The impact of the covid-19 pandemic on major Asian stock markets: evidence of decoupling effects

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Abstracts: This paper investigates the impact of covid-19 pandemic on stock markets behavior in Asia stock markets: Shanghai, Hong Kong , Japan, and Korea during the period 12/2/2019 to 13/3/ 2020. Results indicate evidence of two states that distinguish the behavior of the stock markets during the sample period. In state 1, Shanghai stock market reacted positively to Hong Kong and Japan stock markets behavior, but in state 2, Hong Kong stock market digressed and Japan's Nikkie remained a strong driver of Shanghai stock market. Our findings also indicate in state 1, Hong Kong market was significantly influenced by Korea stock market, but in state 2, reacted significantly to the news from Shanghai stock market, and then digressed from Korea stock market behavior. The response of Japan stock exchange indicate Nikkei was strongly linked with Shanghai stock exchange in state 1, but decoupled from all three markets in state 2.

Keywords: covid-19; Markov switching; Asia; stock markets.

Introduction:

The fast expansion of the corona-virus Covid 19, around the globe, nearly 200,000 infections in about 120 countries by Februry 4, have spread fear around the globe and disrupted the world economic activities, including capital markets, the nerve of the world economy. Despite the start of the outbreak of the virus (Covid-19) was in December 2019, stock markets did not respond immediately as there was little information about the expected duration of the crisis and whether China would be able to contain it within a short period of time, and the risks entailing to the global economy due to the virus spread and becoming pandemic that endanger the global health situation. As a result of the great uncertainty that prevailed among investors in the third week of February, stock markets around the world incurred trillions of US dollars in losses in a single week (ending February) seen as the worst week for financial markets since the 2008 global financial crisis. On this week China's Shenzhen stocks incurred losses among major markets regionally as they closed sharply lower, followed by Nikkei 225, and then Hong Kong's Hang Seng. On the first week of March due to stimulus measures declared by central banks, some of these markets rebounded and gained earnings that erased the previous week's losses, but very soon again hit by another big losses. Central banks stabilization policies around the world took different directions in their attempt to avail the needed fiscal and monetary policy support. While the US Federal Reserve bank cut the interest rate to 1% . The European Central Bank, Bank of Japan and Bank of England announced readiness to respond to any negative impacts caused by the pandemic to safeguard financial stability of their markets. Chinese government approved 500 billion yuan ($71 billion) loans with low interest rates to small enterprises affected by the impact of the pandemic. However, all these moves by the central banks and governments to reassure investors around the world did little to calm fears, as financial markets resumed again their slide down after March second. To date, the virus outbreak is still expanding and causing global chaos that may disrupt economic activities in many countries around the world. Till now, no body knows how long will last the uncertainty hanging over the world economy. Unfortunately, the feared biggest problem ahead, is shrink of global economic growth. The OECD has already warned that continuation of the outbreak could cut global GDP growth to 1.5%, sending a number of major economies into recession.

The major problem facing the global economy as a result of the consequences of the epidemic is that it is difficult to envisage complete containment of the virus outbreak as almost after three months after the Chinese government announcement the globally adopted policy of social distancing without causing disproportionate economic and human costs. The production time for approved and effective Coronavirus vaccine is estimated to be around 18 months, which by then the global economy already plunged in deep recession. The International Monetary Fund disclosed that the pandemic was already driving the global economy into recession, urging countries to respond with "very massive" spending to avoid dipping into recession that may cause debt defaults of emerging markets. As a response to the IMF call, policy makers in major economies including Asia announced massive fiscal and monetary measures that aims to stimulate economies, but these measures characterized as short term measures that mitigates immediate damages to corporate funding to avoid looming credit crisis.

It is well known that transmission of exogenous shocks to the real economy is via capital markets . As stock markets fall and household wealth shrink, household savings increases and consumption fall, which lead into economic depression. This effect can be very strong in the economies where household highly exposed to equity assets. Covid-19 seems to be a potentially powerful direct hit on household confidence, as they become pessimistic about the longer term.

