Impact of Covid-19 Employment Changes On Equity Risk Premiums

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ABSTRACT

Despite worldwide efforts in terms of COVID-19 and its outreaching effects, this study focuses on understanding the underlying repercussions of world economies and how different corporations, organizations, and governments dealt with the pandemic and survived one of the biggest economic crises. Based on continuing research and data, this study also focuses on global dynamics in terms of pre-pandemic, mid-pandemic, and post-pandemic situations, as well as the implications for all public sectors and services. We are modeling and visualizing the data based on the impact of COVID after discovering the data connected to the impact.

This study will focus on the effect that the pandemic had on the Global Stock Markets of 17 of the biggest stock markets in the world, and the relationship between the markets and the respective country's unemployment rates, economic performance, and social effects on employment in general.

The objective of this study is to develop a playbook for global investors and organizations to better prepare for and mitigate market volatility and uncertainty during times of economic downturn. Additionally, we also look and examine the social consequences of such events and how governments can better prepare.

CCS CONCEPTS

•Human centered computing → Visualization; •Information systems → Information retrieval; •

KEYWORDS

COVID-19, pandemic, data visualization, big data, data science, equity volatility.

1 INTRODUCTION

The pandemic's emergence in 2019 led to a rapid shift in global financial markets and their focus. The major causes of this market shift were fear and uncertainty [1]. This fear and uncertainty has led to a global recession, a volatile market environment and unemployment that has not been witnessed since World War 2 (WW2) [2]. The initial months of the pandemic showed that no entity, corporation or country had any plan or playbook to deal with the chaos wrought by the pandemic. Even though in the months following the initial outbreak of the pandemic the economic situation of the world stabilized to an extent, it has yet to reach pre-pandemic levels and still continues to be volatile.
In this study we examined previously done work and available research on the economic impact of the pandemic on global stock markets, on employment and the social impacts on the job market.

1.1 Crisis during pandemic

With the world coming to a standstill, the COVID-19 pandemic is regarded as one of the most devastating pandemics in terms of the economy, healthcare, jobs, education, and energy needs. Individuals had concerns about the pandemic since there were no proper safeguards in place for medicare and health responses, often leading to further fatalities. Most countries imposed initial lockdowns and closures due to COVID-19's transmissibility factor. This initially helped to reduce virus transmission. However, this proved unsustainable in the long-term because it had a significant impact on every nation's economic activity and general stability [10]. To date, the globe has paid a heavy price in terms of human lives lost, economic ramifications, and increasing poverty as a result of this pandemic [11].

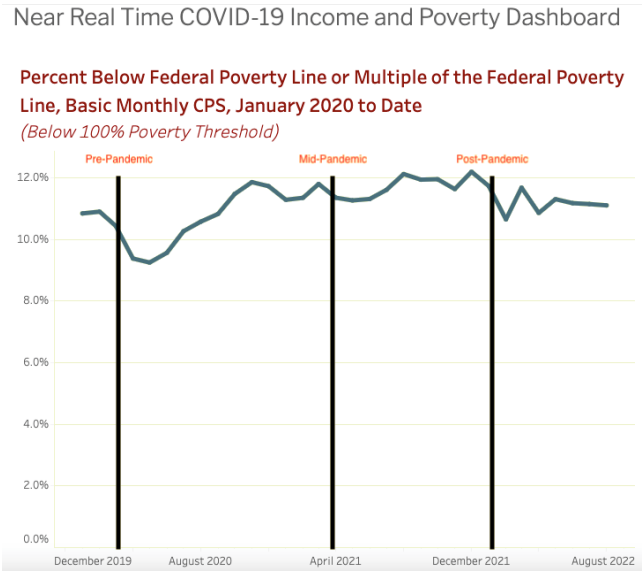

Figure 1. Near Real Time COVID-19 Income and Poverty Dashboard [3]

The poverty line in the United States is depicted in Figure 1 from December 2019 to August 2022. The time span includes the pre-pandemic, mid-pandemic, and post-pandemic situations in the United States. According to the graph, poverty was on the decline prior to the covid pandemic. The drop was also accounted for by the federal government's one-time stimulus checks for unemployment insurance eligibility and benefits. The absence of this program would have resulted in increased poverty. Nonetheless, poverty climbed during the pandemic to a high of 11.8% in November 2020, before gradually declining. Still, the markets have not recovered to their pre-pandemic levels [3]. Stock markets can also be used as a form of marker to track global economic mood. Markets react strongly in the short term to unexpected pieces of news, particularly bad news. The crisis can be tracked, and the relationship between global stock markets and unemployment can be explored [2].

