



John Stuart Mill and the road from ruin to recovery

First, here’s what we’ve added to our [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

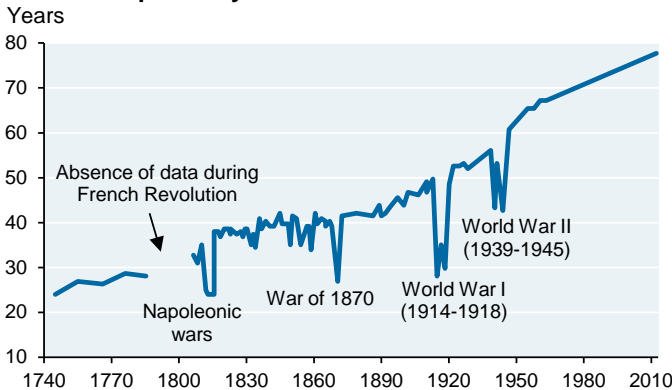
Now, onto this week’s note. There are some difficult days ahead as quarantines and lockdowns grow. I want to share something with you from John Stuart Mill as we head into the unknown. **It’s about how quickly countries rebound from crisis and economic hardship.**

“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

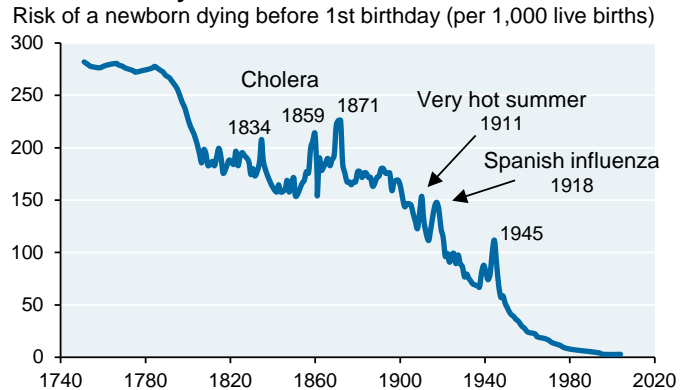
Pandemics like the Black Plague and Spanish Flu created tremendous hardships similar to the ones Mill mentions, and were devastating for the people and economies of Europe. **Both took place, however, before the medical advances of the mid 20th century.** The next two charts show male life expectancy 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.

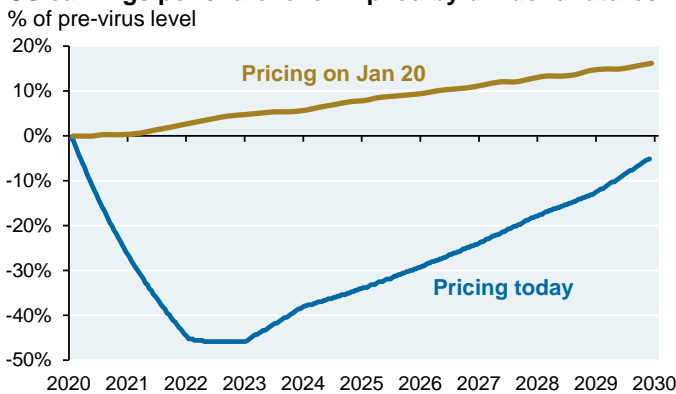


There’s no shortage of dire news about what lies ahead. JP Morgan economists released estimates of what the virus will do to GDP growth¹, and if they’re right, a US GDP decline of 14% in Q2 2020 (annualized, Q/Q) will occur and be the largest decline since 1947; the next largest was a 10% decline in 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



Source: Bridgewater. March 17, 2020.

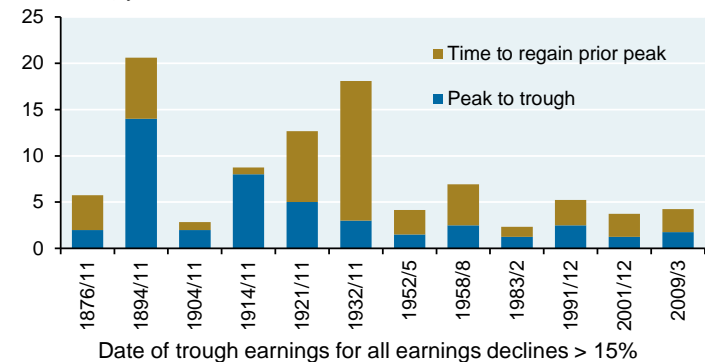
That would be a very slow earnings recovery vs history. The next chart shows US corporate earnings “drawdowns” since 1870 (i.e, how far they fell from their prior peak). The second chart shows how long it took in years from peak to trough earnings in each drawdown (in blue), and then the time it took 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



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.

