2020 Lockwood Investment Insights Update
Lady Fortuna Is Back: Epistemology Collides With Epidemiology

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We published our initial thoughts on the novel coronavirus COVID-19 several weeks ago. Most, not all, of our observations remain valid and we have updated them here. Events have clearly taken a turn for the worse from an economic and markets perspective. We've had astonishing monetary and fiscal policy support announced with more on the way. We began our analysis with a book recommendation from 14th century plague-infested Florence. We will add another book recommendation from the U.S. in 1988.

Lady Fortuna Is Back: Epistemology Collides With Epidemiology

We had virus news cycle fatigue weeks ago, so we're not surprised if you did, as well. It's nearly impossible to keep up with the latest developments from the coronavirus as the news has changed on an hourly basis, but we can read how one author responded to the plague in 1348. If you have never read Giovanni Boccaccio's *Decameron* (1353), considered by many to be one of the best books of all time, you might find it topical and entertaining, perhaps even comforting and enlightening. Boccaccio crafted a series of novellas, based on ten stories each from ten participants (seven women and three men) who escaped from the pestilence raging in Florence to the countryside and waited out the Black Death. This is a set of stories told while ten wealthy nobles practiced "social distancing." His stories draw from his personal experience with the disease. It is a remarkably secular set of stories and may change your world view about what life was like in 14th century Italy.

It reads almost like a set of contemporary tales, except that Lady Fortuna makes a routine appearance. She reflects a medieval world view that a capricious and unstable goddess of fate ruled the luck of mankind. She (Lady Fortuna in Roman, Tyche in Greek) governed the rotation of life between prosperity and disaster, sometimes represented by a Wheel of Fortune and would often carry a cornucopia, a gubernaculum (ship's rudder) and a wheel of fortune or laurel leaves.

Market Overview
Index Returns (%) as of March 31, 2020

Index	1st Qtr.	1 Yr.	3 Yr. ^	5 Yr. ^	2019	2018	2017	2016
S&P 500	(19.6)	(7.0)	5.1	6.7	31.5	(4.4)	21.8	12.0
MSCI USA Small Cap	(31.3)	(24.5)	(3.8)	0.4	27.4	(10.0)	17.3	19.8
MSCI EAFE (net of taxes)	(22.8)	(14.4)	(1.8)	(0.6)	22.0	(13.8)	25.0	1.0
MSCI Emerging Markets (net of taxes)	(23.6)	(17.7)	(1.6)	(0.4)	18.4	(14.6)	37.3	11.2
Bloomberg Barclays US Aggregate Bond	3.1	8.9	4.8	3.4	8.7	0.0	3.5	2.6
Bloomberg Barclays Global Aggregate ex-US	(2.7)	0.7	2.6	2.0	5.1	(2.1)	10.5	1.5
S&P GSCI Crude Oil	(66.5)	(65.9)	(26.0)	(15.5)	34.5	(24.8)	12.5	45.0
S&P GSCI Gold	4.5	22.2	7.7	5.4	18.0	(2.8)	12.8	7.7
Bloomberg Commodity	(23.3)	(22.3)	(8.6)	(7.8)	7.7	(11.2)	1.7	11.8
Bloomberg Barclays US Treasury Bill 6–9 Month	1.1	3.0	2.0	1.4	2.6	1.8	0.7	0.5
Inflation §	0.5	2.3	2.1	2.0	2.3	1.9	2.1	2.1

^3 year and 5 year returns are annualized
Sources: MSCI; Bloomberg Barclays; Standard and Poor's (©2020, S&P Dow Jones Indices LLC. All rights reserved); Bureau of Labor Statistics. § Inflation data through February 2020. Visual created by Lockwood Advisors, Inc. For additional information regarding the indices shown, please refer to the Important Disclosures at the end of this document. Indices are unmanaged and are not available for direct investment. **Past performance is not a guarantee of future results.**

Fall from Grace

For us today, with the fastest collapse of a bull to a bear market in stock market history, the fall from prosperity feels swift and capricious and random, as though we are ruled by the whimsical goddess herself. This sudden stop of economic activity has happened so quickly we have barely had time to adjust in markets or in the general economy. We've been ejected from a "heavenly" state virtually overnight. Who gets infected and where outbreaks develop feels random. It heightens our suspicions that we have no degree of control over events. In short, our worldview is somewhat medieval at the moment. It is not a scientific viewpoint.

