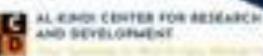# JOURNAL OF BUSINESS AND MANAGEMENT STUDIES

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| **RESEARCH ARTICLE**

Improper Uses of Stock Price Variables in Empirical Research: A Review Article

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| **ABSTRACT**

This review article shows how empirical studies are often inappropriate in using stock price data to be related to firm financial performance and other relevant variables. The analyses of the articles about stock price as a sample show that there is improper use of data on the stock price. Most of them use prices which are closing prices of annual financial statements, when financial statements information is not known to investors because the financial statements have not been published as of that date. All of the article samples used stock prices in absolute terms that are not relative to the movement of the stock price index. This indicates that the results of the previous studies in the articles fail to prove that stock price movements are really influenced by changes in the firm's financial performance and not because the stock market is bullish or bearish. It is recommended that future studies about the firm financial performance and the relation to stock price, consistent with the efficient market hypothesis (EMH) that the stock price should use the stock price after the publication of financial statements when all information about the firm is reflected in firm stock price. Consistent with the capital asset pricing model (CAPM) and arbitrage pricing theory (APT), the stock price should use the stock price relative to its stock market index to prove that the movement of the stock price is affected by the change in the firm financial performance.

| **KEYWORDS**

Stock price, stock market index, firm performance, financial ratios, review article.

1. Introduction

The efficient market hypothesis (Fama, 1970) argued that all information about the individual firms and stock market are reflected in stock prices and eventually affect the stock market index. In the stock markets that are strong-form efficient, all information related to the firms and stock markets is immediately reflected in stock prices, so stock prices are unpredictable and move as a random effect process. Consistent with the efficient market hypothesis, the previous research on stock prices showed that stock prices move randomly (Home & Parker, 1967; Lee, 1992; Zhu, 2010). The result of the study by Lee (1992) showed that the stock markets in 10 industrial countries, which are, the United Kingdom, West Germany, Italy, France, Belgium, Netherlands, Switzerland, Canada, Australia, and Japan showed that in those markets the relevant variables had no effect on stock prices. The studies strengthen the hypothesis that stock prices are unpredictable and move as a random walk process.

Using data from firms listed in the emerging stock markets, Rehman et al. (2018) showed in their study that stock prices in Bombay Stock Exchanges, Karachi Stock Exchanges, and Colombo Stock Exchanges move in a not a random walk process because those markets are weak-form efficient. In a weak-form efficient stock market, investors may be able to get abnormal returns from the information they get.

Information about individual firms used by stock market investors for stock trading in the market may come from the good or bad news about macro factors which affect the firm business and individual firm. Information on macro-economics such as interest rate, inflation rate, currency exchanges, gross domestic product, and commodity prices will also affect the individual firm's business. Dickinson (2000) suggests that a suitable empirical study uses macroeconomic factors as fundamental in the correlation to the

stock market. Omorokunwa and Ikponmwosa (2014) argued that the inflation rate affects stock market volatility in Nigeria. The study of Nikmanesh and Nor (2016) shows that macro-economic factors affect the stock market volatility in Malaysia and Indonesia.

Investors usually also decide to trade in a stock market based on the information about regional and international stock index movements. Solnik et al. (1996) argued that because of correlations of key macroeconomic variables and globalization of financial markets, the inter-correlations between international stock markets occur. The study of Resnick (1989) showed that the globalization of stock markets occurs. Besides they use information about macro-economic factors, investors also use Information about individual firms, such as the periodic financial reporting, which is historical aspects, and all news about the firm management and business which affect the future prospect and the risk of the firm business (Vergin and Qoronfleh, 1998).

Many studies concerning stock prices and the correlation to accounting measures of the firm performance are reflected by financial ratios have been done, and the results are inconsistent with each other. The price to sales ratio, price to book value ratio, price to earnings per share ratio, and price to operating cash flow ratio are the best indicators for forecasting stock prices (Kwang En, 2020). This study is inconsistent with the study of French and Poterba (1991), which argued that firm growth expectation has no correlation to the stock price in Japan Stock Market.

The studies used stock price as a dependent variable to be correlated to firm financial ratios and generally used the ending year stock prices. This phenomenon is inappropriate if it is related to the fact of the information produced by the firms, whether it is time-relevant. At the end of a year, the firm's financial statements have not yet been prepared, nor have they been published, so the information about the financial performance of a firm does not yet exist. But investors may also use rumours about the firm performance to precede other investors in the hope of implementing "buy on rumours sell on news" to get abnormal returns or to minimize losses by cutting losses immediately before the bad news actually arises.

In addition, to investigate the growth of the firm's performance if it is associated with the movement of stock prices only using absolute individual firm stock prices without considering the movement of a stock market index. This is also inappropriate because the firm stock price is also affected by investors' sentiment about the market if it is a bullish or bearish market. In the bullish market, the investors' sentiment toward an individual stock is also rising will result in a higher bid compared to the offer of the stock, so the stock price tends to increase. Most individual stocks tend to increase in price in a bullish market even without considering the firm performance.

2. Stock price
2.1 Stock price and stock market index
The stock price is the equilibrium point that occurs between the demand (bid or ask) and supply (offer) value of a particular stock on a certain stock trading day. The stock price tends to increase when the bid volume of the stock increase and the offer volume is constant or decrease. The stock price tends to decrease when the bid volume decreases and the offer volume is constant or increases.

The stock market index is an index of the stock market on the stock trading day, which is the combined average price of all firm stocks listed on the stock exchanges. Although the stock index fluctuates depending on the price of each stock listed on the stock exchanges, the stock index reflects the indirect investment conditions in stocks in a country. When investors' interest increases in investing in stock exchanges, stock prices will increase due to increased demand for shares. This market condition is called bullish. But, in the bearish condition, when stock prices tend to decrease because investors sell their stocks, the stock index will decrease. In the bullish market, the price of the individual stock also tends to increase because of the increase in investor interest to invest in certain firm stocks. In the bearish market, the price of the individual stock also tends to decrease because of the decrease in investor interest in investing in certain firm stocks.

2.2 Types of stock price
2.2.1 Daily stock price
On every stock trading day, there will be the previous price, opening price, lowest price, highest price, and closing price. The previous price is the closing price on the previous trading day. The opening price is the first price that occurs on the trading day. The lowest price and the highest prices are the lowest stock price and the highest price of an individual stock on a certain trading day during the stock trading hours. Most studies use the daily closing price of the end of the firm quarterly or yearly financial statement period as a stock price data variable.

In a certain stock market, as in Indonesian Stock Exchanges, there are price categories of stocks Rp50 - Rp200; Rp200 – Rp500; Rp500 – Rp2000; Rp2000 – Rp5000. The price categories determine the differences in price fractions and set the maximum price increase and maximum price decrease allowed in a trading day.

2.2.2 Periodically stock price

Besides the daily stock prices, stock market participants and researchers also use stock prices at the end of trading days of each periodic such as weekly, monthly, quarterly, semi-annually, and yearly. The periodic stock prices are usually to be analyzed for technical analysis to predict the stock prices using periodic charts and other analytical tools used by stock market participants. The most common periodic stock price used by interested parties of stock markets and the researchers is the yearly stock price which is the stock price at the end of the last trading day at the end of a certain year. Even the government uses year-end closing prices of all firms listed in the stock markets (stock market index) as one of the economic indicators which shows the economic development of a country to show the performance of a country's stock exchanges.

