



advanced and six are emerging economies:

## Table A

### Economies

Advanced economies	Emerging market economies
United States	China
Euro Area	India
Japan	Russia
United Kingdom	Brazil
Canada	Mexico
Australia	South Africa

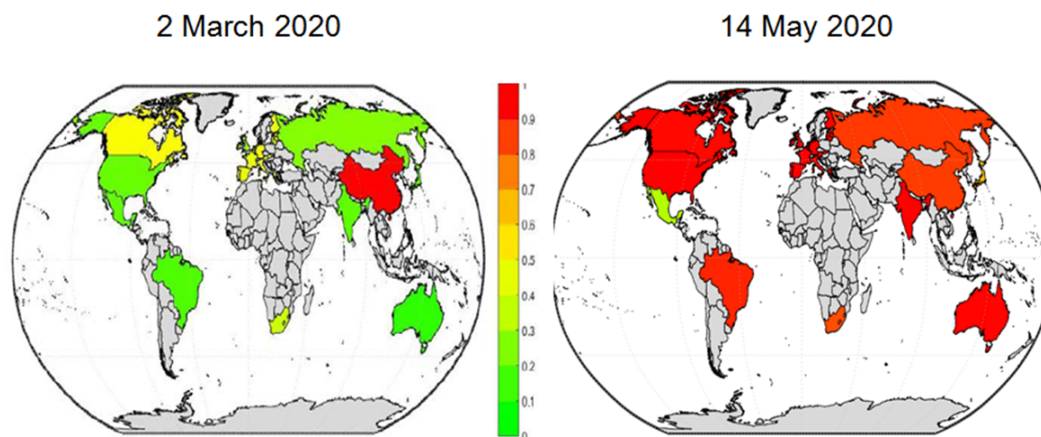
We use supply-side variables (usually, industrial production), internal demand variables (imports or sales), external demand (exports) as well as one additional variable, specific to each economy, usually a soft indicator such as the PMI. All of these variables are monthly. In addition, the models contain GDP as a quarterly variable.<sup>[3]</sup>

The main advantage of relying exclusively on real variables is that we capture all types of recessions, whether they originate in the financial sector, energy prices, a pandemic or any other cause. Whatever is its origin, as long as there is an effect on the economy, the effect will be reflected in these variables.

For every economy, both the probabilities of recessions and the depth of every recession are endogenously estimated. No external dating is used. Chart 1 plots recession probabilities for the different regions in 2 March 2020, the first day in which the model captured a serious increase in global weakness, and in 14 May 2020, the day of the writing of this article.

## Chart 1

### Recession probabilities across countries



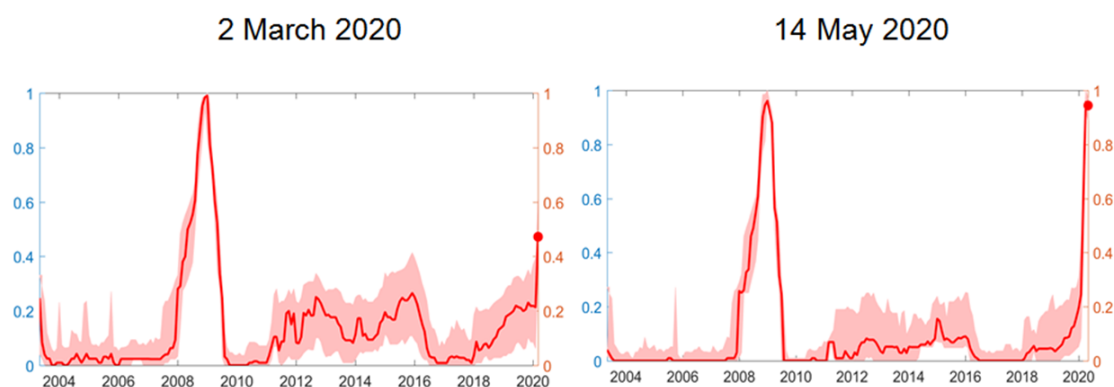
Note: The heatmap of the world plots the overall pattern of the probabilities of the low economic activity regime for specific dates. The darker (lighter) the area, the higher (lower) the probability of recession. The animated sequence of world heatmaps, from April 2003 until February 2020 can be found at: [https://sites.google.com/site/danileivaleon/global\\_weakness](https://sites.google.com/site/danileivaleon/global_weakness)

## Global Weakness Index

The information contained in Chart 1 can be summarised in an index – the Global Weakness Index (GWI). It is a weighted average of the probabilities of recession in different economies<sup>[4]</sup>. The weights depend on the GDP of each region in every quarter. Chart 2 plots the GWI computed on the same dates shown in Chart 1. As the chart shows, there is a sharp increase as early as March 2, which is confirmed by the latest numbers of May 14, where the GWI ends up close to 1. The index can be interpreted as the proportion of the world economy that is currently in recession.

