



John Stuart Mill and the road from ruin to recovery

First, here's what we've added to our [online compilation](#) of coronavirus materials which we continuously revise to reflect the latest economic, market and epidemiological information:

- The latest on infection and mortality rates by country, the growing East-West divide in infection rates, and infections as a function of temperature, latitude and humidity
- An update on vaccine and anti-viral development, including charts on Remdesivir and Chloroquine
- The consequence of Chinese information repression on the outbreak in Wuhan, and its global spread

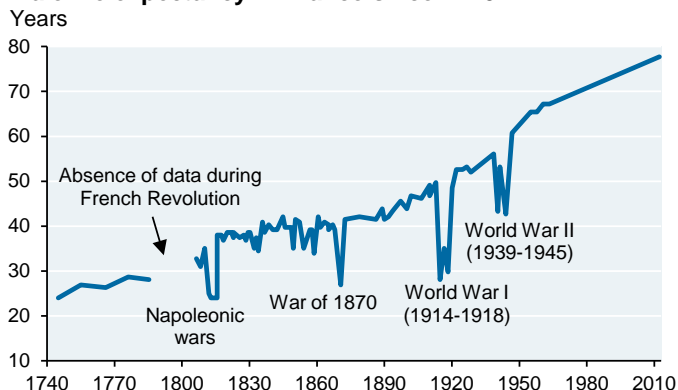
Now, onto this week's note. There are some difficult days ahead as quarantines and lockdowns grow. I want to share something with you from John Stuart Mill as we head into the unknown. **It's about how quickly countries rebound from crisis and economic hardship.**

"What has so often excited wonder, is the great rapidity with which countries recover from a state of devastation, the disappearance in a short time, of all traces of mischief done by earthquakes, floods, hurricanes, and the ravages of war. An enemy lays waste a country by fire and sword, and destroys or carries away nearly all the moveable wealth existing in it: all the inhabitants are ruined, and yet in a few years after, everything is much as it was before."

John Stuart Mill, *Principles of Political Economy*, 1848

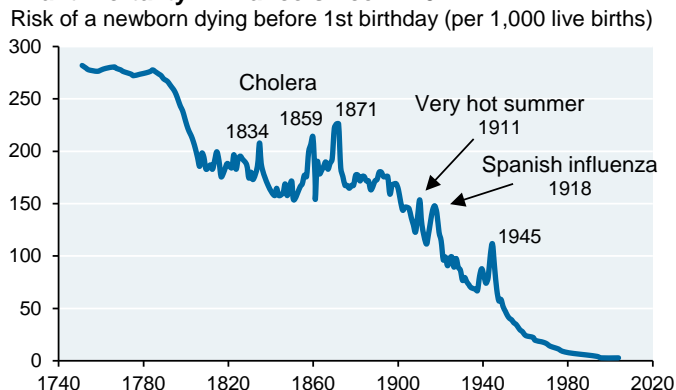
Pandemics like the Black Plague and Spanish Flu created tremendous hardships similar to the ones Mill mentions, and were devastating for the people and economies of Europe. **Both took place, however, before the medical advances of the mid 20th century.** The next two charts show male life expectancy and infant mortality in France since the mid 1700's. These exhibits are a proxy for two things: the astounding medical achievements of the 20th century, including the tools that scientists are using to develop vaccines and anti-viral medications to combat COVID-19 (see p. 6 of this note and p.5-6 in our online compilation); and the fact that greater threats to life expectancy and prosperity have in modern times resulted less from pandemics and natural disasters, and more from what people do to each other in times of war. This is something I will return to on page 3.

Male life expectancy in France since 1740



Source: French Institute for Demographic Studies (INED). 2018.

Infant mortality in France since 1740



Source: French Institute for Demographic Studies (INED). 2017.



