

**COVID'19 AND ITS INITIAL SIGNALING EFFECTS ON THE STOCK
MARKETS OF INDIA, SWITZERLAND, TAIWAN AND BRAZIL- A
COMPARATIVE ANALYSIS OF THE CHANGE IN THE STOCK
MARKET INDICES DURING THE INITIAL PERIOD OF PANDEMIC IN
THE RESPECTIVE COUNTRIES**

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ABSTRACT

The world economies are highly integrated to each other. Events that occur in other economies has an impact on the stock market of a particular country. Many of the events act as financial signals and affects stock market. The purpose of this paper is to conceptualize the views and analysis of initial signalling effect of pandemic like Covid-19 on the stock markets of India, Switzerland, Taiwan and Brazil in the post pandemic declaration by World Health Organization. The number of covid-19 reported cases during initial period of pandemic has been taken for analysis with the corresponding closing price of Sensex, Swiss Market Index (SMI), TAIEX, BOVESPA as the stock market data. The market Indices are affected due to a variety of factors, but the present study aims to find the impact of only one factor that is the pandemic caused by Covid-19 on the stock markets of India, Switzerland, Taiwan and Brazil, all other factor which would have also affected the indices are assumed to be constant. Correlation is used to test if the number of cases has any impact on the respective stock markets. This exploratory study shows a strong negative correlation between these variables which is statistically significant. Furthermore, we also try to show a comparative analysis of the aggregate change in the stock market indices during the initial period of pandemic in respective countries and try to infer that, among the four countries chosen by us, whose stock market index has been affected the most through comparing the aggregate change each country has had in its stock market indices.

Keywords: Corona Pandemic, Financial Signalling, Stock Market, Sensex, SMI, TAIEX, BOVESPA.

JEL CODES: D-53, G-10, F-01

INTRODUCTION

In the era of post globalization, economic crisis seems to be taking place in higher frequency, sometimes the cause may be economic and other non-economic factors such as the one the world is facing at present. This is really an alarming situation and the world is struggling to get a way out of this big crisis, which is seen a far bigger one since 1930s crisis. The 1918 'Spanish Influenza' is considered to be one of the most devastating epidemics to affect humankind but the high rate of affected countries and mortality due to covid-19, it seems it is the most devastating pandemic which has not only affected humankind but has severely damaged economy of most of the country. It has greatly disrupted the world's supply chain, halted future capex by most of the companies and will reduce the earnings of the firm across the countries. A financial crisis could cause workers' earnings to fall as it is expected that there will be more jobs losses in both formal sector and informal sector. Most of the stock market indices around the world has touched bottom. In India, both Sensex and Nifty have fallen by up to 25 percent during first month since world health organization (WHO) has declared it as global pandemic. History suggests that pandemics pertaining to influenza have occurred during last four centuries. Since 1920, three major pandemics have taken place in 20th century. The outbreak of flu in 1918, 1957 and 1968 were marked as pandemics, even the AIDS virus was also classified as pandemics in modern times. Further, countries were affected by 1976 Swine flu, 1977 Russian flu, 1997 avian flu and SARS which spread across all south East Asia and Canada during 2002, but it was not classified as pandemic by the WHO. In US during a same period fall was observed in per capita income and consumer spending by 12% to 14%. The years between 1918 - 1921 also featured sharp decrement in stock prices in most of the country in the world. During this period the weakest market were Italy 69%, Denmark 57%, Japan 52%, Germany 57%, but the US stock market performed better than average of this country. The most recent crisis of SARS in 2002-3 this pandemic caused huge fall in stock prices like Japan fell by 12.8% from January to March, 2002. During March 2020, global stocks saw a downturn of at least 25%, and 30% in most G20 nations. From 24 to 28 February, stock markets worldwide reported their largest one-week declines since the 2008 financial crisis, thus entering a correction. Global markets into early March became extremely volatile, with large swings occurring in global markets. On 9 March, most global markets reported severe contractions, mainly in response to the COVID-19 pandemic and an oil price war between Russia and the OPEC countries led by Saudi Arabia. This became colloquially known as Black Monday. At the time, it was the worst drop since the Great Recession in 2008. The 2020 stock market crash occurred as a result of the COVID-19 pandemic, which is the most impactful pandemic since the flu pandemic of 1918. Rising fears and global economic shutdown due to the economic impact of the COVID-19 pandemic is believed to be a main cause of the stock market crash.

LITERATURE REVIEW

- While much has been written about the medical causes of the past pandemics, the origins of the virus etc., limited attention has been given to the economic effects of the pandemic. In a research, Brainerd and Siegler (2003) study the effects of the Spanish influenza on economic growth in the US. They found that that states that were hit harder by the influenza experienced a higher income growth rate from 1919-21 to 1930 and this positive effect was statistically significant. Further, they found that the economic effect of Spanish influenza indicates that the 1918-19 pandemic in the United States incremented economic growth in 1920.
- Bell and Gers Bach (2004) states strong negative impacts on epidemic on the economic activities measured by gross domestic product. Still studies of the past endow us with most relevant and valuable information about the proper assumption towards “guesstimating” the future of macro -economic in terms of pandemics. The history of stock market shows that the investors react to the epidemics and pandemics as it happened in all the above-mentioned cases. However, other factors affect the market as well, the performance of market also depends on strength or weaknesses of prevailing scenario or situation as observed in case of Avian flu epidemic of 1997 which resulted into Asian crisis and proceeded to the Russian debt crisis.
- The most vital and significant was Spanish influenza in 1918 which is the catastrophic against different modern epidemics and pandemics are measured. In this particular case 20 Million people died. The stock market fell by 24.7% in 1918 and then rose to 8.9% in 1919. The event occurred just 100 years ago! However, it is really hard to say whether (the 1918 pandemic) was priced correctly or not correctly by the market so it is very cumbersome to draw any conclusions from an event that took place 100 years ago.
- There is no pandemic periodicity, the historical facts highlight the real risk and its association that is a needed for policymakers in the government to work out the possible estimate of economic effects due to future pandemic. Significant stock-market declines in 1987, 1998, 2002 and 2008 were preceded by marked increases in bond yields. In each of these financial crises, both the stock market and bond yields eventually suffered sizeable and sharp declines. Data analysis from tradingeconomics.com reveals that the S&P index rose by 24% in 1957 and by 2.9% in 1958. In nominal terms U.K Equity market fell by 5.8% in 1957 and rose by 40% in 1958. The S&P index rose by 12.5% in 1968 and by 7.4% in 1969. In nominal terms U.K equity market fell by 57.5% in 1968 and fell by 15.6% in 1969. In 2003 SARS epidemic, Japan index fell by 12.8% from January to March 2002 but later on Market index returned 42.5% return in next year.
- The whole world has become a different place altogether in last three months due to the pandemic effect of Novel Corona or Covid-19. The virus which started in Wuhan (China),

quickly engulfed the whole world. WHO declared it as a pandemic resulting in to travel bans, lockdowns, emergencies and too many restrictions? The Tsunami effect on financial market washed away faith and stability across the globe in spite of geographical and economic boundaries.

- Ali & Afzal (2012) in their paper, studies the impact of 2008 financial crisis on Karachi Stock Exchange (KSE) of Pakistan and Bombay Stock Exchange of Mumbai in order to find out which economy was worse affected. They have used EGARCH model to study the stock returns of BSE and KSE. As a result, they find out very thin negative impact of crisis on the stock returns in Pakistan than India. But the paper still lacks the clarity on fact that the difference in negative and strong shocks is more in India than Pakistan due to large economy size and more openness. Though both the economy has been affected through this.
- Zeren & HiAce (2020) in their paper have tried to study the relationship between COVID-19 and stock markets in China, South Korea, Italy, France, Germany and Spain. The study proves the nature of relationship between the variables daily total cases and stock market data related to COVID-19 from Jan 2020 to March2020 using Maki Cointegration test is long term except in Italy. Through this they also analyse that investors in Italy, France and Germany are not psychologically affected but by death rates they have reacted.
- Rastogi (2014) in his paper studies the impact of 2008 crisis on emerging economies selected on the basis of GDP growth rates, inflation, unemployment, government finances, CAD, FDI inflow were Singapore, Taiwan, India, china, Argentina, Brazil, Malaysia, Hong Kong, Korea and Indonesia. The impact has been studied using GARCH model to analyse the two parameters the conditional volatility of stock returns and the time it takes for change to die out in both pre and post period of crisis in the selected countries. The study reveals that though leverage effect was present in all ten indices taken both in pre and post times but the decrease was seen more in that of India, Indonesia, Hong Kong and Argentina.
- Previous studies have investigated the impact of different epidemics on stock performance in the 21st century. The researches assert that the fluctuations in the stock markets caused by investors' worries about and pessimism on future incomes because of epidemics have brought significant economic losses to markets (Jiang et al., 2017; Liu et al., 2020). For example, Nippani and Washer (2004) find negative impacts of the SARS outbreak on China's JES and Vietnam's stock markets.
- Chen et al. (2007) and Chen et al. (2009) explored the influence of SARS epidemic on the Taiwan stock market and reveal a negative association between the disease outbreak and stock returns of hotel businesses, tourism, wholesalers and the retail sector. Conversely, biotechnology industries show a positive, significant relationship with stock returns in Taiwan during the epidemic.

- Jiang et al. (2017) assessed the relationship between the influenza virus H7N9 outbreak and China's stock performance. They find that the daily number of cases increased significantly and negatively impacted stock prices in the overall market index as well as relevant sectors, including Chinese traditional medicine, biological production and the biomedicine sectors in China.
- Ashraf (2020) investigated the influence of the pandemic on stock market performance in 64 nations and finds reverse relationships between increasing numbers of confirmed cases and stock returns. Alfaro et al. (2020) show negative effects of COVID-19 on US stock returns.

The impact of the COVID-19 lockdown on stock markets

- The COVID-19 pandemic was an unprecedented event that compelled one-third of the world's population to experience some form of lockdown (Hoof, 2020). Several studies have paid attention to the impact of the COVID-19 lockdown on stock market performance. For example, Baig et al. (2020), when assessing the effects of COVID-19 and its lockdown on the US stock market, reveal that the lockdown contributed to a decline in the market's stability and liquidity. Eleftheriou and Patsoulis (2020) measured the effects of the COVID-19 lockdown and social isolation on the stock market indexes of 45 nations. The authors find a COVID-19 lockdown on stock market performance negative relationship between the lockdown and the performance of international stock markets. However, Eleftheriou and Patsoulis (2020) did not clarify the impact of the lockdown on each specific country. In general, the prior studies analysed the effects of the COVID-19 pandemic and its lockdown on stock market returns worldwide. However, no study estimates the influence of the initial detection and rise in the number of Covid'19 cases, prior to the lockdown and announcement of WHO on the stock market indices using the closing price index as a measure, of establishing a relationship between the two variables and comparison based on the change in the indices of these countries like Switzerland(SMI), India(SENSEX), Taiwan(TAIEX) and Brazil(BOVESPA) which have never been taken by the researchers before for the study, on these lines. This gap in the literature and the potential development of the Vietnam stock market motivated this present study.