The initial purpose of this paper is to assess the impact of covid-19 pandemic breakout on Major Asian stock markets, using a number of indexes including Shanghai composite , Hong Kong's Hang Seng index, Nikkei 225 , and Korea stock market index.The interactive association between these stock markets is important for investors as well as for policy-makers in these countries. Increasing departure of stock prices from their fundamental driver, that is the common economic bonds linking these markets, implies increasing risk for investors in these stocks. The results in this paper can help us understand how these markets can react to common shocks that hit the global economies. The purpose of this paper is to assess the impact of covid-19 breakout on the major Asian stock markets including Shanghai composite index, Nikki 225, Hong Kong stock exchange, and Korea stock price index (Kospi).

The importance of this research stems from our view that diversion of these markets from joint long term trend or shared common cyclical path reveal that these markets become fundamentally weak and speculatively strong as covid-19 outbreak raise investment risk in these markets. The results in this paper can help us comprehend the magnitude and scale of the pandemic crisis on major Asian capital markets.

Methodology:

Markov-switching models (MSM) are extensively applied in finance, business and economics to capture switching behavior of capital markets and economic growth at periods of shocks (Hamilton 1989, Garcia and Perron 1996, Engle and Hamilton 1990, Kim, Nelson and Startz (1998), Guidolin (2011b, 2011a), Onour and Sergi (2012), Krolzig, H.-M. 1997, and on infectious disease outbreak detection (Lu., et al.,2010).

MSM models are used for series displaying transition over a finite set of unobserved states, allowing the process to behave differently in each state. The transition time from one state to another and its duration is considered random. For example, these models can be used to indicate the process that controls the time at which stock markets respond to unexpected shock and duration under different states.

Consider the series z_t, where t=1,2,…..T, is characterized by two states as in the following :

$$state\ 1: z_t = \mu_1 + e_t$$

$$state\ 2: z_t = \mu_2 + e_t$$

Where μ_1 and μ_2 are the constant terms in state 1 and state 2, respectively. e_t is a white noise error term with variance σ^2. The two states model shifts in the intercept term, and if the time of switches is known, the above model can be stated as

$$z_t = s_t\mu_1 + (1 - s_t)\mu_2 + e_t$$

Where s_t is 1 if the process in state 1 and 0 otherwise. The above model can be estimated using dummy variables and Ordinary Least Square (OLS) estimation technique. But in our case because we don't know in which state is the process at any time and therefore s_t is not observed then we cannot use OLS with dummy variables.

As a result, Markov-switching regression models (MSRM) designed to allow the parameters to change over the unobserved states. In the simplest form, we can state the MSRM as state-dependent constant term:

$$y_t = \mu_{st} + e_t$$

Where μ_{st} is the parameter of interest; $\mu_{st} = \mu_1$ when $s_t = 1$ and $\mu_{st} = \mu_2$ when $s_t = 2$

Even though it is difficult to specify with certainty in which state the process lies at any point of time, but the probabilities of being in each state can be estimated. For that purpose, the transition probabilities in two states process of Markov chain can be stated as $p_{s_t s_{t+1}}$. For example, p_{11} denotes the probability of being in state 1 in the next period given that the process is in state 1 in the current period. Similarly, p_{22} indicate the probability of staying in state 2, while in state 2 in the most recent immediate period.

Probability values closer to 1 imply more persistent process which remains at a given state for longer period of time.

Markov-switching regression models allow a quick adjustment after the process change from one state another, and their general specifications can be stated as:

$$z_t = \mu_{s_t} + x_t\alpha + y_t\beta_{s_t} + e_s$$

Where z_t is the dependent variable, μ_{st} is the state dependent constant (intercept) term, x_t is the vector of exogenous variables with state-invariant coefficient α , y_t is a vector of exogenous variables with state dependent coefficients β_{s_t} and e_s is independent and identically distributed error term.

