# Econometrics 871 - 2020

## Guidelines for the Time Series research project

**Assignment:** replicate and test the robustness of an extant study that uses time-series methods

**Requirements:**

- The assignment is an individual project, conducted on your own. Each student should thus choose a unique paper to replicate. You may consult with me or your classmates for advice and hints, but the replication exercise and write up should be your own work. Rather than enforce a sign-up for which paper chosen, I will rely on your sense of honour to do the selection yourself. If some overlap happens, so be it (but I will be rather vigilant in the methods and write up used to do the replication, if there are multiple cases done on the same paper).
- The assignment is an exercise to really learn to do econometric analyses on your own. The replication part is to make this less onerous than to come up with a novel research idea. This is why I would also like you to attempt some robustness checks and/or extensions over and above what the authors did. I will give some more ideas on this below.
- I don't want to give a strong word requirement, as how much space you will need will vary from case to case. I suggest you aim for about 4000 words max.
- Context, literature review etc:
    - I do not expect/want an extensive, novel literature review
    - After the introduction (which summarizes what *you* did and why) provide a brief section that outlines the context and questions of the replicated study:
        - The first part should outline what the authors do, how they motivate the question as of economic interest and/or importance, how they motivate their methods and how they argue that their contribution is novel
        - The second part can be a critical evaluation of their approach and choices which leads to your choices of robustness checks/extensions.
- Content:
    - A first section should document the steps you take in replication and their motivation and interpretation
        - I don't want to see raw output from statistical packages – summarize output of tests and estimations in tables, and discuss them as you would for a normal, novel research project
    - A Second section should present the checks for robustness/extensions
        - Typically, papers have to be concise, so authors only present the most important parts of their empirical analyses.
        - Things to check for robustness or to extend the work:
            - Is there an obvious alternative to their specification choice? i.e. lag structure, variables included
            - If the study is somewhat older, what happens if you extend the sample with more recent data? Do the results remain constant?
            - If you replicate the in-sample model, how well does the model do at predicting data that came after the paper was published?

**Some guidelines:**

1. **Choosing a paper:**

- To be able to replicate a paper, you will need to be able to find the data used in the study, so choose a paper that uses publicly available data. A good paper will clearly state what data is used and where it was obtained.
    - If you cannot find the exact data sources, but can find near comparisons, that should be fine too. If you are uncertain, please ask.
- Bad papers in bad journals will either be difficult to replicate or contain problematic results or obvious mistakes that one does not *want* to replicate, so the first step is to choose a paper from a reasonably good journal.
    - The simplest option for finding a paper is to look in good macroeconomic, monetary or international finance/trade journals – such papers typically use standard methods and macroeconomic data that is usually readily available from e.g. https://fred.stlouisfed.org/
    - A non-exhaustive list of journals where you should find studies that use methods similar to those we covered in class are:
        - The American Economic Review
        - The Journal of Monetary Economics
        - American Economic Journal: Macroeconomics
        - Journal of International Economics
        - Journal of International Money and Finance
        - American Economic Journal: Economic Policy
        - Quarterly Reviews from the Federal Reserve Banks of the US
        - Journal of Money Credit and Banking
        - If you are uncertain about a journal, use the rankings in https://ideas.repec.org/top/top.journals.all.html. Any journal ranked lower than about 600 rank becomes a bit risky.
- Choose a paper that uses a method we covered in class, or one that you think you will be reasonably able to replicate with the statistical packages available to you.
- Some journals require the full set of data and code used for the estimations. These are obviously not allowable as a test of your own ability to replicate a paper! Should you wish to use such a paper, contact me – all the evaluation will then be based on the critique and extension of the paper based on methods and tests not available in the code provided.
- If you have a candidate paper, but are uncertain about it, or struggle to choose between a few, please contact me.
- An interesting question is always: do the results of a paper hold when confronted with new data?
    - There is a trade-off: much older papers sometimes use outdated methods that have been improved on. Very new papers may use techniques that are beyond what we covered and leave little scope for testing the published model out-of-sample. So, I would choose a paper from the late 1990s to the early 2010's.

## 2. What to cover in the replication

- Typically, a good empirical paper has one central contribution to make, and this will be based on a specific estimation or set of estimations. This is the thing to replicate as the first step.
    - In my experience, this is not always as simple as it sounds. If you cannot replicate the results (or something reasonably close to it), have you failed? Not necessarily. If you can show that you have data identical or very close to that of the paper you are working from, and can estimate exactly the same model, but you get different results, this is in itself a valuable piece of evidence. If you find yourself in such a situation, again you may consult me if you are uncertain. Then a good approach would be to use the data to argue why the authors got their results, or what they might have done "in the background" to get the result they wanted.
    - If you use results from good academics, however, you should be able to come close to their results.
    - You may also find obvious mistakes. Document these if you find them!

- Once you have managed to replicate the main results of a paper, the next thing to do is to check whether this "ideal specification" satisfies the requirements of a valid statistical representation of the data generating process, which I emphasized throughout the course.
    - Thus, you should subject the estimated model to a battery of tests to evaluate it.
    - Use the course structure to guide your choice of tests. Additionally, some of the papers that cite the one you are replicating might yield inspiration for more critical analysis. If you use/replicate criticisms from other authors, document this as usual!
    - Typical questions I always have when I read an empirical time series paper
        - Are the residuals white noise?
        - Are the estimates robust to different samples?
        - Are there obvious outliers?
        - Can the model be reduced more than the authors did? (i.e. remove lags)
        - Are all the variables in the model necessary? Are their missing variables given the economic question?
        - Are there alternative economic forces that may explain the results that a more general model can distinguish between?
        - Does the model encompass other models in the literature? (this last one is related to the last lecture which we weren't able to have, so if you are interested in this aspect, go through the notes and references)
    - The first three are definitely necessary to test, the rest are ideas that may or may not be relevant, depending on your context.

- Extensions: here I don't expect you to move mountains. I want to urge you to try something just to push your learning a bit further than replication and robustness testing
    - The simplest option I've mentioned above: After replicating the main results with the same sample as the authors, add newer data and see by how much the results change. If they do change, use your economic and econometric intuition (and tests) to argue for some potential reasons for the changes.
    - Other extensions are changes to the variables included, specifications, alternative models, but whether this is feasible will depend strongly on the particular case.