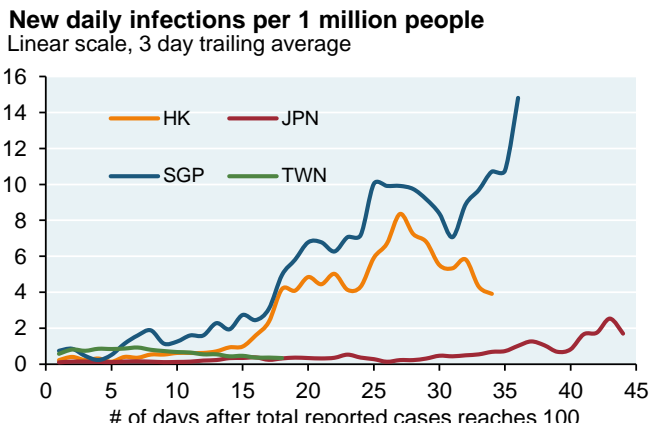




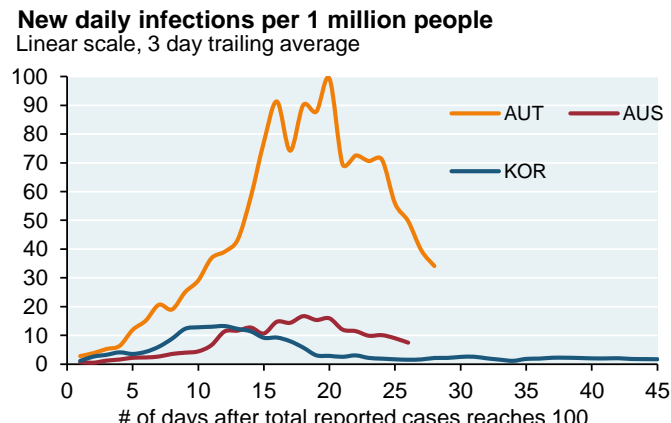
Taking stock of virus data: don't over-extrapolate temporary trends; Convalescent plasma; US vs China lockdowns; "U vs V" is less relevant for investors than equity lead times

As most of our clients know by now, we have aggregated all of our virus research [here](#). I wanted to send you a quick note today on the reported infection trends, since they may be catalysts for market prices. Remember, reported infections can rise due to the spread of the virus, and due to increased testing of the resident population, so there are limits to what can be inferred. **The most important caveat:** don't extrapolate temporary trends (someone sent me a Bloomberg screen which defines countries as "accelerating" or "decelerating", which can be meaningless when reported infections oscillate around a range). The phrase "flatten the curve" means lowering it but also flattening it, which can result in an extended period of roughly constant infection rates which still put a lot of pressure on healthcare systems.

First, there are regions that had minimal exposure in the first place, although even among this group Singapore has just experienced a minor uptick (left chart). Second, the situation looks good in countries that had higher infection rates which **have now more convincingly rolled over (chart on the right)**. Please note the stark differences in y axis maximum levels when comparing charts, countries, provinces and regions.

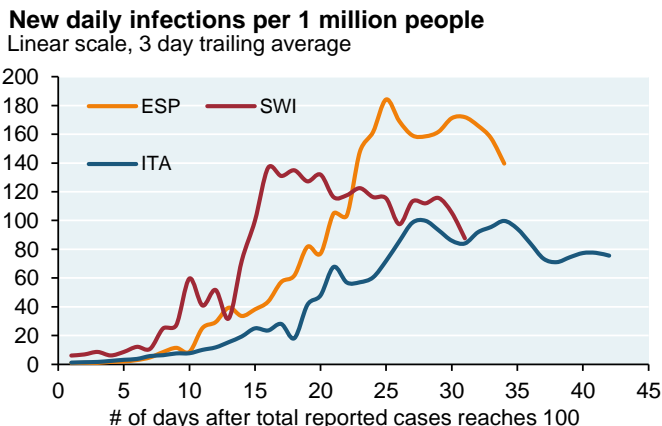


Source: Johns Hopkins University, IMF, JPMAM. April 05, 2020



Source: Johns Hopkins University, IMF, JPMAM. April 05, 2020

Then, there are countries where **the worst is probably over based on a crude reading of the data, but where ongoing infection rates are still extremely high and could possibly reaccelerate**. This is another example of where simple "accelerating/decelerating" categorizations don't capture the stress the country is still under; they have "flattened the curve", but at very high levels.