Empirical Analysis:

The descriptive statistics in table (1) reveal significant changes in the four stock markets indexes after the outbreak of the virus after February 10, when the news spread in Asia and then to the rest of the world. The mean figures indicate the average daily losses of these markets during February 10 to March 13, and shows the most hardly hit market was Japan's Nikki 225 which sustained about (-263) points in loss, and the highest median (-153) losses and volatility (400). Japan's Nikki 225 reaction to Covid outbreak was even more stronger than the Chinese stock markets, Shanghai and Hong Kong, where the virus initially was detected. The standard deviation and the mini/max statistics show Nikki 225 and Hong Kong stock markets were the most volatile as losses in these two markets reached record levels of (-1128) and (-648) respectively. The numbers in the table also reveal that Shanghai and Korea stock markets are the most linked to each other, as the response of these two markets are almost identical in most statistics in the table, including the mean losses, volatility, skewness, and the mini/max statistics as well as the sum point losses. The figures (1) –(5), also reveal the association between these markets.

Table (1): Descriptive statistic of daily change

	Shanghai	Hong Kong	Japan	Korea
mean	-4.26	-11.63	-263.93	-3.85
median	-3.54	18.75	-153.17	-0.78
Std.dev	49.36	322	400	33.15

skewness	-0.33	-0.06	-0.74	-0.38
min	-111	-648.69	-1128.58	-83.8
max	90.63	706.95	229.06	62.3
sum	-110.85	-302.46	-6862	-100

Figures (1)-(3) reveal that based on stock markets reactions the period from the virus outbreak (February-10) to the second week of March can be segmented into two different states. The first state reveal the time period when the news of the pandemic announcement linked with a great deal of hope that China will be able to contain the virus spread, but soon after it became apparent that the virus has already spread to the rest of the world and may cause world economic downfall due to social containment and business lock out the second state started and governments in Asia and elsewhere pledged fiscal stimulus to avoid economic recession that feed capital markets collapse. These two states can be viewed from the plots of stock price changes included in the figures below.

Figure (1) indicate Hong Kong and Japan stock markets were closely linked to each other in the first state period, but then digressed from each other in the second state, which started from the first week of March.

