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Know the Present to Understand the Future: Nowcasting and Forecasting the Finnish Economy

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This report concerns the relationship between forecasting and nowcasting (i.e. the production of real-time estimates of key economic indicators), and the developments in terms of nowcasting research and applications in Finland. I first look at few existing nowcasting applications provided by international and Finnish economic institutions. Subsequently, I consider the current Statistics Finland publications lags of real economic activity indicators and argue that there is ample room for improvement in terms of nowcasting and providing more timely estimates. Finally, I describe the current research project, conducted by Statistics Finland and ETLA, aimed at producing faster estimates of real economic activity indicators, and I highlight the methodological and data-related challenges we face. While the project is still in its initial phase, the preliminary results are promising, indicating the possibility of a substantial reduction of the statistical publication lags, at the cost of a minor increase in the revision errors.

Tunne nykyhetki jotta ymmärrät tulevan: Suomen talouden ennustaminen ja reaaliaikainen talousindikaattorimittaus

Raportissa tarkastellaan ennustamisen ja reaaliaikaisten talousindikaattorien (nowcasting) välistä yhteyttä. Keskityn aiheen viimeaikaiseen tutkimukseen ja uusiin sovelluksiin Suomessa. Ensiksi esittelen joitakin reaaliaikaisten talousindikaattorien mittausmenetelmiä, jotka ovat viime vuosina yleistyneet taloustieteellisissä tutkimuslaitoksissa ja muissa vastaavissa instituutioissa Suomessa ja muualla. Sen jälkeen kerron Tilastokeskuksen talouden indikaattorien nykyisistä julkaisuviiveistä. Väitän, että uusien menetelmien ja parempien aineistojen avulla nykyisiä suhdannetilastojen julkaisuviiveja voitaisiin lyhentää merkittävästi. Lopuksi kerron ETLA:n ja Tilastokeskuksen meneillään olevasta tutkimushankkeesta, jossa pyritään kehittämään reaaliaikaista talousindikaattorimittausmenetelmää. Hanke on ollut meneillään vasta jonkin aikaa, mutta alustavat tulokset ovat rohkaisevia. Näyttää, että julkaisuviivetä on mahdollista lyhentää merkittävästi ilman että mittaustarkkuus kovin olennaisesti heikkenisi.

Forecasting is one of the most important activities performed by private and public economic institutions around the world. Short and long-term predictions of key economic indicators, such as the gross domestic product (GDP)

or the unemployment rate, are produced continuously by many different organizations and are carefully put under scrutiny by the public. The importance of forecasting is not limited to the ability to provide an outlook on the direc-

tion the economy is going, giving important information on whether there is a need for a policy intervention or a change in a monetary policy stance. The production of reliable predictions of economic indicators also provides a crucial basis for policy evaluations, meaning that forecasting is necessary in order to verify if the suggested policies and reforms would lead to the desired impact.

In Finland, economic forecasts are provided by many public organizations, research institutes and private firms. The forecasts produced by institutions such as the Ministry of Finance, Bank of Finland or ETLA, are extensively reported in the media and are the topic of intense political and public debate. However, there is one crucial aspect that it is usually disregarded in the discussion, as it is usually assumed to hold when considering economic policy making and forecasting, i.e. whether we have a good knowledge of the current state of the economy or not. If we want to predict the developments of the economy one or two years from now, we need to have a fairly clear idea of the starting point. This issue is not limited to forecasting. A central bank needs to have a timely and precise picture of real economic activity conditions before deciding its monetary policy, and similar information should be taken into account by the legislators before pushing an economic reform. Finally, short and long-term investment and business-related decisions made by private firms rely on an accurate and timely knowledge of the current state of the market. All these examples highlight the importance of nowcasting, i.e. the production of rapid estimates of key economic indicators for the present, the near future and the recent past.