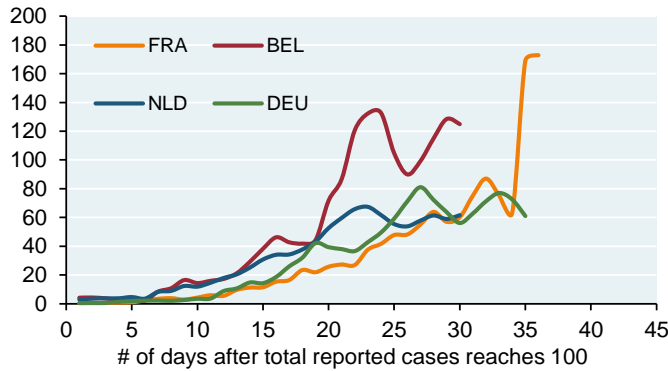
Source: Johns Hopkins University, IMF, JPMAM. April 05, 2020



Where that Bloomberg screen falls apart is when downward trends prove to be a head-fake, since infections subsequently rose after declining. This confuses simple trend following formulas that inherently assume that all trends are maintained (see chart, left). And on the right, we show countries where reported infections are either still accelerating, or where recent mini-downturns are way too soon to extrapolate.

New daily infections per 1 million people

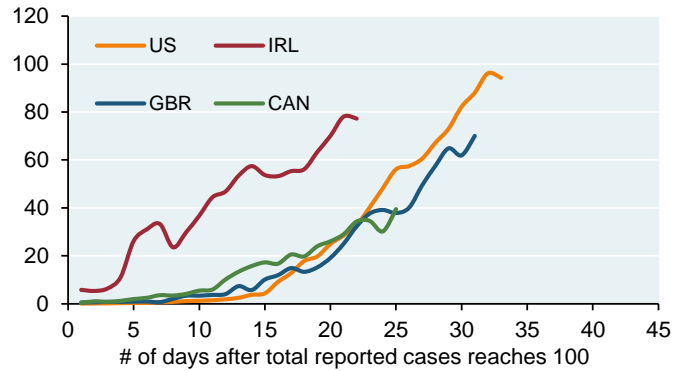
Linear scale, 3 day trailing average



Source: Johns Hopkins University, IMF, JPMAM. April 05, 2020

New daily infections per 1 million people

Linear scale, 3 day trailing average

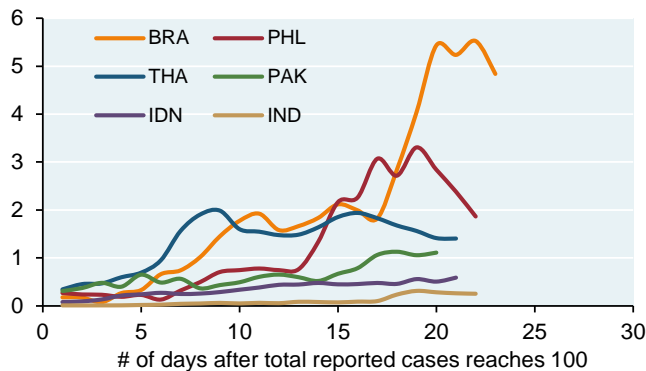


Source: Johns Hopkins University, IMF, JPMAM. April 05, 2020

Another big unresolved issue: what should we make of the apparently low infection rates in parts of the emerging world? There are questions about data reliability, and it's also much sooner in the infection cycle. Even so, for the EM countries shown below, the day-20 reported infection rates per 1 million population currently range from below 1 to 5. For comparison, the day-20 figures were 73 in Spain, 25 in France, 40 in Italy, 17 in the UK, 36 in Germany and 22 in the US. Could environmental and weather factors play a role? This is still being studied intently; as shown on the right, **95% of reported infections have occurred between the latitudinal coordinates 22.5°N and 57.5°N, where 59% of the world's population lives.** In weather terms from January to March, 90% of infections have occurred in regions with temperatures ranging from -5° to 15° Celsius and humidity ranging from 0 to 8 grams per kg.

