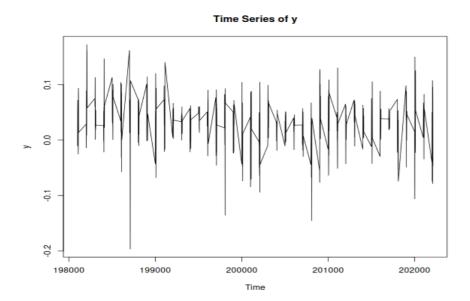
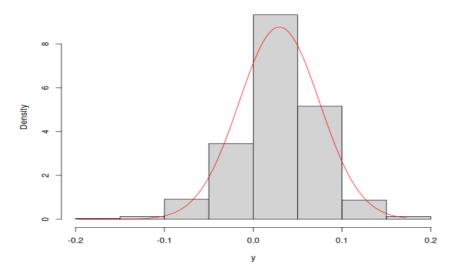
Homework: 2024/9/4

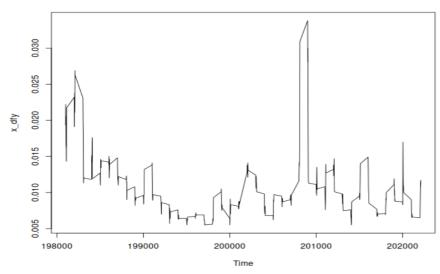
1. Data Visualization



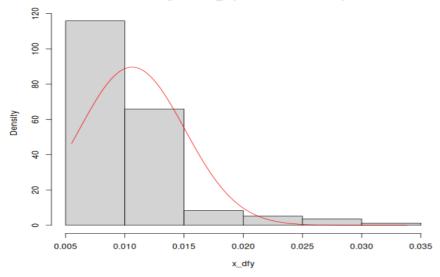
Histogram of y with Normal Density

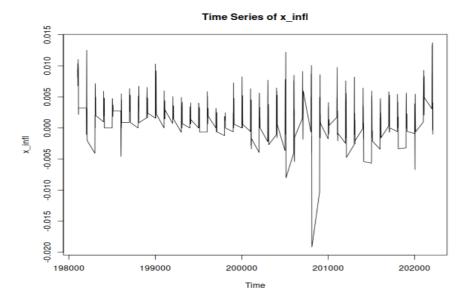


Time Series of x_dfy

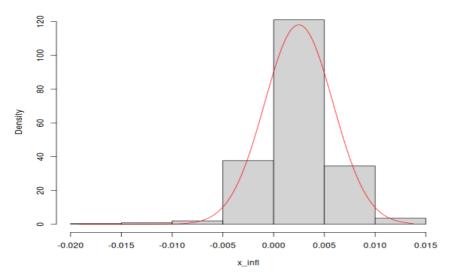


Histogram of x_dfy with Normal Density

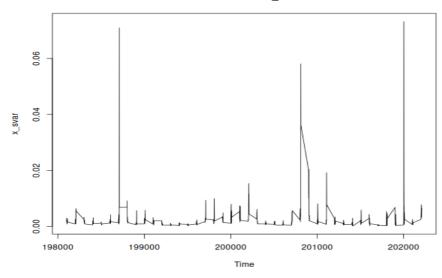




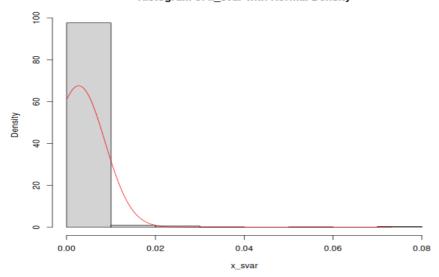
Histogram of x_infl with Normal Density



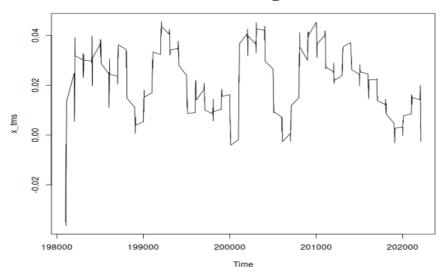
Time Series of x_svar



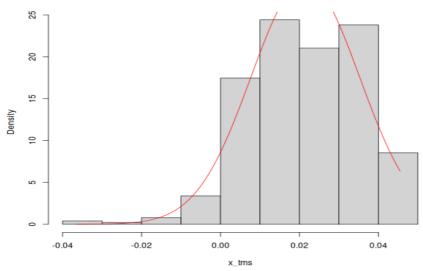
Histogram of x_svar with Normal Density



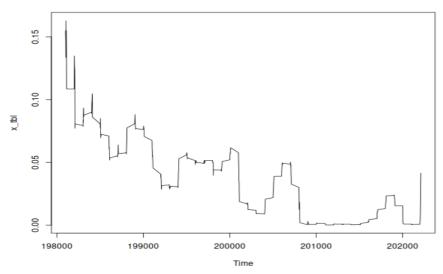
Time Series of x_tms



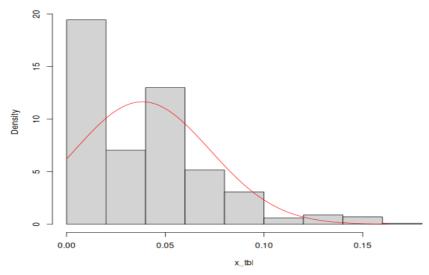
Histogram of x_tms with Normal Density



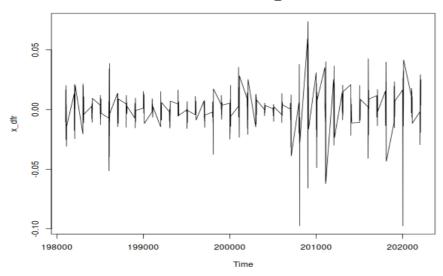
Time Series of x_tbl



