

Bulletin GPoM-epidemiologic no 10

Coronavirus Covid-19 epidemic (2019-2020)

May 6th 2020



Methodology

- **Models** of canonical form (GPoM tools) were **obtained for the outbreaks of Covid-19 at several locations in the world**: for several Chinese provinces (Hubei, etc.), and for **South Korea, Japan and Italy**
- **These models are applied to other outbreaks of Covid-19 in other countries**
- The objective is to identify which are the **closest scenarios** for these other countries

Analysis

- For each country, **all the models** available **are run** (five initial conditions used with each model)
- Diverging models are directly rejected as inconsistent
- Other models are plotted. **Scenarios of inconsistent behavior are rejected** (e.g. a decreasing cumulative number of case proves that the scenario must be rejected)
- Among the remaining **consistent scenarios**, the ones showing the **best consistency with the recent observations** are considered as currently **more realistic**

Note: Correction factor are applied to the time series in order to ensure their consistency.

$C_{\Sigma}(t)$ Cumulative Cases per 10M

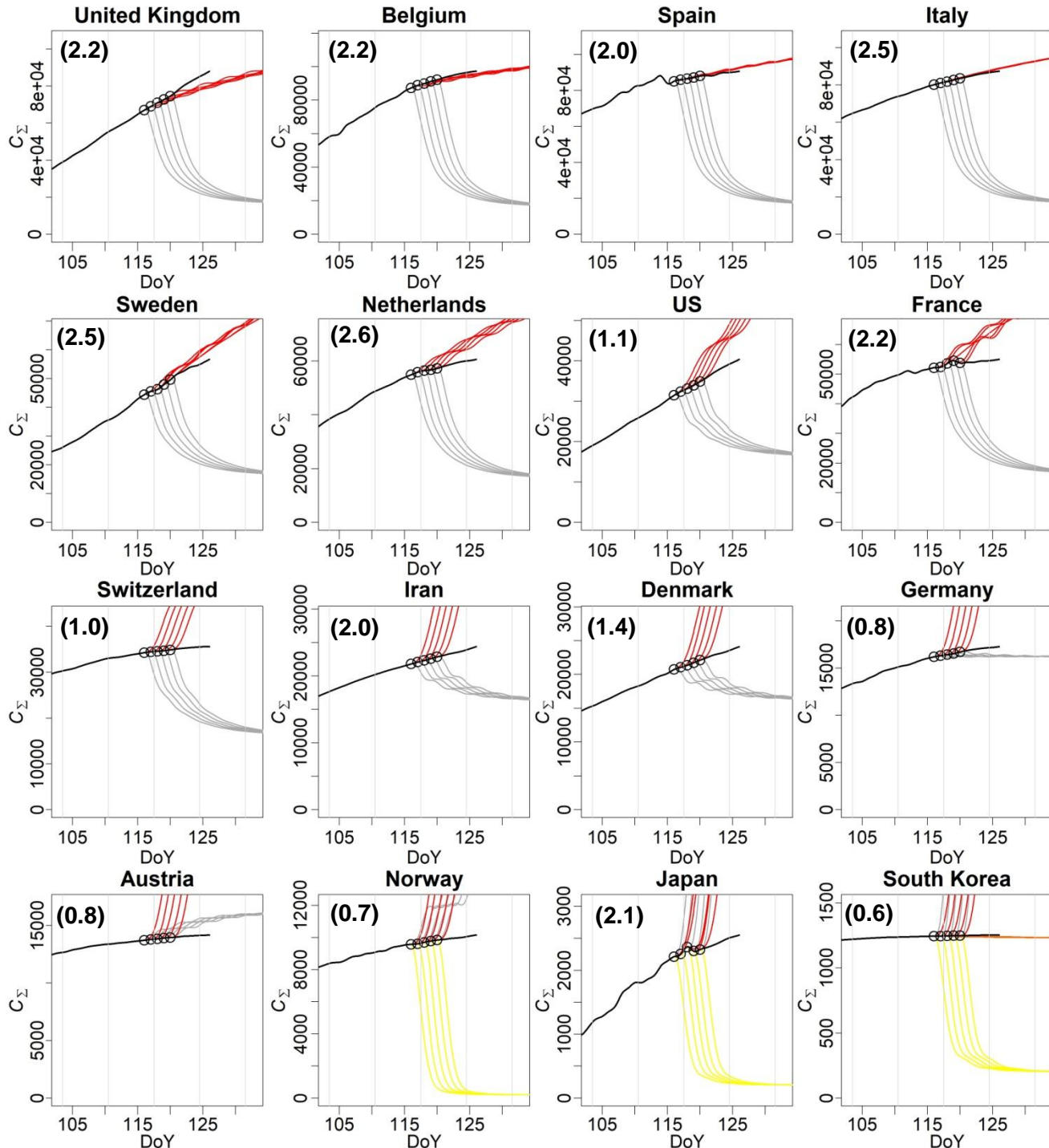
Scenarios:



Observations:

Note:

- A correction factor is applied to each time series to account for the under-estimations of infected cases in comparison to deaths
- This correction is provided in brackets (from 0.6 to 3.0)



$C_1(t)$ Daily new Cases per 10M

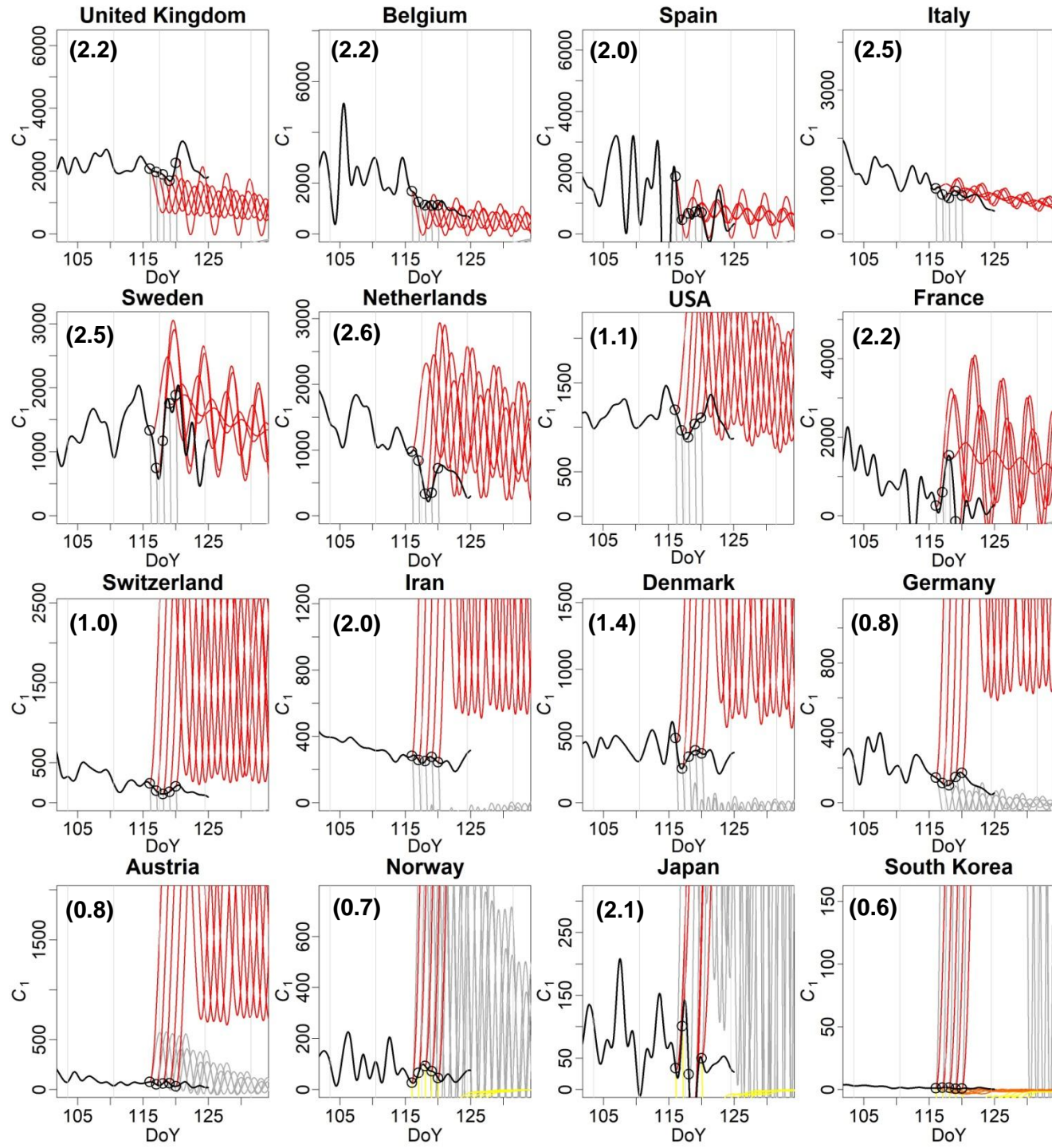
Scenarios:



Observations:

Note:

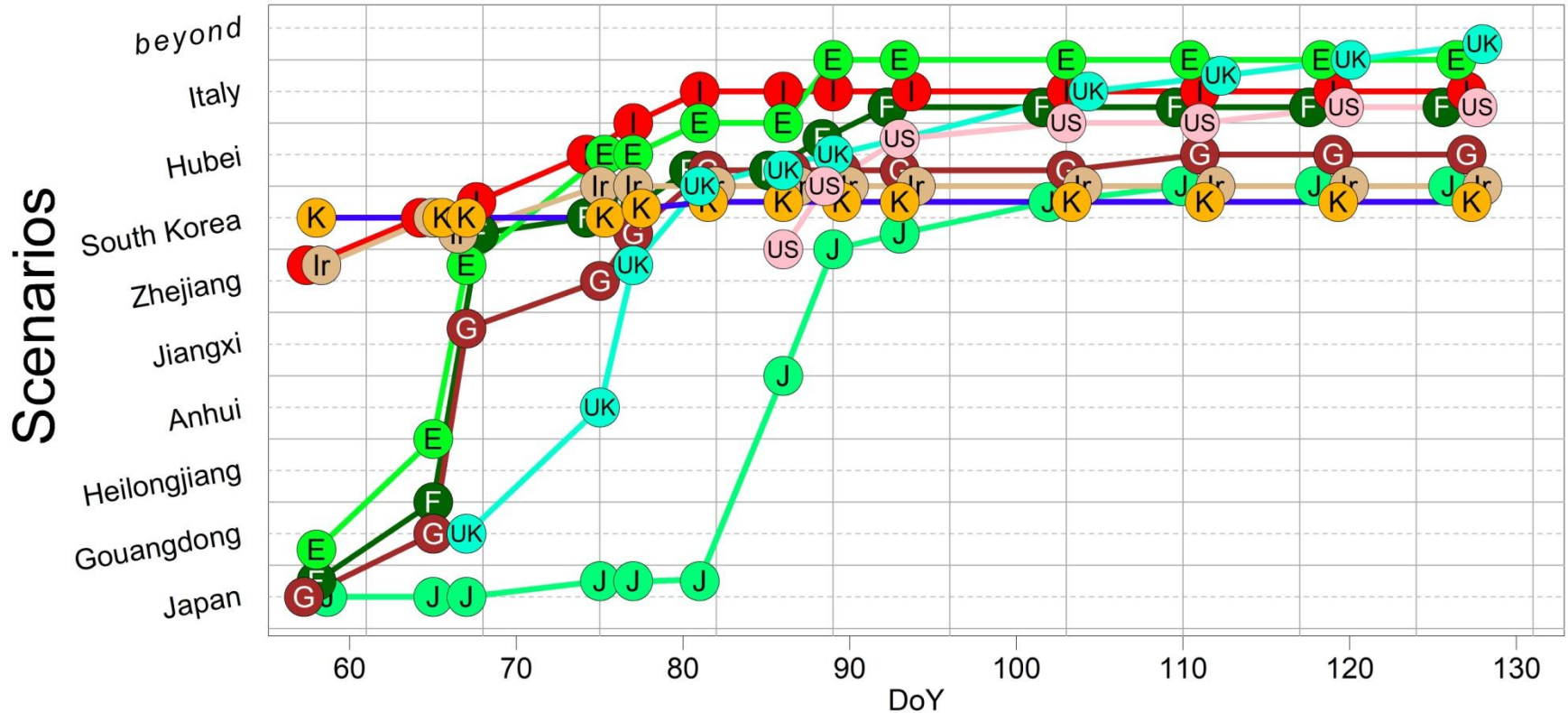
- A correction factor is applied to each time series to account for the under-estimations of infected cases in comparison to deaths
- This correction is provided in brackets (from 0.6 to 3.0)



Results

- The **United Kingdom** has also **overtaken the Italy scenario** the its evolution is clearly not yet stabilized
- **Belgium** and **Spain** have now **overtaken the Italy scenario** in terms of cases and their evolution is not completely stabilized
- **Sweden** and the **Netherlands** are progressively reaching the **Italy scenario** and their evolution is neither stabilized
- **France** seems stabilizing below, but close to, the Italy scenario
- The **USA** have now largely overtaken the Hubei situation and is now **approaching the Italy situation**. Note that an important heterogeneity takes place in the USA, this behaviour is thus the combined result of both light and severe scenarios inside the country. Its **situation is not stabilized**
- **Switzerland, Iran** and **Denmark** have now all largely exceeded the Hubei scenario. Their evolution is not completely stabilized yet
- **Germany, Austria,** and **Norway** are stabilizing below the Hubei scenario
- **Japan** has experienced a restart and is not stabilized yet

Scenarios evolution



Scenarios evolution

- For a given country, the **scenario** can largely evolve in time
- This evolution **highly depends on the control measures** taken to contain (or slow down) the outbreak
- In practice, the resulting scenario **highly depends on the type, earliness and strength** of the control measures, and on the **acceptation of the control measures** as well



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