APJB

by Saarce Elsye Hatane

COVID-19 Catastrophes and Stock Market Liquidity: Evidence from Technology Industry of 4 Biggest ASEAN Capital Market

Abstract

Purpose: This study examines the influence of various COVID-19 catastrophes variables on the stock market liquidity, considering the market depth and market tightness in the technology industry of the four biggest ASEAN capital markets.

Design/methodology/approach: The study utilised the panel data regression analysis obtained from 177 listed technology companies across the four ASEAN countries from 2 March 2020 to 30 June 2021 using the random effect and weighted least squares. The study also supported the result with robustness test, implementing the quantile regression to further present companies' segmentation within the variables.

Findings: The regression results indicate that daily growth COVID-19 confirmed cases and stringency adversely impacted the stock market liquidity. Confirmed deaths were also found to have a detrimental effect on the stock market liquidity. On the other hand, recoveries and vaccination of COVID-19 enhance the stock market liquidity to escalate.

Research limitations/implications: The study affirms that stock market liquidity is bound to be driven by the COVID-19 variables, but only to be limited to the technology industry observed in four major ASEAN capital markets.

Originality/value: This study initiates the investigation in the four biggest ASEAN capital markets, particularly in the technology industry, regarding the COVID-19 catastrophes and stock market liquidity in regard to market depth and market tightness. This study also enriches the impact of COVID-19 by taking the recovery cases and vaccination of COVID-19 as additional consideration.

Through the result, investors and government may gain insights on which COVID-19 variables have a major impact towards the stock market liquidity. Awareness could be shift towards the rise of confirmed cases, recoveries, and vaccination as it improves the liquidity of capital market in aggregate. The government stringency control was proven to make the stock market more liquid, in which investor can use this opportunity. On the other side, illiquidity was proven to be bound by the rise of confirmed deaths, in which government should predominantly focus on the recoveries as it relates to the stock market liquidity.

Keywords: COVID-19, Stock Market Liquidity, ASEAN, Technology

Paper type: Research Paper

1. Introduction

The year 2020 started with a momentous COVID-19 outbreak that emphasis away from the market risk history. Whereas most investors were concerned about a wide range of market threats, the focus of attention dramatically has shifted to the damage wrought by this rapidly spreading virus. Affected nations and presumably international investors were bound by this sensational news, given that there was no certainty of cure in the first several months after the pandemic began. Extreme uncertainty emerges, creating disruption towards the global market that result market volatility to soar into unprecedented heights since 2008 (Baker et al., 2020). Worldwide stock markets induced detrimental impact due to its emerged spread, accordance to studies conducted in Asia, Europe, and North America (Al-Qudah & Houcine, 2021; Al-Awadhi et al., 2020; Ashraf, 2020; H. Liu et al., 2020; Zhang et al., 2020). Nobody would have foreseen that the emergence of this health crisis would influence the global economy and financial markets.

While it is often assumed that the stock market is somehow driven by exploitation and extreme risk, it is a critical indicator for an economy's health due to its pricing element. Asian countries have been structed tremendously right after the designation of COVID-19 as a global pandemic, with the Asia Dow Index tumbled by 4% in midday. The pandemic's breakthrough induced ASEAN markets into a tailspin and created significant currency rates fluctuations across the region. Thai baht, Indonesian rupiah, and Singapore dollar were the major currencies affected (ASEAN Policy Brief, 2020). The stock markets in Indonesia, the Philippines, Thailand, and Vietnam have lost approximately a quarter of their value. In the first three months of 2020, the market index in Vietnam plummeted by 29.3 per cent, while the index in Malaysia declined significantly by 11.8 per cent (Mishra & Mishra, 2020). Massive effect rose in Indonesia Stock Exchange over the same period as it had implied 6 trading halts of the stock market through sharp drops of more than 5% in one day (Andriani, 2020).

The airborne transmission further prompts a cascade of tremendous government interventions aimed at adhering to stringent restrictions. All sectors were bound by preventive strategies with prohibiting international travel initially, followed by workplace and school closures. As observed in Singapore, the country effectively integrated the Circuit Breaker period on shutting down clusters while retaining primary economic operations (Bernbion, 2020). The government in Thailand and Malaysia indeed has gone to enforce lockdowns and social isolation while at the same time to preserve economic stability (Das et al., 2020). However, the efficiency of lockdown ranges as some countries have difficulty executing the limitations in more densely populated emerging markets (Rhee & Svirydzenka, 2021). Such as in Indonesia, coronavirus infections soared to the highest in Southeast Asia in April 2020 in the apparent lack of stringent control measures (Jaffrey, 2020).

The financial market was expected to return to normality and stability with the initiation of the first coronavirus vaccines in early 2021. Several studies have discovered that mass vaccinations have

significantly lifted the stock market performance (Chan et al., 2021; Hartono, 2021; Rouatbi et al., 2021). Considering mass vaccinations have already been pushed out in Southeast Asian countries, this has enlightened the stock market disruption of a substantial chance of bull market position. Almost 10% of Indonesians, Filipinos, and Thailand have been fully vaccinated, whilst 11% of Malaysians have been treated with the doses in Southeast Asia (Nguyen & Karunungan, 2021). However, the effect of mass immunization on financial market stability remains unexplored in ASEAN nations, particularly in stock market liquidity context. As a result, our study covers the loophole in the connection between immunization and stock exchange liquidity.

COVID-19's unusual situation piques this study offers the opportunity to assess further research in the most significant four ASEAN Stock Exchange countries to the recent findings on examining the impact of COVID-19 on financial markets, specifically the stock market liquidity (Alsmi Mdaghri et al., 2020; Chebbi et al., 2021; C. T. Nguyen et al., 2021; Umar et al., 2020; Baig et al., 2021). Therefore, the research question in this study is whether COVID-19 variables have impact towards the stock market liquidity. While previous studies focus on big markets, research conducted in emerging markets are still relatively unexplored. This study compromised the four major ASEAN countries due to its economic growth stage and the existence of capital markets, and significant contribution to global economic production. These specific regions are comprehended as ASEAN is highly dependent and harmed by the supply and trade disruption in commerce with China and the US since the respected countries had the most prominent confirmed cases since the first halted 2020 (Chong et al., 2020). The prominence of these countries – respectively Indonesia, Malaysia, Singapore, Thailand – derives from their rapid economic growth and capital market liberalisation policies. These nations accounted for about 84 percent of the region's market capitalisation, which is paramount since this study emphasised stock markets (Statista, 2021).
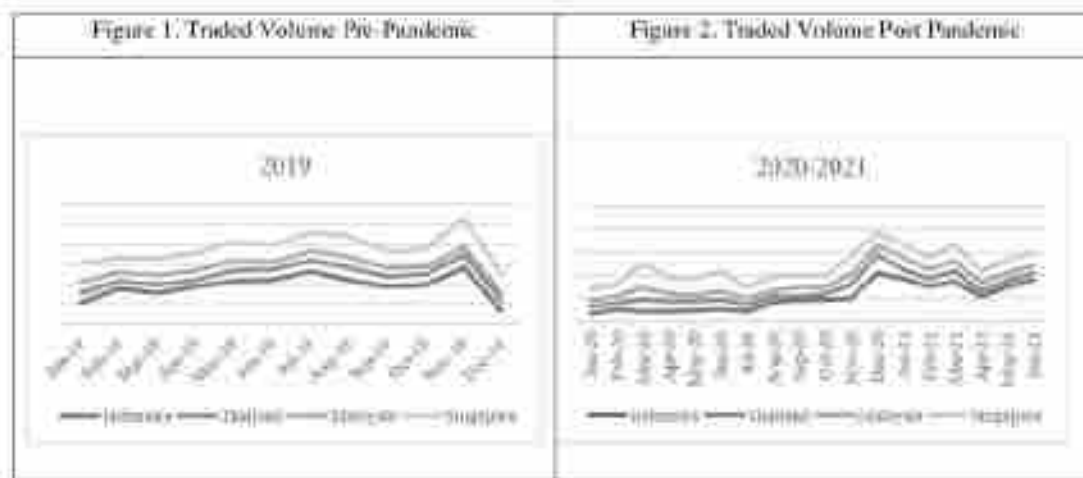
Figure 1. Traded Volume Pre-Pandemic	Figure 2. Traded Volume Post Pandemic

The recent capital market crisis has acted as a wake-up call to market participants in investing in the volatile condition. Two of the figures above present the traded volume in 4 of the biggest capital markets in ASEAN – Indonesia, Thailand, Malaysia, and Singapore respectively. As presented in the pre-pandemic period in 2019, volume traded were increasing from the early year until it started to diminish by the end of 2019 as COVID-19 outbreak began to emerge. During the beginning of post-pandemic 2020, volumes traded were low indicating how investors in ASEAN were in fear on trading stocks in the capital market. In consonance with market efficiency theory, uncertainty leads to dissent within market players, not just among the uninformed but also among the knowledgeable. This ambiguity is reflected in their buy and sell trading activity (Hasan et al., 2018).

Concerning this, stock market liquidity measurement is an essential tool for providing a comprehensive evaluation of financial stability and economic growth. This study contributes to the market liquidity research by examining the impact of good news and bad news from COVID-19 on market liquidity and illiquidity. The proxy for market liquidity is Closing Percent Quoted Spread (CPQS), introduced by Chung & Zhang (2014), which is known as the best approximation to convey the market tightness in estimating the bid-ask spread. While the market liquidity is proxied by Amihud's Illiquidity (Amihud, 2002). This indicator allows various stakeholders to hold and trade stock market securities safely, especially to the fragility of indexes worldwide. Investors can respond to shifting financial needs as an essential part of a company's cost of capital, which influences the portfolio decisions because lower transaction costs imply higher liquidity and vice versa (Ahmed et al., 2020). In addition, the research behind stock market provides insights to the government in relation to a country's economy condition, especially during the epidemic. The consideration of a government controls towards the virus can be adjust as in a way to promise the liquidity in the capital market, thus preserving the outbreak while boost the country's economy health. This implies how the assessment of market liquidity reply to the COVID-19 variables in ASEAN capital market is necessary.

Preceding research has predominantly focused on the influence of fast-spread virus responses in cases, deaths, and stringency. At the same time, the additional impact of COVID-19 recoveries and vaccination is relatively unexplored towards stock market liquidity, especially in the ASEAN countries. Given the above, this research provides a whole package of the crucial aspect of global markets: COVID-19 cases, deaths, stringency, recoveries, and vaccination, to fill in the gap of undiscovered problems in the stock market. The novelty of the present epidemic and new developing worldwide patterns such as aggressive globalisation, quickly evolving technology, and media bonalisation are the drivers of this study. The recent scenario allows this study to examine how market participants have

responded to the epidemic examined in the market liquidity context. Remote working, study-from-home, telemedicine, and international disputes have been established in the meantime, but with the emphasis on minimising COVID-19's spread, these practices have rapidly expanded (Bradley & Stumpner, 2021). Previous research has primarily focused on aggregate sectors, leaving the influence of specific industries on financial markets unexplored. This study addressed this void, at least in part, by concentrating on the sector that mainly took on the lead during the pandemic: the technology industry.