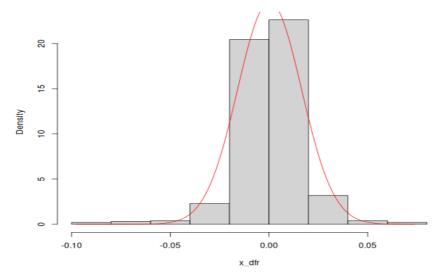
Histogram of x_tbl with Normal Density



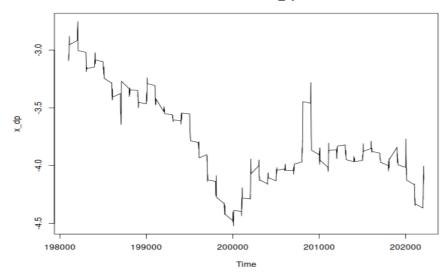
Time Series of x_dfr



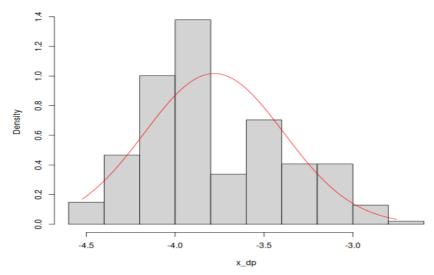
Histogram of x_dfr with Normal Density



Time Series of x_dp

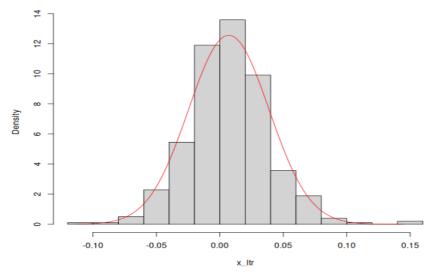


Histogram of x_dp with Normal Density

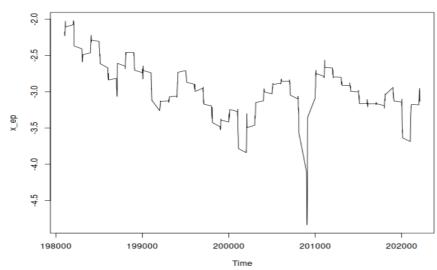


Time Series of x_ltr 91:0 00:0 90:0 00:0 90:0 200000 201000 202000 Time

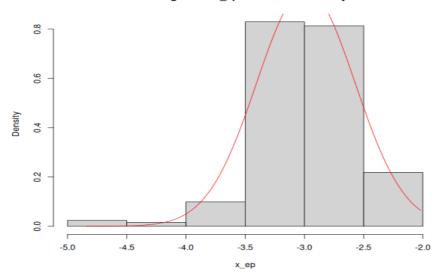
Histogram of x_ltr with Normal Density



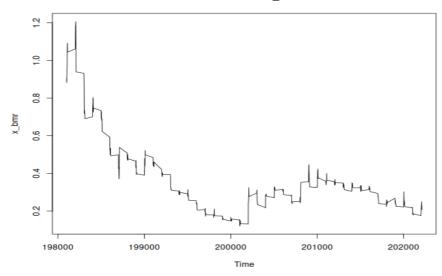
Time Series of x_ep



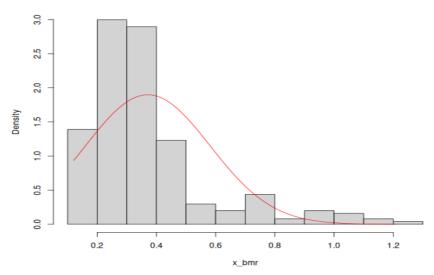
Histogram of x_ep with Normal Density



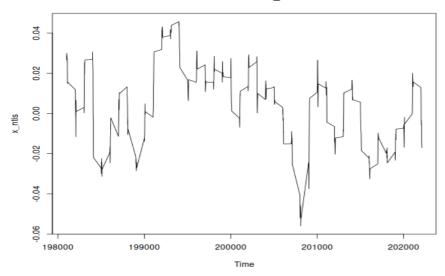
Time Series of x_bmr



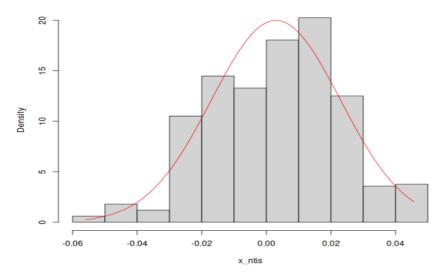
Histogram of x_bmr with Normal Density



Time Series of x_ntis



Histogram of x_ntis with Normal Density



2.