For markets today, epistemology may be as important as epidemiology. Viral epidemiology is a branch of medical science that considers the transmission and control of virus infections in humans. Epistemology is the investigation of what distinguishes belief from opinion. It is concerned with the question "How do you know what you know?"

Clearly, both are colliding now as we attempt to evaluate what we know or think we know about what is occurring and what is likely to occur next. Both epidemiology and epistemology are central questions for understanding market effects from the COVID-19 coronavirus and, now, an oil price shock and perhaps a budding financial liquidity crisis.

Post-World War II Markets Confront Global Pandemic Virus

Markets are dealing with a global pandemic virus for the first time in modern history. Pandemics have left their scars throughout history and ancient history, but modern markets have not had to confront them. SARS (Severe Acute Respiratory Syndrome, 2003-04), MERS (Middle East Respiratory Syndrome, 2012), Ebola (various outbreaks from 1976, the most serious in 2013-16), Zika (2016), Asian flu (H1N1 viral subtype, 2009) and other recent viral outbreaks were contained rather quickly. They also might be considered regional pandemics. Asian flu in 1957 (H2N2) and Hong Kong flu in 1968 (H3N2) occurred at least 50 years ago. The 1918 flu (H1N1) was over a century ago and we did not have even basic understanding of what a virus is or does. We did not have a branch of science called viral pathology

in 1918. Antibiotics, helpful in targeting secondary infections from a virus, were not discovered until 1928 and not used widely until World War II.

Our medical knowledge today is not even comparable to a century or half-century ago. That is very hopeful. Medical experts have sequenced a genome very quickly and perhaps can squash timelines to get to a vaccine in scale. The global medical community is engaged. Major medical companies and institutions are on the hunt for a vaccine. Industrial firms have shifted gears to provide manufacturing prowess. News of a vaccine or more effective treatment protocols would not only be welcome, but they may be necessary for economies and markets to begin to normalize.

COVID-19 has blown away all of these 20th century or later references to capital market impacts. Medically, this episode still has much further to go to compare with even recent pandemics, not to mention the horrors from the 19th century or the ancient world caused by versions of the plague, smallpox, typhus, influenza, cholera, hemorrhagic fevers, yellow fever, salmonella or measles. Polio, for example, once one of the most feared diseases in the U.S. in the early 1950s has largely been eradicated in the U.S. since 1979, due to widespread vaccination.

Consider, for example, that the bacterial infection (there are three) that causes plague was not identified until 1894 by French bacteriologist Alexandre Yersin and Japanese bacteriologist Shibasaburo Kitasato during the so called Third Plague Pandemic. Those suffering from the Plague of Justinian in the Byzantine Empire in the 6th century (541-542 AD), which killed an estimated 40-50% of the population of Europe at the time, had very little understanding of the infection. No wonder they turned to divine inspiration.

Looking backwards, it is now easier to identify that many of the recent global diseases were more serious than markets comprehended at the time. HIV/AIDS, for example, first identified in 1981, has been estimated to have killed 35 million people worldwide. The 2009 Asian Flu event referenced above is estimated to have caused 150,000 to 575,000 deaths globally. In neither case, nor the 1918 Spanish Flu epidemic, did we deploy mass quarantine and shelter-in-place responses.

The 1957 Asian Flu and U.S. Recession

The 1957 Asian flu is perhaps a better modern model than any others. The flu originated in China and killed about 2 million people worldwide including approximately 116,000 Americans. It also coincided with the 1957-1958 recession, the so-called “Eisenhower Recession”, which saw a sharp decline in output and is the most serious economic decline from the post-World War II period up until 1970. It was also a period of intensifying geopolitical pressure as Russia’s launch of the Sputnik satellites in October of 1957 caused anxiety that the U.S. was falling behind the Soviets in the space race. It didn’t help that Ford launched the failed Edsel in 1958 either.

