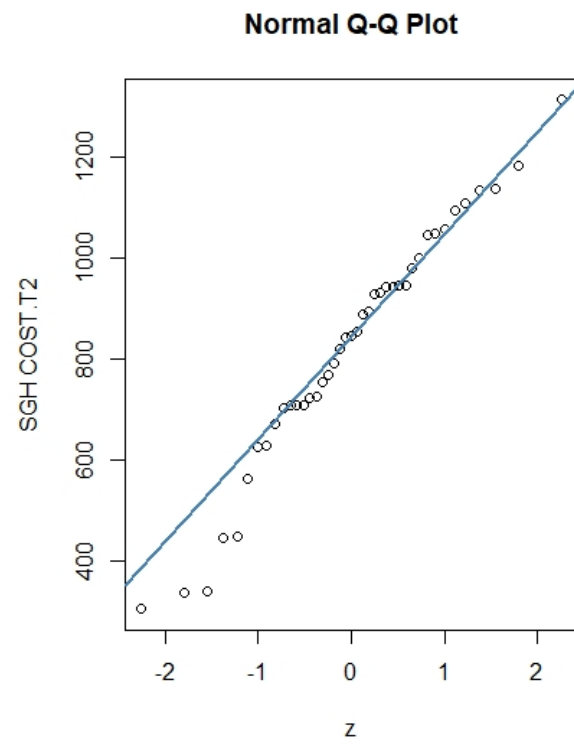
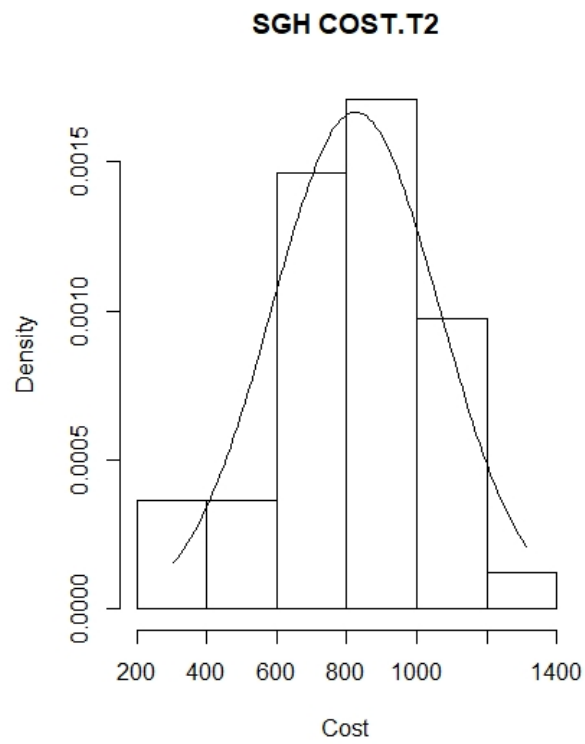