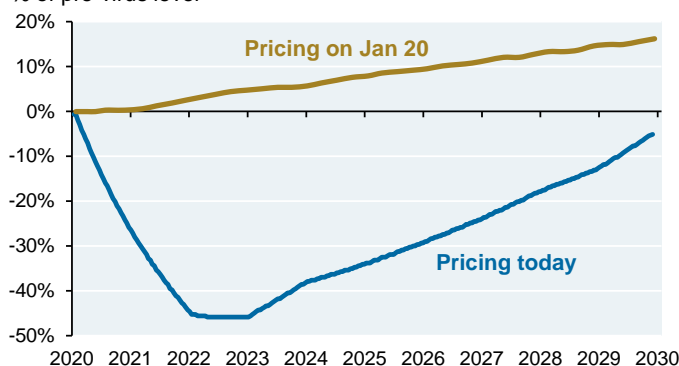
There's no shortage of dire news about what lies ahead. JP Morgan economists released estimates of what the virus will do to GDP growth¹, and if they're right, a US GDP decline of 14% in Q2 2020 (annualized, Q/Q) will occur and be the largest decline since 1947; the next largest was a 10% decline in Q1 1958. The trajectory of JP Morgan's expected US recovery is slow: an initial rebound in virus-impacted sectors in Q3, but lingering weakness through the end of the year. And to be clear, their scenario assumes that **US lockdown restrictions are gradually lifted in May**, with a return to normal levels of mobility, mass gatherings and transport by June. There are certainly more bearish scenarios one can imagine than that. There's also the alphabet soup of Federal Reserve facilities to come, each designed to ease strains in different corners of credit markets, as well as fiscal stimulus and company-specific relief of some kind.

Instead of digging through each one of these, I have been thinking about where the world will be a year from now, since that has been a useful framework for investors during prior calamities.

That's why I have been thinking about Mill's quote, particularly when looking at the magnitude of earnings decline now priced into equity markets. The next chart is one assessment (and there are many) of what is priced in: a 45% earnings decline by the end of 2022, followed by a slow recovery in which the prior earnings peak is not even reached by the end of the decade.

US earnings per share level implied by dividend futures

% of pre-virus level



Source: Bridgewater. March 17, 2020.

That would be a very slow earnings recovery vs history. The next chart shows US corporate earnings "drawdowns" since 1870 (i.e, how far they fell from their prior peak). The second chart shows how long it took in years from peak to trough earnings in each drawdown (in blue), and then the time it took to regain the prior earnings peak (in gold). With the exception of the Great Depression and certainly in the post-war era, it generally took less than four years to regain the peak, and sometimes less than three.

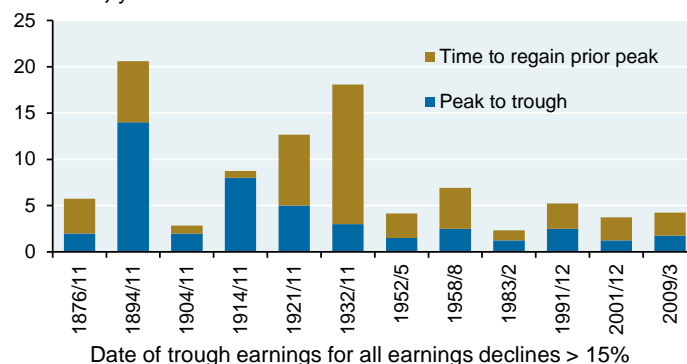
S&P 500 earnings drawdowns

Maximum drawdown of earnings per share



Source: Robert J. Shiller, S&P Dow Jones Indices. Q4 2019.

Peak-to-trough-to-peak analysis of large US earnings declines, years



Source: Bloomberg, J.P. Morgan Asset Management. 2020.