### Chart 2

#### Global Weakness Index

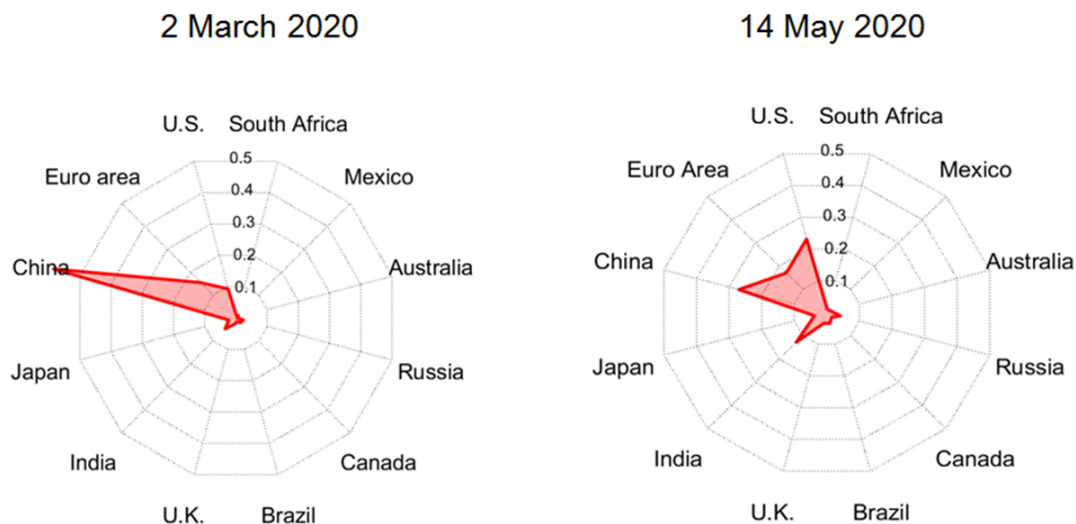


Note: The figure shows the Global Weakness Index, which is constructed as a weighted average of the probabilities of the low economic activity regime across economies. It is weighted by the size of the corresponding economies. The red area represents the credible set based on the 16th and 84th percentiles of the posterior distribution.

Given that the index is computed as a weighted average of the individual economies, it can be broken down by the individual contributors. Each economy's contribution depends on the weight of that economy in world GDP and the probability of that economy being in a recession. The contribution of the different economic areas can be seen in Chart 3. It shows that, at the beginning of March, only China was clearly in a recession, but recently the United States and the euro area have also been large contributors to the high level of the index.

### Chart 3

#### Contributors to the GWI



Note: The radar chart shows the relative contribution of each economy to the GWI. The contributions are normalised to sum up to one.

All in all, the GWI as an indicator has four key benefits. It is (i) updatable in real time; (ii) broken down by regional contributions; (iii) useful for quantifying risks; and (iv) simple to interpret.

### Extensions

Our model includes GDP as one of its indicators, so it can be used to provide forecasts for GDP. As a matter of fact, computing the probability of negative growth or two quarters of negative growth, i.e. the probability of a recession according to its classical definition, is quite straightforward. In the case of the euro area, the latest figures suggest that the probability of a classical recession has reached 100%.

### Conclusions

We present a new indicator of global economic weakness which uses real-time information available to estimate the proportion of the world economy that is in a recession. The indicator is based on the estimation of a dynamic non-linear factor model for individual economies which considers recessions of different depths. Leiva-Leon et al (2020) show the excellent real-time forecasting properties of this model for individual economies.

As this article illustrates, the indicator already pointed to clear signs of economic weakness as early as 2 March 2020. This weakness was confirmed by official statistics on 4 May 2020, when Q1 GDP data for most countries were released. Therefore this indicator helps provide early warnings of a downturn that can be crucial for a fast policy response.

### References

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[2] Indicators are transformed to be stationary. Depending on the indicators, they are used in growth rates, first differences or levels. GDP is included in growth rates but, given that the model is constructed in monthly frequencies, its relation to the factor is a weighted moving average of monthly activity.

[3] This choice follows the original approach of Stock and Watson (1991), Chauvet and Piger (2008) or Camacho et al. (2018). Those papers show that such a small set of variables reliably captures current conditions of the economy and comprises most of the information relevant for inferring recessions in real time.

[4] Technically, the researchers weight the individual draws obtained by Bayesian methods in each country. Therefore, they produce the density function of the distribution of GWI in every time period.