

COVID-19 impact on stock exchange markets.

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Abstract—Spread of Coronavirus impacted severely stock markets globally. We would like to show how pandemic virus affected asset prices of huge stock market indices like Dow Jones, Euro Stoxx 50, Nikkei 225 and others. All the data comes from finance.yahoo.com and investing.com. We also mentioned global analysis of pandemic news and how and which industries suffered most and which of them gained.

Index Terms—COVID-19, financial market, stock exchange market

I. INTRODUCTION

Coronavirus was found in December of 2019 in Wuhan, China. It had a huge worldwide impact especially when COVID-19 was recognized as pandemic on 11 March 2020 by World Health Organization (WHO). Coronavirus become one of the fastest spreading diseases on Earth. There is no vaccine (not found yet) that can prevent 100%. Only prevention methods (as effective right now) are to stay at home and avoid contacting with other people for two to three weeks and stay clean. As practice showed, isolation significantly reduced the speed of spread in Wuhan. Pandemic has its impacts in different levels and it creates tension: for governments - economic decay, political destabilization; for businesses - huge loss in profit; and for ordinary people - unusual circumstance (change of routine) like sitting at home for weeks raise problems like social pressure, anxiety, domestic violence, lack of money for basic needs and etc. We would like to show how listed above examples affected asset price movement for past 6 months.

This paper follows structure: In section II we briefly tell about the background and spread of COVID-19. How it mostly affected (spread fast) densely populated cities and countries. In section III we will do statistical analysis on biggest stock market indices and we will give news analysis on stocks of travelling industry, food supply companies, IT companies, and medical organizations globally. In section IV we give our conclusion and future directions.

II. BACKGROUND

First clinical characteristics of 138 patients infected by COVID-19 were given according to paper [1], where coronavirus has symptoms as fever, fatigue, and dry cough which is very similar to flu. Median age of infected people was 56 and 54.3% of them were men. Lungs of all patients had bilateral patchy shadows and all of them had pneumonia [2].

Coronavirus not only affected older people, but also cases with infants were found in [3]. In [2] warning was given to wear face masks for infected people in order not to infect others and wear N95 respirators for health care practitioners. Prevention methods are advised by WHO like maintaining safe distance, washing hands and using an alcohol-based hand rub, not touching your face, eyes, nose. According to <https://www.worldometers.info/coronavirus/> website, coronavirus was detected in 210 countries, 2,536,598 confirmed cases with leading countries USA(804,759), Spain(204,178), and Italy(183,957); 175,759 deaths, and 677,042 recoveries worldwide as of 21st of April, 2020. Treatment of 5 cases with convalescent plasma transfusion was given in [4], but stable vaccine against this virus have not been found yet. Expectations based on [5] past pandemics that vaccine potentially won't be available in 2 year. However, our point of view is that technological progress (deep learning) that has been made since last pandemic (H1N1pdm09 virus in 2009) can accelerate the process of finding the vaccine against COVID-19.

III. DATA ORGANIZATION AND ANALYSIS

A. Data collection and prearrangement

This study collected yahoo finance public data. We decided to analyze historical daily stock of top three stock indices (according to bloomberg.com) of **Americas** (S&P 500 (GSPC), Dow Jones Industrial Average (DJI), NASDAQ Composite Index (IXIC)), **Europe, Middle East & Africa** (Euro Stoxx 50 PR (STOXX50E), FTSE 100 Index (FTSE), DAX Index (GDAXI)), **Asia Pacific** (Nikkei 225 (N225), Tokyo Stock Exchange Tokyo Price Index TOPIX (TOPX), Hong Kong Hang Seng Index (HSI)), ranging from 4th December 2019 to 4th of May 2020. All the historical data is from yahoo finance except TOPIX from investing.com. Each data consists of Open, High, Low, Close Prices, Volume and Date. We would like to apply statistical analysis methods in order to find useful information. The reason we chose three different continent markets is to cover as much as possible range of markets and not make a biased decision in analysis.

B. Analysis

According to WHO, first COVID-19 case was reported in December 31st of 2019. We thought that analyzing data from 4th of December would show clearly how COVID

started affecting different stock markets worldwide. Mostly this analysis was concentrated on a closing price because in the end of each day closing price matters most. First, we would like to show overall picture of different markets. In Fig. 1 US biggest stock indices are displayed. One of the most important observations to mention is that the higher the stock price is, the more the loss is. If we consider the drawdown measure, we can see that Dow Jones which has the highest stock price shows loss more than 37% in price. S&P 500 and NASDAQ losses are 30.12% and 33.92% respectively. This trend is also can be seen in Figures 2 and 3 for European and Asian market indices. In European market this number is even higher compared to US markets. For instance, DAX stocks lost 38.78% in price where FTSE 100, Euro Stoxx 50 lost 34.93% and 38.27% respectively. Asian market suffered lesser among all: Hong Kong Hang Seng Index (25.33%), Tokyo Stock Exchange (29.24%) which is less than 30% except Nikkey 225 which has 31.27%.

