APOLLON

WEALTH MANAGEMENT

Broader Investment Perspectives in the Face of COVID-19 March 25, 2020

Things are evolving quickly and on a daily basis. In the face of the health, economic and financial challenges resulting from the COVID-19 pandemic, I believe that we need to see empirical evidence that we have the spread of this virus under some semblance of control before economic uncertainty can moderate and financial stabilization can begin to occur. While I don't have a crystal ball, I believe I have an understanding of what the important sign posts will be as we travel the long road back to some semblance of economic and financial normalcy.

I hope your seatbelts are fastened and you're all staying safe. Well, we just concluded another whiplash-inducing trading day in the markets. I won't recap (all) the news events of the day as you're no doubt getting more of that than you care for already. I'll just quickly summarize where the S&P 500 Index stands today with a few exhibits and bullet points before moving on to some important and broader (COVID-19) analysis and perspectives.

S&P 500 Index – Synopsis as of Tuesday, March 24's Close

1) The (S&P 500) market is down 24.2 percent year-to-date and down 27.7 percent since the February 19 all-time peak. See **Exhibit 1**.
    - The market finished last week down 15.0 percent and was the **4th worst week** for the S&P 500 since 1928.
    - The week-ending Friday, February 28 was the **12th worst week** since 1928.
2) Today's +9.4 percent S&P 500 Index swing was actually not that atypical for the last 12 trading days with the average daily move being +/- 6.4 percent.
3) We're now back to December of 2018 levels for the S&P 500 Index. See **Exhibit 1**.
4) Last Friday was the 7th trading day in a row that the market changed directions (- / + / - / + / - / + / -) with only one of the seven daily moves smaller than +/- 4.3 percent. The up/down pattern was broken between Friday and Monday. See **Exhibit 2**.
5) Peak (2/18)-to-trough (currently 3/23), the market was down 33.9 percent.

Exhibit 1

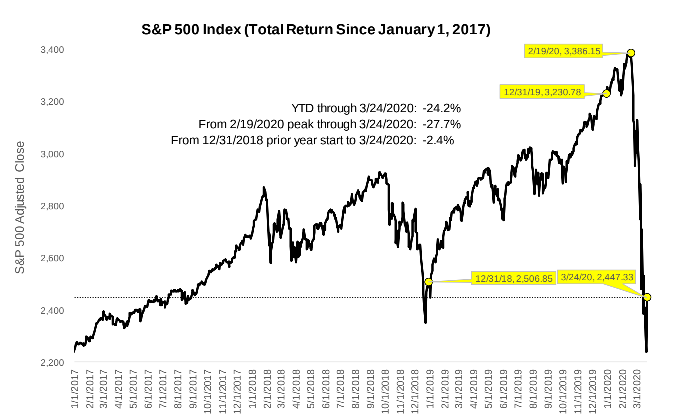
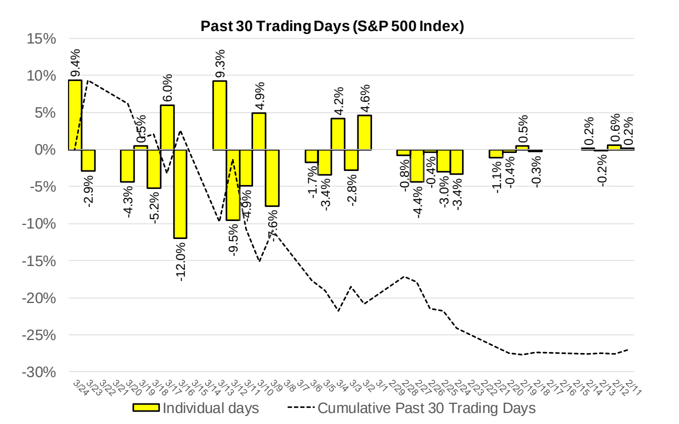