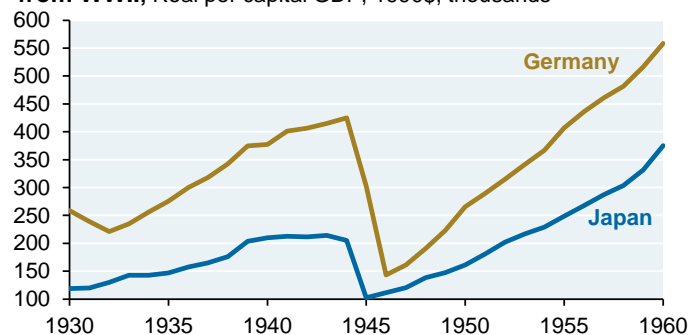
¹ "The lamps are going out all across the economy", Michael Feroli, JP Morgan Economic Research, March 18, 2020



For context, I also wanted to look outside the realm of corporate profits at the history of economic growth. What were the kinds of economic declines that required many years for GDP to recover?

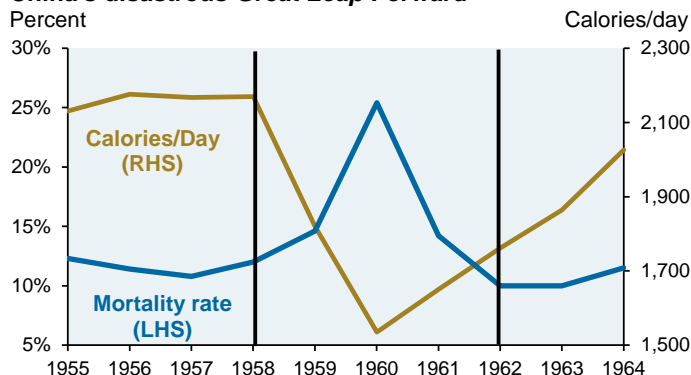
Deep and/or long economic contractions are usually the result of colossal wartime destruction of capital stock, or colossal economic mismanagement. Two examples from the 20th century come to mind²: the decade required for Germany and Japan to regain prewar levels of per capita GDP after WWII, and the mass starvation and spike in mortality resulting from China's "Great Leap Forward" in 1960. The former resulted from widespread wartime destruction of plant, housing, equipment and people, while the latter reflects the impact of what Dutch historian Frank Dikötter describes at the largest government-caused mortality shock in human history. A global COVID-19 pandemic will take its toll, but its economic aftershocks measured in years are likely to be much shorter than any of these episodes.

It took a full decade for Germany and Japan to recover from WWII, Real per capital GDP, 1990\$, thousands



Source: Angus Maddison (Historical Statistics of the World Economy), JPMAM. 2020.

China's disastrous Great Leap Forward



Source: "Visualizing the Effects of the Great Leap Forward", Basil Ashton, '84.

Wartime destruction

- By 1945, 20% of Germany's housing stock was destroyed, food production was half of 1938 levels, industrial production was down by a third and caloric intake was around 1,250 calories per day (average American consumers 3,600 per day)
- Japan, 1945: 40% of its capital stock, 25% of all housing and 180 miles of 67 cities were destroyed by the war
- Japan lost 4% of its population due to WWII, while Germany lost more than 8%

Economic mismanagement

- Forced collectivization and rejection of science as bourgeois propaganda; private farming plots abolished; most villages had to meet steel and other industrial quotas by melting down their existing stock of pots and pans. 30-60 million "unnatural" deaths from 1958-1961
- As per an August 3, 2016 piece in the Washington Post, Dikötter's work demonstrates that part of the death toll was intentional on Mao's part, and included large numbers of victims who were executed or tortured as opposed to merely starved to death

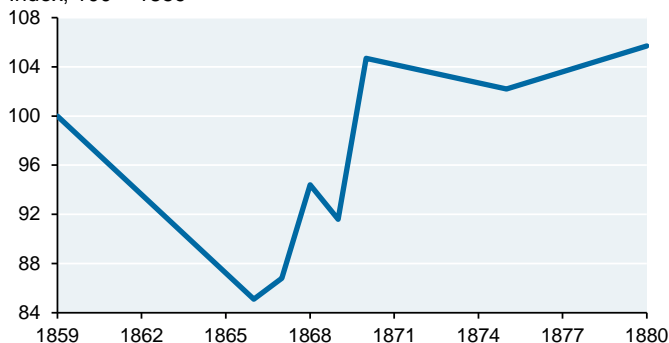
² We also could have included the 15 years for **Iran** to regain its 1978 per capita GDP level after the Iranian Revolution, and the 13 years for **Peru** to regain its prior peak during the rise and fall of the Shining Path movement. Sources for the data cited above include Stanford's Hoover Institution and the Asia Pacific Journal.



