



## Tracking the economy during the Covid-19 pandemic: the contribution of high-frequency indicators

The Covid-19 crisis is not only a shock to public health, it has also triggered major and brutal upheavals on an economic and social level. To supplement the standard measures for tracking the economy, based on monthly or quarterly monetary, financial and business-related statistics, economists have turned to alternative indicators derived from so-called “open” data (pollution, electricity consumption, Google Trends, Twitter). This additional information has made it possible to evaluate levels of household confidence, and to measure new behaviours as well as the economic impact of the shock, especially where official data were not available. As part of its tracking of the Covid-19 crisis and notably the lockdown, the Banque de France has designed a series of dashboards incorporating indicators derived from open data. This article describes the main ones used.

Jérôme Coffinet, Jean-Brieux Delbos, Vojtech Kaiser, Jean-Noël Kien, Etienne Kintzler, Ariane Lestrade, Michel Mouliom and Théo Nicolas  
Data and Analytical Services Directorate

JEL codes  
E21, G51

Jean-Charles Bricongne and Baptiste Meunier  
Economic Affairs and International Cooperation Directorate

**-85%**

decline in mobility in France at the start of the lockdown compared with a normal period

**-92%**

fall in air traffic in France in mid-April compared with the same period in 2019

**35%**

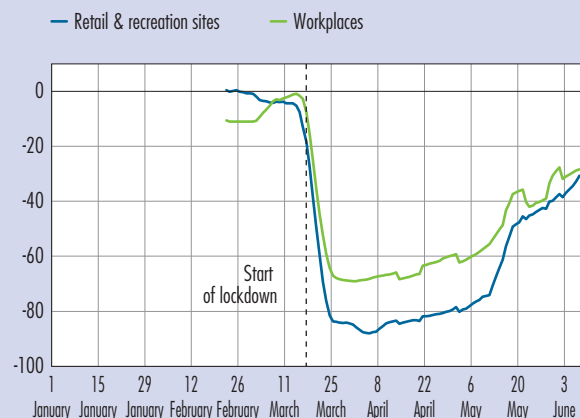
average share of tweets posted by major corporations that mentioned Covid-19 between the end of April and start of May 2020

**83%**

share of French households who declared they were worried about the coronavirus at end-May 2020

### Mobility in France according to Google Mobility Indices

(% change versus baseline = average from 3 to 6 February 2020, 7-day moving average)



Sources: Google Covid-19 Community Mobility Reports, OAG Aviation Limited, World Air Quality Index, Google Trends, InsideAirbnb, authors' calculations.



Due to its brutality, suddenness and multifaceted nature, the Covid-19 crisis has triggered unprecedented shifts in economic activity and household behaviour. To analyse these trends rapidly, institutions such as the Banque de France have made use of high-frequency data – in other words data published on a weekly or daily basis. This has allowed them to get around the problem of the long publication times for official data, and rapidly measure the impact of the economic shock. It has also helped to provide real-time insight into households’ anxieties, behaviour and expectations, and to identify their main concerns, alongside those of the business community. The Banque de France has thus been able to adapt its responses as a public service provider to the expectations of households and businesses – be this in its assistance of overindebted households or in its provision of credit mediation to businesses. This article presents a selection of the indicators used, focusing in particular on household behaviour and on the tracking of the global economy.

### 1 Covid-19: a growing source of concern for internet users

#### The coronavirus is a major topic of discussion on the internet

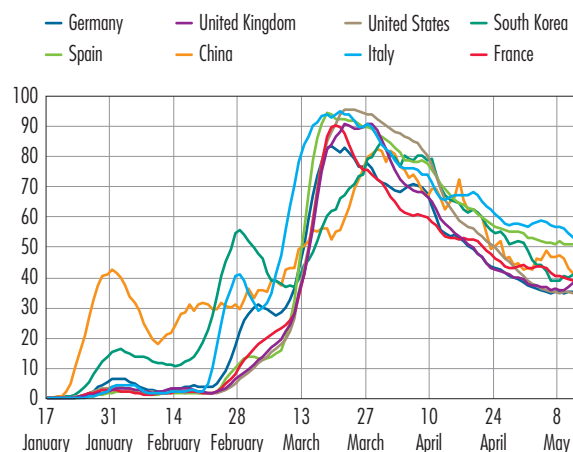
Given the far-reaching and unexpected nature of the health crisis, monitoring how much attention internet users pay to the virus provides crucial information on anxiety and confidence levels among households, and hence on their economic behaviour, and especially their consumption.

The history of global Google searches for the keyword coronavirus and derivatives such as Covid and Covid-19, shows a clear spike in volumes in China from the end of January 2020, then in South Korea and Italy from the end of February, and in other countries from the middle of March. Initially, the lack of knowledge about the virus led to a significant amount of learning behaviour on the part of households. Interest then plateaued at the end of March and throughout the first week of April, before gradually declining thereafter (see Chart 1). It should be noted that levels in individual countries are not comparable (see box).