India and its present situation

Following are some of the key events due to Covid -19 pandemic outbreak in India which had an effect on the stock market, which provides early signalling effect on the market –

1. Covid-19 as a 'notified disaster' as well complete lockdown declared by Government of India from March 22.

2. India becomes 5th country in the world after Japan, Thailand, US and China to isolate or quarantine the COVID-19 patients.
3. Indian Council of Medical Research (ICMR) is expected to expedite development of drugs, vaccines and diagnostic kits.
4. Indian Prime Minister Narendra Modi holds video conference with SAARC countries to discuss and ways to combat corona virus pandemic.
5. Complete lockdown of School, Colleges and Universities in wake of rise in coronavirus cases as well efforts to extend online mode of education. As on March 27, India entered the 6th day of the nationwide complete lockdown, as more than 1100 positive Covid-19 cases across the nation were confirmed. As per the latest update available on March 29 with ABP News (a Hindi news channel), the number of COVID-19 positive cases climbed to 1170, with 29 deaths reported.
6. The Finance Minister Nirmala Sitharaman announced a financial relief package of Rs 170,000 crores. The package included hugely appreciated Rs 50 Lac insurance cover to every individual in the health sector.
7. The International Monetary Fund (IMF) has said the world is in the face of a devastating impact due to the corona virus pandemic and has clearly entered a recession. Covid 19 has created crisis not just in the global stock Market but in the Indian stock market as well. It is sparking fear of global economic crisis and recession too. Stock market index on Bombay Stock exchange, Sensex plunged a lot in the last two months. It fell down from 40,773 in Jan to 28288 on March 19, 2020, which is a fall of approximately 32% in two months. There was heavy sell off by foreign investors (FII) in Indian equity market with net outflow of INR 25938 Crore between January 1 to March 18, 2020. Also, the Indian rupee fell to new low of Rs 75.03 in March 2020 from 71 in January 2020 against a US dollar. The impact of this pandemic on global economic market is turning to be mammoth. The current restrictions on economic activities like travelling and manufacturing will disrupt the supply chain at the same time.

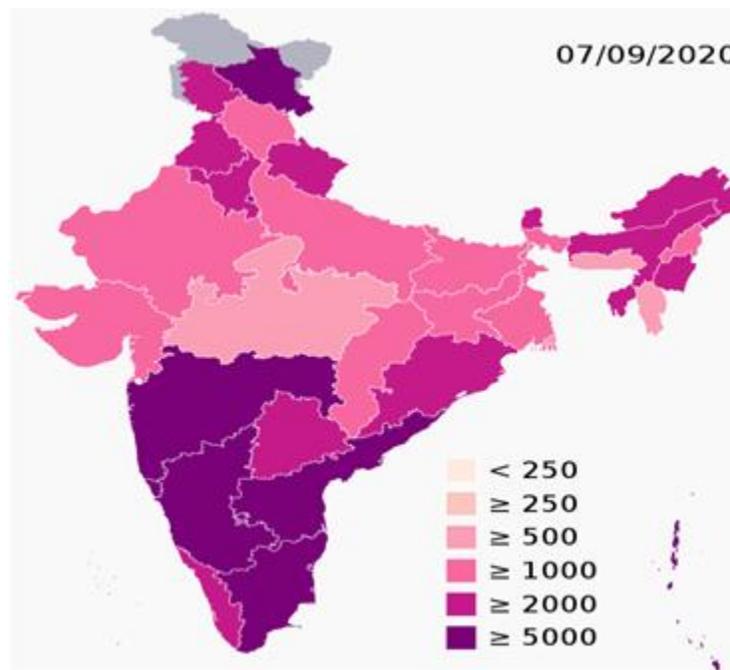


Figure 1 map of confirmed cases per million residents

Source: www.mohfw.gov.in (Wikipedia)

Switzerland and its present situation

Following are some of the key events due to Covid -19 pandemic outbreak in Switzerland which had an effect on the stock market, which provides early signalling effect on the market

- The COVID-19 pandemic in Switzerland is part of the worldwide pandemic of coronavirus disease 2019 (COVID-19) caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). The virus was confirmed to have spread to Switzerland on 25 February 2020 when the first case of COVID-19 was confirmed following a COVID-19 outbreak in Italy.
- On 28 February, the national government, the Federal Council, banned all events with more than 1,000 participants. On 16 March, schools and most shops were closed nationwide, and on 20 March, all gatherings of more than five people in public spaces were banned. Additionally, the government gradually imposed restrictions on border crossings and announced economic support measures worth 40 billion Swiss francs.
- On 28 February, the Federal Council banned events involving more than 1,000 people in an effort to curb the spread of the infection. Multiple events such as carnivals and fairs were either postponed or cancelled. Geneva Motor Show, Basel world, Bern Carnival and the

Carnival of Basel were cancelled.] University of Bern replaced all face-to-face lectures with more than 250 attendees with online lectures.

- On 6 March, the Federal Council announced a 'changed strategy' with a focus on the protection of the most vulnerable individuals, i.e., older persons and persons with pre-existing conditions.
- On 13 March, the Federal Council decided to cancel classes in all educational establishments until 4 April 2020, and banned all events (public or private) involving more than 100 people. It has also decided to partially close its borders and enacted border controls. The canton of Vaud took more drastic measures, prohibiting all public and private gatherings with more than 50 people, and closing its educational establishments until 30 April.
- On 16 March, the Federal Council announced further measures, and a revised ordinance. Measures include the closure of bars, shops and other gathering places until 19 April, but leaves open certain essentials, such as grocery shops, pharmacies, (a reduced) public transport and the postal service.
- The government announced a 42 billion CHF rescue package for the economy, which included money to replace lost wages for employed and self-employed people, short-term loans to businesses, delay for payments to the government, and support for cultural and sport organisations.
- On 20 March, the government announced that no lockdown would be implemented, but all events or meetings over 5 people were prohibited. Economic activities would continue including construction. Those measures were prolonged till 26 April 2020.
- On 16 April, Switzerland announced that the country would ease restrictions in a three-step, gradual way. The first step began on 27 April, for those who work in close contact with others, but not in large numbers. Surgeons, dentists, day care workers, hairdressers, massage and beauty salons could be opened with safety procedures applied. DIY stores, garden centres, florists and food shops that also sell other goods could also be opened. The second step began on 11 May, assuming implementation of the first step without problems, at which time other shops and schools could be opened. The third step began on 8 June with the easing of restrictions on vocational schools, universities, museums, zoos and libraries.
- The 2020 stock market crash is a global stock market crash that began on 20 February 2020. From 24 to 28 February, stock markets worldwide reported their largest one-week declines since the 2008 financial crisis. The Swiss Market Index (SMI) ended down 9.64% on 8,270 points in march, which signalled the worst crash ever since the financial crises of 2008, with banks and insurance companies doing the most damage.

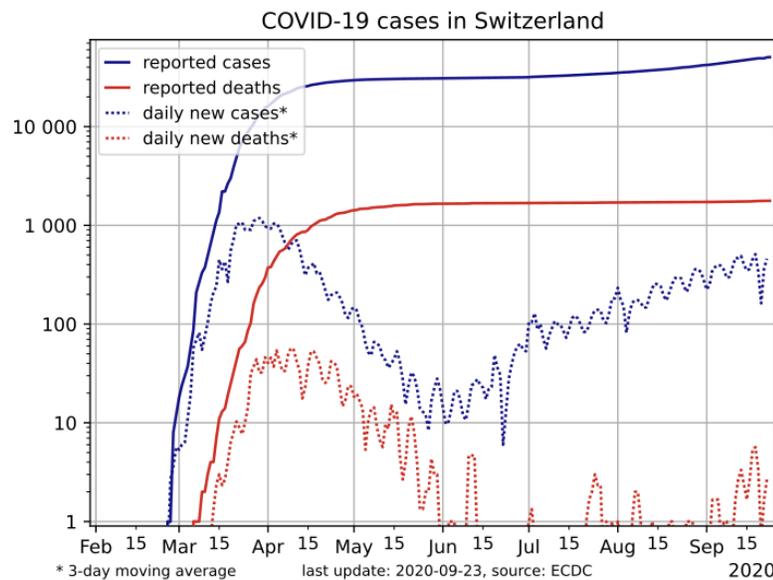


Figure 2 Number of cases (blue) and number of deaths (red) on a logarithmic scale

Source:[BAG Schweiz](#)

Taiwan and its present situation

Following are some of the key events due to Covid -19 pandemic outbreak in Taiwan which had an effect on the stock market, which provides early signalling effect on the market

- The COVID-19 pandemic in Taiwan is part of the worldwide pandemic of coronavirus disease 2019 (COVID-19) caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). The pandemic has had a much smaller impact in Taiwan than in most other industrialized countries, with a total of seven deaths as of 11 May 2020.
- The number of active cases peaked on 6 April at 307 cases, the overwhelming majority of which were imported.
- The Taiwanese government integrated data from the national health care system, immigration, and customs authorities to aid in the identification and response to the virus. Government efforts are coordinated through the National Health Command Centre (NHCC) of the Taiwan Centres for Disease Control, established to aid in disaster management for epidemics following the 2004 SARS outbreak.
- Taiwan's handling of the outbreak has received international praise for its effectiveness in quarantining people. As of 17 August, 168,216 tests had been conducted in Taiwan, with the vast majority not confirming a COVID-19 diagnosis.

- Starting 19 March, foreign nationals were barred from entering Taiwan, with some exceptions, such as those carrying out the remainder of business contracts, and those holding valid Alien Resident Certificates, diplomatic credentials, or other official documentation and special permits.
- Global markets into early March became extremely volatile, with large swings occurring in global markets. On 9 March, most global markets reported severe contractions, mainly in response to the COVID-19 pandemic and an oil price war between Russia and the OPEC countries led by Saudi Arabia. TAIEX fell by -3.04% till end of march, at an index of 9818.20, from an index of 12,670.30.