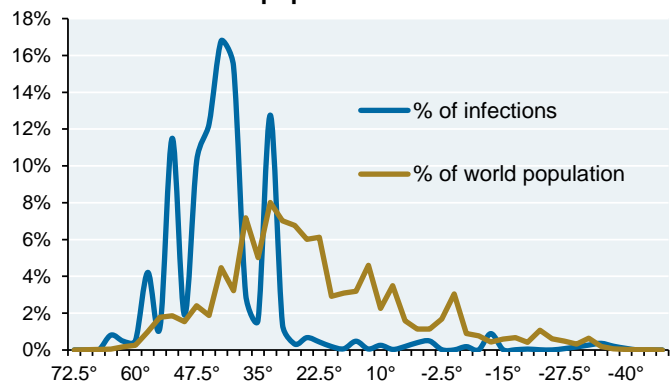
New daily infections per 1 million people

Linear scale, 3 day trailing average



Source: Johns Hopkins University, IMF, JPMAM. April 05, 2020

Infections and world population as a function of latitude



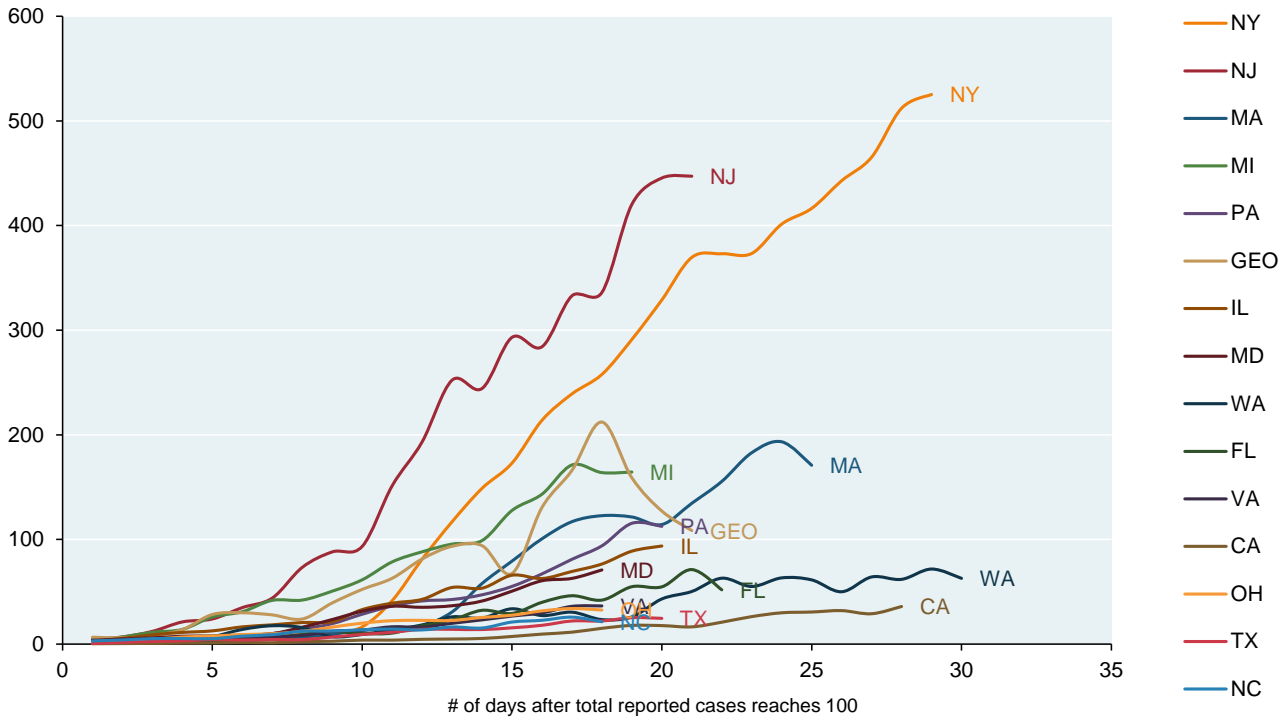
Source: Johns Hopkins University, NASA, JPMAM. April 05, 2020



If there's good news to report, it would be that most large US states appear to be on a lower infection trajectory than New York and New Jersey. The states below encompass 70% of US GDP.

