
What now for the markets, the virus and the economy?

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J. P. Morgan Private Bank Coronavirus web portal link

www.jpmorgan.com/coronavirus-research

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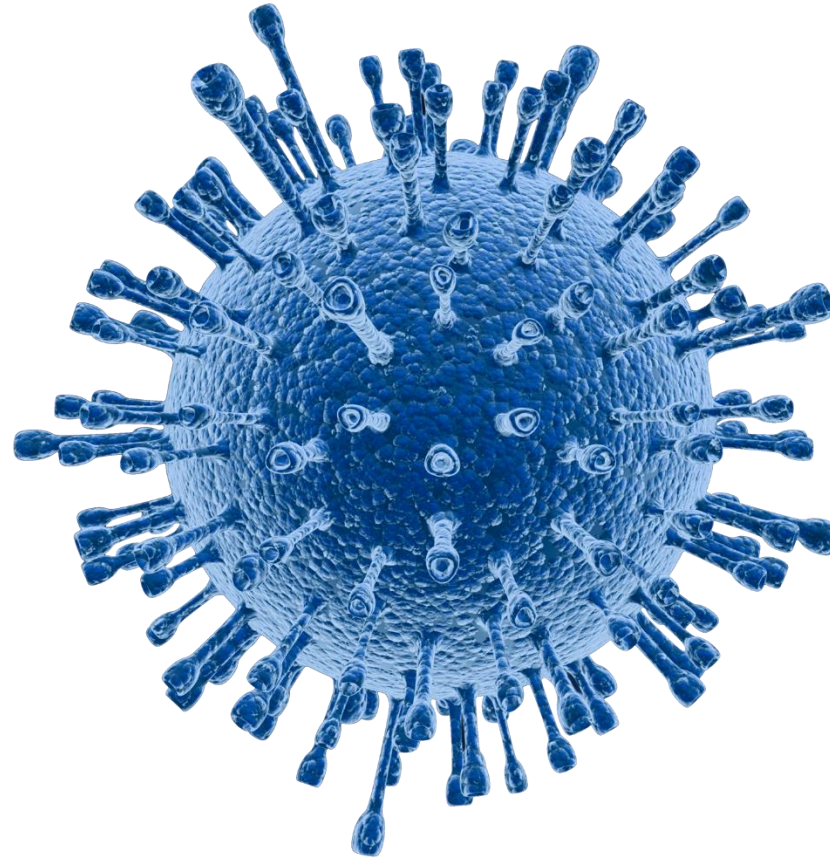
<http://www.jpmorgansecurities.com/coronavirusresearch>

- **Markets**
- The virus, anti-virals and vaccines
- The economy

Then and now, with images sized as a proportion of GDP



WWII Marshall Plan
US Aid to Europe
2.5% of European GDP



COVID Marshall Plan
US aid to itself
13.1% of US GDP

To battle COVID, developed countries created a Marshall Plan for themselves

Monetary and fiscal stimulus

Country	Central Bank Liquidity Injection US\$ trillions	Central Bank Liquidity Injection GDP %	New Govt Fiscal Stimulus US\$ trillions	New Govt Fiscal Stimulus GDP %	Rate cuts basis points
United States	\$4.80	22.4%	\$2.82	13.1%	-150
Eurozone	\$1.10	8.3%	\$1.76	13.2%	
Japan	\$0.20	3.9%	\$0.99	19.2%	
United Kingdom	\$0.25	9.0%	\$0.14	5.1%	-65
China	\$1.29	9.0%	\$0.54	3.8%	-100
Others	\$0.65		\$1.85		
Total	\$8.29	9.6%	\$8.10	9.4%	

Source: Cornerstone, JPM Economic Research. Apr 15, 2020. Others include: RoW, Asian Development Bank, IMF, World Bank.

Fed resuscitated old programs, and designed new ones

Federal Reserve Programs to Support Credit (US\$, Billions)

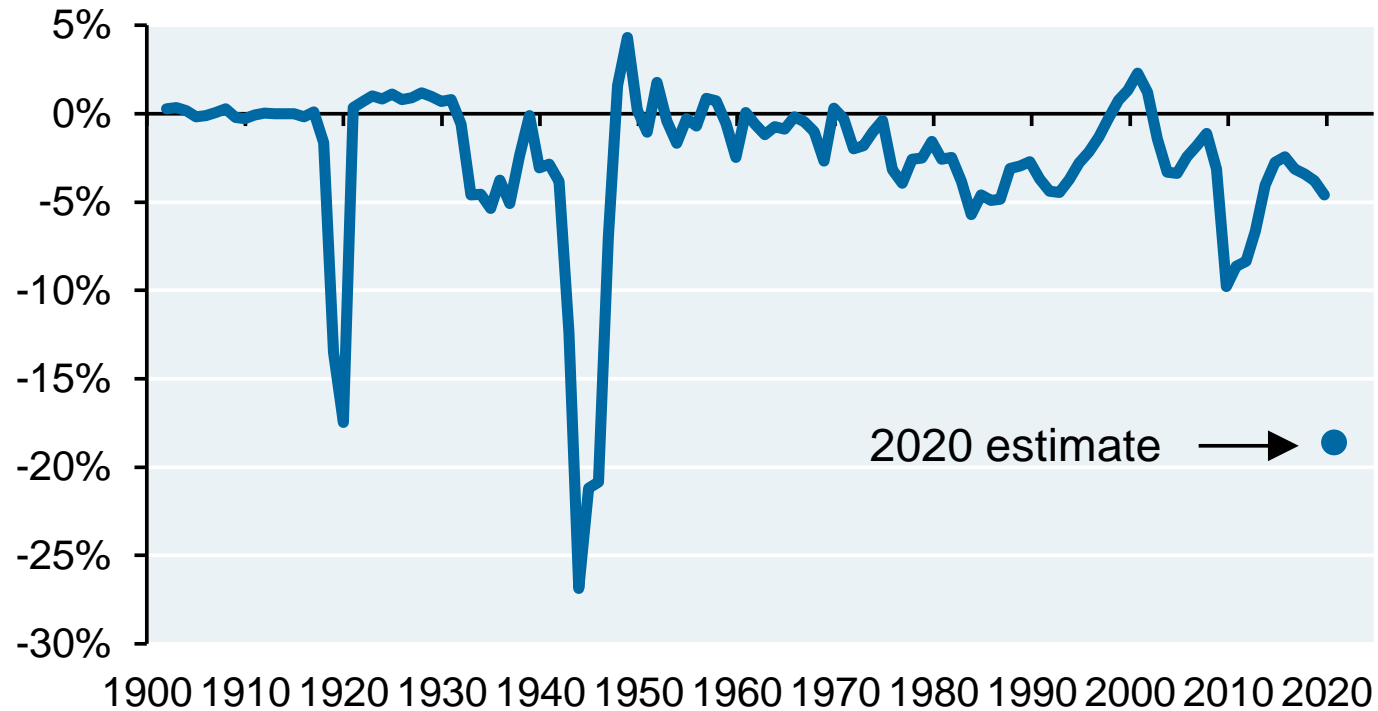
Targeted Sector & Policy	Asset Purchases	Direct Lending	Guarantee/Backstop	
Government				
QE Treasury Purchases	2,200			
Commercial Paper Funding Facility (Muni CP)			30	
Households				
QE MBS Purchases	1,000			
TALF (Consumer ABS Purchases)	100			
Businesses				
Commercial Paper Funding Facility (Non-Fin Corp CP)			240	
Primary Market Corporate Credit Facility		500		New
Secondary Market Corporate Credit Facility	250			New
Paycheck Protection Program Lending Facility	350			New
Municipal Liquidity Facility		500		New
Main St Loan Facility		600		New
Financials/Liquidity				
Repo Operations		200		
Commercial Paper Funding Facility (Fin + ABCP)			640	
Money Market Mutual Fund Liquidity Facility			1,400	
Total by type of program	3,900	1,800	2,310	
Cumulative Total			8,010	
Other Fed facilities include the revival of the Primary Dealer Credit Facility for broker-dealers, and FX swap lines for developed and developing economy central banks.				

Source: Bridgewater, J.P. Morgan Asset Management. April 2020.

US fiscal deficit

US headline fiscal balance

percentage of US GDP

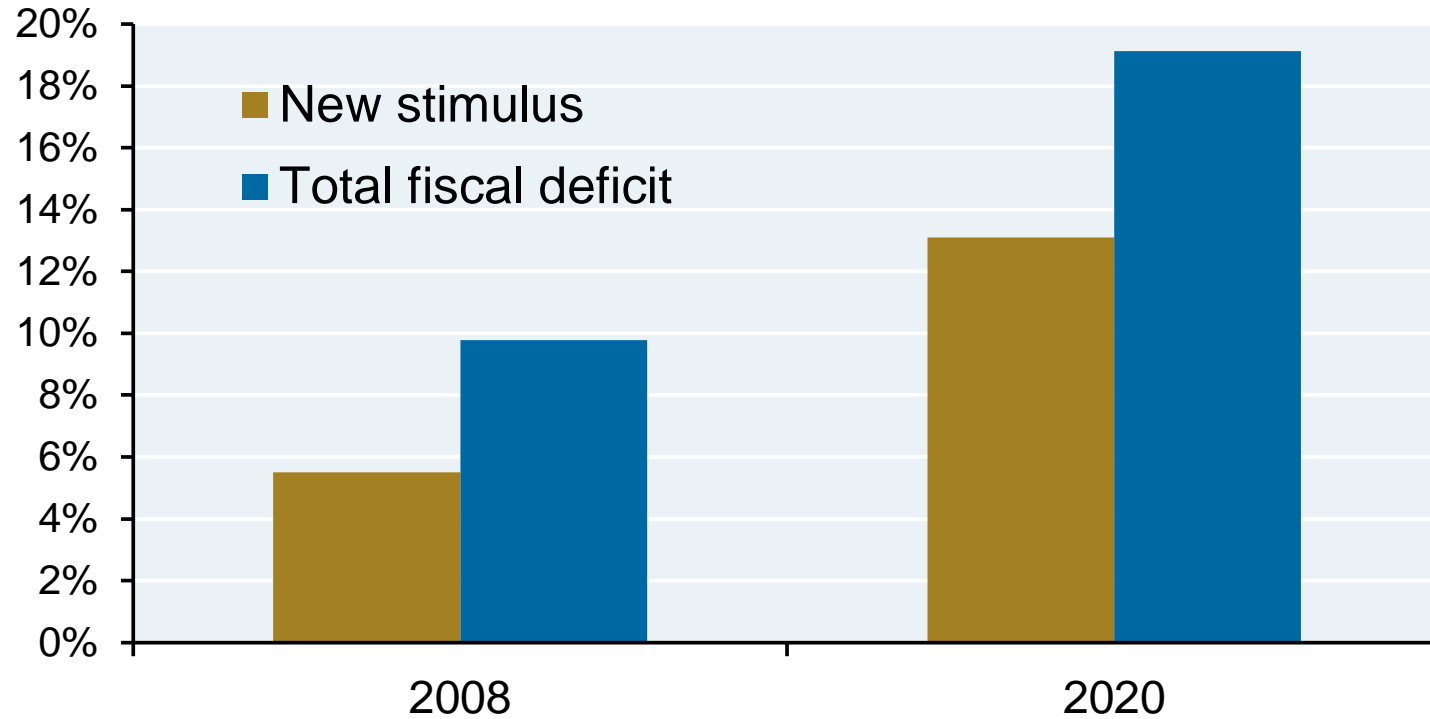


Source: Historical Statistics of the United States, FRB, JPM Economic Research. April 2020.

Clarifying terms

US Fiscal stimulus

% of GDP

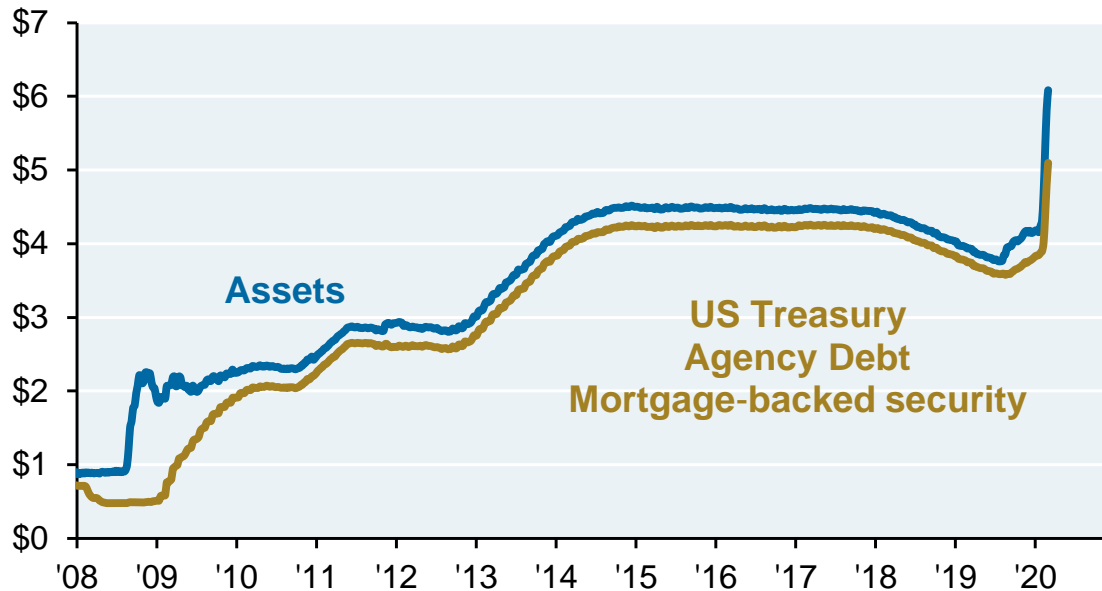


Source: Cornerstone, FRB, ILO, JPM Economic Research. April 2020.

Fed and ECB balance sheet expansion so far

Fed balance sheet

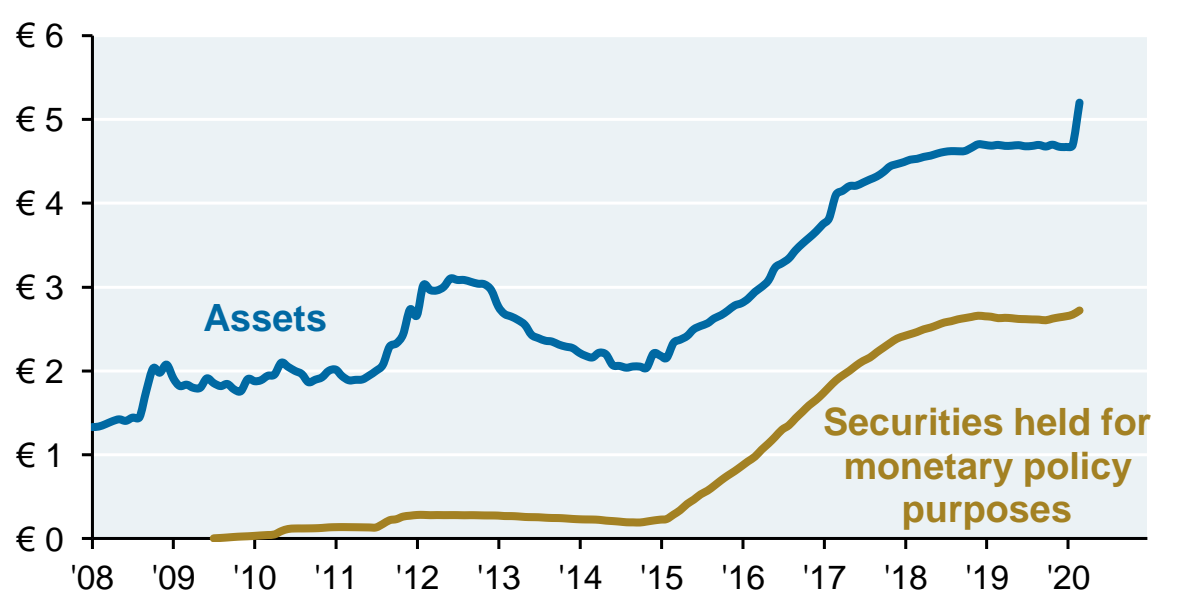
US\$ trillions



Source: Federal Reserve Board. April 08, 2020.