1.2 Immediate effects on the stock markets

The Covid-19 pandemic had driven a rapid shift in the global stock markets. The main cause behind this shift was the fear and uncertainty surrounding economic conditions during the era of a pandemic [1]. Stocks took a dive globally through March 2020 and continued to be volatile through the end of the year. Stock market returns varied wildly and did not reach and still have not reached pre-covid levels [1]. Stock volatility was at its most extreme during the emergence of COVID-19 pandemic in the US than during the emergence of other diseases such as Spanish Flu, Bird Flu, SARS, MERS and Ebola [1].

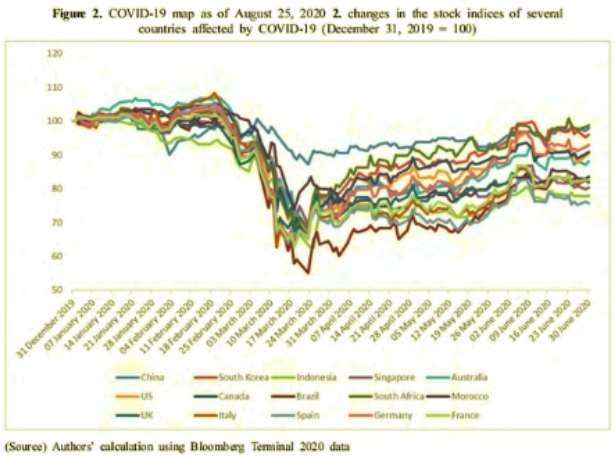

Figure 2. COVID-19 map as of August 25, 2020. 2. Changes in the stock indices of several countries affected by COVID-19 (December 31, 2019 = 100)

The figure above shows that almost all the major countries' markets were negatively impacted by COVID-19 [1]. The study also shows that the stock market performance was correlated with the number of deaths and virality factor of COVID-19 [1]. The drop in the values of the stock markets were not only the result of the pandemic bringing nearly ½ of the world's major industries to a standstill [2], but also the result of human fear and uncertainty in the market [1]. From Figure 2 we can also see that China's index was slightly affected by the Covid-19 pandemic. The reason for China's success is the consequence of stronger, quicker government actions and better public collaboration. After the initial epidemic, the Chinese government made notable changes to its physical separation regulations, movement restrictions, and testing, tracking, and isolation procedures. In contrast, the United States made only token steps to deal with the calamity on a national scale. Despite the increasing level of intimidation generated by COVID-19, the Trump administration mostly rejected the situation as exaggerated, costing the United States precious time in developing effective anti-virus policies. [13].

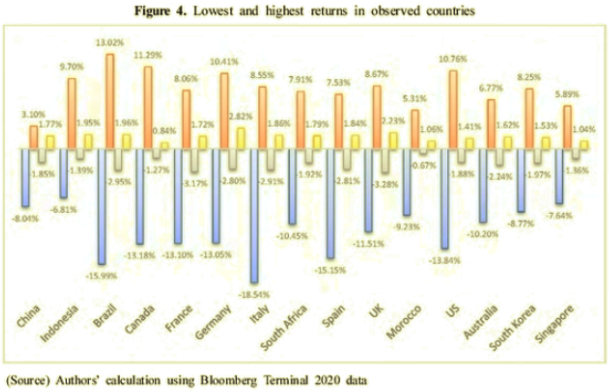

Figure 3. Lowest and highest returns observed countries [1]

The markets mentioned in the figure above had one of the sharpest downfalls on D-Day and then immediate recovery the following subsequent days [2]. For instance, on March 12, 2020 the stock market in Brazil experienced a decline in returns by nearly 15.99%, but the returns increased by 13.02% the following day [2]. This shows how volatile the stock markets can be on such events [2]. Figure 3 shows how drastic these changes are during the pandemic when compared to pre-pandemic era, with the blue and orange bars representing the lowest and highest returns during the pandemic whereas the gray and yellow bars representing the lowest and highest returns pre-pandemic.