#### CI Indicators of searches and mentions of the keyword “coronavirus” on Google and Twitter

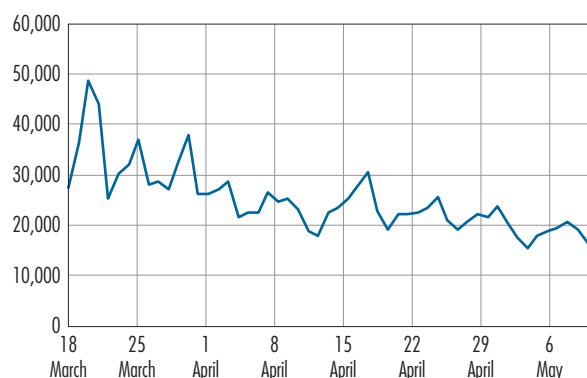
##### a) Index of the popularity of Google searches for the keyword “coronavirus” and its derivatives by country

(17 January-11 May 2020)



##### b) Tweets mentioning the keyword “coronavirus” – France

(18 March-10 May 2020, in number of units)



##### c) Keywords associated with tweets on “coronavirus” – France

(1-10 May 2020)



Sources: Google, Twitter.



An analysis of the **content of Twitter messages** (tweets) posted in France provides a more refined view of internet users' perception of the period from 18 March to 10 May. The evolution of the number of tweets mentioning coronavirus shows clear spikes on 20, 25 and 30 March, all of which follow dates of major announcements linked to the lockdown (respectively its introduction, tightening

and extension). Similarly, the peak of 29 April corresponds to the announcement that masks would go on sale to the general public as of 11 May, while that of 7 May follows the publication of the colour-coded map of France classifying different areas according to their level of health risk (see Chart 1).

### BOX

#### Data from alternative sources – a wealth of information

The so-called “open” data used in this article have three main characteristics:

- they are not included in the official statistics published by the public institutions and authorities responsible for tracking the economy;
- they can be accessed easily and free of charge via the internet;
- they are available at a high frequency, generally at least daily.

Open data are essentially statistics derived from social media platforms (Twitter), the internet (Google searches), granular open data databases (e.g. statistics linked to energy and transportation), and high-frequency consumer surveys carried out by private polling institutes.

Open data – be they completely new data or information that already existed but was previously little-used in economies with developed statistical systems – have proved extremely useful during the Covid-19 crisis for tracking fluctuations in economic activity. Numerous economists have explored different categories of these statistics, such as bank card data (Carvalho et al., 2020), electricity consumption (Cicala, 2020), weekly unemployment figures (Coibion et al., 2020), or the real-time location of global cargo ships (Cerdeiro et al., 2020). More broadly, Chetty et al. (2020) gathered data from private partners on several different topics (unemployment, income, consumption, mobility) to nowcast US economic activity.

It should be noted, however, that in the case of data from social media or search engines, the information only covers households with access to internet rather than all households in the population. As a result, data may be biased due to inequalities in access to digital tools. Nonetheless, data on sentiment among internet users (essentially households and, to a more marginal extent, firms) provide particularly interesting indicators.

The issue of cross-country comparability also needs to be taken into account. Certain indicators are calculated in relative terms for the country for which they are published (e.g. Google search data where the maximum value for each country is set at 100). Other indicators (such as electricity consumption and air pollution) need to be adjusted statistically for local conditions, structural factors or divergences in long-run trends in order to be comparable.

The appendix provides further details on the methodology and data sources used.



We used data mining techniques<sup>1</sup> to analyse the terms most frequently used in tweets containing the keyword coronavirus. The main concerns among Twitter users appear to relate to the pandemic (“virus”, “pandemic”, “epidemic”, “country”, “world”, “United States”, “China” and “Africa”), its spread (“new cases”, “confirmed cases”) and the public health implications (“health crisis”, “fight”), coupled with the immediacy of the crisis (“today”, “now”), its timing (“April”, “month”), the role of states (“government”) and the measures taken in response (“lockdown”).

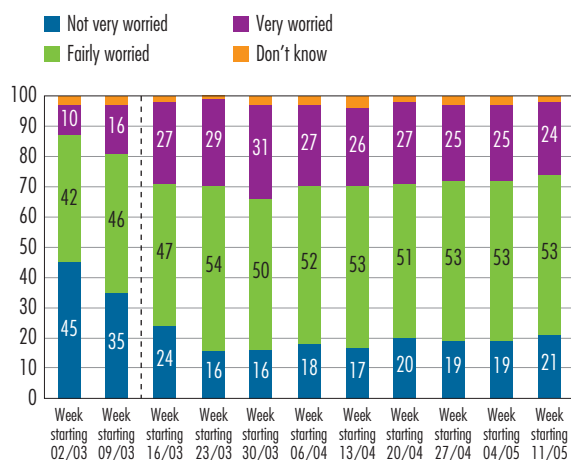
A daily survey by OpinionWay, the results of which are available online, shows levels of anxiety among French households over the period. The vast majority remained worried for the entire duration of the eight-week lockdown (“very worried”: 25%). In the week after the lifting of the lockdown (11 May), there was no sharp change in household sentiment, and the previous main trends remained in place. However, the share of households declaring themselves “not very worried” shifted slightly over the period, rising by 1 percentage point per week from the second week of the lockdown (see Chart 2).