US new daily infections per 1 million people

Linear scale, 3 day trailing average

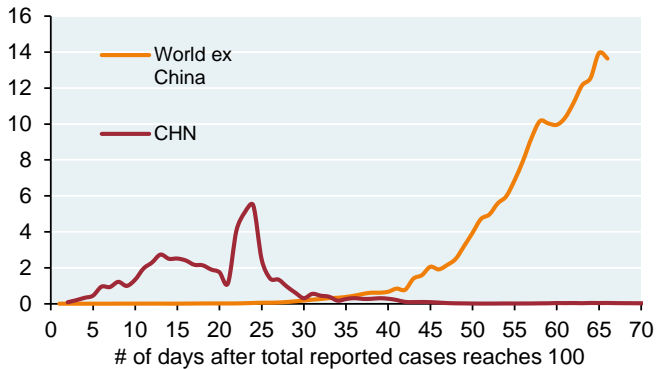


Source: Johns Hopkins University, IMF, JPMAM. April 05, 2020

Bottom line: most reported infection curves are highly idiosyncratic and do not follow neat exponential decay paradigms like they do in scientific literature. In Italy, the government has flattened the curve but may be dealing with a high rate of new infections for a month or more. More broadly, as shown below, the pace of new infections in the world is still rising; or at best, tentatively stable at a high level. I do expect a sharp decline in new infections in the Developed World during April, but that's an expectation that still needs to be borne out by the actual data.

New daily infections per 1 million people

Linear scale, 3 day trailing average



Source: Johns Hopkins University, IMF, JPMAM. April 05, 2020

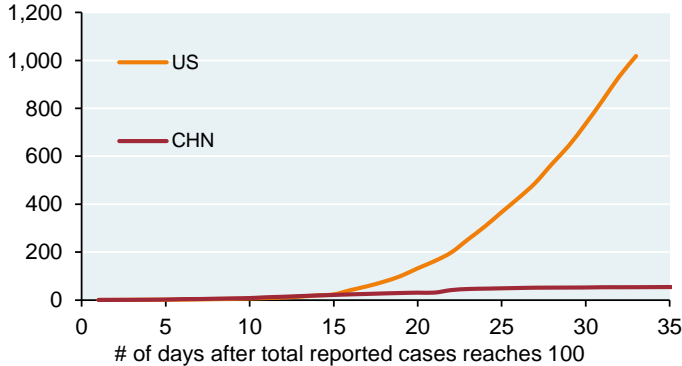


How does the US lockdown compare with the Chinese version?

The most direct answer would be to compare infection rates to-date per million people, since that is the effective end-result of the lockdown, social distancing and a variety of other government policies regarding free movement, work-from-home, etc. Even after accounting for potential Chinese under-reporting (which we discuss in more detail on page 8 in Section 1 on the web portal), this is a very big gap.

Total Infections to date per 1 million people

Linear scale, 1 day trailing average



Source: Johns Hopkins University, IMF, JPMAM. April 05, 2020

A narrower answer would be to compare high frequency measures of economic activity to 2019 to see how much activity the lockdown suppressed.

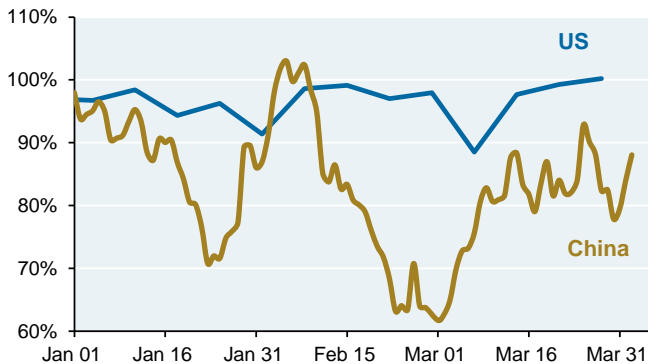
The challenge is that there aren't that many directly comparable high frequency (e.g., weekly) variables to use¹. Take coal production; we have data for both countries, but the US is also undergoing a secular shift from coal to natural gas and renewables, some of which was already showing up in January of 2020 before any lockdowns were imposed in the US. This shift is not taking place at the same speed in China: all of the world's countries except China reduced net coal-fired generation capacity by 8 GW from January 2018 to June 2019. Over the same period, China increased its coal capacity by 43 GW and has another 121 GW under construction.

