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The Impact of Covid-19 on the Shanghai Stock Exchange

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Abstract This study aims to measure the impact of Covid-19 on the Shanghai Stock Exchange in the Republic of China, during the first third of 2020. To do so, simple regression analysis was applied by using ordinary least square (OLS) method. Results of the study revealed that Covid-19 has affected the Shanghai Stock Exchange negatively. In other words, the rise of covid-19 in China by one thousand confirmed cases daily, this leads to a decrease in the Shanghai Stock Exchange by more than 0.1 percent. Also, results showed that the Corona pandemic was contained in the republic of China. Therefore, this study provides important information to investors, first, to keep investing in Shanghai Stock Exchange because the pandemic was brought under control inside and widely spread elsewhere. Second, to scale up the weight of shares of health and technology companies and to reduce airlines and tourism shares weight in the financial portfolios.
Keywords: Republic of China, Covid-19, Shanghai Stock Market, SSE 180 Index.

أثر كوفيد–19 على بورصة شنغهاي للأوراق المالية

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الملخص تهدف هذه الدراسة إلى قياس أثر فيروس كوفيد-19 على بورصة شنغهاي للأوراق المالية في جمهورية الصين الشعبية خلال فترة الثلث الأول من سنة 2020م، وقد تم تطبيق منهجية الانحدار البسيط عن طريق استخدام طريقة المربعات الصغرى والمتوسطة (OLS). أوضحت نتائج الدراسة أن فيروس كوفيد-19 قد أثر بشكل سلبي على بورصة شنغهاي للأوراق المالية، حيث أن ارتفاع حالات الإصابة في جمهورية الصين بعدد ألف حالة مؤكدة يومياً، يؤدي ذلك إلى انخفاض بورصة شنغهاي للأوراق المالية بنسبة 1%. كما بينت نتائج الدراسة أيضاً أن الجائحة تم احتوائها في جمهورية الصين الشعبية. وقد خرجت الدراسة بمجموعة هامة من التوصيات للمستثمرين كان أهمها، أولاً: الاستمرار في الاستثمار داخل بورصة شنغهاي للأوراق المالية باعتبار أن الوباء تمت السيطرة عليه داخل جمهورية الصين، بينما انتشر بشكل كبير في باقي دول العالم، وثانياً، زيادة الوزن النسبي لأسهم شركات قطاع الصحة والتكنولوجيا، وتخفيض الوزن النسبي لأسهم شركات الطيران والسياحة في المحافظ المالية.
الكلمات المفتاحية: جمهورية الصين الشعبية، كوفيد-19، بورصة شنغهاي للأوراق المالية، مؤشر شنغهاي 180.

1.1 Introduction

There have been many global pandemics in history such as the Black Death (Plague) 1346-1353 and the Spanish Flu 1918-1920.Recently, Covid-19has been characterized as a pandemic by the World Health Organization. The evolution and the economic impact of this disease is highly uncertain [1]. A few studies have estimated a massive impact on the growth of global economic, for instance, [2] has estimated a significance contraction in the global economy by 3 per cent as a consequence of the pandemic this year, which is much worse than the financial crisis of 2008-2009. In the same vein, [3] has projected a reduction in GDP according to two scenarios. The first scenario shows a reduction in global GDP by up to ¾ per cent this year if the outbreak is contained, while it will record 1¾ per cent reduction if it is not contained compared to 2019. A few signs of economic decline have already emerged, for example, there has been a plunge in many international financial stock markets such as Dow Jones, S&P 500, FTSE, and SSE in China. More importantly, crude oil prices reached the lowest point in history. The low demand of Chain to crude oil, the second biggest economy globally, is the prime reason behind this decline [3-4].

1.2 Problem Statement.

Financial markets play a vital role in economic growth and they are considered to be mirrors of economics, because they reflect the performance of companies in real economies. Most of financial stock markets decreased sharply as the pandemic widened significantly. This decline can be attributed to the quarantine restrictions imposed on the employment in most economic activities. Subsequently, this may affect many sectors in financial markets such as aviation and tourism, etc. Chinese economy estimated to decline by up to 8 per cent in 2020 which is the highest around the world [3]. Based on that, the purpose of this paper is to measure the impact of Covid-19 on the SSE. The study problem can be summarized in the following question: What is the financial effect of Covid-19 on the Shanghai Stock Exchange?