Statistics Finland, as most of the statistical institutes around the world, publishes the first estimates of economic indicators with considerable delays. For example, the Flash estimate of GDP is published 45 days after the end of the quarter of reference. The same goes for the Trend Indicator of Output (TIO), which is the monthly real economic activity indicator that is also published for the first time 45 days after the end of the reference month. An additional problem is that these initial publications are revised substantially, due to the expansion of data sources and statistical smoothing and benchmarking. In the light of these considerations, we see that in the Finnish setting there is am-

ple room for improvement in the production of faster estimates of key economic indicators and nowcasting.

Some interesting nowcasting examples

During the last decade, there has been a considerable effort in order to provide a real-time picture of the conditions of the economy. A growing academic literature has developed around the topic of nowcasting and the use of statistical models which are suitable to a large dimensional setting (i.e. where the data available to researchers and practitioners is abundant). Nowcasting is currently performed in many public and private institutions. Important examples of real-time tracking of economic conditions are the Aruoba-Diebold-Scotti (ADS) index for the US economy (<https://goo.gl/XqBKl2>) and the Euro-coin index (<http://goo.gl/ZyXGl2>) for the Euro Area.

These two indices are particularly interesting because they show how nowcasting can be approached in rather different ways. The ADS index is released daily and it is not directly related to the GDP, even though it provides a picture of the conditions of real economic activity. On the other hand, the Euro-coin index is published at monthly frequency, and it provides early estimates of GDP growth. Another important difference between these two examples is the type of data source. While the ADS index relies on handful of predictors (only seven), the Euro-coin uses a large dimensional dataset that encompasses industrial production indices, surveys information, price indicators and more.

In Finland, there are some interesting examples of nowcasting, which are conducted by different institutions. As mentioned above, Statistics Finland provides the TIO, a monthly economic activity indicator which constitutes the basis for the GDP flash estimates. Interestingly, the TIO can be seen as a nowcast of quarterly GDP, much in line with the Euro-coin, even though it is published with a considerable delay. The production of a monthly real economic activity indicator is not very common in other statistical institutes and Statistics Finland must be praised for providing reliable, high-frequency (compared to the quarterly interval of the GDP) information on the state of the economy. Bank of Finland is also involved in the production of nowcasts, in particular of the trend of the

quarter-to-quarter GDP growth. A nice summary on the methodologies and data that Bank of Finland uses for nowcasting can be found at <https://goo.gl/44eqSs>. However, Bank of Finland does not yet publish their nowcast projections regularly, at this point in time.

Etla provides daily nowcasts for the unemployment rate (<https://goo.gl/adqLWo>) and for the housing-price index (<https://goo.gl/G0ekSo>), using statistical methodologies which rely on big data. In particular, both models use Google trends and searches data to provide short-term forecasts of the aforementioned indicators. A thorough description of this methodology can be found at <https://goo.gl/xOywZU>.

The way forward: modernizing early estimates

Statistics Finland and Etla have recently started to collaborate on a research project, part of an international European Statistical System project on the use of big data and the creation of faster estimates of economic indicators (<https://goo.gl/tlTnDU>), with two main objectives. Firstly, the work aims at finding methods and techniques which could help in reducing the publication lag of TIO considerably, by around 20 days. Secondly, we want to take advantage of this faster accumulating information set, in order to produce nowcasts of the year-on-year quarterly GDP growth.

To do this, we rely on firm-level data on the sales of a large sample of Finnish firms, called the sales inquiry. This data is accumulated fairly rapidly after the end of the reference month, giving a timely and continuously accumulating information set. It is extremely important to highlight that these micro-level data are actually the first hard data, regarding real economic activity, available for the Finnish economy. However, these data present a number of challenges. Firstly, they are large dimensional, which implies that we need appropriate statistical models. Moreover, this firm-level information represents a small fraction of total business activity, characterized by an over-representation of large firms. Finally, firm-level data are inherently noisy, where firm-level idiosyncratic shocks can affect considerably the performance of an individual enterprise. On these last two points, it is important to notice that the Finnish economy is highly granular, i.e. the activities of