Given this high overall level of anxiety, it is important to understand how the sources of concern evolved over

the period. An analysis of Google searches and social media platforms shows that French people searched for information on the symptoms of coronavirus, the health crisis and related disputes (chloroquine, masks and hand sanitiser), although to differing extents depending on the news flow and the progression of the pandemic. On social media, concerns about the deadliness of the virus came up very frequently and relatively consistently, whereas talk of chloroquine peaked at around the end of March then declined sharply thereafter (see Chart 3).

### C2 Level of concern about the coronavirus

(%)

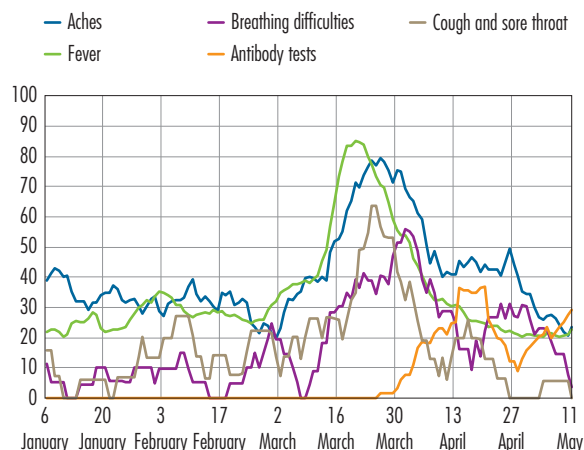


Source: OpinionWay survey.

### C3 Google searches and tweets regarding the public health situation

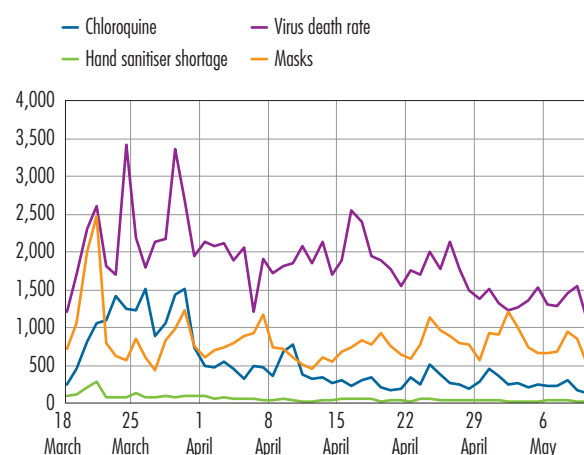
#### a) Google searches for symptoms of and testing for the coronavirus

(6 January-11 May 2020)



#### b) Tweets mentioning a keyword linked to the health crisis

(18 March-10 May 2020, in number of units)



Sources: Google, Twitter.

<sup>1</sup> For example, natural language processing, which combines linguistics techniques with artificial intelligence to facilitate processing.





In parallel, businesses have adapted their communication to the new environment. To study this phenomenon, we analysed the Twitter accounts of the largest French corporations (representative sample of the SBF 120 index)<sup>3</sup> from the beginning of March onwards. The charts obtained show that levels of concern and difficulty increased sharply when the lockdown was introduced, and have since remained high (see Chart 6). In terms of overall trend, the

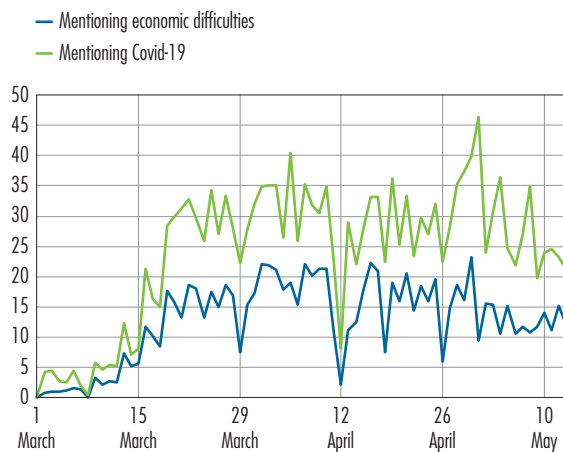
intensity of large corporates' communication on Covid-19 appears to have declined slightly at the end of the period, potentially marking a very slow return to more normal communication.

A study of tweets by all users (individuals and corporates combined) highlights the use of the keyword "help for businesses". Among the different schemes mentioned, the most frequently cited appears to be the "state-guaranteed loan". Other "accompanying measures" for businesses subsequently appear in tweets, such as the "deferral of taxes and social security contributions", "short-time work", "teleworking", "fiscal measures" in general, and the creation of a "solidarity fund". The Twitter analysis also highlights the main institutions seen as being associated with this "help for businesses". The Banque de France is seen as being one of the main contributors, notably via its "credit mediation"; the Ministry of the Economy, Bpifrance and Urssaf also stand out (see Chart 6).