1.3 Aims and Importance of the Study

The aim of this study is to measure the impact of Covid-19 on the performance of SSE. It is of great importance for investors to know whether the pandemic affects SSE, so that they can take the right decisions on time. I chose (SSE) because China was the source of the virus. In addition, it is the biggest economy in terms of imports and exports.

1.4 Hypothesis

H0: Covid-19 has no impact on SSE.
H1: Covid-19 has impact on SSE.

1.5 Data and Methodology.

Variables used in this paper are the daily number of confirmed cases in China as the independent variable and the closed price of SSE as the dependent variable. The former is used as a proxy of the Covid-19. Data collected from daily reports for the first third of 2020. Simple linear regression using (OLS) method was used to measure the impact of the Covid-19 on SSE. All data will be extracted from investment and ourworldindata websites.

1.6 Literature review.

There is a shortage of studies on the impact of Covid-19 on financial markets but there are plenty of studies in terms of macroeconomics. For instance, [1] conducted a study titled The Global Macroeconomic Impacts of Covid-19: Seven Scenarios. Results show that there will be a negative impact on the global economy because of the pandemic, particularly, in the short term. Also, the study shed light on the importance of investment on health care system. [5] conducted a study titled The Macroeconomics of Epidemics. They examined the interaction between economic decisions and epidemic dynamics using SIR. Findings reveal that the epidemic generates both supply and demand effects on economics which lead to a large and persistent recession. [6] modeled Kenyan Economic Impact of Coronavirus using Discrete-Time Markov Chains. Results show that Covid-19 has affected negatively all economic sectors of the country with the agriculture being the hardest hit, followed by tourism sector, while manufacturing sector is the least affected.

This paper contributes to the context of Covid-19 pandemic by discovering its effects on the financial stock exchange (SSE).

The remainder of this paper is structured as follows: Chapter II a brief overview of Covid-19. Chapter III presents Shanghai Stock Exchange in addition to its structure. Chapter IV measures the effect of Covid-19 on SSE, While Chapter V concludes the results and recommendations.

II. Covid-19

Covid-19consists of three parts, i.e., CO is the first two letters of the word corona, VI is the first two letters of the word virus and D is the first letter of the word disease [7]. The virus has emerged in November 2019 in Wuhan province in China. Subsequently, the outbreak of covid-19 has not only been recorded in China, but it has crossed the border and spread globally, particularly, in EU and USA.

Table 1:Global Statics of confirmed cases (01/01/2020 to 30/04/2020)

N	World Confirmed Cases	China Confirmed Cases	China Percentage of the world	N	World Confirmed Cases	China Confirmed Cases	China Percentage of the world
1	27	27	100%	41	98,172	80,667	82%
2	44	44	100%	42	109,695	80,859	74%
3	59	59	100%	43	114,235	80,879	71%
4	59	59	100%	44	118,613	80,908	68%
5	59	59	100%	45	125,497	80,932	64%
6	59	59	100%	46	133,853	80,954	60%
7	59	59	100%	47	167,418	81,020	48%
8	60	59	98%	48	180,094	81,063	45%
9	60	59	98%	49	194,843	81,086	42%
10	61	59	97%	50	213,149	81,130	38%
11	61	59	97%	51	242,374	81,229	34%
12	66	63	95%	52	338,235	81,484	24%
13	239	235	98%	53	377,968	81,553	22%
14	392	386	98%	54	416,881	81,631	20%
15	534	526	99%	55	468,092	81,733	17%
16	631	623	99%	56	527,839	81,827	16%
17	17,372	17,211	99%	57	715,377	82,157	11%
18	20,615	20,448	99%	58	777,187	82,241	11%
19	24,522	24,320	99%	59	851,587	82,295	10%
20	28,273	28,047	99%	60	928,491	82,395	9%
21	31,491	31,207	99%	61	1,006,063	82,465	8%
22	40,540	40,206	99%	62	1,316,988	82,698	6%
23	43,105	42,696	99%	63	1,391,881	82,784	6%
24	45,177	44,724	99%	64	1,476,792	82,870	6%
25	60,328	59,865	99%	65	1,563,819	82,925	5%
26	64,543	64,021	99%	66	1,653,160	83,004	5%
27	71,332	70,618	99%	67	1,873,639	83,303	4%
28	73,327	72,508	99%	68	1,953,786	83,352	4%
29	75,191	74,258	99%	69	2,033,745	83,402	4%
30	75,723	74,652	99%	70	2,117,297	83,754	4%
31	76,719	75,543	98%	71	2,350,993	83,817	4%
32	79,339	77,234	97%	72	2,427,353	83,849	3%
33	80,132	77,749	97%	73	2,513,399	83,864	3%