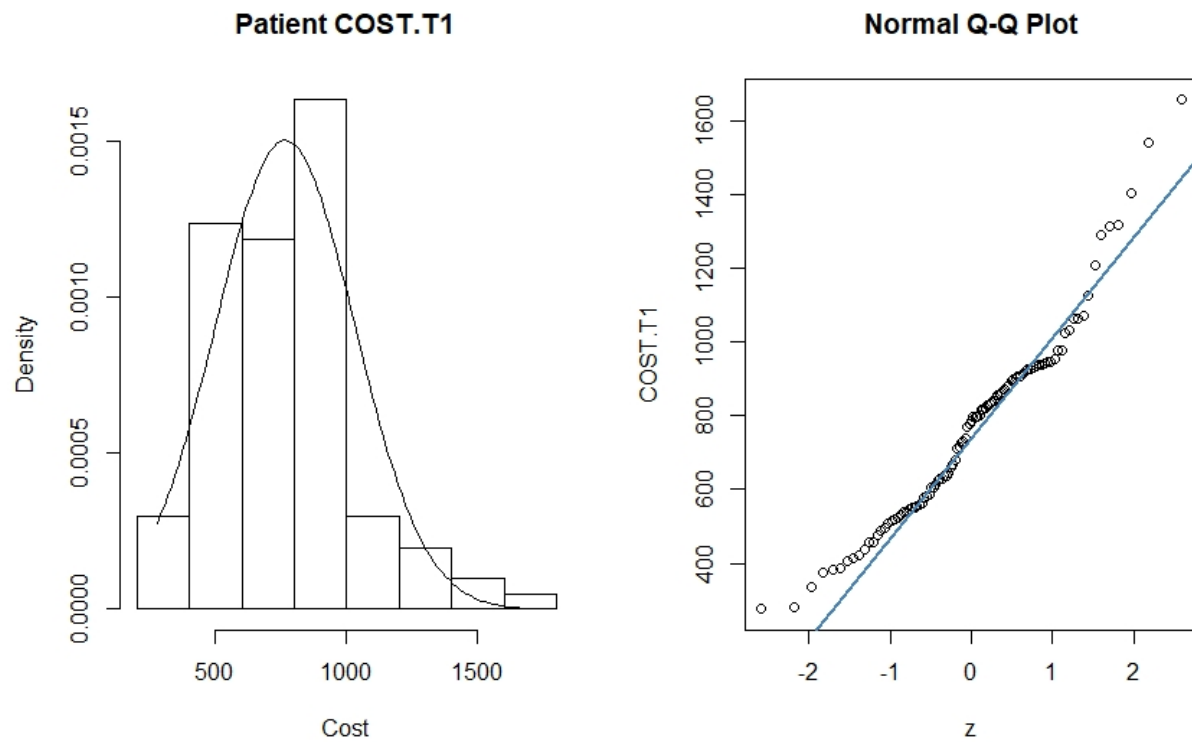












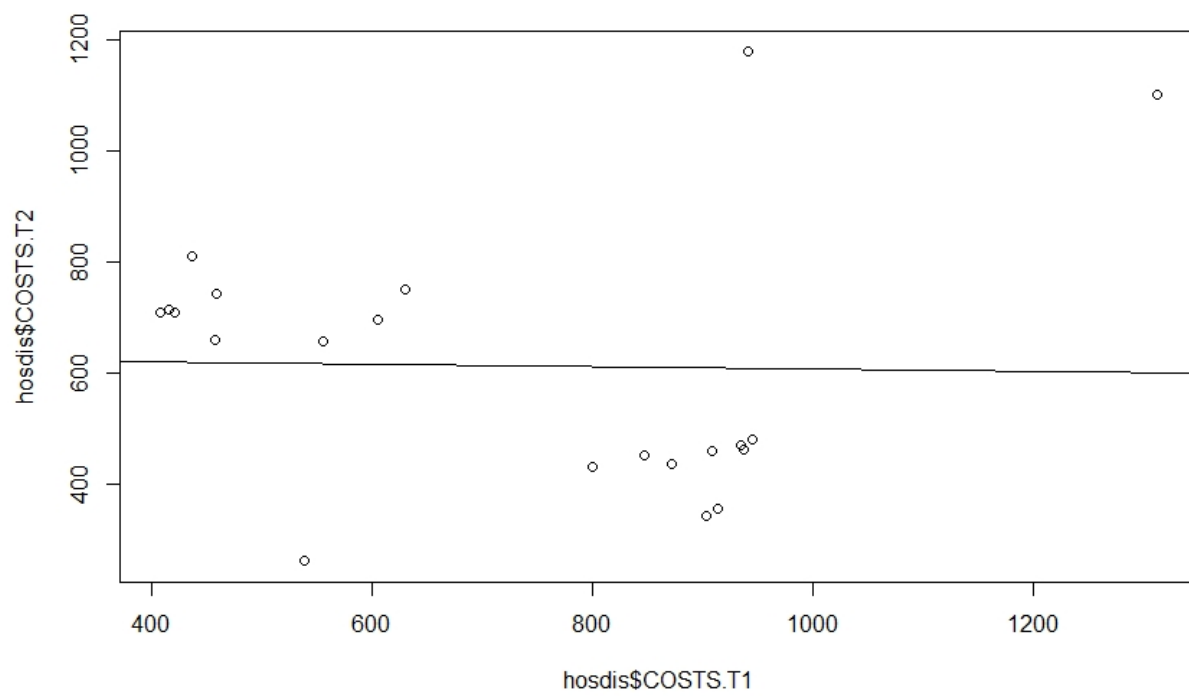
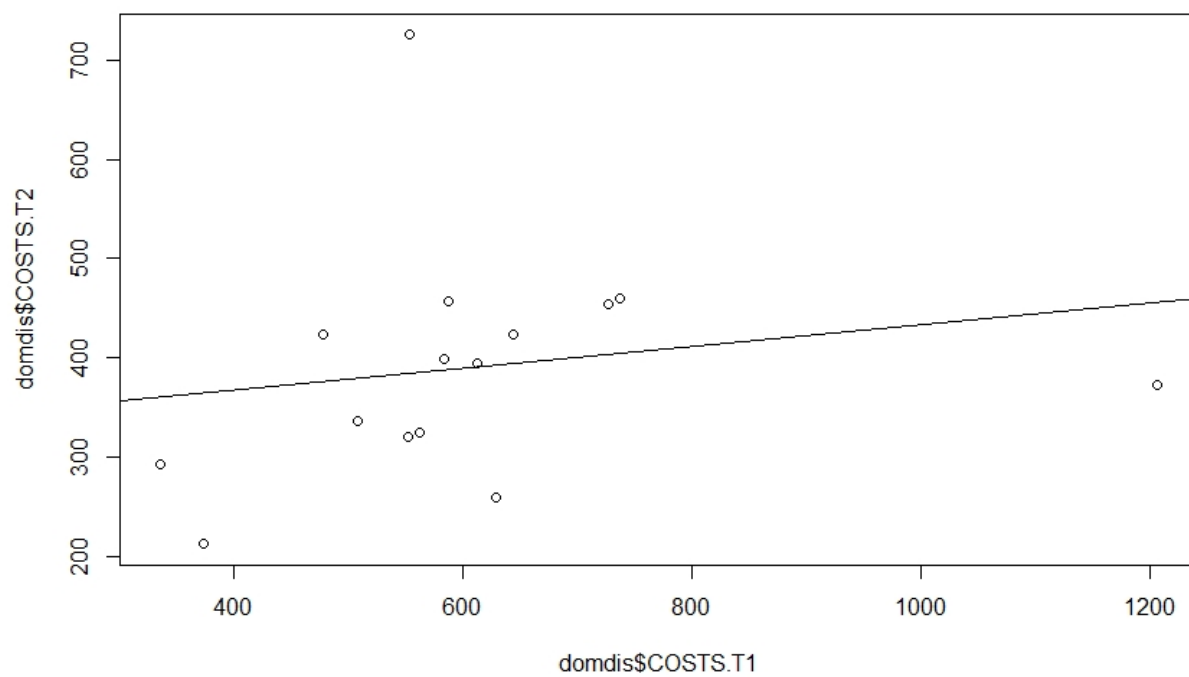
## 4 Associations