Sometimes, even when wars do result in damage and ruin, the speed with which economies rebound is faster than the speed with which they decline. The US Civil War was the deadliest conflict in US history, with 6x the number of war dead as a percentage of the US population than World War II. The Civil War left the southern US in complete shambles; it was fought mostly on southern soil, leaving many cities in ruins with thousands of people lacking food, clothing, or shelter for themselves or their dependents. On top of that, the Federal government did very little to assist them. And yet, look how quickly Confederate farm income rebounded after the war.

Post Civil War recovery in Confederate farm income

Index, 100 = 1859



Source: "Economic Behaviour in Adversity", Jack Hirshleifer, The University of Chicago Press, 1987.

This faster rebound seen after the Civil War is the kind of resilience that Mill was referring to, and is something to keep in mind during the very challenging days ahead. I agree with anyone who says it is likely to get worse before it gets better, certainly from an economic perspective. But if you were to ask me what the world will feel like a year from now, I would say 70%-80% back to normal. To believe otherwise would go against everything we know about the medical achievements of the 21st century, the application of artificial intelligence and big data in the pursuit of drug development, and the resilience of modern economies in adapting to severe shocks to consumption and output³.

One last comment, for investors. In the past, markets often bottomed before manifestations of a crisis (defaults, bank failures, etc) started to meaningfully improve, and sometimes bottomed even as these indicators were still getting worse (see page 5). Something to think about as we all monitor the rate of infection/mortality caused by COVID-19, which is our current pre-occupation.

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³ **Some of the consequences of a pandemic are similar to the aftermath of large natural disasters.** In "Economic development and the impacts of natural disasters" (2007), Hideki Toya from Nagoya University and Mark Skidmore from the University of Wisconsin examine the history of such events. What they found: countries with higher income, higher educational attainment, greater openness, more complete financial systems, better developed supply chains and decentralized governments experience fewer losses in the long run.

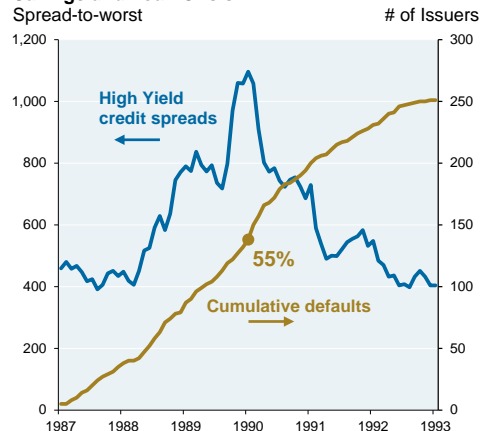


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A history of asset prices bottoming before associated defaults, bank failures and delinquencies started to improve

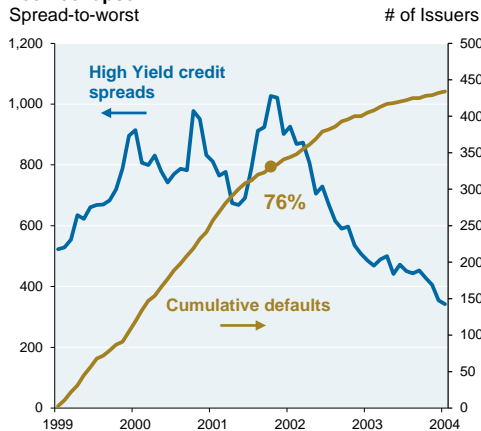
In the first and third rows, spreads peaked well before defaults and delinquencies did; in the middle row, banks stocks bottomed long before bank failures stopped rising.

