

Quantifying the Impact of the Coronavirus on Global Markets and Economies

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Contents

| | |
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| Introduction | 3 |
| Key Variables | 4 |
| Biological Risks | 5 |
| Supply Shocks | 6 |
| Demand Shocks | 7 |
| Government Responses | 8 |
| Mitigating Factors | 9 |
| Best and Worst-Case Scenarios | 11 |
| Microeconomic Analysis | 13 |
| References | 14 |

Introduction

In early January 2020, the coronavirus began to spread throughout central China. At first, the reaction from authorities was muted and markets brushed it off as another ‘common cold’. By the next month, over 100 million Chinese were under lockdown, as factories that once powered the global supply chain, grinded to a halt. As the virus continued to spread, hospitals became overwhelmed, with up to 20% of victims requiring intensive care (Fink). Global travel bans and detection measures proved ineffective, as undetected individuals traveled to other countries such as Italy, Iran, and the United States, infecting many others. The current documented number of infections stands at 135,000, with individuals infected in over 100 countries (Han).

The goal of this paper is to estimate the effects of this novel virus on global markets and economies. We will first look at the key historical and biological data that we have on virus to garner a rough estimate on the spread and its effects. Then, we will attempt to estimate the effects from both the supply and demand shocks to the global economy. Using these estimates we can infer different best- and worst-case scenarios to resolve this crisis. Finally, looking more specifically at how this may lead specific companies to under or out-perform the broader market, which may lead to favorable investment opportunities.

Key Variables

Market Forecast (Y_1) = $\beta_0 - \alpha_1$ *Biological Risk - α_2 *Supply Shocks - α_3 *Demand Shocks + α_4 *Government Response + α_5 *Mitigating Factors

Baseline(β_0): Represents the economic conditions in the present and future states, where coronavirus would not have had any impact.

Biological Risk(α_1): Represents the mortality risks, likelihood of hospitalization, and rate of spread that makes coronavirus unique from previous outbreaks and negatively impacts company earnings.

Supply Shocks(α_2): Represents disruption to global supply chains from stopping production lines in countries like China, labor shortages from sick workers, and increased challenges to movements of products and services between countries due to travel and shipping restrictions.

Demand Shocks(α_3): Represents a decrease in demand for companies goods and services due to consumers reducing spending because of fears of contracting the virus, reduction in consumers' disposable income due to missed work, layoffs, or expectations of future lost income, and investors unwillingness to invest in companies and the economy due to perceived future risks.

Government Response(α_4): The extent to which governments and central banks can mitigate short-term losses to businesses and consumers by reducing interest rates, offering cheap loans to businesses, preventing the spread of the virus, and other policies that can temporarily reduce the impact of shocks to the economy.

Mitigating Factors(α_5): The greatest unknown, which are developments of vaccines and how different climates may slow the spread of the virus.

Biological Risks

There are three key reasons to why the coronavirus is unlike the flu and comparing the coronavirus to the flu is a huge statistical misrepresentation:

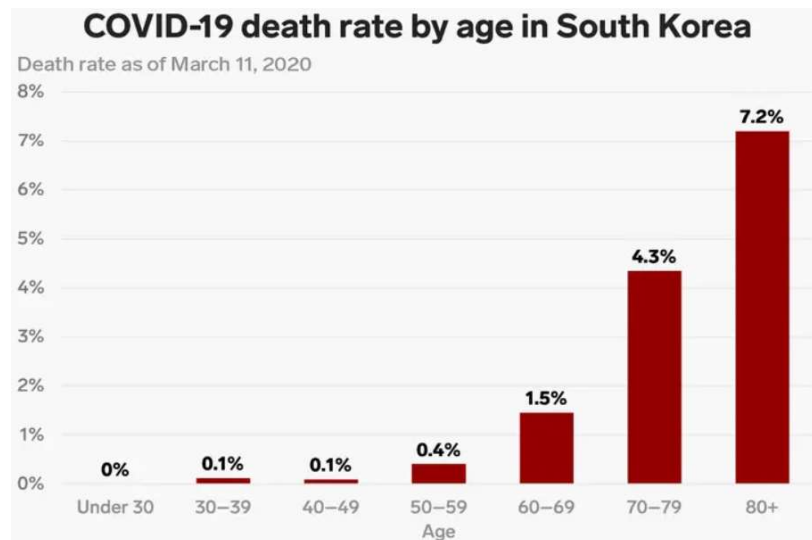
1. Mortality: The current mortality rate for the coronavirus stands at 3.6% (Han). Assuming, there are more minor cases that have not been documented, since 80% of individuals appear to have minor symptoms, the actual mortality rate is likely closer to 1%, a majority of those deaths are individuals 60 and over with underlying health conditions (Fink). The mortality rate for the flu in 2019 was .096%, or approximately 10 times less lethal than the coronavirus (CDC).

