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REVISITING WEAK-FORM EFFICIENCY OF MAJOR SECTORS OF MALAYSIA DURING THE COVID-19 PERIOD

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ABSTRACT

We look into the weak-form informational efficiency for twelve sectors in Malaysia's stock exchange, i.e. Consumer Products & Services (KLCSU), Construction (KLCON), Energy (KLENG), Financial Services (KLFIN), Health Care (KLHEAL), Industrial Products & Services (KLPRO), Property (KLPRP), Plantation (KLPLN), Transportation & Logistics (KLTRAN), Telecommunications & Media (KLTEL), Utilities (KLUTL), and Technology (KLTEC) during the outbreak of COVID-19 pandemic. We use QTEST (without trend) and TQTEST (with trend), which incorporate two structural breaks to carry out the analysis. Data are collected from 02/12/2019 through 31/3/2022. These indices show non-linearity and structural breaks in data. The findings of our study suggest mixed results regarding informational efficiency when breaks are taken. Four indices, i.e. KLCON, KLFIN, KLPRP, and KLUTL, are found to be inefficient, while the remaining eight sectors are found to be efficient.

Keywords: Global pandemic crisis, Panel unit root test, Structural break, Weak-form EMH.

INTRODUCTION

The Malaysian stock market is currently consisting of twelve sectors, namely, Consumer Products & Services (KLCSU), Construction (KLCON), Energy (KLENG), Financial Services (KLFIN), Health Care (KLHEAL), Industrial Products & Services (KLPRO), Property (KLPRP), Plantation (KLPLN), Transportation & Logistics (KLTRAN), Telecommunications & Media (KLTEL), Utilities (KLUTL), and Technology (KLTEC). As of 28 February 2022, the top five best performance sectoral indices in the last three years were Technology, which recorded 150.37% in returns, Health Care 68.08%, Industrial Products & Services 25.48%, Plantation 14.88%, and Transportation & Logistics 8.21%. The rest of the sectors had decreased in returns. The five highest sectoral indices' returns last year were Plantation with 15.86% returns, Industrial Products & Services with 13.78%, Financial Services with 10.15%, Transportation & Logistics with 8.61%, and Property with 2.97%. All other sectors had decreased in returns.[1]

The COVID-19 pandemic spread to many countries around the world. The ongoing pandemic requires different levels of physical distancing and Movement Control Order (MCO) to be practiced by individuals in many countries, including Malaysia. The pandemic makes small businesses financially fragile (Bartik *et al*., 2020). Mass business closures and employee layoffs already occurred. It is doubtful if large businesses are also affected specifically publicly listed companies. Nevertheless, the pandemic is believed to adversely affect the confidence of investors in stock markets and, thus the market efficiency of stock markets. Some studies that assessed stock markets' efficiency during the COVID-19 pandemic include Ozkan (2021) and Tadoori and Vadithala (2022). So far, studies on sectoral efficiency during the pandemic period are lacking. It is crucial to capture the efficiency of the sectors to indicate the predictability of stock returns, especially across sectors during the pandemic period. Efficiency will ensure the efficient allocation of resources to the various sectors.

This paper looks into the weak-form efficiency across twelve sectors of Bursa Malaysia for the period the pandemic is ongoing. We use QTEST (without trend) and TQTEST (with trend). The advantage is that they incorporate two structural breaks for analysis. This study is significant to investors and policymakers. The findings specifically indicate the efficiency of each sector, giving a clear picture of the efficiency across sectors. The remainder of this paper is organized as follows: the literature review is in Section 2, Section 3 presents data and methodology, Section 4 discusses estimated results, and Section 5 is the conclusion.