34	80,995	78,159	96%	74	2,579,823	83,876	3%
35	82,101	78,598	96%	75	2,657,910	83,884	3%
36	83,365	78,927	95%	76	2,915,995	83,912	3%
37	89,068	80,134	90%	77	2,981,427	83,938	3%
38	90,865	80,261	88%	78	3,054,404	83,940	3%
39	93,077	80,380	86%	79	3,131,302	83,944	3%
40	95,316	80,497	84%				

Source: Our world in data. Own elaboration.

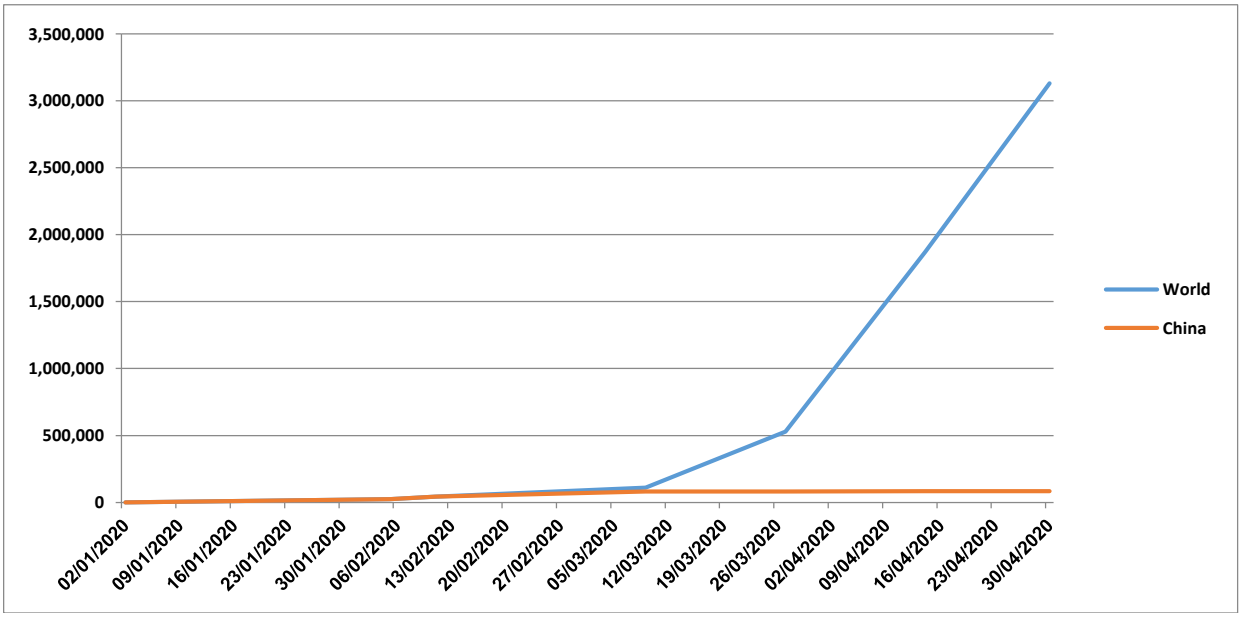


Fig.1: The growth of COVID-19.