Further, the paper is organized as follow: The second chapter introduces the literature review and research hypotheses. Chapter three comprises the data and empirical approach. Empirical findings alongside robustness test are presented in chapter four. Last but not least, conclusion and limitation of this research will be in chapter five.

2. Literature Review

2.1 Efficient Market Hypothesis Theory

The Efficient Market Hypothesis (EMH) has been the prevailing paradigm in the stock market. An efficient capital market depicts how stock prices adequately reflect all available information (Fama,1970). It tackles how security market prices adjust and change, which is a significant implication for both investors and financial managers, especially in a fragile market condition caused by the COVID-19 crisis. Information accessibility is essential for EMH to analyse market reaction to news and events following the publication of the information. The press plays an essential role in conveying information to capital markets (Preindy & Hu, 2014). Depending on the investor's level of expectation, such events and news may have both ordinary and exceptional effects on investment decisions.

The majority of researchers viewed EMH as a theory that needed to be adjusted based on market conditions at the time. In order to test the relevance, the three levels of market efficiency classified as "weak-form, semi-strong form, and strong form" require varying levels of knowledge. Just as the information is equally accessible and disseminated directly to the stock market, technological advancements quickly impact the rise in the efficient market. Institutional investors have the capacity to evaluate publicly accessible data as well as the ability to gain access to private data. Individual investors, on average, increase their information demand during moments of heightened market uncertainty. Market uncertainty considerably impacts individual investors' need for information (Hasan et al., 2018). As a result, these investors will respond immediately when new information emerges, and prices will act accordingly. This can be seen through the convey of COVID-19 illness, as seen by the deflected stock market performance during the outbreak peak. Several studies examine investors' reactions in the equity market segment across countries to the COVID-19 disease outbreak (Salisu &

Vo, 2020; Shaikh & Huynh, 2021). The stock market performance is dependent on both private and public information that is immediately accessible and is reflected in the stock's fair price.

2.2 Stock Market Liquidity

The issue of market liquidity is a contentious issue among investors. Market liquidity is one of the most essential tools for measuring financial stability and economic growth. Liquid markets are commonly regarded as desirable due to the various advantages, such as better allocation and information quality. The indicator is used by a wide range of decision-makers seeking safeguard stability in the stock market, as liquid stock indicates that prices are informative (ElRaman & Farooq, 2019). This is also one of the key indicators of a company's cost of capital, which impacts investors' portfolio decisions because cheaper transaction costs indicate higher liquidity. Market liquidity is defined as a certain asset capacity than is exchanged in the market in a relatively short period with the smallest cost of loss of value (Kyle, 1936). This means, if market participants may quickly sell large quantities of a financial asset without negatively impacting its price, the asset is considered liquid.

Several liquidity interventions have been proposed in the growing empirical literature to capture all of the aforementioned dimensions. The decision to use one liquidity measure over another is inextricably linked to the data's availability. Several researchers have investigated Liquid markets (Sarr & Lybek, 2002; Wyss, 2004) to have four primary characteristics: Tightness, Depth, Breath, and Resiliency. Tightness refers to low transaction costs, such as the disparity between buying and selling rates, as well as implied costs, such as bid-ask spreads in quote-driven markets. Depth refers to the presence of several orders from potential buyers and sellers, either actual or easily discovered, both above and below the current price at which a security trade. The term "breadth" refers to orders that are both numerous and wide in number, with minor price effects. Resiliency is a business trait in which new orders flow rapidly to correct order imbalances, which appear to drive prices away from what fundamentals warrant. No single liquidity indicator, however, adequately account for all of the aforementioned elements.

More benefits arise from stocks' various liquidity capabilities, which play an essential role in enabling investors to minimise substantial costs. According to the liquidity-adjusted CAPM, the liquidity component must be considered for anticipating stock market returns (Acharya and Pederson, 2003). Several papers have been undertaken to respond to this, emphasising the significance of market liquidity in stock market returns. Researchers have shown that capital market liquidity strongly influences stock returns (Abdullahi & Fakanmoju, 2019; Vialita, 2019). Since it is convenient to exchange securities, it triggers investor to purchase shares and cause a company's stock price to rise. Conversely, low liquidity is deemed to have a higher risk, resulting in higher stock market returns as observed in small structures (Reza Sammakhi & Meirobi, 2016).

2.3 COVID-19 Catastrophes

In terms of events, stock markets are remarkably vulnerable to significant and unusual occurrences. It covers media coverage, political events, natural disasters, terrorism threats, and market crashes (Fauzi & Wahyudi, 2016; Liu and Zhang, 2015; Tavor & Teitler-Regev, 2019; T. Nguyen & Chaiechi, 2021; Wu & Liu, 2012). Several papers also observed initial outbreaks such as SARS and Ebola towards the stock market (Chen et al., 2007; Marine, 2016; Ichev and Marine, 2018). Nonetheless, studies found that COVID-19 influences the stock market more than any previous outbreaks that ever struck the world (Kaur & Saxena, 2020; Feng & Li, 2021). COVID-19 is a worldwide emergency that significantly disrupted economic activities, halting the movement of goods and people and affecting various industries across the country.

Table 1 Previous Studies about COVID-19 on Market Liquidity

No	Authors	Variables	Key Findings
1	Umar, Rubbaniy, and Rizvi (2021)	Independent variable: Covid-19 new cases and Recorded deaths Dependent variable: Stock market's liquidity	Illiquidity and volatility rose in response to the Covid-19 breaking news, but the negative impact on stock market liquidity was short-lived, as liquidity quickly returned to normal. Furthermore, there is no longer-term link between Covid-19 incidence and stock market liquidity
2	Nguyen, Hai, and Nguyen (2021)	Independent variable: Government's disease control and Daily Covid-19 case growth Dependent variable: Stock market return and liquidity	COVID-19-related daily increases in the total number of confirmed cases have a considerable adverse impact on stock market returns and liquidity. Despite this, the government's lockdown has a big and favourable impact on stock performance
3	Baig, Butt, Haroon, and Rizvi (2021)	Independent variable: reported number of confirmed Covid-19 cases, Covid-19 death, Government restriction, news, and Mobility restriction Dependent variable: KSE-100 Index in Pakistan	At the individual stock level, the reported number of confirmed coronavirus infections and deaths, overall bad attitude caused by news, limited mobility, and stricter government restrictions have a detrimental influence on the stock market's liquidity and volatility
4	Chebbi, Ammer, and Hameed (2021)	Independent Variable: Daily growth rate of Covid-19 confirmed cases and Daily growth of Covid-19 confirmed death Dependent variable: S&P 500 stock liquidity	The correlation between COVID-19 and stock liquidity is negative and significant
5	Thanh and Oanh (2021)	Independent variable: Daily growth rate of Covid-19 confirmed cases, Daily growth of Covid-19 confirmed death, and Stringency index Dependent variable: Market depth and Market tightness	The rise in the confirmed number of cases and deaths, as well as the stringency index, were all positively connected with the liquidity related to the depth measure. Furthermore, market depth was favourably connected to verified COVID-19 instances

Previous studies have been conducted specifically on the stock market performance in the context of this rapidly spreading illness. While the stock market has grown particularly volatile and unpredictable, the severity of the pandemic in each state is directly linked to individual stock market fluctuations (Zhang et al. 2020). As observed in six major affected regions – Africa, Americas, Eastern Mediterranean, Europe, South-East Asia and Western Pacific – the virus breakout has had a substantial negative impact on the performance of key stock indices to the surge in reported COVID-19 cases (Al-Qudah & Houcine, 2021). The findings are also consistent with studies conducted in 64 countries, which discovered that stock markets respond quickly to pandemics and that this response evolves over time due to the severity of the pandemic (Ashraf, 2020).

Preventive measures such as lockdown that are applied to inhibit the spread also influences the capital market. Stricter regulations by government interventions significantly impact the stock markets in relation to how investors incorporate this implementation, is observed in big emerging countries (Scherf et al., 2021). However, when stringent restrictions are toned down, market participants react negatively and positively to later relaxations. In diminishing the high rate of cases, lockdown is implemented in Vietnam and surprisingly positively influences the stock market performance (Anh & Gan, 2020). Investor confidence has risen as a result of government interference during the lockdown and increased capital inflow from appealing undervalued stocks, which has helped restore the Vietnam stock market.

Despite various results, the findings are all related to the COVID-19 outbreak influence towards the stock market performance. However, as shown in Table 1, numerous former COVID-19 research have only focused primarily on stock market return, and there has been limited examination of stock market liquidity. During the pandemic, the Indian stock market was the most illiquid of the examined countries (Umar et al., 2020). The research also highlights how illiquidity and volatility spiked in the aftermath of the COVID-19 announcement, but that the issue was only temporary as it soon recovers. It is in accordance with Baig et al. (2021) as stock market liquidity deteriorates and volatility emerged to 580% as correspondence to the rapid spread of the coronavirus, including restrictions and lockdowns. Observed in the S&P500 index, it implies how pandemics also decrease the firm liquidity affected by the growth of confirmed cases and total deaths (Chebbi et al., 2021). Previous research was also performed in six MENA countries indicate that COVID-19 influenced the stock market liquidity in the measurement of market depth and tightness (Alnmi Mdagfiri et al., 2020). The previous finding is confirmed in the study observed in Vietnam, as the increased intensity of COVID converts the stock market to more illiquid, thus increasing the transaction cost. However, strict preventive intervention such as lockdown brings a significant and positive influence towards the stock market liquidity of financial sectors in the Vietnam Stock Exchange (C. T. Nguyen et al., 2021).

2.4 COVID-19 Cases and Stock Market Liquidity

The high breakthrough of COVID-19 cases has captured the world's attention towards the health crisis ever since the first case in Wuhan, China, was discovered on December 31, 2019 (Archived: WHO Timeline COVID-19, 2020). Regardless of the fact that it has a lower fatality rate than most outbreaks, the transmission rate of COVID-19 is currently estimated to be considerably higher (Ahad et al., 2020). The outbreak of COVID-19 did, in effect, boost investor fears about the safety of trading stocks without incurring substantial losses, referring to stock market liquidity. In consonance with EMH theory, technological advances result in the emergence of information, which would trigger the investors to respond and force them into price protection to process and analyse the shocks. This matter results in postponing the trading activity, which decreases the liquidity of the stock market. (Bouhaker et al., 2019).