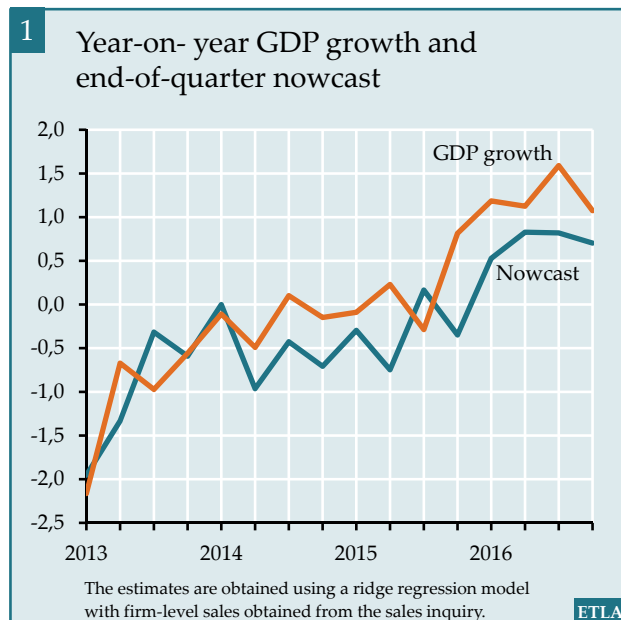
large companies account for a sizable share of GDP, implying that firm-level shocks to larger enterprises could have a sizable impact on Finnish macroeconomic conditions (see Fornaro and Luomaranta, 2016). In the light of these considerations, we believe that the sales inquiry provides an extremely interesting (albeit challenging) source of data, in order to provide a timely picture of Finnish economic activity.

In addition to the sales inquiry, we are considering other data sources such as wages data (accumulated at a slightly later date compared to the inquiry), confidence indices released by EK and Statistics Finland, and a VAT dataset which includes a much larger set of firms (albeit it is available with a long delay). We are considering a large list of statistical models which are capable of handling information rich settings such as ours. Examples of these models are the dynamic factor model, ridge regression and other shrinkage-based methodologies (for a short technical summary on these techniques, the interested reader can refer to <https://goo.gl/z1JyHL>). While the data we use to compute these rapid estimates is large (amounting to almost 1,000 predictors for certain periods), it does bear some differences from the big data sources such as the ones used in the ETLAnow project. Even though data extracted from twitter feeds or google searches can be useful in certain settings, we are a bit skeptical of using big data in the estimation of such delicate indices such as the GDP (or the TIO), especially due to possible breaks in the relationship between big data information and real economic indicators at different points in time. Moreover, we believe that having a data source (firm-level sales data) characterized by a well-defined economic relationship with the target indicators (GDP growth) is beneficial to the user, in our application.

The project is still at its early stages and a proper assessment of the tradeoff between the improved timeliness and the increase in revision error must be done, before implementing new procedures inside the production of statistics. However, the initial results have been promising, highlighting small increase in the revision errors compensated by a substantially shorter publication lag. For example, below we report the year-on-year GDP growth estimates published by Statistics Finland 60 days after the end of the quarter, together with the nowcasts computed 15 days before the end of the same

reference period. In this case, the nowcasts are obtained using the ridge regression methodology. We show the results for the period going from the first quarter of 2013 until the last quarter of 2016.

As it can be seen from Figure 1, our nowcasts provide a reasonable estimate of GDP growth, especially once we consider the relatively small information set we use in order to compute them and the additional timeliness in the publications (around 2 months faster, compared to the flash estimates computed 45 days after the end of the quarter). There are still a number of issues to tackle. For example, our data lacks a lot of potentially interesting information coming from small and medium size enterprises. The VAT data we are planning to use can solve



this problem, but they are available with a considerable delay after the sales inquiry. Moreover, the models we adopt might not benefit from the inclusion of additional sources of information, given the possible noise that higher dimensional dataset would bring. Forecast combinations methodologies could be a beneficial route to investigate in this sense.

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