### C6 Perception of the impact of Covid-19 on businesses

#### a) Share of tweets by SBF 120 companies

(1-13 May 2020, %)



#### b) Keywords associated with tweets on "help for businesses"

(18 March-10 May 2020)



Source: Twitter.

## 2 The effects of the lockdown are real and can be measured physically

### The lockdown and its lifting: two key milestones in the management of the health crisis

The announcement of the lockdown and of its subsequent lifting (16 March and 13 April respectively) triggered an immediate reaction on the part of internet users (see Chart 7a).

Initially (see Chart 7b), the main responses concerned the timing, duration and geographical scope of the confinement ("world"). Then in the ten days preceding its lifting, attention increasingly focused on how this next phase was being prepared. Throughout the entire lockdown period, internet users also appear to have accepted the health measures fairly readily, as terms associated with restrictions on individual freedoms are not among the most frequently cited. On an institutional level, the lockdown appears to have been associated more with the government than with other institutions or authorities (see Chart 7c).

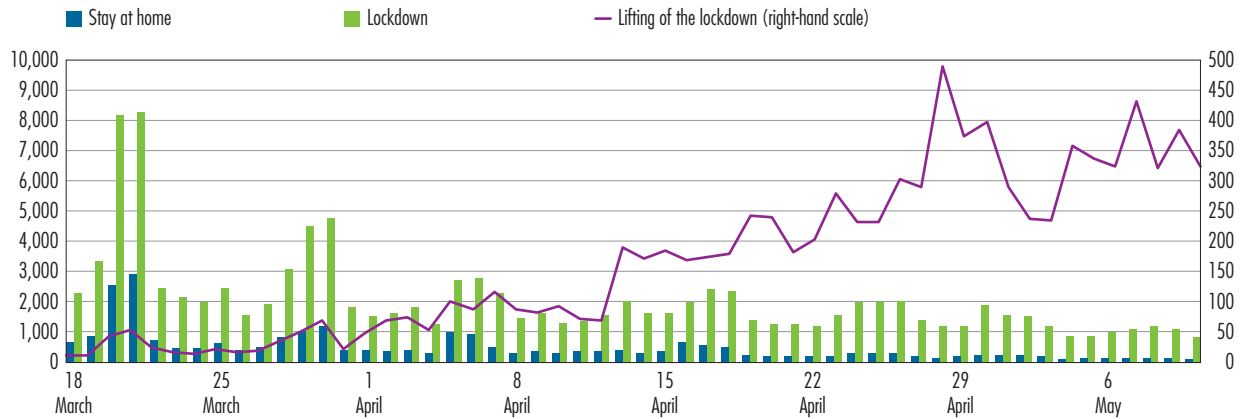
<sup>3</sup> See definition in the appendix.



### C7 Analysis of tweets on the lockdown and its lifting

#### a) Tweets on "stay at home", "lockdown", "lifting of the lockdown"

(18 March-10 May 2020, number of units)



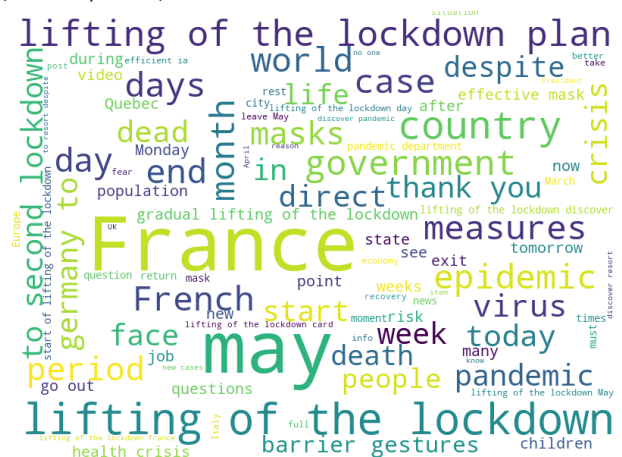
#### b) Keywords associated with tweets on "lockdown"

(12-17 April 2020)



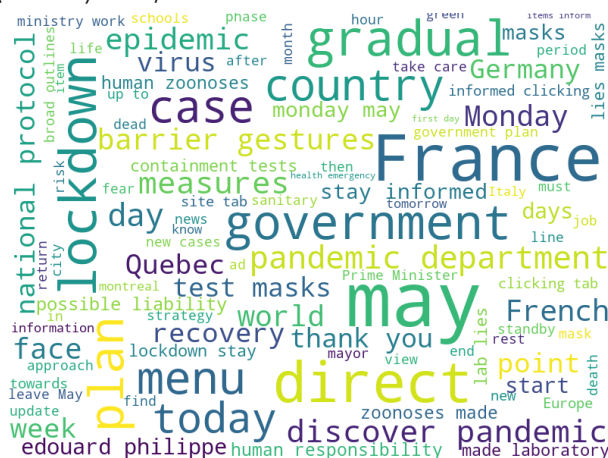
#### c) Keywords associated with tweets on "lockdown"

(1-10 May 2020)



#### d) Keywords associated with tweets on "lifting of the lockdown"

(1-10 May 2020)



Source: Twitter.