2. Hospitalizations: The CDC scenarios estimate 6.2% of those infected could eventually require hospitalization due to the coronavirus, but there are only 925,000 staffed hospital beds in the United States, presenting a risk that our medical system and others worldwide could easily become overwhelmed (CDC). Conversely, only 1.4% of individuals infected with the flu required hospitalization in 2019 (CDC).

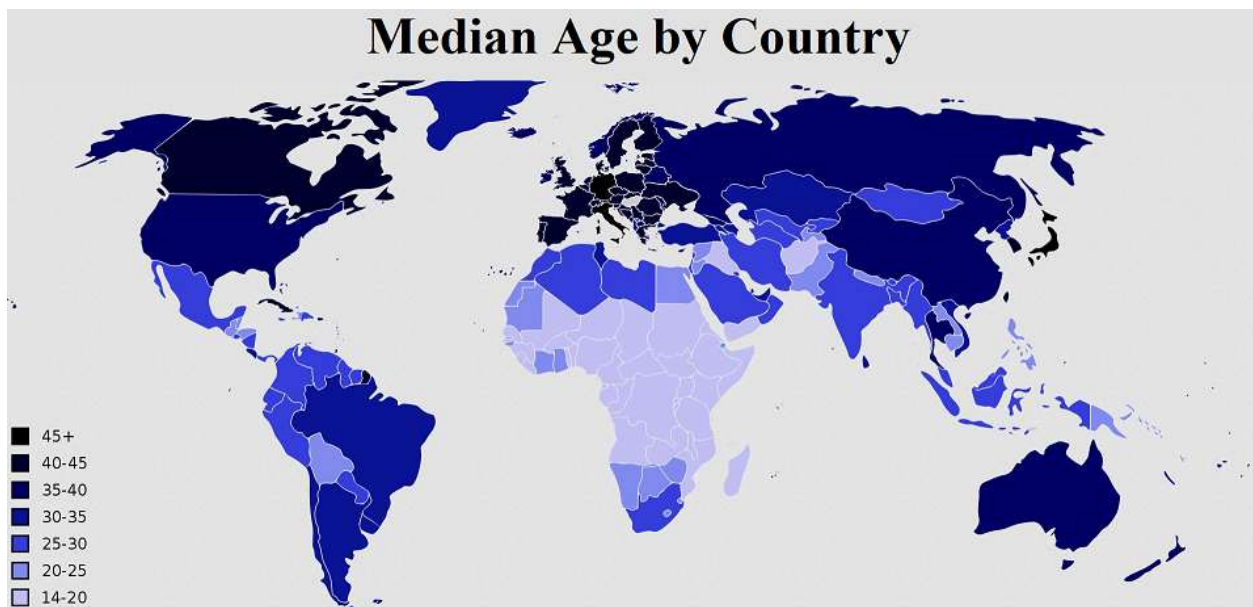
3. Transmission Rate: Another challenge is that closing borders will not completely prevent the spread of the virus, since there is an incubation period of up to 14 days, meaning that individuals can be infecting many others without even knowing it (Fink). A recent conference in Boston showed an incidence of “super-spreaders”, where a man who had recently traveled from Italy to a business conference, was suspected of infecting up to 77 different individuals throughout the duration of the conference (Goldberg). This suggests that the coronavirus just as contagious, if not more, than the flu.