2.2.3 Average stock price

The study of stock prices also used the average stock prices to be correlated to other variables. The average stock prices such as the average daily stock price of a month, the average daily stock prices of a quarter, the average daily stock prices of a year, and the monthly average prices of a year which is the sum of the ending month's stock prices January to December divided by twelve.

3. Macroeconomic factors

The arbitrage pricing theory (APT) by Ross (1976) suggested the relationship between investment risks and asset pricing, such as stock prices and the stock expected returns. Stock markets operate in a risk and uncertainty environment. Investment in the stock market contains asset risk, which is affected by macroeconomic factors. While the capital asset pricing model (CAPM) considers the single factor of the risk level of the stock market, the APT model considers several macroeconomic factors such as gross domestic product, inflation rate, interest rate, foreign exchange, etc., which determine the risks of individual stock and the stock market as a whole.

How stock prices and stock returns move following or are influenced by the stock price index, the beta coefficient is used, which is the difference or covariance between the price of a stock and the stock price index. Beta coefficient (β) is used to represent how much the risk of a firm stock is relative to market risk. Market risks can be divided into unsystematic risk, which is risks that are only related to an asset itself, and systematic risks, which is risks that occur that affect all assets. The use of beta differs within the scope of the CAPM (indicating sensitivity to market returns) and beta within the scope of APT (showing sensitivity to a factor), which are domestic product, inflation rate, interest rate, foreign exchange, etc.

CAPM and APT used beta (β) to determine the covariance of the individual stock to its stock market, which should be considered as asset risk to predict stock price and stock return. When beta is one, the risk of an individual stock is as same as the market risk. Thereby, when the beta is less than one, the risk of the individual stock is below the market risk, and when the beta coefficient is less than zero, the risk of the individual stock is conversely affected by the risk of the stock market, when the beta is above one, the risk of an individual stock is higher than the market risk.

4. Firm financial statements and performance ratios

4.1 Financial statements

A firm must prepare financial statements to report the financial performance periodically, usually at least yearly, at the end of the accounting period, which are December 31th, June 30th, or March 31^{th,} depending on the firm accounting period. For certain purposes, a firm may also prepare financial statements semi-annually, quarterly, and monthly. The financial statement consists of the balance sheet (financial position report), income statement (profit and loss statement), cash flow report, statement of change equity, and notes to financial statements.

For accountability to stakeholders, that are shareholders, creditors, tax-officers, and other interested parties, financial statements must be audited by a public accountant to assess the fairness of the preparation of financial statements. Yearly financial statements are usually audited by an independent public accountant during two-three months after the financial statements are prepared and completed only about three months after the end of the yearly accounting period.

The capital market authorities require every listed firm to submit periodically and yearly financial statements and publish the yearly audited financial statements.

4.2 Firm performance ratios

To show the performance of a firm during a period of time, usually, the financial ratios and operating ratios are used. The performance ratio is historical data as basic data for the decision makers besides current and assuming future predictive data to make the decision about a firm. Firm performance ratios can be categorized as financial ratios and operating ratios.

4.2.1 Financial ratios

Financial ratios are used to show the financial performance of a firm that is derived from the firm periodic financial statements. Firm financial ratios are not only used to show the good financial performance of a firm but also show the financial risk indicators of a firm when the ratios are declining or below the average ratios of its business sector. Financial ratios can be designed by each decision maker according to their respective interests and the focus of attention, but generally, they use liquidity, profitability, solvency, efficiency, and market ratios.

- Liquidity ratios
  Liquidity ratios are financial ratios calculated from the company's financial statement data that indicate how a firm is able to finance its operations and pay its short-term financial obligations.

- Leverage financial ratios
  Leverage ratios are financial ratios calculated from the company's financial statement data that indicate how much a firm finances its operations using external debts in comparison to internal funds.

- Efficiency ratios
  Efficiency ratios or activity financial ratios are financial ratios calculated from the company's financial statement data that indicate how well a firm utilizes firm's assets and other resources for its business.

- Profitability ratios
  Profitability ratios are calculated from the company's financial statement data which indicate how a firm is able to generate profit relative to its revenue, assets, operating costs, and equity.

- Market value ratios
  Market value ratios are financial ratios calculated from the company's financial statement data that indicate how a firm's performance is relative to its stock prices in the capital market.

What factors are used in the formula for calculating financial ratios can be seen in Appendix A, an attachment to this article.

4.2.2 Operating ratios

Operating ratios are used to show how well a firm operates its business. Besides the financial ratio, a firm in certain business sectors needs to use special ratios which are more appropriate to be used for the decision-making of the interest parties. The operating ratios also show how a firm has difficulty in running its business relative to other firms in the same business sector. There are special ratios which generally used by certain business sectors.

In banks and other financing institutions, sectors are known the ratios such as capital adequacy ratio (CAR), non-performing loans (NPL), etc. The capital adequacy ratio (CAR) is a measurement of a bank's available capital expressed as a percentage of a bank's risk-weighted credit exposures. This ratio shows how a bank or other financial institutions finance the credit provided to the borrowing party, whether it is sufficient and available from internal (capital) or external sources. There is a normal limit on how much credit financing comes from external funds because external funds contain interest that must be paid to the fund's owner. Increasing the CAR can improve customer security which can indirectly increase customer confidence in the bank, which in turn can have a positive impact on increasing bank profitability. To ensure the health of financial institutions in the country, financial authorities usually set the minimum limit CAR allowed for financial institutions to provide credit. The lower the capital adequacy ratio (CAR) is, the more risk for the financial institution to suffer losses due to the high interest costs of external parties, and it is also necessary to consider the maturity of loan payments from external parties.

Non-performing loan (NPL) is the ratio of how much bad credit is compared to the total amount of credit granted. This ratio indicates the health of the credit institutions. From the NPL information, the evaluation of the profitability, credit risk, capital condition, liquidity, and market risk can be seen. The financial authority in a country usually also sets the maximum limit of the allowable rate of NPL. If the NPL is greater than the limit indicates that the credit institution is experiencing financial danger.

In a hotel, the business sector is known as occupancy rate (OR), which states the extent to which the number of hotel rooms can be sold when compared to the number of available rooms. The higher the occupancy rate of a hotel, the higher revenue of the hotel. A hotel that always has a low occupancy rate indicates that the hotel is in bad business performance and at high risk of bankruptcy. The other ratio used in the hotel business is the average room rate (ARR) is used to find out the average price of rooms sold in a certain period which is calculated by dividing the total room revenue by the total rooms sold.

In the airline business is known passenger load factor (PLF) is the ratio of the usability value of the available payload capacity of the mode of transportation. This is useful for knowing the average occupancy on various travel routes, from airplanes, trains, or buses. The higher PLF of the airplane, the higher revenue of the airlines. An airline that always has a low PLF indicates that the hotel is in bad business performance and at high risk of bankruptcy.

