Econometrics A
Problem Set #2
Date Due: Thursday, April 17

1. Stock and Watson, Exercises 3.2, 3.3, 3.4, 3.15, 3.16, 3.17, 3.18

2. Let $X_1, ..., X_n$ denote an i.i.d. sample of size n from X. Suppose $\text{Var}[X] < \infty$. For $1 \leq i \leq n$ define $Z_i = a + bX_i$ and $Z = a + bX$ for some constants a and b.

   (a) Show that $\bar{Z}_n = a + b\bar{X}_n$ and $\hat{\sigma}_Z^2 = b^2\hat{\sigma}_X^2$.

   (b) Prove that $\bar{Z}_n$ is an unbiased estimator of $E[Z]$.

   (c) Prove that $\bar{Z}_n$ is a consistent estimator of $E[Z]$. (Hint: Is the function $g(t) = a + bt$ continuous?)

3. Let (X, Y) denote a random vector, and let $(X_1, Y_1), ..., (X_n, Y_n)$ denote an i.i.d. sample of size n from (X, Y). Suppose $\text{Var}[X] < \infty$ and $\text{Var}[Y] < \infty$. Consider estimating $E[X]E[Y]$ using the estimator $\bar{X}_n\bar{Y}_n$.

   (a) Can you prove that $\bar{X}_n\bar{Y}_n$ is an unbiased estimator of $E[X]E[Y]$? Why or why not?

   (b) Show that $\bar{X}_n\bar{Y}_n$ is a consistent estimator of $E[X]E[Y]$.