Previous studies have shown that growth cases of confirmed COVID-19 influence the stock market liquidity, as shown in Table 1. As the growth confirmed cases rise at an alarming rate, stock liquidity is negatively correlated as conducted in MENA countries. Market depth is associated with the growth rate of COVID-19 cases, indicating that the market converting into illiquid due to a decrease in trading volume. It also applies to market tightness as the gap within the bid-ask spread are more comprehensive due to higher transaction cost in trading the securities (Alaoui Mdaghri et al., 2020). Observed in the Vietnam Stock Exchange using the random effects, the research confirms that higher growth rate of confirmed people infect with the virus to drop the stock market liquidity. Then, as of now, the depth of the market is more profound, and transaction cost within the spread in terms of tightness is higher (C. T. Nguyen et al., 2021). A significant negative correlation was also confirmed in the study examined in the S&P500 index. It implies that the daily growth of confirmed cases increases the firm's stock performance (Chebbi et al., 2021). The US capital market is also similarly experiencing a detrimental impact on market liquidity. Throughout terms of the market depth, every percent growth in confirmed cases appears to increase illiquidity by 0.041 percent. While a 1% rise in the bid-ask spread widens the spread gap by 0.038 percent, all of this confirms that confirmed cases degrade stock market liquidity. In that regard, the purpose of this research is to examine the following hypotheses:

H1: COVID-19 cases impact towards the stock market liquidity

2.5 COVID-19 Death Cases, Recoveries, and Vaccinations

Throughout history, there have been many epidemic diseases that have resulted in many deaths. As of 25 April 2021, the total recorded death cases by COVID-19 worldwide have reached 3,092,497 deaths (WHO, 2021). People have become mournfully aware of the death tolls that their governments publish each day as COVID-19 has spread worldwide. This issue is reflected in the stock market liquidity as observed in S&P500; growth death cases by the novel coronavirus has induced a decrease

in company liquidity (Chebbi et al., 2021). Utilising the market tightness, the spread measurement is positively correlated with the growth of deaths, resulting in higher transaction costs as deaths of COVID-19 occurred. Death cases also decrease the liquidity but only in terms of market depth, as observed in six MENA countries (Alaoui Mdaghri et al., 2020). On the other side, the US equity market captures how both measurement of stock market liquidity (depth and tightness) is negatively affected by the increase of death cases (Baig et al., 2021). As opposed to all previous findings, the growth rate of death caused by the airborne virus results in no significant impact towards the stock market liquidity as examined in Vietnam (C. T. Nguyen et al., 2021). Nonetheless, recovery cases have not been explored as most research predominantly focus on deaths. This study enhances the research on assessing the recovery cases of COVID-19 towards the stock market liquidity.

The year 2021 has brought to light the dark tunnel brought by COVID-19, as vaccinations arise as a treatment to boost immunity towards the virus. This topic is remained limited as vaccination had just started in the early year 2021. Several findings integrated that vaccinations of the COVID-19 brought light to the stock market performance (Hartono, 2021; Chan et al., 2021). As evidenced by the contribution of the Diphtheria, Tetanus, and Pertussis (DTP) vaccination, it is found to have a long-term effect on economic development (Masia et al., 2018). The outcome was determined to be substantial, and it is thus vital to place more emphasis priority on vaccination programs in an attempt to optimise economic performance. The COVID-19 vaccination helps promote stability and reduce the volatility level of the global financial market (Rouatbi et al., 2021). This reflects how financial markets throughout the world deliver significant information on market anticipation for COVID-19 vaccine development. Regardless, a specific indicator of stock market performance such as stock market liquidity is yet remained conducted. This research further assesses the vaccination influence on the stock market liquidity, mainly in the four ASEAN countries. Taking all into account, generated hypotheses would be:

H2a: COVID-19 death cases impact towards stock market liquidity

H2b: COVID-19 recovery cases impact towards stock market liquidity

H2c: COVID-19 vaccination impact towards stock market liquidity

2.6 COVID-19 Stringency and Stock Market Liquidity

The widespread coronavirus epidemic (COVID-19) is a disease that has propagated to approximately every country around the world. The spread and intensity of the outbreak prompted government actions such as travel restrictions and quarantines, which halted production and all other economic activities (Wagner, 2020). Aside from the fact that the severity of those impacts varies greatly between countries, some have been somewhat effective in attenuating disease transmission and

reducing fatalities. Variability in government policy responses may account for any discrepancies of this stringent control in relation to each country condition. However, the integration of the lockdown must be conducted at the opportune timing to get the most benefit in terms of disease control (Oraby et al., 2021). Dai et al. (2020) explained that the time required for the virus to decrease would rise as the number of days it takes to begin lockdown surges, especially in the absence of any particular treatment for COVID-19 in the early year.

The Oxford Coronavirus Government Response Tracker provided the analysis on related policy responses (OxCGRT). OxCGRT compiles publicly accessible data on the composite measure on nine of the response metrics covering public closures, movement restrictions, stay-at-home orders, and international travel ban. The daily index ranges from 1 and 100, representing the level of government intervention on the COVID-19 outbreak (COVID-19 Government Response Tracker, 2020). On the other hand, these indicators represent the magnitude of government policies, not the efficiency of a government's responses.

Many economic activities were interrupted as a result of the government's interference. As examined of stringent implementation in 49 countries, workplace and school closures degrade market performance, especially in emerging countries (Zaremba et al., 2021). The restrictions on controlling the virus impact the trading activity since it disrupts investment decision-making in the capital market. Further research agrees with the effect of restriction, as 1% increase of stringency attributed to the increase of 0.11% in illiquidity and 0.1% in widening the gap of bid-ask spread as observed in the US equity market (Baig et al., 2021). The governments' responses in six MENA countries have also precipitated a liquidity jolt on the stock market due to the rise of the stringency index (Alaoui Mdaghri et al., 2020). On the other note, however, the implementation of lockdowns in the financial sectors, as observed in Vietnam, brought higher liquidity on the stock market (C. T. Nguyen et al., 2021). Government containment strategy on combating the pandemic trusts investor confidence, which revives and boost the stock market liquidity. The enforcement of constraints and lockdowns have seemed to be underlying factors to drive the market liquidity. Furthermore, this research integrates the implication towards the four major ASEAN capital markets. This suggests hypotheses for analysing:

H3: COVID-19 stringency impact towards stock market liquidity

3. Data and Methodology
3.1 Data

In terms of sampling, the unit analysis for this research was derived from 177 technology industry firms listed on four major ASEAN capital markets: the Indonesia Stock Exchange, the Stock Exchange of Thailand, Bursa Malaysia, and the Singapore Exchange. Studies within the technology sectors are conducted as the new reality of COVID-19 led to subsequent migration of daily activities to the digital realm. Strong fundamentals have supported the IT sector's extraordinary rise and, according

to experts, is well-positioned to give investors favourable returns in the following years (Bai, 2020). In the scope of the study, 50,268 daily-firms panel sample units are examined, spanning the period from 2 March 2020 to 30 June 2021, correspondingly, to cover active trading days across the respected countries. The period's start date was also implemented to consider the reported COVID-19 first cases in each country. Financial data were collected from Bloomberg, whilst data on COVID-19 cases, death, recoveries, vaccination, and stringency index were retrieved from John Hopkin's database and referred to the Ourworldindata website.

3.2 Methodology

For the reason of variables indicated in the previous sub-chapter, the focus of this study conducts on a multiple regression approach on panel data that encompasses both time series and cross-sectional of firm financial performance data as it is more appropriate for empirical analysis (Anh & Gan, 2020). Furthermore, the panel-data regression approach is also known for its ability to discover time-variant correlations across the dependent and other explanatory variables whilst reducing the risk of biases estimation, individual variability, and multicollinearity (Hsiao, 2014). Therefore, the study developed a panel regression model to investigate the influence of the COVID-19 variables upon two measurements of stock market liquidity:

$$AMIHUD_{i,t} = \beta_1 CASE\_G_{i,t} + \beta_2 DEATH\_G_{i,t} + \beta_3 RECOV\_G_{i,t} + \beta_4 VAC_{i,t} + \beta_5 SGEN_{i,t}$$
$$+ \beta_6 M\_CAP_{i,t} + \beta_7 GK\_VOL_{i,t} + \beta_8 INDEX\_R_{i,t} + \beta_9 EXC\_R_{i,t}$$
$$+ \beta_{10} INTER\_R_{i,t} + \beta_{11} GOLD_{i,t}$$

$$CPQS_{i,t} = \beta_1 CASE\_G_{i,t} + \beta_2 DEATH\_G_{i,t} + \beta_3 RECOV\_G_{i,t} + \beta_4 VAC_{i,t} + \beta_5 SGEN_{i,t}$$
$$+ \beta_6 M\_CAP_{i,t} + \beta_7 GK\_VOL_{i,t} + \beta_8 INDEX\_R_{i,t} + \beta_9 EXC\_R_{i,t}$$
$$+ \beta_{10} INTER\_R_{i,t} + \beta_{11} GOLD_{i,t}$$

3.3 Dependent Variables

This study examines the COVID-19 epidemic-influenced market liquidity. This study used two distinct proxies to represent both market depth and tightness since the latter is multifunctional. According to previous studies, the measurement of stock liquidity does not cover resiliency and immediacy (Alaoui Mdaghri et al., 2020; C. T. Nguyen et al., 2021). The first dependent variable of stock market liquidity measurement is calculated using market depth as Amihud's (2002) proposed, namely illiquidity. The price disruption caused by a one-dollar volume was measured with this indicator. This ratio is calculated by dividing the stock's daily dollar trading volume by its absolute daily return. Due to Amihud's "Illiquidity" feature, this measurement implies the reverse direction, with a higher ratio reflecting less liquid stocks. This is calculated using the following equation:

$$AMIHUD_{i,t} = \frac{|R_{i,t}|}{Ln(Volume_{i,t})}$$

$R_{i,t}$ indicates the daily stock return calculated by dividing closing price at t with the closing price at t−1; $Volume_{i,t}$ expressed by the dollar volume of stock i at day t. In this study, the illiquid measure is referred to as AMIHUD.

Effective spread is utilised as the second dependent variable in measuring market tightness, generally derived from the bid-ask spread. Chung & Zhang (2014) introduced that the Closing Percent Quoted Spread (CPQS) is used in this study as the best approximation to convey the market tightness in estimating the bid-ask spread (Gao et al., 2020). However, aligned with market depth, this measurement also has the opposite direction. Higher CPQS signify a wider spread of bid-ask, implying less liquidity.

$$CPQS = \frac{Ask\ price_{i,t} - Bid\ price_{i,t}}{(Ask\ price_{i,t} - Bid\ price_{i,t})/2}$$

$Ask_{i,t}$ is the ask closing price of stock i on day t, whereas $B_{i,t}$ is the bid closing price of stock i on day t.

3.4 Independent Variables

Taking into account of all COVID-19 outbreak, this study used five independent variables performing daily COVID-19 confirmed cases, deaths, recoveries, vaccination and the stringency index in the four major ASEAN capital markets.

The first variable is the daily growth of the total number of confirmed cases and was denoted as CASE. It is measured by the additional of COVID-19 confirmed cases daily.

The second variable is designed as the daily growth of the number of confirmed deaths and denoted as DEATH.

Regarding assessing further gaps, daily growth recovery of COVID-19 cases is also implied as to the third independent variable and denoted with RECOV. It is derived from the additional of COVID-19 recovery cases daily.

With the introduction of vaccination in early 2021, the fourth independent variable is the fully vaccinated cases denoted as VAC. It is counted by the total fully vaccinated COVID-19 citizen daily.

The last variable was computed with the daily stringency index and was denoted as SGEN. It should be emphasised that the latter is an index rescaled ranging between 0 to 100 and demonstrates the governments' actions in dealing with the COVID-19 pandemic. A metric that comprises a greater stringency index would annotate that the government is taking more stringent preventative actions.