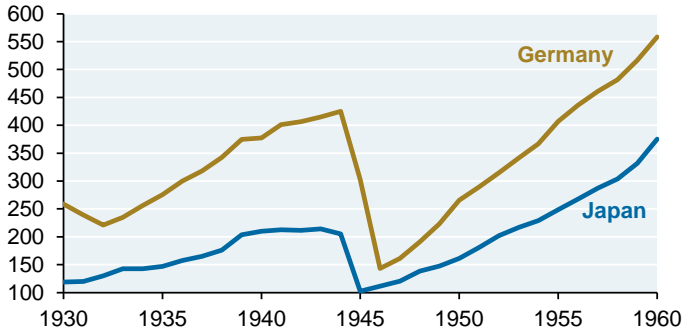
¹ “The lamps are going out all across the economy”, Michael Feroli, JP Morgan Economic Research, March 18, 2020



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?

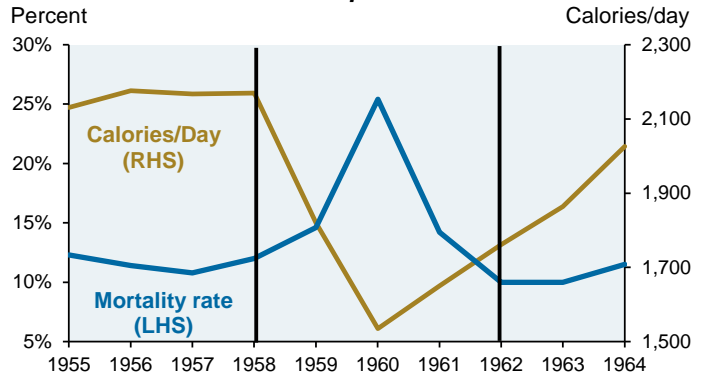
Deep and/or long economic contractions are usually the result of colossal wartime destruction of capital stock, or colossal economic mismanagement. Two examples from the 20th century come to mind²: the decade required for Germany and Japan to regain prewar levels of per capita GDP after WWII, and the 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

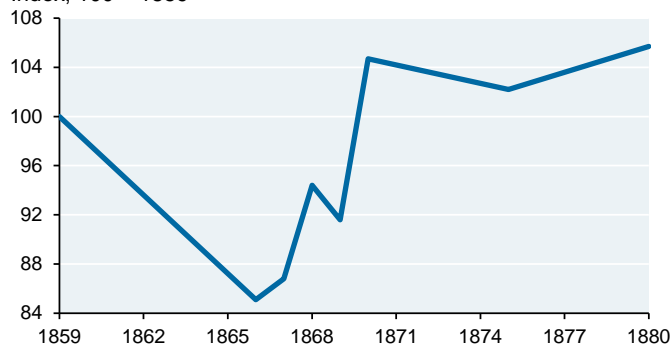
² We also could have included the 15 years for **Iran** to regain its 1978 per capita GDP level after the Iranian Revolution, and the 13 years for **Peru** to regain its prior peak during the rise and fall of the Shining Path movement. Sources for the data cited above include Stanford’s Hoover Institution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

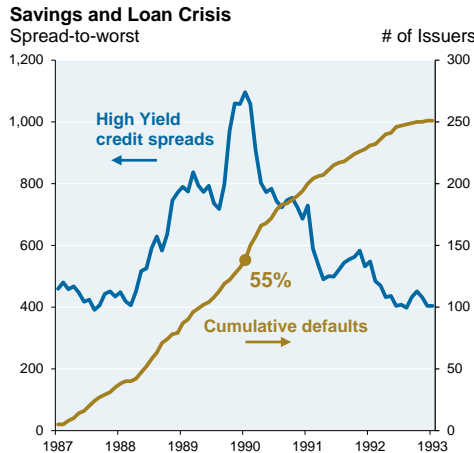
Michael Cembalest
JP Morgan Asset Management

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.