So instead, in the next chart, we compare 2020 daily coal production in China (which represents by far the largest share of Chinese electricity production) vs 2019, and compare US weekly electricity production in 2020 vs 2019.

You can't see much of a decline in the US yet. As shown on the right, weekly power demand dropped in NY, but the declines elsewhere are modest, at least so far.

US electricity production vs Chinese coal consumption

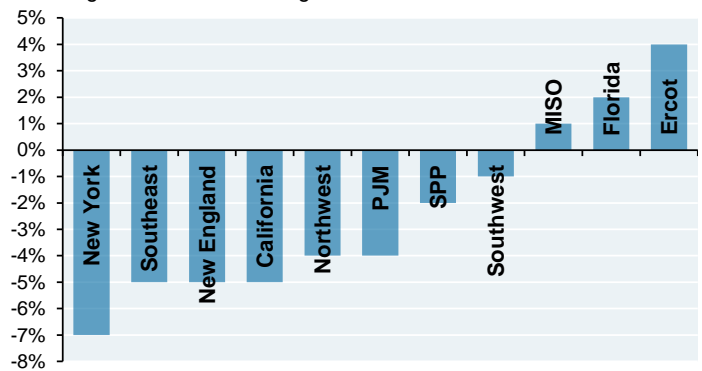
Percent of 2019 level



Source: EEI, cqcoal, Wind. April 6, 2020.

Regional changes in US electricity demand

% change for the week ending March 25



Source: Bloomberg BNEF. March 27, 2020.

¹ As of the end of March 2020, US car sales are down 35% vs 2019 according to data from the St Louis Fed, whereas in China, car sales dropped by over 90% in February 2020 vs 2019 (National Passenger Car Information Exchange). This is another example of China having a more extreme version of a lockdown, at least so far.



In Section 2 of our online portal, we have been updating all of our research on research underway with respect to anti-viral medications, vaccines and immune-modulators. Over the weekend, we added the section below on convalescent plasma.

Convalescent plasma

Houston Methodist Hospital was the first to receive approval from the FDA to use “convalescent plasma” (or “convalescent sera”) to treat infected patients and vulnerable populations. Step 1: collect serum from recovered patients that contain virus-neutralizing antibodies, and step 2: infuse it into other COVID-19 patients. This approach was used during the Victorian era before antibiotics to treat meningitis and pneumonia (by injecting bacteria into horses and harvesting horse serum). High frequency convalescent plasma is currently used to treat immuno-deficient individuals against pathogens like measles and mumps.

Like antivirals and vaccines, convalescent plasma applied to COVID-19 will require clinical trials to demonstrate efficacy. In addition, it would not confer long-term immunity (antibody half-lives are just 30 days), and thus would at best provide a temporary benefit for some period of weeks. However, that might be sufficient when dealing with a pandemic wave of infection over a short period. Convalescent plasma might be difficult to scale and runs the risk of transmission of other undiscovered viruses but could be a vital tool in certain high-risk cases.

More background²:

- The largest convalescent plasma study from the SARS era involved the treatment of 80 patients in Hong Kong. Patients treated before day 14 had improved prognosis defined by discharge from hospital before day 22, consistent with the notion that earlier administration is more likely to be effective
- In the 2009–2010 H1N1 influenza virus pandemic, convalescent plasma was used to treat individuals with severe infection requiring intensive care. The serum-treated individuals manifested reduced respiratory viral burden, inflammatory cytokine responses and mortality
- Risks include inadvertent infection with another infectious disease agent and reactions to serum constituents, including immunological reactions such as serum sickness. Screens for blood-borne pathogens and blood type matches of donors and recipients can reduce this risk, in principle

² “The convalescent sera option for containing COVID-19”, Arturo Casadevall, Department of Molecular Microbiology and Immunology, Johns Hopkins School of Public Health, March 13, 2020