LITERATURE REVIEW

Testing the weak-form EMH is important to determine whether efficiency exists in a stock market or a stock market sector. Some suggest that stock markets are complying with the Adaptive Market Hypothesis (AMH) instead of EMH (Lim & Brooks, 2011; Tadoori & Vadithala, 2022). If the AMH is a true theory to explain the behaviour of a stock market or a sector, then we agree that the market or sector is shifting between efficiency and inefficiency, and investors are rational and irrational. Hence, it is not surprising to find inconsistency in the findings of efficiency for different periods for the same market or

[1] BM_Sectorial_Index_Series_Factsheet_Feb22.pdf

sector. Therefore, these circumstances encourage us to study the efficiency of a stock market or a sector throughout a period undergoing some important events that can be captured by structural breaks. For example, investors may be overreacted to the bad news of COVID-19, and some stock markets and sectors are affected.

There are some studies of sectoral efficiency in the literature. Runs tests and variance ratio tests were performed for the sectoral indices of the Amman stock market for the period 1992-2004. The estimation results indicated that all the sectors were inefficient but mean-reverting, and thus, investment in the short run was risky (Rawashdeh & Squalli, 2006). Eleven sectoral indices in the Indian stock market were tested using variance ratio tests and different unit root tests for the 2004-2014 period. Inefficient sectors found were metal, bank, PSU Bank, and Realty, which suggested exploitable investment opportunities in these sectors (Tripathi & Kumar, 2014). Ten global sectoral indices were examined using Multifractal Detrended Fluctuation Analysis for the period 1/1/1996-31/12/2014. Higher efficiency was found in Islamic sectoral indices (Rizvi, 2016).

Eight sectoral indices in the Malaysian stock market were examined by Lim (2008) for the period 1/1/1994-31/10/2006. The most efficient sector was Tin and Mining, while the least efficient sector was Property. The study applied a rolling bi-correlation test approach, which captured nonlinear predictability in stock returns and indicated seven sectors became most inefficient during the Asian financial crisis period, except for Tin and Mining. The turnaround of the seven sectors during capital control and the USD-pegged period implied that the government was successful in calming the market. Sectoral indices in the Malaysian stock market were examined by Chin (2008) using the Zivot-Andrews unit root test for the period 1/8/1996-30/6/2006. Most of the sectoral indices show structural change from 1997 to 1998. Mean reversions were captured in nearly all the sectoral indices, indicating market inefficiency and predictability, except for Properties. For the period of 1/11/1993-30/6/2011, Lye and Hooy (2012) used Multifractal Detrended Fluctuation Analysis and captured the long-range correlations in sectoral indices in the Malaysian stock market. All the sectoral indices were found to be inefficient and adversely impacted by the Asian financial crisis, global financial crisis, and capital control by the government. Soon et al. (2014) found that almost all the sectors of the Malaysian stock market were not complying with weak-form efficiency, thus enabling prediction using historical price data.

Ozkan (2021) found that during the COVID-19 pandemic, the stock markets in the United States, United Kingdom, Italy, Spain, France, and Germany had become inefficient. Tadoori and Vadithala (2022) estimated the efficiency of forty-four stock markets for the COVID-19 pandemic period from 2019:11 to 2021:1, and the findings showed that the markets mostly complied with AMH instead of EMH.

The literature on weak-form EMH of stock markets is plentiful, but little attention has been focused on sectoral efficiency. Only a small number of studies on sectoral efficiency are found, which are important to track the efficiency across sectors. In addition, studies on sectoral efficiency in Malaysia during the COVID-19 pandemic period are limited.