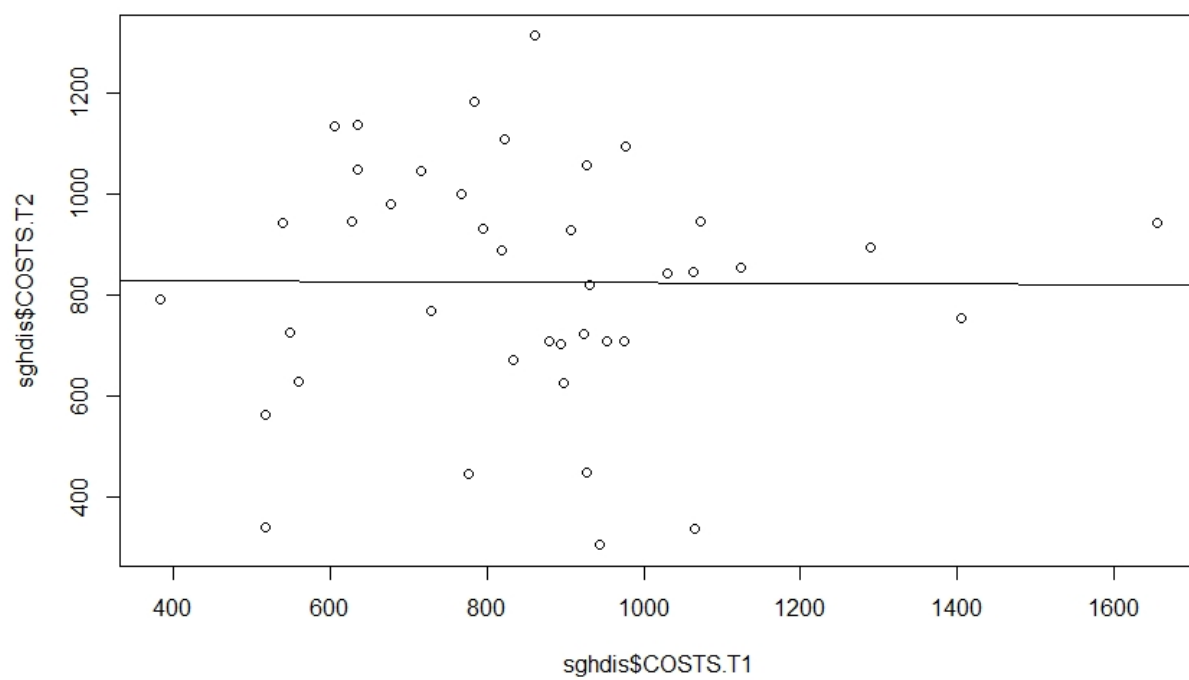
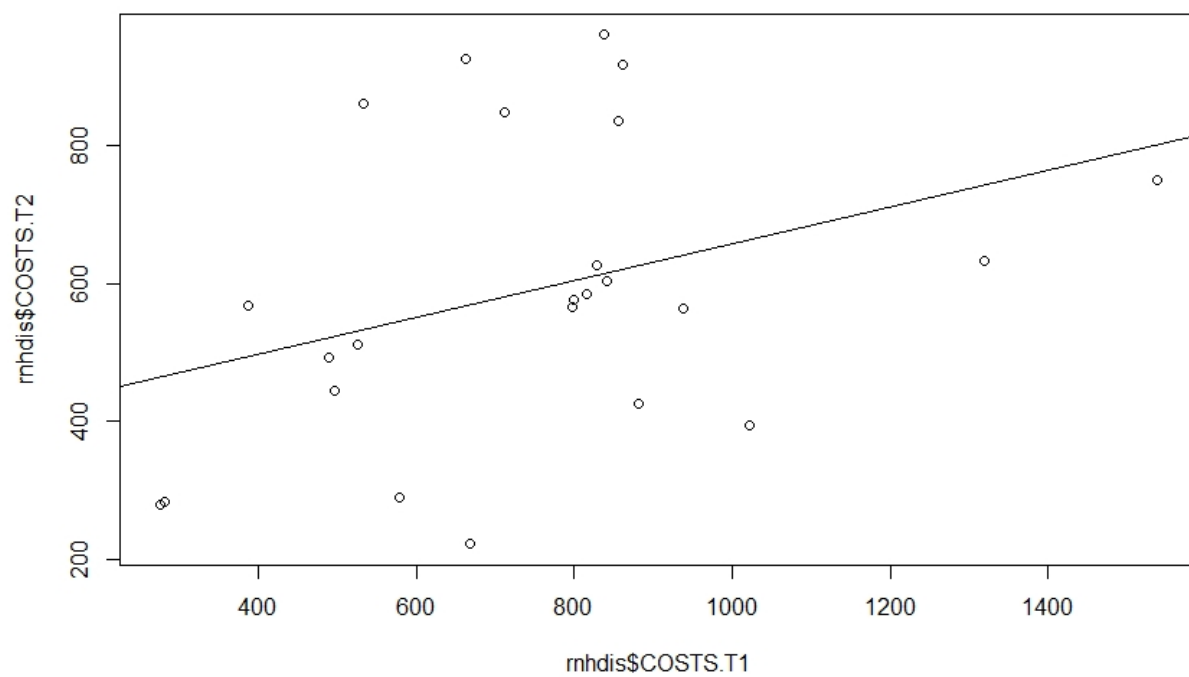
### 4.1 Linear Models

