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The Random Walk and Systematic Risk in Indonesia

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Abstract

Purpose: During the period 2022 until January 2023, several new global issues emerged besides the COVID-19 pandemic and had an impact on economic. This study aims to examine the weak form of market efficiency in Indonesia under the assumption that uncertain economic conditions tend to affect systematic risk and cause stock returns randomly move.

Methodology: This study employs time series data based on the stock returns of 766 firms in Indonesia during the period January 3, 2022, to January 31, 2023. To detect random walk, the runs test is conducted with supporting of the variance ratio test.

Findings: Systematic risk plays an important role in risky assets' efficiency during uncertain economic events which is consistent with the random walk theory. Otherwise, the impact of uncertain economic events on less risky assets gives the investors possibility to obtain extraordinary returns or abnormal returns.

Originality/Value: This study examines market efficiency by taking into account the systematic risk of assets that are rarely analyzed at present.

Introduction

Risk-return is the main factor for investors in compiling an investment portfolio (Fama & MacBeth, 1973; Vo et al., 2019; Halim et al., 2021). This is because investors' preferences of investment tend to be influenced by psychology (Kahneman & Tversky, 1979; Hirshleifer, 2001). Psychologically, investors tend to construct investment portfolios based on risk preferences (Fama & MacBeth, 1973; Daniel et al., 1998; Hirshleifer, 2001; Tian & Wu, 2022). According to Lintner (1965), Parveen et al. (2020), Kyaw et al. (2022), and Nguyen et al. (2022), risk preference appears as a reflection of uncertainty that can have an impact on the expected returns of investors. A risk component that often has a strong relationship with stock returns is systematic risk (Lakonishok & Shapiro, 1986; Patro et al., 2013; Hundal et al., 2019).

Systematic risk is the main focus of investors because this risk is mostly affected by economic events (Patro et al., 2013; Tram & Hoai, 2021). Altig et al. (2020), Harjoto et al. (2021), Shibata (2021), Takyi and Bentum-Ennin (2021), van der Wielen and Barrios (2021), and Deng et al. (2022) report that economic conditions and capital markets have tended to experience shocks since 2020 due to the COVID-19 pandemic. Recent studies, Siregar et al. (2021), Anas et al. (2022), and Budiman et al. (2022) also report that the same conditions also occurred in Indonesia so that the government continuous to improve the fiscal, monetary, and other social policies to carry out recovery in increasing economic growth.

In the context of random walk theory, changes in information from uncertain economic events are immediately responded by investors thereby affecting the randomness of stock prices in the capital market (Fama, 1965, 1970). The evidence of Ozkan (2021), and Wang and Wang (2021) prove that some markets tend to be inefficient during uncertain economic conditions due to a pandemic, although Ngoc et al. (2021), and Ammy-Driss and Garcin (2023) prove otherwise. On those gaps, this study assumes that uncertain economic conditions tend to cause stock returns to become more random through changes in systematic risk. Based on assumption, this study is motivated to find out whether risky assets can provide optimal returns according to the CAPM concept that high risk means high returns. Therefore, this study aims to examine market efficiency between risky and less risky assets in Indonesia. As a contribution, this study complements the evidence of the efficient market hypothesis, especially in the weak form or random walk theory.

Literature review

Market efficiency is defined as a reflection of relevant information that is immediately embedded into the stock prices at the current time (Fama, 1965, 1970). The well-known form of the efficient market hypothesis (EMH) is the weak form or called the random walk theory. The random walk theory is a perspective to explain the movement pattern of stock returns as the result of information about uncertain economic events (Fama, 1965, 1970). Furthermore, Malkiel (1989, 2003) explains that the market is efficient if the current stock prices are independent of past prices as new information emerges. According to Malkiel (1989), new information tends to be unpredictable so the impact on stock prices is also unpredictable, and therefore stock price movements become random. As the prices become more random, Malkiel (1989, 2003) emphasizes that abnormal returns shall not be provided except if the prices are more predictable. In addition, Fama (1970) and Malkiel (2003) explain that unpredictable market conditions due to economic events somehow tend to affect systematic risk or market risk in the concept of the asset pricing model.

There are some studies that examine the efficient market hypothesis in weak form during unstable economics. Heymans and Santana (2018) show that the daily prices of bigger and older firms in Africa during the period 3 July 1997 until 3 March 2015 are efficient. Similarly, Malini (2019) investigates the listed firms in LQ-45 over the period January 2013 to December 2018 and finds that most of their prices are efficient so that investors are unable to get abnormal returns. Enow (2022) proves that weekend anomalies do not occur in several world markets which indicate that psychology plays an important role in the rationality of investors in filtering information that enters the market, especially over the period August 22, 2017, to August 22, 2022. Enow (2023) also emphasizes that investor behaviors tend to be more rational in the era of the global financial crisis from 2007 to 2008 compared to the era of the COVID-19 pandemic, thus indicating that relevant new information prevailing in the market is independent of global financial crisis issues which are still consistent with efficient market hypothesis.

