

## 2. Nowcasting for economic policy and beyond

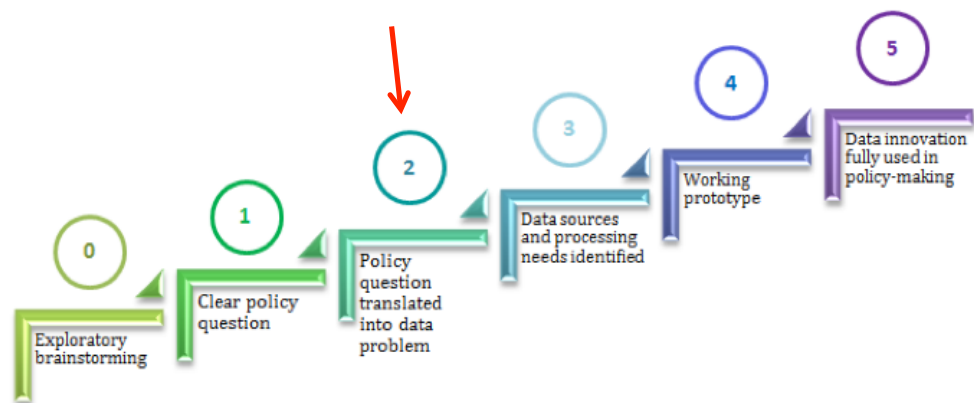
### 2.1 Focus of the use case

This use case reflects on the opportunity provided by the technique of nowcasting for support in policymaking in the economic sphere through real-time monitoring.

The term ‘nowcasting’ is a contraction of ‘now’ and ‘forecasting’. Nowcasting is originally a term used among meteorologists to forecast near-term weather conditions. It is a forecasting methodology that has become increasingly popular also in economics. Nowcasting can be summarised as “the exploitation of (...) information which is published early and possibly at higher frequencies than the target variable of interest in order to obtain an ‘early estimate’ before the official figure becomes available”.<sup>9</sup>

From a design perspective, this use case is to be placed at level 2, i.e. the level of ‘policy question translated into data problem’ (Figure 5). Nowcasting of economic trends has reached higher maturity levels (e.g. macroeconomic indicators such as GDP and unemployment rates) but this use case looks beyond economic nowcasting. Still, the use case considers the potential use of nowcasting based on a set of assumptions and conceptual policy needs in economic policy.

Figure 5 Use case readiness level



### 2.2 The rationale

The potential value of nowcasting lies especially in its capacity to help increasing responsiveness of decision-making in areas with moving targets and quick intervention cycles. Nowcasting methods are expected to add value in those cases where the data collection and computing of the main variable is too slow a process compared to the needed or desirable pace of decision-making. Essentially, it is a statistical method that can be applied to a broad range of policy fields and purposes.

Although nowcasting typically refers to estimating complex variables in the short-term, it can be applied also to infer sentiment data in real-time or close to real-time, in substitution of, for example, surveys. This idea of using nowcasting for public consultations is closely connected to the methodologies of text and sentiment mining, (described in a separate use case on text mining for public consultations).

<sup>9</sup> Banbura M., Giannone D., Modugno M., Reichlin L (2013). *Now-casting and the real-time data flow*. European Central Bank Working Paper Series No. 1564 / July 2013. Frankfurt am Main. <https://www.ecb.europa.eu/pub/pdf/scpwps/ecbwp1564.pdf?063728303566b9f5aed51daa98696a87> (accessed September 4th 2015)

As any forecasting methodology, nowcasting is most often based on predictive analytics and models that are applied to real-time or close to real-time monitoring data of complex variables in order to define an estimate.

First used in meteorology for weather forecasts in the 0 to 12-hour range, nowcasting is used increasingly in economic policy monitoring and setting, notably by central banks. Central banks all over the world are exploring nowcasting methods in order to improve their monetary policy responses to such developments. The main aim consists in assessing changes in the economy during or shortly after they occur, which would enable more timely policy interventions. For instance, it took almost a year to conclude from the published data that the US economy had entered a recession in 2007. The Federal Reserve Bank of Cleveland, for example, provides daily nowcasts of inflation by using a model that provides estimates based on data series at different frequencies, such as daily oil prices and weekly gasoline prices.<sup>10</sup> The Federal Reserve Bank of Atlanta's GDPNow forecast model, instead, estimates GDP growth using an aggregated statistical model based on forecasts of GDP subcomponents that are published more frequently than GDP itself.<sup>11</sup>

Statistical offices are exploring nowcasting as a tool to reduce time lags in statistics that are essential to policymakers. The UK Office for National Statistics, for instance, has developed a methodology to produce early estimates of the households' disposable income, which is an important indicator for economic well-being.<sup>12</sup> In addition to statistical forecasts, some (private) providers of nowcasts also incorporate results from consumer and business surveys in order to improve their estimates of economic indicators.<sup>13</sup>

Epidemiology represents another field of application for nowcasting. A prominent example is Google Flu Trends that nowcasts the extent of influenza based on search queries related to the illness.