Overall picture can be seen in Fig. 4 where all closing stock prices plotted into one line graph. We can observe that COVID-19 hugely affected all the markets. American stocks crash began in 24th of February, 2020 when news about Mr. Trump's administration asking Congress for payment of \$2.5bn to develop vaccine and equipment for protection was released [6]. Situation gotten worse and worse as covid patients kept rising from 4,777 (Mar 20th) and hit 16,354 in 3 days. In one month (24th Feb. - 24th Mar.) all the stock exchange indices fell sharp and after 24th of March started recovering. According to Fig. 5 it is clearly seen that moving averages of 9 and 21 days met in the beginning of April which is a sign to start investing. To see the performance of a stock we decided to use return measure which is expressed as a dollar difference and mostly percentage change in value. After looking at the daily returns chart of S&P 500 (Fig. 6), we can conclude that returns became very volatile. Stocks moved $\pm 10\%$ starting day 60 for 40 days straight. Lets see the histogram returns. In Fig. 7 returns are mostly below 1% for extreme High and Low cases. Additionally, we calculated the growth of the investments (i.e. total return) using cumulative returns. If we analyze Fig. 8, it is clearly visible that people invested during day 40 to 80, lost up to 25 cents per every invested dollar in day 0(Dec 4, 2019). There is a subtle indication that S&P 500 still cannot recover and face the consequences of coronavirus effect which means that you still lose money if you invest now.

Several countries declared quarantine: cancelled mass celebrations, closed cities, cancelled domestic and international flights which had massive effect on stocks. In Fig. 9 (clickable), we can see how Covid-19 affected UK from 2 January to 23 March 2020 [7]. Important to note are the stocks of industries which hit hard are: fossil fuel production and distribution, tourism and leisure, and insurance (10-25%). On the other hand, stocks of food and drug retails, personal goods, medicine and biotech research, gas and water had significant growth rate of 20%. Authors also claim that most changes appeared in the end of February, 2020, when Italy