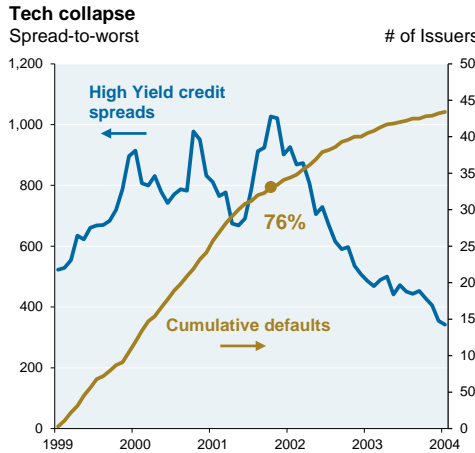


A history of asset prices bottoming before associated defaults, bank failures and delinquencies started to improve

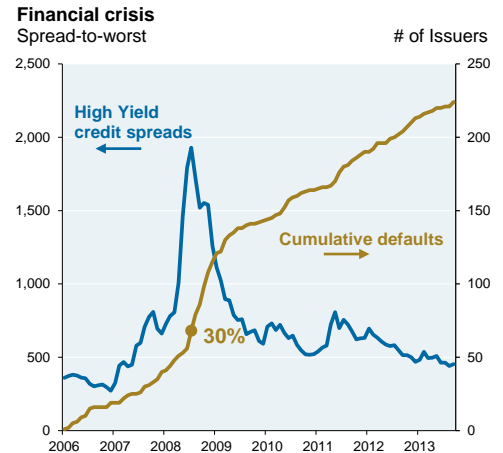
In the first and third rows, spreads peaked well before defaults and delinquencies did; in the middle row, banks stocks bottomed long before bank failures stopped rising.



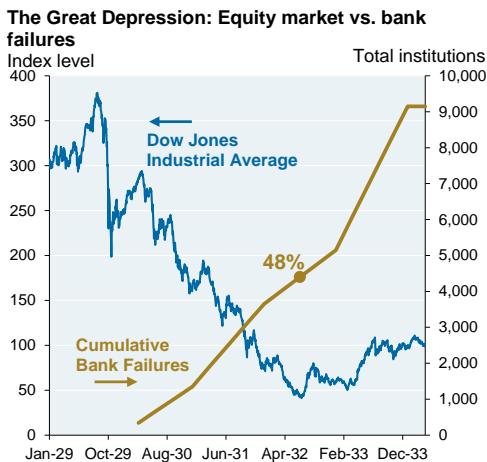
Source: J.P. Morgan Securities LLC. February 2014.



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



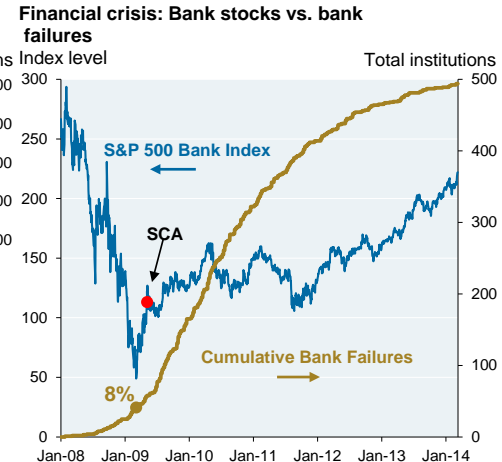
Source: J.P. Morgan Securities LLC. February 2014.



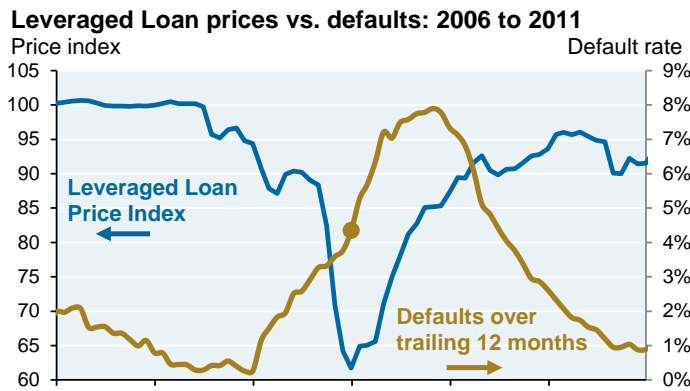
Source: FDIC, Bloomberg. March 2014.



