Navigating Uncertainty: Using CAPM to Invest in LQ45 Index Stocks During the Pandemic

Eni Wuryani(✉)

Universitas Negeri Surabaya, Surabaya, Indonesia
eniwuryani@unesa.ac.id

Abstract. The Capital Asset Pricing Model (CAPM) is often used by investors in making investment decisions. This study aims to determine the Capital Asset Pricing Model for determining investment in LQ45 Index stocks before the pandemic and during the pandemic. The method used in this study is descriptive comparative with a quantitative approach. The data used is data in the form of annual financial reports (annual report) for the LQ45 Index before the pandemic (2018–2019) and during the pandemic (2020–2021). The Capital Asset Pricing Model can be used to determine investment in LQ45 Index Shares.

Keywords: CAPM · Stock Investment · Financial Statements

1 Introduction

According to [1] rational investors make investment decisions starting with analyzing the situation; designing optimal portfolios; formulate investment policies; implicate investment strategy; monitor and supervise the specific performance of financial managers. According to [2] Investment growth has a positive relationship with stock returns. Investment growth for the next 1 year is better than investment growth for 2 years and 3 years. According to [3] Long-term investments will be more profitable because of lower tax rates and generate opportunities for capital gains. According to [4] Forfolio in providing the benefits of risk diversification, the Fama Model provides better information for investors than the CAPM model, this is related to performance in providing returns and efficient portfolio management. Previous research related to CAPM has been conducted by [4–15].

According to [16] portfolio analysis is the desire to obtain a number of securities to hold and benefit from each security.

The existence of a positive relationship between return and risk in investing is known as high risk-high return, which means that the greater the risk that must be borne, the greater the return generated. Return is the result obtained from the investment. Returns can be realized returns that have occurred or expected returns that have not occurred but are expected to occur in the future. Meanwhile, portfolio risk consists of systematic and unsystematic risks.

T. T. Y. Alabdullah et al. (Eds.): ICIGR 2022, ASSEHR 750, pp. 640–650, 2023.
https://doi.org/10.2991/978-2-38476-052-7_70

The application of the Capital Asset Pricing Model (CAPM) model uses a single risk factor, namely market risk as a measure of risk in estimating returns. According to [17] in the CAPM there are two types of risk, namely unsystematic risk and systematic risk. If the two types of risk are combined, then it is called total risk. Although the Capital Asset Pricing Model cannot be proven empirically. The CAPM model has been widely used because this model has a fairly good accuracy in determining the return of a stock. The CAPM model assumes that investors are planners in a single period who have the same perception of market conditions and seek the mean–variance of the optimal portfolio. This study aims to analyze the Capital Asset Pricing Model method in determining LQ45 Index stock investment.

Rational investors will choose an efficient portfolio, because it is a portfolio formed by optimizing one of two dimensions, namely the expected return or portfolio return. An efficient portfolio is a portfolio that provides the greatest expected return with a certain level of risk or a portfolio that contains the smallest risk with a certain level of expected return. A portfolio is said to be efficient if the portfolio is located on an efficient set or efficient frontier.

The Capital Asset Pricing Model (CAPM) explains the relationship between return and beta. The understanding of the CAPM was first raised in the mid-1960s by Willian F. Sharpe, Linter and Mossin. William F. Shape is a Professor of Finance at the Stanford University Graduate School of Business. Calculating the level of portfolio returns, investors need an analytical tool.

The establishment of general equilibrium models allows investors to determine the relevant measure of risk. One of the existing balance models is the CAPM. The main functions of the Capital Assets Pricing Model (CAPM) namely:

1. As a benchmark in evaluating the rate of return on an investment
2. Assist in predicting or predicting the expected return of an asset that is or has not been traded on the market.

The assumptions underlying the CAPM standard are as follows:

1. All investors have an identical future profitability distribution of returns, because they have almost the same expectations. All investors use the same sources of information such as return rates, return variances, and correlation matrices in relation to building an efficient portfolio.
2. All investors have the same time period, for example one year.
3. All investors can borrow (borrowing) or lend (lending) money at a risk-free rate of return.
4. No transaction fees
5. No income tax
6. There are lots of investors, and it's not like any one investor to influence the price of a security. All investors are price-takers
7. The market is in a state of balance (equilibrium)

The assumptions above seem unrealistic, however an important issue that must be considered is how well the CAPM theory predicts or explains reality and not the realism of its assumptions.