Figure (1): Hong Kong (HSE) and Japan (JSE) stock prices fluctuations

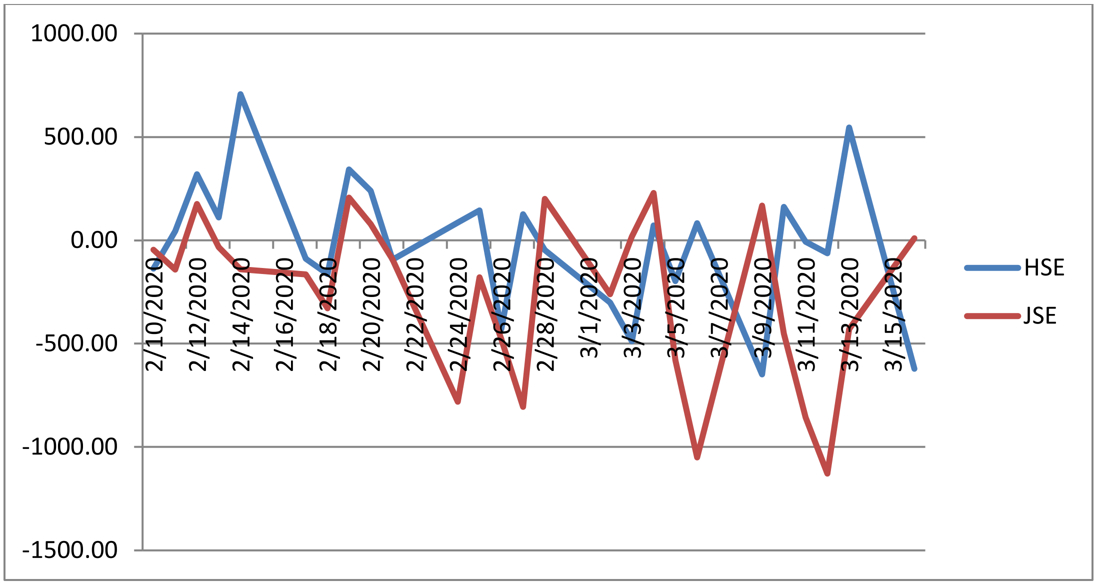
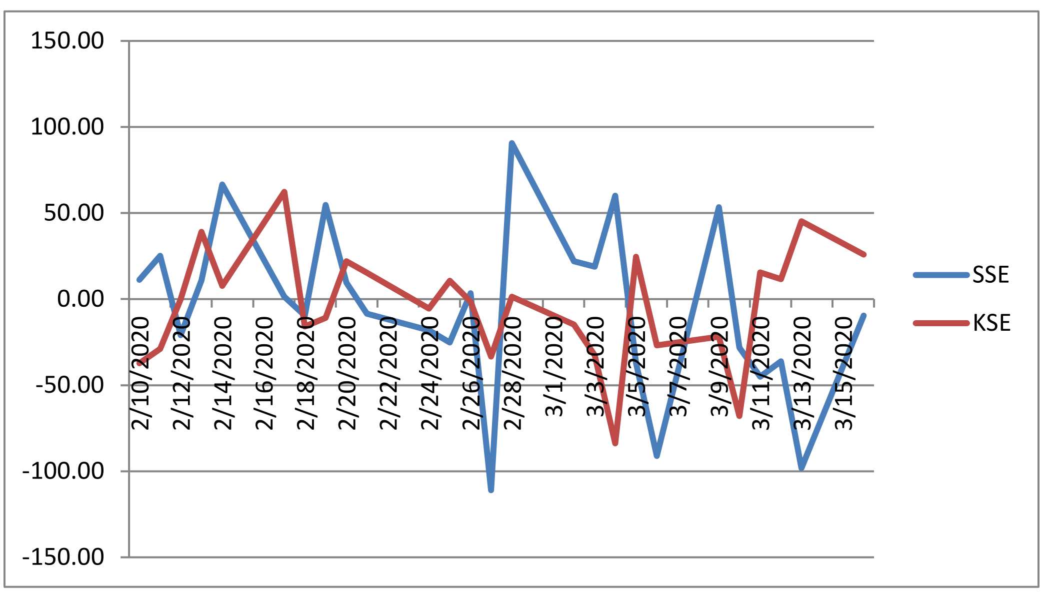


Figure (2) show the behavior of Korean stock market to price change in Shanghai stock market in the two states period. It is apparent that change in Shanghai composite index and Korea stock prices were very closely associated in the first state period, as indicated by the systematic movements, but diverged from each other also by the first week of March, as in the case of figure (1).

Figure (2): Shanghai and Korea stock prices changes



Price fluctuations of Shanghai and Hong stock prices in figure (3), also reveal close association of the two markets in the first period (state 1), despite the higher volatility of Hong Kong stock price movements, compared to Shanghai stock price fluctuations. However, in state two which start from the end of the first week of March, the two markets started decoupling behavior (figures (1) & (2)).