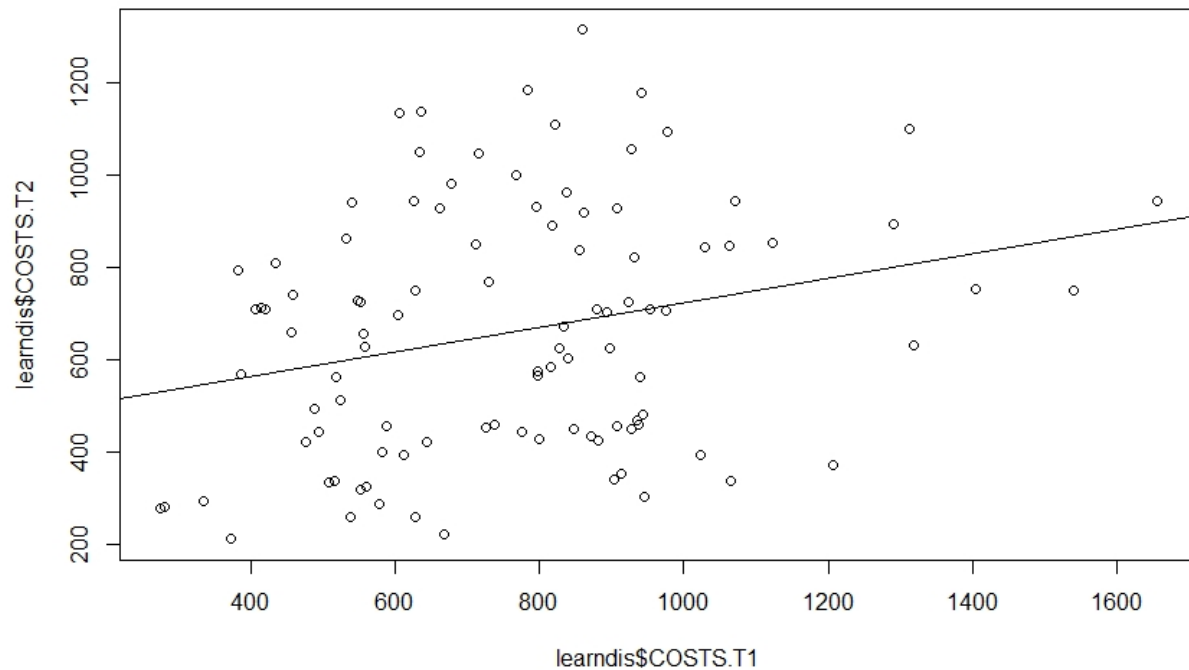
```

lmdom <- lm(domdis$COSTS.T2~domdis$COSTS.T1)
lmhos <- lm(hosdis$COSTS.T2~hosdis$COSTS.T1)
lmrnh <- lm(rnhdis$COSTS.T2~rnhdis$COSTS.T1)
lmsgh <- lm(sghdis$COSTS.T2~sghdis$COSTS.T1)
lmdis <- lm(learndis$COSTS.T2~learndis$COSTS.T1)