3.5 Control Variables

Control variables are implemented that are presumed to influence stock market liquidity for each company respectfully. In terms of corporate level, daily market capitalisation is incorporated by the logarithm of daily closing price multiplied by outstanding shares of each firm to assess the impact of different company sizes. This variable is denoted as M_CAP. Unexpected fluctuations in market volatility substantially influence stock liquidity (K. Cheriyan & Lazar, 2019). In a precursor to a reduction in stock liquidity, the volatility shock increases (Lee & KaeH Chung & Chung, 2017). In regard to that, volatility is regarded as controls by inducing daily volatility using Garman and Klass (1980) to estimate the volatility denoted as GK_VOL. The formula for this measurement is as follows:

$$GK_{vol} = \sqrt{\frac{1}{2}\left(log\left(\frac{HP_{i,t}}{LP_{i,t}}\right)^2 - (2.log(2) - 1).log\left(\frac{CP_{i,t}}{OP_{i,t}}\right)\right)}$$

Where $HP_{i,t}$, $LP_{i,t}$, $CP_{i,t}$, and $OP_{i,t}$ represent the highest, lowest, closing, and opening prices of company i on day t, correspondingly.

This study further incorporated the daily stock market return each of the four ASEAN capital market indexes, notably, Indonesia Stock Exchange, the Stock Exchange of Thailand, Bursa Malaysia, and the Singapore Exchange depicted by INDEX_R. On a macroeconomic scale, daily exchange rates against the US dollar of each respected country are opted as envisaging the impact of the FX market towards the stock liquidity during the COVID-19 period, denoted as EXC_R. The measure is essential as outstanding stock market performance attracts foreign capital to the economy, boost the stock market and, in response, increase the currency (Gokmenoglu et al., 2021). The foundation of liquidity in the stock market comes from monetary policy, expressed in interest rates as the most used instrument in various nations (Keister, 2019; Sun & Yuan, 2021). In regard to that, daily interest rate is used as a control variable as it is essential towards stock market liquidity, denoted as INTER_R.

Last but not least, an additional control variable on the daily gold price is also accounted for denoted as GOLD. The current pandemic boosts the demand for gold as a 'safe haven' during economic turbulence, thus implying the surge to add as the control variable in this research. (Yousef & Shehadeh, 2020).

4. Empirical Findings

4.1 Descriptive Statistics and Multicollinearity Test

Table 2 depicts the descriptive statistics of the variables conducted in the developed panel regression model on 50,268 observations. Market depth is denoted with AMIHUD; which shows a mean

average of 0.14%. The measurement has the highest value with 0.323 and a minimum of 0. The second method of calculating the market liquidity is market tightness, which refers to CPQS. The average is higher than the overall market depth, which accounts for 3.7%. As observed, the CPQS accounts for a maximum value of 1, with the minimum at negative 1.06. Going through the COVID-19 variables, confirmed cases and deaths of the disease accounted for an average of 1,278.51 cases and 2,040.45, respectively. Daily growth cases have reached 21,807 cases and over 44,270 death cases.

The growth rate of COVID-19 recoveries presents a high mean of 3,972.81 cases, reaching a maximum of 44,270 and a minimum of 0 recoveries. In terms of the breakthrough vaccination a year after the outbreak rise, the average of the total vaccination accounts for 294,708 Record is maximum total vaccination accounts for 13,465,499 with a zero minimum vaccination is depicted. With four countries observed, stringency in regard to the COVID-19 preventive measures has 61.33 on average, with the highest index reaching 80.56 and a minimum of 0 stringencies. The standard deviation illustrated in the Table 2 diversely occurs by virtue of some variables that use absolute numbers.

Table 3 portray the Pierson correlation matrix across all variables observed. Findings imply that there is no multicollinearity issue since no strong relationship among the variables is found. This is supported by variance inflation factors (VIF) of each variable which is less than 10.

Table 2. Descriptive Statistics

	Mean	Sd	Min	Max
AMIHUD	0.0015	0.01973	0	0.325
CPQS	0.0376	0.0836	-1.0568	1
CASE_G	1,278.51	2,157.51	0	21,807
DEATH_G	2,040.45	4,188.46	0	44,270
RECOV_G	3,972.81	6,422.99	0	44,270
VAC	294,708.90	1,130,569.24	0	13,465,499
SGEN	61.3274	15.9601	0	80.56
M_CAP	7.3347	0.6514	5.9044	10.4908
GK_VOL	0.1491	0.0872	0	0.7157
INDEX_R	0.0005	0.0145	-0.1112	0.1019
EXC_R	0.2656	0.2353	6.04E-05	0.759
INTER_R	2.55303	1.4276	0.697	8.322
GOLD	1,682.87	460.2157	14.7146	2,062.75

Source(s): Authors' calculation

Table 3. Correlation Matrix

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
(1) AMIHUD	1												
(2) CPQS	-.013	1											
(3) CASE_B	-.047	-.124	1										
(4) DEATH_B	-.037	-.066	.239	1									
(5) RECOV_B	-.065	-.034	.652	.662	1								
(6) VAC	-.005	-.094	.347	.364	.195	1							
(7) SGEN	-.051	-.015	.376	.310	.225	.196	1						
(8) M_CAP	.211	-.316	.014	.076	0.008	.046	-.013	1					
(9) VOL	-0.09	.157	0.064	0.140	0.400	-0.16	.080	-.096	1				
(10) INDEX_B	0.001	-.401	-.014	-.030	-.090	.017	.007	0.006	-0.13	1			
(11) EXC_B	-.191	.170	-.216	.196	-.111	.061	-.107	-.244	.062	0.008	1		
(12) INTER_B	.079	-.019	.300	.361	.242	.357	.317	.408	.070	0.001	.424	1	
(13) CURD_B	-.020	-.001	-.540	-.262	-.022	-.239	-.037	.441	.144	0.000	-.007	.006	1
VIF mean		1.124	1.23	2.329	1.110	1.494	1.001	1.062	1.034	1.259	-.044	4.356	

Source: ** Significant at the 1% level

Table 4. Heteroskedasticity Test and Panel Effects Model Test

Model and P-Value	Heteroskedasticity Test	Fixed Effect Estimator (Chow Test)	Random Effects Estimator (Breusch-Pagan test)	Fixed vs Random Effects Estimator (Hausman Test)
AMIHUD	$TR^2 = 5558.669009$ with p-value = $P(Chi\text{-}square(77) > 5558.669009) = 0.000000$	$F(176, 50080) = 12622.7$ with p-value 0.000	LM = 6.36283e+006 with p-value = probichi-square(1) > 6.36289e+006] = 0.000	H = 7.77139 with p-value = probichi-square(3) > 7.77139) = 0.456114 **Result: Random Effect Model**
CPQS	$TR^2 = 13170.329199$, with p-value = $P(Chi\text{-}square(77) > 13170.329199) = 0.0000$	$F(176, 50080) = 301.932$ with p-value 0.000	LM = 1.40365e+006 with p-value = probichi-square(1) > 1.40365e+006] = 0.000	H = 500.008 with p-value = probichi-square(3) > 500.008) = 7.00650e-107 **Result: Fixed Effect Model**

Earlier studies incorporated random effects on the panel data regression model on stock market liquidity measurement and panel data regression models (Alaoui Mdaghri et al., 2020; C. T. Nguyen et al., 2021). Given data variability and the results from Table 4, the market depth – AMIHUD – is examined using random effects, whilst the market tightness – CPQS – is examined using Weighted Least Squares (WLS) as the best approach to address the presence of the common data issue, heteroskedasticity in Fixed Effect Model (Usman et al., 2019).

Table 5 portrays the regression results between each stock market liquidity towards the independent and control variables. The AMIHUD metric is strongly correlated with the COVID-19 vaccination cases, hence the stringency index. Growth rate of recovery cases has also proven to influence the AMIHUD, but only at 5% level. Research signifies that the stock market's depth measure is favourably impacted by the COVID-19 daily recovery rate and vaccination cases by 1% and 10%, respectively, through implying higher liquidity by the inoculation. Further, the stock market depth is substantially influenced by the restrictions applied by the governments on the technology industry of four major ASEAN countries to forestall and prevent the contagion. However, the market depth is not significantly influenced by the daily rise of confirmed and death cases of the novel virus.

Table 5: Regression results

	AMIHUD	CPQS
Constant	0.0005 (0.0015)	0.1639 (0.002)
CASES_R	5.4137e-09 (6.7775e-09)	−5.6175e-07*** (1.0053e-07)
DEATH_R	3.1258e-09 (3.5213e-09)	3.742e-07*** (5.3149e-08)
RECOV_R	−3.6415e-09* (2.021e-09)	−2.9814e-07*** (2.5939e-08)
VAC	−2.8248e-011*** (8.8294e-012)	1.2023e-011 (1.673 e-010)
SGEN	−2.3083e-06*** (7.1267e-07)	−4.0085e-05*** (8.3677e-06)
M_CAP	5.114e-05 (5.2166e-05)	−0.0211*** (0.0002)
GK_VOL	−5.1602e-05 (0.0001)	0.092*** (0.0017)
INDEX_R	−0.0013** (0.0006)	−0.0234*** (0.0067)
EXC_R	0.0006 (0.0011)	0.8256*** (0.0005)
INTER_R	−0.0001*** (3.177e-05)	0.0003** (0.0002)
GOLD	5.1137e-07*** (1.8394e-07)	3.9614e-06*** (5.305e-07)
P-value	2.2583e-019	0.000
R-Squared	0.0086	0.282072

Note(s): ***p < 1%, **p < 5%, *p < 10%

The presented table further revealed that market tightness, as measured by CPQS, is significantly integrated into the increase in daily confirmed cases, death, recovery, and stringency. In terms of death cases by the virus, the transaction cost to trade stocks increases, and so does the death cases. Conversely, rise COVID-19 daily confirmed cases, recoveries, and stringency index significantly enhance the stock market to be more liquid. At last, vaccination of the COVID-19 featured to have no significant impact towards the spread measurement.

Regarding firm-related characteristics, firms' market capitalisation significantly influenced the market tightness in a negative correlation. The volatility index as measured by GK_VOL also has a significant positive correlation towards the tightness of stock market liquidity. Both AMIHUD and CPQS are affected by the four respected indexed market returns, exhibiting higher index returns to increase stock market liquidity. The exchange rate is found to significantly influence the CPQS, as a higher rate of exchange hinders the stock market liquidity. On the other side, the interest rate is found to have different significant results on both market liquidity measurements. In AMIHUD, a higher interest rate increases the liquidity at 10% level, while in CPQS, the increase of interest rate at 5% level triggers illiquidity. Last but not least, the role of gold price towards the stock market liquidity is found to have a high influence indicating that the rise of gold price decrease of the two stock market liquidity measures.

4.2 Country Analysis

This study is purposefully presenting the extensive panel regression on each country to provide a comprehensive understanding on the implications of COVID-19 pandemic towards the capital market. This further had been taken into account as it may be presumed that each country responds differently towards the outbreak variables. Below, the regression findings for each respected country's market liquidity in terms of depth (AMIHUD) and tightness (CPQS) are presented in Table 6 and Table 7.