ECB balance sheet

EUR trillions

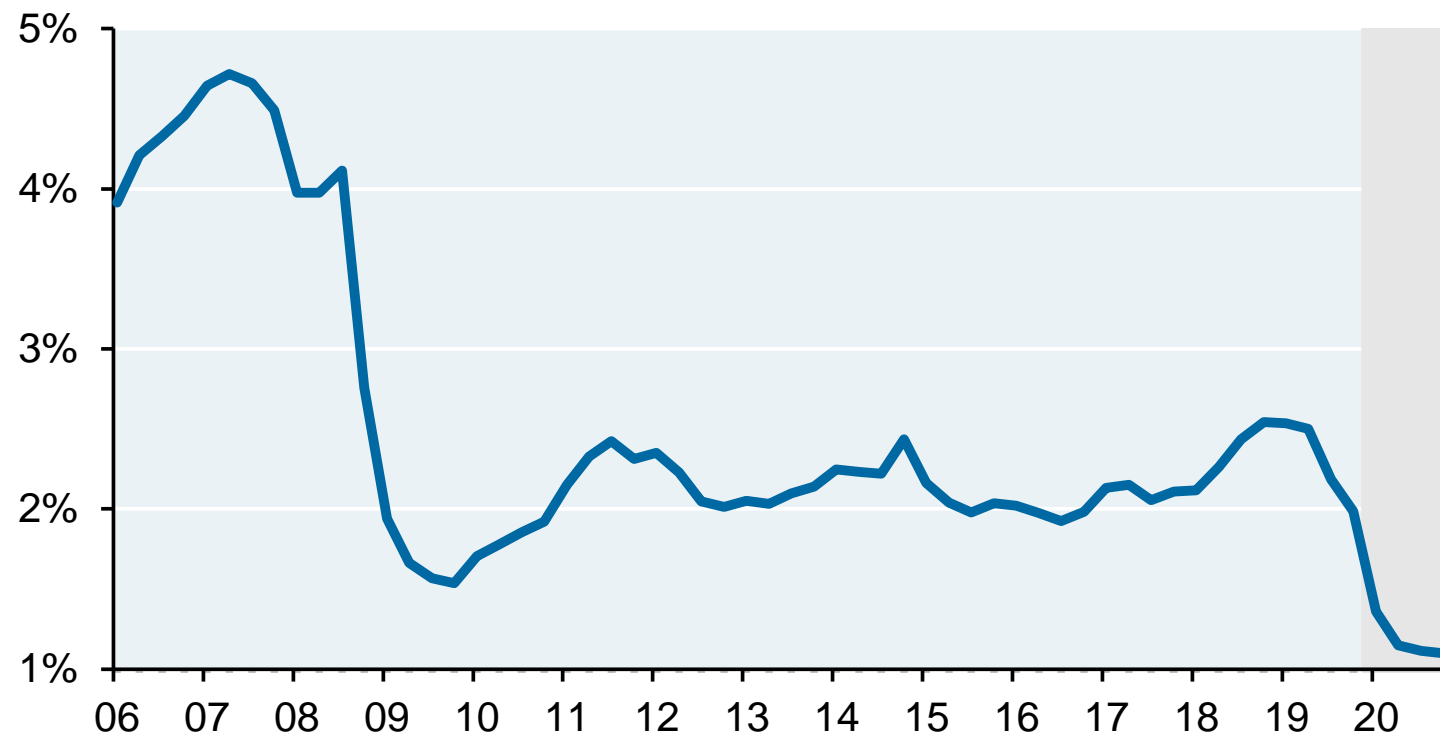


Source: European Central Bank. March 2020.

Cost of money

Monetary policy

Global monetary policy rate

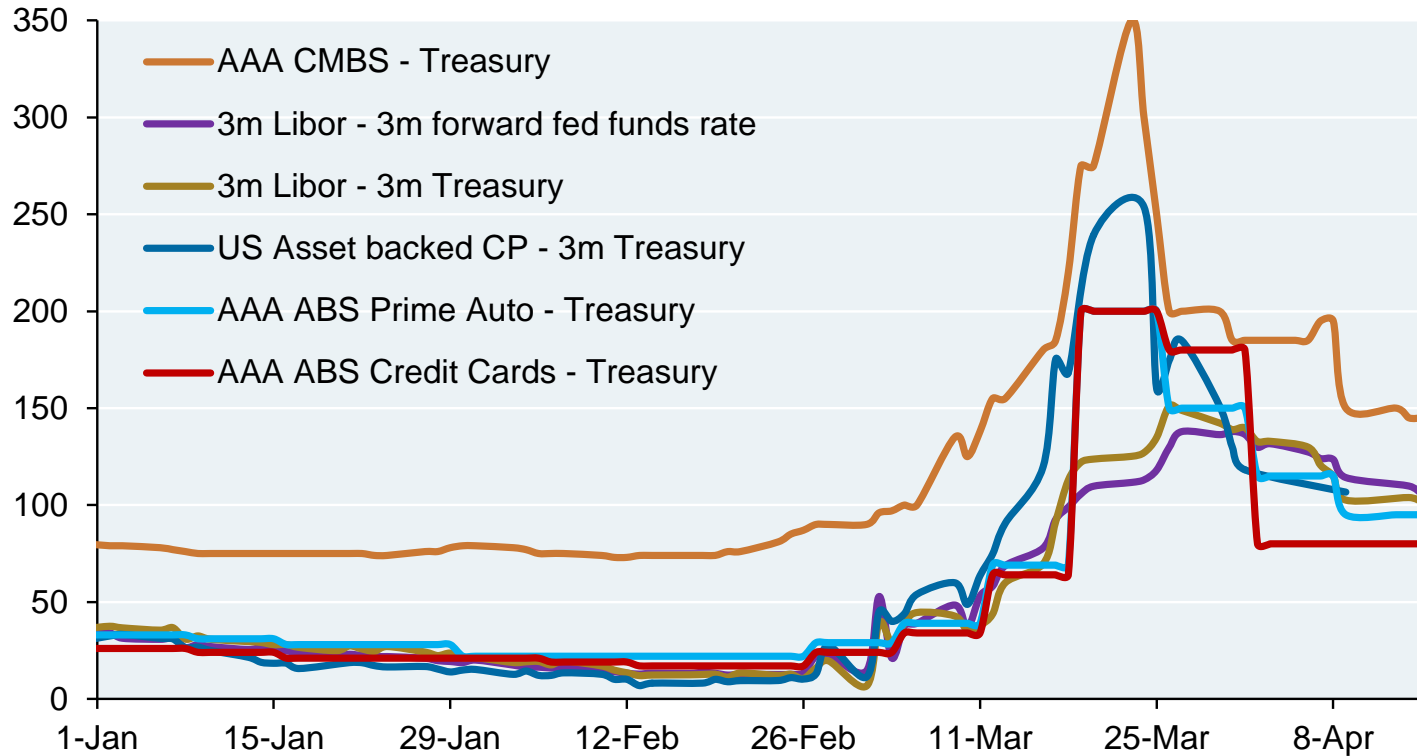


Source: JPM Economic Research. Q3 2020. Shaded area = estimates.

It looks like it's working

Money market spreads

Basis points



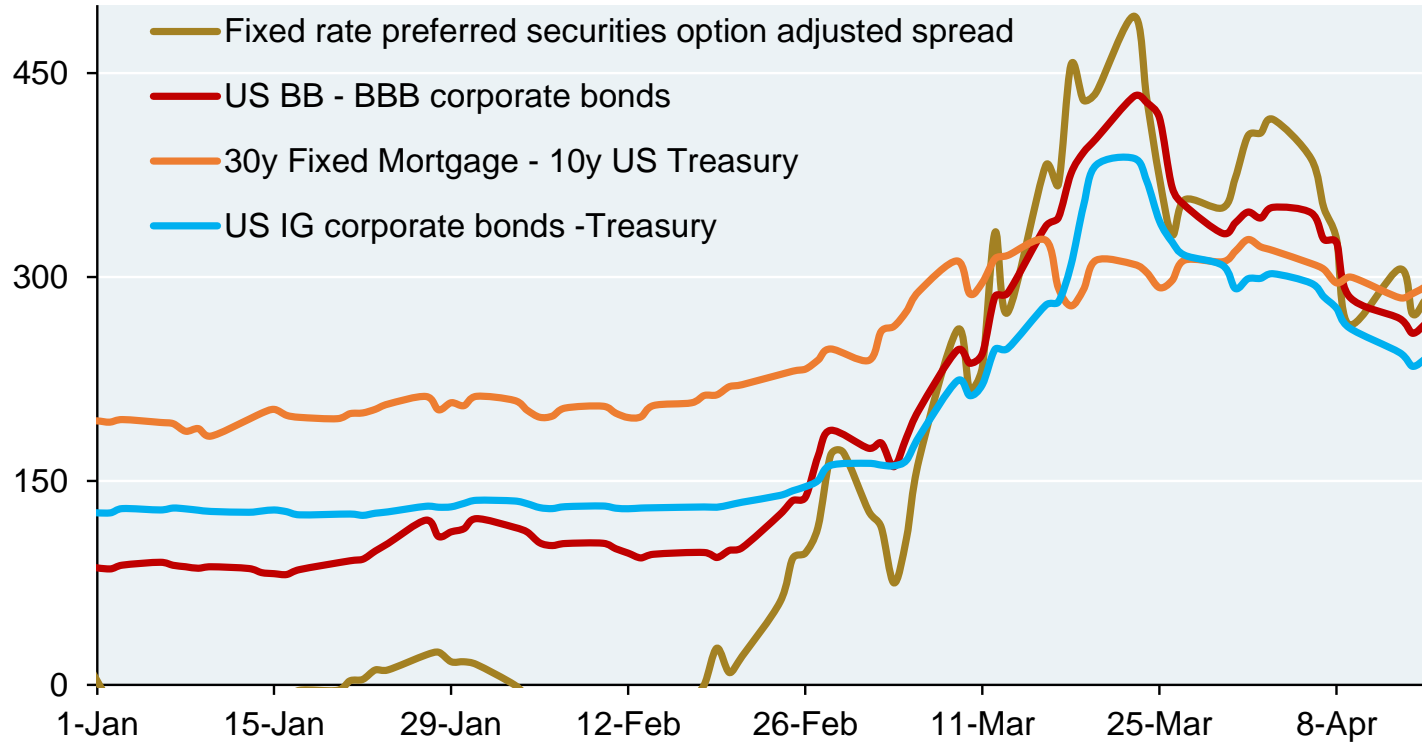
Source: Bloomberg, J.P. Morgan. April 15, 2020.

It is not possible to invest directly in an index.

It looks like it's working

Credit markets part 1

Basis points



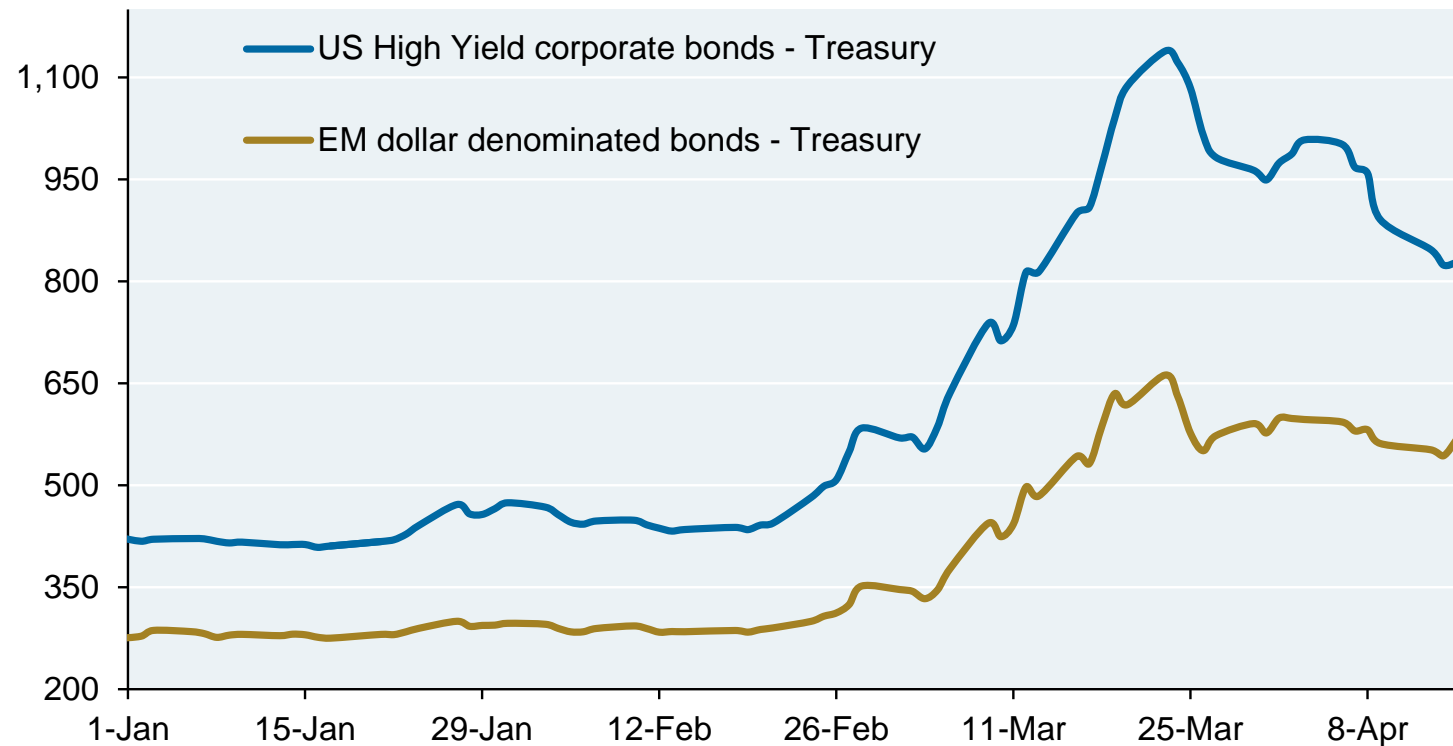
Source: Bloomberg, J.P. Morgan. April 15, 2020.

It is not possible to invest directly in an index.

