Human infection and market infection dynamics in COVID-19 crisis

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Abstract

We compare the dynamics of market stress with the recorded COVID-19 infection cases for 184 countries and relative markets around the world. We observe that most markets react with a surge in intraday volatility corresponding in time with the surge in recorded cases. Some countries such as Australia and in the Middle East record also an early exogenous market surge most likely triggered by their exposure to the commodity market and the initial outbreak in China. The observed market stress dynamics seems to indicate that market turmoil will eventually stabilize once the tide of human infection recedes.

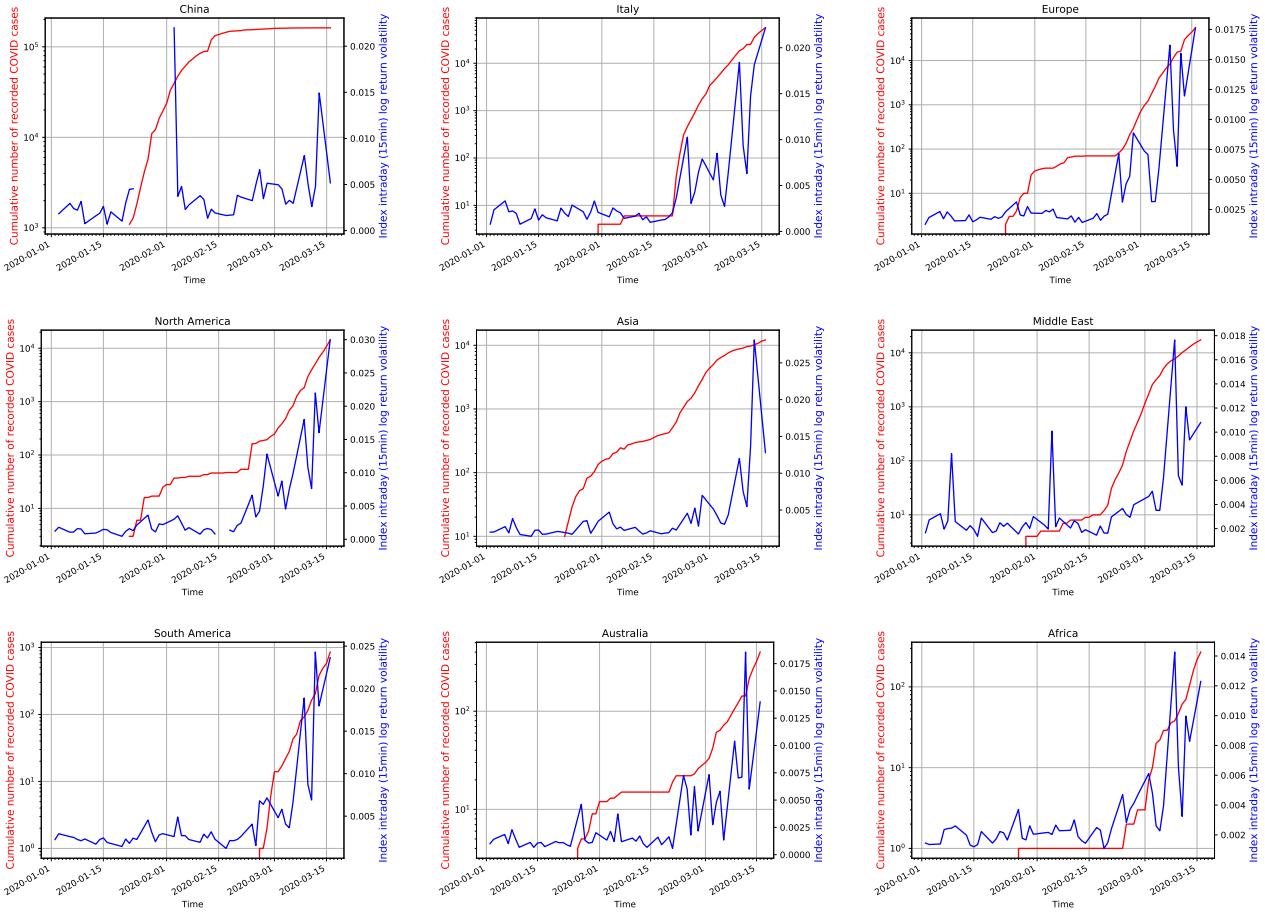

Figure 1: Comparison between COVID-19 cumulative recorded cases per geographical area (we look at individual countries only for the advanced and particular cases of China and Italy) and average intraday return volatility throughout the tradable financial indices of the region.