1.3 Effect on employment

The magnitude of job loss that occurred during Covid has been unprecedented since the end of WW2 [2]. Studies have compared the state of the job market during the covid recession when compared to other recessions, the unemployment rates, and changes in the over available job opportunities [2]. The paper also covers the effect of remote work on job preservation, how jobs that went remote had an 8% greater job preservation than others

and that by May 2020 1/3rd of the workforce had gone remote [2]. However, going remote, while preserving jobs in certain cases, caused job losses in others and there was a marked drop in productivity [2]. Between May and August however, employment rates started making a recovery as businesses began to reopen but have not reached the level they were at before March 2020. Sectors that had been affected the most have shown the greatest rebound [2]. People with greater academic qualifications recovered more than those of lower qualifications [2]. But a number of factors will influence the long-term revival of the job market. One is that many current employers—particularly small businesses—may cease to exist. [2]. A second is that recessions do lasting harm to labor demand [2]. A third is that, in recent years, much of the economy has evolved to use less labor per unit of output [2]. A fourth consideration reflects changes in where and how work is done [2].

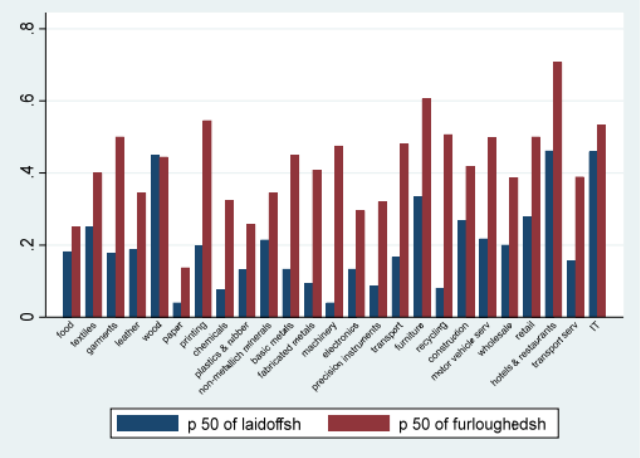

Figure 4. Layoffs and furloughs, fraction by industry [4]

The pandemic, unsurprisingly, had a massive negative effect on firms worldwide [4]. More than ½ the firms worldwide closed temporarily, some permanently, especially in hard-hit sectors, such as hotels and restaurants [4]. Although some businesses had shifted more to online sales and remote work, the majority had not, as many jobs were not well suited to remote work [4]. Exports had fallen for all firms but had fallen much more for multinationals [4].

1.4 Post-Pandemic

It was critical to halt the spread of the virus and restore normalcy to the economy. The entire worldwide supply chain was interrupted as a result of the protracted lockdowns, which proved unsustainable in the long run for both consumers and governments. Although the lockdowns provided the benefit of preventing a more rapid spread of the virus, timely vaccination research also aided in the post-pandemic scenario. We experienced significant recoveries in global stock markets during a rapid bull run, particularly after a series of worldwide lockdowns. Figure 2 depicts the correction after the dip in the markets during the pandemic [1]. Although the pandemic affected the lives of many in some way, it did not affect everyone equally. Individuals with a higher educational degree appeared to be affected less than the other range of people, according to the study.

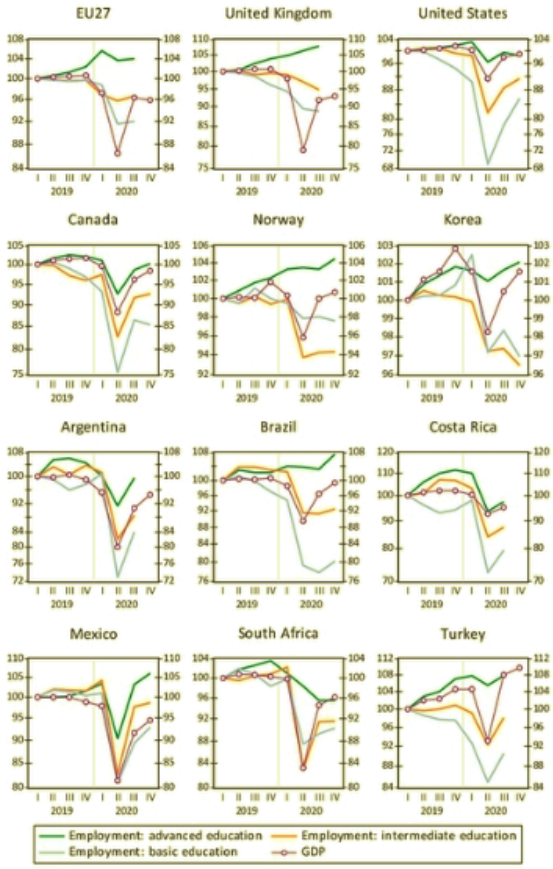

Figure 5. GDP and employment developments in the EU and selected countries, 2019Q1=100 [5]