Reversely, Agustin (2019) finds that random walks do not occur in the Indonesian Islamic Stock Index, especially in the period 3 January 2017 to 8 February 2019, indicating that investors respond passively to new information. Mubarok and Fadhli (2020) also find that Indonesian market is inefficient from 1996 to 2020. During July 29, 2019, to January 25, 2021, Ozkan (2021) finds that the returns in US and Europe

markets are inefficient or not random as the speculation increase in the middle economics shocks caused by the COVID-19 pandemic. The evidence of Wang and Wang (2021) shows that the return of the S&P 500 Index dropped in the period from February to March 2020 as the impact of extreme events which decreases the market efficiency (or become inefficient) of the US. Khan et al. (2021) also report that the returns of the Socially Responsible Index (SRI) and Shariah Compliance Index (SCI) are inconsistent with the random walk theory in the period post-global financial crisis. A recent study by Zebende et al. (2022) from May 2019 to May 2020 find that the returns in the US and countries of G-20 are inefficient (inconsistent with random walk theory) as the global economy is uncertain. Dias et al. (2022) confirm that the markets (such as African, the UK, Japan, and the US) are inefficient during economic instability that is triggered by investors' pessimism. Recently, Ammy-Driss and Garcin (2023) confirm that the market of US is inefficient while the markets in Asia and Australia are more efficient during COVID-19 crisis. Based on review, this study reveals that mostly of the markets in the world become inefficient during economic uncertainty. Moreover, this study also discloses that systematic risk tends to be rarely used as a control variable to look at random walk phenomena more specifically. In this gap, the hypothesis of this study is noted as follows.

H0: The stock returns controlled by systematic risk are random

H1: The stock returns controlled by systematic risk are not random

Method

The data of this study is a time series of 267 market days containing 766 listed firms (equals to population) in Indonesia from January 3, 2022, to January 31, 2023. This period is chosen because many new global events (such as such as health, politics, and economy) tend to affect economic conditions in Indonesia. The stock return (R_{it}) is employed and calculated as follows.

$$R_{it} = \frac{P_{it} - P_{it-1}}{P_{it-1}} \quad (1)$$

P_{it} is the stock price of firm i at day t and P_{it-1} is the stock price of firm i at day t minus 1. This study uses the systematic risk (β_{it}) to split the data where the firm with $\beta \geq 1$ is

categorized as risky assets and $\beta < 1$ is categorized as less risky assets. The β_{it} is estimated by the capital asset pricing model (CAPM) with formula as follows.

$$R_{it} - RF_t = \alpha_{it} + \beta_{it}(RM_t - RF_t) + \varepsilon_{it} \quad (2)$$

RF_t is the risk free rate from Central Bank of Indonesia and RM_t is the market return at day t. In order to test the hypothesis, several procedures (at level of significance of 1%) are carried out as follows. First, the Augmented Dickey-Fuller (ADF) test is conducted to detect the unit root problem with formula as follows.

$$\Delta y_t = \alpha + Y_{y_{t-1}} + V_t \quad (3)$$

Second, runs test is conducted to detect the randomness with formula as follows.

$$z = \frac{U - \left(\sqrt{\frac{2.\eta_p.\eta_n}{\eta}} + 1\right)}{\sqrt{\frac{2.\eta_p.\eta_n(2.\eta_p.\eta_n - \eta)}{\eta^2.(\eta - 1)}}} \quad (4)$$

Third, the variance ratio (VR) test is conducted to confirm the result of runs test with formula as follows.

$$VR(k) = \frac{\sigma^2(k)}{\sigma^2(1)} \quad (5)$$

Result and discussion

Result

Table 1 presents the descriptive statistics of stock returns for risky and less risky assets. The mean value shows that less risky assets have better performance of stock returns than risky assets during the observed period. The risky assets also have higher standard deviation which confirms that those assets are more volatile than less risky assets. The skewness and kurtosis also show that the returns for both assets have left-skewed distribution with peaks of leptokurtic.

Table 1. Descriptive statistics

Variable	N	Mean	Standard deviation	Skewness	Kurtosis
Risky	267	-0.000807	0.013395	-0.54	0.94
Less risky	267	-0.000169	0.004042	-0.94	1.45

Table 2 presents the results of the ADF test for risky and less risky assets. The null hypothesis of the test is the stock returns have a unit root problem and the alternative hypothesis is the stock returns have no unit root problem. The ADF test shows that the t-statistics for risky and less risky assets are significant at 1% which means the null hypothesis of the test is rejected. Those results indicate that both risky and less risky assets do not have unit root problems and can proceed to the runs test.