The SARS Model

Some analysts have spent considerable effort modeling what happens to markets based on the most recent coronavirus, SARS in 2003-04. COVID-19 has now gone way beyond SARS, but there is another problem with this model for markets. The timeline beginning in early 2003, almost exactly overlaps with the anticipation of the Gulf War II, or Iraq War. Markets were most likely reacting to major geopolitical risk rather than worries about a viral outbreak at the time.

Moreover, China has grown dramatically since 2003. For example, China was 1.2% of global trade in 2003. It’s 34% today. China was 16% of Asian trade in 2000. It’s 41% today. SARS in 2003-04 has little to inform us about how markets will react to a global viral pandemic.

These grisly examples were all different threats than the coronavirus. They have giant flaws as models for what happens when modern markets confront pestilence. We also lack relevant data for markets for many historical events. This COVID-19 event is unprecedented and perhaps, in our view, the most significant risk event since the global financial crisis in 2008-09. Markets are echoing these significant concerns.

Seasonal Influenza

Many initially dismissed the COVID-19 concern and pointed to seasonal influenza infections. The CDC (Centers for Disease Control and Prevention) estimates that, since October 1, 2019 to March 21, 2020, the U.S. has already experienced 38 million to 54 million infections from seasonal influenza as well as 24,000-62,000 influenza deaths. The difference to markets is like a comparison between a sine wave and a j curve. A sine wave peaks and troughs with a cadence. A j curve is a hockey stick chart where a variable grows higher indefinitely. Infection rates appear to be doubling every several days. Right now, we have a basic expectation that seasonal influenza begins in October and November and usually peaks between December and February. It can sometimes last until May.

We can hope that there is a seasonal component to the coronavirus, as many expect, but that expectation is merely speculative at this point. Historically, coronaviruses have not been as seasonally sensitive as influenza. The southern hemisphere will begin to cool as the northern hemisphere warms up. Given that the virus has spread globally, this raises the fear that the virus just takes a different path around the globe as opposed to actually receding.

Moreover, viruses have often abated only to return stronger and more deadly. For example, the second wave of the Spanish flu that occurred in the fall of 1918 was much more severe than the first wave earlier that year. We have very little insight into how or when the COVID-19 virus might mutate and what form it could take in the future. For markets, until we begin to experience meaningful curtailment in the infection rate, investors will likely continue to focus on that j curve rather than the sine wave. Lady Fortuna is in charge at the moment.

Innumeracy

Discussions among friends, colleagues, and clients have elicited a wide range of responses to the dramatic government policy responses engaged in an effort to reduce the spread of the virus. We make one observation from these discussions. Many people do not understand exponential growth rates. They are infected with innumeracy.

Some of us employed in the financial markets bemoan the current state of financial literacy in the U.S. We believe that some educated investors seem to lack basic understanding of financial terminology and concepts. Certainly, our industry can produce some complicated jargon, needless buzzwords and financial advisors could often benefit from more plain speaking. But we are not only speaking of financial illiteracy, but also innumeracy.

John Allen Paulos, a Professor of Mathematics at Temple University in Philadelphia, wrote *Innumeracy: Mathematical Illiteracy and its Consequences* in 1988 and updated it in 2001. It's filled with quantitative observations and some practical advice on common mathematical and probabilistic pitfalls. This is our second book recommendation. It is also very humorous and entertaining.

Let us give one other example of innumeracy, in addition to the difference between a j curve and a sine wave discussed above. Some have told me that COVID-19 is not a threat because many more Americans are killed on our nation's highways every year. It's true that, as of this moment, COVID-19 has not generated as many fatalities (approximately 5,550) as traffic accidents in the U.S. According to the National Safety Council, an estimated 38,800 people lost their lives in the U.S. to car crashes in 2019, down from 40,231 in 2017 and 39,404 in 2018. So, there has been an actual decline in traffic fatalities over the past few years, continuing a trend from the early 1970s. Moreover, when we control for population and passenger miles, the conclusion is often that America's transportation network has gotten measurably safer. Contrast that with a global virus that is killing more people than it did yesterday since it began circulating among the human population. It is not just traffic accidents and the flu; many have made this comparison for tobacco-related deaths, cancer, heart disease, workplace accidents, etc. The same logic applies. None of these measures of fatalities in the U.S. are growing at exponential rates like COVID-19.