It looks like it's working

Credit markets part 2

Basis points

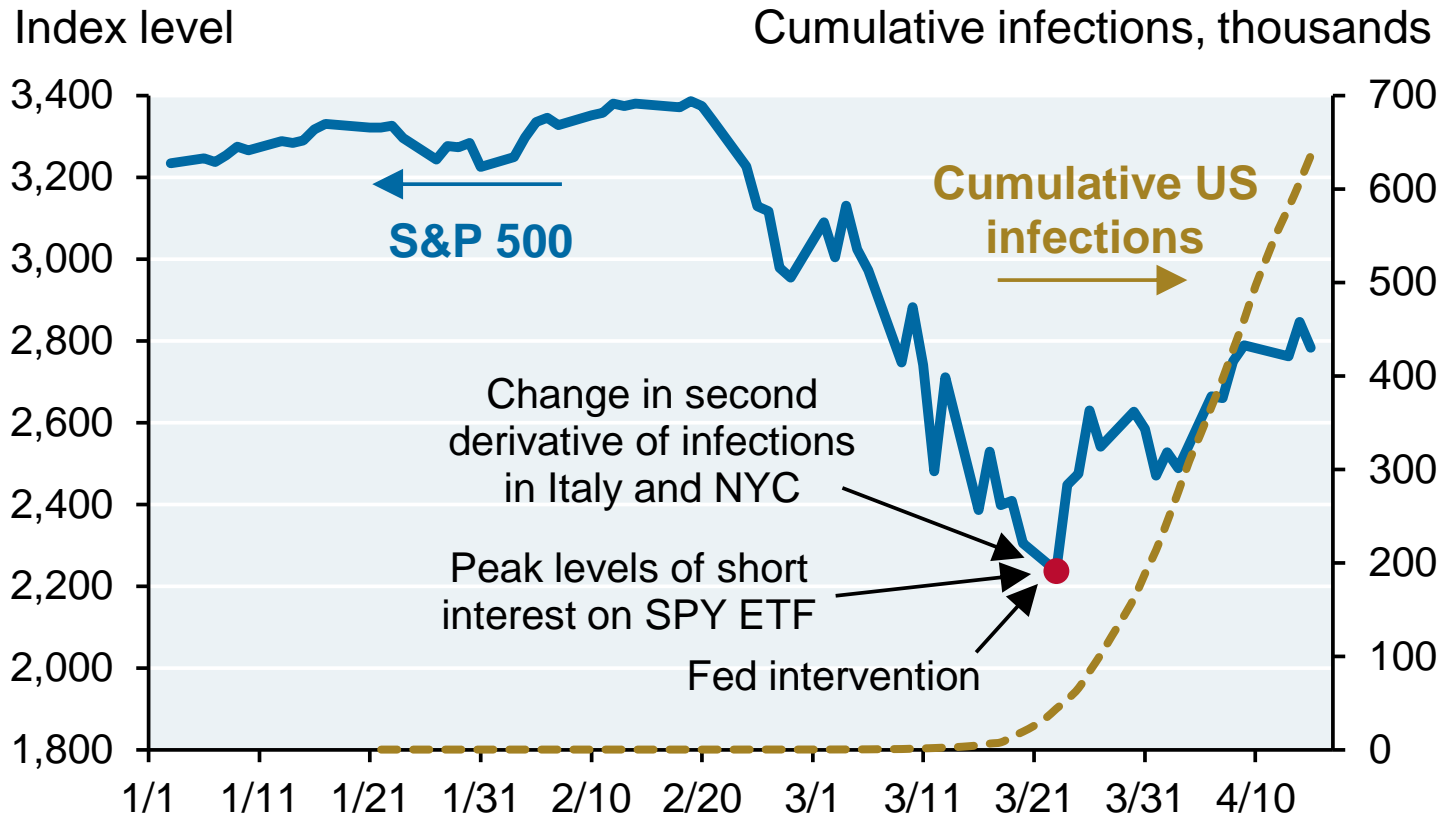


Source: Bloomberg, J.P. Morgan. April 15, 2020.

It is not possible to invest directly in an index.

Result: powerful equity rally as well, retracing 50% of the decline

S&P 500 index and cumulative US infections



Source: Bloomberg, Johns Hopkins University. April 15, 2020.

It is not possible to invest directly in an index.

Sharp rebound in S&P 500 P/E multiples, even before accounting for probable deterioration of 2021 earnings estimates

S&P 500 price/earnings

Price / forward 2 year earnings per share



Source: Bloomberg, J.P. Morgan. April 16, 2020.

It is not possible to invest directly in an index.

Same kind of thing happening in Europe

Stoxx Europe 600 price/earnings

Price / forward 2 year earnings per share

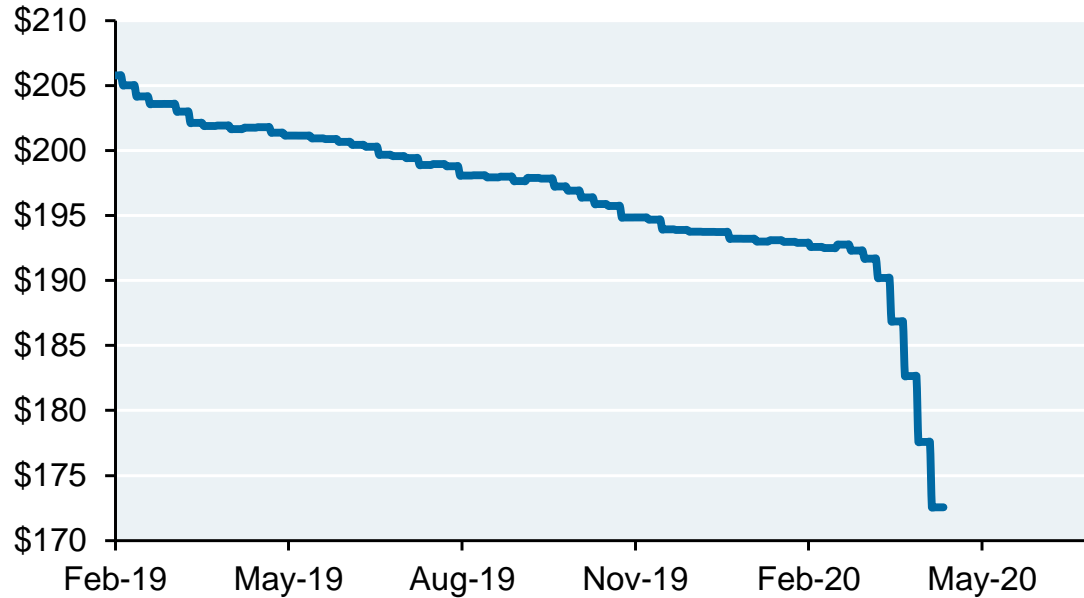


Source: Bloomberg, J.P. Morgan. April 16, 2020.

It is not possible to invest directly in an index.

Virus impact on 2021 EPS: -11% in the US, and -13% in Europe. Is that enough? That would still leave profits 5%-8% above 2019 levels

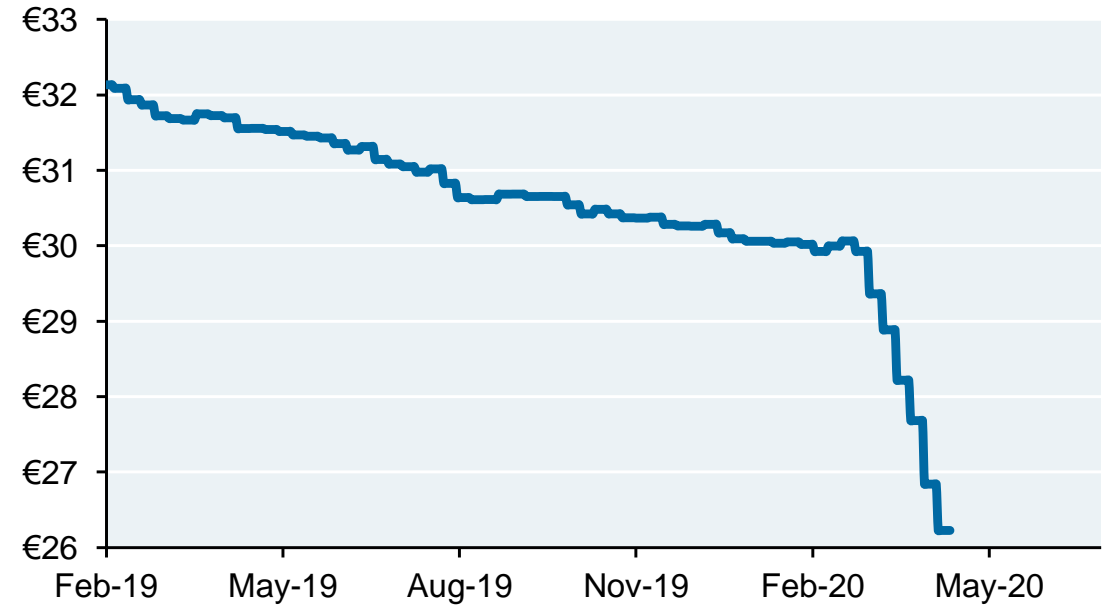
S&P 500 2021 EPS forecasts



Source: Datastream, J.P. Morgan. April 15, 2020.

It is not possible to invest directly in an index.

Stoxx Europe 600 2021 EPS forecasts

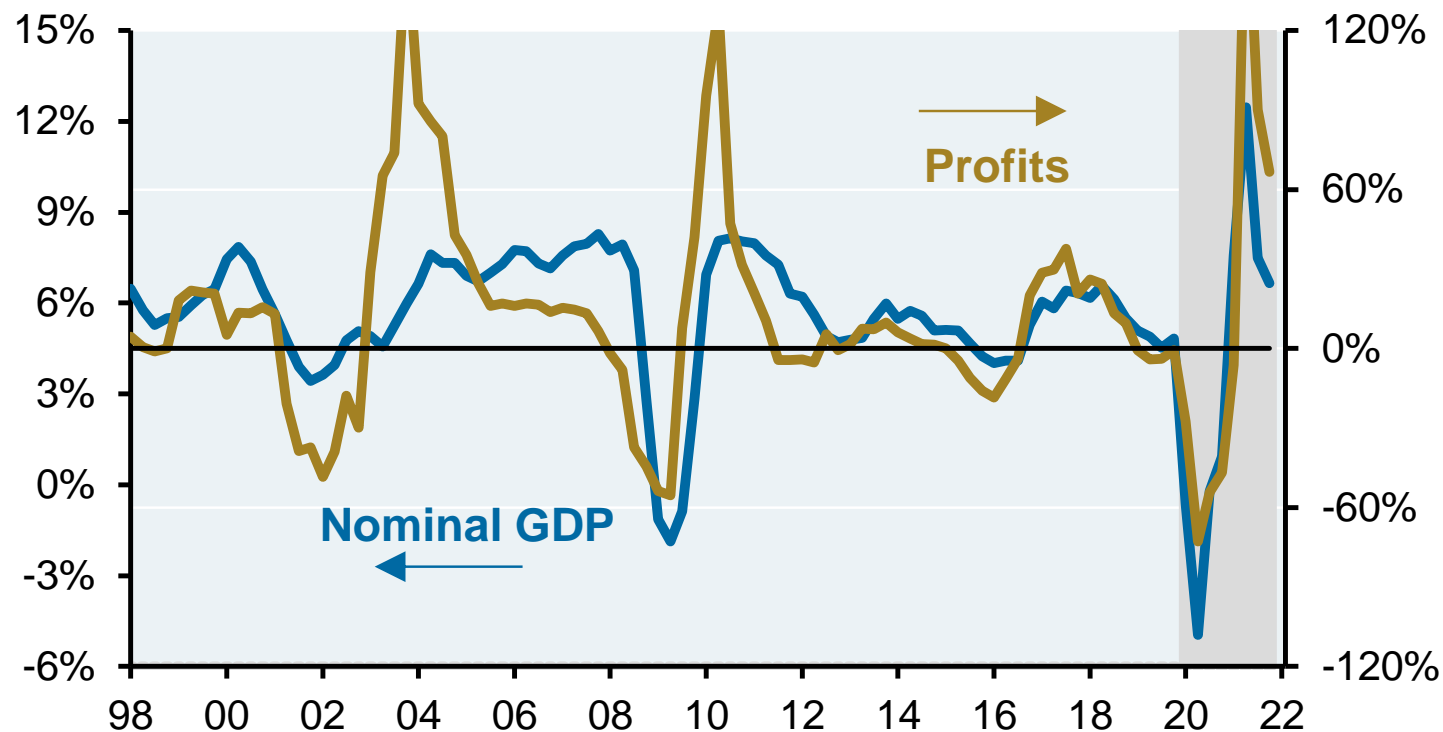


Source: Datastream, J.P. Morgan. April 15, 2020.

Based on historical relationship with GDP, JPM economists project sharp global profit decline in 2020, and a rally in 2021 that ends up just 11% below 2019 levels

Global nominal GDP and corporate profits

% change y/y (both axes)



Source: J.P. Morgan. April 13, 2020. Shaded area = estimates.

Rally during economic distress: par for the course since the 1930's

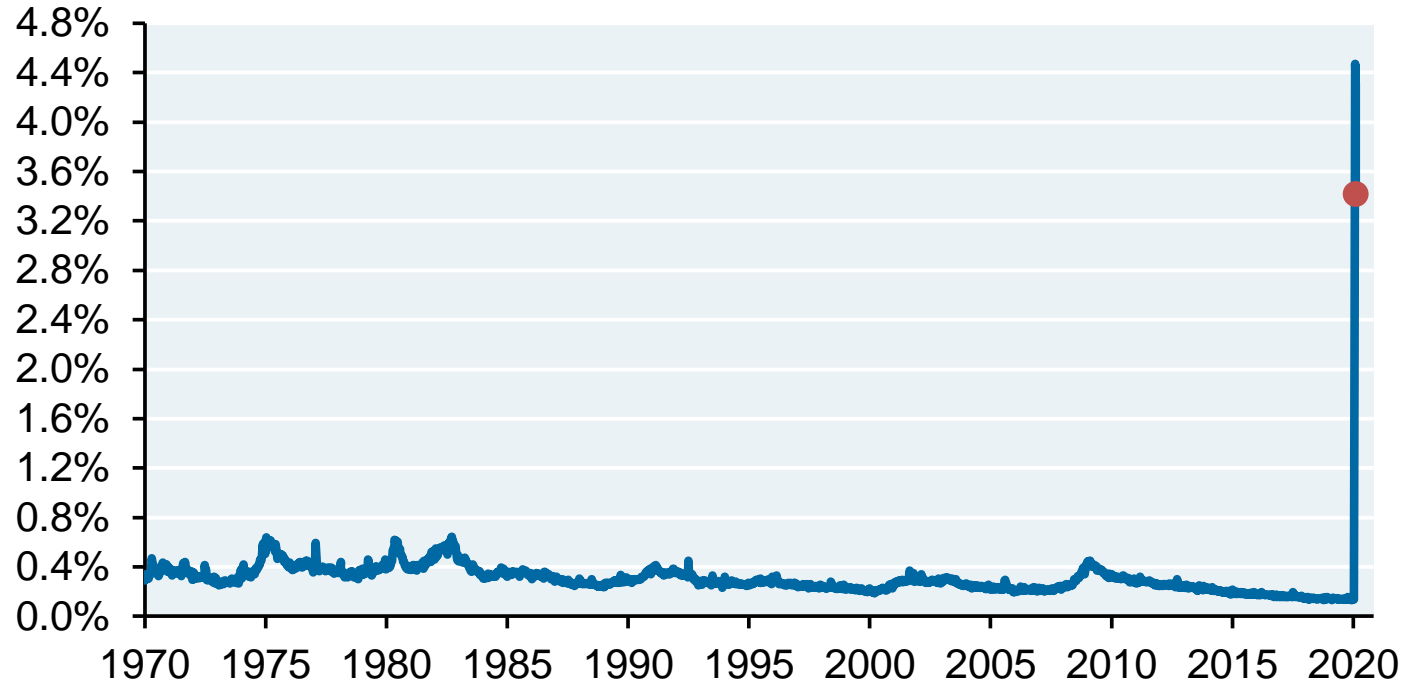
Market appreciation during times of ample economy-wide distress

