Financial Econometrics Rauli Susmel
FINA 4397

Homework 2 (Due September 28)

Instructions: Send your solved homework, along with the code, to my TA, Yousaf, Hammad. His email address is: hyousaf@CougarNet.UH.EDU.

1.1 (**Tests of Hypothesis**). Download the Shiller dataset (Shiller_data.csv) from my homepage. Or just cut-and-paste the following line:

```
Sh_da <- read.csv("http://www.bauer.uh.edu/rsusmel/4397/Shiller_data.csv", head=TRUE,sep=",")
```

You have stock prices (P), dividends (D), earning (E), consumer prices (CPI) and long interest rates (Long_i). Regress log stock returns, r_i, against log earning changes, $earn_i$, inflation rate (in log changes), Inf_i, and interest rates, int_i (need to subtract one observation):

$$r_i = \beta_0 + \beta_1\, earn_i + \beta_2\, Inf_i + \beta_3\, int_i + \varepsilon_i$$

a. Report the regression
b. Interpret the R^2.
c. Interpret the estimated coefficient β_1.
d. Test with a goodness of fit test H_0: $\beta_1 = \beta_2 = \beta_3 = 0$.
e. Test with an F-test H_0: $\beta_1 = \beta_3 = 0$.
f. Test with a Wald test H_0: $\beta_2 = 0.5$ and $\beta_3 = -0.1$
g. Check if the model shows structural change at T_{SB} = October 1973. Perform a Chow test.

1.2 (**Bootstrapping**). Bootstrap the t-statistics in the above regression, with B = 1,000.
a. Report the mean and the bias in your estimation for each parameter.
b. Build a 95% C.I. for β_2.

1. 3 (**Non-nested Tests**) Download the Stocks_FX_1973 dataset (Stocks_FX_1973.csv).
a. Estimate two Fama-French 3-factor model for GE returns: One with Mkt_RF, SMB and HML (Model 1) and the other with Mkt_RF, CMA and RMW.
b. Use a J-test to select a model.
c. Perform an encompassing test to select or favor a model.

1.4 (Structural Change)
a Explain the term 'parameter structural stability'?
b A financial econometrician thinks that the stock market crash of October 1987 fundamentally changed the risk–return relationship given by the CAPM equation. He decides to test this hypothesis using a Chow test. The model is estimated using monthly data from January 1981–December 1995, and then two separate regressions are run for the sub-periods corresponding to data before and after the crash. The model is

$$r_t = \alpha + \beta\, r_{mt} + \varepsilon_t$$

so that the excess return on a security at time t is regressed upon the excess return on a proxy for the market portfolio at time t. The results for the three models estimated for a given stock are as follows:

1981*M*1–1995*M*12

$r_t = 0.0215 + 1.491\ r_{mt}$ $RSS = 0.189$ $T = 180$

1981*M*1–1987*M*10

$r_t = 0.0163 + 1.308\ r_{mt}$ $RSS = 0.079$ $T = 82$

1987*M*11–1995*M*12

$r_t = 0.0360 + 1.613\ r_{mt}$ $RSS = 0.082$ $T = 98$

c. What are the null and alternative hypotheses that are being tested here, in terms of α and β?
d. Perform the test. What is your conclusion?

1.5 (Theory Review)

a. What does it mean that an estimator is unbiased? Consistent? Would you ever consider an inconsistent estimator?
b. Suppose you suspect the unobservable error terms (ε) in a regression does not follow a Normal distribution. Describe how would you test that ε is not normally distributed (state the Null Hypothesis and the test used).
c. Under what circumstances you would use a bootstrap to compute SE for a regression?
d. What are the consequences for the CLM that the errors are not normally distributed?
e. What does it mean that a regression suffer from multicollinearity? What is the possible effect of multicollinearity on a regression? Can you fix it?
f. Describe the omitted variables and irrelevant variables problem. What are the properties of OLS under both scenarios?