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A COMPARISON OF THE WEAK-FORM EFFICIENCY OF THE ASEAN STOCK MARKETS BEFORE AND DURING THE COVID-19 PANDEMIC

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ABSTRACT

This paper aims to examine the weak-form efficient market hypothesis (EMH) for the ASEAN stock markets before and during the outbreak of the COVID-19 pandemic. The pandemic is a tremendous threat to the health condition and mortality of the world population. An important prevention step undertaken was to have social distancing at different levels of strictness. The ongoing pandemic has caused some negative consequences, including businesses enduring a period of hardship and stock market declines. It seems to be expected that a recession is coming ahead and therefore some people are unwilling to invest in the stock market. On the other hand, some people are optimistic about the economy of ASEAN countries and may think that the declines in stock markets are opportunities to invest. They believe in mean reversion that the falls in stock prices are only temporary and the prices will rebound after some time. If this is true, the market is inefficient and stock prices can be predicted. Conversely, if stock price movements are random walks, shocks to prices will be permanent and prices will reach new equilibrium aftershocks. Hence the market is efficient and stock prices are unpredictable. This study analyses the movements of ASEAN stock markets' composite indices before and during the outbreak of the COVID-19 pandemic to find out whether the markets are efficient and thus cannot be predicted. We found that some ASEAN stock markets were efficient in both periods, while some others were showing decreased or increased efficiency from the period before the pandemic to the period during the pandemic.

INTRODUCTION

The efficient market hypothesis (EMH) is the notion that all available information is fully reflected in stock price (Fama, 1970, 1991). The EMH can be in weak form, semi-strong form, and strong form. When the stock price has adjusted with all available information of past trading, the weak-form EMH is achieved. If the stock price has incorporated all publicly available information, the semi-strong form EMH is achieved. When the stock price has reflected all kinds of information including insider information, the strong-form EMH is achieved.

The strong-form EMH is not true when we consider there is transaction cost (Jensen, 1978; Beechey *et al.* 2000). Another constraint to EMH is the cost of information (Grossman and Stiglitz, 1980). A more realistic level of EMH is the weak form. Once the weak-form EMH is achieved, the information of past trading and technical analysis is not useful to predict the movements of stock price. It makes sense if the stock price adjusts with the information to a level where the marginal cost of collecting the information is not more than the marginal benefit of acting on the information. This can explain the reason why perfect efficiency may not exist.

The most important implication of EMH is the effectiveness of capital allocation. In an efficient market, investors can trade stocks at a fair price and this induces confidence among long-term investors. The evidence of market inefficiency is a market overreaction, excessive volatility, mean reversion, small firm effect, calendar anomalies, and the slow adjustment of stock prices to new information. Market inefficiency will impact negatively the ability of the stock market to allocate capital across sectors in an economy (Lim, 2008).

The next implication is the possibility of stock price prediction. A weak-form EMH would imply that past trading information cannot help to predict stock price movements. Meantime, technical analysis which applies past trading information is also not useful for stock price prediction. The prediction of stock price based on public announcements and publicly available information is useless in a semi-strong form market. Investors may not be able to gain abnormal profits by trading based on the announcements of company income, stock split, dividends, and so forth. Therefore, fundamental analysis cannot outwit the market. If a market is strong-form efficient, it is unlikely that one can predict stock price using any information including insider information. Stock price prediction is completely impossible.

ASEAN stock markets are integrated at a certain level and it is important to have a policy to further enhance the integration (Click and Plummer, 2005). For example, we already have the gateway to ASEAN investment to empower the stock markets' investments among the ASEAN countries. To increase the integration, investors are encouraged to invest across the stock markets in the ASEAN region. For this purpose, the efficiency of the stock markets needs to be improved, so that investors can trade at a fair price.

The COVID-19 pandemic is currently a threat to the health condition and mortality of the world population. One of the most important prevention steps for the Covid-19 pandemic is to have social distancing. In the ASEAN countries, businesses are enduring a period of hardship and stock markets are facing declines. Many investors who expect a recession to arise are unwilling to invest in the stock markets. Other investors believe that stock prices are in mean reversions and stock prices will rebound after some time, and this will allow them to predict stock price movements and be able to gain excess returns. The improvement of market efficiency is a concern of the policymakers of ASEAN as well as the investors who invest in the ASEAN stock markets.