Date	Market	Rallied By	From	Before	Action
1932	Dow Jones	67%	Lowest Level	Bank Failures	Reached 75% of eventual total
1957	US Equities	4%	Lowest Level	GDP	Bottomed
1974	US Equities	25%	Lowest Level	GDP	Bottomed
1974	US Equities	35%	Lowest Level	Unemployment	Peaked
1982	US Equities	26%	Lowest Level	GDP	Bottomed
1983	US Equities	27%	Lowest Level	Unemployment	Peaked
1990	US High Yield	350 bps	Widest Spread	HY Defaults	Reached 75% of eventual total
1990	S&P Bank Index	90%	Lowest Level	Bank Failures	Reached 75% of eventual total
2002	US High Yield	0 bps	Widest Spread	HY Defaults	Reached 75% of eventual total
2003	US Equities	17%	Lowest Level	Unemployment	Peaked
2008	US High Yield	1177 bps	Widest Spread	HY Defaults	Reached 75% of eventual total
2009	US Equities	24%	Lowest Level	GDP	Bottomed
2009	S&P Bank Index	180%	Lowest Level	Bank Failures	Reached 75% of eventual total
2009	AAA CMBS	975 bps	Widest Spread	Delinquency rates	Reached 75% of max delinquency rate
2009	Leveraged Loans	6%	Lowest Level	Defaults	Reached 75% of max default rate
2009	US Equities	33%	Lowest Level	Unemployment	Peaked
2012	European Equities	33%	Lowest Level	Unemployment	Peaked

Sources: Spreads measured in basis points. STOXX, Eurostat, FDIC, Bloomberg, J.P. Morgan Securities, BLS, Trepp, Standard & Poor's, S&P/LSTA Leveraged Loan Index, BEA, Shiller, JPMAM. 2020.

How different is a pandemic?

US jobless claims as % of active working population (employed + looking for work)



Source: Department of Labor, St. Louis Federal Reserve. April 16, 2020. Red dot indicates most recent data point.

Today's discussion

- Markets
- **The virus, anti-virals and vaccines**
- The economy

What I am not going to talk about, in the interest of time

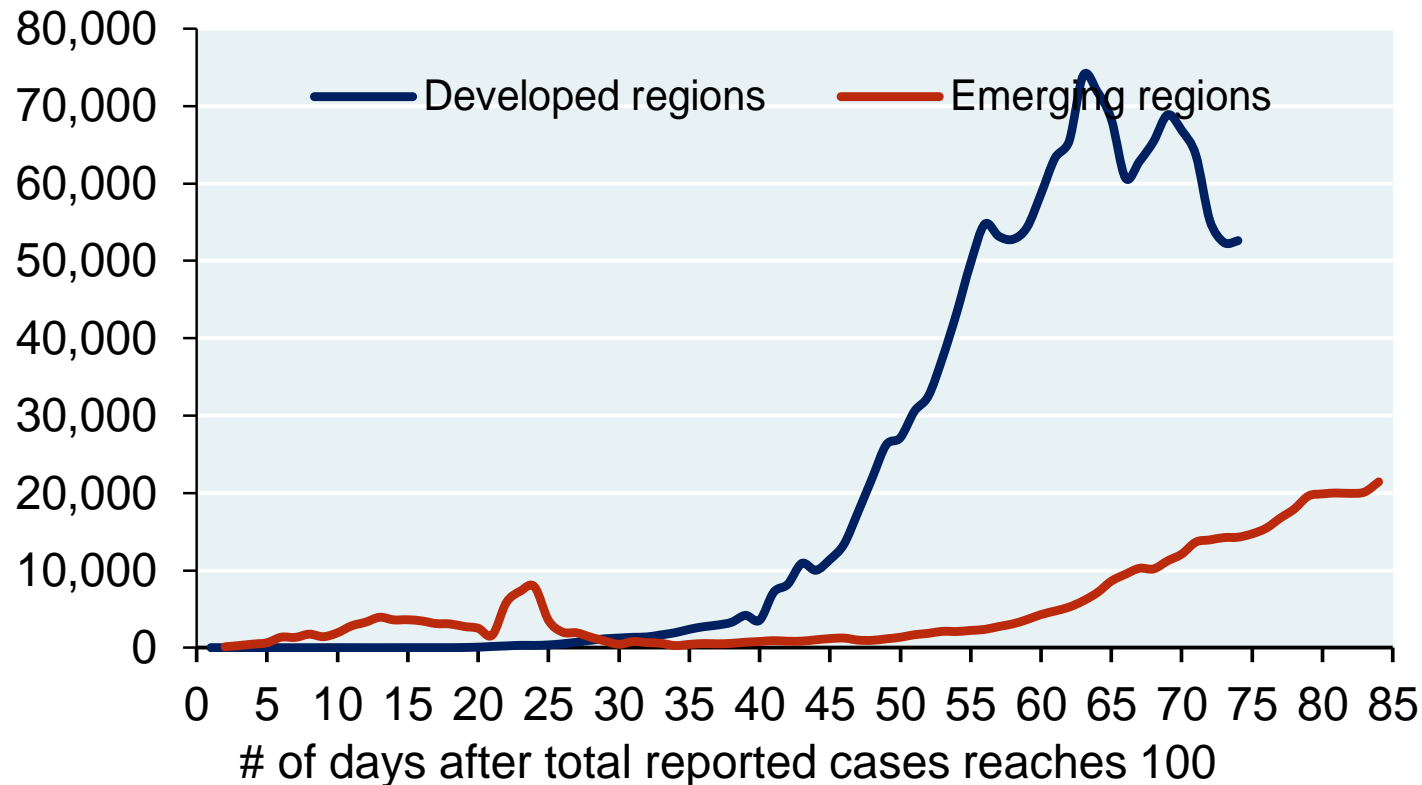
- Understatement of COVID mortality numerators **and** denominators
- How COVID infection rates can allegedly be ascribed to pollution, smoking, obesity, age distributions, intergenerational cohabitation, gender, pre-existing conditions, population density, whether BCG infant tuberculosis vaccines are widely used, etc
- When infected individuals are generally no longer infectious, and when their antibodies typically appear
- The controversy over hydroxychloroquine
- See our coronavirus web portal for more information

Focus: what happens when the first wave subsides, and how countries might approach getting back to fuller employment

Hubei, China is just a blip in the rear review mirror at this point

New daily infections

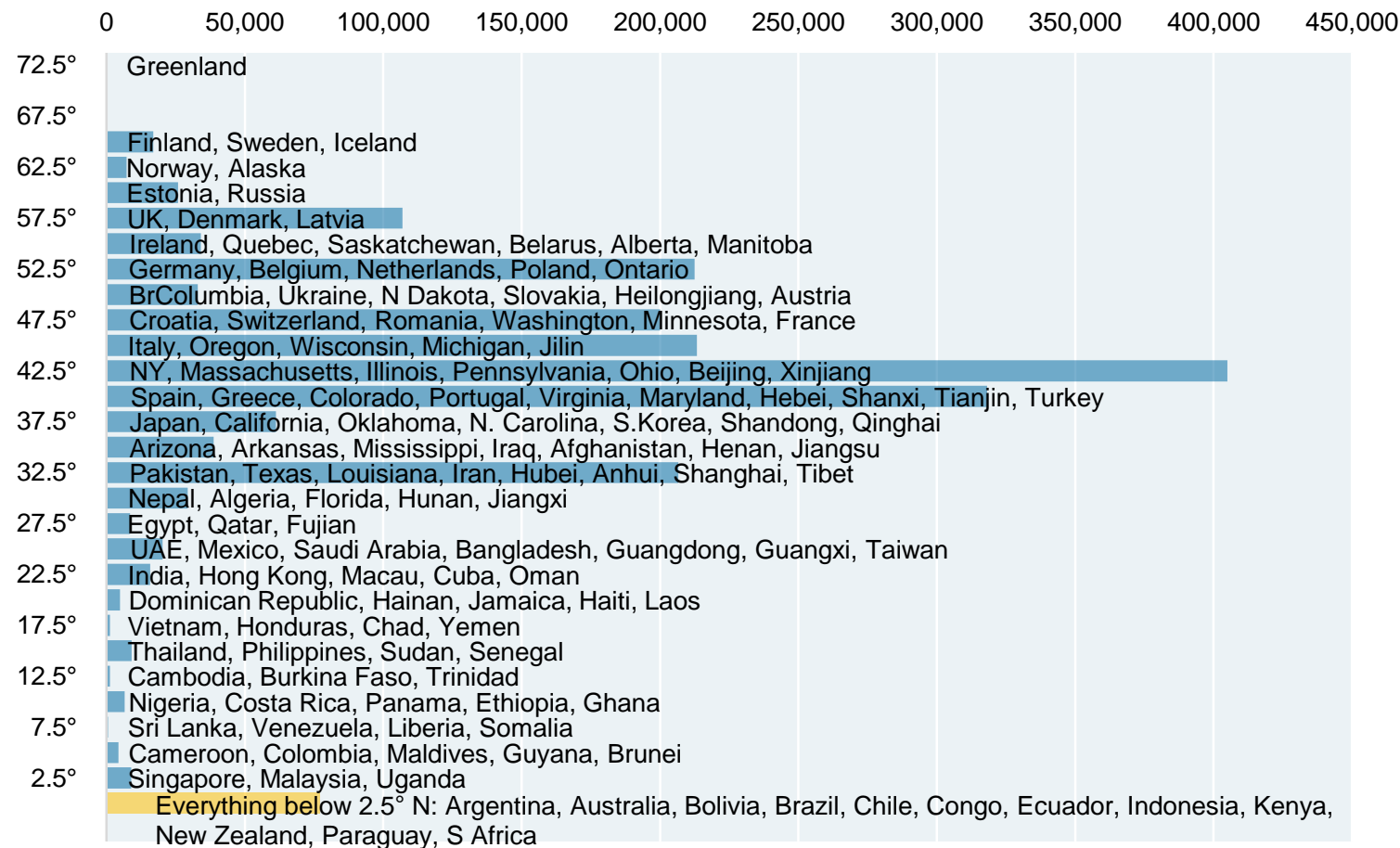
Linear scale, 3 day trailing average



Source: Johns Hopkins University, IMF, JPMAM. April 15, 2020

22nd N parallel still holding, but weakening

Global reported infections by latitude

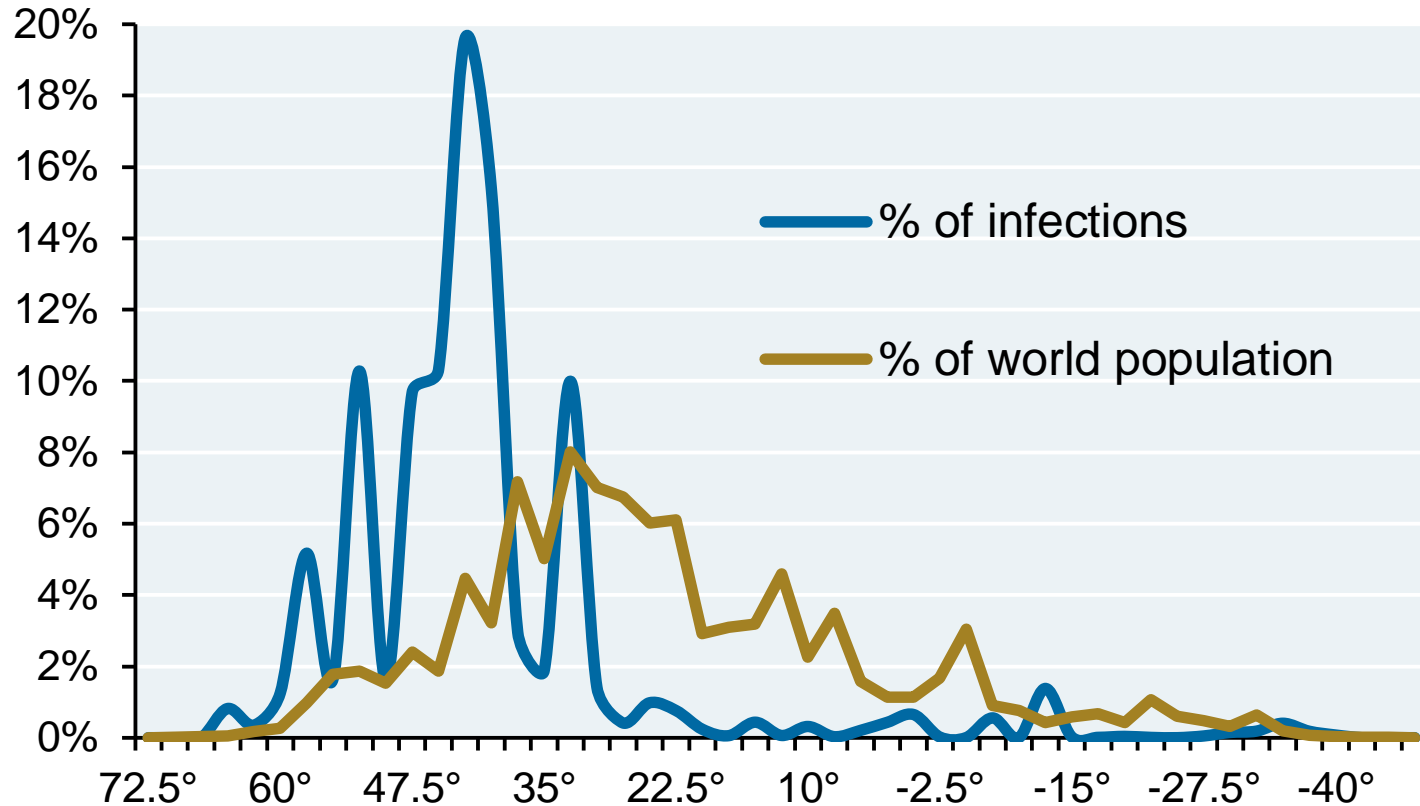


Source: Johns Hopkins University, JPMAM. April 15, 2020

22nd N parallel still holding, but weakening

91% of infections have occurred in regions accounting for 59% of world population