```







```
> summary(lmdom)
```

Call:

```
lm(formula = domdis$COSTS.T2 ~ domdis$COSTS.T1)
```

Residuals:

Min	1Q	Median	3Q	Max
-152.85	-66.10	3.70	48.94	340.69

Coefficients:

	Estimate	Std. Error	t value	Pr(> t )
(Intercept)	324.4758	103.4638	3.136	0.00788 **
domdis\$COSTS.T1	0.1088	0.1628	0.668	0.51555

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 121.5 on 13 degrees of freedom

Multiple R-squared: 0.03323, Adjusted R-squared: -0.04114

F-statistic: 0.4468 on 1 and 13 DF, p-value: 0.5155

```
> summary(lmhos)
```

Call:

```
lm(formula = hosdis$COSTS.T2 ~ hosdis$COSTS.T1)
```

Residuals:

```

      Min      1Q  Median      3Q      Max
-356.32 -157.87   39.95   93.46  569.67

Coefficients:
              Estimate Std. Error t value Pr(>|t|)
(Intercept)    627.32289   163.82292    3.829  0.00113 **
hosdis$COSTS.T1 -0.02037    0.21388   -0.095  0.92511
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 241.6 on 19 degrees of freedom
Multiple R-squared:  0.0004773, Adjusted R-squared:  -0.05213
F-statistic: 0.009073 on 1 and 19 DF,  p-value: 0.9251

> summary(lmrnh)

Call:
lm(formula = rnhdis$COSTS.T2 ~ rnhdis$COSTS.T1)

Residuals:
      Min       1Q   Median       3Q      Max
-347.50 -128.13  -27.94   109.76   359.92

Coefficients:
              Estimate Std. Error t value Pr(>|t|)
(Intercept)    390.4512   119.4008    3.270  0.0035 **
rnhdis$COSTS.T1  0.2674    0.1491    1.793  0.0867 .
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 209.9 on 22 degrees of freedom
Multiple R-squared:  0.1275, Adjusted R-squared:  0.08787
F-statistic: 3.216 on 1 and 22 DF,  p-value: 0.0867

> summary(lmsggh)

Call:
lm(formula = sgghdis$COSTS.T2 ~ sgghdis$COSTS.T1)

Residuals:
      Min       1Q   Median       3Q      Max
-520.28 -117.25   22.53  153.95  488.12

Coefficients:
              Estimate Std. Error t value Pr(>|t|)
(Intercept)    831.501942  136.834644    6.077 4.05e-07 ***
sgghdis$COSTS.T1 -0.007232   0.154079   -0.047  0.963
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 242.5 on 39 degrees of freedom

```



Multiple R-squared: 5.649e-05, Adjusted R-squared: -0.02558  
 F-statistic: 0.002203 on 1 and 39 DF, p-value: 0.9628

```
> summary(lmdis)
```

Call:

```
lm(formula = learndis$COSTS.T2 ~ learndis$COSTS.T1)
```

Residuals:

Min	1Q	Median	3Q	Max
-413.51	-230.12	-7.11	202.78	627.52

Coefficients:

	Estimate	Std. Error	t value	Pr(> t )
(Intercept)	458.47856	78.73975	5.823	7.19e-08 ***
learndis\$COSTS.T1	0.26435	0.09733	2.716	0.0078 **

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 258.1 on 99 degrees of freedom