There are many other operating ratios used in business sectors that indicate the performance of firms that operate in the business both in trend and compared to average industry sectors.

The formulas of the example of operation ratios can be seen in Appendix A.

5. Review of prior studies of stock price

This study selects 50 articles concerning stock price as a dependent variable, published in a scientific journal accessed from google scholar, which can be downloaded as full articles to get data on how the researchers determine stock price variables in the article methodology. The articles selected as a sample contain articles that are the authors and the journal published in several countries, whether the journal is reputable journal or not. Fifty articles used stock price as a dependent variable to be correlated to financial ratios and other relevant independent variables.

Tables 1. shows the author, publication year, article title, journal, independent variable, and dependent variable and how the researcher determines stock price data.

From the data in Table 1. there are:

- 43 articles used the closing price of the periodic financial statements as dependent variables. The closing price of the periodic financial statements is the daily stock price of the end trading day in each year at the end of yearly financial statements;

- 1 (one) article used both the closing price of the periodic financial statements and the stock price at the end of 3 months after yearly financial statements;

- 1 (one) article used monthly data of relevant financial ratios;

- 2 (two) articles used the closing price of the next trading day after the disclosure of the annual report;

- 1 (one) article used month lagged price average monthly price: the average daily prices of 1 month after the date of annual financial statements; 2 months after the date of annual financial statements, 3 months after the date of annual financial statements;

- 1 (one) article used the average of the stock price at each of the closing days of the market for a year;

- 1 (one) article used the average of daily values for each year.

All articles used several periods of financial statements as data to be analyzed in vertical analyses. Vertical analysis is the analysis of several periodic data to see the trend or the growth. The studies concerning the relevant independent variables, macro-economic factors, and the firm financial performance derived from firm financial statements to be correlated to stock prices are to see how the change of the independent variables affected the stock prices.

In bullish conditions, the stock market index tends to increase. This condition increases the investors' interest in investing in certain stocks in the stock market. But in a bearish market, the stock market index tends to decrease. This condition decreases the investors' interest in investing in certain stocks in the stock market. The increase or decrease in individual stock price during a period may be not only because of the change in the financial performance of the firm but also because of the market condition, which is bullish or bearish.

From table 1, all of 50 articles as a sample, there are no articles that consider the stock price index in investigating the increase in stock prices caused by the effect of independent variables. All of the articles used stock price in absolute terms and not relative to the stock price index. These articles fail to prove whether the increase or decrease in stock prices is pure because of the change in financial performance and other independent variables used. The change in stock prices of firms selected as a sample of each article cannot be proven significantly because of changes in independent variables and not the effect of an increase or decrease in stock prices due to a bullish or bearish market.

Table 1. Articles of Stock Price and How Stock Price to be Determined

No	Author (Year)	Title	Journal	Independent Variables	Data of Stock Prices
1	Ligocká, M., & Stavárek, D. (2019).	The relationship between financial ratios and the stock prices of selected European food companies listed on stock exchanges	Acta Universitatis Agriculturae et Silviculturae Mendelianae Brunensis	Financial ratios	Closing price of the periodic financial statements
2	Banchuenvijit, W. (2016).	Financial ratios and stock prices: Evidence from the agriculture firms listed on the stock exchanges of Thailand.		Financial ratios	Monthly data of relevant financial ratios
3	Dzikevičius, A., & Šaranda, S. (2011)	Can financial ratios help to forecast stock prices?	Journal of Security and Sustainability Issues,	Financial ratios	Closing price of the periodic financial statements
4	Hutabarat, F. M., & Simanjuntak, D. (2013)	The Relationship Between Financial Ratios and Stock Prices of Telecommunication Companies of Indonesian Stock Exchanges Telecommunication Sub Sector Indices.	Jurnal Ekonomi Universitas Esa Unggul	Financial ratios	Closing price of the periodic financial statements
5	Ma, L., Ausloos, M., Schinckus, C., & Chong, H. L. (2019)	Fundamental Analysis in China: An Empirical Study of the Relationship between Financial Ratios and Stock Prices	arXiv, Cornel University	Financial ratios	Closing price of the next trading day, after the disclosure of the annual report
6	Lewellen, J. (2004)	Predicting returns with financial ratios	Journal of Financial Economics	Dividend ratios	Closing price of the periodic financial statements
7	Tarmidi, D., Pramukty, R., & Akbar, T. (2020).	Fundamental Analysis of Financial Ratios on Stock Prices	Saudi Journal of Economics and Finance	Return On Assets (ROA), Net Profit Margin (NPM), and Debt to Equity Ratio (DER)	The closing stock price at the end of the financial year and the closing stock price on the date of publication of financial statements on the stock exchanges
8	Bayrakdaroglu, A., Mirgen, C., & Ezgi, K. U. Y. U. (2017).	Relationship between profitability ratios and stock prices: an empirical analysis on BIST-100.	Press Academia Procedia	Profitability ratios	Month Lagged Price Average monthly price in ISE after 1 to 3 month

9	Ligocka, M. (2019)	The Effect of Financial Ratios on the Stock Prices: Evidence from the Polish Stock Exchanges.	Economic Studies & Analyses/Acta VSFS	Financial ratios	The average of daily values for each year
10	Puspitaningtyas, Z. (2017	Is financial performance reflected in stock prices?	International Conference on Accounting, Management, and Economics 2017	Financial ratios	Closing price of the periodic financial statements
11	Herawati, A., & Putra, A. S. (2018).	The influence of fundamental analysis on stock prices: The case of food and beverage industries.	European Research Studies	Financial ratios	Closing price of the periodic financial statements
12	Aktaş, R., & Seyfettin, Ü. N. A. L. (2015)	The relationship between financial efficiency ratios and stock prices: an empirical investigation on insurance companies listed in Borsa Istanbul	Finansal Araştırmalar ve Çalışmalar Dergisi	Financial efficiency ratios	Closing price of the periodic financial statements
13	Sastralaga, N. P. S., Manurung, A. H., Saragih, F. D., & Hutahayan, B. (2020)	The Effects of Macroeconomic Variables and Company's Financial Ratios on Stock Prices of Coal Mining Companies Listed in Indonesia Stock Exchanges for the Period of 2013-2018.	Journal of Applied Finance & Banking	market capitalization, debt to equity ratio, total asset turnover ratio and Fixed Asset Ratio, exchanges rate, coal price, interest rate, oil price, and Inflation	Closing price of the periodic financial statements
14	Ratnasih, C., & Zulher, Z. (2021).	The driving factors of real estate stock prices in Indonesia Stock Exchanges.	Accounting	PER, DER, ROA	Closing price of the periodic financial statements
15	Prasetyo, I., Aliyyah, N., Rusdiyanto, R., Nartasari, D. R., Nugroho, S., Rahmawati, Y., ... & Rochman, A. S. U. (2021).	Impact financial performance on stock prices: Evidence from Indonesia.	Journal of Legal, Ethical and Regulatory Issues	Financial ratios	Closing price of the periodic financial statements
16	Siregar, O. K., & Doriawaty, R. (2021).	The Effect of Financial Ratios on Stock Prices In Food and Beverage Companies on IDX	Accounting and Business Journal	Financial ratios	Closing price of the periodic financial statements