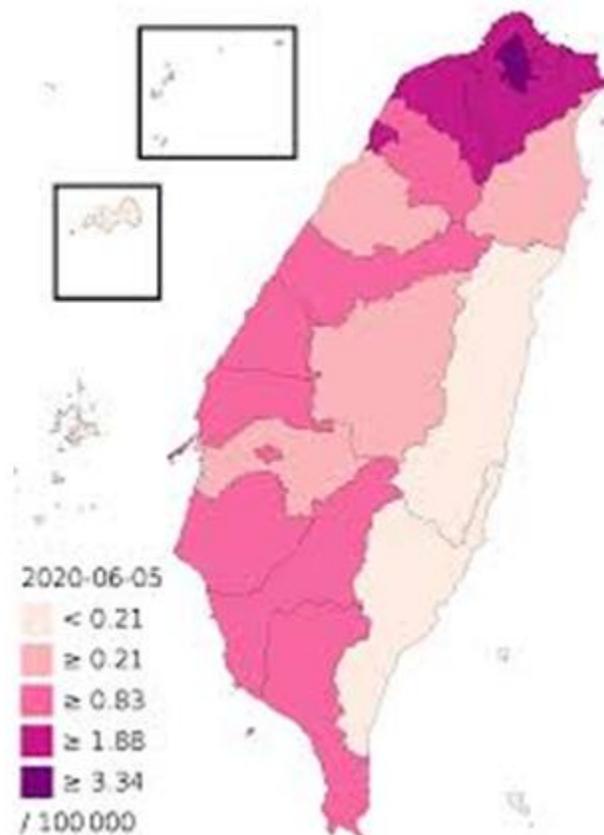


Figure 3 confirmed cases per 100,000 residents as per subdivision

Source:www.cdc.gov.tw/En

Brazil and its present situation

Following are some of the key events due to Covid -19 pandemic outbreak in Brazil which had an effect on the stock market, which provides early signalling effect on the market

- The COVID-19 pandemic in Brazil is part of the ongoing pandemic of coronavirus disease 2019 (COVID-19) caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). The virus was confirmed to have spread to Brazil on 25 February 2020.
- The disease had spread to every state in Brazil by 21 March. On 19 June 2020, the country reported its 1 millionth case; at this time, there had been nearly 49,000 reported deaths. As of September 2020, Brazil has the third-highest number of confirmed COVID-19 cases in the world behind India. On 17 July 2020, the country reported its 2 millionth case. On 8 August 2020, the country reported its 3 millionth case with deaths exceeding up to 100,000. Brazil is one of the worst affected countries in the world.
- The pandemic has triggered a variety of responses from federal, state and local governments, having an impact on politics, education, the environment, and the economy. On 27 March Brazil announced a temporary ban on foreign air travellers and most state governors have imposed quarantines to prevent the spread of the virus.
- Brazilian stock market tumbled down drastically in March, due to rising COVID-19 cases and also as the global markets experienced extreme contractions due to spread of the pandemic all over the world. The benchmark BOVESPA stock market index fell by 9%, the Brazilian real hit a new low of 5.7130 per dollar and interest rate spreads widened significantly.

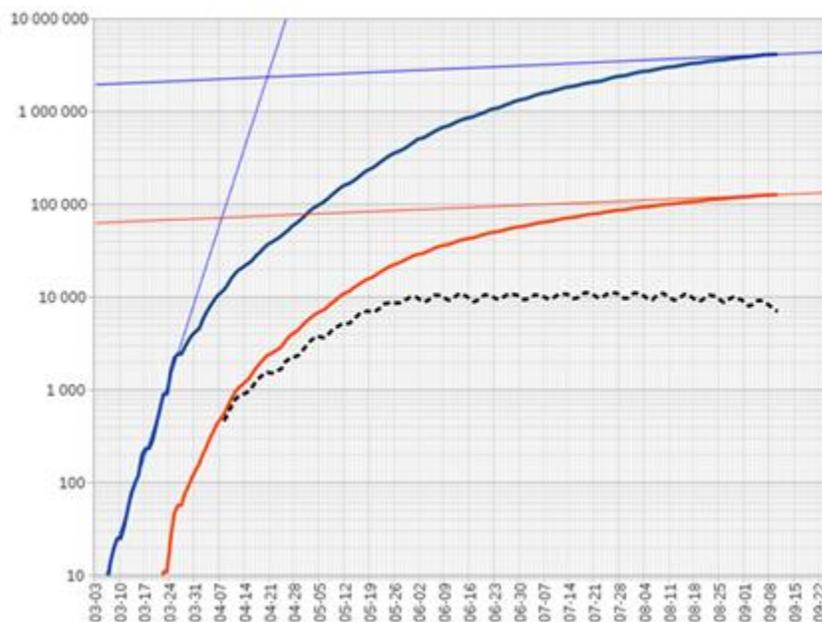


Figure 4 Number of cases (blue) and number of deaths (red) on a logarithmic scale.

Source: coronavirus.saude.gov.br.

Research Gap

The previous study conducted tells about the relation between the selected stocks and the impact they attract as a consequence of Pandemic but as far this study, the main aim is to have a holistic view of impacts on markets, so this view cannot be better than proving market index. Also, the factor of randomness is missing in terms of selection and international impact is analysed through the common popular countries which has revealed the bias of researchers in previous study. So, the paper examines the aggregate impact the countries like India, Taiwan, Switzerland and Brazil faces on their respective stock exchange when COVID-19 was officially announced by WHO.

Research Objectives

- To show the impact of the initial signalling effect of pandemic like Covid-19 on the stock markets of India, Switzerland, Taiwan and Brazil in the post pandemic declaration by World Health Organization.
- to show a comparative analysis of the aggregate change in the stock market indices during the initial period of pandemic in respective countries.

Research Hypothesis

H₀: There is no impact of the increasing covid'19 positive patient number on the stock market index (SENSEX, SMI, TAIEX, BOVESPA).

H₁: There is an impact of the increasing covid'19 positive patient number on the stock market index (SENSEX, SMI, TAIEX, BOVESPA).

Research Methodology

While much has been written about the medical causes of the past pandemics, the origins of the virus etc., limited attention has been given to the economic effects of the pandemic. While the effect of pandemic on the macro data such as employment rate, effect on GDP etc will be studied in long-run but immediate impact on the stock market indices, which are sometimes also called the barometer of economic performance, can be studied in short-run. The market Indices are affected due to a variety of factors, but the present study aims to find the impact of only one factor that is the pandemic caused by Covid-19 on the stock markets of India, Switzerland, Taiwan and Brazil, all other factor which would have also affected the indices are assumed to be constant. As of now the situation around the world and in these countries is yet to be fully contained so more specifically, we aim to find initial signalling effect of Covid -19 on the stock markets of India, Switzerland, Taiwan and Brazil. Secondary data of the Closing price data of Sensex, Swiss Market Index, TAIEX and BOVESPA has been taken as proxy for stock market

and corresponding to it the data of active Covid'19 cases, that is from (18-02-2020-31-03-2020) in case of India , (25-02-2020-31-03-2020) in case of Switzerland ,(26-02-2020-6-04-2020) in case of Brazil and (25-02-2020-6-04-2020) in case of Taiwan of the affected persons due to corona virus,the data has been taken from the ministry of Health and Family Welfare website of the respective countries. There are variations in the data range taken in the four countries, as the Covid'19 initial case was detected on different dates in the four countries.Closing price of the respective market index of the same duration has been obtained from the stock exchange websites. We use statistical tool, namely Karl Pearson's correlation coefficient to find if the initial number of reported cases has any impact on the stock market through the measurement of degree of correlation (High, moderate, low). And furthermore, we also try to show a comparative analysis of the aggregate change in the stock market indices during the initial period of pandemic in respective countries and figure out that among the four countries, whose stock market index was affected the most. Each day's change in the indices is measured using technical analysis.

Testing of the hypothesis is done using the p-value of correlation to conclude the result, using an instant online P-value from Pearson's(R) calculator, where the significance level is 0.05.The aim is to prove a statistically significant relationship between the two variable through the correlation's p-value approach to show causation.

Source used for instant online calculator: www.socscistatistics.com.

Data analysis and Interpretation

The data points taken into consideration for analysis are from (18-02-2020-31-03-2020) in case of India , (25-02-2020-31-03-2020) in case of Switzerland ,(26-02-2020-6-04-2020) in case of Brazil and (25-02-2020-6-04-2020) in case of Taiwan as in this paper we only to portray the initial signalling effects of the detection of the positive Covid cases on the market index, after the announcement of the pandemic by the WHO on 11th March 2020.. There are variations in the data range taken in the four countries, as the Covid'19 initial case was detected on different dates in the four countries.

India

In the following section, we first present the data of number of reported cases of corona virus affected patient and closing price of Sensex from 18th February to 31st March inTable 1. A graph of these data has been presented next.

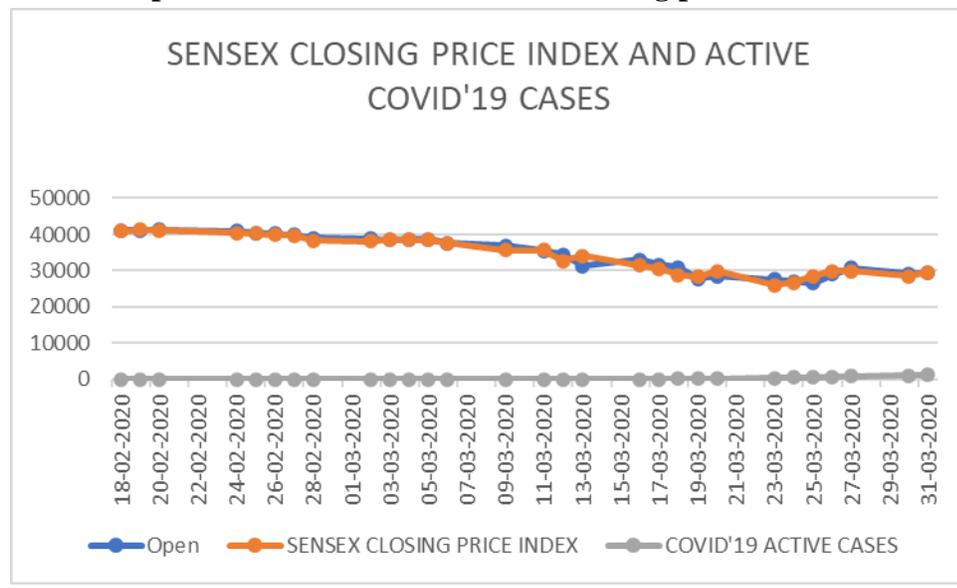
Thereafter, we show the impact of the initial increase in the active Covid'19 cases on the Sensex through the measurement of the degree of the Karl Pearson's correlation coefficient, andthereafter we test the hypothesis using correlation and obtain p value of the data to conclude the result.

