ISLR Lab 4.6.1-4.6.2

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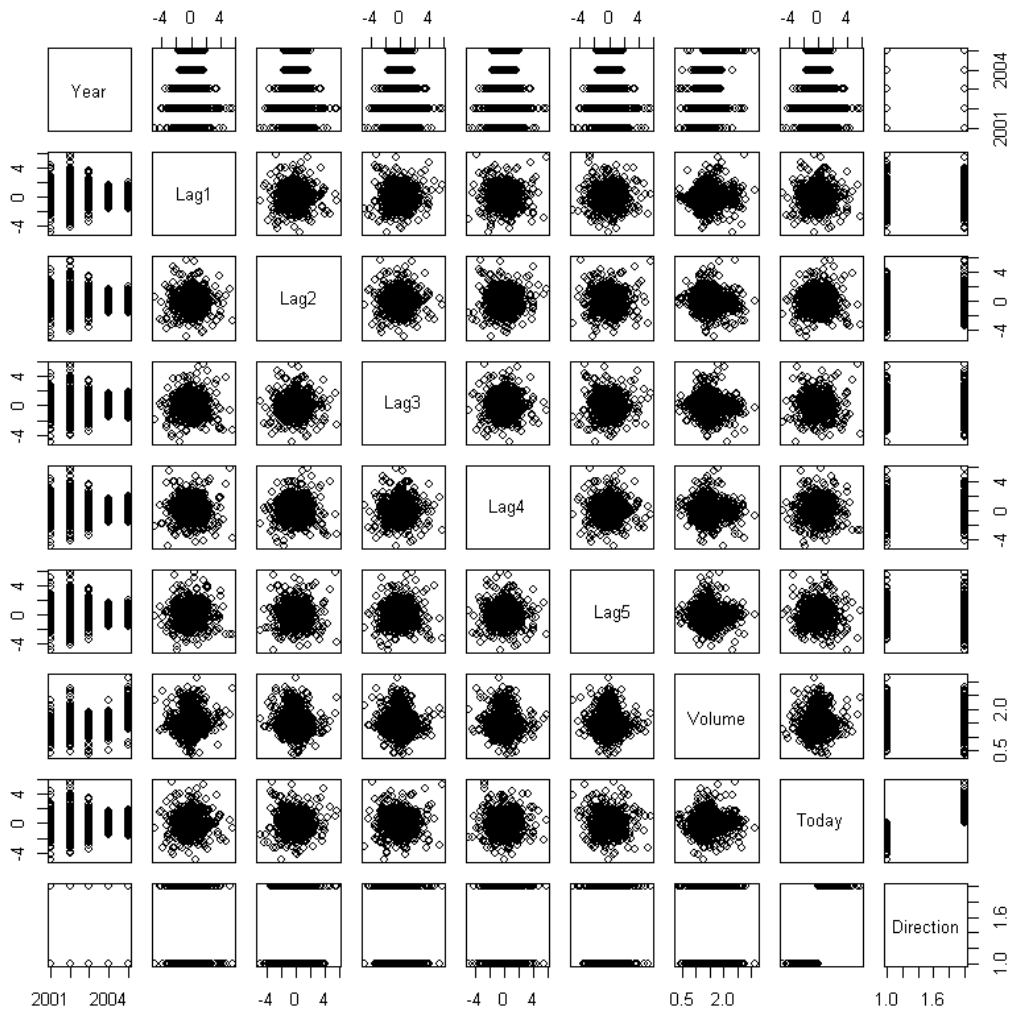
Section 4.6.1