2 Methodology

This research was conducted at companies whose shares were listed in LQ 45 for the 2018–2020 period. The secondary data used are quarterly close price data, equity value, Bank Indonesia interest rate (risk free rate) and number of shares outstanding. The monthly share price of each company is obtained from the Yahoo Finance website (www.yahoofinance.com), the equity value of each company and data on the number of shares outstanding are obtained from the financial statements of each company which have been published on the Indonesia Stock Exchange website (www.idx.co.id) or contained in the Indonesian Capital Asset Market Electronic Library (ICAMEL) database, and the risk free rate per month is obtained from the Bank Indonesia website (www.bi.go.id).

Operational Definition and Measurement of Research Variables.

2.1 Dependent Variable

This study uses stock returns as the dependent variable and can be formulated according to market excess returns, namely the difference between quarterly stock returns and the average quarterly risk free rate as follows:

$$Excess\,Return = R_i t - R_f t$$

$$R_i = \frac{(P_t - P_{t-1})}{P_{t-1}}$$

Information:
$R_i t$ = stock returns
$R_f t$ = risk free return
Pt = stock price in month t
Pt-1 = stock price in month t-1

Independent Variables
The independent variable of this study is the risk premium

The market risk premium can be defined as the difference between the monthly average of all stocks (JCI) and the quarterly risk free rate. The value of market risk premium can be obtained based on historical data. Mathematically, the calculation of the risk premium is as follows:

$$RP_m = R_m - R_{rf}$$

$$R_m = \frac{(P_t - P_{t-1})}{P_{t-1}}$$

Information:

RPm = Market risk premium
Rm = JCI quarterly average
Rrf = Average quarterly Risk-free rate
Pt = Stock price in month t
Pt-1 = Stock price in month t-1

2.2 Research Sample

The sampling technique in this study was purposive sampling, with the following criteria:

1. Company shares listed in LQ 45 for the 2018-2020 period.
2. Companies that publish financial reports for the first, second, third and fourth quarters on the website of the Indonesian Stock Exchange and in the Indonesian Capital Asset Market Electronic Library (ICAMEL) database during the study period.
3. Companies in the mining sector that have an optimal average close price according to the estimates in this study.
4. Companies in the mining sector with positive book-to-market equity.

2.3 Method of Collecting Data

The data collection method used is the documentation method, by collecting documents in the form of data, through the official websites of the Indonesia Stock Exchange, Yahoo Finance, Bank Indonesia, and the Indonesian Capital Asset Market Electronic Library (ICAMEL).

2.4 Data Analysis Techniques

The analysis technique in this study is to use simple linear and multiple linear regression analysis with the Eviews 8 analysis tool. This method is used to find out how much the relationship between each independent variable and the dependent variable is Prerequisite Test.

a. Stationary Test (Unit Root Test)

Stationary data is data that has a constant mean and variance over time and covariance between two time series data depending on the lag between the two periods or not. The unit root test is used to see the stationary data used. If the data is not stationary, the variance of the data will change.

b. Normality Test

The normality test is useful for knowing whether the data population is normally distributed or not. This test is carried out to measure data on an ordinal, interval or ratio scale. Decisions are made using the Jargue-Bera test or J-B test, that is, if the value of the J-B test is < X2 (Chi Square) in the Chi Square table.

c. Multicollinearity Test

It is used to determine whether or not there is a deviation from the classical assumption of multicollinearity, namely the existence of a linear relationship between the independent variables in the regression model. The prerequisites that must be met in the regression model are the absence of multicollinearity and it is said to have no deviations between the dependent and independent variables if the correlation level does not exceed 0.90. The test is used by looking at the centered variance inflation factor (VIF) value.

a. Heteroscedasticity Test

The heteroscedasticity test is used to determine whether or not there is a deviation from the classical assumption of heteroscedasticity, that is, there is an inequality of the variance of the residuals for all observations in the regression model. Heteroscedasticity testing was carried out using the White Heteroscedasticity Test. This test is done by looking at the Obs*Rsquared probability.

b. Autocorrelation test

The autocorrelation test aims to determine whether or not there is a deviation from the classic assumption of autocorrelation, namely the correlation that occurs between residuals in one other observation in the regression model. The decision is made whether there is autocorrelation through the Breusch-Godfrey Serial Correlation Test. If the p value is higher than the commonly used level of significance (1%, 5% or 10%) then the data is free from autocorrelation.