Table 1: Covid-19 affected persons & Closing price of SENSEX

DATE	SENSEX CLOSING INDEX	COVID'19 ACTIVE CASES
18/02/2020	40,894.38	3
19/02/2020	41,323.00	3
20/02/2020	41,170.12	3
24/02/2020	40,363.23	3
25/02/2020	40,281.20	3
26/02/2020	39,888.96	3
27/02/2020	39,745.66	3
28/02/2020	38,297.29	3
02/03/2020	38,144.02	5
03/03/2020	38,623.70	6
04/03/2020	38,409.48	28
05/03/2020	38,470.61	30
06/03/2020	37,576.62	31
09/03/2020	35,634.95	44
11/03/2020	35,697.40	60
12/03/2020	32,778.14	73
13/03/2020	34,103.48	81
16/03/2020	31,390.07	114
17/03/2020	30,579.09	137
18/03/2020	28,869.51	142
19/03/2020	28,288.23	149

20/03/2020	29,915.96	244
23/03/2020	25,981.24	415
24/03/2020	26,674.03	511
25/03/2020	28,535.78	562
26/03/2020	29,946.77	680
27/03/2020	29,815.59	887
30/03/2020	28,440.32	1,071
31/03/2020	29,468.49	1,251

Graph 1: Active Covid-19 cases & Closing price of Sensex



The data clearly indicates the fall in Sensex with the rise in number of Covid-19 cases reported in India. The data relates to the early signal of information by which stock market has reacted.

Table 3: Correlations

COUNTRY	N	PEARSON CORRELATION	Sig (2 tailed) p-value
INDIA	29	-0.673701547	<0.00001

The result indicates a high degree of negative correlation (-0.673701547) between the two variables which are number of covid-19 affected patients and closing price of Sensex. Therefore, it can be concluded that as the number of patients goes up there is corresponding fall in Sensex. Also, the change is statistically significant (P-Value is .0001) < 0.05(alpha). Thus, we reject the null hypothesis that covid-19 does not impact the stock market. We therefore conclude that the initial detected positive cases of covid-19 impact the stock market after the announcement of the pandemic by the WHO.

Switzerland

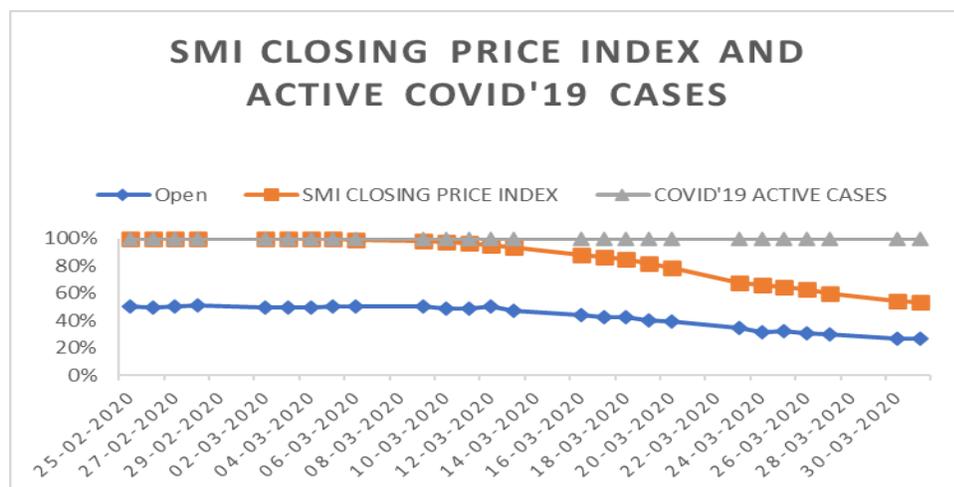
In the following section, we first present the data of number of reported cases of corona virus affected patient and closing price of Swiss Market Index (SMI) from 25thFebruary to 31st March. Table 1. A graph of these data has been presented next. Thereafter, we show the impact of the initial increase in the active Covid'19 cases on the SMI through the measurement of the degree of the Karl Pearson's correlation coefficient, and thereafter we test the hypothesis using correlation and obtain p value of the data to conclude the result.

Table 1: Covid-19 affected persons & Closing price of SMI

Date	SMI CLOSING INDEX	PRICE	COVID'19 CASES	ACTIVE
25/02/2020	10478.50977		1	
26/02/2020	10512.15039		2	
27/02/2020	10205.45996		8	
28/02/2020	9831.030273		13	
02/03/2020	9,950.83		40	
03/03/2020	10087.40039		55	
04/03/2020	10251.38965		72	
05/03/2020	10143.57031		102	
06/03/2020	9736.820313		198	
09/03/2020	9196.599609		369	
10/03/2020	9195.929688		480	

11/03/2020	9152.5	640
12/03/2020	8270.44043	858
13/03/2020	8367.55957	1,139
16/03/2020	8227.080078	2,353
17/03/2020	8493.040039	2,677
18/03/2020	8338.740234	3,070
19/03/2020	8782.240234	3,888
20/03/2020	8623.860352	4,840
23/03/2020	8160.790039	8,060
24/03/2020	8733.320313	8,836
25/03/2020	8989.160156	9,765
26/03/2020	9203.980469	10,714
27/03/2020	8996.370117	12,161
30/03/2020	9174.389648	15,475
31/03/2020	9311.919922	16,176

Graph 1: Active Covid-19 cases & Closing price of SMI.



The data clearly indicates the fall in SMI with the rise in number of Covid-19 cases reported in Switzerland. The data relates to the early signal of information by which stock market has reacted.

Table3. Correlations

COUNTRY	N	PEARSON CORRELATION	Sig (2 tailed) p-value
Switzerland	27	-0.341753946	<0.00004

The result indicates a moderate degree of negative correlation (-0.341753946) between the two variables which are number of covid-19 affected patients and closing price of SMI.

Therefore, it can be concluded that as the number of patients goes up there is corresponding fall in SMI. Also, the change is statistically significant (P-Value is .0004) < 0.05(alpha) Thus, we reject the null hypothesis that covid-19 does not impact the stock market. We therefore conclude that the initial detected positive cases of covid-19 impact the stock market after the announcement of the pandemic by the WHO.

Brazil

In the following section, we first present the data of number of reported cases of corona virus affected patient and closing price of BOVESPA from 26th February to 6th April in Table 1. A graph of these data has been presented next.

Thereafter, we show the impact of the initial increase in the active Covid'19 cases on the BOVESPA through the measurement of the degree of the Karl Pearson's correlation coefficient, and thereafter we test the hypothesis using correlation and obtain p value of the data to conclude the result.

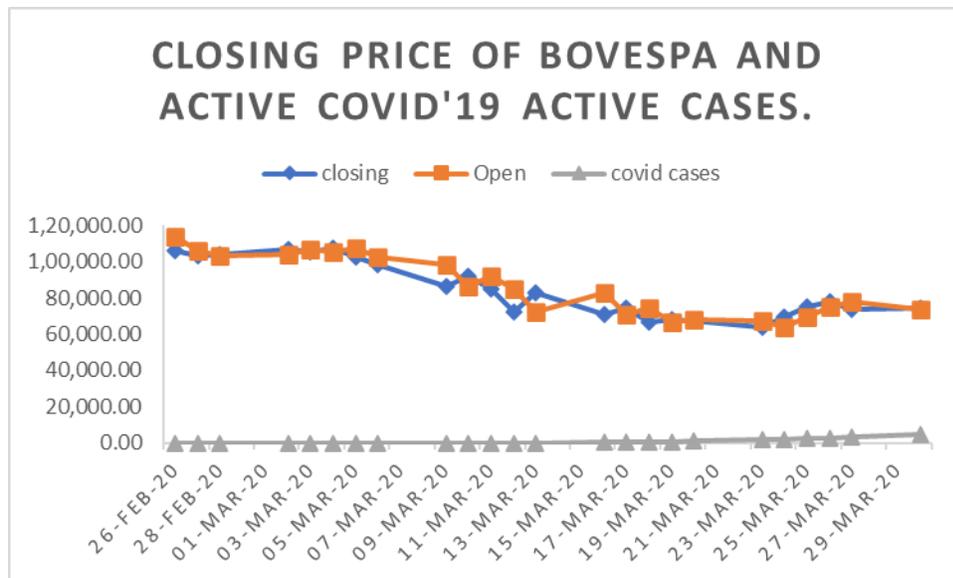
Table 1: Covid-19 affected persons & Closing price ofBOVESPA

DATE	BOVESPA PRICE	CLOSING	COVID '19 ACTIVE CASES
26/02/2020	105718.29		1
27/02/2020	102983.54		1

28/02/2020	104171.57	1
02/03/2020	106625.41	2
03/03/2020	105537.14	2
04/03/2020	107224.22	3
05/03/2020	102233.24	11
06/03/2020	97996.77	13
09/03/2020	86067.2	25
10/03/2020	92214.47	34
11/03/2020	85171.13	52
12/03/2020	72582.53	77
13/03/2020	82677.91	98
16/03/2020	71168.05	234
17/03/2020	74617.24	291
18/03/2020	66894.95	428
19/03/2020	68331.8	621
20/03/2020	67069.36	904
23/03/2020	63569.62	1891
24/03/2020	69729.3	2201
25/03/2020	74955.57	2433
26/03/2020	77709.66	2915
27/03/2020	73428.78	3417
30/03/2020	74639.48	4579
31/03/2020	73019.76	5717
01/04/2020	70966.7	6834
02/04/2020	72253.46	7910

03/04/2020	69537.56	9056
06/04/2020	74072.98	12056

Graph 1: Active Covid-19 cases & Closing price ofBOVESPA.



The data clearly indicates the fall in BOVESPA with the rise in number of Covid-19 cases reported in Brazil. The data relates to the early signal of information by which stock market has reacted.

Table3. Correlations

COUNTRY	N	PEARSON CORRELATION	Sig (2 tailed) p-value
Brazil	29	-0.46809	<0.00001

The result indicates a moderate degree of negative correlation (0.46809) between the two variables which are number of covid-19 affected patients and closing price of BOVESPA.