[2]:
```
library(ISLR)
```

[3]:
```
print(names(Smarket))
print(dim(Smarket))
summary(Smarket)
```

```
[1] "Year"      "Lag1"      "Lag2"      "Lag3"      "Lag4"      "Lag5"
[7] "Volume"    "Today"     "Direction"
[1] 1250    9
      Year           Lag1                Lag2                Lag3
 Min.   :2001   Min.   :-4.922000   Min.   :-4.922000   Min.   :-4.922000
 1st Qu.:2002   1st Qu.:-0.639500   1st Qu.:-0.639500   1st Qu.:-0.640000
 Median :2003   Median : 0.039000   Median : 0.039000   Median : 0.038500
 Mean   :2003   Mean   : 0.003834   Mean   : 0.003919   Mean   : 0.001716
 3rd Qu.:2004   3rd Qu.: 0.596750   3rd Qu.: 0.596750   3rd Qu.: 0.596750
 Max.   :2005   Max.   : 5.733000   Max.   : 5.733000   Max.   : 5.733000
      Lag4                Lag5              Volume           Today
 Min.   :-4.922000   Min.   :-4.92200   Min.   :0.3561   Min.   :-4.922000
 1st Qu.:-0.640000   1st Qu.:-0.64000   1st Qu.:1.2574   1st Qu.:-0.639500
 Median : 0.038500   Median : 0.03850   Median :1.4229   Median : 0.038500
 Mean   : 0.001636   Mean   : 0.00561   Mean   :1.4783   Mean   : 0.003138
 3rd Qu.: 0.596750   3rd Qu.: 0.59700   3rd Qu.:1.6417   3rd Qu.: 0.596750
 Max.   : 5.733000   Max.   : 5.73300   Max.   :3.1525   Max.   : 5.733000
 Direction
 Down:602
 Up  :648
```