Figure (3): Shanghai and Hong Kong stock prices fluctuations

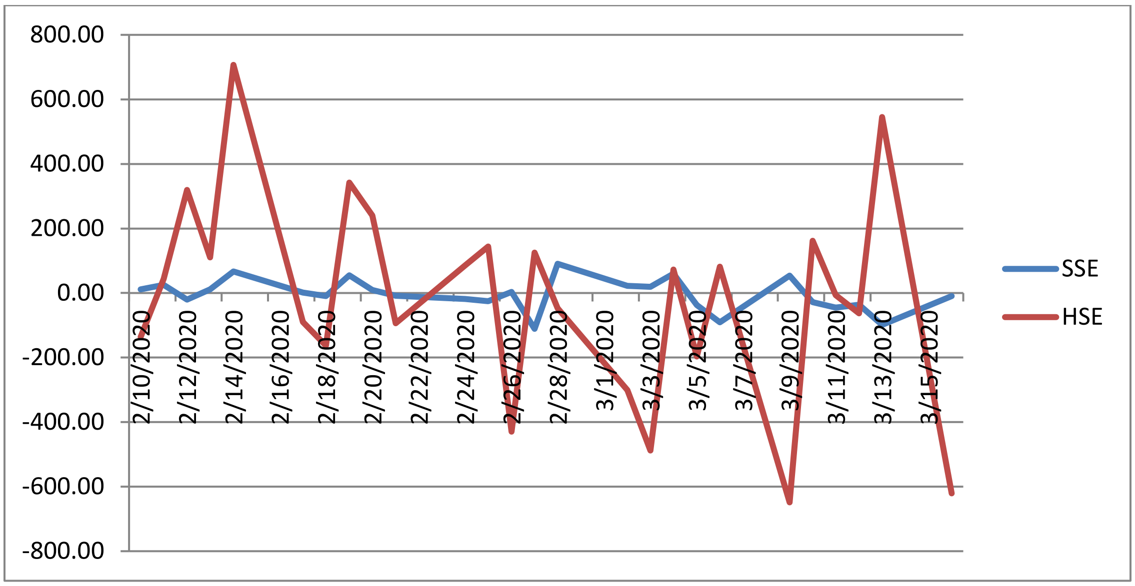
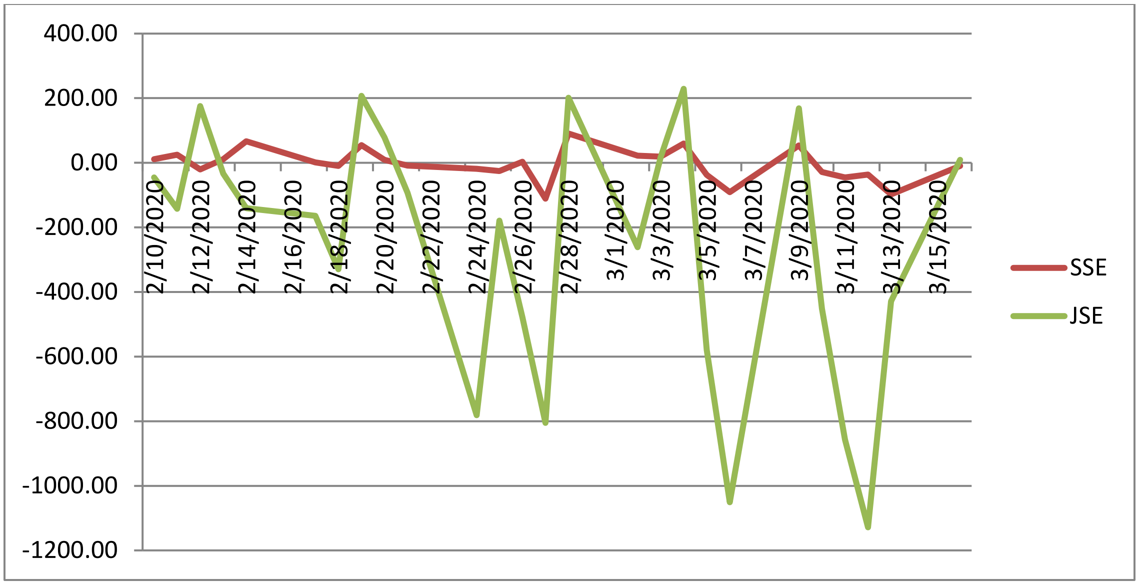


Figure (4) shows the behavior of Shanghai and Japan stock prices movements in the two states, and indicate that there is no clear (or significant) decoupling effect of the two markets, despite the high volatility behavior of Japan stock market compared to Shanghai stock price fluctuations. The behavior of the two markets prices indicate the positive association of the two markets have been maintained thorough out the two states. Figure (4) also indicate, despite the strong belief that the virus outbreak was initiated in main land China, the response of Shanghai composite index was far less than the other markets, in particular Japan stock market which responded more stronger than the rest of the markets.

