Economics 312   Spring 2020
Project #6 Assignment   Due: 11:59pm, Monday, April 13

Because of our enforced social distance, each student will have to submit an individual
report for this assignment. However, you are welcome to work together by whatever means
of communication you can use. Please note on your submitted report the names of the other
students with whom you worked on the project.

Data and background

This project explores the interconnection of (the log of) real GDP in the United States and in
the Euro Area. The data set gfc.dta contains quarterly data for these two variables from
1995q1 to 2009q4, with both GDP levels normalized to be 100 (log = 4.605) in year 2000.
You are to explore the time-series relationship between the two GDP series.

1. Preliminaries

This dataset contains no date information, though the documentation tells us what it should
be. The following sequence of commands performs the necessary housekeeping:

```
gen t=_n
gen year=1994+ceil(t/4)
gen qtr=1+mod(t-1,4)
gen date=yq(year,qtr)
format date %tq
tsset date , q
order date
drop t year qtr
```

Explain in detail what each of these commands does. Look at your data spreadsheet at each
stage and use that to help explain what the command has done and to verify that it has done
what you think it should.

2. Assessing order of integration and cointegration

We expect *a priori* that log GDP in each country would be non-stationary. Use an
appropriate Dickey-Fuller, augmented Dickey-Fuller, or Phillips-Perron test (or more than
one) to assess the order of integration of each variable. If you find that integration is likely,
explore whether or not the variables are cointegrated using the Engle and Granger test
described by Wooldridge in Section 18-4a. (Note: Do not use a deterministic time trend for
any part of this assignment.)

3. A model of Euro Area GDP

Construct a model for Euro Area GDP treating U.S. GDP as an exogenous variable. The model should be appropriate based on your findings about integration and cointegration: a level regression with lags, a differenced regression with lags, or an error-correction model might be appropriate depending on the outcome of the previous part. Be sure to consider the optimal lag lengths based on significance, information criteria, and residual autocorrelation. Assess the econometric and economic results.

4. A joint model for both GDP variables

It is plausible that Euro Area GDP might affect U.S. GDP, at least over time, making the latter endogenous. Such situations are often modeled by vector autoregressions or vector error-correction models (if cointegrated) in which *only lags* appear on the right-hand side of each equation. Estimate an appropriate VAR or VEC model. Use the appropriate VAR or VEC diagnostics to choose lag length, verify stability, and check for residual autocorrelation. (See Stata's "help var intro" or "help vec intro" to find these commands.) Calculate the impulse-response functions for shocks to each GDP variable, using the assumption that the U.S. GDP affects the Euro Area within the current quarter but not vice versa. Interpret the results of these IRFs to explain the effects of one-time shocks to each economy's GDP on both economies in the short run and long run.