Stock market vulnerability to the Covid-19 pandemic: Evidence from emerging Asian stock markets

Rabhi, Ayoub

University of Sidi Mohamed Ben Abdellah

April 2020

Stock market vulnerability to the Covid-19 pandemic: Evidence from emerging Asian stock markets

Ayoub Rabhi

Sidi Moahmed Ben Abdellah University, Fez, Morocco

E-mail : rabhiayoubaka@gmail.com

Abstract

This paper studies empirically the emerging Asian stock market vulnerability to pandemics. Taking the Covid-19 virus as a case study, we used the ARDL panel data approach to investigate the impact of the daily Covid-19 confirmed cases along with a behavioral component based on a triggering fear event related to news about Covid-19 deaths. The results indicate that both the reported daily growth of Covid-19 confirmed cases along with the triggering fear event related to news about death, affected the Asian stock markets performance negatively, other variables such as oil price, gold price, exchange rates, and the U.S stock market were also found to be determinants of the Asian stock markets during the studied period.

Keywords: Behavioral finance, Covid-19, Event study, Pandemic, Stock market

Jel classification: G1, G14, G15

Introduction

The unprecedented Covid-19 infectious disease outbreak, starting in December 2019 in China (Wuhan) and spreading all over the world 1 month later to be declared a pandemic by the World Health Organization (WHO) on the 11th of march, frustrated economies, surrounded them with uncertainty and caused panic in different stock markets around the world making them plunge while allowing news related to the event to be the main market drivers during this period. (Baker et al., 2020) considered the event to be a first, since no previous infectious disease outbreak, including the Spanish Flu, has affected the U.S stock market as powerfully as the Covid-19 pandemic did. The response of stock markets in a very short period with such volatile movements[1] shows how vulnerable they are to major events, and while the exact global economic impacts are not clear yet, the severity of the situation appealed governments around the world to anticipate and adopt certain policies to mitigate the impact[2] and contain the situation.

The literature on the impact of pandemics on stock markets is scarce since most studies focus on the global impact on economies (McKibbin and Sidorenko, 2006; Smith et al., 2011; Karlsson et al., 2014), and lately, some authors tried to draw a map on the effects of the Covid-19 pandemic on some economies and the world economy (Atkeson, 2020; Luo, Kwok, and Tsang, 2020; Ayittey et al., 2020).

However, some studies on the impact of infectious diseases on stock markets exist, like the impact of Severe Acute Respiratory Syndrome (SARS) on stock prices in Taiwan (Chen, Jang, and Kim, 2007), the impact of Ebola Virus Disease (EVD) outbreak on some stock markets (Ichev and Marinč, 2018) where authors demonstrated the relationship between stock markets and diseases. Dustin L. Pendell and Chulgu Cho's (2013) study examined as well the market reactions following Five Foot-and-Mouth Disease (FMD) outbreak in Korea.

Meanwhile, researchers are putting efforts lately to model the effects of the Covid-19 outbreak on different stock markets, (Al-Awadhi et al., 2020) using Panel data showed how the Covid-19 virus cases and deaths impacted the stock market returns in China, and while (ZEREN and HIZARCI, 2020) cointegration analysis results pointed out the relationship between some European stock market indexes and Covid-19, (Morales and Callaghan, 2020) found when using granger causality and spectral causality that it's the Italian stock market that triggered fear in other European stock markets and made them tumble. Similarly, we conducted our study to investigate the effects of this pandemic with a focus on Asian emerging stock markets, and to do so, we employed dynamic panel data analysis to draw some conclusions about stock markets during this pandemic crisis.

This said, we also refer to the large literature of behavioral finance identifying the stock market's reactions to news and sentiments (Chan, 2003), (Gilbert and Karahalios, 2010) and (Li et al., 2014) since our study will take into consideration two aspects, one related to the general impact of the Covid-19 pandemic on emerging Asian stock markets and one related to the behavior of stock markets after a triggering fear news event. Thus, we think that the pandemic crisis is an

[1] According to (Zhang et al., 2020): "Together with the US crash, stock markets in Europe and Asia have plunged. FTSE, the UK's main index, dropped more than 10% on 12 March, 2020, in its worst day since 1987.2 The stock market in Japan plunged more than 20% from its high in December 2019"

[2] Different central banks around the world lowered interest rates and quantitative easing in the USA

opportunity to study and shed light on stock market vulnerability and reaction to major events and bad news in a short period.