2.5 Statistic Test

a. Simple Regression Test

Simple linear regression analysis was performed on the CAPM with the following model:

$$R_{it} - R_{ft} = \alpha_i + \beta_i(R_{mt} - R_{ft}) + \varepsilon_{it}$$

Information:
R_it = Return of asset i in period t
R_ft = Risk-free asset return in period t
α_i = intercepts
β_i = Market beta or stock regression coefficient i
R_mt = Return or market profit level for period t

a. Partial Test (t test)

The different test t test is used to test how far the influence of the independent variables used in this study individually explains the dependent variable partially. This t test is used to test the significance of the CAPM and TFMFF parameters.

b. Simultaneous Test (Test f)

The model test is a joint regression coefficient test to see the significance of the effect of each independent variable on the dependent variable. The test uses a significance level of 0.05. The F test steps are as follows:

a. Formulate hypotheses

Ho: market risk, firm size and book to market equity simultaneously have no effect on returns for each type of Fama and French portfolio (S/L, S/M, S/H, B/L, B/M and B/H).

Ha: market risk, firm size and book to market equity simultaneously affect the return of each type of Fama and French portfolio (S/L, S/M, S/H, B/L, B/M and B/H).

b. Determine F arithmetic and significance
c. Determine F table by looking at table F.
d. Test criteria:
a. If F count $\leq$ F table, then Ho is accepted.
b. If F count $\geq$ F table, then Ho is rejected.

Determination Coefficient Test (Adjusted R Square)
The coefficient of determination (Adjusted R Square) is used to measure the influence of the model used to explain all the dependent variables in this study. The coefficient of determination is 0 (zero) and 1 (one). The magnitude of Adjusted R2 will measure the proportion or percentage of the total variation in Y described by the regression model.

3 Results and Discussion

Based on Table 1, descriptive statistics are described from the data used in this study. Starting from the mean, median, maximum data, minimum data and standard deviation of the three independent variables, namely the market risk variable, the size risk variable (SMB) and the book-to-market ratio (HML) risk variable, as well as the six portfolios forming the independent variable (S). /L, S/M, S/H, B/L, B/M and B/H). The average value of market risk is 0.004167 which means that the average market return per month is above the risk return. This positive value indicates that market returns tend to be above the risk-free rate of return more often. A negative SMB (Small Minus Big) value (-1.221877) indicates that on average relatively smaller companies have lower returns, while a positive HML (High Minus Low) value (3.646911) indicates that companies with BM (high book-to-market) outperform companies with low BM values.

Table 1. Descriptive Statistics of Research Data

Portofolio	Mean	Median	Maksimum	Minimum	Std.Dev
S/L	3.795503	1.8972	48.0792	1.6582	6.750478
S/M	0.631825	0.6526	0.6997	0.5227	0.058185
S/H	0.288318	0.2914	0.3401	0.1931	0.035119
B/L	9.47677	4.0374	129.1811	3.4157	18.46949
B/M	1.424445	1.4168	1.5187	1.3415	0.040476
B/H	0.654387	0.6939	0.7388	0.3978	0.087607
Marjet Risk	0.004167	0.000000	0.340000	-0.140000	0.061055
SMB	-1.221877	0.042385	3.159565	-22.74676	4.738656
HML	3.646911	-2.085608	91.84453	-40.88306	23.04546

Source: Data processed with Eviews 10 program

Table 2. Normality test

	Normality test	
	Jarque–Bera	Prob
Excess Return (Y)	29.0463	0.3285
Premi Resiko (X1)	34.3219	0.3300
SMB (X2)	94.8350	0.0890
HML (X3)	93.1000	0.4800

Source: Data processed with Eviews 10 program

3.1 Prerequisite Test

Normality test

The normality test is useful for knowing whether the data population is normally distributed or not. This test is carried out to measure data on an ordinal, interval or ratio scale. Decision making with the Jargue-Bera test.

Based on Table 2, it can be seen that the Jarque–Bera probability values for each research variable are 0.3285 (excess return), 0.3300 (risk premium), 0.0890 (SMB) and 0.4800 (HML). These four values meet the minimum threshold value of 5%, so that the assumption of normality is fulfilled.

