PARTNERS CAPITAL

Partners Capital Covid-19 Macro Note #10 – In Liminal Space

On the back of the 27% increase in the S&P 500 since its trough on the 23rd of March, we are looking at the current equity market level (S&P 500 at 2830 – down -12% YTD) and ask four questions before thinking about any investment implications:

1. What explains the 27% recovery?
2. What is the likely impact of the massive government stimulus programs?
3. When will the lockdowns end and will they spur a second wave?
4. When will the largest single focused medical investment in human history deliver a widely available vaccine?

We take a stab at answering each of these questions drawing from some of the recent research and update our downside, base and upside case scenarios and draw out the investment conclusions.

10yr yields: US: 0.61%; UK: 0.25%; Germany: -0.59%

Equity Market Performance

	MSCI World	S&P500	China A-shares
WTD (27 April - 1 May)	0.5%	-0.2%	3.0%
Performance in April	10.6%	12.8%	6.1%
YT-1 May	-13.4%	-11.8%	-4.5%
From Peak	-17.0%	-16.1%	-7.0%
Increase from low	23.1%	26.7%	10.8%

Credit as of 1 May

	Spread	Yield (YTW)
Global High Yield	9.0%	9.4%
US Corp High Yield	7.5%	8.1%
US Corp HY ex-energy	6.6%	7.2%

Q1. What explains the April recovery?

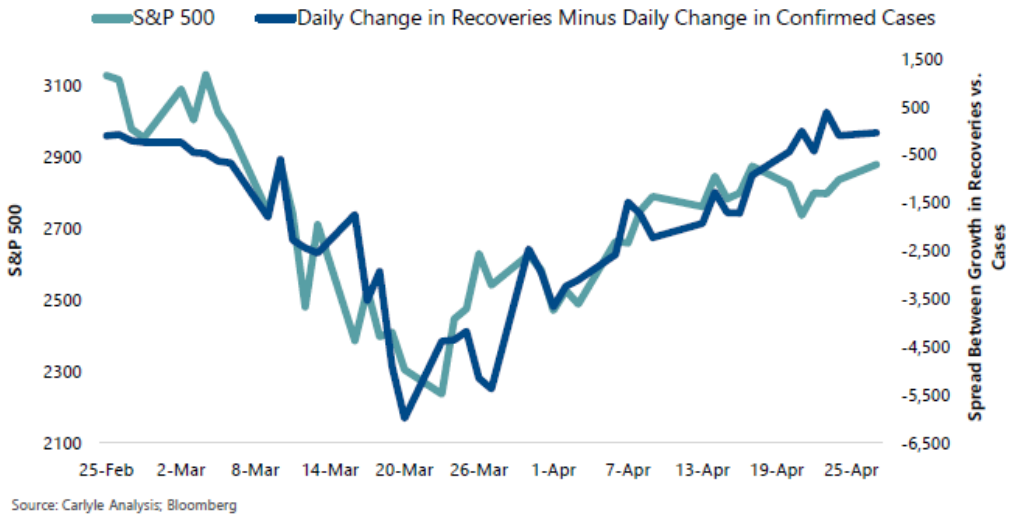
The April recovery was led by, above all, the massive fiscal and monetary stimulus which is conservatively estimated to provide a c. 4% boost to US GDP in 2020. Investors interpreted this level of stimulus as putting a floor on the extent of further declines. In addition, the sharply lower cost of capital has augmented the TINA ("there is no alternative") case for equities, prompting investors to add exposure to risk assets.

Other factors which may have also contributed to the rebound were the peaking of Covid-19 infection rates in Europe and later in the US, the easing of some social distancing in some Western economies, increased signs of effectiveness of the Remdesivir anti-viral medication, and better than feared US Q1 earnings data (with outright strong earnings reported by the five mega-cap tech companies).

With over a third of S&P500 companies having reported so far this season, 65% have beaten previous EPS estimates. EPS growth is coming in at -16% y/y, 2% below consensus expectations. Earnings delivery for Financials has been particularly weak, down nearly 50% y/y, but much of this is related to boosting loan loss reserves. S&P500 ex-Financials EPS growth is flat this quarter, on a yoy basis. Overall top-line revenue growth is flat, with 66% of companies beating estimates.

More for entertainment value, I attach the chart below to prove you can find a chart to prove anything.

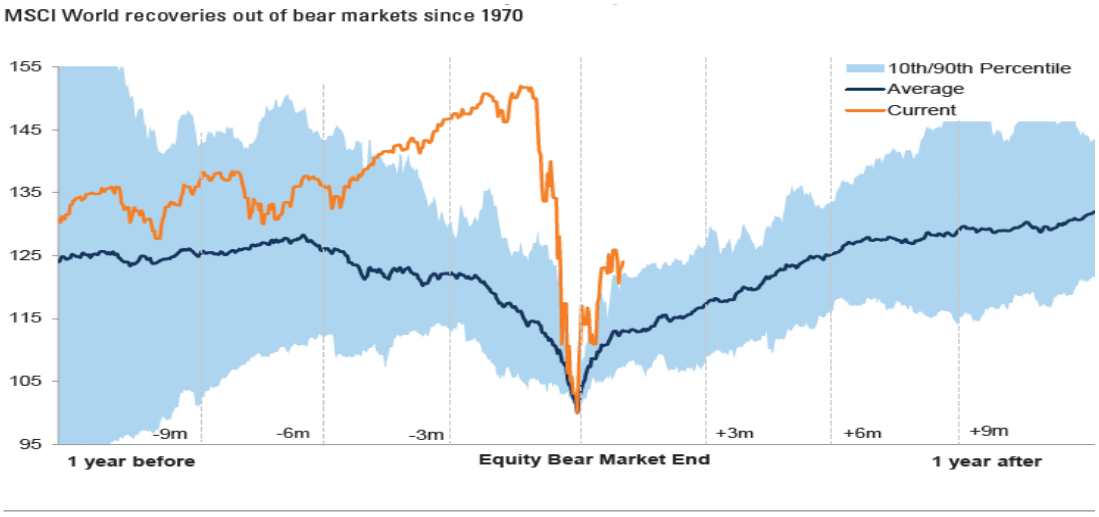
Exhibit 1: Strong relationship between S&P 500 and outstanding Covid-19 cases



Source: Carlyle Analysis; Bloomberg

More relevant is the chart below showing how dramatic this recovery is in an historical context, with the orange line showing how the MSCI World equities index has bounced back relative to the range of past recoveries shown in the blue shading. This adds to the evidence that it was related to the historical record-breaking level of government stimulus.