Now more than ever, when our understanding of the world, the markets and the economy is highly uncertain, we believe we should strive to see the world as clearly as possible. We also believe we should demand quantitative clarity

from our policy makers, who too often fight the last war rather than the one at hand. With trillions of dollars in bailout funds at stake, quantitative clarity is the least we can expect.

Here are some of our basic observations and views on the current state of global economic effects, monetary and fiscal policy responses as well as items to consider for either escalation or de-escalation of the current crisis:

Global Economic Effects

- COVID-19 will leave few areas of the world unscathed.
- For example, UNESCO (United Nations Educational, Scientific and Cultural Organization) estimates that children are out of school in 185 countries, representing 9 of 10 children worldwide.
- Many developed and emerging economies are mostly shut down, other than essential services.
- What started as a disruption to global supply chain and just-in-time inventory delivery systems due to Chinese manufacturing has changed into a much more pernicious sudden stop globally.
- Medical supplies and manufacturing are severely taxed. Additional supply chain disruptions will be chaotic, seemingly whimsical and random.
- This is a supply and a demand shock. It is severely contractionary to economic activity.
- COVID-19 is the most economically disruptive pandemic event since the 20th century, surpassing the 1918 flu epidemic. It has a long way to go before becoming as deadly as many diseases from history prior to the 1918 flu.
- The effects of massive numbers of cancellations have gone beyond initial challenges to travel, tourism, hospitality, cruise ships, airlines. Shelter-in-place provisions affect almost all businesses, for profits and non-profits.

Monetary Policy Response

- While different than 2008-09, this has begun to metastasize into a financial crisis.
- Monetary policy cannot cure a virus. The Federal Reserve (Fed) hopes that a liquidity crisis does not morph into a more severe solvency crisis. Monetary policy is a palliative, not a cure for a global pandemic.
- In effect, Quantitative Easing has returned and, since it's unlimited, it's bigger than ever. Moreover, the Fed can now purchase CMBS (Commercial Mortgage-Backed Securities) in addition to U.S. Treasury and agency MBS securities.
- The Fed lowered rates 150 basis points to the 0-0.25% lower bound in two successive moves on March 3 and 15.
- The Fed has lowered the discount rate and extended terms at the discount window.
- The Fed has been able to dust off many plans established during the Great Financial Crisis (GFC), in order to help provide liquidity to markets and financial intermediaries (banks and other asset owners) and enable markets to clear. The Fed may also establish loans on posted collateral.
    - These include:
        - MMLF: Money Market Mutual Fund Liquidity Fund
        - PDCF: Primary Dealer Credit Facility
        - CPFF: Commercial Paper Credit Facility
        - TALF: Term Asset-Backed Securities Loan Facility
- The Fed has now gone beyond the programs established for the GFC and established programs to help both the primary and secondary corporate bond markets.
        - PMCCF: Primary Market Corporate Credit Facility
        - SMCCF: Secondary Market Corporate Credit Facility. Notably, in a nod to the emergence of exchange-traded funds (ETFs) since the GFC, this facility can purchase corporate bond ETFs as well as individual corporate issuance.

- The Main Street Lending Facility for small and medium-sized US businesses (<5000 employees).
- The Fed has opened swap lines and lending facilities with other major central banks, as well as non-G7 Group of Countries central banks. Some of those facilities have been closed since 2010.

Fiscal Response

- The $2 trillion stimulus package includes direct assistance to middle and lower-income U.S. households.
- Consider that the size of the program is multiples (roughly 2 to 2.5 times) the size of fiscal policy initiatives designed to counter the Great Depression (1929) and the Great Financial Crisis (2008).
- Moreover, fiscal policy has kicked in swiftly. Consider that in the Great Depression, fiscal stimulus only arrived years after the stock market crash in 1929.
- Details:
    - Additional $250 billion for unemployment insurance.
    - Funds to backstop Federal Reserve programs; small business loans and grants; states; hospitals; veterans health programs; hospitals; airlines and cargo carriers; public transit; paid sick leave; and food assistance.
    - The Internal Revenue Service (IRS) announces a 3 month delay (from April 15th to July 15th) in tax filings.