Table 6. Regression results for AMIHUD in each respected country

Variables	Indonesia	Thailand	Malaysia	Singapore
Constant	−4.83073e-06	2.56314e-05***	6.06225e-06**	−8.01253917
CASES_R	7.27195e-011	9.92641e-011	1.07110e-011	−2.98346e-07
DEATH_R	−1.2554|e-011	3.70743e-011	7.66503e-012	−1.49933e-05
RECOV_R	−2.87755e-010	4.98446e-011	−1.26559e-012	−7.22412e-08
VAC	−1.65573e-013**	−3.12060e-011	0.000000	−2.12529e-011
SGEN	−1.66729e-07***	−4.05901e-06***	−5.37981e-09**	−5.30187e-08
M_CAP	6.19144e-09	−2.16692e-07	−1.24189e-07***	0.00318838***
GK_VOL	−4.28886e-06	−1.37606e-05***	−1.31551e-06****	0.00304941***
INDEX_R	−5.22651e-06	5.15216e-06	2.06368e-06	0.00157897
EXC_R	−0.142398	−0.000469080***	−1.01395e-05	−0.01152682
INTER_R	2.46684e-06*	−1.35416e-06**	−1.77414e-07	−9.18309e-05
GOLD	7.73575e-07*	−1.55410e-09	−7.47792e-010*	3.56966e-07
P-Value (F)	1.43e-08	1.48e-13	0.001239	2.91e-27
Adjusted R Square	0.014013	0.006832	0.000722	0.016066

Note(s): ***p < 1%, **p < 5%, *p < 10%

Table 7. Regression results for CPQS in each respected country

Variables	Indonesia	Thailand	Malaysia	Singapore
Constant	0.315417***	0.0678757***	0.454685***	0.446556***
CASES_R	−2.31643e-06***	−2.39863e-08	6.18696e-07***	3.52528e-06
DEATH_R	−1.51373e-08	9.77234e-09	2.09733e-07**	0.00161199
RECOV_R	1.83247e-07	1.05024e-07	−8.89326e-08**	−1.79617e-06
VAC	−8.83081e-010***	−2.23336e-010	−9.07204e-010	1.84513e-09
SGEN	0.000134816	6.35327e-05***	9.14472e-05***	0.000328495***
M_CAP	0.000813429	0.00640476***	0.0280068***	0.0330997***
GK_VOL	0.0227482	0.107652***	0.078141***	0.0341131***
INDEX_R	0.0881983	−0.00045534	−0.0276872	0.0566556
EXC_R	−2277.44***	−0.181758	−0.561836***	−0.148200***
INTER_R	−0.0147672***	−0.000595618	−0.0071511e***	−0.00641641*
GOLD	−0.00252718**	−4.36910e-06*	−3.64216e-05***	−9.68524e-06
P-Value (F)	1.26e-07	1.1e-183	0.000000	3.0e-283
Adjusted R Square	0.012521	0.078229	0.211116	0.123074

Note(s): ***p < 1%, **p < 5%, *p < 10%

In contemplation of market depth findings, the COVID-19 stringency had a detrimental impact on all countries except in Singapore. This result was consistent with the findings in aggregate with a favourable result, as stricter regulations on imposing lockdowns and social distancing would increase

the market liquidity significantly. The effect of vaccination case was found to have a beneficial impact, however, only towards the liquidity in Indonesia Stock Exchange.

In terms of market tightness, the results were a substantial for Indonesia and Malaysia on daily confirmed cases in a different direction. Transaction costs in Indonesia stock market markets decrease as the COVID-19 cases escalate. Meanwhile, investors in Malaysia stock exchange are burden with a higher transaction cost as the confirmed cases of COVID-19 rise. This also applies to the confirmed deaths in Malaysia as it also increases the transaction cost. On the bright side, recovery cases due to the outbreak were found to affect the market tightness in Malaysia, as higher recovery cases would narrow the gap within the spread. The vaccination of COVID-19 was found to have a considerable effect towards the market tightness in Indonesia, imposing increase in vaccinations would increase the market liquidity in tightness. Respecting the stringency index, Thailand, Malaysia, and Singapore all have significant oppose direction, as higher index would decrease the transaction cost in trading stocks.

4.3 Discussion and Managerial implication

4.3.1 Discussion of empirical results

Based on the findings of the four major ASEAN capital market technology industries, stock market liquidity is significantly influenced due to the COVID-19 phenomenon. Market uncertainty emerges during the pandemic, reflecting the EMH theory on how stock prices are reflected from available COVID-19 related information (Fama,1970). Observed in the growth of COVID-19 death cases captured by CPQS, the increase inhibits the stock market's liquidity. Investors induced more outstanding transactions in order to trade in the fragile market. The finding confirms the study examined by Chebbi et al. (2021) and Baig et al. (2021) in the S&P500 index and the US equity market respectably. Just from the other aspect, the emergence of COVID-19 confirmed cases accelerated the stock market's liquidity in terms of market tightness. The discovery contradicts study findings, which show that the alarming incidence of COVID-19 confirmed cases widens the gap within CPQS, diminishing stock liquidity (Alaoui Mdaghri et al., 2020; C. T. Nguyen et al., 2021; Chebbi et., 2021).

The uncertainty of the COVID-19 cure remains undiscovered, and this has sparked the need for information by investors regarding the treatment of the virus. Nonetheless, as the number of COVID-19 recovery cases rises, it has attracted the attention of investors, promoting higher stock market liquidity. Proven through this finding, the growth of recovery cases enhances both the stock market liquidity measurement, AMIHUD and CPQS. Furthermore, the emergence of the vaccination program of the virus is also found to be a promising act on increasing liquidity in the capital market. This is captured by the measurement of AMIHUD, as the vaccination of the virus has a strong negative correlation, reducing the illiquidity. The finding is consistent with the research conducted by Rouatbi et al. (2021), which revealed how the COVID-19 vaccine brought stability to light while also decreasing the volatility in financial markets worldwide. The result also confirms the study of DTP vaccination

role in strengthening the economic performance by Musica et al. (2018), as a higher record of COVID-19 vaccination augments the capital market liquidity.

Stock market liquidity is also discovered to be associated with restrictions imposed by the government. Likewise, as portrayed in Table 5, market depth and tightness are positively affected significantly in the four major ASEAN stock markets. Moreover, higher stringency indexes increase liquidity in the stock market and decrease the cost of trading stocks. Therefore, the research outcome invalidates the observation conducted by Zaremba et al. (2021), Baig et al. (2021) and Alaoui Mdaghri et al. (2020). Nevertheless, the study confirms the findings in the Vietnam Stock Exchange financial services industry, as the government intervention in ASEAN nations is shown to increase rather than decrease stock market liquidity (C. T. Nguyen et al., 2021).

4.3.2 Robustness Test

In order to validate the robustness of this research, this study incorporated development measures using the quantile regression based on the COVID-19 independent variables towards the respected dependent variables, the AMIHUD and CPQS. The implementation of quantile regression allows the research to estimate a variety of conditional distribution functions, with each quantile representing a different point in the conditional distribution (Polemis, 2020). The quantile regression also robust to outliers. Therefore, it can enhance the analysis in which segmentation of the companies best represent the significance of the variables' relationship. The result of the five-level quantile regression is presented as follows:

Table 8. Robustness Test of Quantile in Amihud

Variables	Quantile (AMIHUD)									
	0.05		0.25		0.5		0.75		0.95	
	Coef	T-ratio	Coef	T-ratio	Coef	T-ratio	Coef	T-ratio	Coef	T-ratio
CASE_G	3.06E-16	0.0109	2.21E-14	1.5633	3.30E-13	5.1103	2.33E-12	8.6170	1.66E-10	0.3186
DEATH_G	4.59E-17	4.90E-03	9.05E-15	3.40E-01	1.35E-13	3.99E+00	2.57E-12	15.3766	8.03E-10	0.5579
RECOV_G	3.86E-17	0.0074	3.90E-15	0.566	-3.15E-14	-2.642	-1.01E-12	15.7703	-1.32E-10	-0.9189
VAC	-3.11E-19	-0.013	-2.32E-18	-0.1253	-7.36E-17	-0.8573	-1.71E-15	-4.7701	-4.55E-12	-1.2469
SGEN	1.04E-14	0.0001	1.33E-12	0.3745	1.03E-12	0.1508	-1.58E-10	4.4508	-4.25E-08	-0.145

Note(s): t-ratio > ±1.96

Table 9. Robustness Test of Quantile in CPQS

Variables	Quantile (CPQS)									
	0.05		0.25		0.5		0.75		0.95	
	Coef	T-ratio	Coef	T-ratio	Coef	T-ratio	Coef	T-ratio	Coef	T-ratio
CASE_G	-1.07E-07	-2.7017	8.42E-08	-2.738	-2.27E-07	-3.6599	-5.38E-07	-3.0907	-4.29E-06	-0.3773
DEATH_G	4.12E-07	1.2808	2.46E-08	1.4826	1.79E-07	5.4979	3.23E-07	4.8128	2.86E-05	9.5046
RECOV_G	-1.66E-07	-4.2129	3.30E-08	3.7007	-1.32E-07	8.491	-4.10E-07	-6.6882	1.99E-06	-3.368
VAC	-4.63E-09	-30.3618	3.54E-11	0.5729	-5.58E-11	-3.670	3.19E-08	1.1777	-6.76E-10	-19.936
SGEN	5.30E-06	0.2408	1.15E-05	1.1098	-4.32E-05	6.5233	0.00011	6.06114	0.00016	-6.9911

Note(s): t-ratio > ±1.96

Tables 8 and Table 9 portrayed the 5 quantiles of each independent variable towards both stock market liquidity measurements. As preserved in the regression results, the daily growth of COVID-19 confirmed cases only linked with CPQS, which further is confirmed to increase the liquidity of the lowest liquid firms significantly. COVID-19 death cases growth, as examined against the AMIHUD and CPQS, present a significant positive correlation where higher death resulted in lower liquidity. The increase of confirmed COVID-19 deaths significantly decreases the highest and lowest companies' stock market liquidity, shown in quantile 0.05 and 0.95.

Regarding confirmed recoveries of the Corona Virus, both AMIHUD and CPQS confirm the findings implying higher recoveries rate also increases the stock market liquidity. The lowest liquid firms are highly affected in the measurement of AMIHUD as proven in high T-ratio in quantile 0.75. At the same time, CPQS confirms that each liquidity performance is highly affected with the findings with the most affected on lowest liquid stocks. AMIHUD confirms that the vaccination has a favourable impact on the market depth as higher total vaccinated throughout nations boosts the liquidity, increasing investors' confidence. The findings apply to the highest liquid companies, as presented in the -3(.1619 T-ratio. As the government imposes restrictions to decrease the spread of COVID-19, AMIHUD and CPQS both confirm higher liquidity on the stock market performance. All the liquidity measurement significantly applies to the companies with the lowest liquid performance.