Therefore, it can be concluded that as the number of patients goes up there is corresponding fall in BOVESPA. Also, the change is statistically significant (P-Value is .0001) < 0.05(alpha) Thus, we reject the null hypothesis that covid-19 does not impact the stock market. We therefore

conclude that initial detected positive cases of covid-19 impact the stock market after the announcement of the pandemic by the WHO.

Taiwan

In the following section, we first present the data of number of reported cases of corona virus affected patient and closing price of TAIEX from 25th February to 6th April in Table 1. A graph of these data has been presented next.

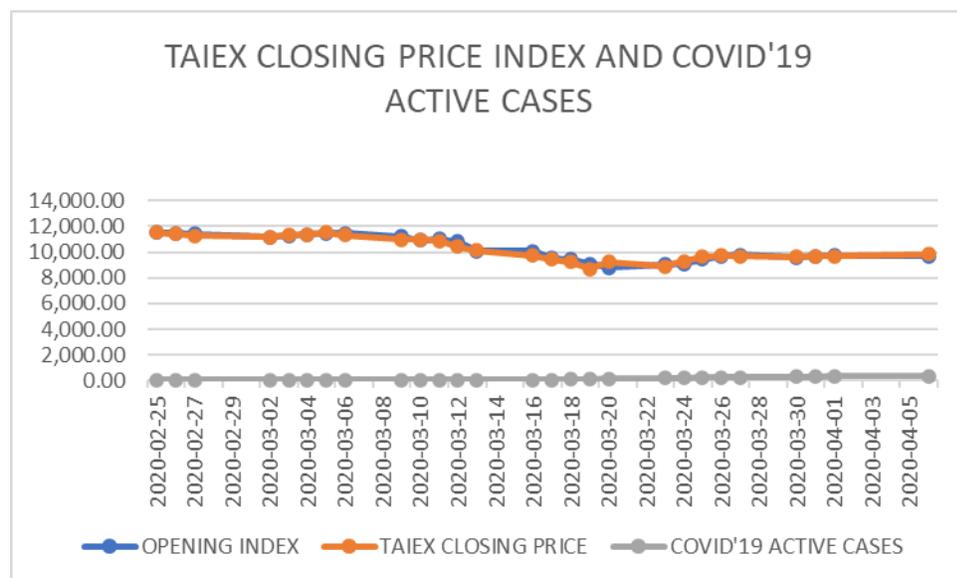
Thereafter, we show the impact of the initial increase in the active Covid'19 cases on the TAIEX through the measurement of the degree of the Karl Pearson's correlation coefficient, and thereafter we test the hypothesis using correlation and obtain p value of the data to conclude the result.

Table 1: Covid-19 affected persons & Closing price of TAIEX.

Date	TAIEX CLOSING PRICE	COVID'19 ACTIVE CASES
2020/02/25	11,540.23	31.00
2020/02/26	11,433.62	32.00
2020/02/27	11,292.00	32.00
02/03/2020	11,170.46	41.00
03/03/2020	11,327.72	42.00
04/03/2020	11,392.35	42.00
05/03/2020	11,514.82	44.00
06/03/2020	11,321.81	45.00
09/03/2020	10,977.64	45.00
10/03/2020	11,003.54	47.00
11/03/2020	10,893.75	48.00
12/03/2020	10,422.32	49.00
13/03/2020	10,128.87	50.00
16/03/2020	9,717.77	67.00
17/03/2020	9,439.63	77.00

18/03/2020	9,218.67	100.00
19/03/2020	8,681.34	108.00
20/03/2020	9,234.09	135.00
23/03/2020	8,890.03	195.00
24/03/2020	9,285.62	215.00
25/03/2020	9,644.75	235.00
26/03/2020	9,736.36	252.00
27/03/2020	9,698.92	267.00
30/03/2020	9,629.43	306.00
31/03/2020	9,708.06	322.00
01/04/2020	9,663.63	329.00
06/04/2020	9,818.74	373.00

Graph 1: Active Covid-19 cases & Closing price of TAIEX



The data clearly indicates the fall in TAIEX with the rise in number of Covid-19 cases reported in Taiwan. The data relates to the early signal of information by which stock market has reacted.

Table3. Correlations

COUNTRY	N	PEARSON CORRELATION	Sig (2 tailed) p-value
Taiwan	30	-0.600987391	<0.00001

The result indicates a high degree of negative correlation (-0.600987391) between the two variables which are number of covid-19 affected patients and closing price of TAIEX.

Therefore, it can be concluded that as the number of patients goes up there is corresponding fall in TAIEX. Also, the change is statistically significant (P-Value is .0001) < 0.05(alpha) Thus, we reject the null hypothesis that covid-19 does not impact the stock market. We therefore conclude that the initial detected positive cases of covid-19 impact the stock market after the announcement of the pandemic by the WHO.

Table 5. Correlations

COUNTRY	N	PEARSON CORRELATION	P-VALUE
INDIA	29	-0.673701547	<0.00001
BRAZIL	29	-0.46809	<0.00001
SWITZERLAND	27	-0.341753946	<0.00004
TAIWAN	30	-0.600987391	<0.00001

A comparative analysis of the aggregate change in the market indices

To study the element of impact, the aggregate is always a key to better understanding. The aggregate has been taken as an instrument stating comparative impact in terms of market movement through change%. Where the change is the indication of difference in currents and previous day’s closing price. This impact is as measured:

country	Period	Aggregate Impact
India	18 th feb’20-30 th march’20	-0.01208%
Taiwan	25 th feb’20- 6 th april’20	-0.00558%

Switzerland	25 th feb'20-31 st March'20	-0.00475%
Brazil	26 th feb'20-6 th April'20	-0.01227%

In the 2020 stock market crash, the stock market indices of all the four countries have shown a negative impact due to the initial rise in the active number of Covid'19, but the worst impact was seen in Brazil's Stock market index BOVESPA, though the cases were increasing at a slower pace as compared to India. Taiwan's TAIEX has amore, negative impactas compared to Switzerland's SMI. The lowest impact was seen on Switzerland's SMI.

Results and findings

- The stock market indices of all the four countries have shown a negative impact due to the initial rise in the active number of Covid'19 cases during the period of last week of February and the entire month of march, after the announcement of the pandemic by the WHO, on 11th March 2020. This very well proves a inverse relationship between the two variables.
- The highest impact was seen in Brazil's BOVESPA, which reported an aggregate negative impact -0.01227% in its stock market index than the other three countries. The second being India's BSE-SENSEX which reported an aggregate impact of -0.01208%, followed by Taiwan's TAIEX at -0.00558% and Switzerland's SMI at -0.00475%.
- After the 2008 financial crises, the 2020 stock market crash was the worst fall in the market indices ever seen since then.

Road map ahead- has the rising number of Covid'19 cases affected the stock market indices after the market crash in March

The data of respective stock market index and active covid'19 cases are taken, from May to September 22nd to show that after the March crash, the indices have become unreactive to rise in the active number of Covid'19 cases. They're not moving in tandem with the reality of the economy of a country, which shows that rise in the cases affect the economy adversely. Hence, now a positive relationship is established among the two variables, in the period of 6 months after the crash in march. The other factors affecting the market index have proved to be strong in nullifying the impact of the rise in Covid'19 cases, as now the fear among the investors hasgradually started to reduce as the announcement of the vaccine in the near future and easing of lockdowns will be effective in improving the overall economic scenario and investor confidence in the long run. The indices have become unreactive to rise in the active number of Covid'19 cases because of the increase in the liquidity in the market, due to excess pumping in of liquidity by the major central banks, as central banks have become the major investors in the

equity markets, to raise funds. Higher the liquidity in the market, the more it becomes less sensitive to price changes and increment in the prices of the stock indices is not due to the change in the fundamental factors, but due to the excess global liquidity.

INDIA

Table 1: Covid-19 affected persons & Closing price of SENSEX.

DATE	OPENING PRICES	BSE SENSEX CLOSING INDEX	COVID'19 ACTIVE CASES
04/05/2020	32,748.14	31,715.35	42,836
05/05/2020	32,182.90	31,453.51	46,711
06/05/2020	31,577.63	31,685.75	49,391
07/05/2020	31,677.69	31,443.38	52,952
08/05/2020	32,083.32	31,642.70	56,342
11/05/2020	32,030.34	31,561.22	67,152
12/05/2020	31,342.93	31,371.12	70,756
13/05/2020	32,841.87	32,008.61	74,281
14/05/2020	31,466.33	31,122.89	78,003
15/05/2020	31,296.28	31,097.73	81,970
18/05/2020	31,248.26	30,028.98	96,169
19/05/2020	30,450.74	30,196.17	101,139
20/05/2020	30,159.59	30,818.61	106,750
21/05/2020	30,904.29	30,932.90	112,359
22/05/2020	30,822.78	30,672.59	118,447
26/05/2020	30,864.27	30,609.30	145,380
27/05/2020	30,793.11	31,605.22	151,767
28/05/2020	31,827.80	32,200.59	158,333