Figure (4): Shanghai (SSE) and Japan (JSE) stock price changes



Tables (2) - (5) investigate more formally, the dynamics of price change of the four markets using Markov switching dynamic regression (MSDR) that uses change in prices of each market as dependent variable and price change of the other remaining markets as independent variables during covid-19 outbreak from December-2-2019 to 13-March-2020. Estimation results of MSDR corroborate with the data plots of the figures (1 – 4), indicating that there are two distinct states, the state after the announcement of the virus but before realizing it a serious global threat, and the state when the virus outbreak was recognized as a global threat and this was the time when governments comprehended that the pandemic may cause a serious risk to the global economy, as it may roll on uncontrolled for uncertain period of time. Table (2), reveal the behavior of Shanghai stock market reacting to the behavior of the other markets. It shows that in state 1, only Hong Kong and Japan stock markets influence significantly and positively Shanghai stock market, but in state 2, while the impact of the two markets are significant, Japan still linked positively with Shanghai stock price changes, but Hong Kong and Shanghai decouple from each other in state 2 as the coefficient of Hong Kong market become negative. This is exactly what is portrayed in figures (3) and (4). This implies that after the pandemic outbreak, Hong Kong and Shanghai markets digressed from each other, but Nikki still remained influential to Shanghai stock market. The transition probability p22=0.92, implies that duration of state 2 was about at least two weeks (13 trading days), that is the digression period of Hong Kong market from Shanghai stock market.

Table (3) assesses the behavior of Hong Kong stock market as response to the reaction of the rest of the markets to covid-19 pandemic effects. It shows in state 1, Hong Kong market was significantly influenced by Korea stock market, but in state 2, started reacting to the news from Shanghai stock market, while diverting from Korea stock market behavior. The impact on Hong Kong market due to covid-19 pandemic effect initially was significant, even though of short term, lasted only for 3 days, as indicated by the transition probability (p22=0.68).

Table (2): Shanghai stock market

Independent vbls	Coefficient	Std. error	p-value
State 1:			
Δ Hong Kong	0.18	0.02	0.000*
Δ Japan	0.09	0.03	0.006*
Δ Korea	0.62	0.59	0.29
constant	-38.4	10.9	0.000*
State 2:			
Δ Hong Kong	-0.02	0.01	0.07
Δ Japan	0.05	0.01	0.000*
Δ Korea	-0.13	0.13	0.34
Constant	9.27	3.63	0.01*
Transition probabilities:			
P11 = 0.37			
P12=0.63			
P21 =0.08			
P22 =0.92			
D(2,2)= 13 days			
N =67			

Table (3): Hong Kong SE

Independent vbls	Coefficient	Std. error	p-value
State 1:			
Δ Shanghai	-3.96	2.42	0.10
Δ Japan	-0.17	0.29	0.56
Δ Korea	6.68	3.46	0.05**
constant	-198	129.5	0.12
State 2:			
Δ Shanghai	2.48	0.83	0.000*
Δ Japan	0.02	0.12	0.82
Δ Korea	-0.75	1.83	0.67
Constant	78.9	46.6	0.09
Transition probabilities:			
P11 = 0.26			
P12=0.74			
P21 =0.32			
P22 =0.68			
D(2,2)=3 days			
N =67			

Results in table (4), reveal reaction of Korea stock exchange to responses of the other three markets, and indicate that Korea stock exchange was not showing any signs of being significantly influenced by any market in the group in the two states. The response of Japan stock exchange, in table (5) to the behavior of the other three markets, indicate that Nikki was strongly associated with Shanghai stock exchange in state 1, but showed decoupling effect from all three markets in state 2. The transition probability p22=0.99, indicate the duration of state 2, which reflect its reaction to the behavior of the other markets expected to last at least about three months (100 days) from the start of state 2, that is the beginning of June-2020.