The lifting of the lockdown also triggered responses regarding its timing (“May”, “today”, “gradual” lifting), with some marginal references to the associated health measures (tests, masks, barrier gestures). There were also concerns about national problems (“France”) and, on an institutional level, about the “government” (see Chart 7d).

### The effects of the lockdown on the economy can be measured physically

A first group of high-frequency indicators are those provided directly, and on an exceptional basis, by certain suppliers during the Covid-19 crisis (see Chart 8 below).

- **Google** provides a Google Mobility Index, which is **based on Google Maps data on the number and length of visits to certain locations**. In France, movement to leisure sites and places of work fell by 85% during the lockdown (in other words, the observed level was just 20% of that recorded prior to the lockdown). After the lockdown was lifted mobility increased, but in June it was still 30% below its baseline level (see Chart 8b).
- **OAG Aviation Limited – which compiles data on air traffic** – also provides data on the number of passenger and freight flights during the crisis. At the global level, flights have fallen by 65% compared with 2019. In France, the decline is even more severe, with the number of flights leaving the country down by 92%.

Other high-frequency indicators (see Chart 8) show a clear year-on-year slump at the start of the lockdown, followed by a rebound at the end of April. These indicators are also derived from open source data but, unlike Google Mobility and OAG Aviation Limited data, they have to be processed statistically before being used (see appendix).

- **The Google Trends Index, which shows the popularity of Google searches linked to consumer spending**, dropped sharply following the lockdown in the categories “leisure” and “transportation”. This is a logical consequence of the closure of public places and reduction in transport provision. Conversely, the category “food and tobacco” hit a peak in popularity at the time of the lockdown – which potentially reflects panic-buying on the part of households to stockpile goods. Since the end of April, the Google Trends Index has risen in all categories.
- **Air pollution** (corrected for the impact of temperatures, atmospheric pressure, wind speed and air humidity) also declined with the introduction of the lockdown. Nitrogen dioxide (NO<sub>2</sub>: a gas produced by the combustion of fossil fuels in industry and transportation) pollution dropped well below historical levels, reflecting the stoppage of industrial sites and of a portion of transportation activities. The decline can be seen in all French towns, especially Paris and Lyon.
- Tourism also collapsed. **The number of new reviews posted on Airbnb** – an indicator of the number of stays booked and completed via the platform – plunged by 99%, meaning that activity all but evaporated. Unlike the other indicators, which increased again once the lockdown was lifted, this one remained flat at end-April due to the continuing shutdown of the tourist industry.

These indicators are available for a large number of countries:<sup>4</sup> Google Mobility and Google Trends Indices are available for nearly all countries in the world, air traffic data cover the largest countries, hourly electricity consumption is available for nearly all advanced economies,<sup>5</sup> air pollution for 380 cities in emerging and advanced economies, and Airbnb data for all major global tourist destinations. It is therefore possible to draw lessons and comparisons from these indicators for all other major countries.

<sup>4</sup> The Banque de France publishes an online high-frequency data dashboard for the main global economies at <https://www.banque-france.fr/statistiques> (French only).

<sup>5</sup> For electricity consumption in France, see Castelletti (B.), Delorme (M.), Diev (P.), Kalantzis (Y.), Lalliard (A.) and Mogliani (M.) (2020), “Covid-19 and monitoring economic activity: the contribution of high-frequency data”, *Eco Notepad*, Banque de France, July, <https://blocnotesdeleco.banque-france.fr/en>

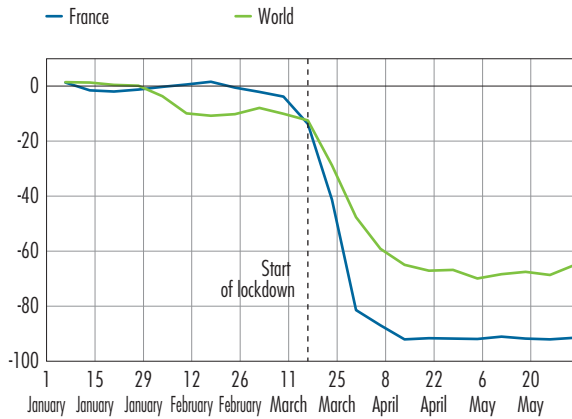




### C8 High-frequency indicators – France

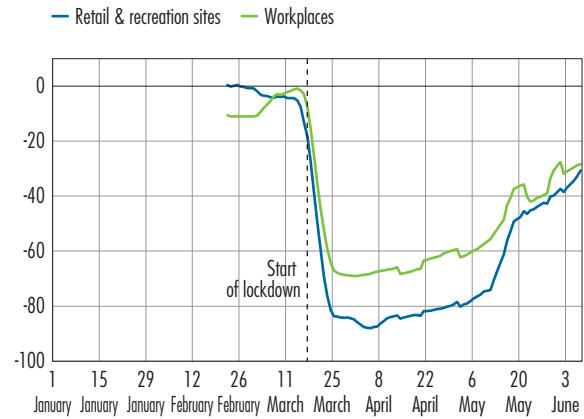
#### a) Number of flights per week leaving the country