Table 2. The Augmented Dickey-Fuller (ADF) test

Variable	t-Statistic				Prob.
	ADF test	1%	5%	10%	
Risky	-14.21681	-3.454812	-2.872203	-2.572525	0.0000
Less risky	-12.63311	-3.454812	-2.872203	-2.572525	0.0000

Table 3 presents the results of runs tests for risky and less risky assets. The null hypothesis of the test is the stock returns have random movement and the alternative hypothesis is the stock returns do not move randomly. The runs test shows that the probability of risky assets is insignificant at 1% which means the null hypothesis is accepted and otherwise for less risky assets.

Table 3. The runs test

Variable	N	Sample mean (K)	Observations		Runs		Prob.
			≤ K	> K	Observed	Expected	
Risky	267	-0.0008072	123	144	131	133.67	0.741
Less risky	267	-0.0001692	111	156	94	130.71	0.000

Table 4 presents the results of VR tests for risky and less risky assets and also confirms the results of the run tests. The null hypothesis and the alternative hypothesis for this test are similar to runs test. On results, the probability of joint tests for risky assets is insignificant while the result of less risky assets is significant at 1%. Those results confirm that the movements of stock returns for risky assets are random and less risky assets are not random. There are several additional notes on the test results for each sub-period for risky and less risky assets. The variance ratio test for risky assets shows that stock returns in sub-period 2 tend to show non-random movements even though they become more random in the next sub-periods. In contrast, the movement of stock

returns from less risky assets shows consistency since sub-period 2 but becomes random in the last sub-period.

Table 4. Variance ratio test

RISKY				
Joint Tests				
Value	2.728435			
Probability	0.0252			
Individual Tests				
Period	**Var. Ratio**	**Std. Error**	**z-Statistic**	**Probability**
2	1.141310	0.066183	2.135142	0.0327
4	1.342620	0.125574	2.728435	0.0064
8	1.497639	0.198620	2.505477	0.0122
16	1.588151	0.287655	2.044643	0.0409
LESS RISKY				
Joint Tests				
Value	4.615517			
Probability	0.0000			
Individual Tests				
Period	**Var. Ratio**	**Std. Error**	**z-Statistic**	**Probability**
2	1.255508	0.069680	3.666883	0.0002
4	1.589662	0.127756	4.615517	0.0000
8	1.750386	0.196061	3.827303	0.0001
16	1.684162	0.283941	2.409523	0.0160

Discussion

This study aims to examine market efficiency in Indonesia by concerning systematic risk. The results show that the stock returns of less risky assets are better than risky assets. In addition, the abnormal returns based on CAPM (unreported) for less risky assets are also higher than risky assets. Based on the findings, this study suspects that increases in systematic risk will be followed by decreases in the returns including abnormal returns. In the next analysis, the ADF test does not detect any unit root problem for both risky and less risky assets so the time series data for risky and less risky assets are stationary.

The further procedure, the results of runs tests confirm that risky assets tend to be more random than less risky assets. Moreover, the joint tests of variance ratio also show similar results to the runs test although by individually there is an anomaly for both assets. Those findings indicate that the stock prices of risky assets fully reflect the new relevant information and make the returns become more unpredictable. Otherwise, the new relevant information tends not to be immediately attached to the stock prices of

less risky assets which make their returns more predictable. In the case of risky assets, systematic risk plays a significant role and it is more volatile when new information about any issues comes into the market.

The findings clearly answer the hypothesis that has been formulated where H0 is acceptable in the case of risky assets and otherwise for less risky assets. Rather than less risky assets, the finding on risky assets is inconsistent with the findings of Agustin (2019), Mubarok and Fadhli (2020), Ozkan (2021), Wang and Wang (2021), Khan et al. (2021), Zebende et al. (2022), Dias et al. (2022), and Ammy-Driss and Garcin (2023) in the US market. But, the finding on risky assets has a similar result to Heymans and Santana (2018), Malini (2019), Ammy-Driss and Garcin (2023), and Enow (2022, 2023).

Conclusion

During 2022 until January 2023, information about global issues (such as health, politics, and economy) comes around capital market activities in Indonesia and tends to result in conditions of economic uncertainty. In order to anticipate the impact of global issues, the Indonesian government has made several efforts (such as the COVID-19 vaccination program, tax incentives, and interest rate revaluation to control inflation) with the aim of maintaining and increasing national economic stability.

The findings of this study imply that the new information has a significant impact on price movements and returns. Specifically, new relevant information about global issues affects significantly the systematic risk especially for risky assets compared to less risky assets. This phenomenon implies risky assets to be more efficient than less risky assets according to the perspective of EMH in the weak form or random walk theory. Consistent with the random walk theory, the uncertain economic events make market not providing space for investors to gain abnormal returns so they must actively improve the asset portfolio (especially for risky assets). On the other hand, uncertain economic events also create opportunities for investors to obtain extraordinary returns in the assumption that investment preferences are focused on less risky assets. The findings of this study are limited to the observation period, so further studies need to use another period. Moreover, further studies need to add other control variables (such as idiosyncratic risk or market liquidity) that need to be applied to other capital markets, at least with similar characteristics.

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