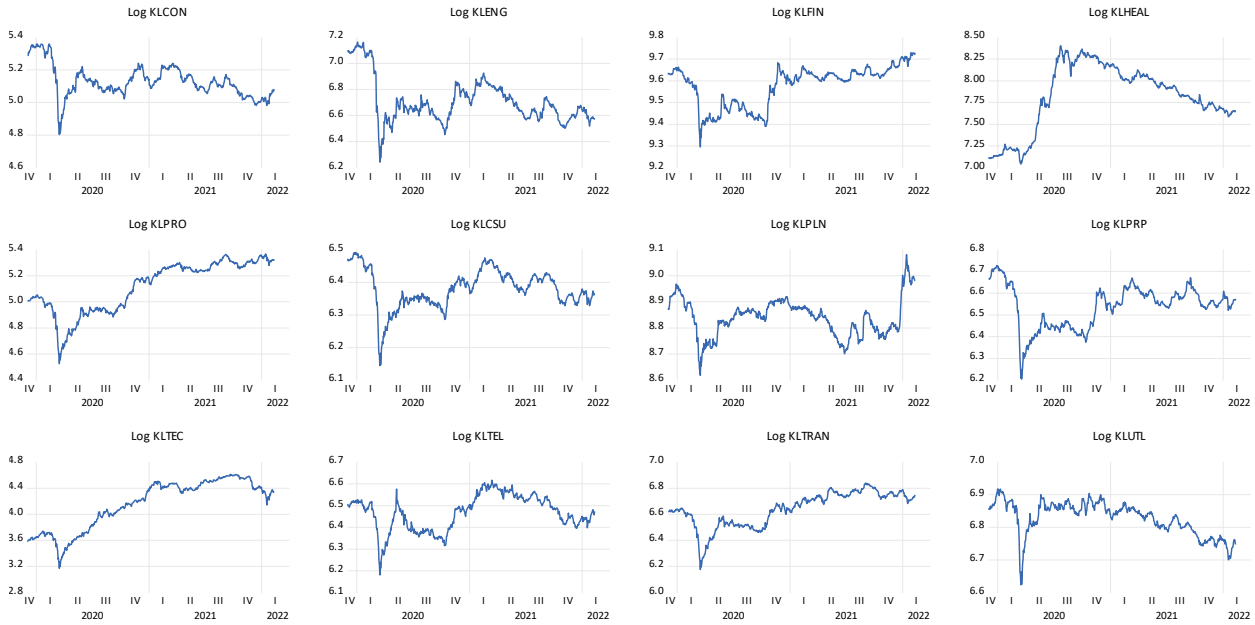
METHODOLOGY AND DATA

Dataset

We used the daily data of the twelve indices of Malaysia's stock exchange. The data start from 02/12/2019 to 31/03/2022. The indices include Construction (KLCON), Energy (KLENG), Financial Services (KLFIN), Health Care (KLHEAL), Industrial Products & Services (KLPRO), Consumer Products & Services (KLCSU), Plantation (KLPLN), Property (KLPRP), Technology (KLTEC), Telecommunications & Media (KLTEL), Transportation & Logistics (KLTRAN), and Utilities (KLUTL). The indices were transformed into their natural logarithm, and the start and end dates were chosen purely based on data availability. Figure 1 depicts mixed trends and possible structural breaks in the series. However, it is noticeable that all the indices show sharp declines between the first and second quarters of 2020, and most of the indices show sharp declines between the third and fourth quarters of 2020.

Figure 1

Plots of the Indices from the Years 2019 to 2022



Estimation Technique

We use Lumdaine and Papell (2006) unit root tests incorporating two structural breaks to test the random walk properties of the twelve sectoral indices. We apply both the unit root tests without trend and with trend. Perron and Vogelsang (1992) developed the QTEST for a unit root in a non-trending time series with one structural break. The possible changes are considered to occur at an unknown time. We consider an Additive Outlier type (AO) model to model changes that occur instantaneously. Perron (1997) and Vogelsang and Perron (1998) developed the TQTEST for a unit root in a trending time series with one

structural break. The AO model is estimated using a two-step process. For values of the breakpoints Tb_1 and Tb_2 with .10T< *Tbi* <.90T (where T is the sample size and i = 1,2), the deterministic part of the series is removed using the following regression:

$$q_t = \mu + \gamma_1 DU1_t + \gamma_2 DU2_t + \tilde{z}_t \qquad (1)$$

where $DU1_t$ = 1 if t > Tb_1 , 0 otherwise and $DU2_t$ = 1 if t > Tb_2 , 0 otherwise. Using the t-statistic for α = 0 in the regression, the unit root test is then performed.

$$\Delta\tilde{z}_t = \sum_{i=0}^{k} \omega_{1i} D(Tb_1)_{t-i} + \sum_{i=0}^{k} \omega_{2i} D(Tb_2)_{t-i} + \alpha\tilde{z}_{t-1} + \sum_{i=1}^{k} c_i \Delta\tilde{z}_{t-1} + \varepsilon_t, \qquad (2)$$

where D(*Tbi*)t = 1 if t = *Tbi* +1 and 0 otherwise. Statistics are computed for all possible combinations of break dates, taking into account the trimming and not allowing breaks to occur in consecutive years.