Exhibit 2: The current recovery has been the sharpest among historical bear markets



Source: Datastream, Goldman Sachs Global Investment Research

Q2. What is the likely impact of the massive stimulus programs?

The total fiscal stimulus to date tallies to $8.1T worldwide (9.3% of global GDP) and there is a similar amount of $8.3T (9.6%) in central bank liquidity injections, for a grand total of 19% of the global GDP.

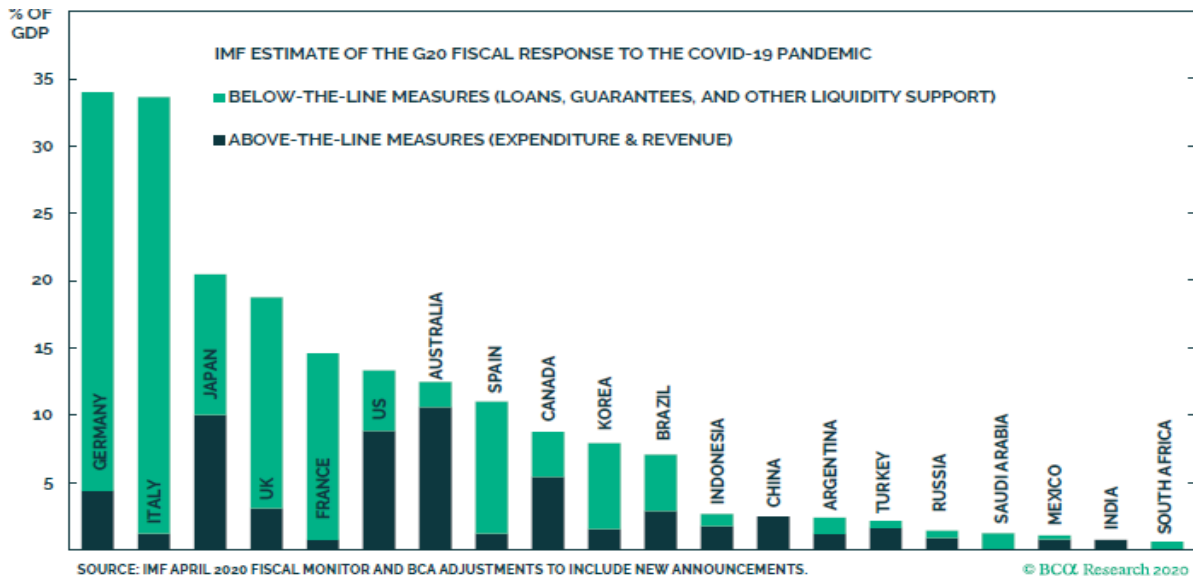
Exhibit 3: Current tally of global stimulus is over $16T or 19% of global GDP

	Central Bank Liquidity Injection		New Government Fiscal Stimulus		Rate Cuts
	US$ Trillions	Percent of GDP	US$ Trillions	Percent of GDP	Basis Points
US	$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%**	

Sources:
1. Asian Development Bank, IMF, World Bank
2. Data as of 15 April 2020, source is Cornerstone, JP Morgan

The $8.1T of fiscal stimulus has been broken down by the IMF into "above the line measures" which are expenditures and revenue (blue part of bars) and the "below the line measures" which are loan guarantees and other liquidity support (green part of the bars). "Revenue" stimulus means tax cuts. The above the line measures have a higher multiplier (or yield) impact on GDP than the below the line measures and varies between 1% of GDP for France and 11% of GDP for Australia with straight line average being 4% of GDP, with the US at 9% of GDP.

Exhibit 4: IMF Summary of G20 Fiscal Response at a % of GDP

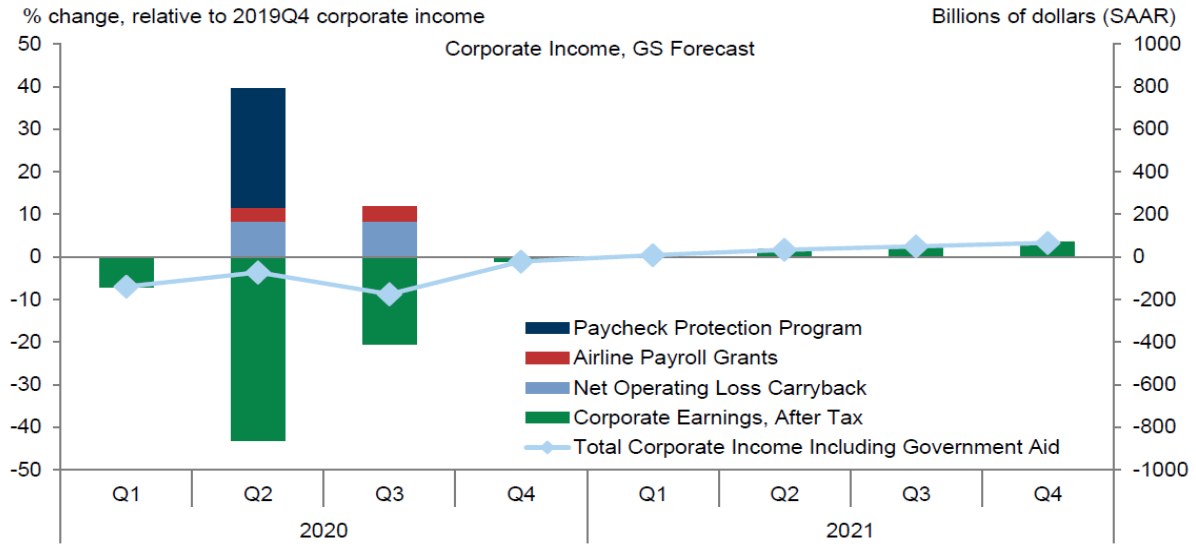


Wharton, JP Morgan, Goldman Sachs, the IMF and BCA have all just published their research on the likely impact of government stimulus, helping us to answer the question of the extent to which it will offset the direct and indirect effects of the pandemic on global economic growth.