Table 3. Multicollinearity Test

Variable	Coefficient Variance	Uncentered VIF	Centered VIF
Premi Resiko (X1)	6.13E-05	1.142431	1.12706
SMB (X2)	8.78E-07	464.5176	1.10010
HML (X3)	2.48E-10	1.153799	1.13606

Source: Data processed with Eviews 10 program

Table 4. Autocorrelation Test

F-statistic	145.61370	Prob. F (2,220)	0.78230
Obs*R-squared	128.17420	Prob. Chi-Square (2)	0.67350

Source: Data processed with Eviews 10 program

Table 5. Heteroscedasticity Test

F-statistic	26.390830	Prob. F (5,219)	0.011900
Obs*R-squared	84.597040	Prob. Chi-Square (5)	0.072800
Scaled explained SS	143.849900	Prob. Chi-Square (5)	0.782700

Source: Data processed with Eviews 10 program

Multicollinearity Test

Based on Table 3, it can be seen that the centered VIF values for each independent variable are as follows, risk premium is 1.12706, SMB is 1.10010 and HML is 1.13606. The four values show a value below 10. This means that the multicollinearity assumption is met.

Autocorrelation Test

Based on Table 4, it can be seen that the Chi-Square shows the number 0.67350.

This value exceeds 5%, meaning that the autocorrelation test assumption is met.

Heteroscedasticity Test

From Table 5, it can be seen that the Chi-Square shows 0.072800. This value exceeds 5%, meaning that the heteroscedasticity test assumption is met (Table 6)

Regression Test

Table 6. CAPM Regression Test on Portfolio

Portofolio	Variable	Coeficient	Std. Error	t-Statistic	Prob
S/L	C	-0.0534	0.0007	-81.7101	0.0000
	Market Risk	0.9706	0.0074	131.1604	0.0000
S/M	C	-0.0562	0.0008	-68.2033	0.0000
	Market Risk	0.9417	0.0108	87.5355	0.0000
S/H	C	-0.0425	0.0007	-57.9608	0.0000
	Market Risk	1.0927	0.0087	125.5931	0.0000
B/L	C	-0.0502	0.0004	-125.4946	0.0000
	Market Risk	0.9989	0.0047	210.9713	0.0000
B/M	C	-0.0496	0.0006	-89.3379	0.0000
	Market Risk	1.0097	0.0099	101.6372	0.0000
B/H	C	-0.0526	0.0007	-70.4246	0.0000
	Market Risk	1.0558	0.0133	79.1111	0.0000

Source: Data processed with Eviews 10 program

3.2 Discussion

The results of the coefficients in this study show different numerical values for each form of portfolio. This means that market risk variables can still explain risk-free returns for each form of portfolio. However, this research is not in line with research conducted [18]. With the addition of 2 independent variables, the market coefficient or market risk for each form of portfolio will be close to one. With the addition of two independent variables, the market risk coefficient or beta for each portfolio will be close to one. The market risk coefficient which is close to one for all portfolios indicates that market risk cannot explain stock returns for each form of portfolio after adding size and BE/ME.

This research is not the same as previous research, the samples used in previous studies such as the NYSE (New York Stock Exchange), AMEX (American Stock Exchange), NASDAQ (National Association of Securities Dealers Automated Quotations), Stock Exchange of Mauritius and Istanbul Stock Exchange have different investor behavior from investors in stocks incorporated in the LQ-45 index. The market risk value near one suggests investors' stock returns are usual. The lack of abnormal returns suggests that this capital market is a "strong" market form where all investors have the same information to make investment decisions. This study's market risk worth differs for each portfolio. This suggests that the capital market used in this study is "weak," where past information can predict future prices and investors react differently and slowly due to information differences. Thus, abnormal results persist for a long time. In addition to capital market factors and market forms in prior studies, this study's market risk values vary due to the limited sample of LQ-45 index companies.

4 Conclusion

Tests using the capital asset pricing model (CAPM) in this study showed the results of a significant influence from the independent variable (market risk) on the dependent variable (excess return). The Capital Asset Pricing Model for determining investment in LQ45 Index Shares before the pandemic, shows that the independent variables market risk, size and BE/ME have a significant effect on the dependent excess return variable for each type of portfolio form (S/L, S/M, S/H, B/L, B/M, and B/H). The Capital Asset Pricing Model for determining investment in LQ45 Index Shares during a pandemic shows that the independent variables market risk, size and BE/ME have a significant effect on the dependent excess return variable for each type of portfolio form (S/L, S/M, S/H, B /L, B/M, and B/H).