Savings and Loan Crisis



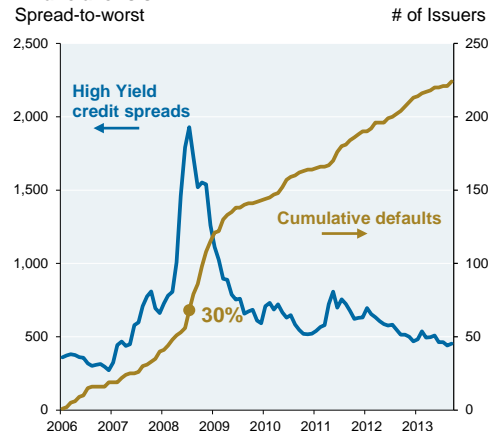
Source: J.P. Morgan Securities LLC, February 2014.

Tech collapse



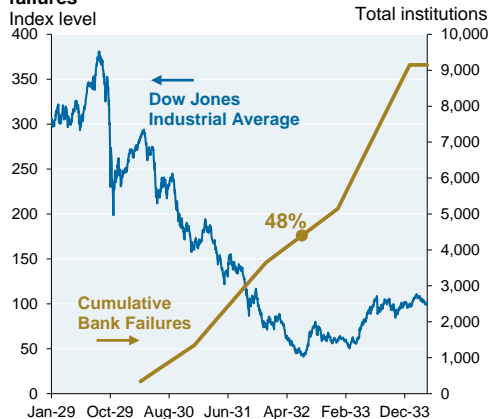
Source: J.P. Morgan Securities LLC, February 2014.

Financial crisis



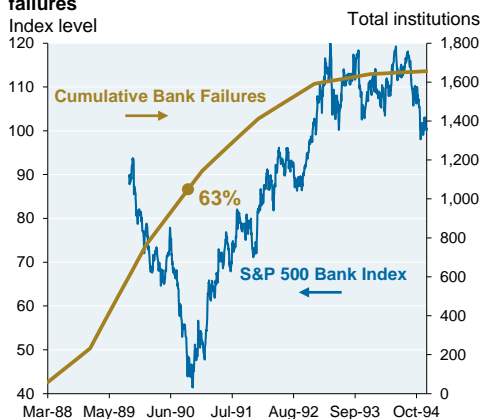
Source: J.P. Morgan Securities LLC, February 2014.

The Great Depression: Equity market vs. bank failures



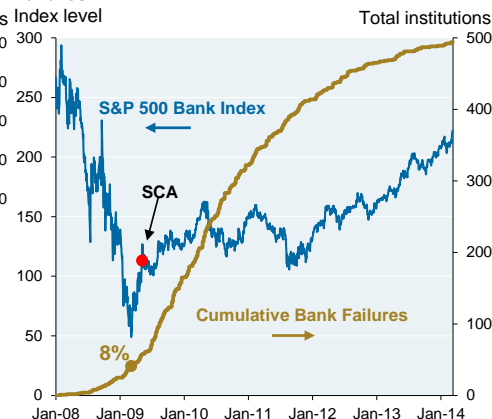
Source: FDIC, Bloomberg, March 2014.

Savings and Loan Crisis: Bank stocks vs. bank failures



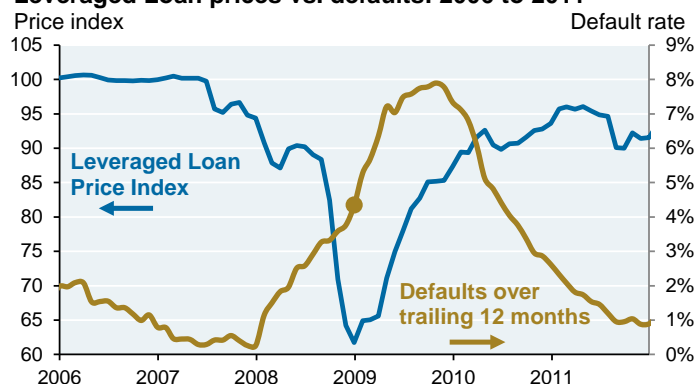
Source: FDIC, Bloomberg, March 2014.