(% change versus 2019)



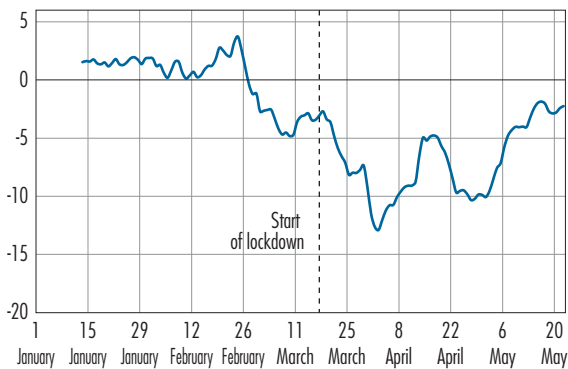
#### b) Mobility in France according to Google Mobility Indices

(% change versus baseline = average from 3 to 6 February 2020, 7-day moving average)



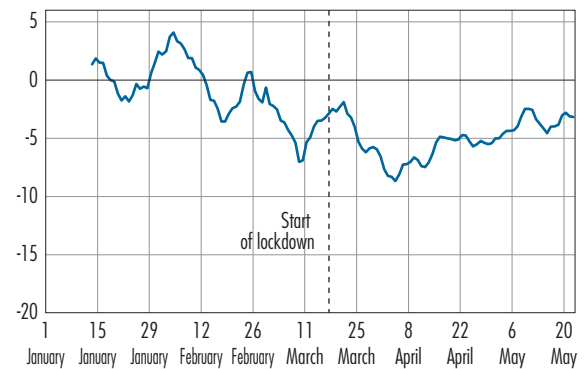
#### c) NO<sub>2</sub> pollution in Paris, corrected for meteorological data

(difference versus 2019, 14-day moving average)



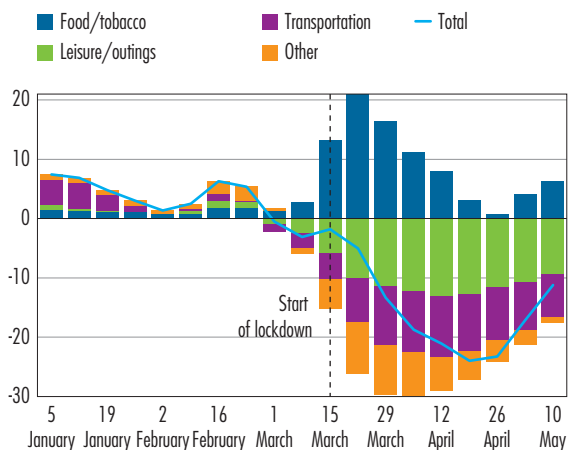
#### d) NO<sub>2</sub> pollution in Lyon, corrected for meteorological data

(difference versus 2019, 14-day moving average)



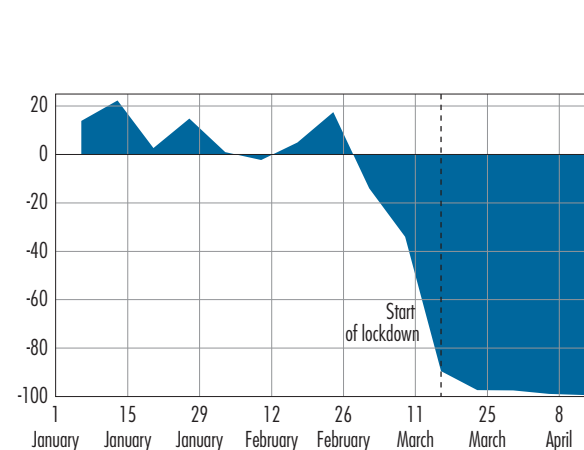
#### e) Popularity of searches linked to consumer spending according to Google Trends Indices

(% change versus 2019, 2-week moving average)



#### f) Number of new reviews on the Airbnb platform in Paris

(% change versus 2019)



Sources: Google Covid-19 Community Mobility Reports, OAG Aviation Limited, World Air Quality Index, Google Trends, InsideAirbnb, authors' calculations.



The indicators also make it possible to analyse the different stages of the lockdown lifting in each country (see Chart 9).