References

1. Jones, Charles P, 2000, "Investment Analysis and Management 7th ed", USA: John Wiley & Sons, Inc
2. Özkan, N. (2021). Expected investment growth and stock returns in an emerging market. Economics Letters, 207, 110008. https://doi.org/10.1016/j.econlet.2021.110008
3. He, E., Jacob, M., Vashishtha, R., & Venkatachalam, M. (2022). Does differential taxation of short-term relative to long-term capital gains affect long-term investment ? Journal of Accounting and Economics, xxxx, 101479.https://doi.org/10.1016/j.jacceco.2022.101479
4. Cos, Y., Selcuk-kestel, A. S., & Yilmaz, B. (2017). Borsa _ Istanbul Review Diversification benefit and return performance of REITs using CAPM and Fama-French : Evidence from Turkey *. https://doi.org/10.1016/j.bir.2017.08.003
5. Bai, H., Hou, K., Kung, H., Li, E. X. N., & Zhang, L. (2019). The CAPM strikes back? An equilibrium model with disasters. Journal of Financial Economics, 131(2), 269–298. https://doi.org/10.1016/j.jfineco.2018.08.009
6. Kilic, M., Yang, L., & Ben, M. (2022). The cross-section of investment and profitability : Implications for asset pricing R. Journal of Financial Economics, 145(3), 706–724. https://doi.org/10.1016/j.jfineco.2022.06.003
7. Urom, C., Chevallier, J., & Zhu, B. (2020). A dynamic conditional regime-switching GARCH CAPM for energy and financial markets. Energy Economics, 85, 104577. https://doi.org/10.1016/j.eneco.2019.104577
8. Lin, Q., & Lin, X. (2021). North American Journal of Economics and Finance Are the profitability and investment factors valid ICAPM risk factors ? Pre-1963 evidence. North American Journal of Economics and Finance, 58(May), 101460. https://doi.org/10.1016/j.najef.2021.101460
9. Cenesizoglu, T., & Reeves, J. J. (2018). CAPM , components of beta and the cross section of expected. Journal of Empirical Finance, 49(January 2017), 223–246. https://doi.org/10.1016/j.jempfin.2018.10.002
10. Swanson, E. T. (2021). Measuring the effects of federal reserve forward guidance and asset purchases on financial markets R. Journal of Monetary Economics, 118, 32–53. https://doi.org/10.1016/j.jmoneco.2020.09.003
11. Mishra, D. R., & Brien, T. J. O. (2019). Fama-French , CAPM , and implied cost of equity ☆. Journal of Economics and Business, 101(July 2018), 73–85. https://doi.org/10.1016/j.jeconbus.2018.08.002

12. Karydas, C., & Xepapadeas, A. (2022). Climate change financial risks : Implications for asset pricing and interest rates. Journal of Financial Stability, August, 101061. https://doi.org/10.1016/j.jfs.2022.101061
13. Hearn, B., Li, J., Mykhayliv, D., & Waqas, M. (2021). Journal of International Financial Markets , Institutions & Money Asset pricing in the Middle East ' s equity markets. Journal of International Financial Markets, Institutions & Money, 72, 101337. https://doi.org/10.1016/j.intfin.2021.101337
14. Singh, K., Singh, A., & Prakash, P. (2022). Estimating the cost of equity for the regulated energy and infrastructure sectors in India. Utilities Policy, 74(December 2021), 101327. https://doi.org/10.1016/j.jup.2021.101327
15. Rutkowska-ziarko, A., Pyke, C., & Amin, S. (2022). Conventional and downside CAPM: The case of London stock exchange. 54(October 2021). https://doi.org/10.1016/j.gfj.2022.100759
16. Elton, E.J, and Grubber, 1977, "Risk Reduction and Portofolio Size: An AnalyticalSolution", Journal of Business, Vol 50 October p.415–437.
17. Gitman, Lawrence J dan Chad J. Zutter. 2012. Principles of Managerial Finance. 13th Edition.Global Edition: Pearson Education Limited.
18. Fama, E. F., and Kenneth R. French. 1996. "Multifactor Explanations of Asset Pricing Anomalies", Journal of Finance. Vol 51, No. 1, 55-84.