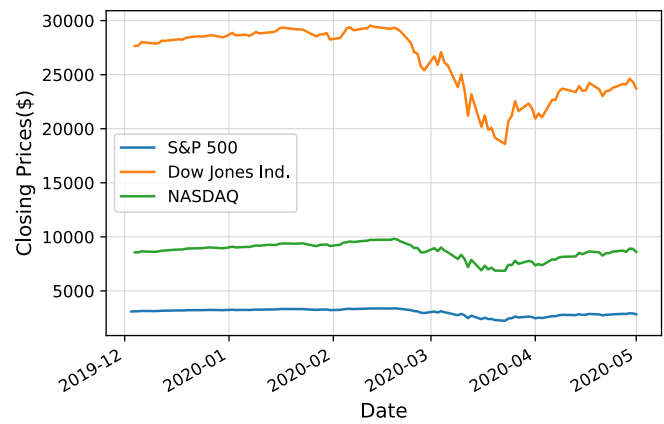


Fig. 1: Daily closing prices of American stocks

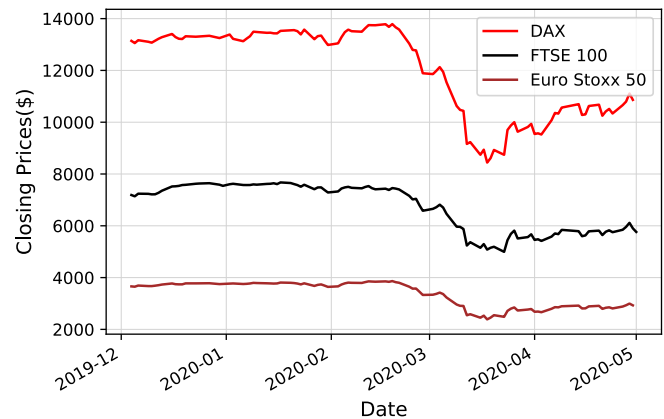


Fig. 2: Daily closing prices of European stocks

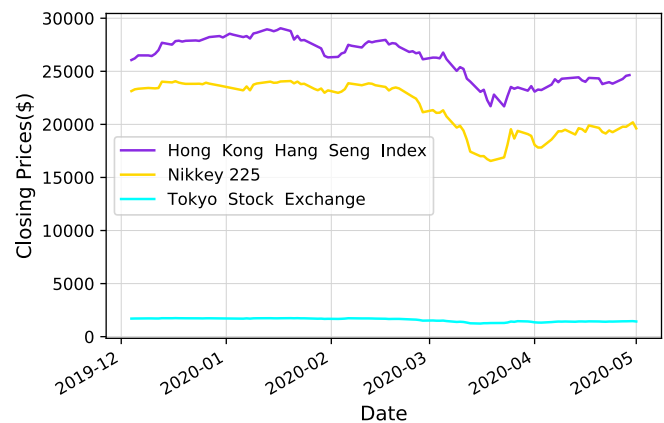


Fig. 3: Daily closing prices of Asian stocks

initiated lockdown (proof figure). Massive lockdowns had an influence to supply chain management, manufacturing sectors worldwide because number of countries barred access in order to stop the spread of virus. Closure of universities, schools, and businesses had a huge impact worldwide by changing the routine of people. Cashflow shortage made companies strive to pay salary for employees because of reduction in economic activity which means that coronavirus impacted