17	Luckieta, M., Amran, A., & Alamsyah, D. P. (2020).	The fundamental analysis of stock prices.	Test Engineering and Management	Financial ratios	Closing price of the periodic financial statements
18	Hakim, H. M. Z. (2021).	Analysis of Financial Ratios to Stock Prices:(Case Studies in Banking on The Indonesian stock Exchanges).	International Journal Accounting Tax and Business	Financial ratios	Closing price of the periodic financial statements
19	Pudji, A. (2017).	The influence of fundamental factors and systematic risk to stock prices on companies listed in the Indonesian stock exchanges.	European Research Studies Journal	PER, EPS, NPM, PBV, systematic risk	Closing price of the periodic financial statements
20	Lumbantobing, R., & Salim, S. (2021).	Does the Leverage Ratio Mediate the Effect of Liquidity Ratios, Profitability Ratios, and Activity Ratios on Stock Prices? (Empirical Study of Food and Beverage Sub-Sector Companies Listed on the Indonesia Stock Exchanges for the Period of 2015-2019).	Enrichment: Journal of Management	Financial ratios	Closing price of the periodic financial statements
21	Hoti, A. H., Ismajli, H., Ahmeti, S., & Dërmaku, A. (2012).	Effects of Audit Opinion on Stock Prices: The case of Croatia and Slovenia.	EuroEconomica	Financial ratios	Closing price of the periodic financial statements
22	Sholichah, F., Asfiah, N., Ambarwati, T., Widagdo, B., Ulfa, M., & Jihadi, M. (2021).	The Effects of Profitability and Solvability on Stock Prices: Empirical Evidence from Indonesia.	Journal of Asian Finance, Economics, and Business	Profitability and solvability	Closing price of the periodic financial statements
23	Anwar, Y. (2019).	The effect of return on equity, earning per share, and price earning ratio on stock prices.	The Accounting Journal of Binaniaga	ROA and ROE	Closing price of the periodic financial statements
24	Kabajeh, M. A. M., Al Nu'aimat, S. M. A., & Dahmash, F. N. (2012).	The relationship between the ROA, ROE, and ROI ratios with Jordanian insurance public companies' market share prices.	International Journal of Humanities and Social Science	Profitability ratio	Closing price of the periodic financial statements
25	Al-Manaseer, S. R. (2020).	Impact of Market Ratios on the Stock Prices: Evidence from Jordan.	International Business Research	Financial ratios	Closing price of the periodic

				financial statements
26	Alfitra, D., & Anwar, F. (2022).	Financial Performance and Stock Prices in Indonesia: An Empirical Study of the Relationship between Financial Ratios and Stock Prices.	Himalayan Journal of Economics and Business Management	Financial ratios	Closing price of the periodic financial statements
27	Fauzan, A., & Matoati, R. (2021).	Financial Ratios and Share Prices of JII70 Indexed Companies for the 2018-2020 Period.	Management	Financial ratios	Closing price of the periodic financial statements
28	Nugroho, M., Halik, A., & Arif, D. (2020).	Effect Of Camels Ratio On Indonesia Banking Share Prices.	The Journal of Asian Finance, Economics, and Business	CAMELS ratios	Closing price of the periodic financial statements
29	Khanji, I. M. (2020). International	Can Market Ratios Predict Stock Prices: Empirical Study of Manufacturing Companies in Jordan.	Journal of Economics, Commerce, and Management	Financial ratios	Closing price of the periodic financial statements
30	Alaagam, A. (2019).	The relationship between profitability and stock prices: Evidence from the Saudi Banking Sector.	Research Journal of Finance and Accounting	Profitability ratios	Closing price of the periodic financial statements
31	Al-Qudah, H. A. (2020).	The impact of financial performance of stock prices of Jordanian Islamic banks (During the period from 2010 to 2018).	International Journal of Economics and Financial Issues	Financial performance	The periodic financial statements
32	Riani, M., Muda, I., & Rini, E. S. (2020).	The Analysis of the Influence of financial performance on stock prices with earning growth as a moderating variable in infrastructure, utility, and transportation sector companies listed on the Indonesia Stock Exchanges.	International Journal of Innovative Science and Research Technology	Financial ratios	Closing price of the periodic financial statements
33	Brastama, R. F., & Yadnya, I. P. (2020).	The effect of capital adequacy ratio and non-performing loan on banking stock prices with profitability as an intervening variable.	American Journal of Humanities and Social Sciences Research (AJHSSR)	Capital adequacy ratio, non-performing loan, profitability	Closing price of the periodic financial statements

34	Antono, Z., Jaharadak, A., & Khatibi, A. (2019).	Analysis of factors affecting stock prices in mining sector: Evidence from Indonesia Stock Exchanges.	Management Science Letters	World oil price, inflation, exchanges rate, and price to rarnings Ratio (PER), political affairs, basic metal prices, etc	Closing price of the periodic financial statements
35	Suryana, N., & Anggadini, S. D. (2020).	Analysis of stock prices affected by current ratio.	International Journal of Science, Technology & Management	Financial ratios	Closing price of the periodic financial statements
36	Lusiana, H. (2020)	The Effect of Return on Equity (ROE) and Earning per Share (EPS) on Stock Prices In Indonesia Stock Exchanges 2015-2018	Ilomata International Journal of Tax and Accounting	Profitability ratios	Closing price of the periodic financial statements
37	En, T. K. (2020).	Is Stock Prices Reflected In Market Ratios?	International Journal of Contemporary Accounting	Price to sales ratio, price to book value ratio, price to earnings per share ratio, and price to operating cash flow ratio	The average of the stock price at each of the closing days of the market for a year
38	Shehzad, K., & Ismail, A. (2014).	Value relevance of accounting information and its impact on stock prices: Case study of listed banks at Karachi Stock Exchanges.	Journal of Economic Info	Value Relevance, Earnings per Share, Book Value per Share, Accounting Information	Closing price of the periodic financial statements
39	Alam, N., Aida, N., & Mukhtar, A. (2021).	Effect of Financial Performance on Stock-Prices in Food and Beverages Firm.	Golden Ratio of Finance Management	Financial ratios	Closing price of the periodic financial statements
40	Septiani, M., Ariyani, N., & Ispriyahadi, H. (2020).	The effect of stock prices, return on assets, and firm size on dividend pay-out ratio: evidence from Indonesian financial service companies.	Diponegoro International Journal of Business	Financial ratios	Closing price of the periodic financial statements
41	Hutasoit, D. T. M., Toni, N., & Ariesa, Y. (2022).	Effect of Loan to Deposit Ratio, Capital Adequacy Ratio, Return On Equity, and Dividend Payout Ratio on stock prices with Bank Indonesia Interest Rates as Moderating Variables in Banking Companies in Indonesia Stock Exchanges.	International Journal of Social and Management Studies	Financial ratios	Closing price of the periodic financial statements