Exhibit 2



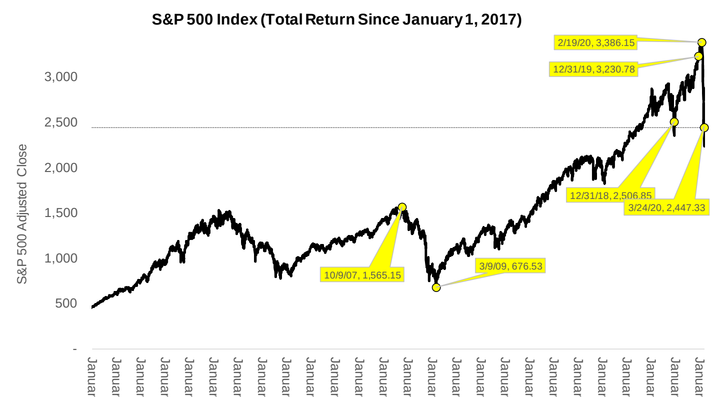
APOLLON

WEALTH MANAGEMENT

Exhibit 3

Rank	Friday Date	Week's Loss
1	Friday, July 21, 1933	-18.6%
2	Friday, October 10, 2008	-18.2%
3	Friday, May 17, 1940	-15.4%
4	**Friday, March 20, 2020**	**-15.0%**
5	Friday, September 16, 1932	-13.5%
6	Friday, October 7, 1932	-13.1%
7	Friday, April 8, 1932	-12.8%
8	Friday, October 23, 1987	-12.2%
9	Friday, May 27, 1932	-11.9%
10	Friday, November 19, 1937	-11.8%
11	Friday, September 21, 2001	-11.6%
12	**Friday, February 28, 2020**	**-11.5%**
13	Friday, October 2, 1931	-11.2%
14	Friday, April 14, 2000	-10.5%
15	Friday, October 20, 1933	-10.1%
16	Friday, September 18, 1931	-9.7%
17	Friday, October 25, 1929	-9.4%
18	Friday, September 24, 1937	-9.4%
19	Friday, October 3, 2008	-9.4%

Exhibit 4



Sources for data represented in Exhibits 1 – 4: Yahoo! Finance

COVID-19 Situational Analysis (as of March 24)

Let me start by saying my initial comment is a nerd-out session that involves the definition of an obscure term. The term multicollinearity refers to a situation in which two or more explanatory variables in a multiple regression model are highly linearly related. Right now, all (individual) risk factors that drive the global capital markets (including equity, credit spread, volatility, liquidity, interest rates, inflation, etc.) are highly correlated to datasets surrounding a novel virus. Therefore, virus analysis has become financial analysis. The virus is currently ahead of the world by one touchdown after the first quarter. While we might be down, we're certainly not out. We have at least three quarters to implement a new game plan. Unlike a virus (which is a dumb strand of RNA), we have the most highly evolved problem-solving brain of any creature that ever roamed the earth. We will whip this virus, but it will take some time.

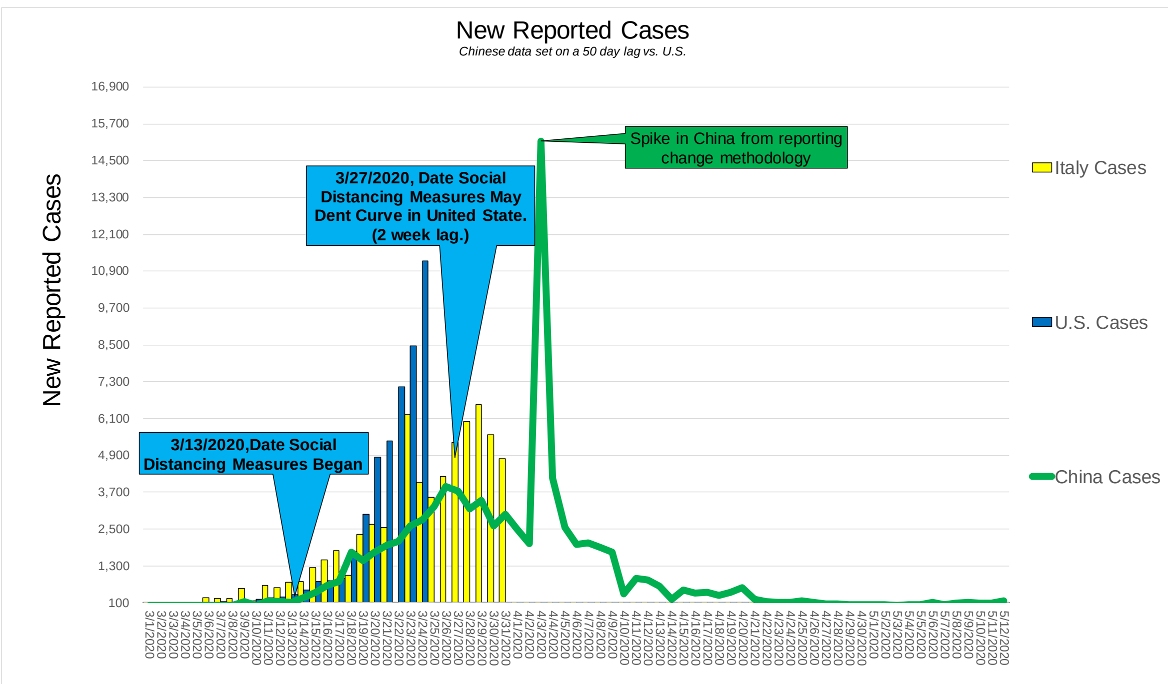
History is not destiny, but it rhymes. The year 1918 may have preceded a lot of capital market datasets or our understanding of diseases and how they work, but context is important. Please read up. I'm pretty sure that in the year 2120, people will likely have little recollection about what happened to us in 2020. [1918 Flu]