[4]:
```
pairs(Smarket)
```

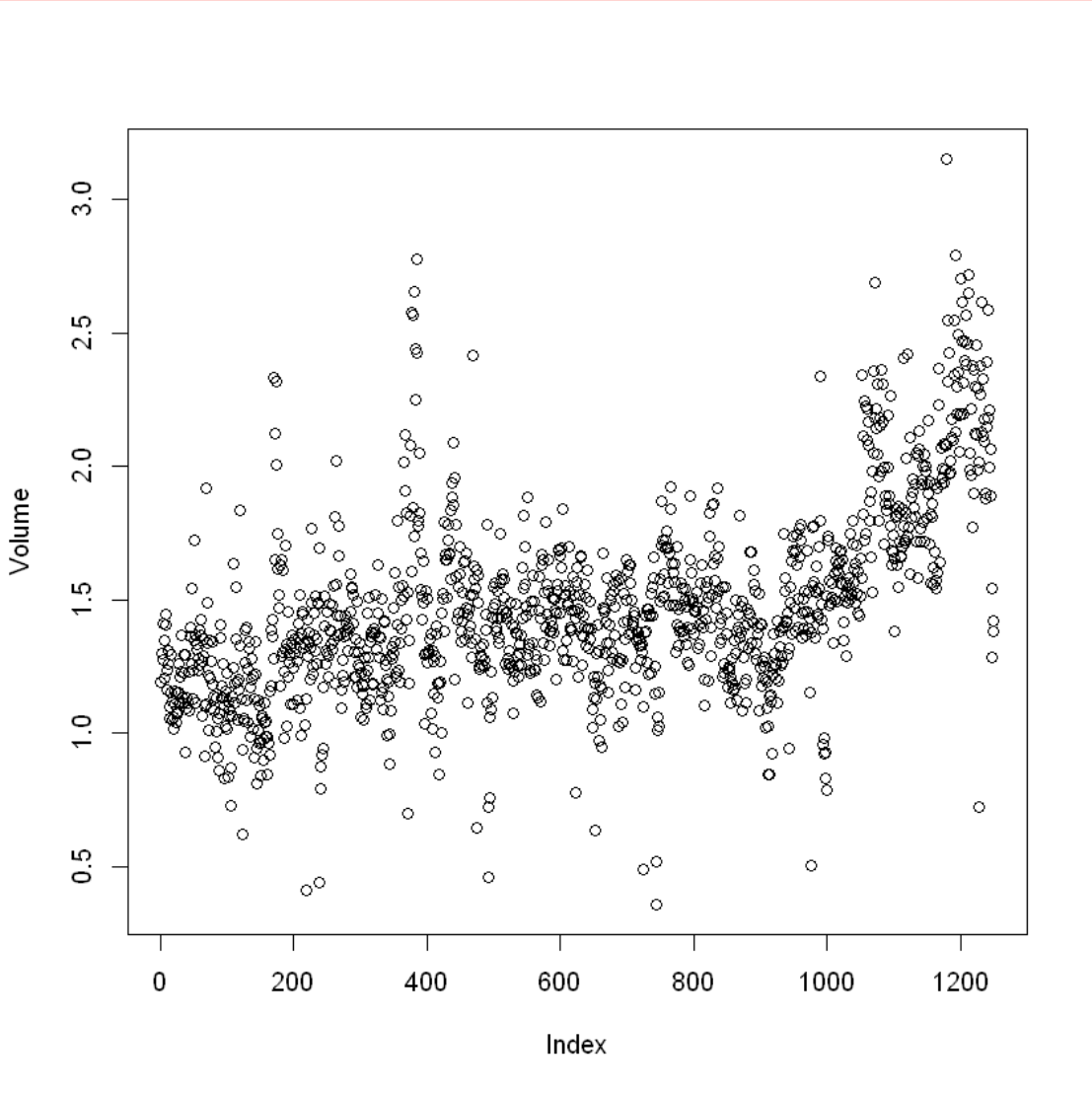


[19]:
```
print(cor(Smarket[,-9]))
```

```
              Year         Lag1         Lag2         Lag3         Lag4
Year    1.00000000  0.029699649  0.030596422  0.033194581  0.035688718
Lag1    0.02969965  1.000000000 -0.026294328 -0.010803402 -0.002985911
Lag2    0.03059642 -0.026294328  1.000000000 -0.025896670 -0.010853533
Lag3    0.03319458 -0.010803402 -0.025896670  1.000000000 -0.024051036
Lag4    0.03568872 -0.002985911 -0.010853533 -0.024051036  1.000000000
Lag5    0.02978799 -0.005674606 -0.003557949 -0.018808338 -0.027083641
Volume  0.53900647  0.040909908 -0.043383215 -0.041823686 -0.048414246
Today   0.03009523 -0.026155045 -0.010250033 -0.002447647 -0.006899527
               Lag5       Volume         Today
Year    0.029787995  0.53900647  0.030095229
Lag1   -0.005674606  0.04090991 -0.026155045
```

```
Lag2   -0.003557949 -0.04338321 -0.010250033
Lag3   -0.018808338 -0.04182369 -0.002447647
Lag4   -0.027083641 -0.04841425 -0.006899527
Lag5    1.000000000 -0.02200231 -0.034860083
Volume -0.022002315  1.00000000  0.014591823
Today  -0.034860083  0.01459182  1.000000000
```

[6]:
```
attach(Smarket)
plot(Volume)
```



Section 4.6.2

[9]:
```
glm.fits=glm(Direction~Lag1+Lag2+Lag3+Lag4+Lag5+ Volume, data=Smarket
,family=binomial )
summary(glm.fits)
```

```
Call:
glm(formula = Direction ~ Lag1 + Lag2 + Lag3 + Lag4 + Lag5 +
    Volume, family = binomial, data = Smarket)

Coefficients:
             Estimate Std. Error z value Pr(>|z|)
(Intercept) -0.126000   0.240736  -0.523    0.601
Lag1        -0.073074   0.050167  -1.457    0.145
Lag2        -0.042301   0.050086  -0.845    0.398
Lag3         0.011085   0.049939   0.222    0.824
Lag4         0.009359   0.049974   0.187    0.851
Lag5         0.010313   0.049511   0.208    0.835
Volume       0.135441   0.158360   0.855    0.392

(Dispersion parameter for binomial family taken to be 1)

    Null deviance: 1731.2  on 1249  degrees of freedom
Residual deviance: 1727.6  on 1243  degrees of freedom
AIC: 1741.6

Number of Fisher Scoring iterations: 3
```