Finally, the AO model of Vogelsang and Perron (1998) was extended by Lumdaine and Papell (2006), for trending data to allow for two breaks. The deterministic part of the series is removed using the following regression:

$$q_t = \mu + \beta_t + \gamma_1 DU1_t + \gamma_2 DU2_t + \tilde{z}_t \qquad (3)$$

where 10% trimming is used to avoid finding spurious breaks. Monte Carlo methods are used to compute critical values.

ESTIMATED RESULTS

Descriptive Statistics

In Table 1, descriptive statistics are reported. The means of the indices range from 67.80 to 14510.22. The standard deviations of the indices range from 16.87 to 1289.78. The maximum values range from 100.86 to 16795.58. The minimum values range from 23.81 to 10885.45. KLFIN has the highest maximum and minimum values. The standard deviation, mean, maximum, and minimum values are distinct across the data series, suggesting the sectors are heterogeneous. Most of the data series show left skewness and excess kurtosis. The Jarque-Bera normality test indicates that all the data series are non-normally distributed.

Table 1

Descriptive Statistics of the Indices

Indices	Mean	Maximum	Minimum	Std. Dev.	Skewness	Kurtosis	Jarque-Bera
KLCON	169.76	212.55	121.91	16.87	0.69	3.66	56.00
KLENG	832.27	1291.25	513.75	155.48	1.37	4.32	221.25
KLFIN	14510.22	16795.58	10885.45	1289.78	-0.63	2.27	51.43
KLHEAL	2661.38	4456.09	1142.40	894.82	-0.05	1.99	24.81
KLPRO	169.49	214.32	92.52	30.79	-0.42	1.92	44.96
KLCSU	590.69	659.41	466.27	34.16	-0.38	3.60	22.77
KLPLN	6923.54	8782.59	5532.03	502.39	0.37	3.57	21.15
KLPRP	694.78	834.87	495.19	65.16	-0.29	2.76	9.28
KLTEC	67.80	100.86	23.81	22.23	-0.27	1.66	49.81
KLTEL	646.46	747.72	483.54	51.10	-0.30	2.46	15.35
KLTRAN	771.20	936.01	480.71	96.59	-0.54	2.56	32.83
KLUTL	924.56	1010.10	752.78	46.26	-0.75	3.25	55.02

Tests For a Unit Root in the Presence of Structural Change

Table 2 reports the estimated results of QTEST (without trend) and TQTEST (with trend), which incorporate two structural breaks. The results of both tests consistently show that the levels' four indices, i.e. KLCON, KLFIN, KLPRP, and KLUTL, are stationary in the levels. The null hypothesis of a unit root is rejected for KLCON, and the result is significant at a 10% level. For KLFIN and KLPRP, the null hypothesis is rejected at the 5% level. Meantime, the result of KLUTL rejects the null hypothesis of a unit root at the 1% level. These four data series are thus stationary in the levels and inefficient. The remaining eight indices, i.e. KLCSU, KLENG, KLHEAL, KLPLN, KLPRO, KLTEC, KLTEL, and KLTRAN, are found to be efficient. The indices are nonstationary in the levels.

Both the QTEST and TQTEST incorporate two structural breaks. The first breaks across all indices mostly take place in the early stage of the COVID-19 pandemic, that is, between February 2020 and June 2020. The second break in the indices seems to be more dissimilar, which occurs between June 2020 to November 2021.