Table 1 and figure 1 exhibit the evolvement of Covid-19 in China and all over the world. At the beginning of January 2020, Covid-19 was still in its fancy where there were only 27 confirmed cases over the world and all of them were in China. Thirteen days later, first confirmed cases were diagnosed out of China (Thailand). In the same context, confirmed cases recorded more than fifteen thousand worldwide in the beginning of Feb and China represented more than 91 percent of these cases. Covid-19 virus is highly contagious [8] so that confirmed cases exceeded its first million in the third of April, but China at this time accounted only for less than 9 percent with 82,465 confirmed cases. Globally, confirmed cases have grown exponentially, thus, the second million confirmed cases had been recorded in the middle of April, while the third was recorded at the end of it, China accounts for only 4 and 2 percent approximately with 83,402 and 83,938 confirmed cases respectively. It is obvious that the pandemic is widely spread globally while it has been contained in China due to strict quarantine regulations.

2.1 Incubation, attributes and symptoms of the pandemic.

The mean incubation period of Covid-19 ranges from 2.1 to 11.1 days [9]. Human-to-human transmissions, facilitating its spread via droplets, contaminated hands or surfaces. Covid-19 can persist on inanimate surfaces like metal, plastic or glass for up to 9 days, but can be efficiently inactivated by surface disinfection procedures with 62e71% ethanol, 0.5% hydrogen peroxide or 0.1% sodium hypochlorite within 1 minute [9] [10]. [11] conducted a study with a total of 201 patients, results reveal that the most common symptoms are fever 93.5%, cough 81.1%, productive cough 41.3%, dyspnea 39.8% and fatigue ormyalgia 32.3%. Chinese government rolled out a new restrictive regulation in order to contain the spread of the pandemic such as self-isolate, social distancing and isolate the infected province. In the same vein, [12] distributed its strategic objective with the aim of mitigating the infection of the virus and they are:

1) Avoiding close contact with people suffering from acute respiratory infections.
2) Frequent hand-washing, especially after direct contact with ill people or their environment.
3) Avoiding unprotected contact with farm or wild animals.
4) People with symptoms of acute respiratory infection should practice cough etiquette (maintain distance, cover coughs and sneezes with disposable tissues or clothing, and wash hands).
5) Within healthcare facilities, enhance standard infection prevention and control practices in hospitals, especially in emergency department.

[13] have studied the proximal origin of Covid-19 from comparative analysis of genomic data. Results clearly show that the virus is not a laboratory evolved or a purposefully manipulated virus.

III. Shanghai Stock Exchange.

SSE was founded in September 1990 [14]. Since then, many reforms under the supervision of State

Council and the direct guidance of the Chinese Securities Regulatory Commission have implemented and led to the evolution of SSE, for instance, in late of 1997, a new structure on the basis of the separation of the supervision of banking, securities and insurance sectors have been adopted, subsequently, a package of several laws were enacted, in order to enhance the securities and future markets [15]. Nowadays, Shanghai Stock Exchange comes forth globally in terms of total market capitalization, after NYSE, Nasdaq – US and Japan Exchange Group, while it is ranked twelve in terms of listed companies [16].

3.1 Main Market Data of the SSE.

Monthly trading days range between 20 to 22 days, except for January which has more off days because of the end of year holidays. At the end of April, there were 1,599 companies listed on the SSE, with 19,384 listed securities and a market capitalization of 346,830 million Yuan with the total turnover of 347,423 million Yuan. Furthermore, in the same month, there were 1661 listed stocks, 50717 shares, 9,840 bonds, 7256 funds, 400 optional and 203374 repo with 14.07 weighted averages P/E ratio (table3).

SSE reflects the performance of many sectors in the economy of China. The pie chart, figure 2, presents the main sectors, in terms of listed companies in SSE. It is clear that the financial sector comprised of more than one-third followed by materials sector which represents approximately 16% of the market, while industrial, health care, consumer staples, consumer disc and information tech, account for 8.4%, 7.4%, 6.98%, 6.9%, 5.7%, respectively. In addition, utilities, energy and telecom sectors represent altogether less than 11% of the market.

Table 2: Key statistics of SSE during the period of study.

Item	Jun.2020	Feb.2020	Mar.2020	Mar.2020
Trading days	16	20	22	21
Number of Listed Companies	1583	1599	1605	1618
Number of Listed stocks	1626	1642	1648	1661
Number of Listed Securities	18152	18407	18914	19384
Total Issued Volume (100 Million)	40761	40826	40915	41078
Total Market Capitalization (100 Million RMB Yuan)	354226	346830	330897	347423
Total Turnover in Value (100 Million RMB Yuan)	220362	278701	311766	271303
Share (100 Million RMB Yuan)	44701	75661	75158	50717
Bond (100 Million RMB Yuan)	5028	5468	10142	9840
Fund (100 Million RMB Yuan)	5117	8303	10277	7256
Option (100 Million RMB Yuan)	310	600	960	400
Repo (100 Million RMB Yuan)	165076	188631	215068	203374
Weighted Average P/E Ratio	14.42	14.08	13.44	14.07

Source: SSE Monthly Market Statistics. Own elaboration.