42	Ozlen, S. (2014).	The effect of company fundamentals on stock values.	European Researcher	Financial ratios	Closing price of the periodic financial statements
43	Hutajulu, I.R., Fachrudin, K.A., & Silalahi, A.S. (2020)	Analysis of the Effect of Financial Ratios and Corporate Social Responsibility on Stock Prices with Company Size as a Moderating Variable in Food and Beverage Industry Companies Listed on the Indonesia Stock Exchanges	International Journal of Research and Review	Financial Ratios, CSR	Closing price of the periodic financial statements
44	Dang, N. H., Tran, M. D., & Nguyen, T. L. A. (2018).	Investigation of the impact of financial information on stock prices: The case of Vietnam.	Academy of Accounting and Financial Studies Journal	Financial ratios	31st December and end of 1st quarter after year end (31st March)
45	Nisa, M. U., & Nishat, M. (2011).	The determinants of stock prices in Pakistan.	Asian Economic and Financial Review	Macro economics and financial ratios	Closing price of the periodic financial statements
46	Sihotang, A. S., & Munir, A. (2021).	Analysis of the profitability ratio effect, market value ratio, and coal prices to stock prices of coal companies.	Journal of Management and Leadership	Earning per Share (EPS), Net Profit Margin (NPM), Price to Book Value (PBV), Reference Coal Price (HBA)	Closing price of the periodic financial statements
47	Janudin, J., Oktrima, B., Rachmawaty, R., Ganar, Y. B., & Hasanudin, H. (2020). 1(1).	The Effect Of Return On Equity To Stock Prices At Pt. Unilever Indonesia.	HUMANIS (Humanities, Management and Science Proceedings)	ROE	Closing price of the periodic financial statements
48	Al-Oshaibat, S. D., & Manaseer, S. (2018).	The Effect of Accounting and Market Indicators on Predicting the Stock Prices for Jordanian Banks: An Econometric Study for the Period (2010-2015).	International Journal of Economics and Finance	Net income, dividend distributions, book value per-share, earning per-share	Closing price of the periodic financial statements
49	Refianti, S., Weningsih, D., Rahmadani, N. A., Vutezah, R., & Christine, D. (2020).	The Effects Of Financial Ratios On Share Prices (An Empirical Study Of Agricultural Sector Companies Plantation Subsector Listed On The Indonesia Stock Exchanges (IDX) For The 2013-2019 Period).	PalArch's Journal of Archaeology of Egypt/Egyptology	Return on Assets (ROA), Debt to Equity Ratio (DER), and Price Earnings Ratio (PER),	Closing price of the periodic financial statements
50	Setiawan, A., & Sumantri, M. B. A. (2020).	The Effect of Return On Asset (ROA), Debt to Equity Ratio (DER), and Earning Per Share (EPS) on Stock	Technium	Return on Asset (ROA), Debt to Equity Ratio	Closing price of the periodic financial statements

Prices in the Mining Sector on the Indonesia Stock Exchanges for the 2015-2019 Period.	(DER), Earning Per Share (EPS),

6. Conclusion and recommendation

This study shows the improper use of stock price data as a dependent variable in the study of stock price correlated to other variables such as firm financial performance and macro-economic factors. The study of stock price usually used the stock price at the end of the year, which is the date of the annual financial statements that is December 31 of each year, to be correlated to firm financial performance and other relevant variables. This is not appropriate because, at the end of the year, the financial statements have not been prepared and have not been published. So that the good or bad of a firm financial performance should not be reflected in the stock price because investors have not used this information for making decisions in stock trading. Assuming that the stock price of a firm will move according to changes in the firm's performance, the firm's stock price will not change at the date of the financial statements.

Some studies used stock prices of the trading day after the financial statements are published and also used the average daily or monthly share prices during the period of time from the date of the financial statements to the time the financial statements are published. However, this is also improper because the increase or decrease in stock prices is not only affected by the increase or decrease in the firm's financial performance according to the financial statements.

General conditions related to the stock market will also affect the individual firm's stock price. Even in a firm that does not improve its financial performance condition, its stock price often increases due to the influence of bullish market conditions. Likewise, even though the financial performance of a firm has improved greatly because the market conditions are bearish, the stock price has not increased significantly.

According to the capital asset pricing model (CAPM) and arbitrage pricing theory (APT) that stock prices will move proportionally, slower, faster, or even move the opposite of the movement of the stock price index. The deviation of change in the stock price to change in the stock market is the beta coefficient.

The study on how stock prices are affected by financial performance should include a stock price index factor. Stock price data used in such a study should use stock prices relative to the stock price index. Thus, it will be known how much the actual change in the firm's financial performance affected its stock price. In addition, the study of stock prices associated with changes in financial performance should use stock prices on the date or average price of the period of time after the financial statements are published. Although stock prices can change due to rumours about the condition of the firm's financial statements, this usually only precedes the information produced officially. Consistent with the efficient market hypothesis (EMH) that the effect that actually occurs is when the information regarding the condition of the financial statements is known by investors and the stock price reflects all information related to the stock. It is recommended that future studies about the effect of changes in the firm's financial condition on stock prices should use stock price data after the financial statements are published and also consider the stock price index.

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APPENDIX A

Firm Financial Ratios

1. **Liquidity ratios**
   Liquidity ratios are financial ratios that measure a firm's ability to repay both short- and long-term obligations. Common liquidity ratios include the following:
   a. The current ratio measures a firm's ability to pay off short-term liabilities with current assets:
      Current ratio = current assets / current liabilities
   b. The acid-test ratio measures a firm's ability to pay off short-term liabilities with quick assets:
      Acid-test ratio = current assets – inventories / current liabilities
   c. The cash ratio measures a firm's ability to pay off short-term liabilities with cash and cash equivalents:
      Cash ratio = cash and cash equivalents / current liabilities
   d. The operating cash flow ratio is a measure of the number of times a firm can pay off current liabilities with the cash generated in a given period:
      Operating cash flow ratio = operating cash flow / current liabilities

2. **Leverage financial ratios**
   Leverage ratios measure the amount of capital that comes from debt. In other words, leverage financial ratios are used to evaluate a firm's debt levels. Common leverage ratios include the following:
   a. The debt ratio measures the relative amount of a firm's assets that are provided from debt:
      Debt ratio = total liabilities / total assets
   b. The debt to equity ratio calculates the weight of total debt and financial liabilities against shareholders' equity:
      Debt to equity ratio = total liabilities / shareholder's equity
   c. The interest coverage ratio shows how easily a firm can pay its interest expenses:
      Interest coverage ratio = operating income / interest expenses
   d. The debt service coverage ratio reveals how easily a firm can pay its debt obligations:
      Debt service coverage ratio = operating income / total debt service

3. **Efficiency ratios**
   Efficiency ratios, also known as activity financial ratios, are used to measure how well a firm is utilizing its assets and resources. Common efficiency ratios include:
   a. The asset turnover ratio measures a firm's ability to generate sales from assets:
      Asset turnover ratio = net sales / average total assets
   b. The inventory turnover ratio measures how many times a firm's inventory is sold and replaced over a given period:
      Inventory turnover ratio = cost of goods sold / average inventory
   c. The accounts receivable turnover ratio measures how many times a firm can turn receivables into cash over a given period:
      Receivables turnover ratio = net credit sales / average accounts receivable
   d. The days sales in inventory ratio measures the average number of days that a firm holds on to inventory before selling it to customers:
      Days sales in inventory ratio = 365 days / inventory turnover ratio