Table 2

Unit Root Tests with Two Structural Changes

Indices	α	*Break 1*	γ_1	*Break 2*	γ_2	*k*	t_α
	QTEST test with two structural changes						
KLCON	-0.049	2020:03:06	-0.19	2021:09:10	-0.08	5	-5.24*
KLCSU	-0.039	2020:03:03	-0.14	2020:09:30	0.07	8	-4.6
KLENG	-0.038	2020:02:28	-0.4	2021:04:21	-0.06	8	-3.91
KLFIN	-0.066	2020:03:04	-0.17	2020:10:08	0.18	7	-5.57**
KLHEAL	-0.026	2020:04:22	0.91	2021:05:07	-0.29	5	-4.97
KLPLN	-0.029	2020:03:03	-0.08	2021:11:25	0.1	6	-3.67
KLPRO	-0.024	2020:03:03	-0.15	2020:09:02	0.38	8	-4.76
KLPRP	-0.067	2020:02:28	-0.25	2020:10:28	0.16	5	-5.87**
KLTEC	-0.019	2020:03:05	0.2	2020:12:08	0.59	6	-4.03
KLTEL	-0.035	2020:03:03	-0.12	2020:10:02	0.12	8	-4.34
KLTRAN	-0.037	2020:03:02	-0.14	2020:09:29	0.25	8	-5.01
KLUTL	-0.065	2020:03:06	-0.03	2021:05:05	-0.06	5	-7.01***
	TQTEST test with two structural changes						
KLCON	-0.058	2020:03:06	-0.19	2020:10:05	0.13	5	-5.92*
KLCSU	-0.045	2020:03:03	-0.13	2020:10:01	0.09	8	-5.09
KLENG	-0.063	2020:03:02	-0.41	2020:10:20	0.24	8	-5.14
KLFIN	-0.095	2020:02:28	-0.2	2020:10:26	0.13	3	-6.24**
KLHEAL	-0.037	2020:03:18	0.34	2020:06:04	0.93	6	-5.32
KLPLN	-0.032	2020:04:30	0.06	2021:11:25	0.14	4	-3.82
KLPRO	-0.04	2020:02:28	-0.23	2020:10:05	0.2	5	-4.26
KLPRP	-0.067	2020:02:28	-0.26	2020:10:27	0.15	5	-6.01**
KLTEC	-0.031	2020:06:08	0.24	2021:11:15	-0.34	5	-3.94
KLTEL	-0.04	2020:03:03	-0.11	2020:10:02	0.14	8	-4.85
KLTRAN	-0.044	2020:03:02	-0.2	2020:09:29	0.12	8	-4.61
KLUTL	-0.067	2020:03:06	0	2020:10:13	0.06	5	-7.46***

Note: *, **, *** denote significance at the 10%, 5%, and 1% level of significance, respectively. The critical values for t_α are:
-5.24 (10%), -5.51 (5%), and -6.06 (1%) (QPPP test including two structural changes)
-5.69 (10%), -5.96 (5%), and -6.45 (1%) (TQPPP test including two structural changes)

CONCLUSION

Twelve sectors in Malaysia's stock exchange were examined for weak-form efficiency from 02/12/2019 to 31/03/2022. The period covered the early and ongoing stages of the outbreak of COVID-19. We use QTEST and TQTEST with two structural breaks. Construction (KLCON), Financial Services (KLFIN), Property (KLPRP), and Utilities (KLUTL) are the four sectoral indices that are found to be inefficient. These indices are stationary in log levels, and the null hypothesis of a unit root is rejected for each of the

indices. Both the QTESR (without trend) and TQTEST (with trend) results imply that the remaining eight indices are efficient because the null hypothesis of a unit root fails to be rejected, and the indices are not stationary in log levels. Our findings are inconsistent with Lim (2008), Chin (2008), Lye and Hooy (2012), and Soon et al. (2014), which show that the results are more towards inefficiency during the previous financial crises, as compared to the pandemic period. For the four indices that are stationary in log levels, investors can predict the movements of stocks and gain abnormal returns from these stocks. Some investors may be overreacted to the bad news of COVID-19 during the study period. Predictable stocks will attract investors who seek short-term investments and tend to buy and sell within a short period. Policymakers may encourage more trades to be carried out to make the market more efficient by gradually eliminating the opportunities to earn abnormal returns.

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