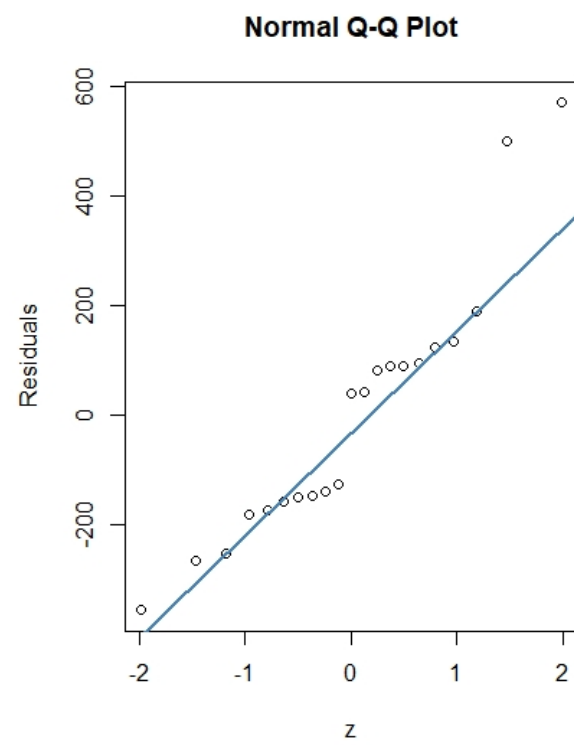
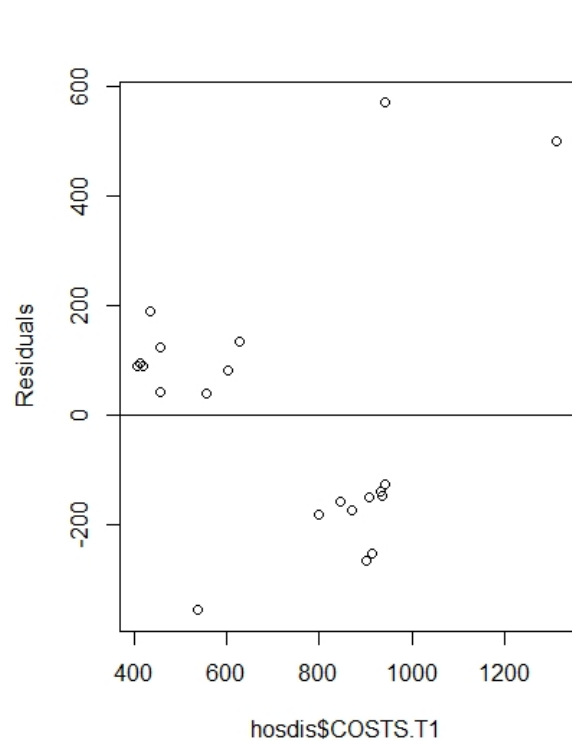
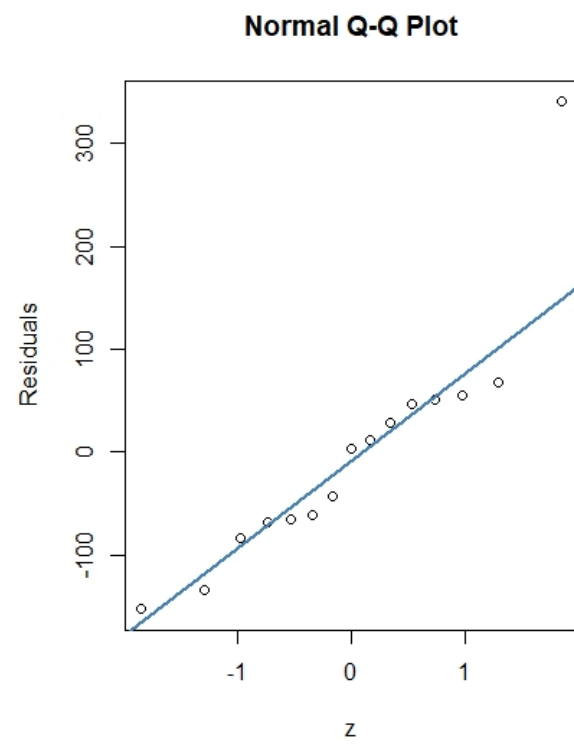
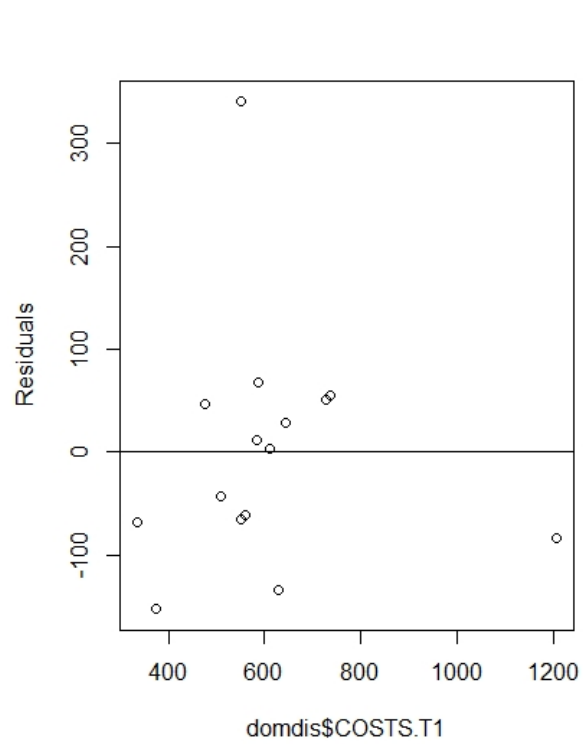
Multiple R-squared: 0.06935, Adjusted R-squared: 0.05995