The outbreak of the COVID-19 virus has now reached most parts of the world and it has significantly impacted global financial markets across the globe. In this note we begin to share our investigation of the impact of the disease's spread on global financial markets.

We calculate intraday log-return volatility for the major indices of 95 countries across the globe and COVID-19 confirmed cases for 184 countries across the globe. We analyse the cases of Italy and China separately, as they stand at a more advanced stage of development of the outbreak. In order to obtain meaningful statistics and summarise the results we aggregate confirmed cases by geographical region and observe the growth of the aggregate values. Analogously we average across the volatilities of all indices in the region for each day. We study intraday volatility as a proxy for uncertainty and nervousness in markets.

Continent/Country	**COVID Infection Surge**	**Market Stress Surge**	**Nature (Commodity)**
China	20/01/2020	20/01/2020	Endogenous
China	-	01/03/2020	Exogenous - Global Demand
Italy	20/02/2020	20/02/2020	Endogenous
Europe (excl. Italy)	24/01/2020	26/01/2020	Endogenous
Europe (excl. Italy)	23/02/2020	24/02/2020	Endogenous
North America	24/01/2020	26/01/2020	Endogenous
North America	24/02/2020	25/02/2020	Endogenous
South America	26-28/02/2020	26/02/2020-07/03/2020	Endogenous
Asia (excl. China)	23/01/2020	26/01/2020	Endogenous
Asia (excl. China)	20/02/2020	23/02/2020	Endogenous
Middle East	-	09/01/2020 - 05/02/2020	Exogenous - Oil
Middle East	20/02/2020	23/02/2020	Endogenous
Australia	-	20/02/2020	Exogenous - Mining
Australia	6/02/2020	8/02/2020	Endogenous
Africa	25/02/2020	28/02/2020	Endogenous

Table 1: Comparison between the surge in COVID-19 cumulative recorded cases and the surge in average intraday return volatility throughout corresponding financial indices.

These values are plotted for the main global regions in Figure 1, we observe some regions which show two temporal clusters of volatility, whilst some show only one. Table 1 reports approximate dates for the beginning of high volatility periods in markets as well as those corresponding to an increase in the epidemic's rate of spread. We clearly observe the beginning of most volatility clusters to be driven by (i.e. they coincide with or are preceded by) a surge in the pace of the virus' spread. The continuation of this pace accompanies these periods of high volatility. We observe that some countries such as Australia and most Middle Eastern countries have volatility spikes before the beginning of recorded infected cases. We classify these cases as exogenous. Such an exogenous effect is most likely due to the early market reactions to the epidemic in China, a major receiver of commodities these countries export. Australia and New Zealand are major extractors and exporters of metals and coal, whilst most Middle Eastern economies rely heavily on crude oil exports. China instead presents an apparently exogenous late peak of volatility likely due to the foreseen slowing of the global economy and reduction in demand for its production exports.

In conclusion we notice that individual geographic regions do not seem to experience significant market nervousness until the the disease's spread climbs within countries that are part of the region. This can be observed through the asynchronous volatility spikes, with regions like Africa and South America showing only moderate volatility prior to the epidemic reaching the area. We should though notice that these regions are not necessarily the most globalised ones. On the other hand Italy, one the world's largest economies, does also not seem to show noticeably higher market nervousness in correspondence of the early outbreak of the epidemic in China.

We observe for most countries a return of volatility to pre-COVID-19 levels as the rate of the disease's spread decreases. In the particular case of China which seems to have, at the time of writing, effectively tackled the disease's spread we also observe a return to lower volatility levels and more moderate spike driven by exogenous threats. We can draw the tentative conclusion from this analysis that COVID-19 driven market volatility will eventually stabilise once the number of cases starts to flatten out and people recover. This early analysis cannot yet account for the potential for a global recession, or local ones, to drive market volatility and nervousness up again.