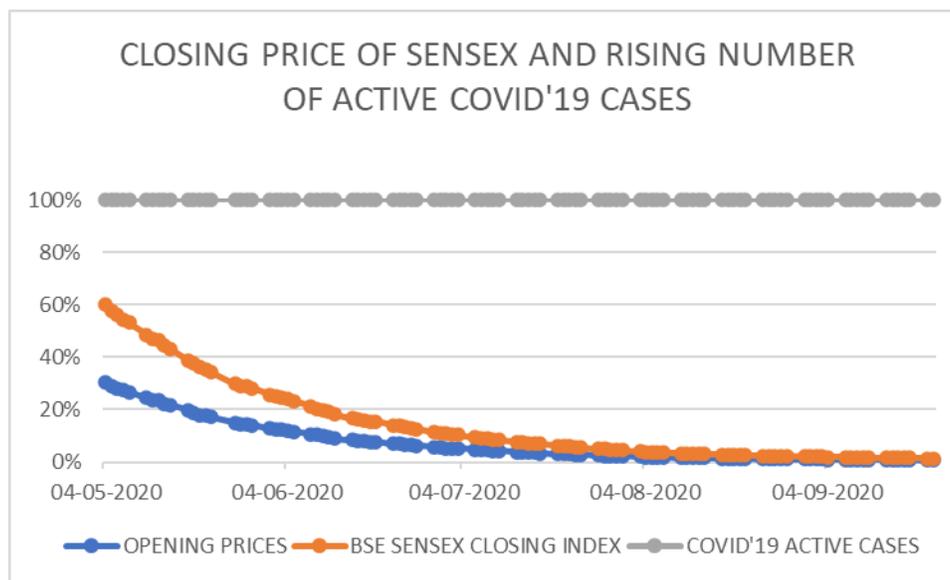
29/05/2020	32,041.29	32,424.10	165,799
01/06/2020	32,906.05	33,303.52	190,535
02/06/2020	33,450.19	33,825.53	198,706
03/06/2020	34,185.41	34,109.54	207,615
04/06/2020	34,072.50	33,980.70	216,919
05/06/2020	34,198.55	34,287.24	226,770
08/06/2020	34,841.17	34,370.58	256,611
09/06/2020	34,520.79	33,956.69	266,598
10/06/2020	34,029.14	34,247.05	276,583
11/06/2020	34,214.69	33,538.37	286,579
12/06/2020	32,436.69	33,780.89	297,535
15/06/2020	33,670.55	33,228.80	332,424
16/06/2020	33,853.72	33,605.22	343,091
17/06/2020	33,434.13	33,507.92	354,065
18/06/2020	33,371.52	34,208.05	366,946
19/06/2020	34,335.38	34,731.73	380,532
22/06/2020	34,892.03	34,911.32	425,282
23/06/2020	35,015.73	35,430.43	440,215
24/06/2020	35,679.74	34,868.98	456,183
25/06/2020	34,525.39	34,842.10	473,105
26/06/2020	35,144.78	35,171.27	490,401
29/06/2020	34,926.95	34,961.52	548,318
30/06/2020	35,168.18	34,915.80	566,840
01/07/2020	35,009.59	35,414.45	585,493
02/07/2020	35,604.00	35,843.70	604,641

03/07/2020	36,025.38	36,021.42	625,544
06/07/2020	36,313.46	36,487.28	697,413
07/07/2020	36,660.35	36,674.52	719,665
08/07/2020	36,738.38	36,329.01	742,417
09/07/2020	36,450.69	36,737.69	767,296
10/07/2020	36,555.13	36,594.33	793,802
13/07/2020	36,880.66	36,693.69	878,254
14/07/2020	36,517.28	36,033.06	906,752
15/07/2020	36,314.76	36,051.81	936,181
16/07/2020	36,401.20	36,471.68	968,876
17/07/2020	36,547.75	37,020.14	1,003,832
20/07/2020	37,409.03	37,418.99	1,118,043
21/07/2020	37,823.61	37,930.33	1,155,191
22/07/2020	38,178.07	37,871.52	1,192,915
23/07/2020	37,814.92	38,140.47	1,238,635
24/07/2020	37,949.59	38,128.90	1,287,945
27/07/2020	38,275.34	37,934.73	1,435,453
28/07/2020	38,052.18	38,492.95	1,483,156
29/07/2020	38,427.15	38,071.13	1,531,669
30/07/2020	38,262.83	37,736.07	1,583,792
31/07/2020	37,847.88	37,606.89	1,638,870
03/08/2020	37,595.73	36,939.60	1,803,695
04/08/2020	37,092.86	37,687.91	1,855,745
05/08/2020	37,892.36	37,663.33	1,908,254
06/08/2020	37,946.80	38,025.45	1,964,536

07/08/2020	37,951.07	38,040.57	2,027,074
10/08/2020	38,167.27	38,182.08	2,215,074
11/08/2020	38,371.34	38,407.01	2,268,675
12/08/2020	38,321.13	38,369.63	2,329,638
13/08/2020	38,456.64	38,310.49	2,396,637
14/08/2020	38,432.94	37,877.34	2,461,190
17/08/2020	38,055.01	38,050.78	2,647,663
18/08/2020	38,084.70	38,528.32	2,702,742
19/08/2020	38,727.89	38,614.79	2,767,273
20/08/2020	38,283.90	38,220.39	2,836,925
21/08/2020	38,471.93	38,434.72	2,905,823
24/08/2020	38,566.96	38,799.08	3,106,348
25/08/2020	38,948.46	38,843.88	3,167,323
26/08/2020	38,930.18	39,073.92	3,234,474
27/08/2020	39,293.53	39,113.47	3,310,234
28/08/2020	39,264.48	39,467.31	3,387,500
31/08/2020	39,888.15	38,628.29	3,621,245
01/09/2020	38,754.00	38,900.80	3,691,166
02/09/2020	38,892.64	39,086.03	3,769,523
03/09/2020	39,165.80	38,990.94	3,853,406
04/09/2020	38,325.00	38,357.18	3,936,747
07/09/2020	38,284.78	38,417.23	4,204,613
08/09/2020	38,498.07	38,365.35	4,280,422
09/09/2020	37,988.56	38,193.92	4,370,128
10/09/2020	38,516.88	38,840.32	4,465,863

11/09/2020	38,865.17	38,854.55	4,562,414
14/09/2020	39,073.51	38,756.63	4,846,427
15/09/2020	38,904.67	39,044.35	4,930,236
16/09/2020	39,161.01	39,302.85	5,020,359
17/09/2020	39,120.64	38,979.85	5,118,253
18/09/2020	39,200.42	38,845.82	5,214,677
21/09/2020	38,812.69	38,034.14	5,487,580
22/09/2020	38,200.71	37,734.08	5,562,663

Graph 1: Rise in the active number of Covid-19 cases & Closing price of SENSEX



Switzerland

Table 1: Covid-19 affected persons & Closing price of SMI

DATE	OPENING PRICE	SMI CLOSING INDEX	COVID'19 ACTIVE CASES
04/05/2020	9618.929688	9390.269531	29,981

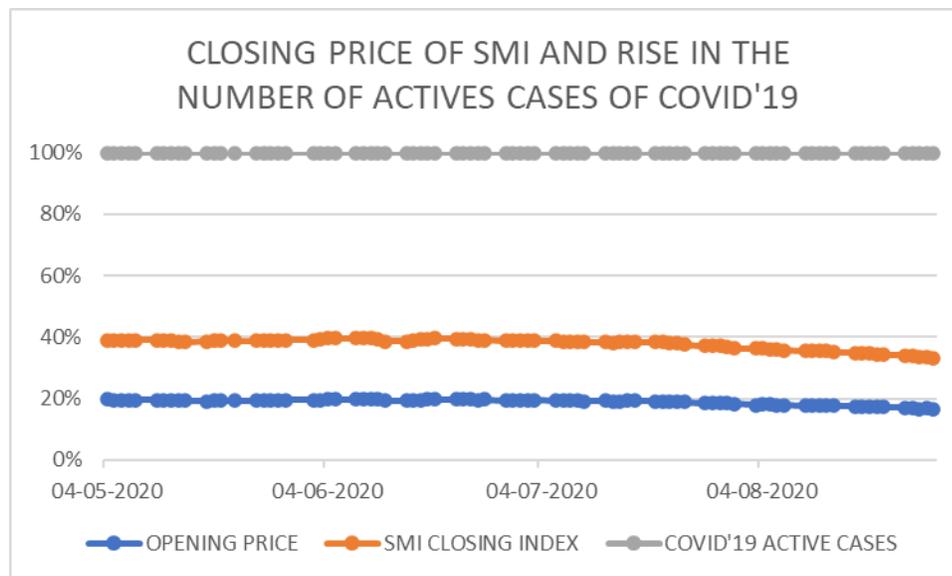
05/05/2020	9444.580078	9512.169922	30,009
06/05/2020	9506.280273	9571.700195	30,060
07/05/2020	9609.129883	9617.980469	30,126
08/05/2020	9666.660156	9665.349609	30,207
11/05/2020	9679.530273	9689.709961	30,344
12/05/2020	9693.05957	9733.530273	30,380
13/05/2020	9679.879883	9631.620117	30,413
14/05/2020	9581.599609	9448.139648	30,463
15/05/2020	9526.44043	9483.099609	30,514
18/05/2020	9536.719727	9740.769531	30,597
19/05/2020	9741.209961	9764.230469	30,618
20/05/2020	9731.900391	9790.849609	30,658
22/05/2020	9713.75	9688.990234	30,707
25/05/2020	9743.129883	9824.540039	30,746
26/05/2020	9879.05957	9830.830078	30,761
27/05/2020	9853.900391	9716.519531	30,776
28/05/2020	9776.929688	9926.030273	30,796
29/05/2020	9918.5	9831.490234	30,828
02/06/2020	9874.839844	9951.450195	30,874
03/06/2020	9962.219727	10183.76953	30,893
04/06/2020	10152.58984	10075.67969	30,913
05/06/2020	10082.55957	10190.37012	30,936
08/06/2020	10114.01953	10152.76953	30,972
09/06/2020	10153.38965	10184.82031	30,988
10/06/2020	10190.07031	10147.17969	31,011

11/06/2020	10108.17969	9828.580078	31,044
12/06/2020	9800.009766	9796.370117	31,063
15/06/2020	9762.950195	9842.55957	31,131
16/06/2020	9873.450195	10034.29004	31,154
17/06/2020	10084.09961	10202.19043	31,187
18/06/2020	10191.87988	10186.5	31,200
19/06/2020	10226.53027	10266.29004	31,235
22/06/2020	10196.01953	10151.12988	31,310
23/06/2020	10205.71973	10246.55957	31,332
24/06/2020	10187.78027	10021.99023	31,376
25/06/2020	9976	10089.83008	31,428
26/06/2020	10163.91016	10041.91016	31,486
29/06/2020	10021.88965	10060.45996	31,652
30/06/2020	10070.95996	10045.29981	31,714
01/07/2020	10027.4502	10089.66992	31,851
02/07/2020	10157.83008	10187.55957	31,967
03/07/2020	10204.49023	10125.83984	32,101
06/07/2020	10248.87988	10253.37988	32,315
07/07/2020	10213.54004	10207.95996	32,369
08/07/2020	10150.62012	10178.41016	32,498
09/07/2020	10219.15039	10143.37988	32,586
10/07/2020	10114.91992	10229.96973	32,690
13/07/2020	10298.82031	10300.95996	32,946
14/07/2020	10204.87988	10259.5	33,016
15/07/2020	10358.83008	10460.00977	33,148