Capital Market Impact

- We're in the teeth of the bear market. It's possible, but unlikely, that lows in markets have been established.
- Performance tables provided for major indices, sectors and countries provide some color on what areas have succeeded or failed so far.
- Credit spreads have widened out considerably. Energy patch credit spreads are back to some of the worst levels we have seen historically.
- Some market-derived forecasts already look too pessimistic or unrealistic. For example, bonds are forecasting actual deflation out several years.
- We are in a rapidly deflating economy and some of the initial data looks depressionary. The global economy was already slowing going into the coronavirus scare.
- The type of recession we may encounter will likely depend on the duration and timing of the virus and its effects. For now, estimates of future growth and earnings are deflating rapidly. There will be some permanent loss of output from what has already occurred.
- Analysts have been slow to cut earnings estimates. Those will come in sharply.

Epidemiology

- Market strategists are not epidemiologists and know little about viral pathology. Listen to the real epidemiologists.
- With that caveat, the number of infections continues to show exponential growth rates.
- Death rates from recent data, especially in some developed markets like Italy, are substantially higher than initial estimates and close to initial worst case scenarios.
- So far, the U.S. death rates are lower than other countries.

Epistemology: How do we know what we know?

- Lady Fortuna is an extremely challenging central narrative for markets. Markets have trouble determining what to expect next when they have very unreliable and inconsistent data sets.

- The global rate of infections is hard to determine with an inadequate number of test kits. China is an unreliable source, at best, for data. Other countries have similar data quality problems. There is little uniformity among global definitions.
- A long incubation period complicates matters. Markets don't know how to interpret increasing infection rates.
- As the infection goes global, our data sources should become more transparent because they are not controlled by totalitarian regimes or governments that preside over underdeveloped medical infrastructure.
- However, more reliable data has not been encouraging to date. In almost every way, newer and more reliable data sources have painted a less optimistic assessment than what markets had expected.

Escalation Triggers

- Substantially worse news than current expectations on global infections and death rates. Unfortunately, this has occurred since our initial evaluation.
- Markets will evaluate not just the number of infections, but the first derivative velocity (infections/time) and the second derivative acceleration (infections/time-over-time). So far, these have not been very encouraging.
- The return of the virus at a later date.
- Mutation of the virus into something even more dangerous.
- Debt overhangs cause a credit cycle to escalate dramatically. This has also occurred since our initial update. High yield spreads, a measure of the difference between what investors expect from low-grade corporate paper and U.S. Treasury securities, has soared.
- Potential evolving geopolitical risk.
    1. Russia has chosen this moment to test the Saudis and the energy sector, while making an attempt to allow Vladimir Putin to remain in power indefinitely. There seems to be some thawing of relationships between Saudi Arabia and Russia. Perhaps a supply cut is in order that would normalize supply to dramatically reduced demand.
    2. Iran continues to meddle in Syria, where a conflict looks like it is rekindling.
    3. North Korea chose to test a missile in the midst of this global crisis.
    4. Lastly, and perhaps more importantly, if China has been less than forthright about the origins and development of this disease and the world comes to believe that is the case, there could be major geopolitical consequences. China should have to answer questions from the world community. See epistemology, or how do you prove what you know?

De-escalation Triggers

- The cure. Technology that can generate a vaccine would generate immediate relief. That could not only stop the suffering but could help quickly return markets and economies near to their prior growth rates. While a 'V' recovery looks unlikely, quick relief would help the economy and markets recover more swiftly. Time is important, both to slow the virus spread and as a means to potential cures and treatments.
- Better than expected news around infections and fatalities. Markets will evaluate the number of infections as well as velocity and acceleration.
- Some evidence that the dramatic shutdowns and social distancing are having an effect on "flattening the curve" of infection penetration in the U.S. and globally.
- More effective preventatives and treatment protocols.
- Global monetary and fiscal policy that mitigates the economic effect of the virus, calms investors and eases much tighter financial conditions. We expect to see additional and more surgical responses from policymakers.
- Finally, to end on a really positive note, healthy folks who stay home with their loved ones might spur a future increase in the birth rate. We need help mitigating future demographic pressures. Lady Fortuna can also smile.

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