To explore the behavior of different Asian stock markets during this crisis, this paper uses available data in an attempt to answer the following questions: How did the Covid-19 pandemic outbreak impact Asian stock markets? How the stock markets reacted to bad news related to the pandemic? And what short term factors determine the Asian stock market's behavior during uncertain times?

The remainder of this paper is as follows. Section 2 provides the research methodology and the econometric model, section 3 presents data analysis, section 4 concludes.

Methodology

To examine the effects of this pandemic on stock markets behavior, we use daily data of 6 emerging Asian countries (China, India, Indonesia, Malaysia, Philippine, Thailand) and focus on the period from the 2nd of January 2020 to the 1ST of April 2020, we employed dynamic panel data and selected panel data ARDL approach since we have a time series long panel (Time dimension greater than cross-sectional dimension) which makes the dynamic mean group estimators (MG and PMG) more appropriate in this case. Besides, the panel ARDL (Autoregressive distributed lag) approach is used regardless of the variables are I(0), I(1), or both I(0) and I(1). Therefore, the estimation of the Mean group (MG) and the Pooled Mean Group (PMG) are both presented in section 3, as the main goal is to estimate the long-term cointegration relationship and to identify the short-term dynamics.
We estimate 2 equations, one using the S&P emerging Asia 40 Index as a dependent variable, and the second using every country's stock market index as a dependent variable

Two estimators PMG and MG are used to estimate each equation and the choice between the two is done by the Hausman test. We recall that the MG estimator provides the long-run parameters for the panel through making an average of the long-run parameters for individual countries from the ARDL model.

For instance, if the ARDL model follows:

$$Y_t = a_i + \gamma_i Y_{i,t-i} + \beta_i X_{i,t-1} + \varepsilon_{it}$$

Then the long-run parameter is θ_i

$$\theta_i = \beta_i / 1 - \gamma_i$$

The MG estimator for the whole panel will be

$$\hat{\theta}_i = {}^{1}/_{N} \sum_{i=1}^{N} \theta_{i,}$$

$$\hat{a}_i = {}^{1}/_{N} \sum_{i=1}^{N} a_{i,}$$

The above equations show how the model estimates separate regressions for each country and calculate the coefficients as an unweighted mean of the estimated coefficients for the individual countries. According to (Pesaran and Smith, 1995), the MG estimator does not impose any restrictions. It allows all parameters to vary and be heterogeneous in the long-run and short-run.

The ARDL specification is presented as follow:

$$Y_{i,t} = \sum_{j=1}^{p} \lambda_{ij} Y_{i,t-j} + \sum_{j=0}^{q} \delta_{ij} X_{i,t-j} + \mu_i + \varepsilon_{i,t}$$

Where $Y_{i,t}$ is the dependent variable of country *i* at day *t* (S&P emerging Asia 40 Stock Index, used for all countries in the first estimation, and every country's stock market index in the second estimation) regressed on $X_{i,t-j}$ which is the vector of independent variables (daily growth percentage in the number of Covid-19 cases; News on Covid-19 deaths (Which is a dummy variable reflecting bad news and starts taking 1 once the first death is declared in a country and 0 otherwise); other stock market determinants: The natural logarithm of Gold price, the natural logarithm of Exchange rate, the natural logarithm of Oil price and the natural logarithm SP 500 stock market index)); $\mu_i$is the fixed effects and $\varepsilon_{i,t}$ is the error component.

The error- correction form of the PMG estimator is presented as follow:

$$\Delta y_{i,t} = \theta_i (y_{i,t-1} - \beta_i X_{it}) + \sum_{j=1}^{p-1} \lambda^*{}_{ij} \Delta y_{i,t-1} + \sum_{j=0}^{q-1} \delta^*{}_{ij} \Delta X_{i,t-j} + \mu_i + \varepsilon_{i,t}$$

θ is the error correction coefficient that measures the speed of adjustment towards the long-term equilibrium; λ^* and δ^* are the short term coefficients of dependent and independents variables; β are the long term coefficients while the subscripts *i* and *t* represent the country and time.

3. **Data Analysis**

Daily data of stock market indexes (S&P emerging Asia 40 Stock Index) were obtained from Standard and Poor's database, the other stock market indexes for the six emerging Asian countries (The FTSE Straits Times Index (TSI); FTSE Bursa Malaysia (KLSE); Jakarta Composite Index (JKSE); Bombay Stock Exchange Sensex (BSESN); Shanghai Stock Exchange Composite Index (000001. SS); Philippines Stock Exchange Index(PSEI)) and Exchange rates for every country were obtained from Yahoo finance database; we also obtained the data related to Covid-19 cases and deaths for the same period from Eurostat; while the data related to Oil price and Gold price were retrieved from the Federal Reserve database.