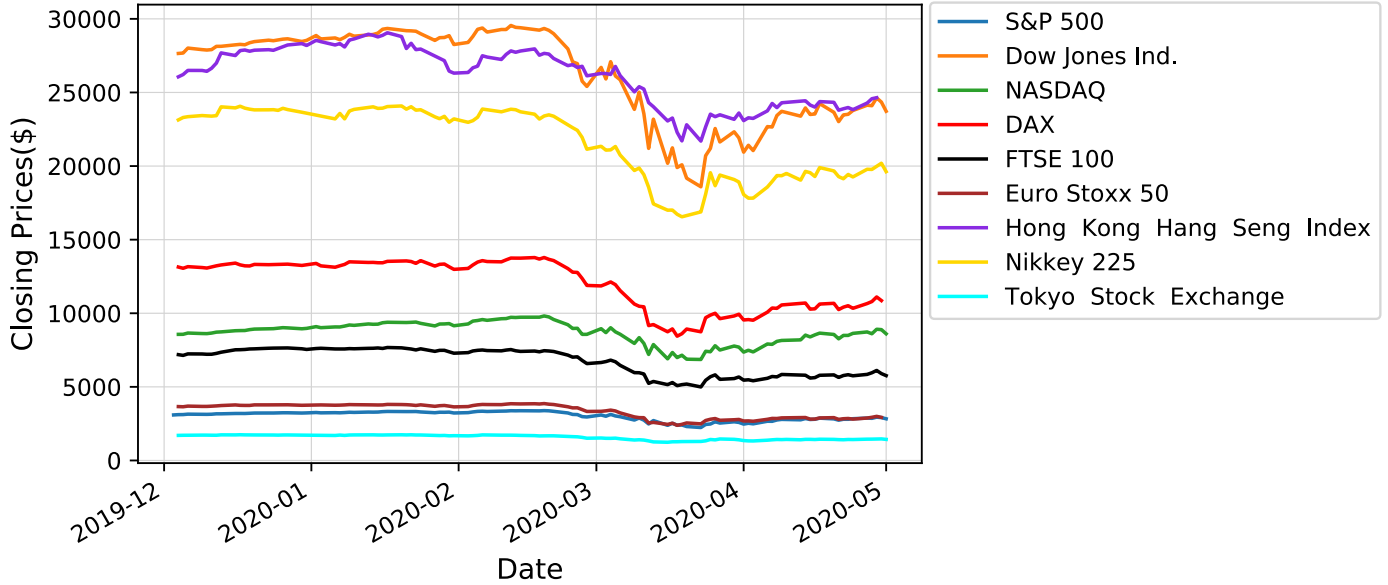


Fig. 4: All stocks with closing prices

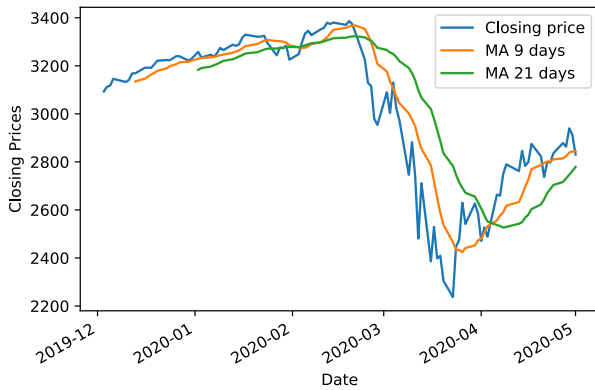


Fig. 5: S&P 500 line graph with 9 and 21 day Moving Averages

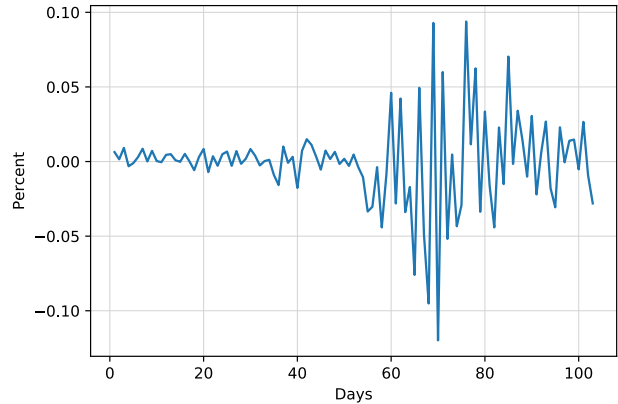


Fig. 6: S&P 500 daily cumulative return

financial stability of millions of people worldwide [8]. Several findings were presented in [9] about striving economics during the pandemic period. Authors pointed out that all measures done to prevent the spread of virus has its' consequences. Significant slowdowns are observed in supply and demand of goods because international borders are closed and labor force is locked at home (few people can afford to work risking their life). As of China being the largest supplier of goods internationally, countries worldwide are experiencing panic of scarcity of goods; resulting in the shock that is seen in stock market exchanges worldwide. Impact of coronavirus death ratio on volatility index (VIX) was researched in [10] showing positive change of 11% on financial volatility for each 1% in

the death ratio.

Thorough analysis has been done in [5] for dividend futures for S&P500 and Euro Stoxx 50. Authors showed that COVID-19 has larger impact (drop) on stock markets compared to financial crisis of 2008.

Please don't forget to analyze this source <https://voxeu.org/article/what-stock-market-tells-us-about-consequences-covid-19>

C. Oil prices

Lockdowns and quarantine measures significantly impacted international trading. One of the most suffered industries in Europe was fossil fuel production and distribution which had been reported in [7] that hit 27% negative change. According

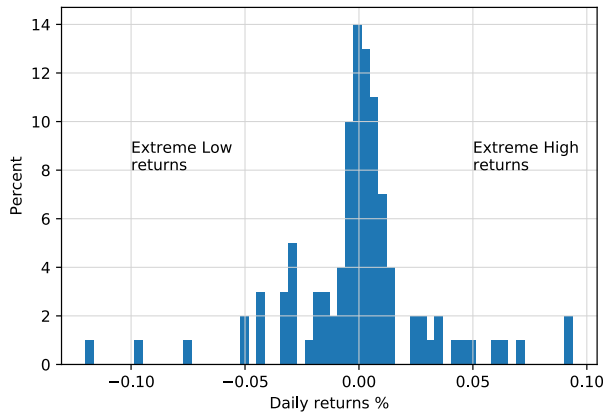


Fig. 7: S&P 500 daily cumulative return(cont.)

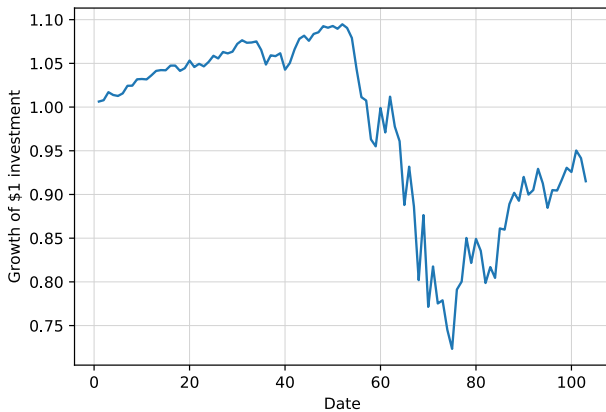


Fig. 8: S&P 500 growth chart

to authors in [9], Brent oil fell from \$68.90/barrel (Jan. 1) to \$50.5/barrel (Feb. 28). Situation got worse when Brent Crude was trading at \$19.33/barrel in April 21st which was a 18-year low (source: oilprice.com). As of 6th of May Brent July contracts are traded \$28.40/barrel. Brent price was affected because even terrible situation happened on Monday 27th of April when West Texas Intermediate (WTI) oil price fell below \$0 with closing price of -\$37.63/barrel. First reason is the quarantine measures followed by lockdowns resulted in no free space where oil would be held. Since that time as of May 4th, WTI recovered and traded \$22.78/barrel (source: oilprice.com). Here should be a paragraph about oil crash [11].

IV. CONCLUSION AND FUTURE WORK

In this work we showed how various stock markets suffered globally because of pandemic situation worldwide. We also connected different news with the trends that are given in the figures above. Overall picture is getting better financially, but number of active cases and death rate does not seem to retard. Consequences of lockdowns and quarantine measures significantly give its' hit for all markets differently, some gained in stocks and some lost. We tried to show overall picture

for the last half a year during COVID-19 times. Additional information about oil crash was given that was affected by coronavirus pandemic situation. As a future reference, we would like to analyze and compare market temporary shocks during past epidemics and pandemics.

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