Q1 and Q2.

1.

As lenght, $E[\hat{e}'\hat{e}] = (n-k)\sigma^2$, $E[s^2] = \sigma^2$

$E[C_p] = E[\hat{e}'\hat{e}] + E[s^2]\cdot 2k = (n+k)\sigma^2$

$\hat{m} - m = X(\hat{\beta} - \beta) = X((X'X)^{-1}X'Y - \beta) = Pe$

$R = E[|Pe|^2] = E[e'PPe] = \sigma^2 \, trace(P) = k\sigma^2$

$E[C_p] = R + n\sigma^2$

2.

$E[C_{1,p}] = E[\hat{e}_1'\hat{e}_1] + 2k_1 E[s^2]$

$\hat{e}_1 = Y - X_1\hat{\beta}_1 = Y - X_1(X_1'X_1)^{-1}X_1'Y$

$= Y - X_1(X_1'X_1)^{-1}X_1'(X_1\beta_1 + X_2\beta_2 + e)$

$= M_1(X_2\beta_2 + e)$

$\hat{e}_1'\hat{e}_1 = \beta_2'X_2'M_1X_2\beta_2 + e'M_1e$

$E[\hat{e}_1'\hat{e}_1] = E[\beta_2'X_2'M_1X_2\beta_2] + \sigma^2 \cdot trace(M_1)$

$= E[\beta_2'X_2'M_1X_2\beta_2] + \sigma^2 \cdot (n-k_1)$

$E[s^2] = \sigma^2$

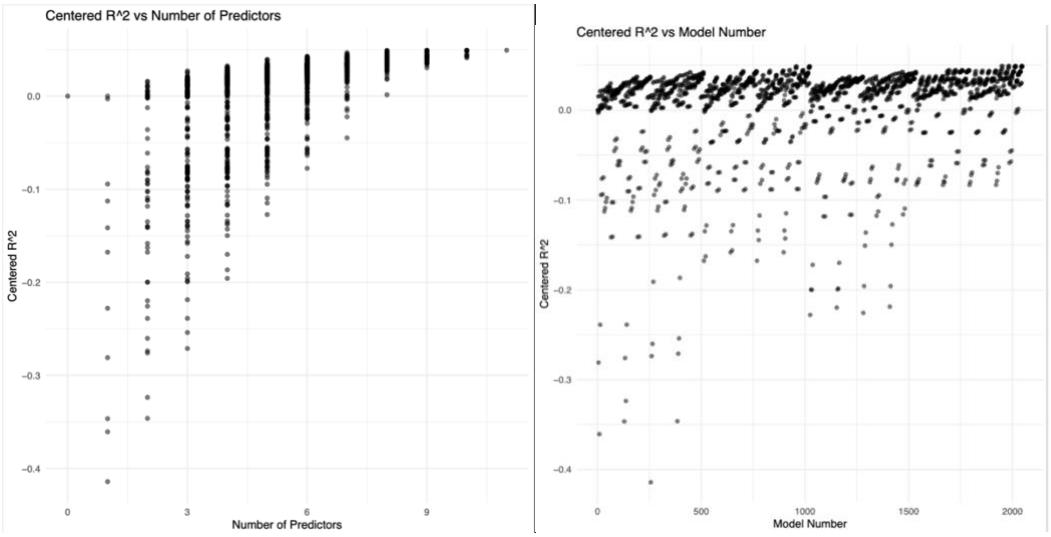
$E[C_{1,p}] = \underline{E[\beta_2'X_2'M_1X_2\beta_2] + k_1\sigma^2} + n\sigma^2$

R #

Q3.

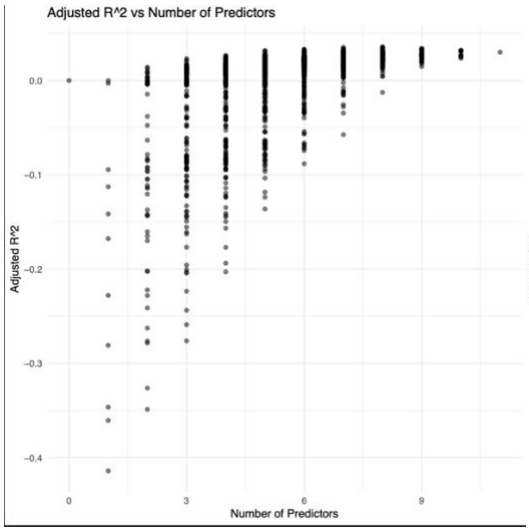
R-square:

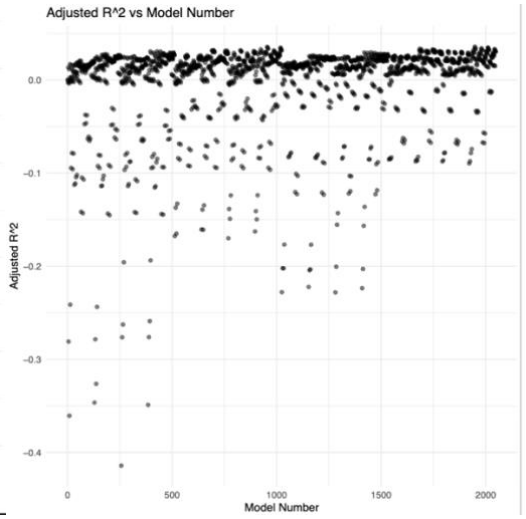
Best model = unconstrained



Adjusted R-square:

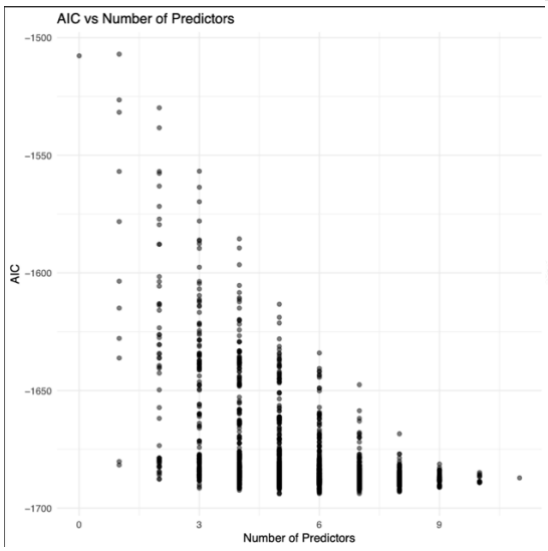
Best model = intercept, x_dfy, x_svar, x_tms, x_infl2, x_svar2, x_tms2, x_tbl2

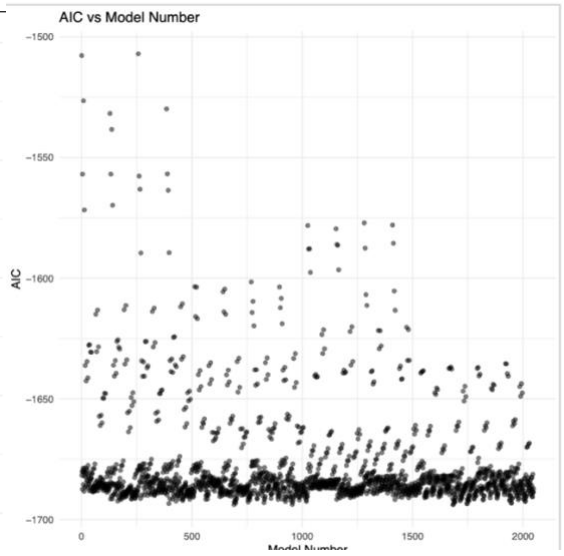




AIC:

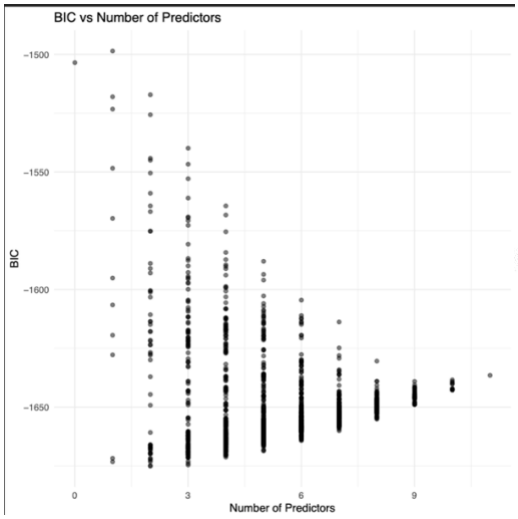
Best model: x_dfy, x_tms, x_tbl, x_infl2, x_tms2