Financial crisis: Bank stocks vs. bank failures



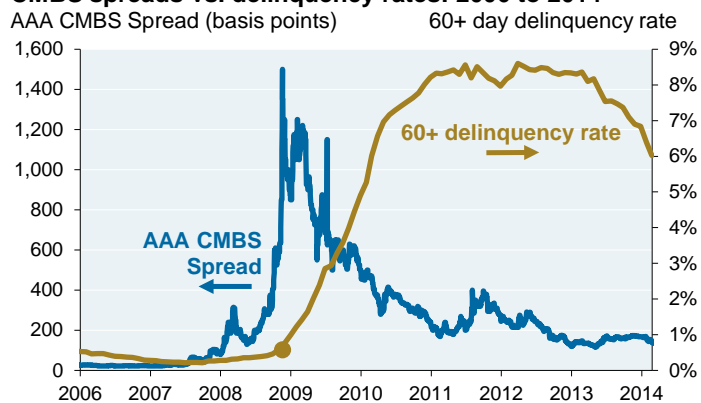
Source: FDIC, Bloomberg, March 2014.

Leveraged Loan prices vs. defaults: 2006 to 2011



Source: J.P. Morgan Securities LLC, Standard and Poor's, S&P/LSTA Leveraged Loan Index. February 2014.

CMBS spreads vs. delinquency rates: 2006 to 2014



Source: Trepp, J.P. Morgan Securities LLC, February 2014.



Appendix: update on vaccine and anti-viral development

We have no way of knowing which of these treatments may ultimately be successful. The purpose of the table is to convey the extent of research underway. Medical countermeasures generally fall into three categories: vaccines, direct viral inhibitors (anti-retrovirals, antivirals, prophylactic polypeptides, nanoviricides, antibody-based therapies and cell therapy) and immunomodulators.

