Untitled

Andrew Liu

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3a

```r
A<- as.factor(rep(c("A0","A1"),8))
B <- as.factor(rep(c("B0","B0","B1","B1"),4))
C <- as.factor(rep(c("C0","C0","C0","C0","C1","C1","C1","C1"),2))
D<-as.factor(c(rep("D0",8),rep("D1",8)))
E<-as.factor(c("E1","E0","E0","E1",
        "E0","E1","E1","E0",
        "E0","E1","E1","E0",
        "E1","E0","E0","E1"))

y <- c(8,9,34,52,
          16,22,45,60,
          6,10,30,50,
          15,21,44,63)

A <- relevel(A,ref="A1")
B <- relevel(B,ref="B1")
C <- relevel(C,ref="C1")
D <- relevel(D,ref="D1")
E <- relevel(E,ref="E1")

df.5=data.frame(A=A,B=B,C=C,D=D,E=E,y=y)
```

```r
out <- lm(y~A+B+C+D+E+A:B+A:C+A:D+A:E+B:C+B:D+B:E+C:D+C:E+D:E,data=df.5,
         contrasts=list(A="contr.sum",B="contr.sum",C="contr.sum",D="contr.sum", E="contr.sum"))
aov(out)
```

```
## Call:
##    aov(formula = out)
##
## Terms:
##                      A        B        C        D        E      A:B
## Sum of Squares  495.062 4590.062  473.062    3.062    1.563  189.063
## Deg. of Freedom       1        1        1        1        1        1
##                    A:C      A:D      A:E      B:C      B:D      B:E
## Sum of Squares   0.562    5.062    5.062    1.563    0.062    0.062
## Deg. of Freedom      1        1        1        1        1        1
##                    C:D      C:E      D:E
## Sum of Squares   3.062    0.562    7.563
## Deg. of Freedom      1        1        1
##
## Estimated effects may be unbalanced
```

```r
C.matrix <- model.matrix(out)
```

```r
(2*solve(t(C.matrix)%*%C.matrix)%*%t(C.matrix)%*%cbind(y))[-1,]
```

```
##      A1      B1      C1      D1      E1  A1:B1  A1:C1  A1:D1  A1:E1  B1:C1
## 11.125 33.875 10.875 -0.875  0.625  6.875  0.375  1.125  1.125  0.625
##   B1:D1  B1:E1  C1:D1  C1:E1  D1:E1
## -0.125 -0.125  0.875  0.375 -1.375
```

```r
est.effects <- 2*coef(out)[-1]
est.effects
```

```
##      A1      B1      C1      D1      E1  A1:B1  A1:C1  A1:D1  A1:E1  B1:C1
## 11.125 33.875 10.875 -0.875  0.625  6.875  0.375  1.125  1.125  0.625
##   B1:D1  B1:E1  C1:D1  C1:E1  D1:E1
## -0.125 -0.125  0.875  0.375 -1.375
```

```r
eff.name <- c("A","B","C","D","E","AB","AC","AD","AE","BC","BD","BE","CD","CE","DE")
qx <- qqnorm(as.numeric(est.effects),datax=T,pch=19)
qqline(as.numeric(est.effects),datax=T)
text(qx$x,qx$y,eff.name,pos=3,col=2)
```


Normal Q–Q Plot