3.1. Data and stationarity

Table 1

Summary statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
LSPTRINDEX	384	3.562	0.047	3.448	3.610
LSPP500INDEX	384	3.787	0.053	3.658	3.837
DUMDEATH	384	0.325	0.469	0	1
CASES	384	15.71	44.04	0	440
LOIL	384	1.665	0.175	1.18	1.85
LGOLD	384	3.199	0.012	3.168	3.226
LCURUSD	384	1.780	1.152	0.608	4.221
LSMIND	372	4.929	0.970	0	5.910

Note. LSPTRINDEX is the natural logarithm of the daily S&P Emerging Asia 40 Index (Total Return), LSPP500INDEX is the natural logarithm of the daily S&P 500 Index(Total Return), DUMDEATH is a dummy variable (Starts taking 1 when first death was declared and 0 before); CASES is the daily growth of confirmed cases, LGOLD is the natural logarithm of daily Gold price, LOIL is the natural logarithm of daily Crude oil price, LCURUSD is the natural logarithm of the daily nominal exchange rate of every countries currency against the dollar; LSMIND is the natural logarithm of the six countries stock market indexes (TSI, KLSE, JKSE, BSESN, 000001SS, PSEI)

Table 2

Panel Unit root tests

Variables	Tests			Integration
	Im, Pesaran, and Shin	ADF	PP	
LSPTRINDEX	-9.65907 (0.0000)	110.524 (0.0000)	288.321 (0.0000)	I(0)
LSP500INDEX	-11.3695 (0.0000)	135.166 (0.0000)	305.881 (0.0000)	I(0)
CASES	-6.74920 (0.0000)	69.2997 (0.0000)	245.127 (0.0000)	I(0)
LOIL	-5.93757 (0.0000)	110.524 (0.0000)	278.252 (0.0000)	I(0)
LGOLD	-3.32985 (0.0004)	58.5762 (0.0000)	278.252 (0.0000)	I(0)
LCURUSD	-2.7733 (0.0028)	25.2800 (0.0136)	243.035 (0.0000)	I(0)
LSMIND	0.76778 (0.7787)	4.94381 (0.9598)	8.28179 (0.7627)	I(1)

Note: the P-values are in parentheses

Table 1 presents the summary statistics of the data included in our study. It can be seen that the highest growth in daily total confirmed cases is 440% (registered in India when the cases went from 5 to 27 in one day). **Table 2** shows the results of panel unit root tests which indicate that all the variables in our study are stationary at level with constant and trend except for (LSMIND) that becomes stationary after the first difference. The optimal lag structure for the model is ARDL (1, 1, 1, 1, 1, 1)

3.2. Estimation

Table 3

First regression: LSPTRINDEX as dependent variable

Variables	PMG		MG	
	Long run	Short-run	Long run	Short-run
Error correction		-1.097*** (0.032)		-1.120*** (0.028)
LGOLD	0.221*** (0.0475)	-0.065* (0.038)	0.223*** (0.081)	-0.058** (0.023)
LOIL	0.104*** (0.009)	-0.018 (0.011)	0.098*** (0.012)	-0.024*** (0.009)
CASES	1.120 (0.000014)	-0.000025 (0.000013)	-5.330 (0.00001)	-0.000021** (0.00001)
DUMDEATH	0.032*** (0.0075)	-0.036*** (0.008)	-0.006*** (0.002)	-0.0073*** (0.002)
LSP500INDEX	0.330*** (0.028)	-0.039** (0.015)	0.309*** (0.042)	-0.041** (0.021)
LCURUSD	-2.558*** (0.294)	1.176 *** (0.415)	-1.444*** (0.431)	-1.65*** (0.505)
Constant		3.866*** (0.433)		4.523*** (0.930)
Hausman test		chi2(5) = 14.94 P = 0.0106***		

Note: the table reports the coefficients. Standard errors are in parentheses between parentheses
*, **, and *** indicate significance at 10 %, ** at 5 % and *** at 1 %.