Our conclusion from reading all of this analysis is that governments have averted a global depression and reduced it to a large-scale recession. What would have been a 2020 global GDP decline of -6% to -8% is more likely to be -3% to -4%. Liquidity injections have stabilized the financial system which doesn't show up in these figures. Similarly, loans and other corporate support payments have kept companies from insolvency and defaulting on their debt, which could have seen corporate earnings taking a disproportionate hit relative to GDP impacts. It has done the trick in terms of stabilizing financial markets, which says it is enough for now, but more may be needed, and governments are likely to add if needed. There will be pushback from here, and so we should not assume the hole is filled under any circumstance. There is a limit, and we are probably not there yet, but we should not need more if we test, track and isolate soon and testing supplies and tracking teams are needed to pre-empt that need.

Below is an illustration of some of the analysis produced around these stimulus programs. The Goldman Sachs work shows how the Paycheck Protection Program and other programs have nearly, but not quite, offset the full effect of the Covid-19 impact on corporate profits.

Exhibit 5: US Government fiscal support will offset much of the decline in corporate earnings



Source: Goldman Sachs Global Investment Research

Our base case of negative -3.0% global GDP growth in 2020 assumes that, without the stimulus, global GDP would be closer to -6.5%. The IMF and JP Morgan analysis both point to this 3.5% boost in global GDP. This number is broadly in line with the IMF's summary of revenue and expenditure stimulus assuming dollar for dollar impact. The reality is that there will be leakage from individuals not spending their unemployment benefits for example, but there will be second order benefits to GDP from the massive loan guarantees, liquidity support and monetary stimulus.

The big issue is what the academics call the multiplier effect on money spent. Income recovery payments will be inefficient as individuals generally do not spend nearly as much locked up at home (so it will be in part used to pay off debt or go into savings). Injecting liquidity into banks or buying bonds to save the credit market ends up in equity prices (which is explicitly a Fed policy – keeping markets stable), and so does not support GDP directly. Government spending where they are hiring people for example or paying state and local municipalities to not fire people, increases income and spending almost dollar for dollar.

If we take the US as an example with 9% of GDP in expenditure and revenue stimulus, JP Morgan estimates that this will translate into 4% GDP impact. Wharton analysed the $2.3T US CARES Act program line by line, and came out with a similarly huge haircut, estimating that only $800B will translate into economic output (4% of GDP), but there are other programs beyond CARES, so the total offset could be more than 4%.

BCA researched deep into each program in each country and concluded that these programs will be sufficient to avoid an "L-shaped recovery" (i.e., no recovery for a long time) in the US, China and Germany and deficient for Italy, Spain and France. They go on to say that the level of stimulus must rise if there is a second round of lockdowns of major economies. US House Speaker, Nancy Pelosi, is already proposing an additional $1 trillion for state and local government support.

We conclude from this that the programs are sufficient to fund the current expected lockdown scenario. But in the absence of adequate testing and tracing of cases, we will see a very expensive second set of lockdowns around the world or social distancing that has to go beyond what China, Korea and others are still deploying which will keep output at suppressed levels compared to what is being forecast for late 2020 and 2021.

Q3. When can the lockdowns end?

Economies should only open up when they believe the virus' impact can be minimised through isolation of the vulnerable, testing and tracing, and having adequate healthcare resources to deal with the expected increased number of cases from opening. By isolating those most vulnerable, that is those over 70 years old or with severe underlying conditions, one can dramatically reduce the strain on hospital resources and the overall mortality rate. The table below shows that 70% of all hospitalisations for Covid-19 are patients who are over 70 years old. The proportion of Covid-19 related deaths accounted for by those over 70 are 75% in the US, 80% in the UK and 87% in Europe. Over 90% of deaths involve hospital patients with known underlying conditions (which includes most of those over 70). The most dangerous underlying conditions related to Covid-19 appear to be severe hypertension, morbid obesity and chronic lung diseases.

Exhibit 6: Proportion of hospitalisations and deaths accounted for by those over 70 and by those with severe underlying health conditions

	Hospitalisation		Deaths	
	Those >70yrs	With Underlying Conditions	Those >70yrs	With Underlying Conditions
US (CDC)	70%	90%	75%	91%
UK (GOV.UK)	70%	55%	80%	95%
EU (ECDC)	70%	66%	87%	93%

As a working example, we can take the peak daily case level in the UK (circa. 6,000/day) and distribute these cases by age cohort in line with the research so far. We can then take the hospitalisation rate observed so far for each cohort and look at what would happen to hospital cases if the economy was to fully re-open with and without those most vulnerable. The notional effect of this would be to reduce daily hospital admissions from nearly 1,300 to 479. While hospitalisations for the under 70s will go up with opening, we have that much more hospital capacity to cope.

Exhibit 7: If Over 70s are isolated, hospital demand drops by over 60%

Age Cohort	Share of cases	Cases/day	Hospitalisation Rate	Hospitalised	Proportion of Hospitalised
70+	17%	1020	80%	816	63%
60-69	9%	540	22%	119	9%
50-59	14%	840	15%	126	10%
40-49	12%	720	12%	86	7%
30-39	12%	720	9%	65	5%
20-29	30%	1800	4%	72	6%
0-19	6%	360	3%	11	1%
	100%	6000	22%	1295	100%
		Hospital cases excluding over 70s		479	

We can carry out the same exercise for mortality. Imperial College looks at the probability of dying from COVID by age group, computed as a percentage of all people estimated to have contracted the disease (reported + unreported). The latter grouping is not observable and has to be estimated using different techniques, but is more informative than the "case fatality rate" which typically excludes asymptomatic people, many of whom are young.

