

Problem Set 4
Due Tuesday, Feb 21

This problem set asks you to replicate and extend the analysis by Hayashi and Fama of the joint hypothesis of efficient markets and constant ex ante real interest rates. You can download the data set from

<http://fhayashi.fc2web.com/datasets.htm>

The data set for this problem can be obtained in either ASCII format (<http://fhayashi.fc2web.com/hayashi%20econometrics/ch2/MISHKIN.ASC>) or Excel spreadsheet (<http://fhayashi.fc2web.com/hayashi%20econometrics/ch2/mishkin.xls>) This data set has the following monthly data from February 1950 to December 1990:

Column 1: year

Column 2: month

Column 3: one-month inflation rate (at annual rate)

Column 4: three-month inflation rate (at annual rate)

Column 5: one-month T-bill rate (at annual rate), as of beginning of month t

Column 6: three-month T-bill rate (in percent, annual rate), as of beginning of month t

Column 7: CPI for urban consumers, all items (the 1982-1984 average is set to 100), as reported for month t and assumed to be known at the end of month t .

For this exercise we will only use columns 5 and 7. You can analyze this data set using any package you like. You should hand in a copy of your computer output along with a brief write-up of your calculations and answers to the following specific questions. This problem set includes instructions for carrying out some of the steps on STATA, since that is up in the lab.

STATA wants to input data in csv format (comma separated values), which you can create by opening `nerlove.xls` with a spreadsheet program such as Excel and saving as csv type.

After opening STATA, you can make sure you have a new session by typing the command

```
clear
```

If the directory you're using for your analysis has the address `c:\mydocs\prob4` you can migrate to that directory using the command

```
cd "c:\mydocs\ prob4"
```

We'll next read the data into the format of a STATA data file (*.dta file) which we'll call "mishkin.dta" using the STATA "insheet" command. We can create a log that records what we did (call it "convert.log") using the "log using" command, like this:

```
log using convert.log,replace
insheet using mishkin.csv
save mishkin.dta
log close
```

You can then set up a new log (call it "mishkin.log") of your regression results, which could look something like this:

```
clear
use mishkin.dta
log mishkin.log, replace
gen inf = (((cpi/cpi[_n-1])^12)-1)*100
gen tb1_lag = tb1[_n-1]
:
reg inf tb1_lag in 36/258, r
:
log close
```

The "gen" command in the fourth line generates the variable "inf." "[_n-1]" is used to create a lagged variable. The "reg" command in the sixth line is to run a regression. "36/258" denotes that we use the data from the 36th row to the 258th row which correspond to data from 1/53 to 7/71. In order to estimate the equation with White standard error you should put "r" at the end of the "reg" command as in the sixth line. Other STATA commands you might find helpful for completing this exercise are "test", and "predict". You can find out how to use these by typing a command like "help reg"

1.) Use the "gen" command to create the ex post inflation rate for month t using the raw CPI data as $\text{inf} = (((\text{cpi}/\text{cpi}(-1))^{12}) - 1) * 100$. "cpi[_n-1]" denotes the lagged variable of "cpi". Which dates of CPI must be matched up with the t-bill rates for a correct investigation of this hypothesis? Try to replicate the estimate of (2.11.9) in Hayashi's text. Estimate the equation both with the usual standard errors and with White standard errors (you can add ", r" in the "reg" command line to use White standard error). Use the White standard errors to calculate p -values for tests of the following null hypotheses, and indicate in each case whether you accept or reject the hypothesis:

- a) $\beta_1 = 0$
- b) $\beta_2 = 1$
- c) the joint hypothesis that $\beta_1 = 0$ and $\beta_2 = 1$.

2.) Use the "predict" command with sample specified to create a series that extends the residuals so that pre-sample values are set to zero. Perform the TR^2 test for omitted second-order serial correlation. Does this lead you to conclude that the errors are serially correlated? Does this lead you to think that your tests of the efficient markets/ constant real interest rate hypothesis are invalid? Hint: be sure to think about what this hypothesis really means before answering.

3.) Perform the TR^2 test for omitted second-order ARCH effects and the TR^2 form of White's test for omitted general heteroskedasticity. Does this lead you to conclude that the errors are homoskedastic? Does this lead you to think that your tests of the efficient markets/ constant real interest rate hypothesis are invalid? Again please reflect on the hint in question (2) before answering.