Infections and world population as a function of latitude

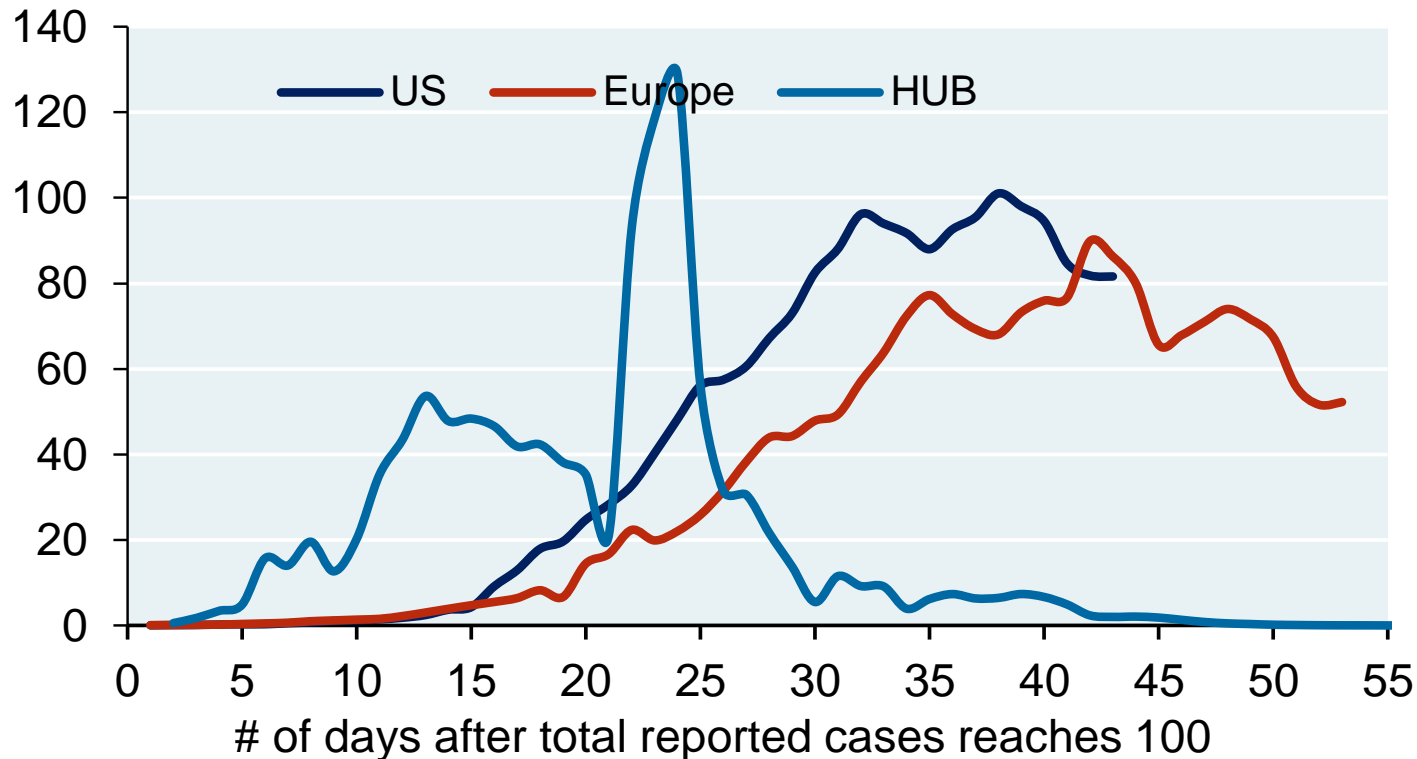


Source: Johns Hopkins University, NASA, JPMAM. April 15, 2020

In the West: flattening the curve means flatter but also longer, sometimes much longer

New daily infections per 1 million people

Linear scale, 3 day trailing average



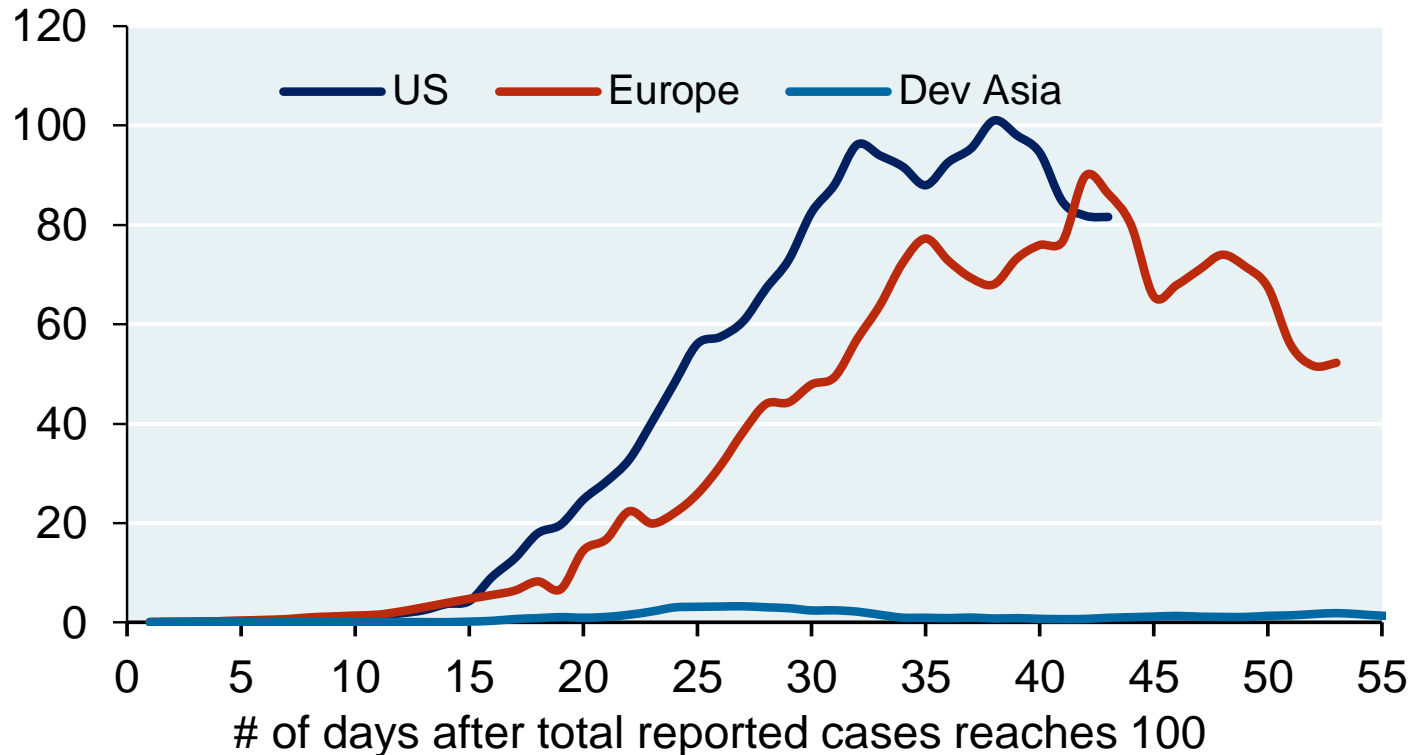
A shift from an exponential curve to a flattened curve is unambiguously good news, but does not tell you enough about the pace of reopening that countries, states and provinces might be able to withstand

Source: Johns Hopkins University, IMF, JPMAM. April 15, 2020

One of the most remarkable East-West gaps in the history of the modern world, even when excluding China data for reliability/credibility reasons

New daily infections per 1 million people

Linear scale, 3 day trailing average



Source: Johns Hopkins University, IMF, JPMAM. April 15, 2020

Why and how

South Korea

- checking a person's use of medical facilities and pharmacies, and for what reason
- global positioning system (GPS) tracking of their movements
- credit card transaction logs as another way of figuring out where they went and who they were with
- close-circuit television (CCTV) records to see whether people are wearing masks or coughing

Singapore

- Infectious Diseases Act provides legal power to enforce contact tracing and quarantine and to prosecute those who do not comply
- new Bluetooth app that tracks users contacts with other users, and is used for enforcement

Taiwan

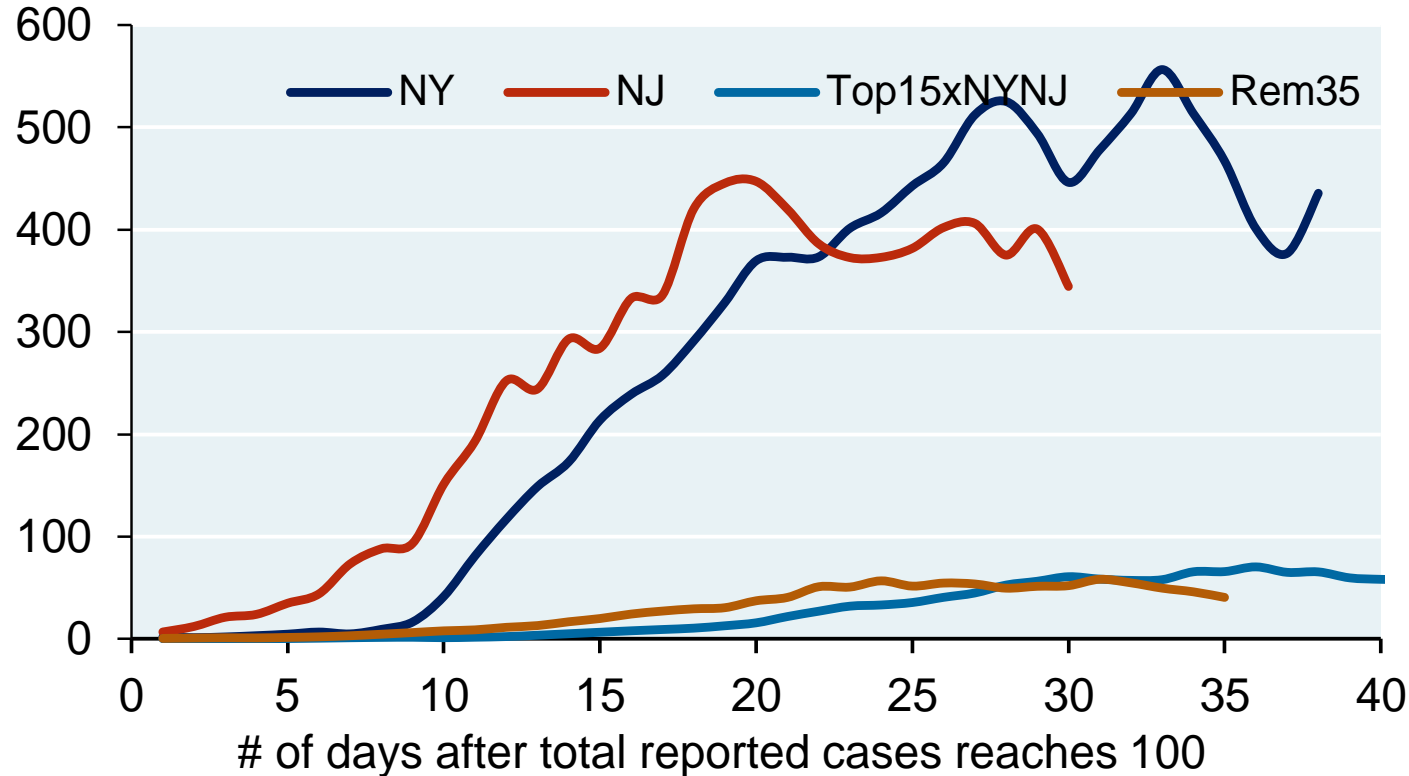
- QR code scanning and online reporting of each person's travel history and health symptoms
- Used to classify traveler infectious risks based on flight origin
- People with low risk are sent a health declaration border pass via SMS to their phones
- Mobile phones to ensure compliance

Sources: Korea Centers for Disease Control & Prevention. D. Fisher, Singapore National University Hospital. J. Wang, Stanford University. 2020.

Silver linings for the US: NY and NJ are exceptions

US new daily infections per 1 million people

Linear scale, 3 day trailing average

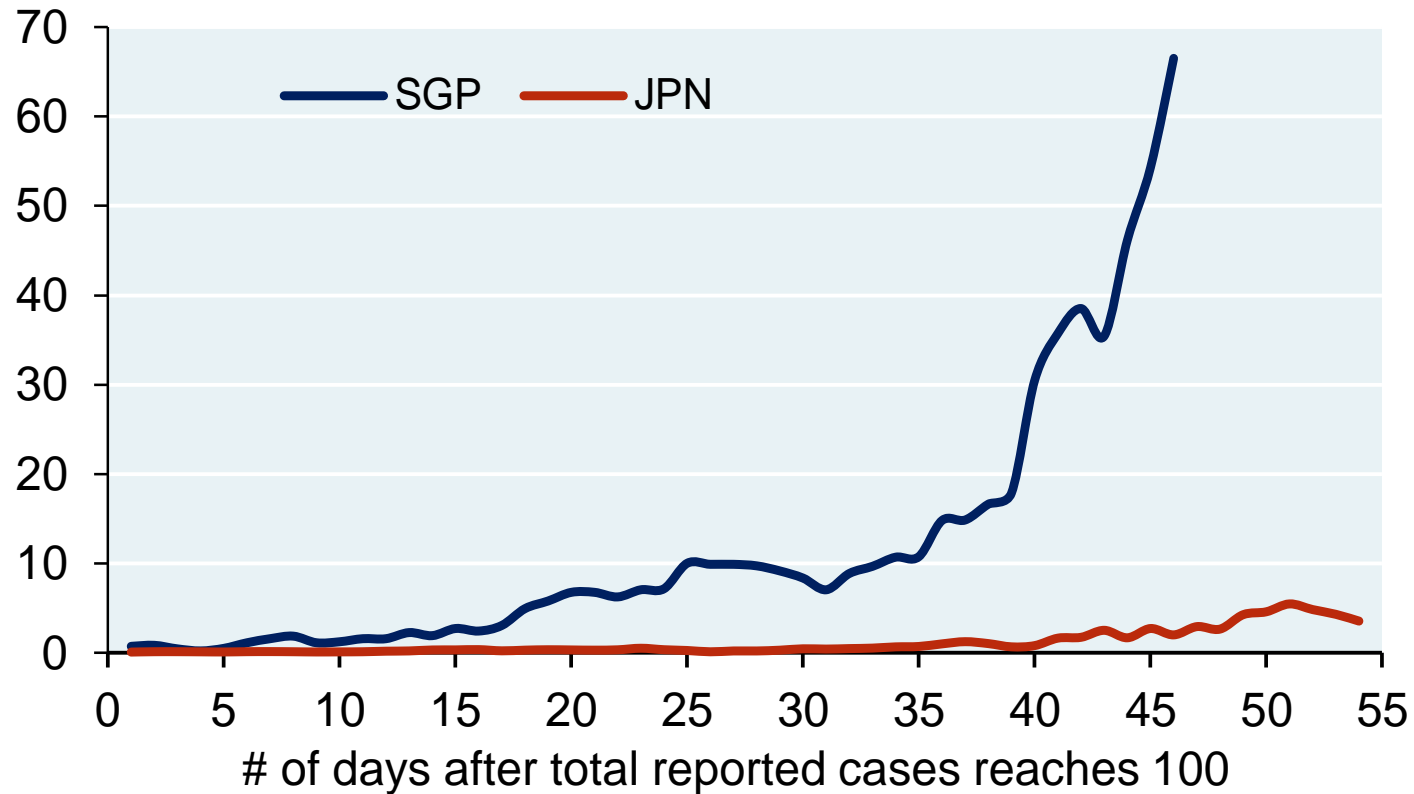


Source: Johns Hopkins University, IMF, JPMAM. April 15, 2020

Second wave/relaxation risks already appearing?