According to Figure 5, there is a correlation between employment prospects and GDP in relation to level of education. The World Bank believed that within-country income inequality has likely deteriorated because it disproportionately disadvantaged informal employees vs high-skilled service workers. Events such as pandemics and recessions have a significant influence on GDP while also widening the wage disparity between highly trained and unskilled labor forces [5]. Based on prior experiences, a study discovered that there are many likely global pandemic occurrences in the future. Given the environmental concerns we face, such as climate change and biodiversity loss, three pandemics in 20 years is an alarming rate [8]. This will have a greater influence on markets and disrupt global supply networks, leading financial markets to become more volatile in general. Disruptions may potentially result in a shift in the global balance of power in the future. Each country has its different crisis

management plans, and the COVID-19 pandemic was no exception. When comparing the cold war era, it ended with the demise of the Soviet empire, resulting in the globe transitioning from bipolar to unipolar. COVID-19 is one potential scenario in comparison to the cold war disruption. The rate at which countries recover is primarily determined by the resources and assistance provided by governments and non-governmental organizations. It will also be determined by cooperation and collaboration among countries [9].

1.5 Social effects

The social effects of the pandemic opened the eyes of the world to the flaws in the social equality and social systems globally, particularly in the global south. The global south was more greatly affected by the pandemic than the more developed countries [6]. The onset of the pandemic further highlighted the systematic flaws that exist in the socioeconomic inequalities of our current system [6]. More developed countries began to hoard medical resources to mitigate the effects of the pandemic, testing and vaccinations were lacking in disadvantaged communities, countries began to protect their interests over addressing the issue with inequality, the virus being used as a cover to hide human rights abuses [6]. Perhaps the most documented effect in the global south was the collapse of all medical and social care industries and branches of governments under the pressure of the virus outbreak and the complete withdrawal of organizations and aid from these nations; aid which was vital to help these countries deal with the virus [6]. In many of these countries, the health care system is nonexistent and is highly dependent on community or family care [6]. Furthermore, people living below the poverty line will only continue to fall below it, as even a small drop in income as a result of the pandemic can have lasting consequences [6].

In addition to socioeconomic factors of inequality, the pandemic also highlighted gender inequality issues in both developed and developing countries. The closure of schools and daycare systems meant that parents had to stay at home to look after children [7]. This affected the ability of women more, as most often, given the structure of society, women had to stay back to look after their children [7]. This affected their ability to work more [7]. Women's rate of full-time employment declined by 19.1% by July of 2020 relative to January of that year, compared with a decline of only 11.6% for men [7]. The gap was more pronounced in the initial months of the pandemic but began to shrink down and was substantially reduced by September [7].

Figure 6. Labor force participation, full time employment, and unemployment rates for women and men relative to January of 2020 (January = 100) [7]

The figure above shows the results of individual fixed-effects models examining gender differences in the three employment measures in 2020 [7]. Consistent with previous studies, we find a significantly greater gender disparity in labor force participation, full-time employment, and unemployment during the months of the COVID-19 epidemic starting in March of 2020: compared with men, women experienced greater declines in employment beginning in that month [7].

1.6 Research Questions

Given all the previous work done on the economic impact of Covid and the effects on the stock markets of the world, our study plans to focus on answering the following research questions:

1. What is the effect that changes in employment due to COVID-19 had on global stock markets?
2. Which recovery metrics are the most related to stock market performance?
3. What data based approach can investors use to effectively allocate their money during future times of adversity?

2 DATA

2.1 Datasets

The crux of the datasets lies on data that tracks the performance of seventeen different stock market indices from January 1st, 1998 to October 1st, 2022, acquired from Yahoo Finance. The data utilizes monthly intervals in order to add more nuance to stock market performance and be able to better identify outlier cases (for example, if a stock market rose 15% in 11/12 months in a given year then fell by 20% in the last month, we want to be able to capture this rather than saying the stock market fell by 8% in that calendar year). This also matches the monthly intervals utilized for COVID-19 vaccination data acquired from Our World In Data.

One of the limitations of our data is related to currency exchange rates. While some of the indices contain performance data relative to their local currency, others utilize the US dollar, which in reality represents a conversion shown by brokers or financial websites. It is important to note that certain high-inflation countries may be highly misrepresented in this case, as while the stock markets of countries such as Argentina seem to rise precipitously in local currency terms, the picture would change when converted to US dollars. While tracking currency exchange rates over time can be a complex matter, especially with countries that had currency changes or reforms within 1998 to 2022, this will be something that will have to be kept in mind when analyzing the overall performance of the markets of certain countries, and outliers will have to be analyzed relative to their respective currency conversion rates over time.