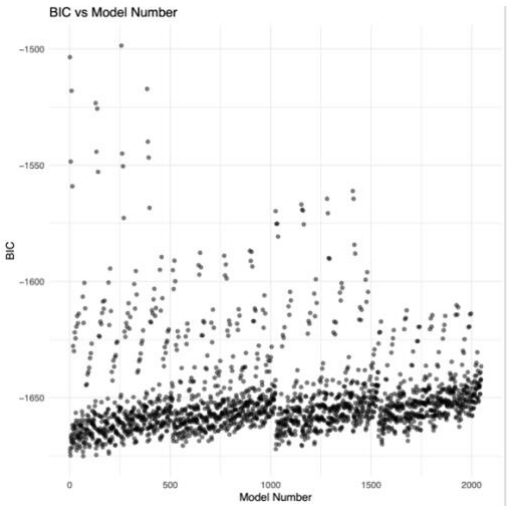




BIC:

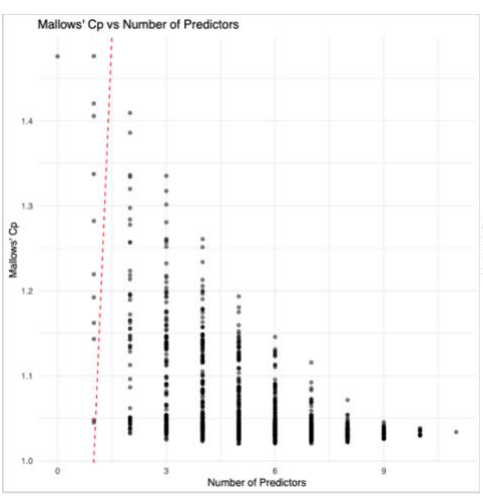
Best model: x_dfy, x_dfy2

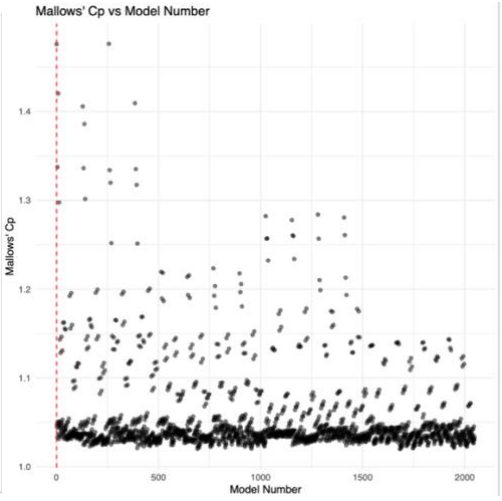




Mallow's CP

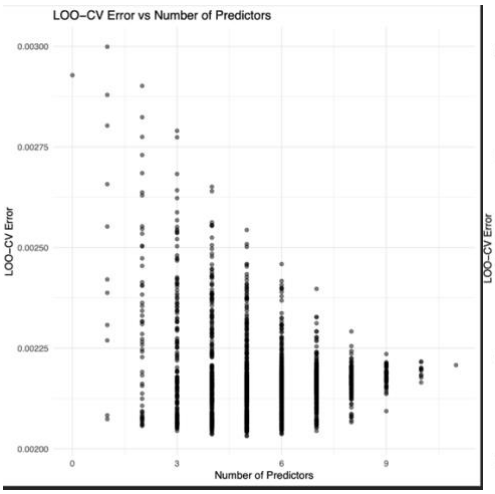
Best Model: x_dfy, x_tms, x_tbl, x_infl2, x_tms2

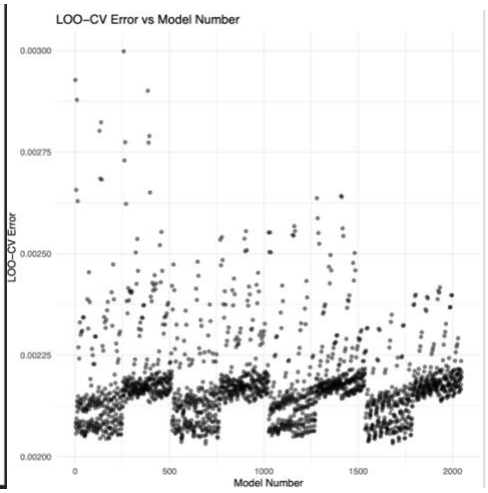




LOOCV:

Best model: x_dfy, x_tms, x_tbl, x_infl2, x_tms2





All code can be found on https://github.com/YuJu0819/quant-method in hw8 folder