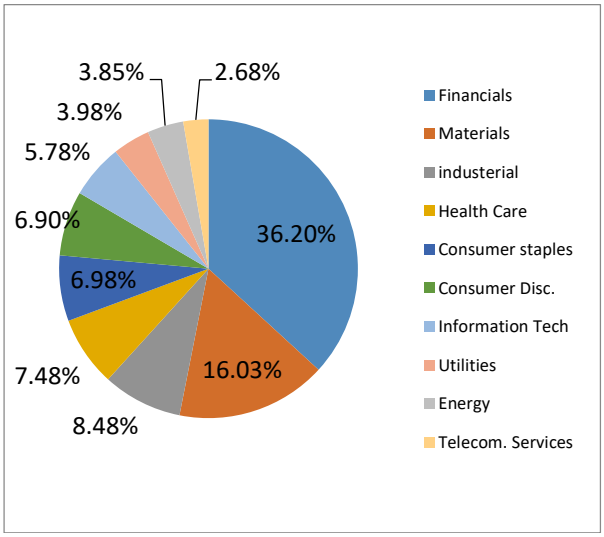


Fig.2: Sector Break down of SSE

3.2 Shanghai Stock Exchange Indices System Construction.

SSE consists of four indexes and they are listed below [17]:

3.2.1 SSE Composite Index, launched in 15 July 1991, is the first index and it aims to reflect the overall performance of the SSE. It represents A and B shares stocks on SSE, both of them are issued by companies incorporated in mainland China. The former are ordinary and common shares traded in local currency, whilst the latter are special shares traded in foreign currencies because they dedicated to foreign investment.

3.2.2 SSE 180 Index, launched in 01 Jul 2002, consists of the largest 180 A-share stocks that represent all sectors based on size and liquidity. It aims to reflect the performance of Shanghai blue chips.

3.2.3 SSE 50 Index, launched in 02 Jan 2004, represents 50 of the largest, highly liquid A-share stocks incorporate on SSE.

3.2.4 SSE 380 Index, launched in 29 Nov 2010, comprises of 380 stocks which are well-developing with good profitability. It aims to reflect the development of national economy; therefore, the stocks of this index are selected from the remaining Shanghai listed A-shares after removing the constituents of SSE 180 Index.

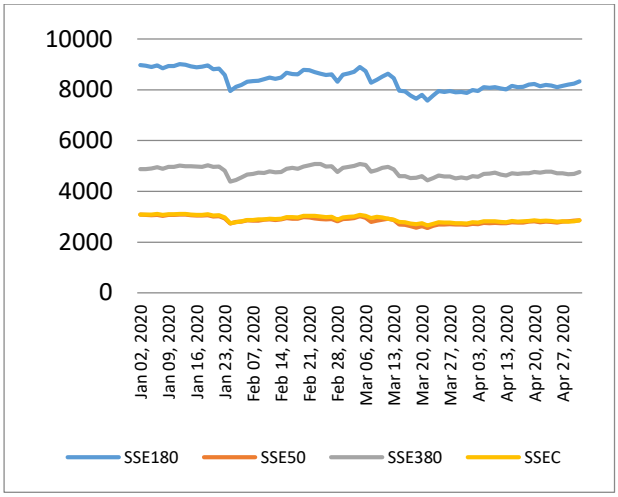


Fig. 3 Closed price of main stock indices of SSE, daily data (Feb to April 2020) Source: SSE website, Own elaboration.

Figure 3 displays the performance of SSE's indices during the period of the study. The indices, SSE Composite, 180, 50 and 380 indexes, showed a real reduction at the beginning of Feb, but they re-corrected themselves at the end of March and this re-correction can be attributed to the containment of Covid-19 announced by China government on the 10th of Mach.