4. Median Population Age: There appears to be a significant correlation between median population age and the percentage of individuals that will require

hospitalization or perish. Looking at South Korea, we see that the elderly are disproportionately affected by the virus, especially those with other conditions.



If the virus continues to spread, third-world regions that don't have the resources to deal with the virus may see a significant spread, but the overall hospitalization and mortality percentages would be much lower because of their overwhelmingly young populations. For individuals below age 60, this comprises roughly 80% of the population in India, 85% in Africa, and 75% in Latin America.



Supply Shocks

We will examine key supply shocks that have negatively impacted the global economy:

1. Factories Ceasing Production: Since many companies around the world rely on China to either produce their products or parts for their products, it's affecting supply chains across the globe. So far, the effects have been relatively muted due to companies burning through their current inventory, but it will be difficult to make up for lost production over the past few months, and it will likely affect US companies' bottom line. Furthermore, in other regions where the virus has not spread as vastly, such as Vietnam or Thailand, where there are factories that rely heavily on Chinese parts to produce final goods that are shipped to the US, these factories are being affected because they do not have the parts available even though their workers are not sick.

2. Labor Shortage: When workers become infected with the virus, it is possible that they may still infect many other employees, resulting in a large portion of the workforce being unavailable. In many industries where remote work is not possible, this can have a significant impact on business operations and future viability. Also, government and travel restrictions may make it extremely difficult for companies to engage in international business or prevent workers from traveling to and from work.

3. Movement of Goods and Services: The global ban on travel will place an increased burden on businesses and individuals to conduct transactions, further depressing the global and local economies, which have become incredibly dependent on each other.

Demand Shocks

The following demand shocks present risks to global economies and markets:

1. Decrease in Consumer Spending: As consumers are urged to stay away from populated places and stay home, they are less likely to purchase goods, particularly where it would be difficult for them to obtain services without being exposed. It has also caused consumers to cut back significantly on travel and other extra expenses, which a lot of countries depend on. Approximately 65% of tourists to the US are from Europe or Asia, which represents a significant shock to travel and tourism industries in the US, comprised of 24 Million visitors annually from these regions (NTTO).

2. Decrease in Disposable Income: A recent study found that 59% of consumers live paycheck to paycheck in the U.S., and in an adverse economic situation, lenders may be more reluctant to give auto loans, payday loans, or issue credit if they believe a large portion of future Americans may get laid off or have reduced income as a result of the coronavirus (Brockman). Also, if there are a large number of layoffs or reduced working hours, this can cause increased defaults on debt obligations such as mortgages, that will further impact earnings for US companies, particularly financial institutions.

3. Decreased Investment: If investors and businesses believe that the future outlook for the economy is negative, they will be more likely to hold onto cash rather than investing it. This will particularly impact companies that have relied heavily on investor financing, such as large tech startups. Overall, this can depress the economy and may take a significant amount of time to regain traction, after the virus has passed its peak.

Government Responses

While government and central bank responses can help alleviate some of the negative effects of the coronavirus, they don't address the core issues:

1. Quarantine vs Economic Activity: One of the biggest challenges that governments face is the tradeoff between the amount of restrictions they place on their citizens versus favoring less restrictions for greater economic activity. Many democratic nations do not have the ability or resources to restrict movements of their citizens in the way that China has. The challenge China faces is when to allow their citizens to return to work? If too early, it's likely that the virus will continue to spread, and the quarantine measures merely delayed the progress of the virus.

2. Economic Stimulus: Many governments are proposing offering additional benefits to companies and individuals impacted by the coronavirus. While this may work in the short term, this likely will not be a viable long-term solution. In the event of an extended downturn, companies and individuals that have few liquid assets and low cash flows will likely default on their obligations.