Table 3 reports the results of our dynamic panel data estimation in which the Hausman test indicates that the (MG) estimator is more efficient than the (PMG) estimator. The error correction term is significantly negative and between 0 and -2 which validates the existence of cointegration in the model and supports our findings. Our target variables show that the daily growth of Covid-19 confirmed cases had a significant negative short-run relationship on the Asian stock markets performance represented by the daily S&P Emerging Asia 40 Index, the same significant negative short-run relationship is also found with the fear triggering news variable representing the start of death event, it is seen that once death started, the stock markets performance reacted in a stronger negative way to the bad news compared to the previous period of unregistered death, the long-run relationship, on the other hand, shows that only the bad news related to Covid-19 death that is significantly negative with the stock markets performance, which indicates that a triggering fear event (news related to death here) can drive the stock markets in short term.

Other variables that are supposed to determine the stock markets behaviour in short term, they are significant and show different signs, as for Gold price (LGOLD) it is significant and have a negative sign in the short run, this confirms its role as a safe-haven in destabilized stressed stock markets, however, the long run shows a significant positive relationship with the stock markets

performance. The same result was found with crude oil price variable (LOIL), it shows that an increase in oil price can have a significant negative impact on the stock markets performance in the short run but a significant positive impact on the long turn, this result is in line with other studies (Zhu et al., 2014; Mishra and Debasish, 2019), but the literature on the relationship between Asian stock markets and crude oil price is ambiguous, however, the usual presumption that oil-importing countries should have a negative relationship with oil prices can't be tested here since we have a mix of exporting and importing oil countries, but one reason could be that the falling prices of oil during this period[3] contributed positively to the Asian stock markets performance. Concerning the S&P 500 Index (LSP500INDEX), we can notice a significant negative relationship in the short run while a positive impact in the long run, the significance means that Asian stock markets are integrated with the U.S stock market and that the latter can be a driving force of the emerging Asian stock markets. Coming to the Exchange rate (LCURUSD), both the short and long-run coefficients are significantly negative, the increase of exchange rate of different currencies against the dollar (which is a depreciation of the currencies in our case) can negatively impact the stock markets performance, this result confirms the exchange rates to be considered as a driving force of Asian stock markets.

Table 4
Second regression: LSMIND as a dependent variable

Variables	PMG		MG	
	Long run	Short-run	Long run	Short-run
Error correction		-1.067232*** (0.032)		-1.077855*** (0.0343)
LGOLD	6.909*** (1.839)	-2.359305 (1.471)	7.839502*** (2.526)	-1.844516* (1.002)
LOIL	0.989*** (0.346)	-0.4842268 (0.350)	0.963177** (0.435)	-0.5755052** (0.272)
CASES	0.0001673 (0.00056)	-0.000649** (0.00027)	0.000343 (0.0003)	-0.0006279*** (0.00012)
DUMDEATH	0.3606421 (0.260)	-0.2792607** (0.116)	0.1416735 (0.125)	0.1546499 (0.134)
LSP500INDEX	5.656694*** (1.116)	0.2417298 (0.407)	5.083937*** (1.609)	0.2838542 (0.708)
LCURUSD	-29.281*** (4.744)	-25.28168** (12.283)	-28.53437* (16.234)	-32.38703* (18.506)
Constant		40.01294** (19.015)		50.51063* (27.153)
Hausman test		chi2(5) = 2.60 P = 0.7613		

Note: the table reports the coefficients. Standard errors are in parentheses between parentheses
*, **, and *** indicate significance at 10 %, ** at 5 % and *** at 1 %.

[3] According to the Federal reserve database, the prices went from 67 dollars to 19 dollars from the first of January to the First of April.

The second estimation with every country's stock market index reported the (PMG) estimator to be more efficient according to Hausman test, the significant error correction term value is also respecting the criteria for cointegration, and showing similar results compared to the first regression, thus, the daily growth of confirmed Covid-19 cases affected negatively the stock markets performance in the short run, same significant negative effect in the short run is seen when news about the first death in every country was declared. Other explanatory variables (Gold price, Crude oil price, S&P 500 Index and Exchange rates) show same significant signs in the long run but insignificant short-run effects (although the signs of the coefficients are the same as those in the first regression), except for the Exchange rates variable that have the same significant negative impact on Asian stock markets performance.

4. Conclusion

Investigating the vulnerability and reaction of the emerging Asian stock markets performance (China, India, Indonesia, Malaysia, Philippine, and Thailand) to the Covid-19 pandemic outbreak, we found that the reported daily growth of Covid-19 confirmed cases along with the triggering fear event related to news about death, affected the Asian stock markets performance negatively, other explanatory variables such as Gold Price, Crude Oil price, Exchange rates, and the U.S major 500 stock market index were also included and proved themselves to be stock market drivers during periods of turmoil and uncertainty.