IV. Results and discussion.

The purpose of this paper is to discover whether Covid-19 has adverse effect on SSE. Thus, simple linear regression was carried out using (OLS) technique and expressed in model (1) below:

Log_sse = α + βLog _cc+ μ(1)

Where (Log_sse) is the daily closed price of SSE, α is the constant, while Log _ccis the daily confirmed cases andμ is the error. The coefficient β reflects the relative importance of the independent variable when it explained by the dependent one.

All data were converted into logarithmic form to minimize heterogeneity problem if exists and this may stem from the different kinds of variables[18]. Ordinary least squares (OLS) were employed to estimate equation number (1), employing observations consists of 79 which covers the daily period from the 1st of Feb to 30th of June 2020. The results obtained are shown in table 3.

Table 3: Effects of Covid-19 on SSE (model 1)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	3.508579	0.005838	600.9765	0.0000
LOGX	-0.010683	0.001320	-8.096310	0.0000
R-squared	0.459840	Mean dependent var		3.463039
Adjusted R-squared	0.452824	S.D. dependent var		0.018787
S.E. of regression	0.013897	Akaike info criterion		5.689340
Sum squared resid	0.014870	Schwarz criterion		5.629354
Log likelihood	226.7289	Hannan-Quinn criter.		5.665308
F-statistic	65.55023	Durbin-Watson stat		0.205388
Prob (F-statistic)	0.000000			

For the confirmed cases, the coefficients β is statistically significant and the relationship between Covid-19 and SSE is negative as it was expected. The model has a good explanatory power, as reflected in the R squared 0.459840, which means that the model explains more than 45% of the variability of the dependent variable. Regarding the model specification, it is obvious that the model is suffering from autocorrelation problem (D. W statistic is close to zero. i.e., 0.205388).

In order to remedy this technical problem, the model is switched to the first difference [19], provided omitting the consonant from the converted model. The new specification is presented in model 2 and the results obtained are shown in table 4:

log yt−log yt−1= B(Log xt−Log xt−1) (2)

Table 4: Effects of Covid-19 on SSE (model 2)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Logxt-xt-1	-0.018932	0.003802	-4.979296	0.0000
R-squared	0.240796	Mean dependent var		0.000422
Adjusted R-squared	0.240796	S.D. dependent var		0.007017
S.E. of regression	0.006114	Akaike info criterion		7.343774
Sum squared resid	0.002878	Schwarz criterion		7.313559
Log likelihood	287.4072	Hannan-Quinn criter.		7.331678
Durbin-Watson stat	2.146626			

The new results have been improved remarkably in terms of autocorrelation problem, it is clear that the latter problem is resolved, as it shows a value of 2.146626 for the Durbin-Watson.

Regarding R-squared of this model, it decreased substantially with respect to model (1), more bluntly, the model explains around 24% of the variability of the dependent variable. The low value of R-squared can be attributed to the cause

of containing the pandemic as Chinese government declared on the 10thof April 2020.Thecoefficient of confirmed cases keeps statistically significant at 99% confidence level with negative sing. The estimation reveals that increasing one thousands of confirmed cases leads to a reduction of one percent in the Shanghai Stock Exchange during the period of the study.

The headings and subheadings from introduction to Acknowledgement must be in 9 points, bold face, aligned left, don't underline any words in your paper, subheadings are numbered with 1, 2, 3 etc, delete and type).

Last part of this paper is dedicated to check the model in terms of the stability and the fitness of the residual which are of paramount importance to accept the model.

4.1 Testing for model stability:

(CUSUM) Cumulative sum test (Brooks, 2014), is performed to diagnose how stable the parameter is, results expressed in figure number 6prove the stability of the parameter β of the model.