New daily infections per 1 million people

Linear scale, 3 day trailing average

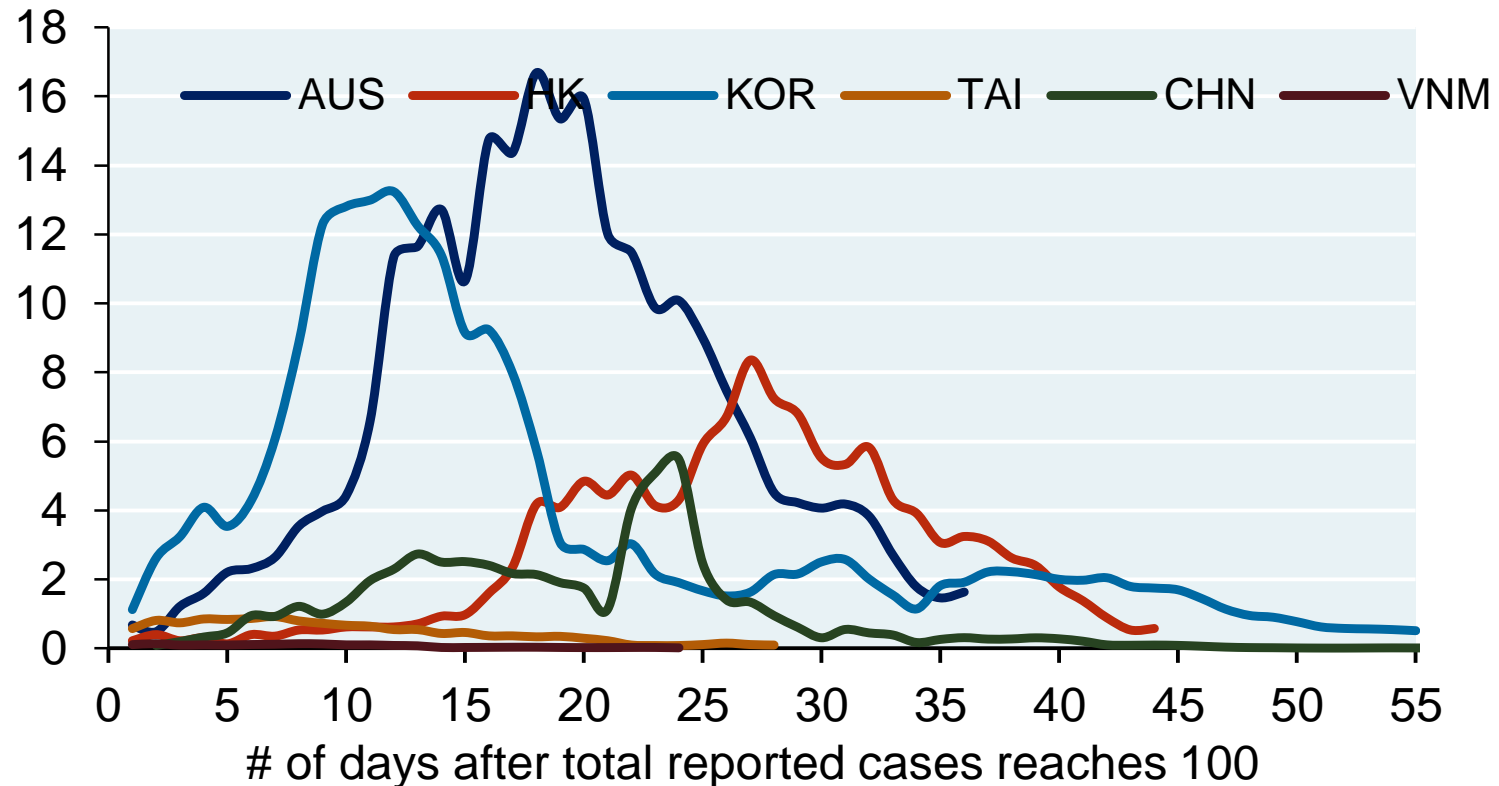


Source: Johns Hopkins University, IMF, JPMAM. April 15, 2020

Even so, some economies are starting to reopen, or were never really locked down to begin with

New daily infections per 1 million people

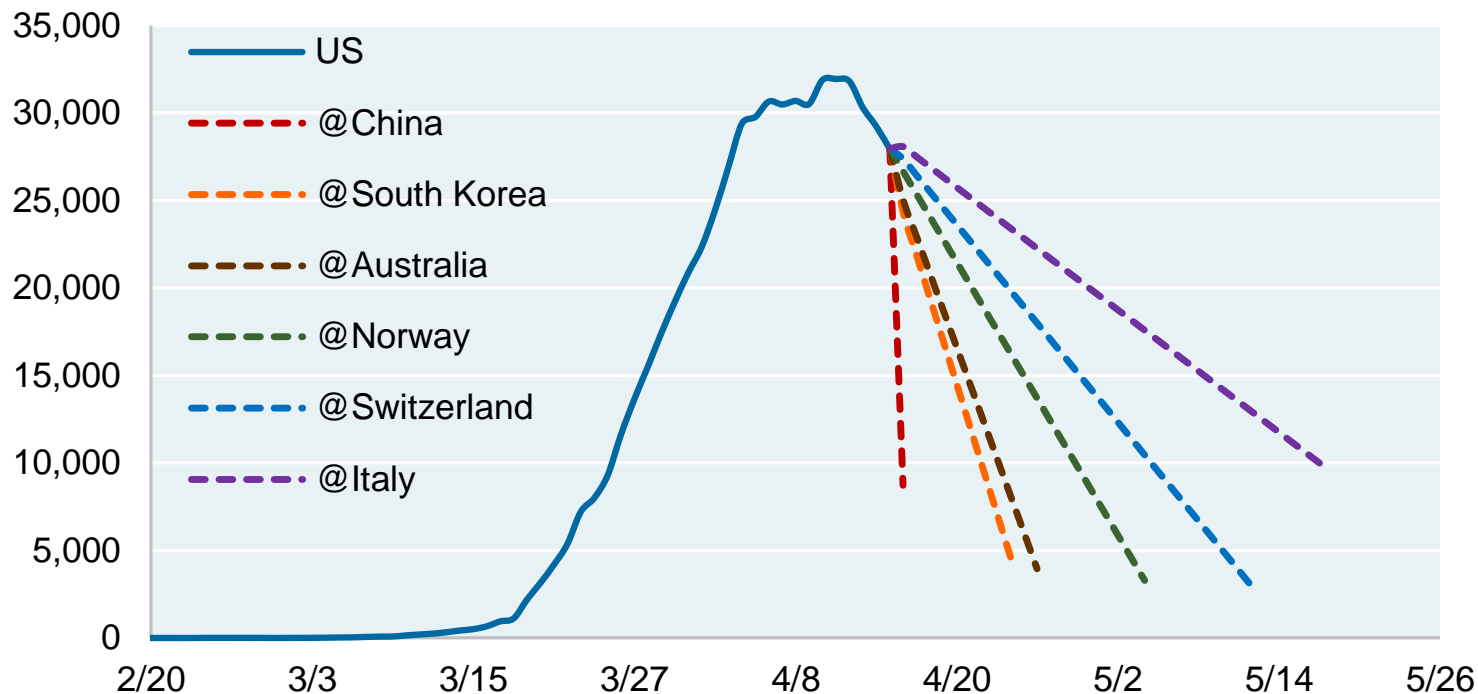
Linear scale, 3 day trailing average



Source: Johns Hopkins University, IMF, JPMAM. April 15, 2020

The US, assuming that peak levels have actually set in, could be facing similar decisions in late May
For the US, European paths are more likely than Asian/Australian ones

US new daily infections (5 day avg), with projections based on observed decline rates in countries with at least 70% declines from peak (except Italy), assuming that the US has in fact entered a decline phase



Source: Johns Hopkins University, IMF, JPMAM. April 15, 2020

How?

- **Keep flattening the curve and gradually let people go back to work as infection levels drop.** Problem: it only takes a small number of infectious people wandering around to ignite a second wave without a healthcare system that can track down and isolate new clusters
- **Relax lockdowns, and use a SWAT-team approach to identify any new clusters.** Immediately isolate and quarantine new clusters as well as their contacts via contact tracing. Life gets back to normal faster, but this approach works best when combined with an **extremely well organized healthcare system**, a compliant population that obeys social distancing rules, a legal system that allows the government to use a wide variety of electronic monitoring; and **when the run rate of new daily infections is low enough to handle the influx of new cases**
- **Serological testing to identify people who have been exposed to the disease, possess the antibodies to prevent them from infecting others or getting sick again, and let them get back to work.** Biggest challenge: requires herd immunity for maximum impact

Specific lockdown relaxation approaches

NY State 4 quadrants: essential and non-essential industries, low and high infection risk

Germany: re-opening of smaller shops, but retail malls closed, and limits on number of customers allowed in at one time; schools re-open for older students with exams, smaller class sizes required; restaurants remain closed; no visiting friends and family until early May

Wuhan, China: Residents are allowed to leave as long as a mandatory smartphone app indicates they're healthy and haven't been in recent contact with anyone confirmed to have the virus. Prevention measures such as wearing masks and temperature checks will remain in place to prevent a second wave of cases.

California: reopening contingent on decline in ICU bed utilization, and development of adequate workforce to conduct contact tracing of new clusters; continued lockdown of seniors and people with co-morbidity issues; physical distancing will remain in place at businesses/schools

Austria: some schools reopening; stores less than 4,300 sq ft can reopen if they limit the number of people inside to maintain distancing. Face masks are mandatory in shops and public transport. If there's no pickup in infections, all other stores can reopen May 2 with schools, restaurants and hotels following in the middle of the month

Specific lockdown relaxation approaches

Spain: 300,000 nonessential workers estimated to have gone back to their jobs in Madrid region; gradual return to work for those who cannot work from home (construction/manufacturing)

France: Kindergartens, grade and high schools will progressively reopen as of May 11 (social-distancing measures to be determined)

Norway: Scale back lockdown measures starting April 20, kindergartens will start to reopen. A week later, schools will reopen for pupils in grades one to four.

Denmark: Partial reopening of schools for younger students. Children up to the age of 11 are returning to nurseries and schools across Denmark. All daycare institutions reopening

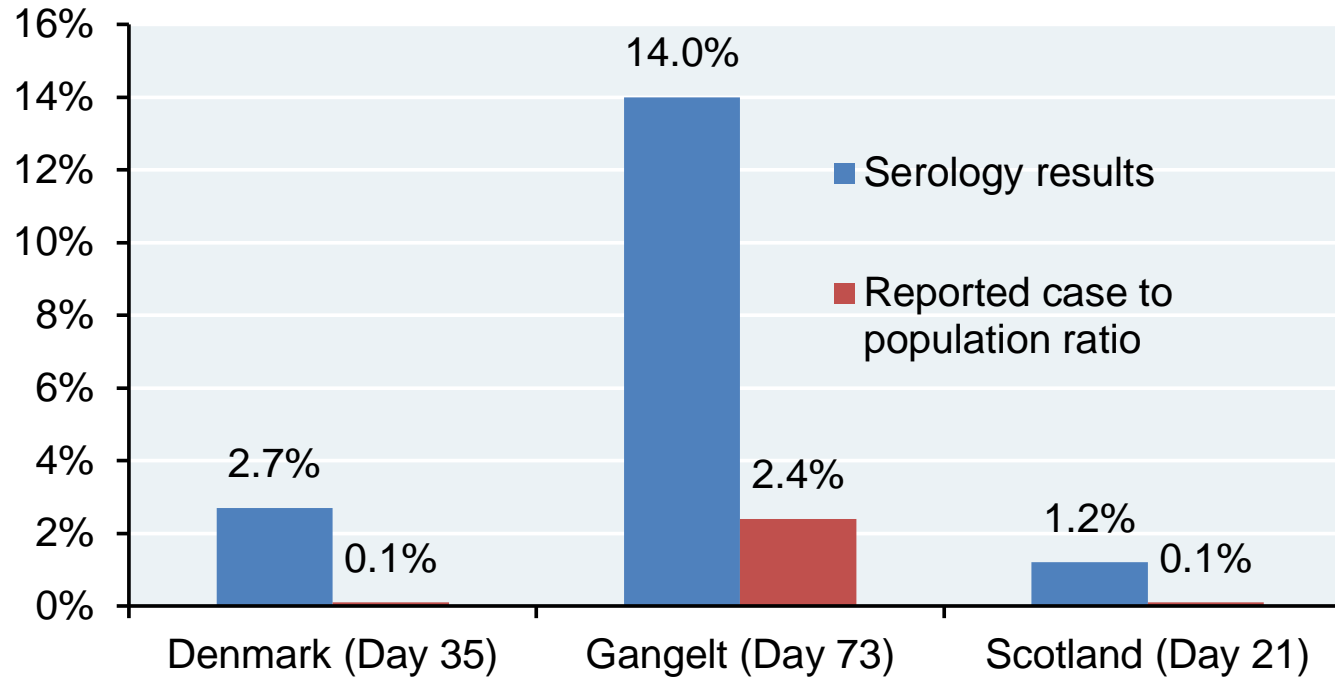
Quebec: Some construction and renovation work to resume next Monday. Building inspections and land surveying for construction will be permitted, necessary supply chains will be reopened. Mines will be allowed to reopen starting Wednesday, but only with social distancing measures

India: Will allow agricultural businesses to open; public works programs will also reopen under social distancing norms; trucks, trains and planes carrying cargo will also be allowed to operate; Banks will reopen, as will government centers distributing social security benefits and pensions

Sources: CNN, BBC, Politico, Montreal Gazette, Business Insider. 2020.

Increasing evidence of much wider infection levels than by looking at reported cases alone...