Exhibit 8: Imperial College estimates that the true mortality rate for the c 85% of the population under 70 is very low

Infection fatality ratio

Age-group (years)	% symptomatic cases requiring hospitalization	% hospitalized cases requiring critical care	Infection fatality ratio
0 to 9	0.1%	5.0%	0.002%
10 to 19	0.3%	5.0%	0.006%
20 to 29	1.2%	5.0%	0.03%
30 to 39	3.2%	5.0%	0.08%
40 to 49	4.9%	6.3%	0.15%
50 to 59	10.2%	12.2%	0.60%
60 to 69	16.6%	27.4%	2.2%
70 to 79	24.3%	43.2%	5.1%
80+	27.3%	70.9%	9.3%

Source: Imperial College COVID-19 Response Team. March 16, 2020.

We also know that a disproportionate number of Covid-19 hospitalisations and fatalities for those under 70 have severe underlying conditions including severe hypertension, morbid obesity and chronic lung diseases. 85% of hospitalisations of under 65 have underlying conditions according to the CDC (see table below). So the expected mortality rate from going back to normal social distancing after isolating the vulnerable population could be well below 0.1% of those infected. Once enough serology testing is done to prove the true mortality rate and this thesis is proven more robustly by those findings, we should then see a return to more normal social and economic activity.

Exhibit 9: US hospitalisations with underlying conditions by age group

	Age group (yrs), no./total no. (%)			
Underlying condition	Overall	18–49	50–64	≥65 years
Any underlying condition	159/178 (89.3)	41/48 (85.4)	51/59 (86.4)	67/71 (94.4)
Hypertension	79/159 (49.7)	7/40 (17.5)	27/57 (47.4)	45/62 (72.6)
Obesity[§]	73/151 (48.3)	23/39 (59.0)	25/51 (49.0)	25/61 (41.0)
Chronic metabolic disease[¶]	60/166 (36.1)	10/46 (21.7)	21/56 (37.5)	29/64 (45.3)

Source: CDC US study 1 – 31 March, 2020.

BCA released a model on Friday for predicting lock-down end dates based on the linear trend from the peak 5-day moving average of confirmed cases and fatalities when we reach zero. The table below highlights that these methods generally prescribe a reopening date of May 31 or earlier, with a few exceptions. BCA compare these projected dates to what Wuhan experienced starting from lock-down date to zero cases and deaths, which was 70 days. BCA highlight that US newly confirmed cases are only currently projected to fall to zero by February 2021 which is the clear outlier on this table. This is a somewhat mechanical extrapolation from a curve that has yet to flatten and we would expect this to be a much earlier date as long as individuals and state government leaders are sensible about isolating the vulnerable and meeting testing needs to identify cases early.

Exhibit 10: BCA of potential lockdown end dates using 70-day rule and straight-line projection from peak cases

COUNTRY	70-DAY RULE**	BASED ON: CONFIRMED CASE TREND
AUSTRALIA	MAY 31, 2020	APRIL 24, 2020
CANADA	MAY 25, 2020	JUNE 21, 2020
FRANCE	MAY 12, 2020	APRIL 29, 2020
GERMANY	MAY 6, 2020	MAY 5, 2020
ITALY	MAY 2, 2020	MAY 22, 2020
JAPAN	MAY 5, 2020	MAY 11, 2020
NETHERLANDS	MAY 21, 2020	MAY 15, 2020
SPAIN	MAY 18, 2020	MAY 21, 2020
SWEDEN	NA	MAY 14, 2020
SWITZERLAND	MAY 22, 2020	MAY 1, 2020
UK**	MAY 25, 2020	JULY 11, 2020
US	MAY 28, 2020	**FEBRUARY 11, 2021**
ADVANCED ECONOMIES OVERALL	MAY 31, 2020	JUNE 14, 2020

* SOURCE: CENTER FOR SYSTEMS SCIENCE AND ENGINEERING (CSSE) AT JOHNS HOPKINS UNIVERSITY AND BCA CALCULATIONS. DATA AS OF APRIL 29, 2020.
** SOURCE: OXFORD COVID-19 GOVERNMENT RESPONSE TRACKER AND BCA CALCULATIONS. CALCULATED AS 70 DAYS FOLLOWING DATE OR SCHOOL OR WORKPLACE CLOSURE.
*** EXCLUDES APRIL 29 FATALITY UPDATE OWING TO DEFINITION CHANGE.

The UK's confirmed case count and fatality trends are still too shallow to suggest an end of May re-opening, as is the case in Canada. We compare the UK to Italy and Germany in the chart below to show how different their respective linear forecasts are.

Exhibit 11: Simple straight-line projection of when cases go to zero in UK, Italy and Germany