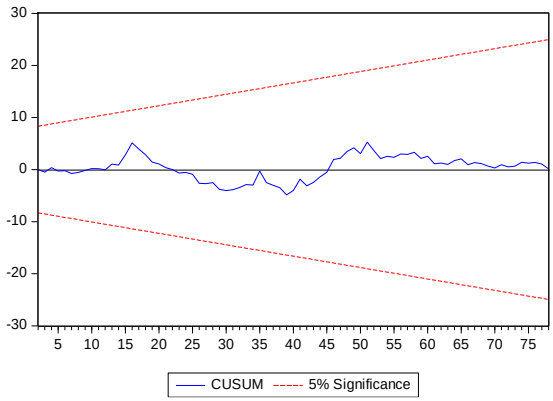
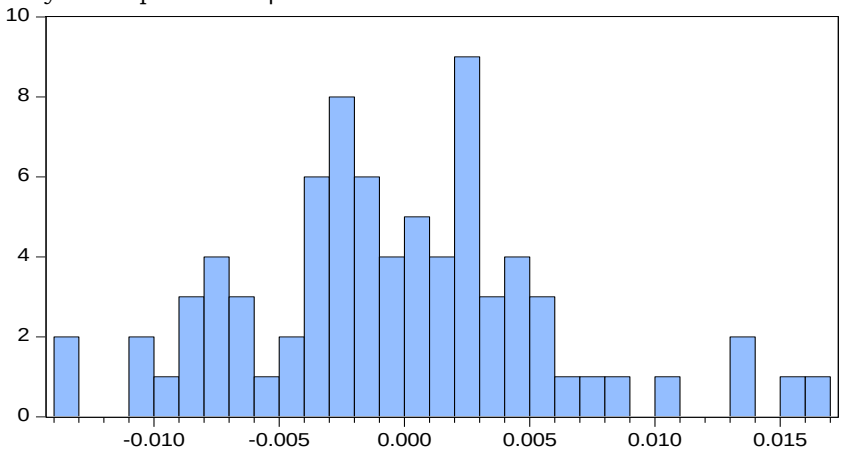


Fig. 6: Cumulative Sum Test.

4.2 Jarque–Bera (JB) Test of Normality.

Jarque-Bera test is a commonly applied test for normality [20]. The p value of this test is 0.291290, which is more than 0.05, and that illustrates the normality distribution of the residuals.



Series: Residuals	
Sample 1 78	
Observations 78	
Mean	-0.000426
Median	-0.000640
Maximum	0.016392
Minimum	-0.013679
Std. Dev.	0.006099
Skewness	0.370005
Kurtosis	3.459806
Jarque-Bera	2.466869
Probability	0.291290

Fig. 7: Jarque-Bera s 'histogram of normality

4.3 Heteroscedasticity.

Goldfeld–Quandt test is used to discover whether the model has heteroscedasticity [20], the value of F-statistic in table 5, F=0.2644, proves the null hypothesis. i.e., Model does not have heteroscedasticity.

Table 5: Breusch-Pagan-Godfrey Test

F-statistic	1.26	Prob. F(1,76)	0.264
Obs*R-squared	1.27	Prob. Chi-Square(1)	0.259
Scaled explainedSS	1.46	Prob. Chi-Square(1)	0.227

V. Conclusion.

Covid-19 was emerged in China in November 2019. Subsequently, it has spread transferring immensely across the world. Therefore, WHO announced Covid-19 as a pandemic. This paper has tried to assess the effect of Covid-19 on the SSE in China. For this, regression estimation using OLS method to measure the effect has been done using the confirmed cases in China as the independent variable;and the closed price of SSE as the dependent variable. The results obtained show that Covid-19 has an adverse effect on SSE. In other words, when the number of the confirmed cases rises by 1000 thousand, the SSE decrease by more than 0.1 percent during the period of the study. Furthermore, approximately 24% of the decline in the SSEC during the period of study is explained by the Covid-19.

The outcomes also show that the first million confirmed cases wererecorded on the third of April, while the second and third millionswere recorded on the sixteenth and twenty ninth of April respectively. More specifically, China accounted for more than 90% of confirmed cases till the second of March 2020, while it accounted for just 3 percenton the thirtieth of April 2020 and that can be attributed to thecontainment of Covid-19 due to quarantine restrictions implemented by the Chinese government.Based on the above conclusions, the researcherprovides two kinds of recommendations to investors who run financial portfolios. First, is to keep investing in Shanghai Stock Exchange because the pandemic was controlled inside China and widely spread elsewhere. Second and most importantly, is to scale upthe weight of shares of health and technology companies and to reduce airlines and tourism share weight. In addition to that, investorshave to follow restrictively the WHO's recommendations concerning combating Covid-19

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