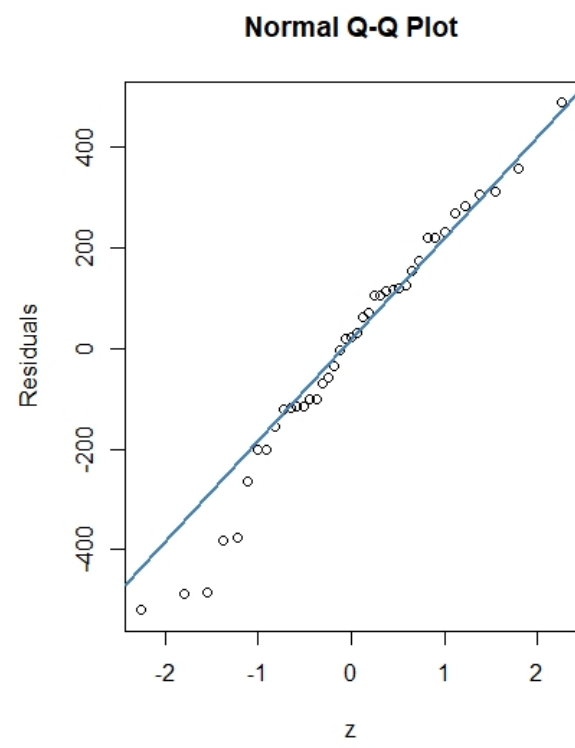
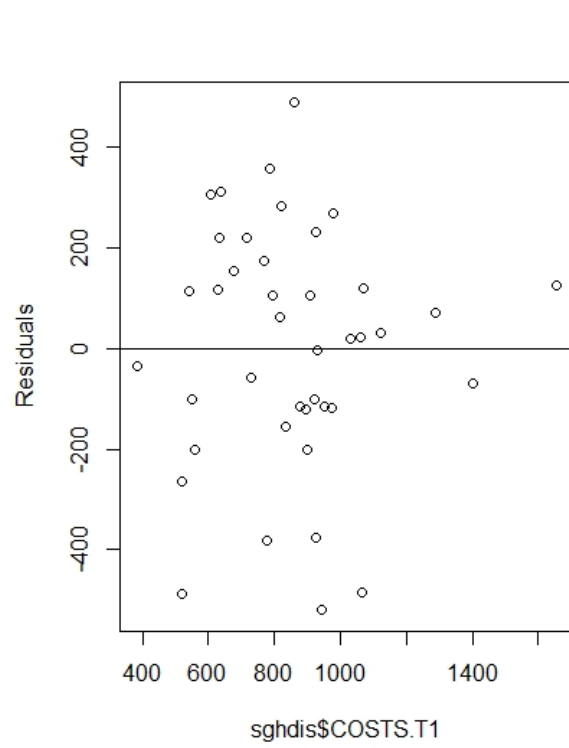
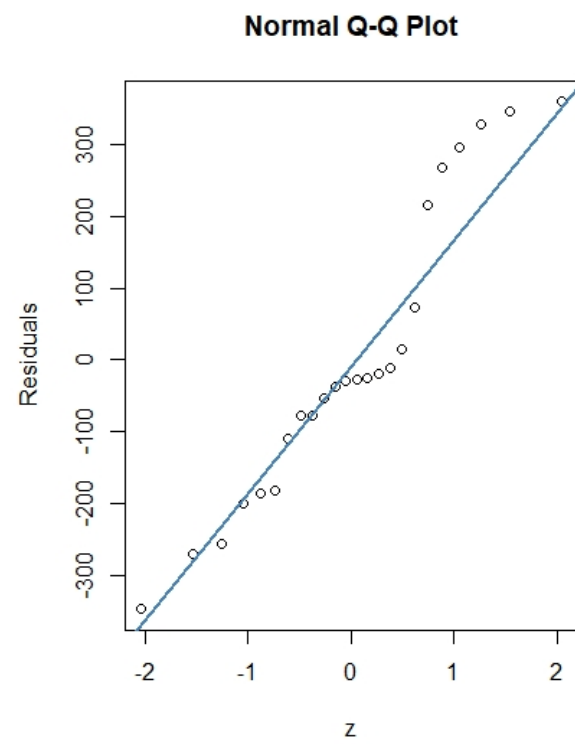
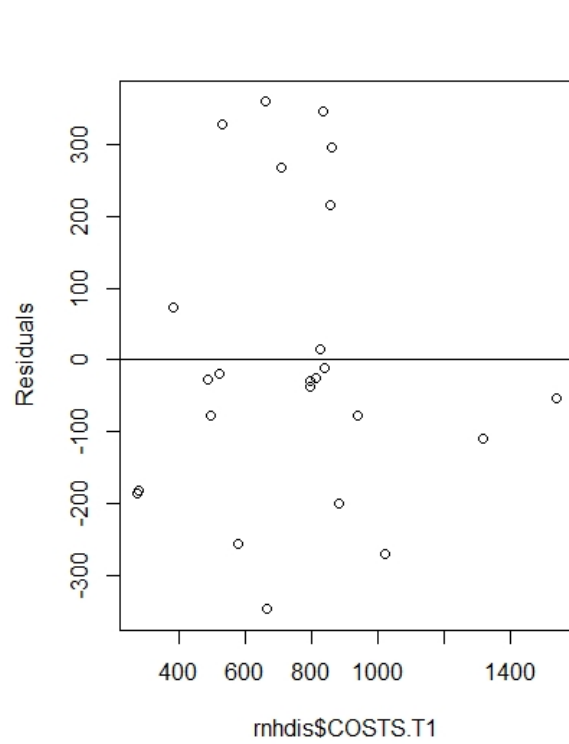
F-statistic: 7.377 on 1 and 99 DF, p-value: 0.007797