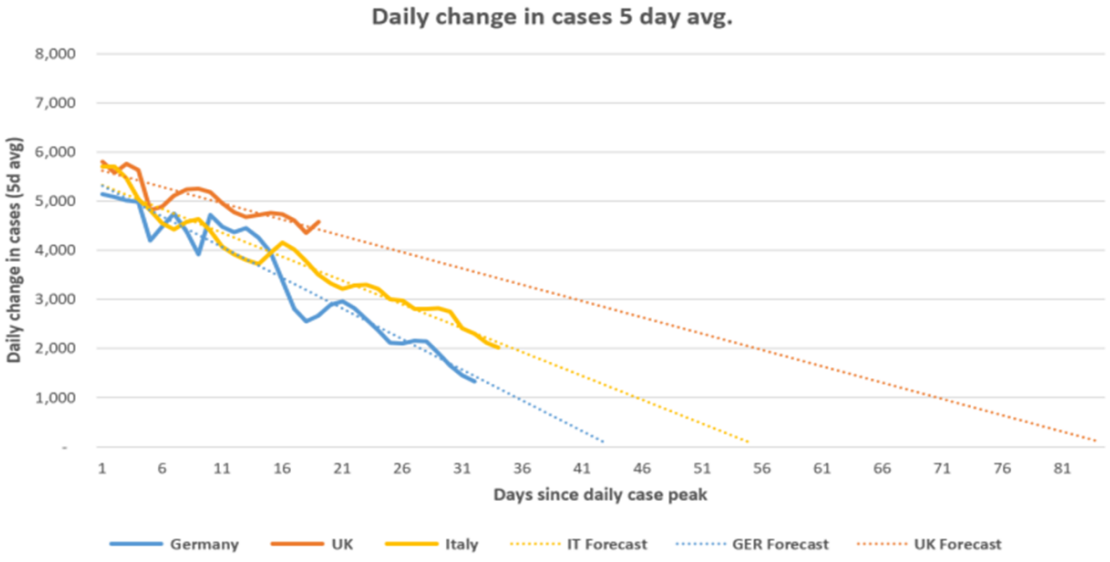
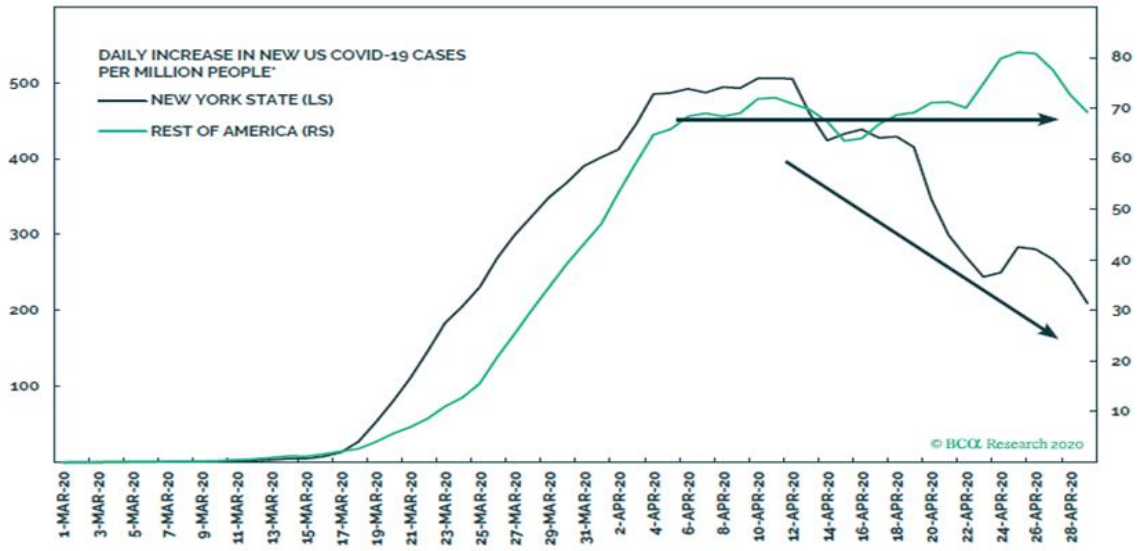
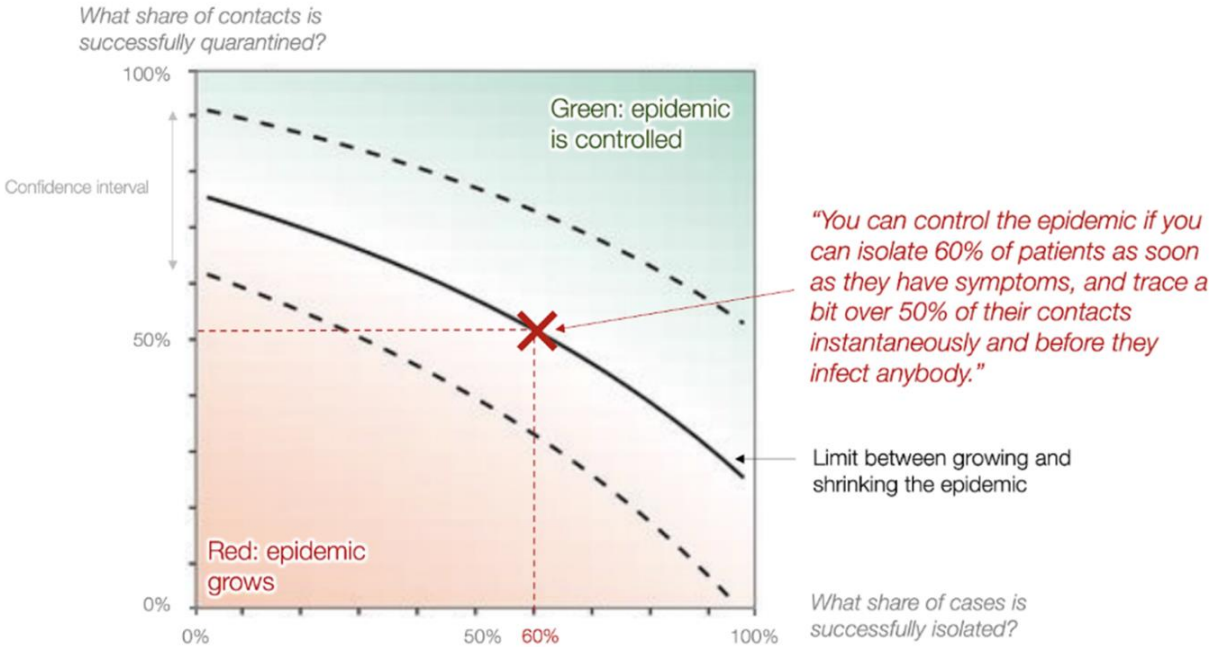


Exhibit 12: The US has no clear downtrend yet outside of NY State



After isolating the vulnerable, and with testing tracking and tracing in place this should give governments, business and schools the confidence to open back up. An Oxford University research team published in Science magazine on 31 March a very compelling piece of research entitled "Quantifying SARS-CoV-2 transmission suggests epidemic control with digital contact tracing." It concludes that to control the virus (keep the R-0 below 1), you must test enough to isolate over 60% of cases and trace and quarantine over half of the contacts made by any infected person identified with no delays in isolating cases once discovered.

Exhibit 13: Oxford suggests controlling the epidemic requires isolating 60% of cases and trace half of those they contacted



Source: chart annotated and graphically adapted by Tomas Pueyo from the paper "Quantifying SARS-CoV-2 transmission suggests epidemic control with digital contact tracing", authored by Luca Ferretti, Chris Wymant, Michelle Kendall, Lele Zhao, Anel Nurtay, Lucie Abeler-Dörner, Michael Parker, David Bonsall, Christophe Fraser. Link: https://science.sciencemag.org/content/early/2020/04/09/science.abb6936

This research does not assume the vulnerable are isolated, but rather they are among the 60% of cases that must be caught with testing. So lower levels of testing and tracing should be able to achieve R0 <1.0 in the case where the vulnerable are isolated.