Some historical data is also difficult to find accurately represented. For example, some countries with currency changes or rebalances can show precipitous drops or rises, which can be the result of a change in currency or monetary reform (where, for example, a country that previously used bills denominated in the thousands prints a new set of bills denominated in singles, tens, and hundreds, effectively taking three zeroes off the currency). The data exported from financial websites such as Yahoo Finance has to be checked in order to identify any precipitous drops or falls in seemingly random periods of time, and has to be compared with the data from other financial data providers in order to establish the accuracy of the data utilized.

Other supplementary datasets present are those related to worldwide working hours lost during the COVID-19 pandemic and unemployment rates, both of which were acquired from Kaggle.

2.2 Data Cleaning

In order to be able to successfully compare the data, the values being analyzed need to be in similar terms. This is why much of the data was modified with a percentage change formula ([new value - old value]/old value) in order to have values that are directly comparable. Unemployment data is already presented in percentages, as well as certain development indices, which represent ratios or percentages. Stock market indices are represented with dollar (or other currency) values. A percentage change formula can be applied to turn the monthly values being analyzed into a month-over-month percentage change. Without these changes, stock markets valued in high local currency amounts such as Argentina's would look like they are greatly overperforming other stock markets, while this may not be the case.

The data was also modified to contain the exact same format in the related files being analyzed. One axis contains the dates being analyzed (broken up by month or year, such as 01-2022, or 2022), another axis contains one of the countries in question (Argentina, Belgium, Brasil, etc). The values of both axes represent the statistics being utilized in that given time period, such as stock market performance on a month-over-month basis, unemployment rate, full vaccination rate per 100 people, etc. The datasets utilized for this study were also global datasets and required the filtering of the data of other countries in order to keep the datasets focused only on the countries whose markets are being analyzed.

2.3 Descriptive Statistics

Our analysis found that correlations between unemployment rates and relative global stock market performances range widely during the long term. During the period of January 1st, 1998 to October 1st, 2022, the global stock market that was most correlated with drops in unemployment rates was that of Israel, with a statistically significant correlation of -0.94, followed by the German DAX with -0.8. Spain's stock market is the most positively correlated with unemployment, with a correlation of 0.63. The world's largest stock market indices (the S&P 500 and NASDAQ, both in the United States) have a slight positive correlation of 0.26 and 0.24.

When the time period is changed to the period of March 2020 to December 2021, the correlation with unemployment (from Q1 2020 to Q4 2021), every global stock market tracked becomes negatively correlated with unemployment, ranging from -0.99 in the case of the Hong Kong stock market, to -0.43 in the case of the Belgian stock market. The US markets both present a correlation below -0.9. The only stock market that is positively correlated with unemployment in this period is that of France, with a correlation of 0.99. Upon further investigation, this is due to a part time work programme implemented by the French government in 2020, [12]. it is important to note that even though unemployment is, in theory, lower in 2020 than in 2019 (see Figure 7), the average salaries and work hours were still lower than in 2019, and when compared to other countries in terms of the average percentage of working hours lost due to the pandemic, France ranks in the middle of the pack (see Figure 8), showing the nuance present in unemployment statistics.

Our analysis also found increased volatility in emerging markets, where markets such as India experienced much more steep ups and downs than a developed market such as Belgium, with India's market ranging from -4 to 10 standard deviations from the norm (see Figure 10), while Belgium's market only ranged from -6 to 4 standard deviations (see Figure 9)