This study has comprised the stock markets of all the member countries of ASEAN to examine the weak-form EMH and thus the prediction of stock prices, for the periods before and during the COVID-19 pandemic. So far, Dias et al. (2020) had studied the weak-form EMH for the ASEAN-5 countries during the outbreak of the COVID-19 pandemic using the data from 2/1/2019 to 6/7/2020. Different from the study, we use unit root tests to analyze the weak-form EMH for a longer period of study that is from 3/1/2017 to 30/12/2022, and include all ASEAN countries in our analysis. Our study provides more insights into the impact of COVID-19 on the ASEAN stock markets and gives more efficient findings for the knowledge of the policymakers of ASEAN as well as investors who are interested to invest in the ASEAN stock markets.

LITERATURE REVIEW

The literature on EMH is plentiful. Worthington and Higgs (2005) studied the weak-form EMH for emerging markets (i.e. China, India, Korea, Taiwan, Pakistan, Sri Lanka, Indonesia, Malaysia, Thailand, and the Philippines), and developed countries (i.e. Japan, Hong Kong, Singapore, Australia, and New Zealand). Serial correlation coefficient and run tests showed all the stock markets were inefficient. Unit root tests showed all the stock markets were weak-form efficient except Taiwan and Australia. The variance ratio test showed Hong Kong, Japan, and New Zealand were weak-form efficient. Risso (2008) used symbolic time series analysis and the Shannon entropy approach to rank the efficiency of developed and emerging markets. Taiwan, Japan, and Singapore were the top-ranking efficient markets. Lagoarde-Segot and Lucey (2008) examined the informational efficiency of seven emerging markets of Middle-Eastern North Africa (MENA) stock markets, using a multinomial ordered logistic regression. The results were heterogeneous influenced by market depth and corporate governance. Kiran and Rao R. (2009) performed tests for both linear dependencies and non-linear dependencies in the data of BRICS stock markets (i.e. Brazil, China, India, Russia, and South Africa). The variance ratio test was used to detect linear dependencies, while the BDSL test was used to detect non-linear dependencies. From the results of variance ratio tests, Brazil and China were found weak-form efficient in all periods, and Russia and South Africa were found weak-form efficient in the full period. India was weak-form efficient in the pre-crisis and crisis periods. The BDSL tests showed all BRICS stock markets' indices were not random walk and thus rejected the EMH. Konak and Seker (2014) tested the random walk hypothesis for FTSE100 using unit root tests of Augmented Dickey-Fuller and Philip-Peron. The stock market's index was found to follow a random walk and supported the weak-form EMH. Lingaraja et al. (2017) utilized GARCH to test volatility and autocorrelation and run tests to test the efficiency of the emerging markets (i.e. China, India, Indonesia, Korea, Malaysia, Philippines, Taiwan, and Thailand). Autocorrelation tests showed all stock markets' composite indices were significant at a 95% confidence level. Runs tests indicated that the stock markets' composite indices of Malaysia, India, Philippines, and Indonesia were random distribution at a 95% confidence level. Emenike and Joseph (2018) tested the weak-form EMH for the Ugandan stock market. Using linear models, the results showed weak-form efficiency that linear models and technical analysis cannot predict stock prices. While using non-linear models, the result showed inefficiency meaning that prices can be predicted by non-linear models.

There were several studies specifically done on the stock markets in ASEAN countries. Palac-McMiken (1997) used a cointegration approach to examine the efficiency of ASEAN stock markets. All the stock markets' composite indices were linked together except for Indonesia. Thus, the markets were found mostly inefficient. Munir et al. (2012) applied a two-regime threshold autoregressive model to analyze ASEAN-5 stock markets (i.e. Malaysia,

Thailand, Philippines, Indonesia, Singapore). All the stock markets' composite indices were found non-linear. Only the indices of Thailand and Malaysia followed a unit root process which is consistent with the weak-form EMH. Guidi and Gupta (2013) applied multivariate and cointegration tests to analyze the weak-form efficiency of ASEAN stock markets. Thailand and Singapore were found efficient. Malaysia, Indonesia, Vietnam, and the Philippines were found inefficient. Shaik and Maheswaran (2017) used variance ratio tests to examine the weak-form efficiency of ASEAN stock markets. The stock markets in Singapore, Laos, and Cambodia were efficient, whereas the stock markets in Vietnam, Indonesia, Thailand, Malaysia, and the Philippines were inefficient. Dias et al. (2020) carried out variance ratio tests and detrended fluctuation analysis to the stock markets' composite indices of ASEAN-5 countries and China for the period of 2/1/2019-6/7/2020 during the outbreak of the Covid-19 pandemic. All the stock markets' composite indices were not random walks and thus the weak-form EMH was violated.