3. Central Bank Intervention: Many of the central banks have already decreased interest rates in an attempt to ease shocks to financial markets. The challenge is this does not help companies if they do not have products to sell as a result of shocks to their supply chains and no one to buy them as a result of demand shocks. Lowering interest rates at this point may help increase liquidity in the financial system, but it does not address the core challenges to the global economy.

Mitigating Factors

1. Warm Temperature: A study on viruses performed using guinea pigs found that transmission rates were inversely correlated with temperature and relative humidity. Viruses tend to thrive in cold and dry climates. In the study, there was a transmission rate of nearly 100% among subjects at a temperature of 5 C (41 F) and 20% relative humidity (Lowen). When temperature and humidity were increased, transmission rates dropped in a linear fashion, until 0% transmission rates were observed at 30 C (86F) and 80% relative humidity (Lowen). There may be some validity to the claim that warm weather will help abate the spread of the virus, but that does not stop it from being retransmitted from others who have been infected in colder climates.



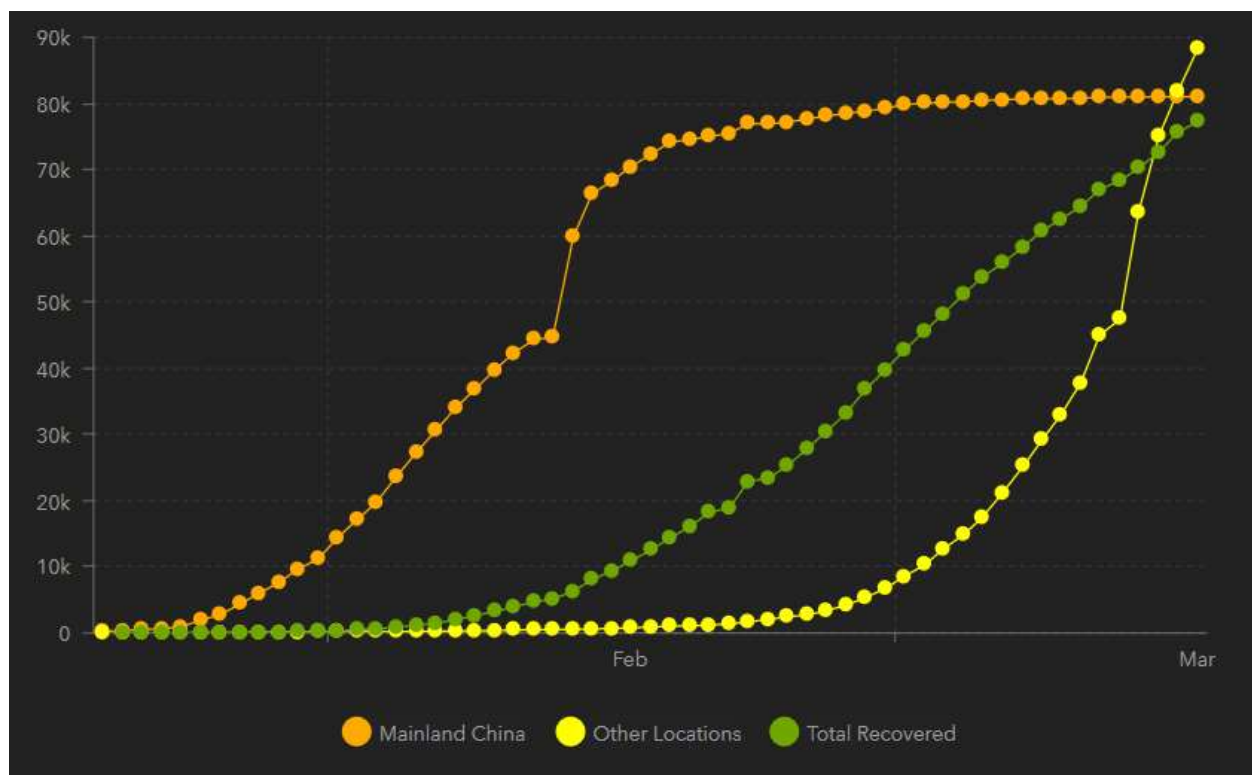
The warmer regions below the equator appear to be less affected, but monitoring is critical to gauge the viruses' ability to spread. If the virus continues to spread throughout warmer regions, such as South America, this may indicate that warm climate alone may not be enough to stop the spread of the virus.