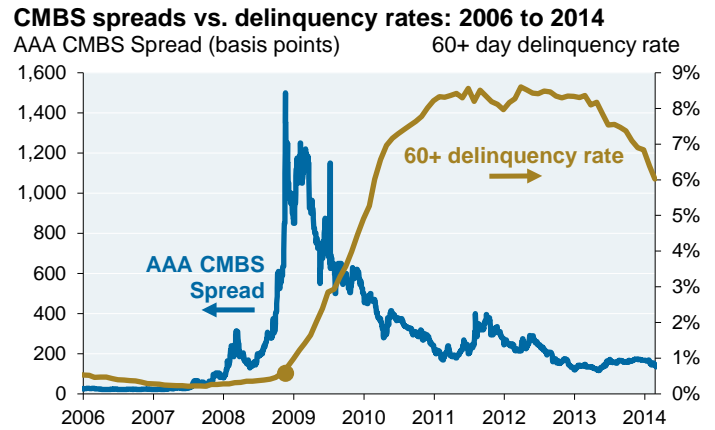
Source: FDIC, Bloomberg. March 2014.



Source: FDIC, Bloomberg. March 2014.



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



Purpose of This Material: This material is for information purposes only. The views, opinions, estimates and strategies expressed herein constitutes Michael Cembalest's judgment based on current market conditions and are subject to change without notice, and may differ from those expressed by other areas of J.P. Morgan. **This information in no way constitutes J.P. Morgan Research and should not be treated as such.**

GENERAL RISKS & CONSIDERATIONS

Any views, strategies or products discussed in this material may not be appropriate for all individuals and are subject to risks. **Investors may get back less than they invested, and past performance is not a reliable indicator of future results.** Asset allocation / diversification does not guarantee a profit or protect against loss. Nothing in this material should be relied upon in isolation for the purpose of making an investment decision. You are urged to consider carefully whether the services, products, asset classes (e.g. equities, fixed income, alternative investments, commodities, etc.) or strategies discussed are suitable to your needs. You must also consider the objectives, risks, charges, and expenses associated with an investment service, product or strategy prior to making an investment decision. For this and more complete information, including discussion of your goals/situation, contact your J.P. Morgan representative.

NON-RELIANCE

Certain information contained in this material is believed to be reliable; however, JPM does not represent or warrant its accuracy, reliability or completeness, or accept any liability for any loss or damage (whether direct or indirect) arising out of the use of all or any part of this material. No representation or warranty should be made with regard to any computations, graphs, tables, diagrams or commentary in this material, which are provided for illustration/reference purposes only. The views, opinions, estimates and strategies expressed in this material constitute our judgment based on current market conditions and are subject to change without notice. JPM assumes no duty to update any information in this material in the event that such information changes. Views, opinions, estimates and strategies expressed herein may differ from those expressed by other areas of JPM, views expressed for other purposes or in other contexts, and **this material should not be regarded as a research report.** Any projected results and risks are based solely on hypothetical examples cited, and actual results and risks will vary depending on specific circumstances. Forward-looking statements should not be considered as guarantees or predictions of future events.

Nothing in this document shall be construed as giving rise to any duty of care owed to, or advisory relationship with, you or any third party. Nothing in this document shall be regarded as an offer, solicitation, recommendation or advice (whether financial, accounting, legal, tax or other) given by J.P. Morgan and/or its officers or employees, irrespective of whether or not such communication was given at your request.

J.P. Morgan and its affiliates and employees do not provide tax, legal or accounting advice. You should consult your own tax, legal and accounting advisors before engaging in any financial transactions.

LEGAL ENTITY, BRAND & REGULATORY INFORMATION

In the **United States**, bank deposit accounts and related services, such as checking, savings and bank lending, are offered by **JPMorgan Chase Bank, N.A.** Member FDIC. **JPMorgan Chase Bank, N.A.** and its affiliates (collectively "JPMCB") offer investment products, which may include bank-managed investment accounts and custody, as part of its trust and fiduciary services. Other investment products and services, such as brokerage and advisory accounts, are offered through **J.P. Morgan Securities LLC** ("JPMS"), a member of FINRA and SIPC. Annuities are made available through Chase Insurance Agency, Inc. (CIA), a licensed insurance agency, doing business as Chase Insurance Agency Services, Inc. in Florida. JPMCB, JPMS and CIA are affiliated companies under the common control of JPMorgan Chase & Co. Products not available in all states.