METHODOLOGY

Dataset

The dataset used in this study is comprised of the daily close prices of ASEAN stock markets' composite indices for the period from 3/1/2017 to 30/12/2022. These include the composite indices of Cambodia (Cambodia Stock Exchange Composite Index - CSX Index), Indonesia (Jakarta Stock Exchange Composite Index - JCI Index), Malaysia (Kuala Lumpur Composite Index - FBMKLCI Index), Laos (Laos Securities Exchange Composite Index - LSXC Index), Philippines (Philippines Stock Exchange PSEi Index - PCOMP), Thailand (Stock Exchange of Thailand Index - SET Index), Singapore (Straits Times Index - SET Index), Vietnam (Vietnam Hanoi Stock Exchange Equity Index - VHINDEX Index), and Vietnam (Vietnam Ho Chi Minh Stock Index - VNINDEX Index).

Method of Analysis.

In our analysis, we divided the study periods into the period before COVID-19 from 3/1/2017 to 31/12/2019 and the period during the pandemic from 2/1/2020 to 30/12/2022. We first performed the Augmented Dickey-Fuller (ADF, 1979) unit root test and then followed by the Phillips-Perron (PP, 1988) unit root test. The unit root tests are used to test for a unit root or random walk in each index series. The PP unit root test is an alternative to the ADF unit root test. The PP test has a non-parametric method that is used for controlling serial correlation in unit root testing. CSX 1, FBMKLCI 1, JCI 1, LSXC 1, PCOMP 1, SET 1, STI 1, VHINDEX 1, and VNINDEX 1 indicate the series in the period before the pandemic. CSX 2, FBMKLCI 2, JCI 2, LSXC 2, PCOMP 2, SET 2, STI 2, VHINDEX 2, and VNINDEX 2 denote the series in the period during the pandemic.

FINDINGS

The ADF and PP unit root tests' results were reported in Table 1. For CSX 1 and CSX 2, both reported having a unit root from the ADF and PP tests' results. This means that both the CSX 1 and CSX 2 series followed a random walk and the Cambodia stock market was weak-form efficient in the periods before and during the COVID-19 pandemic.

For the FBMKLCI 1, the results of the ADF and PP unit root tests showed the series had a unit root. However, for the FBMKLCI 2 constant, the null hypothesis of a unit root was rejected as shown by both the ADF and PP unit root tests' results. The FBMKLCI 2 constant series was not followed by a random walk. Meantime, the FBMKLCI 2 series was found to have a unit root or followed a random walk when tested for a unit root with a trend. In other words, the stock market of Malaysia was weak-form efficient before the pandemic and became less efficient during the pandemic.

The ADF results showed the JCI 1 constant and JCI 2 with trend had rejected the null hypothesis of unit root while the PP results showed only the JCI 2 with trend had rejected the null hypothesis of a unit root. So, the results were mixed. The stock market of Indonesia was found to be less efficient during the pandemic.

The stock market of Laos is represented by LSXC 1 and 2 series for the periods before and during the COVID-19 pandemic. Both the ADF and PP tests consistently indicated the LSXC 1 tested with trend had rejected the unit root null hypothesis at the 1 per cent significance level, meaning that the series with trend did not follow a random walk before the pandemic. However, both the ADF and PP tests consistently showed that the LSXC 1 constant, and LSXC 2 constant and with the trend all had a unit root or follow a random walk. This indicated that the efficiency results had improved in the pandemic period as compared to before the pandemic.

For the Philippines, the results of the ADF and PP tests were compatible. Both showing the PCOMP 1 and PCOMP 2 constant rejected the null hypothesis of a unit root, but PCOMP 1 and PCOMP 2 with trend were found to have a unit root. The stock market of the Philippines was less efficient in both the periods before and during the COVID-19 pandemic.