2. Vaccine Development: CDC estimates it could take approximately 12 – 18 months to develop a vaccine (Russell). The two major challenges to developing a vaccine are regulatory hurdles required for human trials, that can take at least 8 months. The other challenge is setting up the infrastructure to produce billions of doses of the vaccine. Large health corporations are often reluctant to invest in vaccines, and researches have to rely on government funding as a result. There is a chance that governments may speed up the development of a vaccine, due to the urgency of the situation, and one may be developed quicker, by the summer in the best case scenario.

Best and Worst-Case Scenario

All of the variables above are significant to developing these scenarios, but the most important unknown variables are the timelines for this significant event. The best-case scenario balances favorable factors with quick vaccine development to reduce significant downturns by mid to late 2020. The worst-case scenario would be a spread to the majority of the world's population, with significant deaths, until enough of the population has developed immunity to stop the spread of the virus, as happened in the 1918 Influenza Pandemic (CDC).

China Infections vs Other Countries



Infections continue to rise in other countries, and it's critical to monitor how the virus spreads in other large developing countries such as India, Brazil, and Mexico.

Best Case Scenario

The warm summer in the northern hemisphere reduces the spread of the virus that the majority of Chinese, Europeans, and Americans can return to work. The virus continues to have hotspots and spread to colder regions in the southern hemisphere around South America and Australia. This will depress economic activity, but it will likely avoid a recession in the US and globally. By mid to late 2020, a vaccine could be ready to develop and mass produce, which would eventually bring an end to the outbreak. The market would most likely bottom out around the summer when infections show signs of slowing in the US and Europe, as they did in China. So far, developing countries have handled the outbreaks fairly well, but the main concern is under-developed regions such as Africa, India, and Central and South America, which do not have the resources to handle a major outbreak nor do their governments operate in an efficient manner to effectively deal with a major outbreak like this.

Worst Case Scenario

The virus continues to spread globally and infects a large portion of the global population. The global economy remains severely constricted due to quarantines and restrictions. A vaccine is not developed until mid-2021. In the meanwhile, the US and other large economies experience recessions, with indicators pointing to a prolonged downturn. Inevitably, large firms become insolvent and the markets experience significant declines. The virus' spread eventually slows due to enough individuals developing immunity or dying so that it no longer poses a significant threat. It would take a significant time to restore consumer confidence and rebuild after the downturn, likely requiring a large stimulus to spur growth again.

Microeconomic Analysis

Given the risks above, certain firms are likely to under-perform and out-perform the broader indexes in the US. Firms with cash flow challenges, such as startups, that have struggled to be profitable in the booming economy, will have great challenges staying solvent if they are unable to find continued funding. Financial institutions that are highly leveraged or heavily reliant on debt payments will have increased risks if borrowers begin to default along with pressures from decreased interest rates. Furthermore, firms whose supply chains are highly reliant on China will have difficulty sourcing their products. As we have seen already, airlines and travel companies have been among the hardest hit, with a significant decrease in demand and infection risks directly tied to the services they offer. Also, if the oil market remains depressed, energy firms that have high debt obligations are likely to default, since energy prices are likely to remain in a glut while demand is down.

Firms that are likely to out-perform the market would have three key factors. First, they are not heavily reliant on China, or they offer digital products that will not be impacted by supply chain disruptions. Second, a majority of their workforce can work remotely with disruptions to the company's operations, and third, consumers can utilize their products without significant risk of being exposed to the virus. One example is Netflix; in fact, they may experience a boost in earnings with the amount of individuals staying home and utilizing their services.

We will continue to monitor economic indicators and infection numbers to adjust this analysis as time goes on. There will certainly be great buying opportunities moving forward, and investors should focus on the long-term rather than the short-term turmoil and hysteria that is taking place.

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