How widespread is COVID-19? Serology test results vs reported cases as a % of population

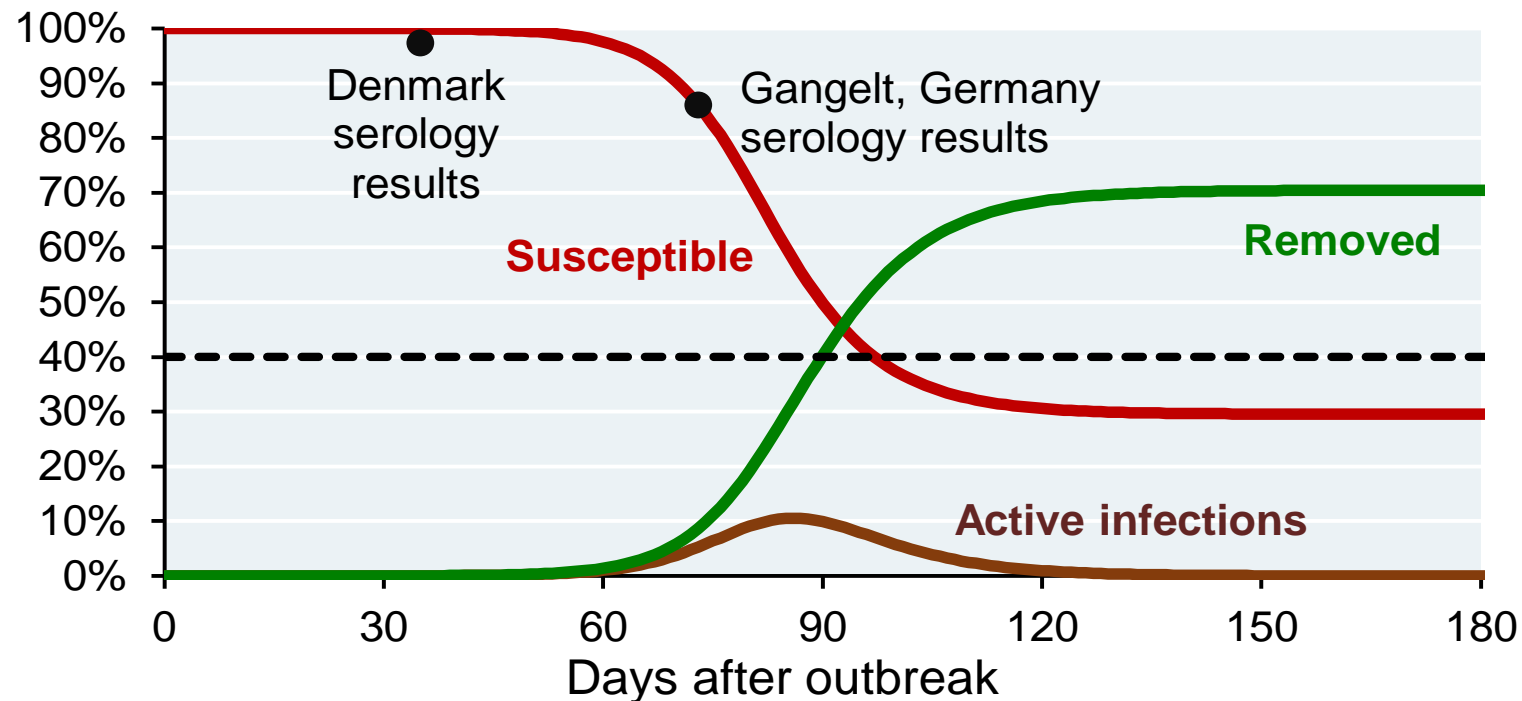


Source: Bonn University Medical Center, Rigshospitalet (Copenhagen), Evolutionary Ecology of Infectious Disease (UK), JHU, JPMAM. April 2020.

...which means that herd immunity in some places may be closer than we think, in spite of social distancing efforts

When might herd immunity occur, after which serology tests could have a greater "return to work" impact?

percent of population



Source: J.P. Morgan Asset Management, Bonn University Medical Center, Rigshospitalet (Copenhagen). 2020.

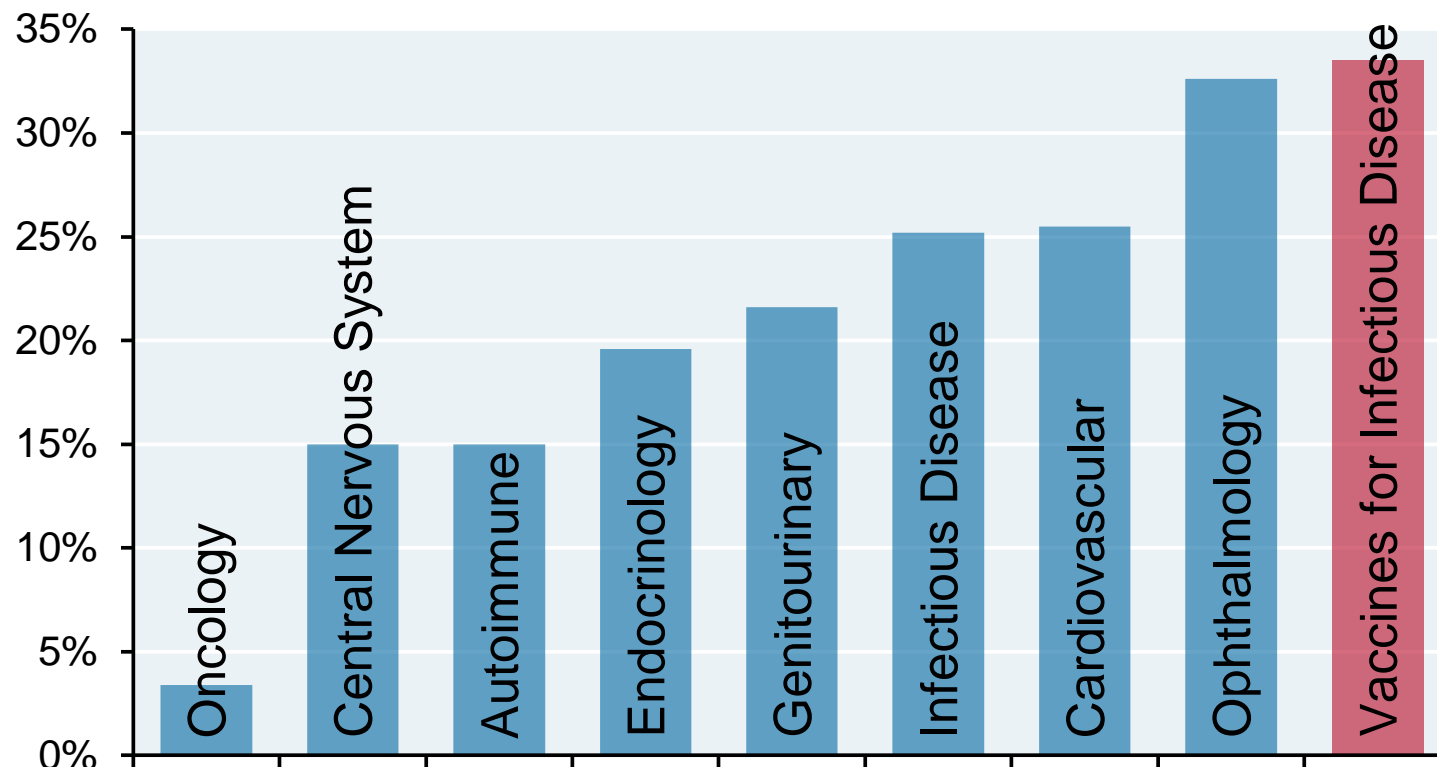
Caveats

- Epidemiological models are highly sensitive to input parameters
- COVID-19 serology tests may involve substantial false positives
- Are people who test positive with “insufficient” antibodies immune to the disease?
- Sample populations might not be representative of the whole, or of other countries
- Even if herd immunity were reached, the virus would still spread, but at a more manageable rate involving smaller clusters that are dealt with independently

Even so, results so far **provide a rationale for serological testing as PART of a “back to work” plan in the summer or fall (under the presumption that a society can organize itself to do it).**

What if herd immunity can only be achieved with a vaccine, even if there is no mutation?

Probability of success for clinical trials, 2000 - 2015



Source: Chi Heem Wong et al, MIT Computer Science and Artificial Intelligence Laboratory. 2018.

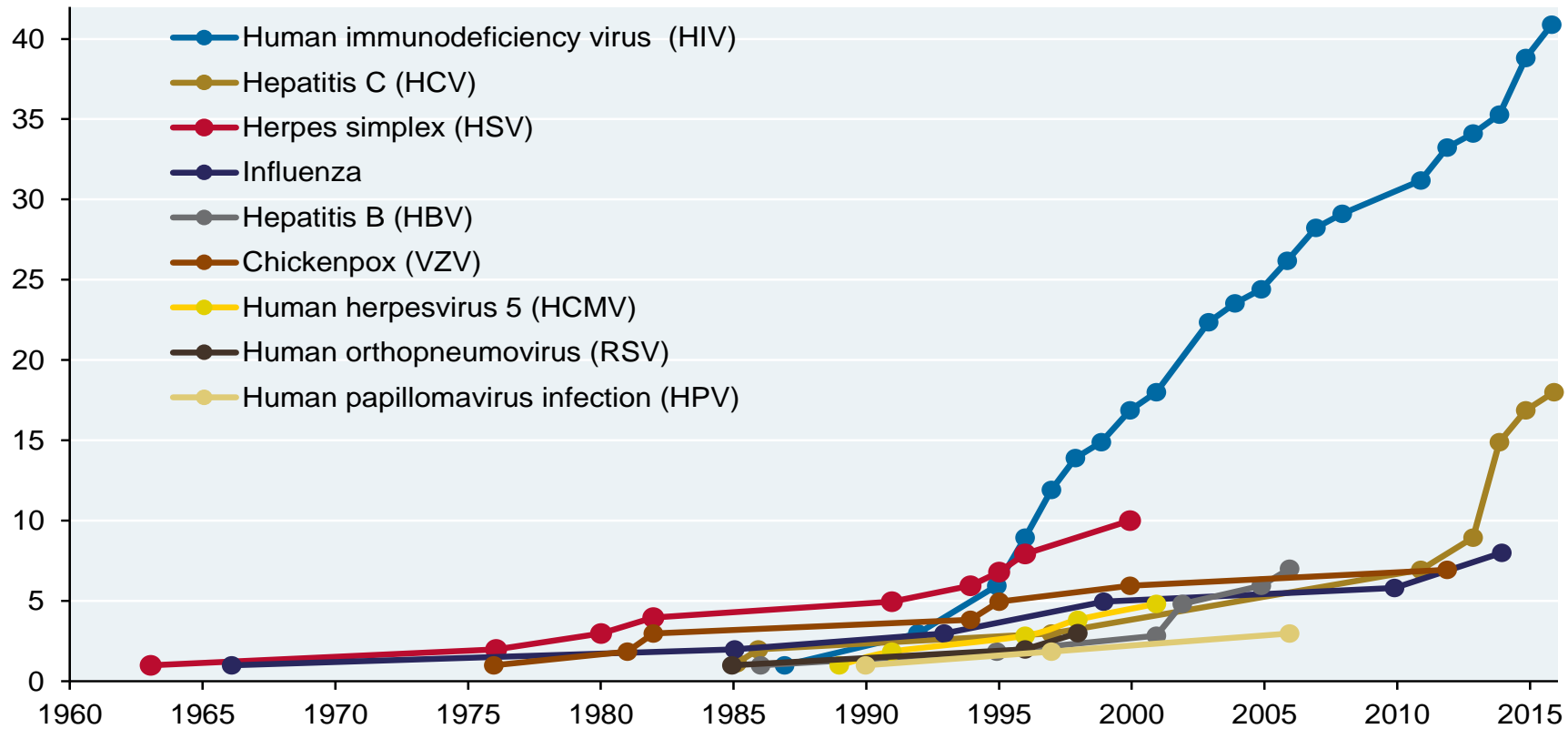
What if herd immunity can only be achieved with a vaccine, even if there is no mutation?

- No vaccines exist for any human Coronaviruses (some failed in clinical trials despite success in vitro)
- 78 COVID vaccine candidates under investigation; no consensus yet about most likely candidates
- Typically takes years for vaccines to be tested and approved for viruses, but the timeline is improving:
 - 20 months for SARS vaccine to reach human testing (never completed since virus eradicated first)
 - 6 months to move to human testing for Zika
 - Moderna entered coronavirus testing in humans for mRNA vaccine in 2 months
- RNA vaccines, recombinant protein vaccines and cell culture-based vaccines
 - RNA vaccine is most novel, leverages body's ability to generate immunogenic protein; body then generates antibodies against the protein to provide downstream protection.
 - Cell culture-based vaccines are the incumbent technology: immunogenic protein is generated outside the body in vitro. In both cases, the body generates protective antibodies
- **Latest news:** Sanofi/GSK to begin human testing in H2 2020 using Flu-Block delivery mechanism, adapted for the COVID spike protein. File for regulatory approval: H2 2021.

Anti-virals: some history

History of antiviral drug development

Number of approved drugs



Source: De Clercq and Li, "Approved anti-viral drugs over the past 50 years", Clinical Microbiology Reviews. June 2016.

Anti-virals: no substitute for large, randomized clinical trials

- Only 90 anti-virals were approved for final use from 1963 to 2016 out of the thousands proposed in scientific literature
 - Viruses reproduce by hijacking host's own biological machinery. Having few of their own enzymes and proteins, they typically present few opportunities for drugs to target
- 300 clinical trials now underway
- Solidarity trial (WHO) will determine effectiveness of Remdesivir, Chloroquine, Lopinavir-Ritonavir and Lopinavir-Ritonavir-Interferon Beta-1a
 - While such trials can take years to design and conduct, the Solidarity trial may reduce the timeline by 80% by conducting a single global clinical trial
- Convalescent plasma: temporary boost for very sick patients

Anti-virals: no substitute for large, randomized clinical trials

- JAMA: “Currently, there is no evidence from randomized clinical trials that any potential therapy improves outcomes in patients with either suspected or confirmed COVID-19, and there are no clinical trial data supporting any prophylactic therapy” [April 14, 2020]
- Gilead/Remdesivir: promising results, but there was no control group in the partial results that were announced, and the broader randomized trials involving 2,400 patients in the severe COVID group and 1,600 patients in the mild COVID group are still underway
- Biotech pioneer William Haseltine: “No go on hydroxychloroquine”, based on 2 recent studies
 - both found no beneficial effect on disease progression or viremia
 - both found that hydroxychloroquine induced dangerous heart rhythm abnormalities
 - one recommended outright against use of HCQ for COVID-19 patients

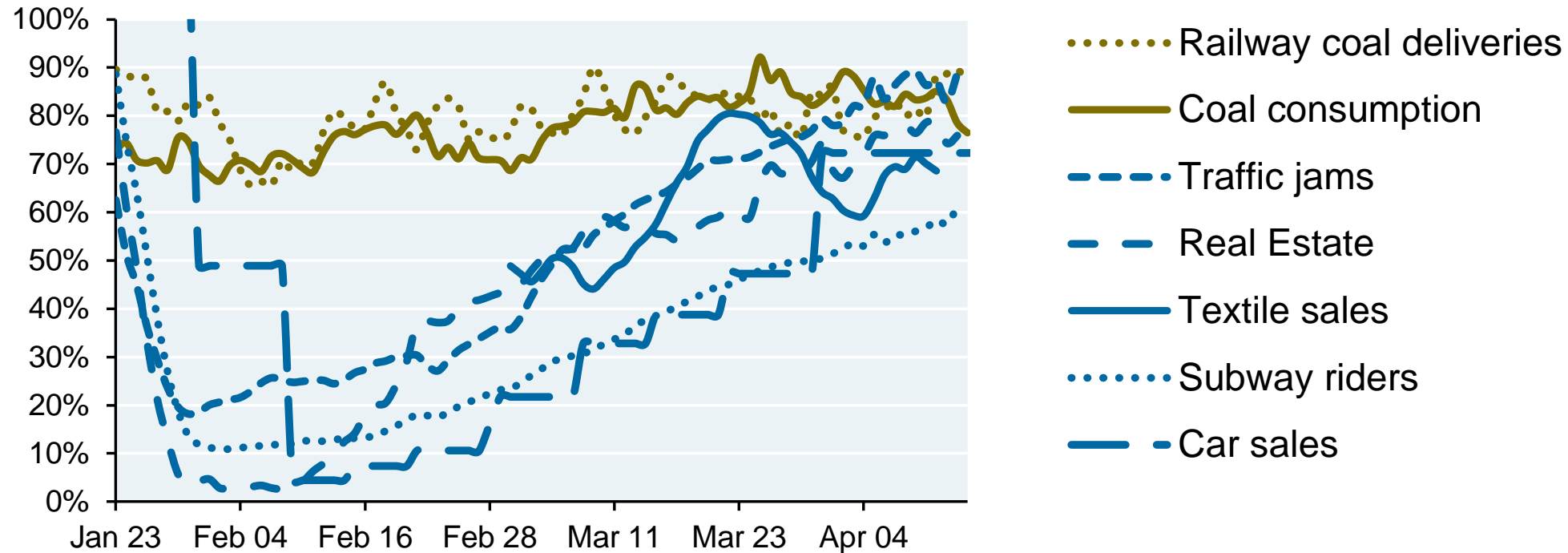
Today's discussion

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China measures shown in the chart now 60%-90% back to normal