4. **Profitability ratios**
   Profitability ratios measure a firm's ability to generate income relative to revenue, balance sheet assets, operating costs, and equity. Common profitability financial ratios include the following:
   a. The gross margin ratio compares the gross profit of a firm to its net sales to show how much profit a firm makes after paying its cost of goods sold:
      Gross margin ratio = gross profit / net sales
   b. The operating margin ratio compares the operating income of a firm to its net sales to determine operating efficiency:
      Operating margin ratio = operating income / net sales
   c. The return on assets ratio measures how efficiently a firm is using its assets to generate profit:
      Return on assets ratio = net income / total assets
   d. The return on equity ratio measures how efficiently a firm is using its equity to generate profit:
      Return on equity ratio = net income / shareholder's equity

5. **Market value ratios**
   Market value ratios are used to evaluate the share price of a firm's stock. Common market value ratios include the following:
   a. The book value per share ratio calculates the per-share value of a firm based on the equity available to shareholders:
      Book value per share ratio = (shareholder's equity – preferred equity) / total common shares outstanding
   b. The dividend yield ratio measures the amount of dividends attributed to shareholders relative to the market value per share:
      Dividend yield ratio = dividend per share / stock price

c. The earnings per share ratio measures the amount of net income earned for each share outstanding:
Earnings per share ratio = net earnings / total stocks outstanding
d. The price-earnings ratio compares a firm's share price to its earnings per share:
Price-earnings ratio = share price / earnings per share

Firm Operation Ratios

1. **Capital adequacy ratio (CAR)**
Capital adequacy ratio can be calculated by the following equation:
CAR = Capital / risk weighted assets * 100%
Risk weight assets (RWA) = aktiva tertimbang menurut risiko (ATMR)
Following the provisions set by the government, the Capital Adequacy Ratio of banking for the year 2002 is at least 8%, namely according to Bank Indonesia Regulation Number 3/21/PBI/2001 Article 2 concerning Bank Minimum Requirements, which was later updated in the Minimum Capital Adequacy for Commercial Banks in article 2.
The provisions of the 8% capital adequacy ratio for the minimum capital adequacy requirement of banks are divided into 2, namely:
4% of core capital (TIER 1), consisting of shareholders' equity, preferred stock, and reserves.
4% secondary capital (TIER 2), consisting of subordinate debt, loan loss provisions, hybrid securities, and revaluation reserves.
2. **Non-performing loan (NPL)**
Non-performing loan (NPL) is one of a number of factors that indicate the health of a bank. From the NPL information, it can be seen the evaluation of the condition of profitability, credit risk, capital condition, liquidity, and market risk.
Equation:
NPL = [(substandard credit + doubtful + loss) / total credit disbursed] x 100%
3. **Occupancy rate (OR)**
Occupancy rate (OR) is the ratio of how available hotel rooms can be sold during a period.
OR = Number of rooms sold / Number of rooms available x 100%
Average room rate (ARR) is the ratio of how much average revenue of a hotel in term of each room available during a period.
ARR = Total revenue of hotel / Number of rooms available x 100%
4. **Passenger load factor (PLF)**
Passenger load factor (PLF) is an airline industry metric that measures how much of an airline's passenger carrying capacity is used.
PLF is calculated by dividing revenue passenger kilometers (RPK) by the available seat kilometers (ASK).
PLF = (number of carried passenger x distance) / (available seat x distance) x 100%

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Improper Uses of Stock Price Variables in Empirical Research:
A Review Article

Yohanes Indrayono

Abstract

This review article is to show how the empirical studies often inappropriate in using stock prices data to be related to firm financial performance and other relevant variables. From the analyses of the articles about stock price as a sample shows that there are improper use data of stock price. Most of them use prices which are closing prices of annually financial statements when financial statement information is not known to investors because the financial statements have not been published as of that date. All of the articles as a sample used stock prices in absolute terms that are not relative to the movement of the stock price index. This indicates that the results of the previous studies in the articles fail to prove that stock price movements are really influenced by changes in the firm's financial performance and not because the stock market is bullish or bearish. It is recommended that the future studies about the firm financial performance and the relation to stock price, consistent to efficient market hypothesis that the stock price should use the stock price after the publication of financial statements when all information about the firm are reflected in firm stock price. Also consistent to arbitrage pricing theory that the stock price should use the stock price relative to its stock market index to prove that the movement of stock price is affected by the change of firm financial performance.

Keywords: Stock price, stock market index, firm performance, accounting measure, review article.

1. Introduction

Efficient market hypothesis (Fama, 1970) argued that all information about the individual firm and stock market are reflected in stock prices and eventually affected stock market index. In the stock markets that strong-form efficient all information related to the firms and stock markets immediately reflected in stock prices so stock prices unpredictable and move as a random effect process. Consistent to efficient market hypothesis the previous researches on stock prices showed that stock prices move randomly (Home & Parker, 1967; Lee, 1992; Zhu, 2010). The result of the study by Lee (1992) showed that the stock markets in 10 industrial countries which are United Kingdom, West Germany, Italy, France, Belgium, Netherlands, Switzerland, Canada, Australia, and Japan showed that in those markets the relevant variables had no effect on stock prices. The studies strengthen the hypothesis that stock prices unpredictable and move as a random walk process.

Used data of firms listed in the emerging stock markets, Rehman et al. (2018) showed in their study that stock prices in Bombay Stock Exchanges, Karachi Stock Exchanges, and Colombo Stock Exchanges are move in a not a random walk process because those markets are weak-form efficient. In a weak-form efficient stock market investors may be able to get abnormal returns from the information they get.

Information of individual firm used by stock market investor to stock trading in the market may come from the good or bad news about macro factors which affected the firm business and individual firm. Information of macro-economic such as interest rate, inflation rate, currency exchange, gross domestic product, and commodity prices will also affect the individual firm business. Dickinson (2000) suggest that for a suitable empirical study use macroeconomic factors as fundamental in the correlation to the stock market. Omorokunwa and Ikponmwosa (2014) argued that inflation rate affects stock market volatility in Nigeria. The study of Nikmanesh and Nor (2016) shows that macro-economic factors affect the stock market volatility in Malaysia and Indonesia.

Investors usually also decide to trade in a stock market based on the information about regional and international stock index movements. Solnik et al. (1996) argued that because of correlations of key macroeconomic variables and globalization of financial markets the inter corelations between international stock markets occurs. The study of Resnick (1989) showed that the globalization of stock markets occurs. Besides they use information about macro-economic factors, investors also use Information of individual firm such as the periodic financial reporting which is historical aspects and all news about the firm management and business which affect the future prospect and the risk of the firm business (Vergin and Qoronfleh, 1998).

Many studies concerning stock prices and the correlation to accounting measures of the firm performance are reflected by financial ratios have been done and the results are inconsistent of each other. The price to sales ratio, price to book value ratio, price to earnings per share ratio, and price to operating cash flow ratio is the best indicators to forecasting stock prices (Kwang En, 2020). This study is inconsistent to the study of French and Poterba (1991) which argued that firm growth expectation has no correlation to stock price in Japan Stock Market.