How back to normal will we be when no longer locked down? One month after removing restriction in late March, China is still not back to normal – it looks like about 90% back if you look at the numbers below. China has fully opened their economy but with continued mass testing, contact tracing and quarantining of the small handful of new cases. They have ongoing restrictions on international travel. What we have observed so far is a reasonably strong rebound in manufacturing but a degree of caution on the consumer side. While retail sales, auto sales and property sales have rebounded we can see that consumers are uncomfortable travelling around cities. Retail footfall is at 73% of pre-crisis levels, public transport is at 41% and air travel is at just 36%. There have been numerous photos and videos of restaurants in Beijing and Shanghai that are essentially empty. There are some tentative signs of improvement however and this will be likely to continue further with the passage of time and with low severity of second waves.

Exhibit 14: China is still not fully back to pre Covid-19 levels (year on year %)

China Economic Openness Measure	at Trough	Today (April)
% of retail stores operational	78%	98%
Retail customer traffic	41%	73%
Retails sales	58%	92%
Air Travel	16%	36%
Auto Sales	21%	93%
Subway ridership	7%	41%
Cargo Throughput volumes	67%	136%
New residential property sales (50 cities)	34%	80%

Source: Carlyle Group Economic Indicators April 2020

With isolation of the vulnerable and adequate testing and tracking resources, we would expect major Western economies to see a similar pattern of gradually returning to a semblance of normalcy as implied above. Cautious consumer spending is however likely to persist and act as a drag on the economy until a vaccine is found.

Risk of Second Wave. It would appear that the global scientific community have come to the conclusion that second and further waves are inevitable.

"There's a possibility that the assault of the virus on our nation next winter will actually be even more difficult than the one we just went through… We're going to have the flu epidemic and the coronavirus epidemic at the same time."
CDC Director Robert Redfield
21 April 2020

"[A second round of the coronavirus] is inevitable… If by that time we have put into place all of the countermeasures that you need to address this, we should do reasonably well. If we don't do that successfully, we could be in for a bad fall and a bad winter."
NIAD Director Anthony Fauci
29 April 2020

China, South Korea, Taiwan, Hong Kong, and other countries early to the virus, have given us the best proof that significant second waves that prompt further lock-downs may be manageable by isolating the vulnerable and having sufficient testing and tracing.

The greatest risk of a second wave in a major economy appears to be in the US. If a portion of the US states are presently or soon to be relaxing lock-down including not isolating the vulnerable and do not have the testing and tracking capability, experts feel there is a high chance of a second wave.

Increasing quantities of PCR testing kits are on their way with innovations in progress for home testing. We are very unlikely to reach the testing levels proposed by the Harvard Safra report (20M per day required for full economic opening), but by late June, we should have in most countries enough to test those who need

to be tested (vs want to be tested) and positive cases from those tests can then be traced. This is where the real obstacle comes in.

Exhibit 15: New confirmed cases in China

According to the Johns Hopkins plan, the US would need 100,000 contact tracers. Other calculations put that number at 600,000. Tomas Pueyo's most recent chapter of "The Hammer and the Dance" educates us on the labour intensity of tracking and tracing, suggesting that each positive tested case requires between 15 and 20 person days of effort to track and isolate those in contact with each case. With the US currently reporting 30,000 cases per day, this implies that a small army of 600,000 people would be required. Pueyo suggests that countries wait until daily new case loads reach a more manageable number when we would require fewer contact tracers.

High tracing technology adoption can reduce this considerably. A number of countries are turning to smartphone apps to help with contact tracing, with Germany one of the most successful. In the US, Apple and Google are expected to release by mid-May a mobile software tool that will let iPhones and Android devices talk to each other and enable future digital contact tracing.

The Cost of a Longer Lockdown. The cost of a longer lockdown on risk asset valuations should not be huge as those costs are incurred over just 2020 and 2021 with more lasting structural economic damage limited to certain sectors (airlines, travel and mass events), with offsetting benefits to technology and healthcare sectors. Bank analysts (GS, JPM, MS, CS, DB, RBC, IBES consensus) have published an average S&P 500 earnings decline forecast of -22% for 2020 vs 2019. If we assume a second lockdown with some rough math, we could see a -56% decline in corporate earnings in 2020, but with this behind them at the end of 2021, investors will be focused on what happens in 2021 and beyond. The effects of a second lockdown in the winter of 2020/21 will certainly spill over into 2021 but analysts are forecasting average earnings growth of +26% in 2021 over 2020, leaving corporate earnings -3% behind where they were in 2019. We don't know how much a second wave would enlarge this decline, but investors should still be looking beyond 2021 for the bulk of equities valuation impact.

Governments may increase stimulus for longer lockdowns which would serve to offset the -56% downside case scenario for 2020 earnings. Obviously, more stimulus enlarges the deficits that need to be funded from government balances sheets which in turn gets paid off through inflation and higher taxes which comes out of our pockets, just spread out further down the road. Any further government support would offset some of the expected 2021 corporate earnings hits from longer lockdowns or second lockdowns.

Q4. When will the largest single focused medical investment in human history deliver a widely available vaccine?

It is now abundantly clear that the world cannot fully return to normal levels of social and economic activity until a vaccine is found. Never before have so many lives, livelihoods, and economies depended so much on a single health intervention. Never before have so many research organisations, pharmaceutical companies, governments and multi-lateral organisations invested as much as they are investing now in any one medical endeavour -- with 111 potential vaccines currently in various stages of development, of which 8 are in phase 1 trials and only CanSino is in phase 2. Success is not certain as we are reminded that no vaccine has yet been developed for any human coronavirus.

The pandemic can only be brought to an end after billions of doses are produced affordably and made available to everyone. Producing and distributing billions of doses of a new vaccine would be challenging at the best of times. Doing so during a pandemic will require an unprecedented global effort.