As previously discussed (but I think cannot be overstated), the COVID-19 invasion in the U.S. and large pockets around the world is going to continue to look parabolic based on transmissions that occurred before extreme measures were enacted to slow the rate of spread. We're currently trending at a doubling of reported cases at a rate of every ~2.0 to 3.0 days, which is similar to what we saw from China when lagging their data by 50 days. 50 days is my best estimate of how far the U.S. is behind China on the breakout calendar. Data surrounding (early) deaths was how I lagged relative datasets to make them comparable to one another.

While I believe we're about 50 days behind China, I think we're about seven days behind Italy. While there are certain error terms (of cumulative and daily positive tests) we cannot accurately quantify due to highly varied detection and testing practices across boarders (and time), early deaths from COVID-19 are less likely to have error terms as they are observable and represent healthcare systems that have not (yet) been overwhelmed by the virus. As time goes along, death rates will become more a function of health care capacity and less a function of time from the infection's initial breakout.

Of all the things I have analyzed in my 23-year finance career, I never anticipated these *World Health Organization* datasets (about a disease originating in China) would be among them. Nonetheless, in my opinion, the only way the markets can find a bottom is when there is indication we have this disease under some semblance of control in America. That will be an indication that things can start (the long path) to return to normal even if they will continue to remain abnormal for quite some time. Based on my analysis of COVID-19 data from China (overlaying Chinese data on a 50-day lagged basis to United States data), I believe we could be three to four days from the first glimpse of that light at the end of that tunnel. That light at the end of the tunnel could emerge as early as March 27 (or this upcoming Friday). **See Exhibit 5**.

Exhibit 5



Sources for data represented in exhibits: European CDC latest situation update, BNO News, U.S. CDC, WHO

Last Tuesday (March 17), the United States crossed the 5,000 COVID-19 confirmed case count threshold. I told you all then that we'd likely see 50,000 cases in the coming weeks, and to prepare yourself mentally and emotionally for that. Well, it took precisely one week to go from 5,000 to 50,000 confirmed cases. These 50,000+ reported COVID-19 cases are still the tip of the iceberg (like 5,000 was last week), but I think much more of the iceberg is above sea level now than it was last week.

The U.S. is currently running at about 11,000 new case counts rate today. See **Exhibit 6**. When we overlay China and Italy new daily case counts over the United States on a time-adjusted basis (50-day China lag and seven-day Italy lag), there is some light at the end of the tunnel. While the news out of Italy has been grim, there is actually some good news in that their new daily case count peaked a few days ago and has begun to fall. If this continues, Italy's case count comes off of the scary parabolic math in a similar way that China did on a similar timeline. Furthermore, the United States is about a week behind Italy, which reinforces the notion we could see improvements in the United States in the coming days.

Exhibit 7 shows days to double (on a rolling two-day basis) comparing the United States to China on a 50-day lag and a 56-day lag. We're currently running at 2.4 days to double and have trended in the right direction from 2.0 days 5.0 days ago. I don't know precisely where the United States should be overlaid on the Chinese data, but I think it is somewhere between a 50-day and 56-day lag.

Exhibit 6

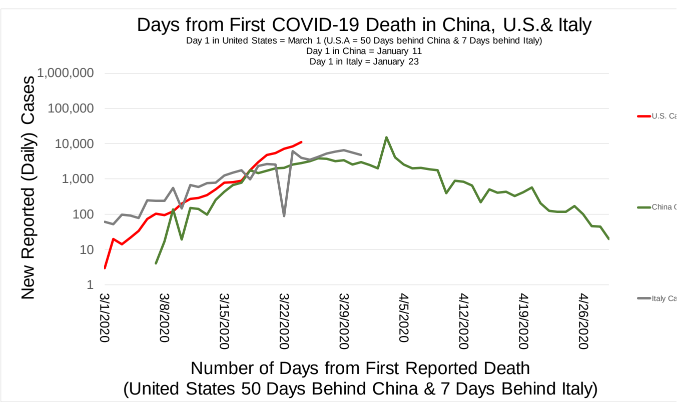
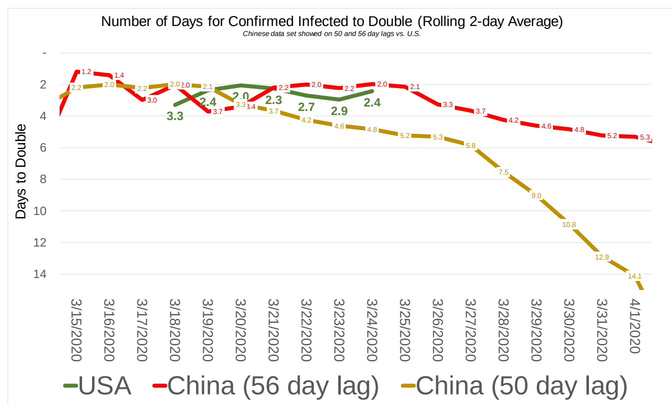