Table (4): Korea SE

Independent vbls	Coefficient	Std. error	p-value
State 1:			
Δ Hong Kong	0.04	0.02	0.11
Δ Japan	-0.05	0.09	0.55
Δ Shanghai	-0.92	0.57	0.11
constant	-5.95	18.8	0.75
State 2:			
Δ Hong Kong	0.002	0.01	0.83
Δ Japan	0.001	0.01	0.89
Δ Shanghai	-0.028	0.06	0.67
Constant	1.52	3.2	0.63
Transition probabilities:			
P11 = 0.20			
P12=0.80			
P21 =0.08			
P22 =0.92			
D(2,2)= 13 days			
N =67			

Table (5): Japan

Independent vbls	Coefficient	Std. error	p-value
State 1:			
Δ Hong Kong	0.28	0.22	0.21
Δ shanghai	6.96	1.18	0.000*
Δ Korea	-0.09	1.78	0.95
constant	-268	63	0.000*
State 2:			
Δ Hong Kong	-0.03	0.11	0.75
Δ Shanghai	1.01	0.83	0.22
Δ Korea	-2.41	1.52	0.11
Constant	5.42	33.4	0.87
Transition probabilities:			
P11 = 0.96			
P12=0.04			
P21 =0.01			
P22 =0.99			
D(2,2)=100			
N =67			

*Significant at 1% significance level
**significance at 5% significance level

Concluding remarks:

This paper investigates the impact of covid-19 pandemic on stock markets behavior in major Asian stock markets, including Shanghai, Hong Kong (SEHK), Japan's Nikkei 225, and Korea Stock price index (kospi) , using Markov switching dynamic regression (MSDR) that uses stock price return of each market as dependent variable and price returns of the remaining markets as independent variables during covid-19 outbreak from December-2-2019 to 13-March- 2020. Estimation results of MSDR, indicate there are two distinct states, the state at the announcement of the virus news but before realizing that it may become serious global threat, and the state when the virus outbreak was realized as a global problem and subsequent governments comprehension that the pandemic may cause a serious risk to the global economy, as it may roll on uncontrolled for unknown period of time. Results in the study reveal that Shanghai stock market in state 1, was positively and significantly reacted to Hong Kong and Japan stock price behavior, but in state 2, while the impact of the two markets was still significant on Shanghai stock exchange, Nikkei 225 remained a strong driver of Shanghai stock price changes, but fluctuation in Hong Kong stock price showed decoupling evidence as its coefficient become negative. This implies that after the pandemic outbreak, Hong Kong and Shanghai markets digressed from each other, but Nikkei still remained influential to Shanghai stock market. The transition probability p22=0.92, implies that duration of state 2 was at least two weeks (13 trading days), that is the digression period of Hong Kong market from Shanghai stock market.

However, the behavior of Hong Kong stock market as response to the reaction of the rest of the markets to covid-19 pandemic effects, indicate in state 1, Hong Kong market was significantly influenced by Korea stock market, but in state 2, started reacting to the news from Shanghai stock market, and decoupling from Korea stock market price changes. The transition probability (p22=0.68) reveal that the digression from Shanghai stock market due to covid-19 pandemic effect was short term, lasted only for 3 days.

Results in the paper also reveal reaction of Korea stock exchange to responses of the other three markets, and indicate that Korea stock exchange was not showing any signs of significant influence by any other market in the group in the two states. The response of Japan stock exchange, to the behavior of the other three markets, indicate Nikkei was strongly associated with Shanghai stock exchange in state 1, but showed decoupling effect from all three markets in state 2. The transition probability p22=0.99, indicate the duration of state 2, which reflect its reaction to the behavior of the other markets expected to last for three months (100 days) from the start of state 2, that is until the beginning of June-2020.

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