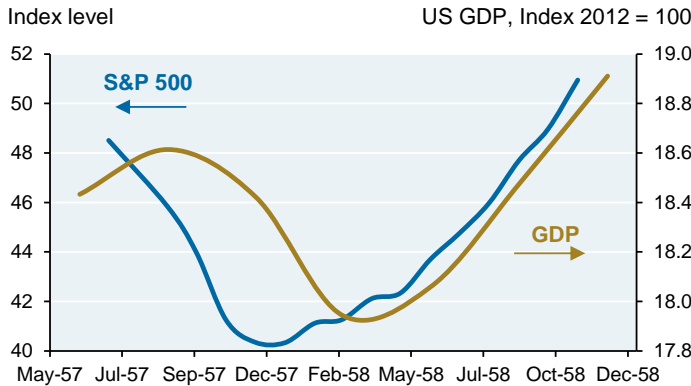


“U vs V” is less relevant to investors; what matters is the lead time for equities vs the economy

The discussion of the shape of any recovery is much less important in my view than the precedent showing that equities tend to lead the trough in economic data by 4-8 months, as shown below. So when just before the economic data looks like it’s forming a solid bottom (i.e., second derivative changes are improving), historically it was a good time to start looking for value in equities.

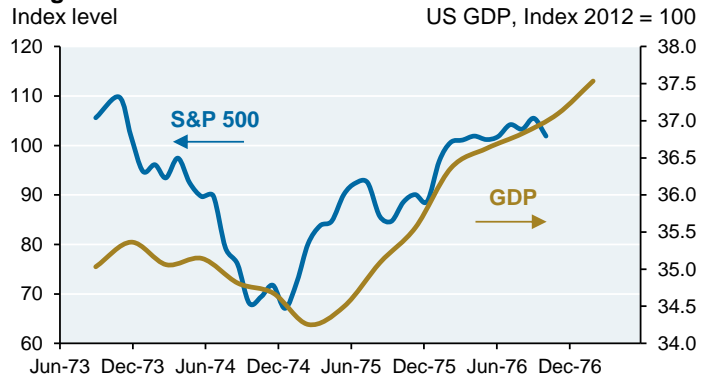
The full collection of our historical market bottom charts appears in Section 3 on the web portal, and explores the lead times between bank stocks and bank failures, between high yield spreads and high yield defaults, and between equities and unemployment.

Eisenhower recession



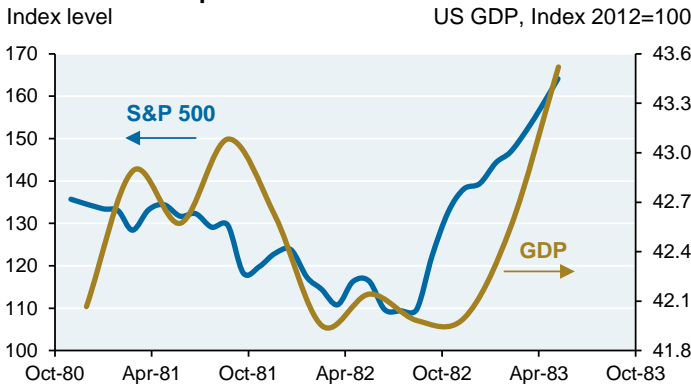
Source: BEA, Shiller. April 2020.

Stagflation era



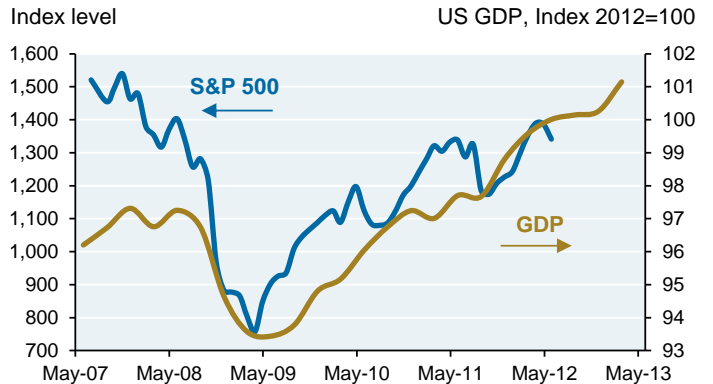
Source: BEA, Shiller. April 2020.

1980's double-dip recession



Source: BEA, Shiller. April 2020.

Global financial crisis



Source: BEA, Shiller. April 2020.



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