Problem set 8
607: Applied Macroeconometrics
Fall 2017
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The following is due at the beginning of next class. Everything should be submitted by email. You may work in groups; hand in a single submission for the group. The submission should list those who contributed.

Note 1: This is a new problem set. Please help me proofread it and let me know if there are confusing or ridiculous bits.

Note 2: The first two problems are for everyone. Then come three problems about empirical papers in macro. These will form the basis of projects we work on for the rest of the course.

Each student will do only one of these. I'd like to cover all three across the class as a whole. Thus, it would be nice if more than one person worked on each. You can pick. Let me know by email if this sounds unreasonable or if you are unable to divide up appropriately.

Note 3: On each of the empirical questions, it will be useful to keep in mind the role of going from Y_{all} to Y_{few} and then filtering Y_{few} to capture just a trend or just a cycle component.

1. Define the following.
   (a) Observationally equivalent.
   (b) Statistically identified.
   (c) Classical rank and order conditions for identification.
2. Suppose we posit that our data of choice, Y, $(K \times T)$ follow a covariance stationary process driven by K shocks, and with VAR represenataion,

$$A(L)Y_t = \varepsilon_t$$

   The K shocks originate in mutually distinct areas of the economy. For example, we might have a shock to the productivity of factories and a shock to the value of leisure, and, say, a shock to fiscal policy

stimulus. The K shocks are by assumption, mutually uncorrelated and uncorrelated through time:

$$\begin{aligned} E\varepsilon_t &= 0 \\ E\varepsilon_t\varepsilon_{t-k}' &= 0 \quad k \neq 0 \\ E\varepsilon_t\varepsilon_t' &= I \end{aligned}$$

where the unit variance of each shock is simply a normalization. Just for simplicity, let's assume that the εs are also jointly normal so we can think concretely about a likelihood.

The polynomial $A(L)$ is invertible so that

$$Y_t = B(L)\varepsilon_t$$

where, as always $B(L) = \sum_{j=1}^{\infty} B_j\varepsilon_{t-j}$.

(a) Take full rank $K \times K$ orthonormal matrix C and write,

$$\begin{aligned} CA(L)Y_t &= C\varepsilon_t \\ \tilde{A}(L)Y_t &= \tilde{\varepsilon}_t \end{aligned}$$

where

$$\begin{aligned} \tilde{A}(L) &\equiv CA(L) \\ \tilde{\varepsilon}_t &\equiv C\varepsilon_t \end{aligned}$$

Does this new transformed system satisfy all the conditions we've specified for the original (including having a $E\tilde{\varepsilon}\tilde{\varepsilon}' = I$)?

Call the two VAR models we have the 'true' model and the 'tilde' model.

(b) For concreteness, let's assume that one of the shocks, say the j^{th} shock, is a fiscal policy shock. In the 'true' model, a unit fiscal policy shock at t will shift the k^{th} variable at time $t+\ell$ by $[B_\ell]_{k,j}$, that is the (k, j) element of B_ℓ.

What is the response of the k^{th} variable at horizon ℓ to the j^{th} tilde shock?

(c) How will the Gaussian likelihood of any sample under the 'true' parameters and the 'tilde' parameters differ?

(d) Given the assumptions stated thus far, can we determine from data whether a unit shock has the causal effect given by the 'true' system vs. the 'tilde' system?

(e) For simplicity, suppose that $K = 2$, and that the 'true' system satisfies $B_0\lambda = 0$. Will this allow us to rule out the tilde system?

3. Lots of data, little structure: Was the financial crisis different from other recessions?

   Cite: James H. Stock and Mark Watson, Disentangling the Channels of the 2007–09 Recession, BPEA, Sring 2012.

   > This paper takes an empirical look at this recession and recovery, with an eye toward quantifying the extent to which this recession differs from previous postwar recessions, the contributions of various shocks to the recession, and the reasons for the slow recovery. More specifically, we consider three questions. First, beyond its severity, how did this recession differ from previous postwar recessions? Second, what were the economic shocks that triggered this recession, and what were their quantitative contributions to the collapse of economic activity? Third, to what extent does the current 'jobless' recovery constitute a puzzle, something out of line with historical patterns and thus requiring a new explanation?

   For each part write a page or less for your answer.