16/07/2020	10402.24023	10433.42969	33,290
17/07/2020	10428.90039	10410.51953	33,382
20/07/2020	10388.16016	10470.91992	33,634
21/07/2020	10495.2002	10444.04981	33,742
22/07/2020	10406.20996	10439.04004	33,883
23/07/2020	10456.66016	10383.37988	34,000
24/07/2020	10271.37988	10214.20996	34,154
27/07/2020	10174.71973	10272.33984	34,477
28/07/2020	10292.21973	10277.2002	34,609
29/07/2020	10276.94043	10272.80957	34,802
30/07/2020	10267.61035	10095.33984	35,022
31/07/2020	10127.03027	10005.90039	35,232
03/08/2020	10013.36035	10229.66992	35,616
04/08/2020	10244.98047	10162.04004	35,746
05/08/2020	10199.30957	10097.96973	35,927
06/08/2020	10084.95996	10067.12988	36,108
07/08/2020	10061.7002	10068.03027	36,269
10/08/2020	10080.48047	10090.91016	36,708
11/08/2020	10133.29004	10153.24023	36,895
12/08/2020	10142.62012	10278.66016	37,169
13/08/2020	10280.62988	10260.11035	37,403
14/08/2020	10225.92969	10163.59961	37,761
17/08/2020	10174.91992	10228.05957	38,252
18/08/2020	10189.63965	10168.40039	38,449
19/08/2020	10153.29981	10310.00977	38,760

20/08/2020	10233.55957	10229.91992	39,026
21/08/2020	10266.37012	10218.2002	39,332
24/08/2020	10313.66016	10308.38965	40,060
25/08/2020	10330.09961	10231.25	40,262
26/08/2020	10205.17969	10309.65039	40,645
27/08/2020	10312.92969	10240.45996	41,006
28/08/2020	10233.48047	10164.49023	41,346

Graph 1: Rise in the active number of Covid-19 cases & Closing price of SMI



BRAZIL

Table 1: Covid-19 affected persons & Closing price of BOVESPA

DATE	OPENING PRICES	BOVESPA CLOSING INDEX	COVID'19 ACTIVE CASES
04/05/2020	80501.17	78,876.22	107,780
05/05/2020	78,887.12	79,470.78	114,715
06/05/2020	79,472.78	79,063.68	125,218

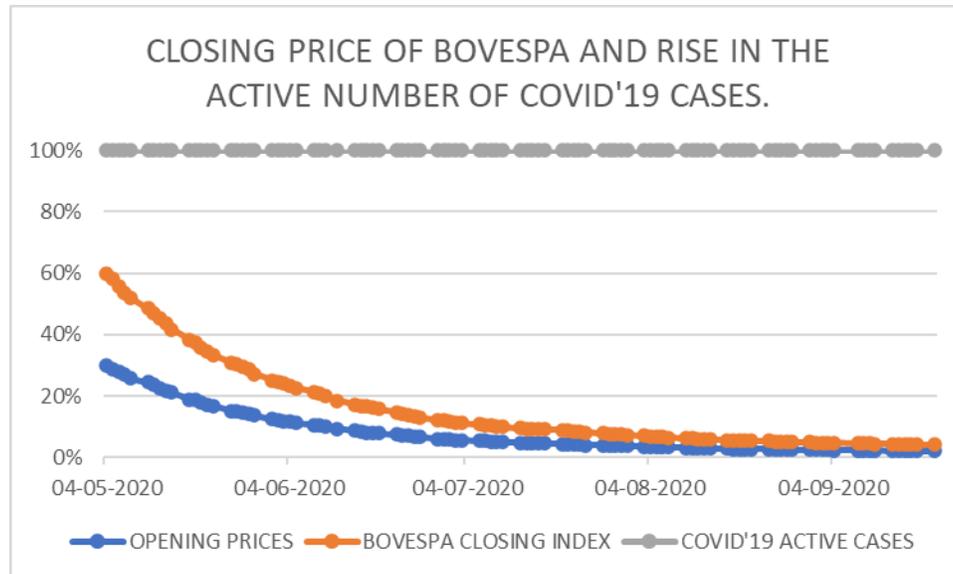
07/05/2020	79,072.28	78,118.57	135,106
08/05/2020	78,151.87	80,263.35	145,328
11/05/2020	80,263.42	79,064.60	168,331
12/05/2020	79,064.60	77,871.95	177,589
13/05/2020	77,876.88	77,772.20	188,974
14/05/2020	77,770.48	79,010.81	202,918
15/05/2020	79,010.59	77,556.62	218,223
18/05/2020	77,575.71	81,194.29	254,220
19/05/2020	81,196.69	80,742.35	271,628
20/05/2020	80,746.81	81,319.45	291,579
21/05/2020	81,319.73	83,027.09	310,087
22/05/2020	83,027.09	82,173.21	330,890
25/05/2020	82,197.76	85,663.48	374,898
26/05/2020	85,667.50	85,468.91	391,222
27/05/2020	85,467.50	87,946.25	411,821
28/05/2020	87,946.10	86,949.09	438,238
29/05/2020	86,951.32	87,402.59	465,166
01/06/2020	87,395.15	88,620.10	526,447
02/06/2020	88,622.49	91,046.38	555,383
03/06/2020	91,048.10	93,002.14	584,016
04/06/2020	92,992.63	93,828.61	614,941
05/06/2020	93,839.16	94,637.06	645,771
08/06/2020	94,640.43	97,644.67	707,412
09/06/2020	97,644.34	96,746.55	739,503
10/06/2020	96,747.32	94,685.98	772,416

12/06/2020	94,677.14	92,795.27	828,810
15/06/2020	92,780.35	92,375.52	888,271
16/06/2020	92,386.66	93,531.17	923,189
17/06/2020	93,531.17	95,547.29	955,377
18/06/2020	95,547.20	96,125.24	978,142
19/06/2020	96,137.89	96,572.10	1,032,913
22/06/2020	96,572.24	95,335.96	1,106,470
23/06/2020	95,343.52	95,975.16	1,145,906
24/06/2020	95,973.81	94,377.36	1,188,631
25/06/2020	94,382.05	95,983.09	1,228,114
26/06/2020	95,979.03	93,834.49	1,274,974
29/06/2020	93,836.94	95,735.35	1,368,195
30/06/2020	95,727.60	95,055.82	1,402,041
01/07/2020	95,061.62	96,203.20	1,448,753
02/07/2020	96,205.58	96,234.96	1,496,858
03/07/2020	96,236.97	96,764.85	1,539,081
06/07/2020	96,775.74	98,937.16	1,623,284
07/07/2020	98,937.40	97,761.04	1,668,589
08/07/2020	97,764.95	99,769.88	1,713,160
09/07/2020	99,770.32	99,160.33	1,755,779
10/07/2020	99,160.17	100,031.83	1,800,827
13/07/2020	100,027.40	98,697.06	1,884,967
14/07/2020	98,698.88	100,440.23	1,926,824
15/07/2020	100,444.28	101,790.54	1,966,748
16/07/2020	101,791.01	100,553.27	2,012,151

17/07/2020	100,554.09	102,888.25	2,046,328
20/07/2020	102,887.60	104,426.37	2,118,646
21/07/2020	104,426.49	104,309.74	2,159,654
22/07/2020	104,311.59	104,289.57	2,227,514
23/07/2020	104,291.24	102,293.31	2,287,475
24/07/2020	102,291.82	102,381.58	2,343,366
27/07/2020	102,380.85	104,477.08	2,442,375
28/07/2020	104,477.08	104,109.07	2,483,191
29/07/2020	104,111.75	105,605.17	2,552,265
30/07/2020	105,605.17	105,008.70	2,610,102
31/07/2020	105,009.99	102,912.24	2,662,485
03/08/2020	102,912.87	102,829.96	2,750,318
04/08/2020	102,825.55	101,215.87	2,801,921
05/08/2020	101,219.98	102,801.76	2,857,597
06/08/2020	102,794.76	104,125.64	2,912,212
07/08/2020	104,116.04	102,775.55	2,962,442
10/08/2020	102,776.02	103,444.48	3,057,470
11/08/2020	103,448.75	102,174.40	3,109,630
12/08/2020	102,175.95	102,117.79	3,164,785
13/08/2020	102,118.28	100,460.60	3,224,876
14/08/2020	100,469.44	101,353.45	3,275,520
17/08/2020	101,348.15	99,595.41	3,359,570
18/08/2020	99,597.01	102,065.35	3,407,354
19/08/2020	102,072.16	100,853.72	3,456,652
20/08/2020	100,852.94	101,467.87	3,501,975

21/08/2020	101,459.55	101,521.29	3,532,330
24/08/2020	101,525.44	102,297.95	3,622,861
25/08/2020	102,292.87	102,117.64	3,669,995
26/08/2020	102,118.76	100,627.33	3,717,156
27/08/2020	100,624.98	100,623.64	3,761,391
28/08/2020	100,631.21	102,142.93	3,804,803
31/08/2020	102,141.53	99,369.15	3,908,272
01/09/2020	99,382.02	102,167.65	3,950,931
02/09/2020	102,168.42	101,911.13	3,997,865
03/09/2020	101,910.94	100,721.36	4,041,638
04/09/2020	100,733.12	101,241.73	4,091,801
08/09/2020	101,239.34	100,050.43	4,162,073
09/09/2020	100,050.43	101,292.05	4,197,889
10/09/2020	101,291.31	98,834.59	4,238,446
11/09/2020	98,839.08	98,363.22	4,282,164
14/09/2020	98,366.62	100,274.52	4,345,610
15/09/2020	100,277.00	100,297.91	4,382,263
16/09/2020	100,298.86	99,675.68	4,419,083
17/09/2020	99,673.77	100,097.83	4,455,386
18/09/2020	100,097.73	98,289.71	4,495,183
21/09/2020	98,282.75	96,990.72	4,558,068

Graph 1: Rise in the active number of Covid-19 cases & Closing price of BOVESPA



TAIWAN

Table 1: Covid-19 affected persons & Closing price of TAIEX.