In **Luxembourg**, this material is issued by **J.P. Morgan Bank Luxembourg S.A. (JPMBL)**, with registered office at European Bank and Business Centre, 6 route de Treves, L-2633, Senningerberg, Luxembourg. R.C.S Luxembourg B10.958. Authorised and regulated by Commission de Surveillance du Secteur Financier (CSSF) and jointly supervised by the European Central Bank (ECB) and the CSSF. J.P. Morgan Bank Luxembourg S.A. is authorized as a credit institution in accordance with the Law of 5th April 1993. In the **United Kingdom**, this material is issued by **J.P. Morgan Bank Luxembourg S.A.– London Branch**. Prior to Brexit, (Brexit meaning that the UK leaves the European Union under Article 50 of the Treaty on European Union, or, if later, loses its ability to passport financial services between the UK and the remainder of the EEA), J.P. Morgan Bank Luxembourg S.A.– London Branch is subject to limited regulation by the Financial Conduct Authority and the Prudential Regulation Authority. Details about the extent of our regulation by the Financial Conduct Authority and the Prudential Regulation Authority are available from us on request. In the event of Brexit, in the UK, J.P. Morgan Bank Luxembourg S.A.– London Branch is authorised by the Prudential Regulation Authority, subject to regulation by the Financial Conduct Authority and limited regulation by the Prudential Regulation Authority. Details about the extent of our regulation by the Prudential Regulation Authority are available from us on request. In **Spain**, this material is distributed by **J.P. Morgan Bank Luxembourg S.A., Sucursal en España**, with registered office at Paseo de la Castellana, 31, 28046 Madrid, Spain. J.P. Morgan Bank Luxembourg S.A., Sucursal en España is registered under number 1516 within the administrative registry of the Bank of Spain and supervised by the Spanish Securities Market Commission (CNMV). In **Germany**, this material is distributed by **J.P. Morgan Bank Luxembourg S.A., Frankfurt Branch**, registered office at Taunustor 1 (TaunusTurm), 60310 Frankfurt, Germany, jointly supervised by the Commission de Surveillance du Secteur Financier (CSSF) and the European Central Bank (ECB), and in certain areas also supervised by the Bundesanstalt für Finanzdienstleistungsaufsicht (BaFin). In **Italy**, this material is distributed by **J.P. Morgan Bank Luxembourg S.A.– Milan Branch**, registered office at Via Catena Adalberto 4, Milan 20121, Italy and regulated by Bank of Italy and the Commissione Nazionale per le Società e la Borsa (CONSOB). In the **Netherlands**, this material is distributed by **J.P. Morgan Bank Luxembourg S.A., Amsterdam Branch**, with registered office at World Trade Centre, Tower B, Strawinskylaan 1135, 1077 XX, Amsterdam, The Netherlands. J.P. Morgan Bank Luxembourg S.A., Amsterdam Branch is authorised and regulated by the Commission de Surveillance du Secteur Financier (CSSF) and jointly supervised by the European Central Bank (ECB) and the CSSF in Luxembourg; J.P. Morgan Bank Luxembourg S.A., Amsterdam Branch is also authorised and supervised by De Nederlandsche Bank (DNB) and the Autoriteit Financiële Markten (AFM) in the Netherlands. Registered with the Kamer van Koophandel as a branch of J.P. Morgan Bank Luxembourg S.A. under registration number 71651845. In **Denmark**, this material is distributed by **J.P. Morgan Bank Luxembourg, Copenhagen Br**, filial af J.P. Morgan Bank Luxembourg S.A. with registered office at Kalvebod Brygge 39-41, 1560 København V, Denmark. J.P. Morgan Bank Luxembourg, Copenhagen Br, filial af J.P. Morgan Bank Luxembourg S.A. is authorised and regulated by Commission de Surveillance du Secteur Financier (CSSF) and jointly supervised by the European Central Bank (ECB) and the CSSF. J.P. Morgan Bank Luxembourg, Copenhagen Br, filial af J.P. Morgan Bank Luxembourg S.A. is also subject to the supervision of Finanstilsynet (Danish FSA) and registered with Finanstilsynet as a branch of J.P. Morgan Bank Luxembourg S.A. under code 29009. In **Sweden**, this material is distributed by **J.P. Morgan Bank Luxembourg S.A. - Stockholm Bankfilial**, with registered office at Hamngatan 15, Stockholm, 11147, Sweden. J.P. Morgan Bank Luxembourg S.A. - Stockholm Bankfilial is authorised and regulated by Commission de Surveillance du Secteur Financier (CSSF) and jointly supervised by the European Central Bank (ECB) and the CSSF. J.P. Morgan Bank Luxembourg S.A., Stockholm Branch is also subject to the supervision of Finansinspektionen (Swedish FSA). Registered with Finansinspektionen as a branch of J.P. Morgan Bank Luxembourg S.A.. In **France**, this material is distributed by **JPMorgan Chase Bank, N.A. ("JPMCB"), Paris branch**, which is regulated by the French banking authorities Autorité de Contrôle Prudentiel et de Résolution and Autorité des Marchés Financiers. In **Switzerland**, this material is distributed by **J.P. Morgan (Suisse) SA**, which is regulated in Switzerland by the Swiss Financial Market Supervisory Authority (FINMA).