References

Al-Awadhi, A.M., Alsaifi, K., Al-Awadhi, A., Alhammadi, S., 2020. Death and contagious infectious diseases: Impact of the COVID-19 virus on stock market returns. J. Behav. Exp. Finance. 27, 100326. https://doi.org/10.1016/j.jbef.2020.100326

Atkeson, A., 2020. What Will Be the Economic Impact of COVID-19 in the US? Rough Estimates of Disease Scenarios. NBER Work. Pap. Ser. 25.

Ayittey, F.K., Ayittey, M.K., Chiwero, N.B., Kamasah, J.S., Dzuvor, C., 2020. Economic impacts of Wuhan 2019-nCoV on China and the world. J. Med. Virol. 92, 473–475. https://doi.org/10.1002/jmv.25706

Baker, S.R., Bloom, N., Davis, J., Kost, K., Sammon, M., Viratyosin, T., 2020. The unprecedented stock market reaction to Covid-19. PANDEMICS LONG-RUN Eff. Eff. 1, 33–42.

Chan, W.C., 2003. Stock price reaction to news and no-news: Drift and reversal after headlines. J. finance. econ. 70, 223–260. https://doi.org/10.1016/S0304-405X(03)00146-6

Chen, M.H., Jang, S.C. (Shawn), Kim, W.G., 2007. The impact of the SARS outbreak on Taiwanese hotel stock performance: An event-study approach. Int. J. Hosp. Manag. 26, 200–212. https://doi.org/10.1016/j.ijhm.2005.11.004

Gilbert, E., Karahalios, K., 2010. Widespread worry and the stock market. ICWSM 2010 - Proc. 4th Int. AAAI Conf. Weblogs Soc. Media 58–65.

Ichev, R., Marinč, M., 2018. Stock prices and geographic proximity of information: Evidence from the Ebola outbreak. Int. Rev. Financ. Anal. 56, 153–166.

https://doi.org/10.1016/j.irfa.2017.12.004

Karlsson, M., Nilsson, T., Pichler, S., 2014. The impact of the 1918 Spanish flu epidemic on economic performance in Sweden. An investigation into the consequences of an extraordinary mortality shock. J. Health Econ. 36, 1–19. https://doi.org/10.1016/j.jhealeco.2014.03.005

Li, Q., Wang, T., Li, P., Liu, L., Gong, Q., Chen, Y., 2014. The effect of news and public mood on stock movements. Inf. Sci. (Ny). 278, 826–840. https://doi.org/10.1016/j.ins.2014.03.096

Luo, S., Kwok, †, Tsang, P., 2020. How Much of China and World GDP Has The Coronavirus Reduced? * 1–16.

McKibbin, W.J., Sidorenko, A.A., 2006. Centre for Applied Macroeconomic Analysis Global Macroeconomic Consequences of. Crawford Sch. Public Policy.

Mishra, S., Debasish, S.S., 2019. The quantile dependence between global crude oil price and stock markets in emerging Asia: Evidence from major oil consuming nations. Afro-Asian J. Financ. Account. 9, 309–331. https://doi.org/10.1504/AAJFA.2019.100980

Morales, L., Callaghan, B.A., 2020. Covid19 : Global Stock Markets " Black Swan " Critical Letters in Economics & Finance Covid-19 - Global Stock Markets " Black Swan " 1, 0–14.

Pesaran, M.H., Smith, R., 1995. Estimating long-run relationships from dynamic heterogeneous panels, Journal of Econometrics. https://doi.org/10.1016/0304-4076(94)01644-F

Smith, R.D., Keogh-Brown, M.R., Barnett, T., 2011. Estimating the economic impact of pandemic influenza: An application of the computable general equilibrium model to the UK. Soc. Sci. Med. 73, 235–244. https://doi.org/10.1016/j.socscimed.2011.05.025

ZEREN, F., HIZARCI, A., 2020. the Impact of Covid-19 Coronavirus on Stock Markets: Evidence From Selected Countries. Muhasebe ve Finans İncelemeleri Derg. 1, 78–84. https://doi.org/10.32951/mufider.706159

Zhang, D., Hu, M., Ji, Q., 2020. Financial markets under the global pandemic of COVID-19. Finance. Res. Lett. 101528. https://doi.org/10.1016/j.frl.2020.101528

Zhu, H.M., Li, R., Li, S., 2014. Modeling dynamic dependence between crude oil prices and Asia-Pacific stock market returns. Int. Rev. Econ. Finance. 29, 208–223. https://doi.org/10.1016/j.iref.2013.05.015