DATE	OPENING PRICE	CLOSING INDEX	TAIEX	COVID'19 ACTIVE CASES
04/05/2020	10,781.51	10,720.48		438
05/05/2020	10,756.95	10,774.61		438
06/05/2020	10,771.09	10,774.98		439
07/05/2020	10,778.53	10,842.92		440
08/05/2020	10,883.22	10,901.42		440
11/05/2020	10,942.18	11,013.26		440
12/05/2020	10,974.51	10,879.47		440
13/05/2020	10,861.01	10,938.27		440
14/05/2020	10,894.17	10,780.88		440
15/05/2020	10,833.16	10,814.92		440

18/05/2020	10,753.21	10,740.55	440
19/05/2020	10,812.79	10,860.44	440
20/05/2020	10,892.76	10,907.80	440
21/05/2020	10,933.21	11,008.31	441
22/05/2020	10,977.55	10,811.15	441
25/05/2020	10,812.94	10,871.18	441
26/05/2020	10,903.32	10,997.21	441
27/05/2020	11,023.93	11,014.66	441
28/05/2020	11,040.62	10,944.19	441
29/05/2020	10,921.16	10,942.16	442
01/06/2020	10,971.40	11,079.02	443
02/06/2020	11,109.27	11,127.93	443
03/06/2020	11,182.52	11,320.16	443
04/06/2020	11,373.94	11,393.23	443
05/06/2020	11,418.01	11,479.40	443
08/06/2020	11,539.00	11,610.32	443
09/06/2020	11,600.61	11,637.11	443
10/06/2020	11,635.99	11,720.16	443
11/06/2020	11,738.49	11,535.77	443
12/06/2020	11,406.54	11,429.94	443
15/06/2020	11,436.28	11,306.26	445
16/06/2020	11,380.67	11,511.64	445
17/06/2020	11,525.50	11,534.59	445
18/06/2020	11,534.20	11,548.33	446
19/06/2020	11,557.27	11,549.86	446

22/06/2020	11,553.91	11,572.93	446
23/06/2020	11,618.42	11,612.36	446
24/06/2020	11,647.86	11,660.67	446
29/06/2020	11,608.80	11,542.62	447
30/06/2020	11,563.60	11,621.24	447
01/07/2020	11,622.64	11,703.42	447
02/07/2020	11,694.10	11,805.14	448
03/07/2020	11,857.90	11,909.16	449
06/07/2020	11,941.84	12,116.70	449
07/07/2020	12,176.79	12,092.97	449
08/07/2020	12,086.13	12,170.19	449
09/07/2020	12,222.90	12,192.69	449
10/07/2020	12,250.44	12,073.68	451
13/07/2020	12,109.61	12,211.56	451
14/07/2020	12,202.89	12,209.01	451
15/07/2020	12,233.99	12,202.85	451
16/07/2020	12,173.04	12,157.74	452
17/07/2020	12,195.72	12,181.56	454
20/07/2020	12,205.25	12,174.54	455
21/07/2020	12,242.32	12,397.55	455
22/07/2020	12,389.76	12,473.27	455
23/07/2020	12,423.02	12,413.04	455
24/07/2020	12,467.43	12,304.04	458
27/07/2020	12,618.69	12,588.30	462
28/07/2020	12,951.72	12,586.73	467

29/07/2020	12,530.74	12,540.97	467
30/07/2020	12,691.86	12,722.92	467
31/07/2020	12,653.46	12,664.80	467
03/08/2020	12,642.73	12,513.03	475
04/08/2020	12,577.88	12,709.92	476
05/08/2020	12,762.34	12,802.30	476
06/08/2020	12,894.24	12,913.50	477
07/08/2020	12,901.43	12,828.87	477
10/08/2020	12,786.80	12,894.00	480
11/08/2020	12,856.46	12,780.19	480
12/08/2020	12,713.63	12,670.35	481
13/08/2020	12,758.87	12,763.13	481
14/08/2020	12,709.97	12,795.46	481
17/08/2020	12,813.94	12,956.11	485
18/08/2020	12,974.96	12,872.14	486
19/08/2020	12,904.84	12,778.64	486
20/08/2020	12,764.75	12,362.64	486
21/08/2020	12,462.52	12,607.84	487
24/08/2020	12,629.78	12,647.13	487
25/08/2020	12,706.40	12,758.25	487
26/08/2020	12,768.96	12,833.29	487
27/08/2020	12,888.65	12,797.31	487
28/08/2020	12,759.30	12,728.85	487
31/08/2020	12,763.44	12,591.45	488
01/09/2020	12,617.39	12,703.28	488

02/09/2020	12,772.43	12,699.50	489
03/09/2020	12,774.97	12,757.97	489
04/09/2020	12,645.92	12,637.95	490
07/09/2020	12,645.93	12,601.40	494
08/09/2020	12,637.42	12,663.56	495
09/09/2020	12,592.18	12,608.58	495
10/09/2020	12,665.74	12,691.75	496
11/09/2020	12,697.46	12,675.95	498
14/09/2020	12,680.41	12,787.82	499
15/09/2020	12,787.42	12,845.65	499
16/09/2020	12,989.81	12,976.76	500
17/09/2020	12,920.15	12,872.74	503
18/09/2020	12,858.60	12,875.62	503
21/09/2020	12,874.61	12,795.12	509

Graph 1: Rise in the active number of Covid-19 cases & Closing price of TAIEX.

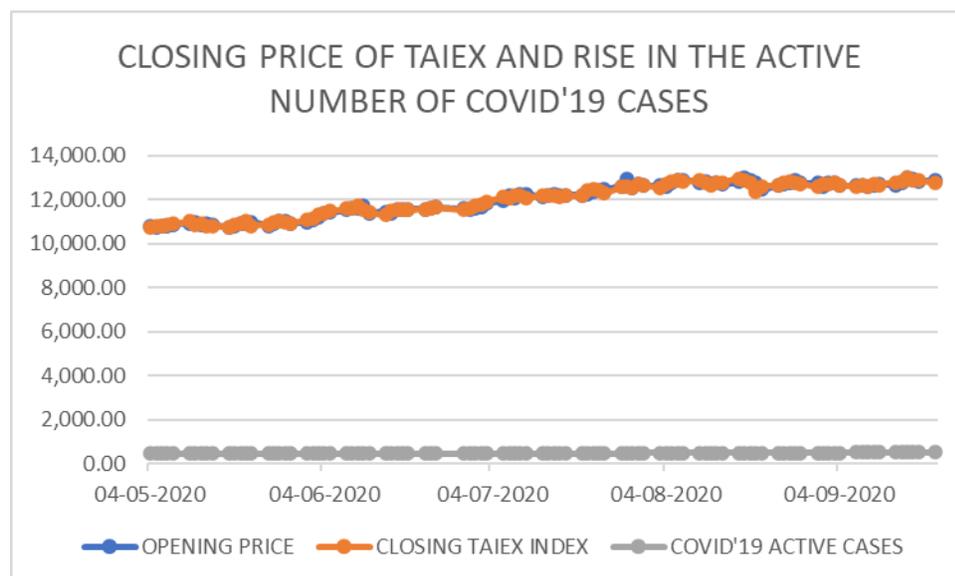


Table: correlations

CORRELATION RESULTS

INDIA	BRAZIL	SWITZERLAND	TAIWAN
0.78792	0.758335	0.542795007	0.870478

CORRELATION DEGREES	
DEGREES	RANGE
HIGH DEGREE	+/-0.50 to +/-1
MODERATE DEGREE	+/-0.30 to +/-0.49
LOW DEGREE	below +/- 0.29

The outbreak of COVID'19 has crashed the stock market in all the countries across the globe. The major impact was seen in February-March'2020 when COVID'19 as a pandemic was announced by WHO. This was the period of major impact financially and physically but with the onset of May The index of few countries have shown speedy recovery by catching up the bullish trend but in certain markets the signals of bullish periods is still persistent.

In India the period from 4th May'20-22nd September'20 the positive correlation between Active COVID cases and SENSEX market Index is 0.78792 which signifies the market is no longer impacted due to increasing cases. Many factors have influenced market among which one factor is COVID. So on 4th September it was seen as if bulls have almost lost their grip in market, the market was heavily overbought and FPI's were seen buying heavily and the persistent herd mentality was seen and the same FPI's sold during the month of March. Also, NASDAQ witness the crash which showed the impact through fall in global equities. On 18th September Rallies of FPO and IPO's were seen again flooding liquidity in Market,such profits further increase risk taking appetite both in primary and secondary markets causing bullish sentiments. Also the market movement remains uncertain. As the September has more twist to be added to markets depends on risk associated with upcoming MPC meeting in October and the decision to release aid packages.

In Brazil the period from 4th May '20-21st September'20 shows the correlation of 0.758335 which is highly correlated. The same trend is seen in Brazil as that of India but the difference is BOVESPA does not experience a continuous fall in the index but there is upward and downward trends going on simultaneously which makes it unpredictable for investors to determine the

market direction. (As seen from 17th September'20). The instability in market is seen due to emerging political risk, as a series of setbacks for President Jair Bolsonaro sucks the life out of a broad-based recovery that had appeared to be gathering momentum following March's market crash. The mishandling of Pandemic and battles with Supreme Court has led many to resign from cabinet including himself which is likely to create impact on stock market and rising tensions amid investors.

In Switzerland the period taken to understand the impact is from 4th May-31st August'20 showing high degree of positive correlation i.e.0. 542795007. This also shows SMI is no more affected by the increasing cases. But recently the Index has a nullifying impact where there is continuous growth then again down. No pattern is sustained but it's not showing bearish trends as in SENSEX and BOVESPA. The SSMI index this year advanced by 4.16% (YTD) despite concerns about a global slowdown that has arisen driven by geopolitical tensions among the major developed economies.

In Taiwan the base period to forecast is 4th May-21st September'20 where the highest correlativity of 0.870478 is seen. Taiwan's equity benchmark experienced high market in July due to effective control and rally in technological stocks. As Taiwan is known for R&D and its semiconductor industry, rising tensions between the United States and China will fuel demand for servers and chips not made on the mainland. The coronavirus pandemic is only expected to accelerate the shift to Taiwan, as more companies domestically and globally begin to re-evaluate China-dependent supply chains.

Globally, COVID outbreak has directly or indirectly impacted the market Index. The global aggregate says the market is to have long term negative impact where it has already stated its arrival by the crash in market prices.

Conclusion

In the present pandemic situation, predicting the stock market like this is a herculean task but even though we tried to spell out initial signalling effect of Covid-19 on the stock markets of India, Switzerland, Taiwan and Brazil, as the case of uncertainty out of uncertain situation. But we can clearly observe that the increase in the reported cases of corona virus affected patients sends a negative financial signal to the stock market and the stock market has reacted negatively at very initial level of pandemic. This study is exploratory in nature and takes only initial level secondary data of reported cases of pandemic and closing of the stock Market indices of India, Switzerland, Brazil and Taiwan. Further, long run effect can be observed by taking a long-range data, which at present is not possible, as the number of cases is escalating every day and uncertainty is knocking the doors of real time uncertain situations. It is left to the prudence and knowledge of the investors about the ongoing real time situation. Lastly, corona virus is a

tangible thing and we know how to fight against. But depression in the economy is intangible panic force and it can cause far more problems.

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