Seminar 1

Exercise 1

1. Consider a regression model $y = X\beta + \epsilon$ with $E\epsilon = 0$ and $Var(\epsilon) = \sigma^2 I$. The residuals are calculated as $\hat{e} = y - X\hat{\beta}$
   Show that $E(\hat{e}'\hat{e}) = (N - K) * \sigma^2$

2. Show that if $\frac{1}{N}X'X$ converges to a singular matrix, OLS is not consistent. Explain what it means that the asymptotic matrix is non-singular and why this may occur.

3. Show that if $\frac{1}{N}X'X$ (or some elements of it) goes to $+\infty$ as N gets large, the central limit theorem doesn't apply. What could be the reasons for the matrix not converging? Is OLS consistent in this case?

Exercise 2

Exercises 1, 2, and 5 from *Forty exercises for seminars etc*

Exercise 3 (time permitting)

All the exercises in *Exercises in calculations with variances and covariances*