Financial Econometrics Workshop 5

Binzhi Chen

July 16, 2020

1 Introduction

In this workshop we will introduce cointegration in STATA. We will estimate the cointegrating rank of a VECM and select the best lag length. Lastly, we will examine the autocorrelation and stable unit circle for VECM.

We have quarterly data on the natural logs of aggregate consumption, investment, and GDP in the United States from the first quarter of 1959 through the fourth quarter of 1982. As discussed in King et al. [1987], the balanced-growth hypothesis in economics implies that we would expect to find two cointegrating equations among these three variables. In the output below, we use EG-ADF and *vecrank* to determine the number of cointegrating equations using Johansen's multiple-trace test method.

2 Input Data and Date Transformation

The first step in STATA is input data, make sure your .dta file is in the right working directory. In this workshop we will use the dataset: quarterly data on the natural logs of aggregate consumption, investment, and GDP in the United States from the first quarter of 1959 through the fourth quarter of 1982.

Menu:
File → Change Working Directory → STATA Workshop

Command:

```
use http://www.stata-press.com/data/r15/balance2,clear #macro data
    for VECM/balance study
tsset t
```

Note:

`tsset` declares data to be time-series data.

3 Graphic Analysis and Data Transformation

In this section, you will learn how to add source note in your graph

Command:

```
tw line c i y t, sort title("Graphic Analysis") ///
note("Source:http://www.stata-press.com/data/r15/balance2") lpattern
    ("_""-")
```

4 EG-ADF Approach

Before we produce cointegrating analysis, make sure your variables are stationary. You can use ADF test to examine your variables.

Command:

```
reg y i c
```

Note:

The long run equilibrium would be

$$\hat{y} = -0.04 + 1.23c - 0.19i$$

We will compare the OLS result with the MLE Johansen Approach.

5 Johansen Approach(1)

Before we produce cointegrating analysis, make sure your variables are stationary. You can use ADF test to examine your variables.

Command:

```
varsoc y i c, maxlag(12)
vecrank y i c, lags(3) level99
```

```
3    vec y i c, lags(3) rank(1) #VECM analysis
```

Note:

The header produces information about the sample, the trend specification, and the number of lags included in the model. The main table contains a separate row for each possible value of r, the number of cointegrating equations. When $r = 3$, all three variables in this model are stationary.

Note:

In this example, trace statistics at rank 2 is lower than %1 critical value, we can not reject the null hypothesis.

Note:

The long run equilibrium would be

$$\hat{y} = -0.11 + 0.46c + 0.52i$$

6 Johansen Approach(2)

`veclmar` implements a Lagrange multiplier (LM) test for autocorrelation in the residuals of vector.

Command:

```
1    veclmar
2    vecstable,graph
```

Note:

The output contains a table showing the eigenvalues of the companion matrix and their associated moduli. The table shows that one of the roots is 1. The table footer reminds us that the specified VECM imposes one unit modulus on the companion matrix.

Question:

What if it implies autocorrelation?

References

R. G. King, C. I. Plosser, J. H. Stock, and M. W. Watson. Stochastic trends and economic fluctuations. Technical report, National Bureau of Economic Research, 1987.