[11]:
```
print(coef(glm.fits))
```

```
 (Intercept)         Lag1         Lag2         Lag3         Lag4         Lag5
-0.126000257 -0.073073746 -0.042301344  0.011085108  0.009358938  0.010313068
      Volume
 0.135440659
```

[12]:
```
summary(glm.fits)$coef
```

	Estimate	Std. Error	z value	Pr(>|z|)
(Intercept)	-0.126000257	0.24073574	-0.5233966	0.6006983
Lag1	-0.073073746	0.05016739	-1.4565986	0.1452272
Lag2	-0.042301344	0.05008605	-0.8445733	0.3983491
Lag3	0.011085108	0.04993854	0.2219750	0.8243333
Lag4	0.009358938	0.04997413	0.1872757	0.8514445
Lag5	0.010313068	0.04951146	0.2082966	0.8349974
Volume	0.135440659	0.15835970	0.8552723	0.3924004

[14]:
```
print(summary(glm.fits)$coef[,4])
```

```
(Intercept)        Lag1        Lag2        Lag3        Lag4        Lag5
  0.6006983   0.1452272   0.3983491   0.8243333   0.8514445   0.8349974
     Volume
  0.3924004
```

[18]:
```
glm.probs=predict(glm.fits,type="response")
print(glm.probs[1:10])
```

```
        1         2         3         4         5         6         7         8
0.5070841 0.4814679 0.4811388 0.5152224 0.5107812 0.5069565 0.4926509 0.5092292
        9        10
0.5176135 0.4888378
```

[20]:
```
contrasts(Direction)
```

	Up
Down	0
Up	1

[25]:
```
glm.pred = rep("Down" ,1250)
glm.pred[glm.probs >.5]="Up"
```

[26]:
```
table(glm.pred ,Direction )
```

```
        Direction
glm.pred Down  Up
    Down  145 141
    Up    457 507
```

[27]:
```
(507+145) /1250
mean(glm.pred==Direction )
```

```
0.5216
0.5216
```

[30]:
```
train=(Year <2005)
Smarket.2005= Smarket[!train ,]
print(dim(Smarket.2005))
Direction.2005= Direction [!train]
```

```
[1] 252   9
```

[34]:
```
glm.fits=glm(Direction~Lag1+Lag2+Lag3+Lag4+Lag5+ Volume ,data=Smarket
,family=binomial ,subset=train)
glm.probs=predict (glm.fits,Smarket.2005, type="response")
```

[37]:
```
glm.pred=rep("Down",252)
glm.pred[glm.probs >.5]="Up"
table(glm.pred ,Direction.2005)
```

```
        Direction.2005
glm.pred Down Up
    Down   77 97
    Up     34 44
```

[38]:
```
mean(glm.pred==Direction.2005)
mean(glm.pred!=Direction.2005)
```

```
0.48015873015873
0.51984126984127
```

[39]:
```
glm.fits=glm(Direction~Lag1+Lag2 ,data=Smarket ,family=binomial ,subset=train)
glm.probs=predict (glm.fits,Smarket.2005, type="response")
```

[40]:
```
glm.pred=rep("Down",252)
glm.pred[glm.probs >.5]="Up"
table(glm.pred ,Direction.2005)
```

```
        Direction.2005
glm.pred Down  Up
    Down   35  35
    Up     76 106
```

[42]:
```
mean(glm.pred==Direction.2005)
106/(106+76)
```

```
0.55952380952381
0.582417582417582
```

[44]:
```
print(predict(glm.fits,newdata =data.frame(Lag1=c(1.2 ,1.5),Lag2=c(1.1,-0.8)
),type="response"))
```

```
        1         2
0.4791462 0.4960939
```