Coronavirus: some questionable mathematics?

Deon Gouws - CIO, Credo Wealth - 27 March 2020

My mother is 93 years old. Thankfully she is quite healthy for someone of that age, and she lives in relative comfort in a nice retirement home in Johannesburg. I last saw her about a month ago – she looked well, given the circumstances.

But I am rather concerned about her today: I am concerned, because at her age, she is probably a lot more at risk of coronavirus and its deadly consequences than most people around her. We've all seen the statistics: **if you're lucky enough to be younger than 50 today, chances are that, even if you do get Covid-19, it probably won't affect you too much. But for anyone older than that, the risk of a bad outcome starts to increase incrementally as your age goes up.**

I start with reference to my own mother in case anyone thinks that I'm taking this disease lightly. On the contrary, I am taking it very seriously indeed: Covid-19 is clearly harrowing for many (including some younger patients who have been healthy otherwise, although this appears to be a very small percentage overall). The plight of hospitals around the world and their overworked staff will continue to be overwhelming for some time. The rapidly rising death toll is tragic. And it's horrible to see the number of doctors that have succumbed whilst looking after patients suffering from this condition in Italy and elsewhere.

Having said that, I do however also believe that there has been a huge amount of misleading reporting about the pandemic, much of it a consequence of questionable mathematics. Some might even call it fake news… And this matters – a lot – because most people watching the news and reading newspapers and following Twitter feeds, tend to accept the "information" which is put in front of them. As such, it will affect not only their behaviour, but also their psyche, potentially leading to anxiety and a range of other mental health issues (in addition to the Covid-19 risk itself).

Best to have accurate reporting (based on better maths), therefore? ▸▸

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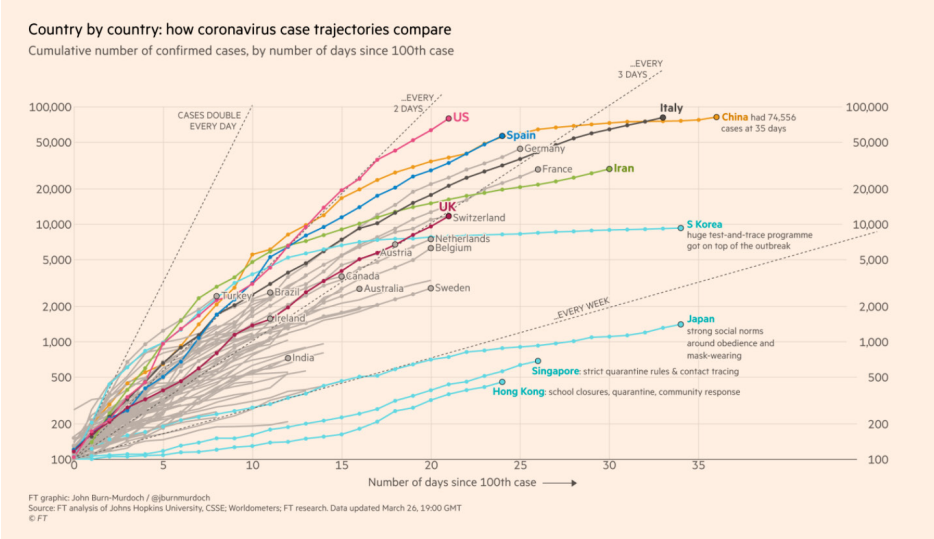
The first bit of dubious mathematics in the reporting, relates to the infection rate of the coronavirus. According to most summaries, the number of new cases of Covid-19 has been doubling every two to three days in many countries in the West over the past few weeks, making it one of the most infectious diseases in history. And of course, it's easy to illustrate that, if this trend continues, the result will be that every single one of us will be suffering from the disease in just a few weeks' time.

Only yesterday, the Director General of the World Health Organisation (WHO) was quoted as saying: "The pandemic is accelerating at an exponential rate. The first 100,000 cases took 67 days. The second 100,000 took 11 days, the third 100,000 took just 4 days, and the fourth 100,000 just 2 days."

This graph, which is updated on a daily basis by the Financial Times – arguably one of the most respected publications in the world – further underscores the argument:



Unfortunately, this kind of picture is as misleading as the WHO Director General's words: even though the coronavirus is clearly very infectious, there's no real proof that the pandemic has actually been accelerating of late, and **new cases are certainly not doubling every two to three days.**

What is of course true, is that the number of **confirmed cases** has been following this kind of dramatic trajectory. But confirmed cases is clearly a **function of testing**; as recently as 5 weeks ago (i.e. when the scale of the epidemic in Italy started to become evident), practically no-one in either the US or UK was even thinking of testing for coronavirus, because the perceived problem was still considered to be negligible at the time. Most famously, Donald Trump referred to it as "just the flu" at the end of February, and that the problem would soon disappear, "like a miracle".

This has changed and recently Prime Minister Boris Johnson spoke about the UK performing 10,000 coronavirus tests per day, soon to be increased to 25,000 per day.

The more you test for anything, the more you're likely to find – that much seems obvious. But what is even more interesting, is the hypothesis that coronavirus may have already affected as much as half the population of the UK (as has been suggested in a study by researchers at the University of Oxford only a few days ago).

Might this be possible? Personally, I would not be surprised in the slightest.

A blog post by Dr Zoe Harcombe last weekend included reference to a tweet from the 13th of March which posed the following question: *"Can anyone explain how a virus (identified in Wuhan in Dec 2019) spread to the Canadian prime minister's wife, one of Hollywood's top actors & his wife, a Premier League football manager, and a British member of parliament – within 16 weeks – while bypassing the majority of us?"* (to which we can of course now also add members of both the Monaco and British royal families… not to mention Boris Johnson himself).