In Hong Kong, this material is distributed by **JPMCB, Hong Kong branch**. JPMCB, Hong Kong branch is regulated by the Hong Kong Monetary Authority and the Securities and Futures Commission of Hong Kong. In Hong Kong, we will cease to use your personal data for our marketing purposes without charge if you so request. In **Singapore**, this material is distributed by **JPMCB, Singapore branch**. JPMCB, Singapore branch is regulated by the Monetary Authority of Singapore. Dealing and advisory services and discretionary investment management services are provided to you by JPMCB, Hong Kong/Singapore branch (as notified to you). Banking and custody services are provided to you by JPMCB Singapore Branch. The contents of this document have not been reviewed by any regulatory authority in Hong Kong, Singapore or any other jurisdictions. This advertisement has not been reviewed by the Monetary Authority of Singapore. JPMorgan Chase Bank, N.A., a national banking association chartered under the laws of the United States, and as a body corporate, its shareholder's liability is limited.

JPMorgan Chase Bank, N.A. (JPMCBNA) (ABN 43 074 112 011/AFS Licence No: 238367) is regulated by the Australian Securities and Investment Commission and the Australian Prudential Regulation Authority. Material provided by JPMCBNA in Australia is to "wholesale clients" only. For the purposes of this paragraph the term "wholesale client" has the meaning given in section 761G of the Corporations Act 2001 (Cth). Please inform us if you are not a Wholesale Client now or if you cease to be a Wholesale Client at any time in the future.

JPMS is a registered foreign company (overseas) (ARBN 109293610) incorporated in Delaware, U.S.A. Under Australian financial services licensing requirements, carrying on a financial services business in Australia requires a financial service provider, such as J.P. Morgan Securities LLC (JPMS), to hold an Australian Financial Services Licence (AFSL), unless an exemption applies. **JPMS is exempt from the requirement to hold an AFSL under the Corporations Act 2001 (Cth) (Act) in respect of financial services it provides to you, and is regulated by the SEC, FINRA and CFTC under US laws, which differ from Australian laws.** Material provided by JPMS in Australia is to "wholesale clients" only. The information provided in this material is not intended to be, and must not be, distributed or passed on, directly or indirectly, to any other class of persons in Australia. For the purposes of this paragraph the term "wholesale client" has the meaning given in section 761G of the Act. Please inform us immediately if you are not a Wholesale Client now or if you cease to be a Wholesale Client at any time in the future.

This material has not been prepared specifically for Australian investors. It:

- may contain references to dollar amounts which are not Australian dollars;
- may contain financial information which is not prepared in accordance with Australian law or practices;
- may not address risks associated with investment in foreign currency denominated investments; and
- does not address Australian tax issues.

With respect to countries in **Latin America**, the distribution of this material may be restricted in certain jurisdictions. We may offer and/or sell to you securities or other financial instruments which may not be registered under, and are not the subject of a public offering under, the securities or other financial regulatory laws of your home country. Such securities or instruments are offered and/or sold to you on a private basis only. Any communication by us to you regarding such securities or instruments, including without limitation the delivery of a prospectus, term sheet or other offering document, is not intended by us as an offer to sell or a solicitation of an offer to buy any securities or instruments in any jurisdiction in which such an offer or a solicitation is unlawful. Furthermore, such securities or instruments may be subject to certain regulatory and/or contractual restrictions on subsequent transfer by you, and you are solely responsible for ascertaining and complying with such restrictions. To the extent this content makes reference to a fund, the Fund may not be publicly offered in any Latin American country, without previous registration of such fund's securities in compliance with the laws of the corresponding jurisdiction. Public offering of any security, including the shares of the Fund, without previous registration at Brazilian Securities and Exchange Commission-CVM is completely prohibited. Some products or services contained in the materials might not be currently provided by the Brazilian and Mexican platforms.

References to "J.P. Morgan" are to JPM, its subsidiaries and affiliates worldwide. "J.P. Morgan Private Bank" is the brand name for the private banking business conducted by JPM.

This material is intended for your personal use and should not be circulated to or used by any other person, or duplicated for non-personal use, without our permission. If you have any questions or no longer wish to receive these communications, please contact your J.P. Morgan representative.

© 2020 JPMorgan Chase & Co. All rights reserved.