High frequency China data during COVID-19 lockdown

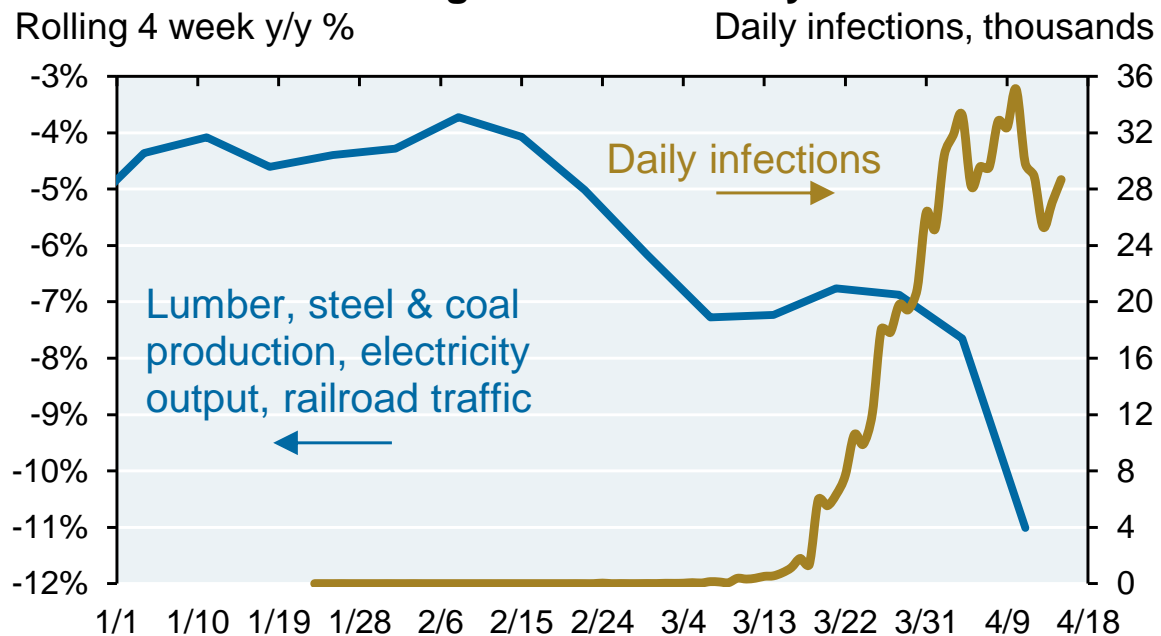
Percent of historical average



Source: National Passenger Car Information Exchange, AMAP, Cqcoal, WIND, JPMAM. April 13, 2020

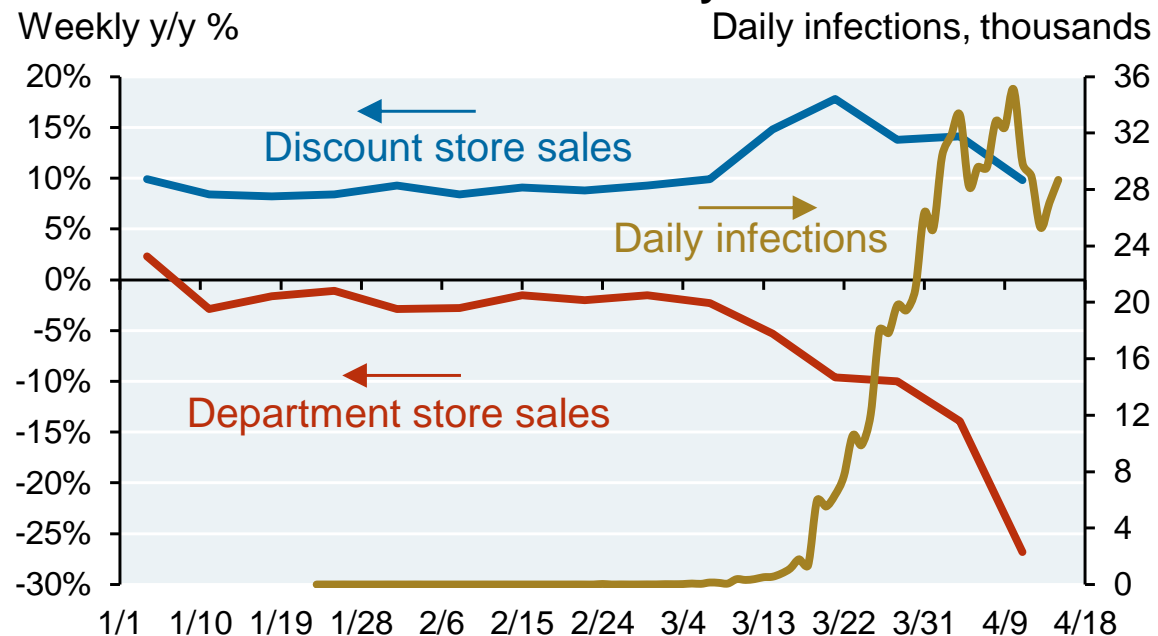
US economic collapse just getting started

US 2020 manufacturing tracker and daily infections



Source: WWPA, EIA, AISI, AAR, EEI, Haver. JPMAM. April 15, 2020

US 2020 consumer tracker and daily infections

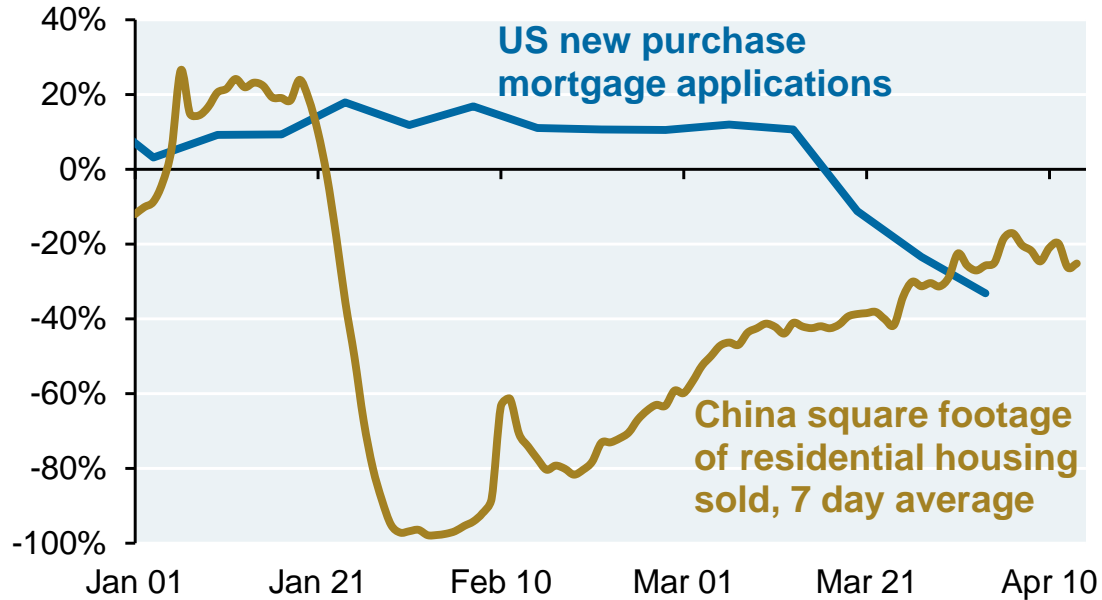


Source: Redbook Research, Johns Hopkins University. April 15, 2020

US vs China

US vs China residential real estate transactions

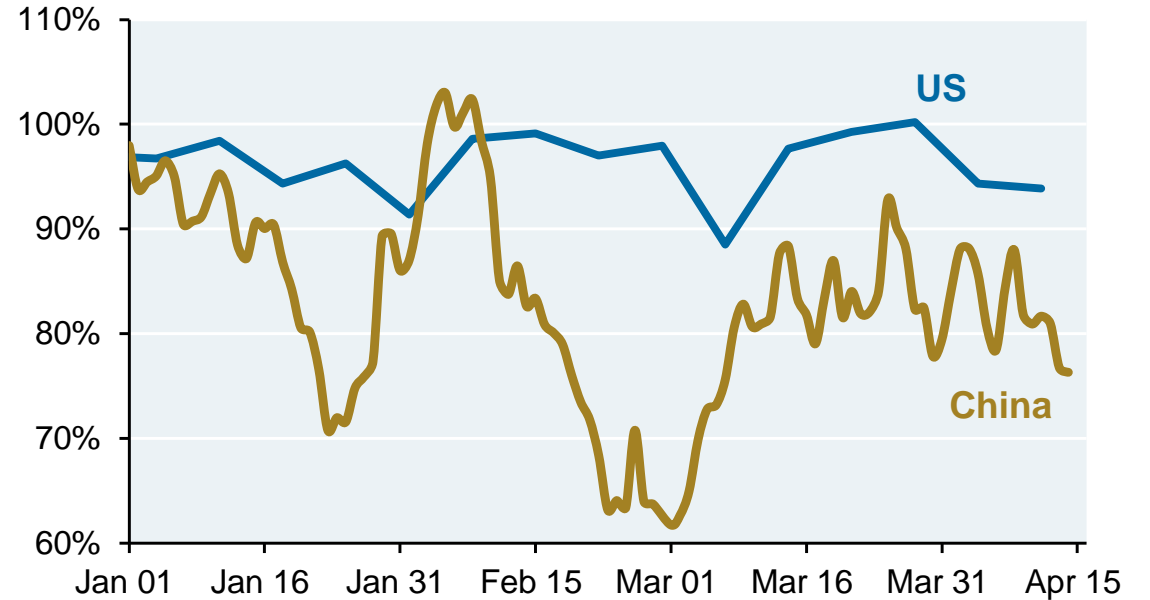
y/y % change



Source: Mortgage Bankers Association, Wind. April 13, 2020.

US electricity production vs Chinese coal consumption

% of 2019 level

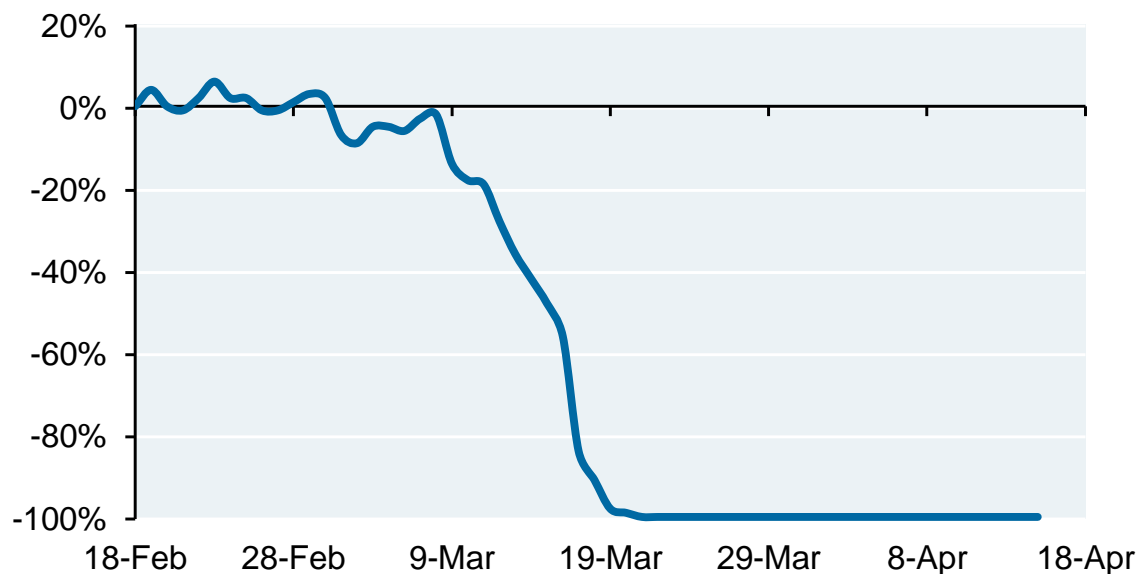


Source: EEI, cqcoal, Wind. April 14, 2020.

Unprecedented declines, and a very, very long road back

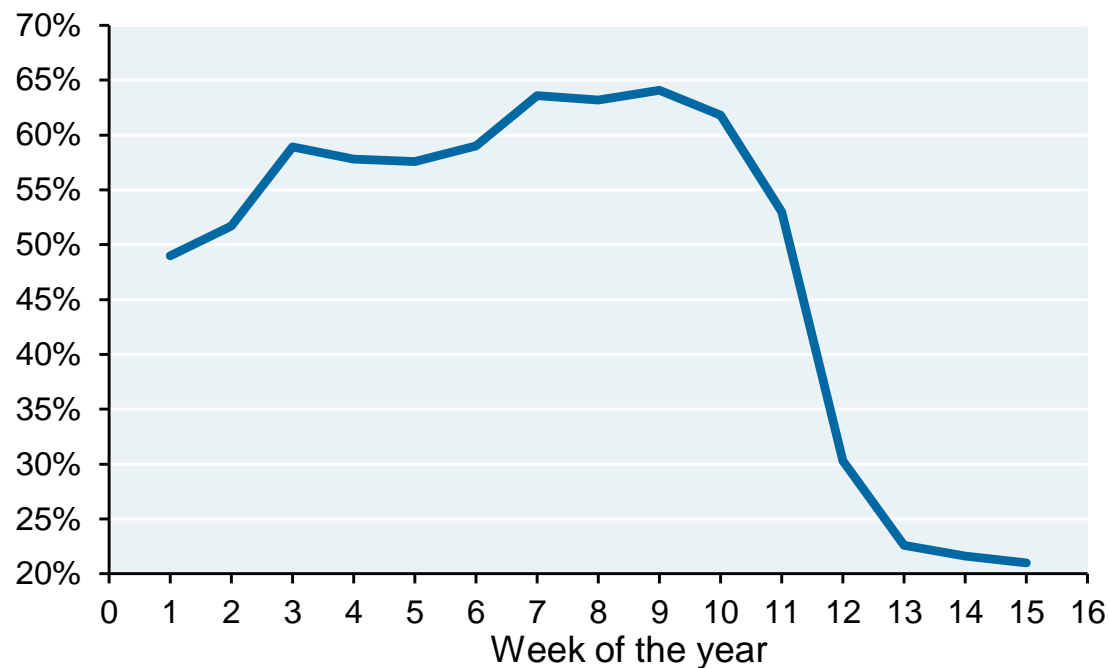
US nationwide seated restaurant diners

y/y % change



Source: Opentable.com. April 15, 2020.

US hotel occupancy rate



Source: Smith Travel. April 11, 2020.

Important Information

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