And, as pointed out by Dr Harcombe, the answer is, of course, it didn't. Many of us must have (or have had) the virus already.

For what it's worth, I personally think that I may very well be one of those who's had the disease as far

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back as the middle of January this year. I won't go into all the details of the symptoms that I suffered at the time, as most people would probably not be that interested. And of course, I can also not "prove" that I've had it (maybe my wife is right, maybe it was just another case of man flu).

But soon there will be a test, according to Boris Johnson and his scientific advisors, which should be able to identify whether one has immunity to Covid-19 in the form of antibodies, suggesting that you've probably contracted Covid-19 previously and recovered from it (potentially without ever realising it – many cases are said to be asymptomatic).

I suspect this test will be a game changer, and one can only hope that it will soon be available: it will make it possible for many of us to go back to work sooner rather than later, for example. Most importantly, it should give a lot more comfort to those medical professionals who have the immunity, to continue confronting the disease on a daily basis.

The second bit of questionable mathematics in the reporting, relates to the mortality rate – often said to be in the double digits. At the time of writing, for example, Italy had approximately 80,000 confirmed cases of Covid-19, resulting in just over 8,000 deaths to date; according to some reports and commentators, this translates into a 10% mortality rate, meaning that it's one of the most lethal diseases in history.

Not quite as dramatic, but even the WHO themselves have also been guilty of this kind of flawed logic: the last "official death rate" mentioned by them, was 3.4% (based on numbers about a month ago).

This is simply not realistic: at the risk of stating the obvious, the 10% mortality rate referred to above (or even the WHO's 3.4% one) suffers from a material problem with the denominator (as well as a small issue with the numerator – more about that later).

It may be understandable that some people will want to divide the number of deaths into the number of confirmed cases (which is the only available "base" for which we have accurate numbers), but unfortunately there is not very much useful information in the resulting metric.

This denominator clearly suffers from a huge amount of selection bias:

in most countries, the only people who are likely to get tested (and who will thus potentially end up being included in the number of confirmed cases) are those who are displaying some of the symptoms of the virus today. What this number of confirmed cases does not tell us, therefore, is how many people have already had the disease and recovered from it – which, as mentioned previously, could very well be substantial indeed. This has huge potential implications for the actual mortality rate (possibly pushing it down to a fraction of 1%?).

The third and last point relating to the numbers that I'd like to focus on, is the obsession with absolute rather than relative metrics. There are various websites with lots of visuals where one can track the spread of the virus by country/region, for example (more than half a million cases around the world, at the time of writing), as well as the deaths resulting from it (some 25,000 to date). This fixation with the absolute is understandable: the overall numbers appear substantial and are increasing fast, the virus has captured the public imagination as a result, and many people are (rightfully) scared of contracting the disease.

But I think it is equally important to stand back and put the numbers in perspective: what do they tell us, in relative terms? To be specific, how many more people have been ▸▸

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dying on a daily basis, compared to what we would expect in a "normal" (non-coronavirus) year?

To return to Italy, for example: a country that has received more airtime than most, given how quickly Covid-19 started spreading there more than a month ago.

The Italians are the oldest population in Europe, with approximately 7% of its 60 million people being older than 80 (i.e. some 4.2 million in total). What percentage of them are likely to pass away in any given year? Perhaps 10%?

In the absence of any pandemic, 10% of 4.2 million Italians over the age of 80 (i.e. a total of 420,000 people) might thus pass away annually. This translates into 35,000 per month (or more than 1,000 each day). Such approximation does not take into account the fact that it's been winter in the northern hemisphere, which means that the daily average might in fact be higher this time of the year.

If there is any sense in this logic, it would appear to put the statistics of Italian Covid-19 deaths in some perspective: to date, the highest daily total of 793 was reported on Saturday 21 March; since then, the average has been some 668 per day – well within the expected range calculated earlier.

Also bear in mind that most of these fatalities should not be considered to be "additional" ones: according to reports, as many as 99% of the deceased had been suffering from at least one comorbidity (and in a large number of cases, two or more). I mentioned earlier that there was an issue with the numerator in the reported mortality rate of the coronavirus, and this is the point: if an 85-year old with stage 4 or 5 cancer contracts Covid-19 and passes away a week or two later, is it really fair to ascribe the resulting death to the virus (as opposed to the cancer), skewing the statistics even further in the process?

If this logic stacks up, if we really have seen the peak in Covid-19 deaths in Italy, and if we see a similar "curve" (peaking at a not-unrealistic daily level, before starting to drop off slowly) in countries such as Spain & France (hopefully in the next week or so), followed by the UK and eventually the US, my guess would be that hope will start taking over from fear…

Policy measures will quickly start to be reconsidered around the world as a result, and financial markets should respond favourably.

Do bear in mind that the actual news-flow is likely to get quite a lot worse before it gets better, though: Covid-19 has claimed "only" about 1,000 lives in the US to date, but the number has been rising rapidly of late. If the experience in Italy is anything to go by, a daily peak of perhaps as many as 5,000 deaths in the US seems possible in just a few weeks' time (a multiple of Italy, due to relative population size). One can only hope that the eventual numbers do not exceed this by some order of magnitude?

The next period is going to be crucial. Wash your hands, take your vitamins, stay at home, look after your loved ones, and cross your fingers (or hold thumbs – whatever works for you). But please be mindful of some of the numbers that are being reported in the media, and consider them in proper perspective.

Finally, to get back to my mother. At 93, she's not great with email or the internet; chances are she'll never get to see this piece. But if anyone is kind enough to share it with her in the coming days, please tell her to take care, and that I'm looking forward to seeing her again (once the planes resume flying)… hopefully soon. ■