Exhibit 7



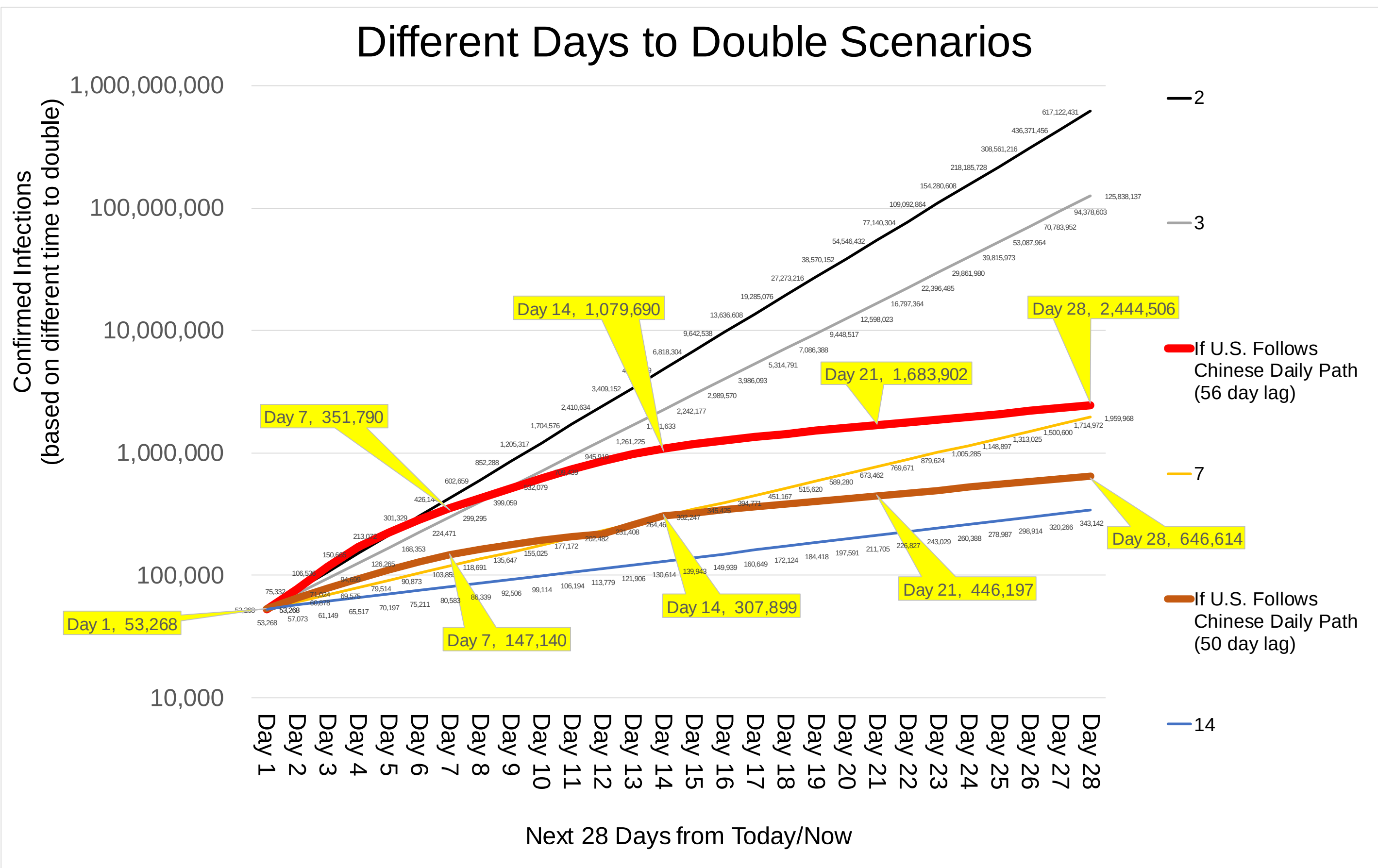
Bending the curve is not only critical to mitigating a healthcare disaster, but tangible evidence that the curve is bending would also be a prerequisite for a market bottoming.