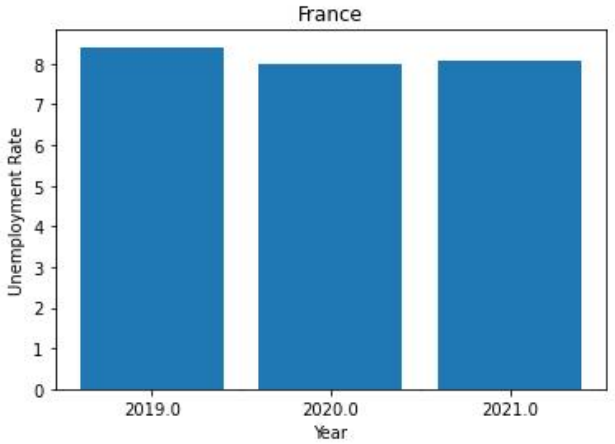

Figure 7. Unemployment rate in France 2019-2021

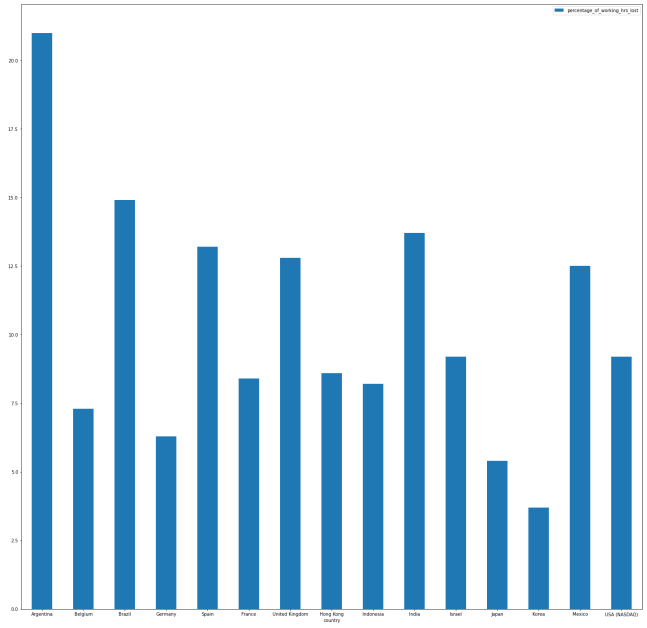

Figure 8. Percentage of working hours lost during the onset of the COVID-19 pandemic

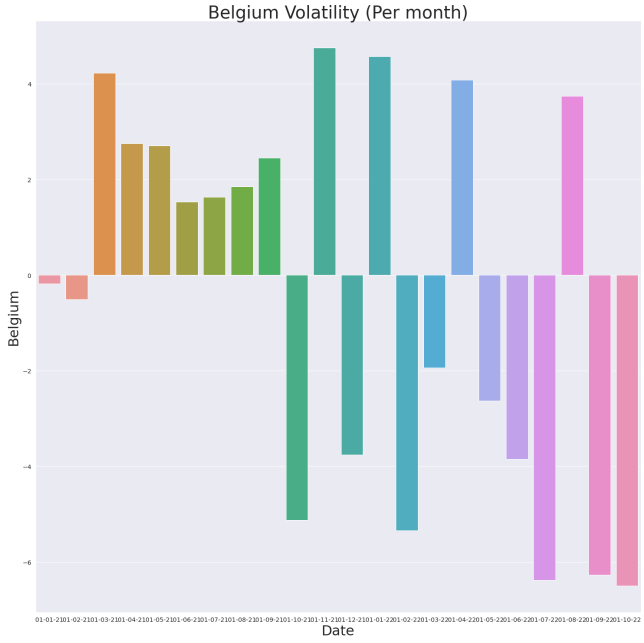

Figure 9. Monthly Volatility in Belgium's Stock Market Index (Jan 2021 - Oct 2022)

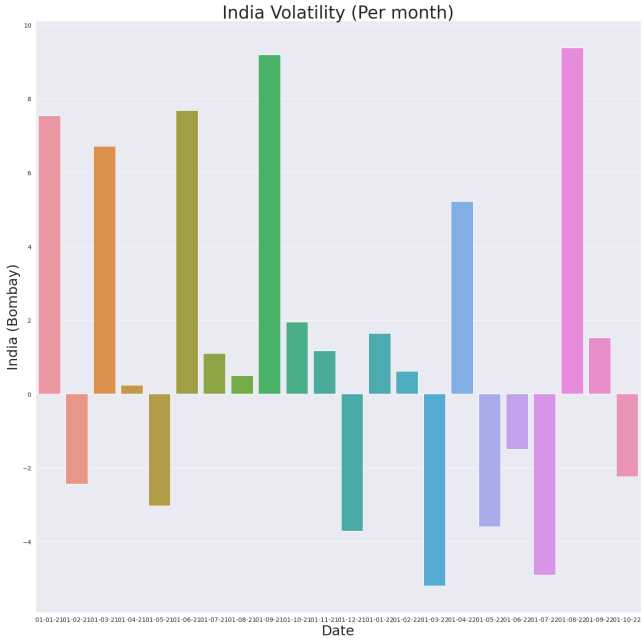

Figure 10. Monthly Volatility in India's Stock Market Index (Jan 2021 - Oct 2022)