The internet, and more specifically web searches, as well as social media are increasingly explored as potential sources for nowcasting data. Google Flu Trends illustrates the potential use of internet search data (and the limitations of these data and predictive algorithms). Another example is using search queries such as "file for unemployment", "unemployment office" etc. in order to nowcast the US Department of Labor's weekly report on the number of people that filed for unemployment benefits.<sup>14</sup> Studies also explored similar applications of Google searches predicting unemployment in Finland<sup>15</sup>, but also Germany and the UK.

Researchers have also started incorporating data obtained from social media into their nowcasts. For example, signals can be derived about labour market flows such as job loss, job search and job posting by counting job-related phrases in Twitter postings.<sup>16</sup> In a recent project, the United Nations Global Pulse initiative explored how Twitter data can be used to nowcast food prices in Indonesia.<sup>17</sup> The project successfully

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<sup>10</sup> <https://www.clevelandfed.org/our-research/indicators-and-data/inflation-nowcasting.aspx>

<sup>11</sup> <https://www.frbatlanta.org/cqer/research/gdpnow.aspx?panel=2> (accessed on October 28<sup>th</sup> 2015).

<sup>12</sup> <http://www.ons.gov.uk/ons/rel/household-income/nowcasting-household-income-in-the-uk/initial-methodology/nowcasting-household-income-in-the-uk--initial-methodology.html?format=print>

<sup>13</sup> One leading company in this field is UK-based „Now-Casting.com“, founded by academics.

<sup>14</sup> Choi H.; Varian H. (2011). Predicting the Present with Google Trends. Working Paper. <http://people.ischool.berkeley.edu/~hal/Papers/2011/ptp.pdf> (accessed on September 4<sup>th</sup> 2015).

<sup>15</sup> J. Tuhkuri, Big data: Google Searches Predict Unemployment in Finland, <https://www.etla.fi/en/publications/33195/> (2014).

<sup>16</sup> Antenucci D.; Cafarella M., Levenstein M., Ré C., Shapiro M., (2014). Using Social Media to Measure Labor Market Flows. NBER Working Paper No. 20010 <http://www.nber.org/papers/w20010> (accessed on September 7<sup>th</sup> 2015).

<sup>17</sup> UN Global Pulse, „Nowcasting Food prices in Indonesia using Social Media Signals“, Global Pulse Project Series no. 1, 2014. [http://www.unglobalpulse.org/sites/default/files/UNGP\\_ProjectSeries\\_Nowcasting\\_Food\\_Prices\\_2014.pdf](http://www.unglobalpulse.org/sites/default/files/UNGP_ProjectSeries_Nowcasting_Food_Prices_2014.pdf) (accessed on October 28<sup>th</sup> 2015).

demonstrated that near real-time social media signals (such as a tweet about the price of food paid at a market) could function as a proxy for actual daily food price statistics, at least in a country such as Indonesia, one of the most-tweeting countries in terms of Twitter users and generated content.

“Orchestrating Information Technologies and Global Systems Science for Policy Design and Regulation for a Resilient and Sustainable Global Economy” (SYMPHONY) is a project co-funded by the EU under the 7<sup>th</sup> Framework programme that researched nowcasting applications in the policy context. It was funded from 2013 to 2016 and developed a framework for the design of a policymaking tool based on an agent-based macroeconomic model. The approach described on the project website relates to nowcasting in the sense that social media and other web-based information are used to infer citizens’ economic expectations about the economy.<sup>18</sup>

### 2.3 The policy context

This use case sets the potential value of an extended use of nowcasting against different contexts. On the one hand, there is the increasing complexity of economic indicators that need to be considered in economic forecasts, going beyond GDP and including well-being and broader quality of life indicators. On the other hand, there is the increasing pace of change in society and the growing need for ‘near real-time’ data among policymakers, in particular in the policy design stage.

Nowcasting can also act as a tool for macroeconomic monitoring of the effects of policy interventions. Compliance monitoring is a ‘relatively straight-forward’ field of nowcasting application for European policies. Nowcasting can therefore support the Europe 2020 strategy by enabling an increase in efficiency of EU economic governance and surveillance of economic and fiscal policies in the Member States.

The EU institution most likely to use nowcasting is the European Central Bank, which has already produced a working paper on the use of nowcasting for the real time assessment of the state of economy.<sup>19</sup>

### 2.4 The data process: from data collection to analysis and visualisation

#### Data sources

Sources for the collection of data that can be used for nowcasting exercises range from web traffic data, internet searches and social media (such as Twitter, Blogs) to news media and Wikipedia queries.