Drug	Companies	Status	Type	Details
Favipiravir	Fujifilm; Medivector; Zhejiang Hisun Pharmaceutical	Launched	Antiviral	Avigan approved for influenza in Japan and Ebola in Guinea; Zhejiang began clinical trial in Feb 2020 in China to study for emergency use for COVID-19
Chloroquine	Bayer AG	Launched	Immuno-modulator	Bayer AG's Resochin (chloroquine phosphate) approved for malaria and has shown signs of efficacy in China on COVID-19 related pneumonia
Actemra	Genentech/Roche	Launched	Immuno-modulator	As of Mar 2020, Chinese authorities allows the Actemra to be used on COVID-19 patients who show serious lung damage
Rintatolimod	Aim Immunotech; GP Pharm SA; Goethe University	Launched	Immuno-modulator	Approved for chronic fatigue syndrome in various countries; entered discovery for coronavirus in Feb 2020
ASC-09 + ritonavir	Ascleptis Pharma	Phase III	Anti-retroviral	Initiated a phase III trial in China in Feb 2020
Remdesivir	Gilead	Phase III	Antiviral	In development for Ebola, Nipah virus and COVID-19
Kevzara	Regeneron/Sanofi	Phase III/II	Immuno-modulator	As of Mar 2020, clinical program has begun in the US with 400 patients with severe COVID-19
BDB-1	Beijing Defengrei	Phase II	Antibody	Received approval in Feb 2020 for clinical trials in China for COVID-19
Brilacidin	Innovation Pharmaceuticals	Phase II	Antibody	Brilacidin has potential for treating COVID-19 as well as MERS/SARS
INO-4800	Beijing Advaccine Biotech; GeneOne Life Science; Inovio	Preclinical	Vaccine	DNA vaccine for MERS and COVID-19; as of Jan 2020, Inovio planned to initiate phase I trials in the U.S. and China
CYNK-001	Celularity; Sorrento Therapeutics	Preclinical	Cell Therapy	In development for multiple myeloma/ other cancers; in Jan 2020, Sorrento in discussions on fast-track in China for COVID-19
SARS-CoV-2 vaccine	Chongqing Zhifei Biological; Institute of Microbiology	Preclinical	Vaccine	In Feb 2020, the vaccine entered the animal experimental stage
Adjuvant/COVID-19 vaccine	Novavax	Preclinical	Vaccine	Novavax is assessing candidates in animal models and will begin clinical trials by the end of spring 2020
S-protein/ACE2	Sichuan Kelun Pharmaceutical	Preclinical	Prophylactic polypeptide	In Feb 2020, preclinical data in primates showed good biological activity and safety; clinical trials were planned
ChAdOx1 nCoV-19	Jenner Institute	Preclinical	Vaccine	By Feb 2020, vaccine constructed and manufacturing for clinical doses planned
Mesenchymal stem cells	Wuhan Hamilton Biotechnology	Preclinical	Cell Therapy	In Feb 2020, a clinical trial was planned in China
Dendritic cell vaccine	Beijing Dingcheng Taiyuan Biotechn; Betta Pharma	Discovery	Vaccine	In Feb 2020, development was ongoing in China
Recombinant vaccine	Clover Biopharmaceuticals	Discovery	Vaccine	In Feb 2020, preclinical studies using Glaxosmithkline pandemic vaccine adjuvant technology with the vaccine were planned
Live-attenuated vaccine	Codagenix; Serum Institute of India	Discovery	Vaccine	By Feb 2020, Codagenix designed candidate genomes, planned to evaluate the vaccine viruses in vivo prior to clinical trials
SARS-CoV-2 mRNA vaccine	Curevac AG	Discovery	Vaccine	In Jan 2020, the project was in the discovery/planning stage
Monoclonal antibodies/vaccine	Dyadic International; Israel Institute for Biological Res	Discovery	Antibody/ Vaccine	Development stage for both an rVaccine candidate and monoclonal antibodies
SARS-CoV-2 vaccine	Fudan University; ID Pharma	Discovery	Vaccine	In Feb 2020, early research was underway
Z-VacciRNA	Guanhao Biotech; Zy Therapeutics	Discovery	Vaccine	In Feb 2020, it was at discovery stage
Antibodies	Immunoprecise Antibodies	Discovery	Antibody	Using transgenic animal platform OmniAb for direct generation of human antibodies
SARS-CoV-2 vaccine	Medigen Biotechnology; National Institutes of Health	Discovery	Vaccine	In Feb 2020, preclinical studies in animals were planned in Taiwan
mRNA-1273	Moderna Therapeutics	Discovery	Vaccine	In Jan 2020, National Institute of Allergy and Infectious Diseases planned to conduct IND-enabling studies and a U.S. phase I trial
Anti-SARS-CoV-2 program	Nanoviricides	Discovery	Nanoviricide	In Jan 2020, company started preparations to test candidates in cell cultures against certain known coronaviruses
Antibodies	Regeneron Pharmaceuticals	Discovery	Antibody	In Feb 2020, development of a vaccine was planned
Protein subunit vaccine	Sanofi Pasteur	Discovery	Vaccine	In Feb 2020, Sanofi planned to advance a preclinical candidate
Coronavirus vaccine	Vaxart	Discovery	Vaccine	Recombinant protein vaccine being analyzed
Protein subunit vaccine	University of Queensland	Discovery	Vaccine	Glaxosmithkline and Seqirus GmbH providing access to pandemic vaccine adjuvant technologies; as of Feb 2020, preclinical studies planned
Monoclonal antibodies	Vir Biotechnology	Discovery	Antibody	In Feb 2020, two antibodies were identified; company formed collaboration with Wuxi Biologics

Source: Cortellis, Bioworld, Johns Hopkins, JPMAM. As of March 5, 2020.



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