2.1. $trace(X(X'X)^{-1}X')=11$ (calculated by R)

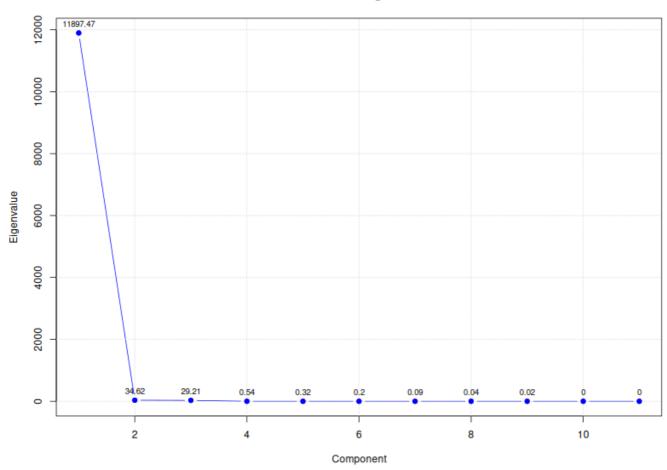
2.2. $trace(I_n - X(X^\prime X)^{-1} X^\prime) = 493$ (calculated by R)

Question 2-1:
The sum of the diagonal elements of the result matrix is: 11
Question 2-2:
The sum of the diagonal elements of the final matrix is: 493

3. Eigenvalue Scree Plot

eigenvalues scree plot (sorted)

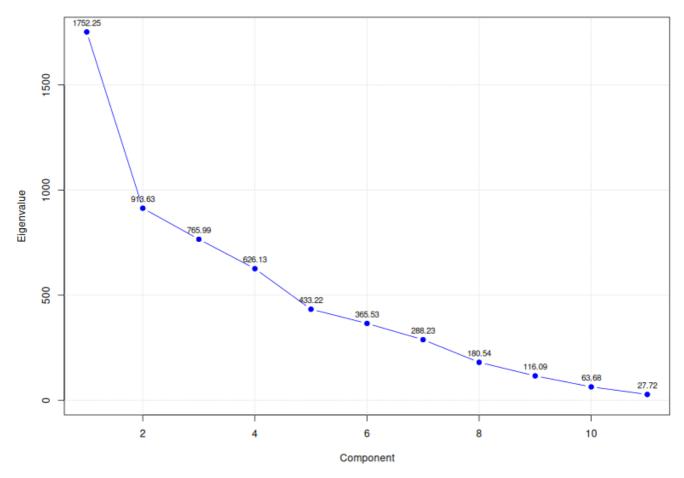
Scree Plot of Eigenvalues



4. Standardized Matrix Comparison

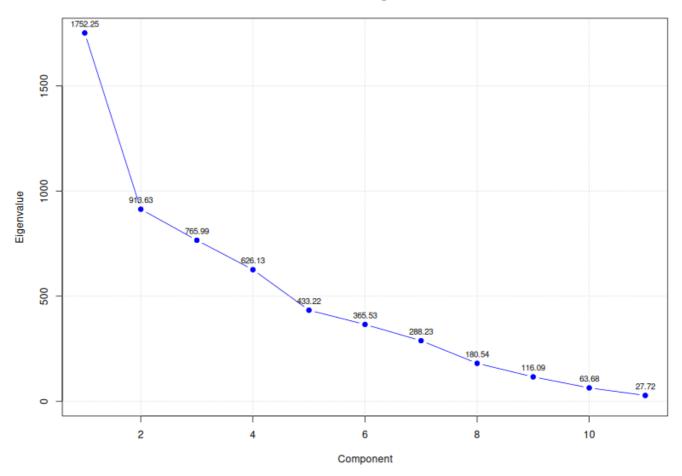
scree plot of the eigenvalues of $\bar{X}^{{}^{\prime}}\bar{X}$

Scree Plot of Eigenvalues



scree plot of the eigenvalues of $\bar{X}\bar{X}'$

Scree Plot of Eigenvalues



The results imply that the eigenvalues of the two matrix are the same.

check inverse result: TRUE
check identity matrix: TRUE

5. Spectral Decomposition and Matrix Inversion

Apply the equation

$$H=\widetilde{X'}\widetilde{X}$$

$$A = H\Lambda^{-1}H'$$

The result turns out $AA^{-1} = I_k$ (verified by R)

6. Linear Equation Solution

Since X isn't a symmetric matrix, we must apply another method to calculate b. By using the below equation, we can figure out b.

$$b = \left(\widetilde{X}'\widetilde{X}
ight)^{-1}\widetilde{X'}Y$$

The result of b

7. Source Code

Source Code