2.4 Data Visualizations

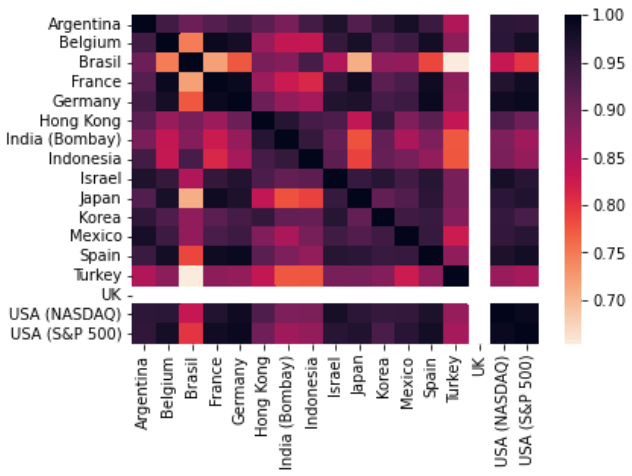

Figure 11. Correlations between different stock market indices Jan 1998-Oct 2022

It is important to note that the world stock markets are often correlated to each other, especially considering the common assumption that in the long term most stocks will appreciate in value. The US stock markets show a high degree of correlation with other stock markets, especially in the developed world or directly in the Americas.

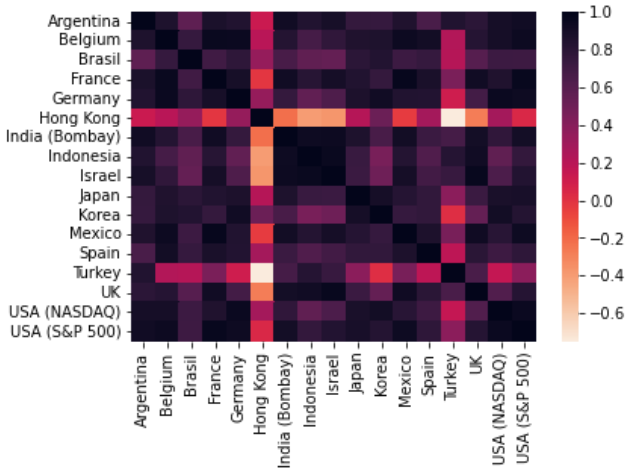

Figure 12. Correlations between different stock market indices March 2020-Oct 2022

This relationship of global markets being correlated to the US markets (and thus to each other) keeps holding up (in most cases even more strongly) since the beginning of the COVID-19 pandemic. This shows the increasing difficulty of finding non-correlated returns in times of economic downturn. The exceptions of Turkey and Hong Kong, shown clearly in this figure, are not due to any COVID-19 related policy effects, but rather to geopolitical complexities in the case of Hong Kong and increased inflation in the case of Turkey, and both represent a significant underperformance relative to other world stock markets. It is thus important to note that stock market correlations since the COVID-19 pandemic may not be the best indicator of the efficiency of individual pandemic responses or policies, and identifying these would require deeper dives. Another important observation from this chart relates to uncorrelated returns becoming more heavily correlated during market downturns, which is something investors should keep in mind in turbulent times.

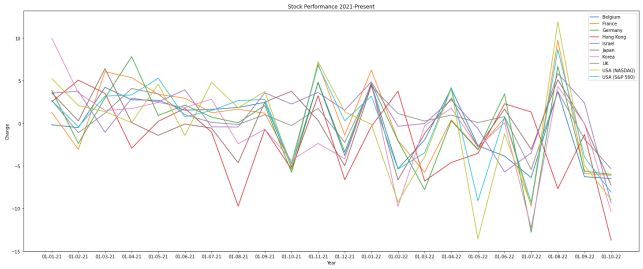

Figure 13. Stock market performance Jan 2021-Oct 2022 (Developed Countries)

Out of the global stock markets analyzed, those of developed countries have mostly moved in tandem since the mass-rollout of vaccines in January 2021. Despite achieving quicker vaccination rates due to earlier developments and availability of vaccines, the stock markets of these countries show a general downward trend. One notable exception is that of Israel, which counted with both a high early vaccination rate and a relatively well performing stock market. The reason for Israel's better performance in the first half of 2021 was the result of something called the "RobinHood phenomenon"[14]. Young people, trapped at home during the pandemic, began investing in the stock market in their free time [14]. This resulted in the opening of hundreds of new stock accounts and stabilized the Israeli stock market [14]. However, as the pandemic began to wind down and people lost interest, the investments began to decrease, hence Israel began following the stock trends of other nations around the start of 2022 [14]. The fluctuations in the stock returns in the graph above, especially at the start and through 2022, were the result of the Russian invasion of Ukraine and the unprecedented effects it had on the global economy [14].