- A very gradual return to normal in China as of end-March: after a very sharp drop, NO<sub>2</sub> pollution returned to its 2019 level in Wuhan at the start of June. Air traffic also began to rise again as of end-February, although it was still 30% below its 2019 level in June 2020.
- Italy's economic activity has also been picking up. In northern Italy, electricity consumption during peak

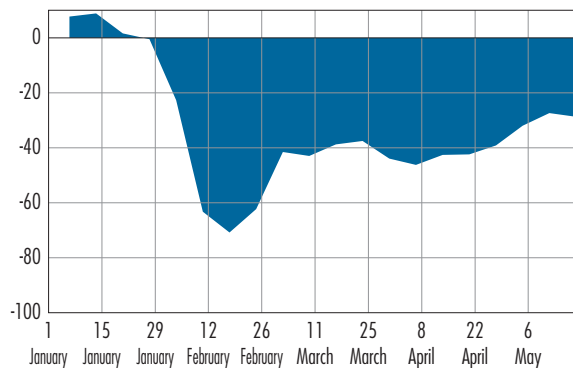
hours (corrected for temperatures) dropped by 40% after the lockdown. This reflected the abrupt stoppage of industrial and commercial activities, which was not offset by the rise in consumption by households that were confined to their homes. The indicator gradually began to increase again after 14 April (reopening of non-essential manufacturing industries and shops) and 4 May (phase 1 of the lockdown lifting).

- According to Google Trends Indices for various countries, household consumption bottomed out at end-April and has since been improving.<sup>6</sup>

### C9 High-frequency indicators – China, Italy, United States

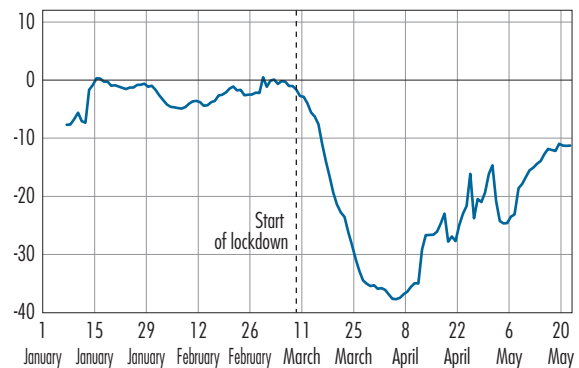
#### a) Number of flights per week leaving China

(% change versus 2019)



#### b) Electricity consumption in northern Italy, corrected for temperatures

(% change versus 2019, consumption from 7 a.m. to 7 p.m., 7-day moving average)



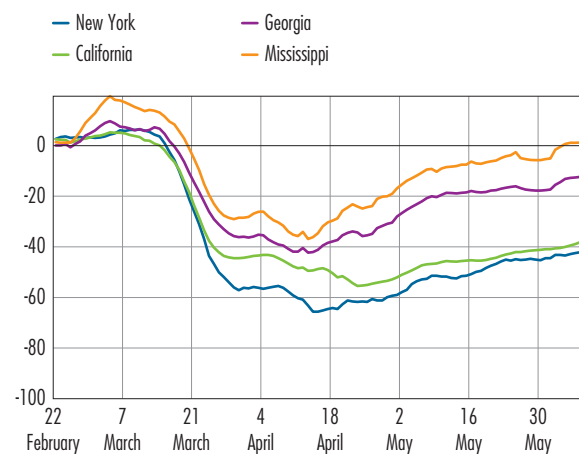
#### c) NO<sub>2</sub> pollution, corrected for meteorological data

(difference versus 2019, 14-day moving average)



#### d) Google Mobility Indices

(% change versus period from 3 January to 6 February 2020, 7-day moving average)



Sources: Google Covid-19 Community Mobility Reports, OAG Aviation Limited, World Air Quality Index, Google Trends, InsideAirbnb, authors' calculations.

<sup>6</sup> See "Quelle vision sur la consommation les données Google trends donnent-elles dans le contexte de la crise du Covid-19?", 2020, Covid-19 et économie, les clés pour comprendre, Banque de France, May, <https://covid19-economie.banque-france.fr/comprendre> (French only).





## References

Carvalho (V. M.), Garcia (J. R.), Hansen (S.), Ortiz (Á.), Rodrigo (T.), Rodríguez Mora (J. V.) and Ruiz (P.) (2020) "Tracking the Covid-19 crisis with high-resolution transaction data", *Cambridge-INET Working Paper Series*, No. 2020/16, University of Cambridge, July.

Cerdeiro (D. A.), Komaromi (A.), Liu (Y.) and Saeed (M.) (2020)

"World seaborne trade in real time: a proof of concept for building AIS-based nowcasts from scratch", *IMF Working Papers*, No. 20/57, International Monetary Fund, May.

Cicala (S.) (2020)

"Early economic impacts of Covid-19 in Europe: a view from the grid", Mimeo, April.