The studies used stock price as a dependent variable to be correlated to firm financial ratios generally used the ending year stock prices. This phenomenon is inappropriate if it is related to the fact of the information produced by the firms, whether it is time-relevant. At the end of a year, the firm's financial statements have not yet been prepared nor have they been published so that the information about the financial performance of a firm does not yet exist. But investors may also use rumours about the firm performance to precede other investors in the hope of implementing "buy on rumours sell on news" to get abnormal returns or to minimize losses by cut losses immediately before the bad news actually arise.

In addition, to investigate the growth of the company's performance if it is associated with the movement of stock prices only using absolute individual company stock prices without considering the movement of stock market index. This is also inappropriate because the firm stock price is also affected by investors' sentiment about the market if it is bullish or bearish market. In the bullish market, the investors' sentiment to an individual stock is also rising will result in the higher bid compared to offer of the stock so the stock price tends to increase. Most of individual stocks tend to increase in price in a bullish market even without considering the firm performance.

2. Stock Price

2.1. Stock price and stock market index

The stock price is the equilibrium point that occurs between the demand (bid or ask) and supply (offer) value of a particular stock on a certain stock trading day. The stock

price tends to increase when the bid volume of the stock increase and the offer volume is constant or decrease. The stock price tends to decrease when the bid volume decreases and the offer volume is constant or increase.

Stock market index is an index of stock market at the stock trading day which is the combined average price of all firm stocks listed on the stock exchange. Although the stock index fluctuates depending on the price of each stock listed on the stock exchange, the stock index reflects the indirect investment conditions in stocks in a country. When investors interest increases to invest in a stock exchange, stock prices will increase due to increased demand for shares. This market condition is called bullish. But, in the bearish condition when stock prices tend to decrease because of investors sell their stocks, the stock index will decrease. In the bullish market, the price of the individual stock also tends to increase because of the increase in investor interest to invest in a certain firm stock. In the bearish market, the price of the individual stock also tends to decrease because of the decrease in investor interest to invest in a certain firm stock.

2.2. Types of stock price

2.2.1. Daily stock price

On every stock trading day there will be the previous price, opening price, lowest price, highest price, closing price. The previous price is the closing price at previous trading day. The opening price is the first price occurred in the trading day. The lowest price and the highest prices are the lowest stock price and the highest price of individual stock at a certain trading day during the stock trading hours. Most of studies use daily closing price of the end of firm quarterly or yearly financial statement period as a stock price data variable.

In certain stock market as in Indonesian Stock Exchange, there are price categories of stocks Rp50 - Rp200; Rp200 – Rp500; Rp500 – Rp2000; Rp2000 – Rp5000. The price categories are to determine the differences in price fractions and to set the maximum price increase and maximum price decrease allowed in a trading day.

2.2.2. Periodically Stock Price

Besides the daily stock prices, stock market participants and researchers use also stock prices at the end of trading days of each periodic such as weekly, monthly, quarterly, semi-annually and yearly. The periodic stock prices usually to be analysed for technical analyse to predict the stock prices used periodic charts and other analyse tools used by stock market participants. The most common of periodic stock price used by interested parties of stock markets and the researchers is yearly stock price which is the stock price at the end of the last trading day at the end of certain year. Even the government uses year-end closing prices of all firms listed in the stock markets (stock market index), as one of economic indicators which shows the economic development of a country, to show the performance of a country's stock exchange.

2.2.3. Average Stok Price

The study of stock prices also used the average stock prices to be correlated to other variables. The average stock prices such as average daily stock price of a month, the average daily stock prices of a quarter, the average daily stock prices of a year, and the monthly average prices of a year which is the sum of the ending month stock prices January to December divided by twelve.

3. Macroeconomic factors

The arbitrage pricing theory (APT) by Ross (1976) suggested the relationship between investment risks and the asset pricing such as stock prices and thus the stock expected returns. Stock markets operates in risk and uncertainty environment. Investment in stock at stock market contains asset risk which affected by macroeconomic factors. While the capital asset pricing model (CAPM) consider the single factor of risk level of stock market, the APT model considers several macroeconomic factors such as gross domestic product, inflation rate, interest rate, etc. which determine the risks of individual stock and stock market as a whole.

The arbitrage pricing theory (APT) used beta (β) to determine the covariance of the individual stock to its stock market which should be considered as asset risk to predict stock price and stock return. When beta is one, the risk of an individual stock is as same as the market risk. Thereby, when beta is less than one, the risk of the individual stock is below the market risk and when the beta coefficient is less than zero, the risk of the individual stock is conversely affected the risk of stock market. When the beta above one, the risk of individual stock is higher than the market risk.

4. Firm Financial Statements and Performance Ratios

4.1. Financial Statements

A firm must prepare financial statements to report the financial performance periodically usually at least yearly at the end of accounting period which are December 31th, June 30th, or March 31th depend on firm accounting period. For certain purposes a firm may also prepare financial statement semi-annually, quarterly, and monthly. Financial statement consists of balance sheet (financial position report), income statement (profit and loss statement), cash flow report, statement of change equity, and notes to financial statements.

For accountability to stakeholders that are shareholders, creditors, tax-officers, and other interested parties, financial statements must be audited by a public accountant to assess the fairness of the preparation of financial statements. Yearly financial statement usually audited by independent public accountant during two-three months after the financial statements are prepared and completed in only about three months after the end of the yearly accounting period.

The capital market authorities require every listed firm to submit periodically and yearly financial statements and publish it to the public and for yearly audited financial statements.

4.2. Firm Performance Ratios

To show the performance of a firm during a period of times, usually the financial ratios and operating ratios are used. The performance ratio is historical data as a basic data for the decision makers besides current and assuming of future predictive data to make decision about a firm. Firm performance ratios can be categorised as financial ratios and operation ratios.

4.2.1. Financial ratios

Financial ratios are used to shows the financial performance of a firm that derived from the firm periodic financial statements. Firm financial ratios not only used to show good financial performance of a firm but also shows the financial risk indicators of a firm when the ratios are declining or at below the average ratios of its business sector.

Financial ratios can be designed by each decision makers according to their respective interests and the focus of attention, but generally they used liquidity, profitability, solvency, efficiency and market ratios.

- Liquidity Ratios
  Liquidity ratios are financial ratios that measure a company's ability to repay both short- and long-term obligations.

- Leverage Financial Ratios
  Leverage ratios measure the amount of capital that comes from debt. In other words, leverage financial ratios are used to evaluate a company's debt levels.

- Efficiency Ratios
  Efficiency ratios, also known as activity financial ratios, are used to measure how well a company is utilizing its assets and resources.

- Profitability Ratios
  Profitability ratios measure a company's ability to generate income relative to revenue, balance sheet assets, operating costs, and equity.

- Market Value Ratios
  Market value ratios are used to evaluate the share price of a company's stock.

What factors are used in the formula for calculating financial ratios can be seen in the Appendix A an attachment to this article.