For nowcasting to be effective, data must be available in near-real time and with frequent updating cycles. This is the case for a range of economic indicators produced by public bodies across the world, including the statistical offices of EU Member States and Eurostat. The enrichment of statistical models by building on these economic indicators through surveys, transaction data, stock market data, etc., however, would entail commissioning these studies or buying the data from private brokers. Policymakers can also mandate data owners to make their data available in high frequency, in order to enable use for nowcasting applications. Such data could be especially important for nowcasting applications in supervision and regulation, for example in the context of the European Single Supervision Mechanism for banking supervision.

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<sup>18</sup> <http://www.projectsymphony.eu> (accessed on September 4<sup>th</sup> 2015).

<sup>19</sup> Banbura M., Giannone D., Modugno M., Reichlin L (2013). *Now-casting and the real-time data flow*. European Central Bank Working Paper Series No. 1564 / July 2013. Frankfurt am Main. <https://www.ecb.europa.eu/pub/pdf/scpwps/ecbwp1564.pdf?063728303566b9f5aed51daa98696a87> (accessed September 4<sup>th</sup> 2015).

As for the geographical scope, data would have to be analysed by the geographical location of the target group, which would ideally be a reflection of EU geography, or a large area, when considering global trends in economics, well-being, health, etc.

### Data analytics and visualisation

Machine learning is an essential component of nowcasting based on social media or internet search data sources. It is needed for picking up trends as early as possible, but also for ensuring a correct processing and interpretation of vast amounts of key words, opinions, statements, links, etc.

Data analytics require “medium powered” computing platforms and tools, such as centralized data servers and statistical analysis software.

### 2.5 Reflections on challenges and next steps

As this use case shows, nowcasting is increasingly being used in the economic policy realm. Especially **central banks** are exploring or testing nowcasting applications.

In November 2015, **Eurostat** launched its Big Data for Official Statistics Competition that calls on contributors to nowcast a range of economic indicators such as unemployment level, inflation and even tourism number of nights spent at hotels using big data sources.<sup>20</sup>

Although the term nowcasting in its true sense refers to **forecasting** the near future, more and more applications start to use **real-time data** (e.g. from social media) to detect events that are occurring now. Japanese researchers, for instance, used tweets (which they call “social sensors”) to detect earthquakes and send out notifications.<sup>21</sup> As such, the concept of nowcasting is blurring the lines between forecasting and monitoring, especially when similar datasets are being used.

An important issue to bear in mind is that nowcasting always depends on the **accuracy of the real-time information**. For instance, the example of Google Flu Trends cited above shows that nowcasting can lead to flawed conclusions. Google Flu Trends proved to persistently overestimate flu prevalence because, amongst other reasons, the search queries used by people seemed to be biased.<sup>22</sup>

There are also **privacy** issues with nowcasting, especially when used for public consultations. People might state opinions or comments on social media but would not want to have them included in any public consultation process.

Finally, the **challenges in data collection and modelling** for nowcasting are manifold and a first challenge is the identification of observable factors that influence the main variable and which, factored into a reliable conceptual model, allow for extrapolation and an estimate of the dependent variable. The question whether it is possible to identify such ‘observable factors’ and especially to monitor and measure them is critical for decision-makers. Only when the conceptual model is valid, the data sources are reliable and the data collection and analysis are sound, nowcasting can be used by policymakers.

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<sup>20</sup> [http://www.cros-portal.eu/sites/default/files/Call\\_BDCOMP\\_1.pdf](http://www.cros-portal.eu/sites/default/files/Call_BDCOMP_1.pdf) (accessed on November 12<sup>th</sup> 2015)

<sup>21</sup> Sakaki, T., Okazaki, M., and Matsuo, Y. (2010) Earthquake shakes Twitter users: real-time event detection by social sensors. In Proceedings of the 19th international conference on World Wide Web. ACM, New York, pp. 851-860. <http://www.ymatsuo.com/papers/www2010.pdf> (accessed on November 12<sup>th</sup> 2015)

<sup>22</sup> Lazer D., Kennedy R., King G., Vespignani A. (2014). The Parable of Google Flu: Traps in Big Data Analysis. Science. Vol. 343 no. 6176 pp. 1203-1205. DOI: 10.1126/science.1248506.

### **Further reading**

Banbura M., Giannone D., Modugno M., Reichlin L (2013). *Now-casting and the real-time data flow*. European Central Bank Working Paper Series No. 1564 / July 2013. Frankfurt am Main.

<https://www.ecb.europa.eu/pub/pdf/scpwps/ecbwp1564.pdf?063728303566b9f5aed51daa98696a87>

Choi H.; Varian H. (2011). Predicting the Present with Google Trends. Working Paper. <http://people.ischool.berkeley.edu/~hal/Papers/2011/ptp.pdf>

Tuhkuri J. (2014), Big data: Google Searches Predict Unemployment in Finland, <https://www.etla.fi/en/publications/33195/>