The first effective and FDA approved vaccine could be available by this fall from the Oxford project, but most developments are managing expectations to mid or late 2021. Last week, **Oxford's Jenner Institute** announced two partnerships; one with AstraZeneca which will provide the capabilities to produce up to 100M doses of the vaccine by year end, and one with the Serum Institute of India (one of the largest vaccine manufacturers in the world) to produce 40M doses beginning right now in anticipation of the vaccine being approved. They have announced a target of 1M doses produced by the fall.

There is no good or bad news out of the other high-profile developments in progress with firms including **J&J, Sanofi/GSK, CanSino, BioNTech/Pfizer, Sinovac/Dynavax, Novovax and Moderna/Inovio. Moderna** talks about emergency use in primary populations as early as fall 2020.

Moving beyond vaccines into antivirals, this week the US National Institute of Health (NIH) released results of a trial on severely ill patients being treated with the Gilead antiviral drug, **Remdesivir.** The trial showed that Remdesivir had a statistically significant benefit as a therapeutic being used against Covid-19. The average patient in the Remdesivir trial group recovered after 11 days versus 15 days for the control group. There was also a notable (but statistically insignificant) decrease in the mortality rate. While this is unlikely to be a game changer in terms of the speed and degree of re-opening (Remdesivir is administered intravenously as opposed to at point of care) it is promising news which led to its approval for emergency use last night by the FDA. Under the emergency authorization, the drug can be used to treat patients who are hospitalized with a severe enough case of the disease that they need to be given supplemental oxygen or placed on a ventilator. Results of a similar Remdesivir trial of earlier stage patients will be released later this month and many analysts believe the antiviral may be even more effective when administered at earlier stages.

PCR testing levels have continued to grow globally, particularly in the UK. The UK is just now testing over 100,000 people per day according to last night's report from Health Secretary Matt Hancock. This is four times the level of two weeks ago but is still below the levels being carried out in other European countries. In the latest chapter of the "Hammer and the Dance" from Tomas Pueyo, he suggests that a good benchmark for countries to begin reopening would be the point at which just 3% of all tests are returned positive. This assumes testers are working their way from the most infected populations to the least, with early populations expected to test over 10% positive after outbreaks and closer to zero for many subsets of the population who would be the last to test. This target can be combined with the research completed by Oxford which indicates that the effective reproduction rate (R) can be brought below 1 by capturing 60% of cases with testing and tracing 50% of their contacts. 60% is a tough target given the nature of the virus where infected individuals have no symptoms but are contagious.

Serological antibody blood tests are performed to identify those who have immunity and can therefore return to normal activity. The false positives are a problem though. One such test claims to correctly identify people with those antibodies 94% of the time. By contrast, it identifies phantom antibodies in 5% of people who don't have them (false positive). That false-positive rate sounds acceptably low. It's not. Let's assume 5 percent of the U.S. has been infected so far. Among 1,000

people, the test would correctly identify antibodies in 47 of the 50 people who had them (94%), but it would also wrongly spot antibodies in 50 of the 950 people without them (=5% false positives). The number of true positives and false positives would be almost equal. In this scenario, if you were told you had coronavirus antibodies, your odds of actually having them would be near 50/50.

The rate of false positives needs to be extremely low (<1%) for such tests to be reliable enough to filter one's workforce for example and determine who need not socially distance. There remain some issues around reinfection as well.

Macro Scenarios and Investment implications:

Keeping our eyes on the long-term, we have been looking for insights around how the world and the US will be different with near zero interest rates which are forecast to remain in place for an extended period in light of slower US economic growth and the overhang of continued massive monetary easing.

Long Term implications of zero interest rates. The US has returned to ZIRP (zero interest rate policy) after having already experimented with ZIRP in the aftermath of the GFC and successfully exited it beginning in late 2015. Other economies that have never exited their post GFC ZIRP such as Japan and Europe, have not redefined their respective investment rankings with ZIRP. So looking at the recent history of Europe and Japan, what are the clues for how the US economy might evolve over the longer term under a ZIRP regime? We are only part way into studying this question, but firstly we note that there are significant idiosyncratic reasons why these economies may not be representative of what will happen in the US. The booming Japanese economy of the 1980's has struggled to maintain its position as it faces significant headwinds from both its own aging demographics as well as competition from the Asian tigers which compete in many of Japan's leading industries from consumer electronics to automobiles. Europe has struggled since the inception of the monetary union to reconcile a common currency without a fiscal union and diverging growth rates across member states. In addition, since 2017, its export machine has been impacted by slowing Chinese demand as well as the consistent threat of trade tariffs from the Trump administration. Populist movements have also slowed implementation of much needed structural reforms.

The above constraints are not representative of the US economy, although it could be argued that other risks lie ahead including ballooning budget deficits and political polarisation. However, as we highlighted last week, the US stock market has the highest representation (52%) of the sectors that are likely to thrive in the post-Covid-19 world.

However, it does seem likely that US interest rates will remain low for an extended period. There are two main reasons for this. Not only will policymakers wish to avoid any nascent recovery being stillborn, but also the huge debt burden created by the fiscal stimulus programs will need to be serviced at affordable interest rate levels for many years to come. Last week, Fed Chair Powell's latest communication this week suggests that monetary policy is likely to remain highly accommodative over the foreseeable future.

The main implication of this is likely to by higher inflation rates over the longer term. Clearly the initial demand shock of the Covid crisis is disinflationary, but with continued fiscal stimulus (for example Nancy Pelosi is advocating another $1T in support to State and Local governments), rising risks of protectionism (both Trump and Biden are escalating their anti-China rhetoric) these add further support to our base case outlook that inflation pressures will likely start building over the longer term. With short-term interest rates on hold, this will imply a steepening of the yield curve as a higher term or risk premium is built into longer maturity treasuries. Rising inflation also means real rates will remain low, benefitting inflation-linked bonds and gold. Equities are likely to perform well over the longer term but face short term headwinds given their recent run and elevated valuations. Credit should do well on a risk-adjusted basis, as policymakers are keen to support the flow of credit to businesses. These investment implications are listed in greater detail further below.

Base, Upside, and Downside Case Scenarios. While we of course welcome the recent rally in risk assets given we have held client risk exposure firmly in place, we continue to see risks of elevated volatility in

the second half of the year. Most experts agree that a second wave at some point is inevitable in most countries. This explains our continued push to strengthen safety asset exposure where possible.