SET 1 and 2 series represented the stock market of Thailand. The ADF and PP unit root tests showed SET 1 and 2 were follow a random walk when tested with intercept and with the trend, except SET 2 which rejected the null hypothesis of a unit root when tested with the trend using the PP test. This indicates that SET 2 became less efficient in the pandemic period.

The stock market of Singapore was represented by STI 1 and STI 2. The stock market had improved in efficiency during the pandemic period. The ADF test showed STI 1 constant rejected the null hypothesis of a unit root, while the PP test showed the STI 1 constant and with trend rejected the null hypothesis of a unit root. These results showed inefficiency in the stock market before the pandemic. The period during the pandemic had improved efficiency because STI 2 only showed rejection of the null hypothesis of a unit root by the PP test results when testing with the trend.

The Vietnamese stock market was found to be efficient in the periods before and during the pandemic. The Hanoi Stock Exchange and Ho Chi Minh Stock Exchange were represented by VHINDEX 1 and VHINDEX 2, and VNINDEX 1 and VNINDEX 2. The ADF and PP tests' results were compatible, showing the four series had a unit root when tested for constant and with the trend using the ADF and PP unit root tests. All the series were found to follow a random walk.

Table 1 The ADF and PP Unit Root Tests' Results for the ASEAN Stock Indices

	ADF 1979		PP 1988	
Series	Constant	With Trend	Constant	With Trend
CSX 1	0.309161	-1.747616	0.256995	-1.719730
CSX 2	-1.985857	-2.964015	-1.937587	-2.838420
FBMKLCI 1	-1.271398	-2.889995	-1.367976	-2.949120
FBMKLCI 2	-2.647431*	-2.638114	-2.903232**	-2.896967
JCI 1	-2.584823*	-2.792373	-2.505773	-2.702413
JCI 2	-0.951647	-3.249800*	-1.106755	-3.404743*
LSXC 1	-1.904977	-5.266443***	-0.699513	-7.256988***
LSXC 2	-1.832461	-2.071198	-1.959032	-2.433848
PCOMP 1	-2.968181**	-2.932599	-2.838742*	-2.795528
PCOMP 2	-2.839228*	-3.000756	-2.920515**	-3.073727
SET 1	-1.871370	-1.753319	-1.978075	-1.860201
SET 2	-1.380842	-3.029612	-1.575309	-3.220981*
STI 1	-2.880157**	-3.004876	-3.052172**	-3.154868*
STI 2	-1.601267	-2.995761	-1.739342	-3.153336*
VHINDEX 1	-2.410646	-2.123476	-2.370991	-2.063371
VHINDEX 2	-1.247257	0.359304	-1.264715	0.123262
VNINDEX 1	-2.041267	-1.516504	-2.076354	-1.700386
VNINDEX 2	-1.023134	-0.298409	-1.106965	-0.470020

Note: ***, **, and * denote the rejection of the null hypothesis at 1 per cent, 5 per cent, and 10 per cent significance levels respectively.

CONCLUSION

This study aims at studying the weak-form EMH for the ASEAN stock markets based on the stock indices including CSX, FBMKLCI, JCI, LSXC, PCOMP, SET, STI, VHINDEX, and VNINDEX, for the periods before and during the COVID-19 pandemic. Among the ASEAN countries, we found that Cambodia (CSX) and Vietnam (VHINDEX and VNINDEX) are efficient in both the periods before and during the pandemic. There was decreased efficiency in the stock markets of Malaysia, Indonesia, and Thailand from the period before the pandemic to the period during the pandemic. Meanwhile, the stock markets of Laos (LSXC) and Singapore (STI) had improved efficiency in the pandemic period as compared to before the pandemic period. For the Philippines (PCOMP), there was no significant change in efficiency in the periods before and during the pandemic. PCOMP 1 and PCOMP 2 were found to not follow a random walk when tested with constant only using the ADF and PP tests. We compared our findings with Dias et al. (2020) that found all ASEAN-5 countries' stock markets were inefficient during the pandemic period. Our findings are consistent with the study. On top of that, we provided more findings on the changes in efficiency from the periods before and during the pandemic. To strengthen the efficiency of the ASEAN stock markets, policymakers may further improve access to information. Inefficiency will open up more opportunities to predict stock movements and make the excess returns available in the markets. Investors may make use of technical analysis for prediction.

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