4.4 Managerial Implication

The research examined various findings of the impact of the COVID-19 towards the stock market liquidity. First, COVID-19's repercussions are felt across countries, limiting the access of movements as the airborne strike. Second, the migration to the digital world brought new opportunities for the technology industry and resulted in the stock market's performance skyrocketing. The increased investors' interest in technological firms is due to the stock performance has implied a promising target (Schaefer et al., 2020). Third, as stricter preventive measures are implemented, it urges many activities to be removed and thus increase in demand in the technology sector such as hardware/software, IT services, semiconductors, and network equipment (Deloitte, 2020). The technology industry has consistently outperformed exceptionally in the stock market, but the degree of divergence differs in comparison during the COVID-19 pandemic, as observed in the S&P500 index (Berren, 2021).

The importance of the technology industry rises worldwide, and this applies as well to the capital markets as observed in the four major ASEAN capital markets. The four ASEAN countries — Indonesia, Malaysia, Singapore, Thailand – imposed strict regulations that stimulate the usage of the technology advancement. For example, Indonesia implemented 'large-scale social restrictions' which

are highly dependent on teleworking. Malaysia tightened their restriction to closing borders and lockdowns, which was also imposed in Thailand (OECD, 2020). In addition, technologies are heavily used to trace the COVID-19 cases and verify home-quarantine orders by Singapore, indicating the prominent role of the technology industry during the COVID-19. The led to the background of this research on assessing the impact of COVID-19 towards stock market liquidity, specifically the technology industry.

As observed, new COVID-19 confirmed cases had triggered countries to be more careful in combating the severity of the virus's transmission. Many cases that rise affect many workplace closures to inhibit the spread, leading to dependence on technology. The increase of confirmed cases is found to escalate the stock market liquidity, but only significant to the market tightness gap (CPQS). In terms of growth COVID-19 deaths, it significantly influences the stock market's liquidity examined both in AMIHUD and CPQS measures. It reflects the EMH theory, where the rise of confirmed deaths would spread investors' fear of investing, resulting in illiquidity. On the other side, the rise of recovery cases infected by the COVID-19 increases investors' confidence in the stock market, thus resulting in higher liquidity both captured by the market depth and market tightness. Vaccination has also been found to influence the stock market liquidity as measured in AMIHUD but is insignificant on CPQS. Liquid stock indicates that prices are informative, and this is proven by how the stock market liquidity react to the good news of the virus treatment.

In contrast, the impulsive stringency index escalates the liquidity of the stock market. Although not all the observed countries implemented the lockdown, restrictions are still considerably high. High stringency affects citizens' activities, resulting in a work-from-home and online school to be implemented, indicating how the technology is utilised the most during this condition. Most investors' take opportunities to invest in the technology industry into account, which is reflected in this finding as higher stringency increases the stock market liquidity through the market depth (AMIHUD). This finding is also seen from the CPQS, as the bid-ask spread is tighter during more stringent measures.

5. Conclusion and Limitation

The study conducted the influence of the most significant health catastrophes to date, COVID-19, towards the stock market liquidity in 177 technology industries in 4 major ASEAN capital markets from March 2, 2020, to June 30, 2021. By taking all COVID-19 into account, this study included additional variables; the recoveries and vaccination of COVID-19 to enhance previous studies further. Results of the study vary within each of the virus-related variables as measured using the two-stock market liquidity measure: AMIHUD and CPQS. COVID-19 confirmed cases are positively correlated with liquidity, as the rise of confirmed cases increases the stock market liquidity. However, recorded confirmed deaths were found to inhibits the liquidity as observed in the stock markets. On a positive remark, recovery and vaccination cases of COVID-19 positively impacted the capital market, as higher

recoveries and vaccination improve the liquidity as captured in AMIHUD. The finding further assessed the stringency impact as the government responded to intervene with the outbreak and discovered that higher stringency resulted in higher stock market liquidity.

All in all, this research has limitations to be considered in future studies. First, the observation covers four ASEAN major capital markets, specifically the technology sector. Future studies can enrich the scope of the observation to other regions and industries. Second, the study only covers March 2020 to June 2021, but the COVID-19 has appeared to have grown in extend with new variants and conditions that shall be considered. Third, further research shall implement various indicators on the COVID-19 variables relevant to the later COVID-19 period.

REFERENCES

Abdullahi, I. B., & Fakunmoju, S. K. (2019). Market liquidity and stock return in the Nigerian stock exchange market. *Binus Business Review, 10*(2), 87-94. https://doi.org/10.21512/bbr.v10i2.5588

Abiad, A., Arao, M., Dagli, S., Ferrarini, B., Noy, I., Osewe, P., Pagaduan, J., Park, D., & Platitas, R. (2020). The economic impact of the COVID-19 outbreak on developing Asia. *ADB Briefs.* Published. https://doi.org/10.22617/brf200096

Acharya, V. V., & Pedersen, L. H. (2003). Asset Pricing with Liquidity Risk. *SSRN Electronic Journal*, 375-410. https://doi.org/10.2139/ssrn.366300

Acharya, V., Johnson, T., Sundaresan, S., & Zheng, S. (2021, January 19). *The value of a vaccine to end COVID-19 is worth between 5% and 15% of.* Voxeu.Org. https://voxeu.org/article/value-vaccine-end-covid-19-worth-between-5-and-15-wealth

Ahmed, R., Ullah, S., Hudson, R., & Gregoriou, A. (2020). The implications of liquidity ratios: Evidence from Pakistan stock exchange limited. *The Quarterly Review of Economics and Finance.* Published. https://doi.org/10.1016/j.qref.2020.12.006

Alaoui Mdaghri, A., Raghibi, A., Thanh, C. N., & Oubdi, L. (2020). Stock market liquidity, the great lockdown and the COVID-19 global pandemic nexus in MENA countries. *Review of Behavioral Finance, 13*(1), 51-68. https://doi.org/10.1108/rbf-06-2020-0132

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. *Journal of Behavioral and Experimental Finance, 27*, 100326. https://doi.org/10.1016/j.jbef.2020.100326

Al-Qudah, A. A., & Houcine, A. (2021). Stock markets' reaction to COVID-19: Evidence from the six WHO regions. *Journal of Economic Studies*, ahead-of(ahead-of-print). https://doi.org/10.1108/jes-09-2020-0477

Amihud, Y. (2002). Illiquidity and stock returns: Cross-section and time-series effects. *Journal of Financial Markets*, 5(1), 31–56. https://doi.org/10.1016/s1386-4181(01)00024-6

Andriani, R. S. (2020, March 22). *IHSG Tersungkur 14 Persen Lebih Sepanjang 16-20 Maret 2020*. Bisnis.Com. https://market.bisnis.com/read/20200323/7/1216701/ihsg-tersungkur-14-persen-lebih-sepanjang-16-20-maret-2020

Anh, D. L. T., & Gan, C. (2020). The impact of the COVID-19 lockdown on stock market performance: Evidence from vietnam. *Journal of Economic Studies*, ahead-of(ahead-of-print), 10. https://doi.org/10.1108/jes-06-2020-0312

Archived: WHO Timeline - COVID-19 (2020, April 28). Who.Int. https://www.who.int/news/item/27-04-2020-who-timeline---covid-19

ASEAN Policy Brief. (2020). *Economic impact of COVID-19 outbreak on ASEAN*. ASEAN. https://asean.org/book/asean-policy-brief/

Ashraf, B. N. (2020). Stock markets' reaction to COVID-19: Cases or fatalities? *Research in International Business and Finance*, 54, 101249. https://doi.org/10.1016/j.ribaf.2020.101249

Baig, A. S., Butt, H. A., Haroon, O., & Rizvi, S. A. R. (2021). Deaths, panic, lockdowns and US equity markets: The case of COVID-19 pandemic. *Finance Research Letters*, 38, 101701. https://doi.org/10.1016/j.frl.2020.101701

Baker, S. R., Bloom, N., Davis, S. J., Kost, K., Sammon, M., & Viratyosin, T. (2020). The Unprecedented Stock Market Reaction to COVID-19. *The Review of Asset Pricing Studies*, 10(4), 742–758. https://doi.org/10.1093/rapstu/raaa008

Beaubien, J. (2020, May 3). *Singapore was a shining star in COVID-19 control — Until it wasn't*. Npr.Org. https://www.npr.org/sections/goatsandsoda/2020/05/03/849135036/singapore-was-a-shining-star-in-covid-control-until-it-wasnt

Bei, B. (2020). *Capturing robust growth opportunities in the technology sector*. BlackRock. https://www.blackrock.com/sg/en/insights/growth-opportunities-in-technology-sector

Borrett, A. (2021, March 2). *Why big tech stocks boomed in the pandemic*. Tech Monitor. https://techmonitor.ai/technology/cloud/why-big-tech-stocks-boomed-covid-19

Boubaker, S., Gounopoulos, D., & Rjiba, H. (2019). Annual report readability and stock liquidity. *Financial Markets, Institutions & Instruments*, 28(2), 159-186. https://doi.org/10.1111/fmii.12110

Bradley, C., & Stumpner, P. (2021, April 20). *The impact of COVID-19 on capital markets, one year in*. McKinsey & Company. https://www.mckinsey.com/business-functions/strategy-and-corporate-finance/our-insights/the-impact-of-covid-19-on-capital-markets-one-year-in

Chan, K. F., Chen, Z., Wen, Y., & Xu, T. (2021). COVID-19 vaccines: Saving lives and the global stock markets. *SSRN Electronic Journal*. Published. https://doi.org/10.2139/ssrn.3785553

Chebbi, K., Ammer, M. A., & Hameed, A. (2021). The COVID-19 pandemic and stock liquidity: Evidence from S&P 500. *The Quarterly Review of Economics and Finance*, 81, 134-142. https://doi.org/10.1016/j.qref.2021.05.008

Chen, M. H., Jang, S. S., & Kim, W. G. (2007). The impact of the SARS outbreak on taiwanese hotel stock performance: An event-study approach. *International Journal of Hospitality Management*, 26(1), 200-212. https://doi.org/10.1016/j.ijhm.2005.11.004

Chong, T. T. L., Li, X., & Yip, C. (2020). The impact of COVID-19 on ASEAN. *Economic and Political Studies*, 9(2), 166-185. https://doi.org/10.1080/20954816.2020.1839166

Chung, K. H., & Zhang, H. (2014). A simple approximation of intraday spreads using daily data. *Journal of Financial Markets*, 17, 94-120. https://doi.org/10.1016/j.finmar.2013.02.004

COVID-19 government response tracker. (2020, March 18). Blavatnik School of Government. https://www.bsg.ox.ac.uk/research/research-projects/covid-19-government-response-tracker

Das, S., Ghosh, P., Sen, B., & Mukhopadhyay, I. (2020). Critical community size for COVID-19 - a model based approach to provide a rationale behind the lockdown. *Statistics and Applications*, 18(1), 181-196. https://arxiv.org/abs/2004.03126

Deloitte. (2020, March). *Understanding the sector impact of COVID-19: Technology sector*. https://www2.deloitte.com/global/en/pages/about-deloitte/articles/covid-19/understanding-covid-19-s-impact-on-the-technology-sector-.html