What is not inevitable is that these second waves will be as severe as the first wave, particularly if the vulnerable are isolated and there is adequate testing and tracing of cases for the rest. Better testing and treatment measures will facilitate economic functioning until a vaccine is available.

So in this context, we have updated our macro scenarios into year-end and are spelled out at the back of this document. While we have slightly revised down our expectations for interest rates across scenarios, we have moderately increased our expectations for equity markets.

The investment implications which follow below, reflect this range of scenarios around more or less pronounced second waves with governments flexing monetary and fiscal stimulus in response to those waves.

Investment Implications (similar to last week)

1. Religiously rebalance through expected volatility ahead.

2. Expect risk of higher inflation in the medium term. Longer-maturity US Government bonds to underperform shorter-maturity bonds due to rising inflation and ballooning budget deficits. Find alternative safety net assets starting with inflation-linked bonds and gold.

3. Credit to outperform equities in the near term on a risk-adjusted basis. We are poised for rotation on further credit spread widening.

4. Equities may be subject to further short-term volatility, but over the longer term will be supported by recovering economic activity, better earnings and higher multiples

5. Sectoral mix shifts:

- Technology: Greater demand for on-line/virtual/digital services and infrastructure, whether for public health (surveillance), business resilience, education, leisure or medical diagnosis. Positive effects of WFH on carbon footprint will add further tailwind.
- Healthcare: Countries will not be caught off-guard again. Stockpiles and redundant capacity will drive short-term burst followed by domestic healthcare companies becoming a strategically significant industry.
- Real estate shake-up: lower commercial office space demand, higher warehousing/ logistics demand.
- Our New World Equity Portfolio was specifically built to exploit these sectoral opportunities.

6. Geographic mix shifts:

- US has more of the secular winners (Tech, Comms, Healthcare) which comprise a larger share of US market (52%) than of EM (26%) or Japan (33%).
- The long-term economic damage and debt burden will be lower in Asia/China given their greater capacity to manage the “dance phase” of managing the virus, both from public health and stimulus perspective. China’s equity market will also have a high share of secular winners (40%).

7. Quality Equities to out-perform, especially mega to large-cap companies with bullet-proof balance sheets. Our “quality” equity managers have moved in this direction already

8. Distressed credit and private equity: several manager commitments are in progress alongside due diligence on two others.

Caveat lectorem on our reports – all information changes on a dime

We thought we should finish with a caution about many of our assertions and conclusions in these documents. We are trying to get it as right as we can, but in situations like this, information changes rapidly. I thought Ed Yong, who writes for the Atlantic magazine captured what it feels like right now with the vast amount of information coming your way and our way every day.

"The pandemic's length traps people in a liminal space. To clarify their uprooted life and indefinite future, they try to gather as much information as possible—and cannot stop. "We go seeking fresher and fresher information, and end up consuming unvetted misinformation that's spreading rapidly," Bergstrom says. Pandemics actually "unfold in slow motion," he says, and "there's no event that changes the whole landscape on a dime." But it feels that way, because of how relentlessly we quest for updates. Historically, people would have struggled to find enough information. Now people struggle because they're finding too much."

Exhibit 16: Macro Scenarios (Updated 1st May 2020)

Scenario	Downside– On-again / off-again lockdowns	Base Case- China pattern + manageable 2nd wave	Upside Case – Single Wave
Probability	30%	60%	10%
Spread of virus and Containment Efforts	• Second and multiple outbreaks of large magnitude around the world in 2H of 2020 and winter into 2021 impede attempts to resume normal behaviour – similar pattern to Spanish flu. • Mortality varies by country hospital situation and peaks of resurgences (ranging <1% to 4%). • Travel, work, school and mass event containment measures are on and off and extended into 2021 with winter bringing new outbreaks. • Testing, tracking and tracing in major Western countries continue to lag needs through much of 2020. • Certain sectors of economy collapse and are totally dependent on government support • No vaccine success until late 2021 or later.	• Globally, outbreaks in each country follow the broader China life cycle due to containment efforts and see an active case peak after two months of lockdown. • US is slower than most to contain. Day 1 being 20 Feb, peaking mid-May. Different states opening at different times delays flattening. • In most other develop countries, cases peaking now and recoveries ramping up after two months of lockdown. • Mortality is below 0.5% as vulnerable/elderly people are isolated and younger populations with symptoms get tested and isolate. • Any second / third waves much smaller in scope and manageable with existing healthcare resources. • Many schools closed until Sept. Limited mass events. • Isolated developing countries with weak systems see case growth drag on into 3rd quarter 2020, with major countries having to deploy travel bans. • Testing becomes more widespread along with systematic centrally controlled contact tracing which works. • Antiviral drugs come too late to accelerate exit from lockdown. • Vaccine comes in mass scale in mid-2021.	• Globally, outbreaks in each country follow the broader China life cycle due to containment efforts and see an active case peak after two months of lockdown.US States hold off opening until most are ready. • Massive testing and case tracing put in place by June in most major markets. • Testing proves mortality rate is c 0.5% and lower with vulnerable isolated. Higher than reported infection rates leave 20% plus immune. • Second waves limited to small isolated populations. Travel bans control spread back to DM from lagging EM markets. • Antiviral medicines take the pressure off hospitals and reduce mortality (decreases fear and people move/spend more freely).
Policy Response	• Escalated version of base case (announced) policy action with all guns blazing on rates, fiscal spend in the form of govt liquidity injections; hard hit industries get direct cash injections. Full support to unemployed. Massive fiscal deficits.	• Colossal fiscal support for unemployed, effected businesses, healthcare system, financial system, etc. • Over $8T of global government fiscal stimulus and over $8T of central bank liquidity injections possible = almost 20% of global GDP.	• Same as base case without top ups and less liquidity and fewer asset purchases.
Real 2020 Global GDP Growth (PPP)	-6.0% Long recession	-3.0% Short / sharp recession (vs +3.4% IMF Jan 2020)	-1.0%
10Y Treasury Yld @YE	0.25%	1.25%	1.75%
S&P 500 @YE2020	2,300	2,850	3,200

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