4.2.2. Operating ratios

Operating ratios are used to shows how well is a firm operate its business. Besides the financial ratio, a firm in the certain business sectors need to used special ratios which are more appropriate to be used for the decision making of the interest parties. The operating ratios are also show how a firm have difficulty in running their business relative to other firms in the same business sector. There are special ratios which generally used by certain business sectors.

In banks and other financing institutions sectors are known the ratios such as capital adequacy ratio (CAR), non-performing loans (NPL), etc. The capital adequacy ratio (CAR) is a measurement of a bank's available capital expressed as a percentage of a bank's risk-weighted credit exposures. This ratio shows how a bank or other financial institutions finance the credit provided to the borrowing party whether it is sufficient and available from internal (capital) or external sources. There is a normal limit on how much credit financing comes from external funds because external funds contain interest that must be paid to fund's owner. Increasing the CAR can improve customer security which can indirectly increase customer confidence in the bank, which in turn can have a positive impact on increasing bank profitability.To ensure the health of financial institutions in the country, financial authorities usually set the minimum limit CAR allowed for financial institutions to provide credit. The lower capital adequacy ratio (CAR) is the more risk for the financial institution suffer losses due to the high interest costs of external parties and it is also necessary to consider the maturity of loan payments from external parties.

Non-performing loan (NPL) is the ratio of how much bad credit is compared to the total amount of credit granted. This ratio indicates the health of the credit institutions. From the NPL information, it can be seen the evaluation of the condition of profitability, credit risk, capital condition, liquidity, and market risk. The financial authority in a country

usually also set the maximum limit of allowable rate of NPL. If the NPL greater than the limit indicates that the credit institution experiencing financial danger.

In a hotel business sector is known occupancy rate (OR) which state of the extent to which the number of hotel rooms can be sold when compared to the number of available rooms. The higher occupancy rate of a hotel the higher revenue of the hotel. A hotel in which always the low occupancy rate indicates that the hotel in bad business performance and in high risk of bankrupt. The other ratio used in hotel business is average room rate (ARR) is used to find out the average price of rooms sold in a certain period which is calculated by dividing the total room revenue by the total rooms sold.

In airline business is known passenger load factor (PLF) is the ratio the usability value of the available payload capacity of the mode of transportation. This is useful for knowing the average occupancy on various travel routes from airplanes, trains or buses. The higher PLF of airplane the higher revenue of the airlines. An airline in which always the low PLF indicates that the hotel in bad business performance and in high risk of bankrupt.

There are many other operating ratios used in business sectors which indicate the performance of firm which operate in the business both in trend and compare to average industry sectors.

The formulas of the example of operation ratios can be seen in Appendix B.

5. Review of prior studies of stock price

This study selects 50 articles, concerning stock price as a dependent variable, published in scientific journal accessed from google scholar in which can be download as full articles to get data of how the researchers determine stock price variables in the article methodology. The articles selected as a sample contains articles which are the authors and the journal published in several countries whether the journal is a reputable journal or not. Fifty articles used stock price as a dependent variable to be correlated to financial ratios and other relevant independent variables.

Tables 1. shows the author, publication year, article title, journal, independent variable and dependent variable how the researcher determine stock price data.

From data of Table 1. there are:

- 43 articles used closing price of the periodic financial statement as dependent variables. Closing price of the periodic financial statement is the daily stock price of the end trading day in each year at the end of yearly financial statement;

- 1 (one) article used both closing price of the periodic financial statement and stock price at the end of 3 month after yearly financial statement;

- 1 (one) article used monthly data of relevant financial ratios;

- 2 (two) articles used closing price of the next trading day, after the disclosure of the annual report;

- 1 (one) article used month lagged price average monthly price: the average daily prices of 1 month after the date of annual financial statement; 2 months after the date of annual financial statement, 3 months after the date of annual financial statement;

- 1 (one) article used the average of the stock price at the each of closing days of the market for a year;
- 1 (one) article used the average of daily values for each year.

All articles used several periods of financial statements as data to be analysed in vertical analyses. Vertical analyse is the analyses of several periodic data to see the trend or the growth. The studies concerning the relevant independent variables, macro-economic factors and the firm financial performance derived from firm financial statements, to be correlated to stock prices is to see how the change of the independent variables affected the stock prices.

In the bullish condition, the stock market index tend to increase. This condition increases the investors interest to invest in certain stocks at stock market. But in bearish market, the stock market index tends to decrease. This condition decreases the investors interest to invest in certain stocks at stock market. The increase or decrease in individual stock price during a period may be not only because of the change of the financial performance of the firm but also because of the market condition which is bullish or bearish.

From the table 1, all of 50 articles as a sample there are no articles that consider the stock price index in investigating the increase in stock prices caused by the effect of independent variables. All of article used stock price in absolute terms and not relative to the stock price index. These articles fail to prove whether the increase or decrease in stock prices is purely because of the change in financial performance and other independent variables used. The change in stock prices of firms selected as a sample of each article cannot be proven significantly because of changes in independent variables and not the effect of an increase or decrease in stock prices due to a bullish or bearish market.

6. Conclusion and recommendation

This study is to show the improper use of stock price data as a dependent variable in study of stock price correlated to other variables such as firm financial performance and macro-economic factors. The study of stock price usually used the stock price at the end of the year which is the date of the annual financial statements that is December 31 of each year to be correlated to firm financial performance and other relevant variables. This is not appropriate because at the end of the year, the financial statements have not been prepared and have not been published. So that the good or bad of a firm financial performance should not be reflected in the stock price because investors have not used this information for making decisions in stock trading. Assuming that the stock price of a firm will move according to changes in the firm's performance, the company's stock price will not change at the date of the financial statements.

Some studies used stock prices of the trading day after the financial statements are published and also use the average daily or monthly share prices during the period of time from the date of the financial statements to the time the financial statements are published. However, this is also improper because the increase or decrease in stock prices is not only affected by the increase or decrease in the firm's financial performance according to the financial statements.

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General conditions related to the stock market will also affect the individual firm stock price. Even in a firm that does not improve its financial performance condition, its stock price often increases due to the influence of bullish market condition. Likewise, even though the financial performance of a firm has improved greatly, because the market conditions are bearish, the stock price has not increased significantly.

According to arbitrage pricing theory (ABT) that stock prices will move proportionally, slower, faster or even move the opposite of the movement of the stock price index. The deviation of change in the stock price to change in the stock market is beta coefficient.

The study on how stock prices are affected by financial performance should include a stock price index factor. Stock price data used in such study should use stock prices relative to the stock price index. Thus, it will be known how much the actual change in the firm's financial performance affected on its stock price. In addition, the study of stock prices associated with changes in financial performance should use stock prices on the date or average price of period of time after the financial statements are published. Although stock prices can change due to rumors about the condition of the firm's financial statements, this usually only precedes the information produced officially. Consistent to efficient market hypothesis that the effect that actually occurs is when the information regarding the condition of the financial statements is known by investors and the stock price reflects all information related to the stock. It is recommended that future study about the effect of changes in the firm's financial condition on stock prices should use stock price data after the financial statements are published and also consider the stock price index.

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