Considering that drastic (social distancing) actions to fight the spread began in the U.S. on or around March 13, we are currently about 11 days into the process of bending the curve. The results of those efforts should start to bear fruit in the coming three days. However, over the next several days, no matter what actions our citizens have taken to thwart the contagion since March 13, all of our numbers (including new cases, total cases and deaths) will all look awful and appear to be getting exponentially worse every day. The first chance for the curve to meaningfully bend is ~March 27.

Exhibit 8 lays out the power of compounding math and why the math is so important. I've laid out several scenarios (all starting at today's ~53,000 case count) on what the infection would look like in the United States based on a range between doubling every two days to doubling every 14 days. I can guarantee that this virus will not continue on a two-day doubling rate for a month as that would involve an infection rate of nearly 200 percent of the American population.

The red and orange lines in **Exhibit 8** represent different possibilities that put the U.S. on the (dynamic) Chinese historical path on both a lagged 50-day and lagged 56-day basis. More optimistically, we're 50 days behind China. More pessimistically, we're 56 days behind China. The inputs for the red and orange lines in **Exhibit 8** are from **Exhibit 7**.

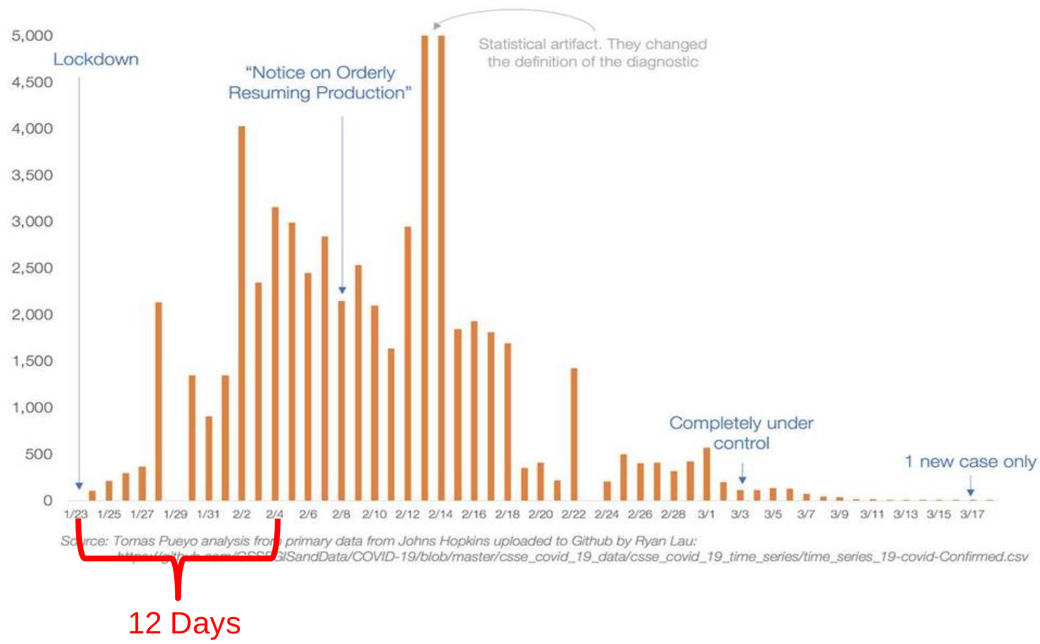
Exhibit 8



I stole **Exhibit 9** from Tomas Pueyo who's done some impressive work analyzing COVID-19. This illustrates what happened in Wuhan. On January 23, they realized they were dealing with a significant risk and they effectively locked down the Wuhan. The result is that cases went parabolic for the next 12 days, but stopped growing (and started falling) after that.

Our March 13 is essentially Wuhan's January 23. 12 days after March 13 is actually March 25 when most of you will be reading this.

Exhibit 9



Beyond the quantitative modeling of this virus intended to predict its future nefarious path, there are many other considerations we need to talk about in the next couple of weeks surrounding how we get things back to (more) normal. I'll continue this conversation with you later in future editions of "In Focus."

In summary, this too will pass. In the meantime, we need to be ready to face the challenges that will continue to unfold over the coming weeks and try not to get caught up in the emotional swings that can accompany this kind of market volatility. We've faced very difficult times in the markets and will face them again in the future.