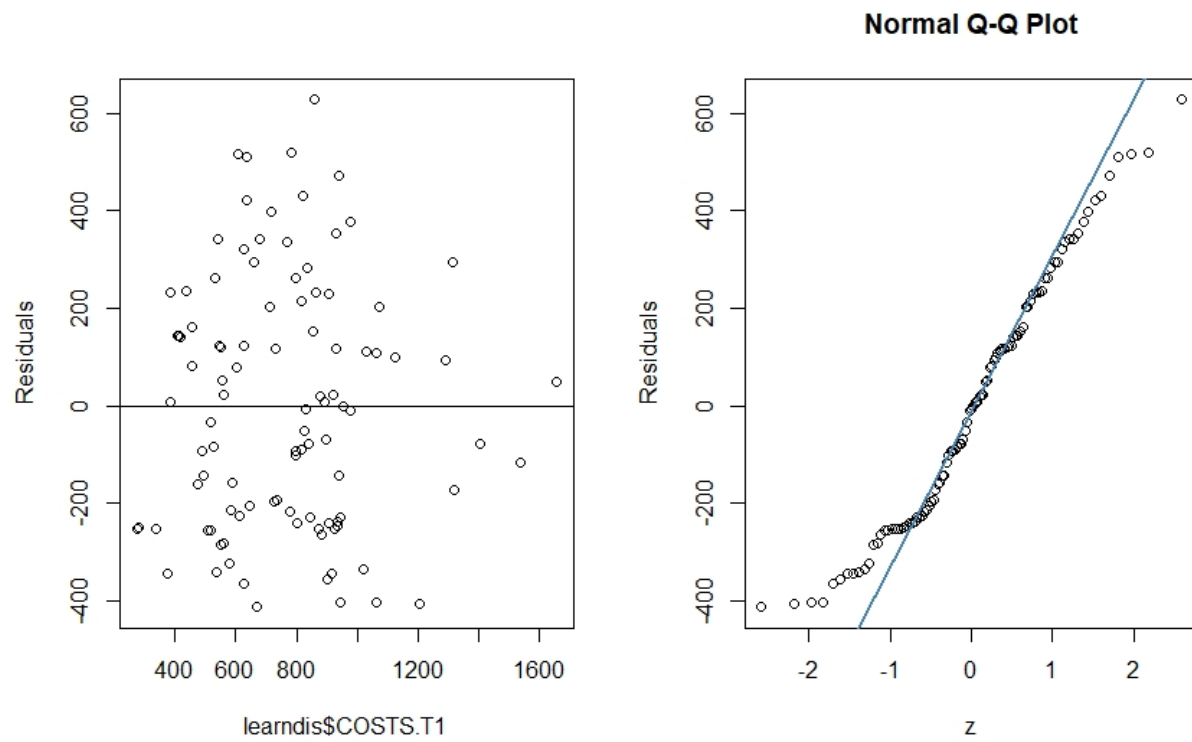
## 5 Stability of Associations

### 5.1 Residuals

```
residdom <- resid(lmdom)
residhos <- resid(lmhos)
residrnh <- resid(lmrnh)
residsgh <- resid(lmsggh)
residdis <- resid(lmdis)
```







## 6 Interpretations