作业3

Write out the code to estimate the parameters _ and $_{jj}$ using the LS-method, with the following sample covariance matrix.

$$\mathbf{S} = \begin{pmatrix} 1.895 & 0.908 & 0.926 \\ 0.908 & 2.367 & 0.718 \\ 0.926 & 0.718 & 1.984 \end{pmatrix}$$

$$\mathbf{\Lambda} = \boldsymbol{\lambda} = \lambda 1 = \lambda(1, 1, \ldots, 1)',$$

$$\Sigma(\boldsymbol{\theta}) = \lambda^2 11' + \Psi,$$

$$F_{LS}(\boldsymbol{\theta}) = \frac{1}{2}\sum_{j=1}^{p}\sum_{k=1}^{p}[s_{jk} - \sigma_{jk}(\boldsymbol{\theta})]^2$$

$$\dot{F}_{LS\lambda}(\theta) = -(2\lambda)\mathbf{1}'\left[S - \sum(\theta)\right]\mathbf{1} = 0$$

$$-(2\lambda)(11.35 - 9\lambda^2 - \Psi_{11} - \Psi_{22} - \Psi_{33}) = 0$$

$$\dot{F}_{LS\Psi_{jj}}(\theta) = -\left[s_{jj} - \sigma_{jk}(\theta)\right] = 0$$

$$1.895 - (\lambda^2 + \Psi_{11}) = 0$$
$$2.367 - (\lambda^2 + \Psi_{22}) = 0$$
$$1.984 - (\lambda^2 + \Psi_{33}) = 0$$

$\lambda^2 = 0.8506667 \Psi_{11} = 1.0443333 \Psi_{22} = 1.5163333 \Psi_{33} = 1.1333333$

代码:

```
> f=matrix(c(9,1,1,1,
+          1,1,0,0,
+          1,0,1,0,
+          1,0,0,1),4,4)
> rf=matrix(c(11.35,
+          1.895,
+          2.367,
+          1.984),c(4,1))
> solve(f,rf)
         [,1]
[1,] 0.8506667
[2,] 1.0443333
[3,] 1.5163333
[4,] 1.1333333
```

得出估计值