

In-Class Lab 13

ECON 4223

October 26, 2023

The purpose of this in-class lab is to use R to practice with time series data. The lab should be completed in your group. To get credit, upload your .R script to the appropriate place on Canvas.

For starters

Open up a new R script (named ICL13_XYZ.R, where XYZ are your initials) and add the usual “preamble” to the top:

```
# Add names of group members HERE
library(tidyverse)
library(wooldridge)
library(broom)
library(magrittr)
library(modelsummary)
library(tsibble)
library(pdfetch)
library(tseries)
library(lubridate) # This package converts dates to a special date numbering system
library(fable)      # This one may take awhile to install
library(feasts)      # You also need to install this one
library(urca)        # and this one
```

Load the data

We’ll look at the return on a 3-month treasury bill over the period of 1960q1–1990q4.

```
# T-bill rates by quarter
df1 <- as_tibble(intqrt)
df1 %<>% mutate(quarter = seq(yq('1960:Q1'), yq('1990:Q4'), by = 'quarters')) # create quarter
df1 %<>% select(r3, quarter)
```

Declare as time series objects

```
df1 %<>% as_tsibble(index=quarter)
```

Plot time series data

Let's have a look at the 3-month T-bill return for the US over the period 1960–1990:

```
autoplot(df1) + xlab("Year") + ylab("T-bill return")
```

```
## Plot variable not specified, automatically selected '.vars = r3'
```

Testing for a unit root

Let's test for a unit root in each of the time series. The way to do this is the Augmented Dickey-Fuller (ADF) test, which is available as `adf.test()` in the `tseries` package.

The function tests H_0 : Unit Root, H_a : Stationary.

```
adf.test(df1$r3, k=1)
```

1. Does this time series have a unit root, according to the ADF test? Explain what the consequences are of analyzing a time series that contains a unit root.

Estimating AR(1) models

To alternatively examine the unit root, we can estimate AR(1) models for each series:

```
est.tbill <- lm(r3 ~ lag(r3,1), data=df1)
```

```
modelsummary(est.tbill)
```

2. Are the R^2 values from these estimates meaningful?