Multivariate state space methods for official statistics and climate modelling

Impact paragraph

Chapters 2 and 3, and to a lesser extent Chapter 4, focus on the use of state space models to provide more timely, accurate and realistic estimates of Dutch unemployment. This is done by either using Big Data (Google Trends) and/or registry-based data (claimant counts), on top of survey-based data, or by employing the latter two types of data while accounting for their time-varying relationship. Clearly this research work can be beneficial for national statistical offices, who are in charge of publishing this kind of official statistics, and therefore interested in doing so in a precise and timely manner. Additionally, not all countries have data about claimant counts, whereas Google Trends are freely available virtually all over the world and therefore represent a very accessible source of information.

The methods employed in the above-mentioned chapters can also be used to estimate other macroeconomic variables, than unemployment, such as the gross domestic product of a country. Achieving accurate and timely estimates of these variables is important in order to have a better understanding of the current state of the economy, especially in times of economic distress. Moreover, modelling parameters as time-varying, which is relatively easily done with state space models, allows us to discover how the same variables can be affected by important events, such as the burst of a pandemic or economic and financial crises. All this knowledge can be used for policy making by, for instance, central banks.

The econometric methods discussed in Chapter 4 can, potentially, be used to model the same time-changing relationship discussed above, but the chapter itself is purely methodological. As already mentioned several times throughout the thesis, the main purpose of Chapter 4 is to illustrate the research process of trying several, unsuccessful, approaches to answer a research question, before finding the right one. Generally research papers only report the performance of the successful methods and therefore tend to hide all the work that has been done behind them. Sharing it can instead be helpful to provide a more realistic picture of what research entails and hopefully be relieving for

researchers undergoing the same type of struggles. Moreover, it can prevent econometricians from taking the same wrong paths, or allow them to start from where we stopped in case they find a solution to our issues.

Chapter 5 illustrates how to use state space methods for modelling climate variables, specifically air pollutants. Climate change is obviously one of the biggest problems and challenges of our times and it is (fortunately) increasingly catching the attention of scientists from all kind of fields, including econometrics. Climate econometric models are thus becoming a complement to the widely used integrated assessment models in economics, which aim at understanding the relationship between economic and environmental variables. They allow to predict how future climate scenarios can affect the economy, or how future economic scenarios can affect the climate. Chapter 5 therefore brings a small contribution to this field by building an econometric model that can be used to evaluate the effect that hypothetical reductions in traffic intensity (and therefore a type of economic activity) have on pollution. This analysis can be relevant for makers of pollution-reduction policies.