   (a) Give a brief summary of how the steps getting from Y_{all} to Y (as discussed in note 3 above) are treated in this paper.

   (b) Give a brief statement of the most important results in your view.

   (c) How do the generic steps described above manifest themselves in this paper?

   (d) Suppose you had a view of financial crises as leading to recessions that are 'different' in the sense of involving widespread and severe bite of occasionally binding constraints. In what way, if any, would this paper change your view?

4. Microfoundations of sticky prices. A great deal of conventional thinking in macro is driven by the notion of sticky prices and/or wages. In recent years, a good deal of work has focussed on simply measuring how often prices on any give good change.

   Two prominent papers in this literature are:

Five Facts about Prices: A Reevaluation of Menu Cost Models, Emi Nakamura and Jon Steinsson, The Quarterly Journal of Economics, 2008, vol. 123, issue 4, 1415-1464

and

The Elusive Costs of Inflation: Price Dispersion during the U.S. Great Inflation (with Jón Steinsson, Patrick Sun, and Daniel Villar) Quarterly Journal of Economics, forthcoming.

For each part, write content equal to at most 1 page.

(a) In standard macro models, the macroeconomic significance of sticky prices operates mostly through the effect on price dispersion. Explain this.

(b) Describe difficulties defining and measuring how frequently prices change.

(c) Everyone knows that there are important secular differences in rates of inflation for different goods. The cost of medical care and textbooks is rising faster than the general price level, and the price of computers is actually falling—thereby growing much more slowly than the general price level). How would this fact affect the interpretation of, say, statistics on the frequency of price increases versus decreases or of statistics on the distribution of sizes of price changes?

(d) How do Nakamura and Steinsson take acccount of the fact of the fact of secular differences in inflation rates?

5. Causal effects of fiscal policy. In discussing inference about causlity, we generally start with some case in which B tends to follow A. Before concluding that A caused B, we must rule out that B caused A (reverse causality[1] or that some third factor C caused both A and B. Drawing inferences about the causal affects of macro policy is all about these two possibilities.

[1] You might wonder about the word 'follow' indicating that B came after A. Is reverse causality assuming that the future causes the past? There are two answers here. First, often timing is ambiguous in macro data, so B follows A can be read as B is notable in the measured data after A. This leaves aside when the events actually happened. Second, B causes A can operate through expectations: expectations of B cause A. These two are essentially versions of the same argument: Those expectations of B may reflect facts known about B that are not yet in the published data.

In macro, we can't hold all background conditions constant and repeatedly run experiments about, say, tax increases. This makes inferences about the causal effects of policy changes difficult for the reasons just stated. We can measure what subsequent changes appear to be correlated with tax changes, but we have difficulty ruling out that the causality runs from outcomes to policy or that both policy and outcomes are due to some third factor. For example, a fiscal stimulus may be implemented because of a forecast drop in economic activity. Or a major Tsunami might cause both a drop in measured economic activity and a fiscal stimulus. In both of the examples just stated, if the stimulus only partly offsets the nasty outcome, we will observe that weak economic activity systematically follows fiscal stimulus. This will be so even if, all else equal, fiscal stimulus is stimulative.

Imagine there existed a large set of instances when fiscal policy had been changed for purely whimsical reasons—that is reasons independent from any economic factor. We could measure average economic activity after one of these changes vs. average activity in other periods distant in time from any such change. This difference, we might logically conclude, is causally attributable to policy. While there are measurement issues here, at least we would know that the measured change in taxes was not due to either reverse causality or some mutual third factor.

A nice paper dealing with these issues is:

Tax multipliers: Pitfalls in measurement and identification, Daniel Riera-Crichton, Carlos A. Vegh, Guillermo Vuletin, JME, 2016, v79, 30-48.

Answer each part in one page or less.

(a) Explain the Riera-Crichton, et al. approach to building a sequence representing 'exogenous' tax changes.

(b) These changes are not argued to be entirely whimsical. In what sense are they exogoenous?

(c) Explain the Blanchard-Perrotti approach (cited in the paper) to building a sequence that represents 'exogenous' fiscal policy shocks?

(d) Discuss how the set of steps from Y_{all} to Y (as in note 3 above) play a central role in both of these identification schemes.