Chetty (R.), Friedman (J.), Hendren (N.), Stepner (M.) and The Opportunity Insights Team (2020)

"How did Covid-19 and stabilization policies affect spending and employment? A new real-time economic tracker based on private sector data", *NBER Working Paper*, National Bureau of Economic Research, No. 27431, June.

Coibion (O.), Gorodnichenko (Y.) and Weber (M.) (2020)

"Labor markets during the Covid-19 crisis: a preliminary view", *Working Papers*, No. 2020-041, University of Chicago, April.



## Appendix

### Methodology and sources

**Twitter data:** data are from a sample of tweets posted in France and downloaded from the public Application Programming Interface (API), and which contain the keyword “coronavirus” or variations of the term Covid-19 (“covid-19”, “covid19”, “covid 19”, etc.). We carried out a semantic analysis of the content of these tweets, focusing on different themes:

- tweets containing a negative opinion of the government: tweets on government policy towards the virus that were negative in tone;
- keywords relating to the economic system: “nationalisation”, “globalisation”, “deglobalisation” and “liberalism”;
- keywords in tweets posted by SBF 120 companies: we analysed tweets posted from the day of the announcement of the lockdown in France. The SBF 120 is a stock market index which combines the CAC 40 and SBF 80 (index of the 80 most actively traded stocks out of the 200 largest French market capitalisations);
- keywords contained in tweets relating to help for businesses: keywords associated with deferrals of taxes and social security contributions, business aid, state-guaranteed loans and credit mediation. These keywords were grouped together as one category, as the number of tweets referring to each one individually was too low. The keyword “partial unemployment” can also be added to this list.

**Google search data (Google Trends Index):** the index does not show the absolute number of searches; results are normalised and then scaled on a range of 0 to 100. A fall in the index therefore indicates a decline in the relative popularity of that keyword but does not necessarily mean that the total number of searches for that word has decreased. Additional information can be found on the website Google Trends: Understand Data. Regarding Google searches related to consumer

spending, the following categories are included in the index: *Grocery & Food Retailers, Non-Alcoholic Beverages, Alcoholic Beverages, Tobacco Products, Apparel, Home Appliances, Home Furnishings, Bed & Bath, Medical Facilities & Services, Autos & Vehicles, Rail Transport, Urban Transport, Parking, Aviation, Travel, Events & Listings, Ticket Sales, Libraries & Museums, TV & Video, Books & Literature, Hotels & Accommodations, Restaurants, Consumer Electronics, Luxury Goods, Shopping, Spas & Beauty Services.*

**Survey data:** the CoviDirect rolling poll created by the institute OpinionWay and conducted on a regular, continuous basis, has tracked real-time sentiment among the French population since 23 March 2020. Prior to this date, surveys were carried out sporadically. 500 individuals are questioned each day and their responses combined with the 500 from the previous day. Each day’s survey round therefore comprises answers from 1,000 individuals selected from a sample of the French population aged 18 and over. To ensure it is representative, the sample is selected using the quota method, based on sociodemographic variables.

**Airbnb data:** users who have booked via the Airbnb platform are strongly encouraged to leave a review after their stay (i.e. a rating of the overall experience and of specific categories such as cleanliness of the property, amenities or noise levels). Reviews have to be posted within two weeks of the end of the stay. Users leave a review in around 80% of cases. The number of new reviews is therefore an indicator of the number of stays booked on Airbnb. To correct for turnover in the supply of rental properties in the database, the sample only includes properties with at least 25 reviews.

**Air transport data:** the number of flights is an indicator of the international mobility of people, but also of levels of global trade – air freight accounts for 35% of global trade by value. The data are from OAG Aviation Limited.



**Mobility data:** Google's *Covid-19 Community Mobility Reports* show changes in footfall to different locations (number and length of visits). We examined two categories of location: Retail & recreation sites and Workplaces. Changes for each day are compared to a baseline value for the corresponding day of the week, calculated over the five-week period from 3 January to 6 February 2020.

**Pollution data:** World Air Quality Index data are corrected for meteorological data (temperature, atmospheric pressure, air humidity, wind speed). NO<sub>2</sub> is produced as a result of fossil fuel combustion and thus indicates levels of industrial output and of transportation. The data are collected from national operators and then standardised by staff at the World Air Quality Index according to the US Environment Protection Agency's AQI standard scale.

**Data on electricity consumption:** these show total electricity consumption (by households and businesses). They include data from ENTSO-E (Italy), the UK National Grid, EIA (United States), RTE (France), Tepco (Japan) and EPSIS (South Korea), and are corrected for temperature data (source: World Air Quality Index) and public holidays.

---

**Published by**  
Banque de France

**Managing Editor**  
Gilles Vaysset

**Editor-in-Chief**  
Claude Cornélis

**Editor**  
Nelly Noulin

**Translator/English Editor**  
Vicky Buffery

**Technical production**  
Studio Creation  
Press and Communication

ISSN 1952-4382

**To subscribe to the Banque de France's publications**  
<https://publications.banque-france.fr/en>  
"Subscription"