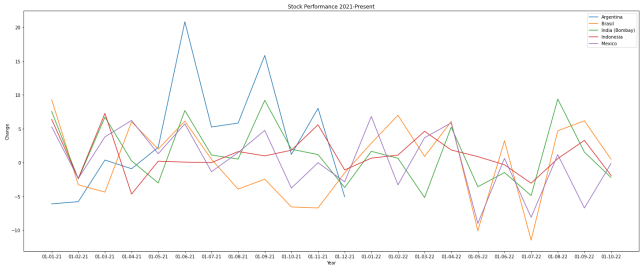

Figure 14. Stock market performance Jan 2021-Oct 2022 (Developing Countries)

While developing countries had vaccines arrive later than their developed counterparts, the stock markets of developing countries we've analyzed have performed slightly better. This is in contrast to the generally worse performance of developing country stock markets during the beginning of the pandemic, where the worst

performer was Brazil. Brazil is now one of the world's most vaccinated countries and has one of the better performing stock markets since the mass rollout of vaccines. However, the similarly performing stock markets of India and Indonesia are also host to countries with a comparatively low vaccination rate, showing that the link between vaccination rates and stock market performance is dubious.

This also tells us that emerging markets, while often more volatile, as was the case during the March 2020 lows where many of these markets had lower lows than developed markets (and higher highs in the recovery period), can also provide returns that are less correlated. That is to say, it is more likely that the stock markets in Belgium or Germany will roughly follow the trends of other developed markets, especially the US, than those of Brazil or Indonesia. It is also important to note that uncorrelated returns does not necessarily equate to better returns, as periods of overperformance by these markets relative to the developed world can also be followed by periods of underperformance, which would be equally uncorrelated.

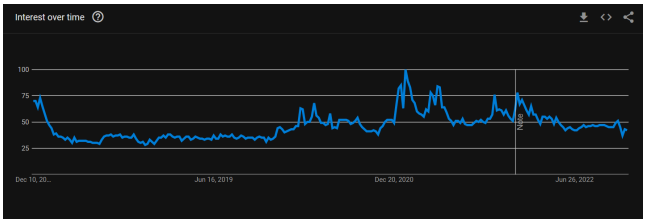

Figure 15. Worldwide Google Trends on "How To Invest", Dec 10, 2017 - Dec 9, 2022

As a regular rule of thumb, interest in investing decreases when the market experiences a downturn. This can be seen in the decrease of general interest in "How to Invest" (extracted from the amount of people looking this up on Google worldwide) in 2018, where global stock markets experienced a downturn due to the introduction of various global tariffs. This trend is reverted during the COVID-19 pandemic, where interest in how to invest actually increased in March 2020 after the market downturn, and peaked in January 2021. This increase in interest from retail investors could be a factor in sustained increased volatility, as more retail money entered global stock markets than during previous times in a sustained way.

2.5 **Inherent Biases**

It is important to note that the datasets being utilized contain inherent biases and omissions. While an earnest attempt was made to include the stock markets of various countries in various regions of the world, this still only includes stock markets that are big enough to merit international attention, and with industries big enough to make up a local stock market index. Countries with a small amount of local industry or public companies are not able to form stock market indexes that are formally tracked over long periods of time by financial data providers, as well as countries with significant amounts of internal turmoil such as wars or political difficulties that cannot maintain a formal stock exchange for extended periods of time. Other countries with smaller stock exchanges may require paid specialized data providers to track, which were not made available when writing this publication nor are they available to many investors.

Other data points, such as unemployment rates and vaccination rates rely on the reports of local governments and thus on the honesty of these governmental bodies. If the government bodies in charge of reporting these statistics are dishonest or utilize heterodox tracking methods for these data points these calculations may prove to be unreliable at best and irrelevant at worst. Data provided by global organizations such as the World Bank, or International Monetary Fund, as well as independent analysts may be used to revise these estimates, however this is also subject to availability and comes with a certain degree of uncertainty baked into it if this data is different from official numbers.

Because of this lack of reliable data from certain countries, there may be certain outlier cases, both in terms of local stock market performances and remarkable responses to the COVID-19 pandemic, that could be completely overlooked by our analysis.

Individual investors may also have limited access to equities from different countries depending on their brokerages and the regulations present in their locales. This may be a source of unintentional bias for investors and brokers, who may not be able to look further than the stock markets of their own countries in tight regulatory environments.

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