

Reader Report

Reading: Background reading on Granger causality and Feedback

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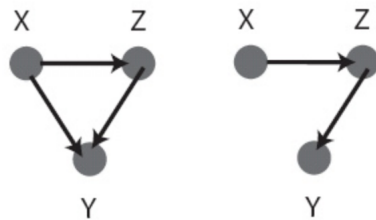
I was going to read the Peters' paper: causal inference on time series but realized that I don't understand the existing methods section in the paper. So I decided to learn about these methods instead.

Granger Causality

The basic definition in his 1980 personal account was quite straight forward, supposed we have three variables X_t , Y_t , and W_t . We first try to predict X_{t+1} using W_t and X_t , then we try to predict X_{t+1} using W_t , X_t and Y_t . If the second prediction is better. Then we say that Y_t causes X_{t+1} .

There are two underlying assumptions in this definition: 1) Y_t contains information about X_{t+1} that's not captured in W_t and 2) Y_t happened before X_{t+1}

There seems to be a lot of issues with this definition. For instance Ding et al. (2006) pointed out that we cannot distinguish the difference between these two causal graph.

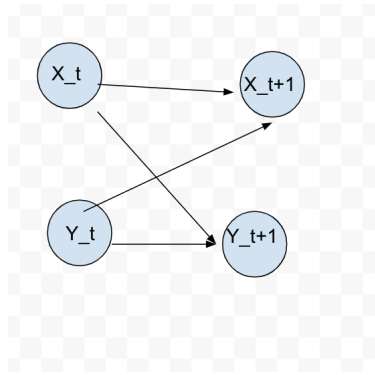


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One thing to note about this method is that the causal chain seems entirely dependent on the selection of variables. (Possibly also make it more adapted for multiple causal inference?) Which often time does not reflect the real causal chain the world.

One issue that I am curious about is whether this causality definition has some asymptotic properties. What's the differences with finite data versus infinite data in this example?

Feedback Time series without feedback loops seems to be an essential assumption, also a major assumption in the Peter's paper. Feedback means that when Y_t is causing X_{t+1} , X_t is also causing Y_{t+1} . Of course this is a dangerous phenomena, this leads to a circular loop, which make it hard to distinguish which causes which. However, as I am drawing this graph. It seems strange to me why we can't just conditional on Y_t if we just want to learn about its effect on X_{t+1}



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