ElBannan, M. A., & Farooq, O. (2019). When are earnings informative? *International Journal of Islamic and Middle Eastern Finance and Management, 12(3)*, 388–406. https://doi.org/10.1108/imefm-08-2018-0270

Fama, E. F. (1970). Efficient capital markets: A review of theory and empirical work. *The Journal of Finance, 25(2)*, 383. https://doi.org/10.2307/2325486

Fauzi, R., & Wahyudi, I. (2016). The effect of firm and stock characteristics on stock returns: Stock market crash analysis. *The Journal of Finance and Data Science, 2(2)*, 112–124. https://doi.org/10.1016/j.jfds.2016.07.001

Feng, Y., & Li, X. (2021). Causal estimation of COVID-19 and SARS on china's stock market: Evidence from a time series counterfactual prediction. *Economic Research-Ekonomska Istraživanja*, 1–17. https://doi.org/10.1080/1331677x.2021.1910533

Frendy, & Hu, D. (2014). Japanese stock market reaction to announcements of news affecting auditors' reputation: The case of the olympus fraud. *Journal of Contemporary Accounting & Economics, 10(3)*, 206–224. https://doi.org/10.1016/j.jcae.2014.08.004

Gao, Y., Zhao, W., & Wang, M. (2020). The comparison study of liquidity measurements on the chinese stock markets. *Emerging Markets Finance and Trade*, 1–29. https://doi.org/10.1080/1540496x.2019.1709819

Gokmenoglu, K., Eren, B. M., & Hesami, S. (2021). Exchange rates and stock markets in emerging economies: New evidence using the Quantile-on-Quantile approach. *Quantitative Finance and Economics, 5(1)*, 94–110. https://doi.org/10.3934/qfe.2021005

Hartono, H. (2021). Covid-19 vaccine: Global stock market "Game changer." *Journal of Asian Multicultural Research for Economy and Management Study, 2(2)*, 8–17. https://doi.org/10.47616/jamrems.v2i2.102

Hasan, R., Kumas, A., & van der Laan Smith, J. (2018). Market ambiguity and individual investor information demand. *Journal of Contemporary Accounting & Economics, 14(1)*, 126–141. https://doi.org/10.1016/j.jcae.2018.03.001

Hsiao, C. (2014). *Analysis of panel data (econometric society monographs, series number 54)* (3rd ed.). Cambridge University Press. https://doi.org/10.1017/CBO9781139839327

Ichev, R., & Marinč, M. (2018). Stock prices and geographic proximity of information: Evidence from the ebola outbreak. *International Review of Financial Analysis*, 56, 153–166. https://doi.org/10.1016/j.irfa.2017.12.004

Jaffrey, S. (2020, April 29). *Coronavirus blunders in indonesia turn crisis into catastrophe*. Carnegie Endowment for International Peace. https://carnegieendowment.org/2020/04/29/coronavirus-blunders-in-indonesia-turn-crisis-into-catastrophe-pub-81684

K. Cheriyan, N., & Lazar, D. (2019). Relationship between liquidity, volatility and trading activity: An intraday analysis of indian stock market. *International Journal of Economics and Financial Issues*, 9(1). https://doi.org/10.32479/ijefi.7268

Kaur, H., & Saxena, S. (2020). Stock market sensitiveness: Impact of epidemic or pandemic. *European Journal of Molecular & Clinical Medicine*, 7(8). https://ejmcm.com

Keister, T. (2019). The interplay between liquidity regulation, monetary policy implementation and financial stability. *Global Finance Journal*, 39, 30–38. https://doi.org/10.1016/j.gfj.2018.01.013

Kyle, A. S. (1985). Continuous auctions and insider trading. *Econometrica*, 53(6), 1315. https://doi.org/10.2307/1913210

Lee & KeeH.Chung, J., & Chung, K. H. (2017). *The effect of market volatility on liquidity and stock returns in the korean stock market*. Working Papers 2017–18. Bank of Korea.

Liu, H., Manzoor, A., Wang, C., Zhang, L., & Manzoor, Z. (2020). The COVID-19 outbreak and affected countries stock markets response. *International Journal of Environmental Research and Public Health*, 17(8), 2800. https://doi.org/10.3390/ijerph17082800

Liu, L., & Zhang, T. (2015). Economic policy uncertainty and stock market volatility. *Finance Research Letters*, 15, 99–105. https://doi.org/10.1016/j.frl.2015.08.009

Lybek, T., & Sarr, A. (2002). Measuring liquidity in financial markets. *IMF Working Papers*, 02(232), 1. https://doi.org/10.5089/9781451875577.001

Marinč, R. I. M. (2016). Geographic proximity of information to financial markets and impact on stock prices: Evidence from the ebola outbreak. *2016 UBT International Conference*. Published. https://doi.org/10.33107/ubt-ic.2016.19

Masia, N. A., Smerling, J., Kapfidze, T., Manning, R., & Showalter, M. (2018). Vaccination and GDP growth rates: Exploring the links in a conditional convergence framework. *World Development, 103*, 88–99. https://doi.org/10.1016/j.worlddev.2017.10.013

McKinsey. (2021, February 10). *Can ASEAN maintain its growth trajectory in a post-COVID-19 world?* McKinsey & Company. https://www.mckinsey.com/featured-insights/future-of-asia/future-of-asia-podcasts/can-asean-maintain-its-growth-trajectory-in-a-post-covid-19-world

Mishra, P. K., & Mishra, S. K. (2020). Corona pandemic and stock market behaviour: Empirical insights from selected asian countries. *Millennial Asia, 11*(3), 341–365. https://doi.org/10.1177/0976399620952354

Nguyen, A., & Karunungan, L. (2021, July 2). *Funds flee southeast asia stocks as vaccine push gets urgent.* Bloomberg.Com. https://www.bloomberg.com/news/articles/2021-07-01/funds-flee-southeast-asia-stocks-as-vaccine-rollout-gets-urgent

Nguyen, C. T., Hai, P. T., & Nguyen, H. K. (2021). Stock market returns and liquidity during the COVID-19 outbreak: Evidence from the financial services sector in vietnam. *Asian Journal of Economics and Banking, ahead-of*(ahead-of-print). https://doi.org/10.1108/ajeb-06-2021-0070

Nguyen, T., & Chaiechi, T. (2021). The effects of natural disasters on stock market return and volatility in hong kong. *Economic Effects of Natural Disasters*, 11–20. https://doi.org/10.1016/b978-0-12-817465-4.00002-9

OECD. (2020, May). *COVID-19 crisis response in ASEAN member states.* Retrieved from https://www.oecd.org/coronavirus/policy-responses/covid-19-crisis-response-in-asean-member-states-02f828a2/#blocknotes-d7e170

Oraby, T., Tyshenko, M. G., Maldonado, J. C., Vatcheva, K., Elsaadany, S., Alali, W. Q., Longenecker, J. C., & Al-Zoughool, M. (2021). Modeling the effect of lockdown timing as a COVID-19 control measure in countries with differing social contacts. *Scientific Reports, 11*(1). https://doi.org/10.1038/s41598-021-82873-2

Reza Sammakhi, H., & Mehrabi, A. (2016). Study of the effect of liquidity of stock on stock returns in the companies listed in tehran stock exchange. *International Journal of Economics, Commerce, and Management, 4*(12). http://ijecm.co.uk/

Rhee, C., & Svirydzenka, K. (2021, March). *Policy advice to asia in the COVID-19 era* (No. 2021/004). International Monetary Fund.

https://www.imf.org/en/Publications/Departmental-Papers-Policy-Papers/Issues/2021/03/01/Policy-Advice-to-Asia-in-the-COVID-19-Era-50009

Rouatbi, W., Demir, E., Kizys, R., & Zaremba, A. (2021). Immunising markets against the pandemic: COVID-19 vaccinations and stock volatility around the world. *International Review of Financial Analysis, 77*, 101819. https://doi.org/10.1016/j.irfa.2021.101819

Salisu, A. A., & Vo, X. V. (2020). Predicting stock returns in the presence of COVID-19 pandemic: The role of health news. *International Review of Financial Analysis, 71*, 101546. https://doi.org/10.1016/j.irfa.2020.101546

Schaefer, A., Nair, S., & MacMurray, D. (2020). *COVID-19: Technology sector perspectives*. EY. https://assets.ey.com/content/dam/ey-sites/ey-com/en_ca/topics/technology-sector/pdf/ey-covid-19-technology-sector-perspectives-v7.pdf?download

Scherf, M., Matschke, X., & Rieger, M. O. (2021). Stock market reactions to COVID-19 lockdown: A global analysis. *Finance Research Letters*, 102245. https://doi.org/10.1016/j.frl.2021.102245

Shaikh, I., & Huynh, T. L. D. (2021). Does disease outbreak news impact equity, commodity and foreign exchange market? Investors' fear of the pandemic COVID-19. *Journal of Economic Studies*, ahead-of ahead-of-print). https://doi.org/10.1108/jes-10-2020-0503

Statista. (2021, March 29). *Leading stock exchanges APAC 2019 by domestic market capitalisation*. https://www.statista.com/statistics/265236/domestic-market-capitalization-in-the-asia-pacific-region/

Sun, Y., & Yuan, X. (2021). Nonlinear relationship between money market rate and stock market liquidity in china: A multifractal analysis. *PLOS ONE, 16*(4), e0249852. https://doi.org/10.1371/journal.pone.0249852

Tavor, T., & Teitler-Regev, S. (2019). The impact of disasters and terrorism on the stock market. *Jàmbá Journal of Disaster Risk Studies, 11*(1). https://doi.org/10.4102/jamba.v11i1.534

Umar, M., Rubbaniy, G., & Rizvi, S. K. A. (2020). COVID-19 and stock market liquidity: An international evidence. *SSRN Electronic Journal*. Published. https://doi.org/10.2139/ssrn.3758201

Violita, C. E. (2019). Stock liquidity and stock return. *Ekspekra : Jurnal Bisnis Dan Manajemen, 3*(2), 111. https://doi.org/10.25139/ekt.v3i2.2047

WHO. (2021, April). *COVID-19 weekly epidemiological update.*
https://www.who.int/publications/m/item/weekly-epidemiological-update-on-covid-
19—27-april-2021

Wu, C. H., & Lin, C. J. (2017). The impact of media coverage on investor trading behavior
and stock returns. *Pacific-Basin Finance Journal, 43*, 151–172.
https://doi.org/10.1016/j.pacfin.2017.04.001

Yousef, I., & Shehadeh, E. (2020). The impact of COVID-19 on gold price volatility.
International Journal of Economics and Business Administration, VIII(Issue 4), 353–
364. https://doi.org/10.35808/ijeba/592

Zaremba, A., Aharon, D. Y., Demir, E., Kizys, R., & Zawadka, D. (2021). COVID-19,
government policy responses, and stock market liquidity around the world: A note.
Research in International Business and Finance, 56, 101359.
https://doi.org/10.1016/j.ribaf.2020.101359

Zhang, D., Hu, M., & Ji, Q. (2020). Financial markets under the global pandemic of COVID-
19. *Finance Research Letters, 36*, 101528. https://doi.org/10.1016/j.frl.2020.10152

APJB

7   Rizwan Ahmed, Subhan ullah, Robert Hudson, Andros Gregoriou. "The Implications of Liquidity Ratios: Evidence from Pakistan Stock Exchange Limited", The Quarterly Review of Economics and Finance, 2020
Publication
<1 %

8   www.koreascience.or.kr
Internet Source
<1 %

9   www.jonesday.com
Internet Source
<1 %

10 Hui-Ching Hsieh, Van Quoc Thinh Nguyen. "Economic policy uncertainty and illiquidity return premium", The North American Journal of Economics and Finance, 2021
Publication
<1 %

11 Www.emerald.com
Internet Source
<1 %

12 Wael Rouatbi, Ender Demir, Renatas Kizys, Adam Zaremba. "Immunizing markets against the pandemic: COVID-19 vaccinations and stock volatility around the world", International Review of Financial Analysis, 2021
Publication
<1 %

13 Bura.brunel.ac.uk
Internet Source
<1 %

14 Isnaini Nuzula Agustin. "How does the impact of the COVID-19 pandemic on Indonesia's Islamic stock returns?", JEMA: Jurnal Ilmiah Bidang Akuntansi dan Manajemen, 2021
Publication
<1%

15 ijsrm.in
Internet Source
<1%

16 jfin-swufe.springeropen.com
Internet Source
<1%

17 Submitted to Heriot-Watt University
Student Paper
<1%

18 openaccess.city.ac.uk
Internet Source
<1%

19 scholar.sun.ac.za:443
Internet Source
<1%

20 Ștefan Cristian Gherghina, Daniel Ștefan Armeanu, Camelia Cătălina Joldeș. "COVID-19 Pandemic and Romanian Stock Market Volatility: A GARCH Approach", Journal of Risk and Financial Management, 2021
Publication
<1%

21 Submitted to Republic of the Maldives
Student Paper
<1%

22 repository.president.ac.id
Internet Source
<1%

23 Submitted to Aalto Yliopisto
Student Paper
<1%

24 Submitted to Associatie K.U.Leuven
Student Paper
<1%

25 Submitted to RMIT University
Student Paper
<1%

26 Xuemei Yuan, Yihong Sun, Xinsheng Lu. "SHIBOR Fluctuations and Stock Market Liquidity: An MF-DCCA Approach", Emerging Markets Finance and Trade, 2021
Publication
<1%

27 s3.amazonaws.com
Internet Source
<1%

28 P. K. Mishra, S. K. Mishra. "Corona Pandemic and Stock Market Behaviour: Empirical Insights from Selected Asian Countries", Millennial Asia, 2020
Publication
<1%

29 Submitted to University of Surrey
Student Paper
<1%

30 Izani Ibrahim, Kamilah Kamaludin, Sheela Sundarasen. "COVID-19, Government Response, and Market Volatility: Evidence from the Asia-Pacific Developed and Developing Markets", Economies, 2020
Publication
<1%

31 Submitted to University of Limerick
Student Paper
<1%

32 Yee-Ee Chia, Kian-Ping Lim, Kim-Leng Goh. "More shareholders, higher liquidity? Evidence from an emerging stock market", Emerging Markets Review, 2020
Publication
<1%

33 www.macrothink.org
Internet Source
<1%

34 Submitted to Universiti Utara Malaysia
Student Paper
<1%

35 d.researchbib.com
Internet Source
<1%

36 journals.sagepub.com
Internet Source
<1%

37 lutpub.lut.fi
Internet Source
<1%

38 jos.unsoed.ac.id
Internet Source
<1%

39 zenodo.org
Internet Source
<1%

40 Mohamed Sherif. "The impact of Coronavirus (COVID-19) outbreak on faith-based investments: An original analysis", Journal of Behavioral and Experimental Finance, 2020
<1%

Publication

41 onlinelibrary.wiley.com
Internet Source
<1%

42 www.econstor.eu
Internet Source
<1%

43 www.journals.vu.lt
Internet Source
<1%

44 "Integrated Risk of Pandemic: Covid-19 Impacts, Resilience and Recommendations", Springer Science and Business Media LLC, 2020
Publication
<1%

45 Ali Amin, Muhammad Arshad, Naheed Sultana, Rabeeya Raoof. "Examination of impact of COVID-19 on stock market: evidence from American peninsula", Journal of Economic and Administrative Sciences, 2021
Publication
<1%

46 Hanen Atri, Saoussen Kouki, Mohamed imen Gallali. "The impact of COVID-19 news, panic and media coverage on the oil and gold prices: An ARDL approach", Resources Policy, 2021
Publication
<1%

47 Ozge Sezgin Alp, Bilge Canbaloglu, Gozde Gurgun. "Stock liquidity, stock price crash risk,
<1%

and foreign ownership", Borsa Istanbul Review, 2021
Publication

48   Rohit Mishra, Rajesh Sharma, Yaswanth Karedla, Nikunj Patel. "Impact of COVID-19 Cases, Deaths, Stringency and Vaccinations on the US Stock Market", Vision: The Journal of Business Perspective, 2022
Publication

<1%

49   Sandeep Basnyat, Sunil Sharma. "Effects of COVID-19 crisis on small and medium-sized hotel operators: insights from Nepal", Anatolia, 2021
Publication

<1%

50   e-journal.president.ac.id
Internet Source

<1%

51   www.diplomacy.bg.ac.rs
Internet Source

<1%

52   www.vditz.de
Internet Source

<1%

53   Abdullah M. Al-Awadhi, Khaled Al-Saifi, Ahmad Al-Awadhi, Salah Alhamadi. "Death and contagious infectious diseases: Impact of the COVID-19 virus on stock market returns", Journal of Behavioral and Experimental Finance, 2020
Publication

<1%

54   Badar Nadeem Ashraf. "Economic impact of government interventions during the COVID-19 pandemic: International evidence from financial markets", Journal of Behavioral and Experimental Finance, 2020
Publication
<1%

55   Chen, M.H.. "Hotel stock performance and monetary conditions", International Journal of Hospitality Management, 200709
Publication
<1%

56   Liam Wright, Daisy Fancourt. "Do predictors of adherence to pandemic guidelines change over time? A panel study of 21,000 UK adults during the COVID-19 pandemic", Cold Spring Harbor Laboratory, 2020
Publication
<1%

57   Mustapha Ishaq Akinlaso, Aroua Robbana, Nura Mohamed. "Volatility transmission within financial markets during the COVID-19 pandemic: are faith-based investors well off in Tunisia?", Journal of Islamic Accounting and Business Research, 2021
Publication
<1%

58   Najaf Iqbal, Zeeshan Fareed, Farrukh Shahzad, Xin He, Umer Shahzad, Ma Lina. "The nexus between COVID-19, temperature and exchange rate in Wuhan city: New findings from partial and multiple wavelet
<1%

coherence", Science of The Total Environment, 2020
Publication

59 Nicholas Apergis, Ghulam Mustafa, Shafaq Malik. "COVID-19 pandemic, stock returns, and volatility: the role of the vaccination program in Canada", Applied Economics, 2022
Publication
<1%

60 ROLL, RICHARD, EDUARDO SCHWARTZ, and AVANIDHAR SUBRAHMANYAM. "Liquidity and the Law of One Price: The Case of the Futures-Cash Basis", The Journal of Finance, 2007.
Publication
<1%

61 Rajib Hasan, Abdullah Kumas, Joyce van der Laan Smith. "Market ambiguity and individual investor information demand", Journal of Contemporary Accounting & Economics, 2018
Publication
<1%

62 Yonghong Liu, Zengmiao Wang, Benjamin Rader, Bingying Li et al. "Associations between changes in population mobility in response to the COVID-19 pandemic and socioeconomic factors at the city level in China and country level worldwide: a retrospective, observational study", The Lancet Digital Health, 2021
Publication
<1%

63 Zeynep Cobandag Guloglu, Cumhur Ekinci. "Liquidity measurement: A comparative review of the literature with a focus on high frequency", Journal of Economic Surveys, 2021
Publication
<1%

64 african-review.com
Internet Source
<1%

65 b3b7dd1a-d8cb-4579-8cfc-f21897e0f1ee.filesusr.com
Internet Source
<1%

66 datascience.yyu.edu.tr
Internet Source
<1%

67 fbj.springeropen.com
Internet Source
<1%

68 hrmars.com
Internet Source
<1%

69 icbf2021.sciencesconf.org
Internet Source
<1%

70 mpra.ub.uni-muenchen.de
Internet Source
<1%

71 nepjol.info
Internet Source
<1%

72 oecd.org
Internet Source
<1%

riset.unisma.ac.id

73	Internet Source	<1%
74	seenthis.net Internet Source	<1%
75	storage.googleapis.com Internet Source	<1%
76	www.apsscr.cz Internet Source	<1%
77	www.asianinstituteofresearch.org Internet Source	<1%
78	www.businessperspectives.org Internet Source	<1%
79	www.emeraldinsight.com Internet Source	<1%
80	www.mdpi.com Internet Source	<1%
81	www.medrxiv.org Internet Source	<1%
82	www.ukm.my Internet Source	<1%
83	xxicongreso.aeca.es Internet Source	<1%
84	Ahmed S. Baig, Hassan Anjum Butt, Omair Haroon, Syed Aun R. Rizvi. "Deaths, Panic,	<1%

Lockdowns and US Equity Markets: The Case of COVID-19 Pandemic", Finance Research Letters, 2020
Publication

85   Costas Siriopoulos, Argyro Svingou, Jagadish Dandu. "Lessons for Euro markets from the first wave of COVID-19", Investment Management and Financial Innovations, 2021
Publication   <1%

86   Cuong Thanh Nguyen, Phan Thanh Hai, Huyen Khanh Nguyen. "Stock market returns and liquidity during the COVID-19 outbreak: evidence from the financial services sector in Vietnam", Asian Journal of Economics and Banking, 2021
Publication   <1%

87   Dao Le Trang Anh, Christopher Gan. "The impact of the COVID-19 lockdown on stock market performance: evidence from Vietnam", Journal of Economic Studies, 2020
Publication   <1%

88   Muhammad Umar, Yan Xu, Sultan Sikandar Mirza. "The impact of Covid-19 on Gig economy", Economic Research-Ekonomska Istraživanja, 2020
Publication   <1%

89   Yihong Sun, Xuemei Yuan. "Nonlinear relationship between money market rate and   <1%

stock market liquidity in China: A multifractal analysis", PLOS ONE, 2021
Publication

90   Adam Zaremba, David Y. Aharon, Ender Demir, Renatas Kizys, Dariusz Zawadka. "COVID-19, Government Policy Responses, and Stock Market Liquidity around the World: A Note", Research in International Business and Finance, 2020
Publication   <1 %

91   Mingfa Ding, Sandy Suardi. "Government ownership and stock liquidity: Evidence from China", Emerging Markets Review, 2019
Publication   <1 %

Exclude quotes   On   Exclude matches   Off
Exclude bibliography   On