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Principal Component Analysis to Determine the Main Factors of Stock Prices

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Abstract

Stock investments reach the point of maximum profit when good observations are made. The many variables that determine stock prices make it difficult for potential investors to identify which stocks are the right ones to invest in. So, it is necessary to reduce the variables to form the main component without eliminating the information that existed before. This study aims to determine what variables are forming the main factors in determining stock prices in the Consumer Non-Cyclicals sector companies indexed by LQ45 using 18 independent variables and stock prices as the dependent variable. This study uses the Principal Component Analysis method to form a new component that determines stock prices, which is called the principal component. The results showed that the main factor determining the stock price of companies coded as CPIN issuers, namely forming 3 components, in HMSP which formed 5 components, in GGRM which formed 5 components, in JPFA namely forming 5 components, in UNVR which formed 5 components, in INDF which formed 5 components, and the company coded the ICBP issuer, which formed 4 components.

Keywords
investment; stock price; consumer non-cyclicals; principal component analysis

I. Introduction

One way to control assets is to invest, because investing can make assets continue to grow. Stock investment is an investment that is chosen by many investors because it provides an attractive level of profit for the owner (Indonesia Stock Exchange 2018). Based on data from the Jakarta Composite Index (JCI) for the 2016-2020 period, investors are interested in investing their assets in shares. This is evidenced by the movement of the JCI which tends to increase but declines sharply to the lowest level which then gradually improves at the end of 2020. Human Resources (HR) is the most important component in a company or organization to run the business it does. Organization must have a goal to be achieved by the organizational members (Niati et al., 2021). Development is a change towards improvement. Changes towards improvement require the mobilization of all human resources and reason to realize what is aspired (Shah et al, 2020). The development of human resources is a process of changing the human resources who belong to an organization, from one situation to another, which is better to prepare a future responsibility in achieving organizational goals (Werdhiastutie et al, 2020).

The increase was due to increased demand and the amount of foreign capital that entered until the end of the year (Kontan.co.id 2020). Based on (ekonomi.bisnis.com 2021) it is said that foreign capital will increase in 2020 due to the Job Creation Act and the Covid-19 vaccine. The existence of the Job Creation Law encourages investors to invest, one of which is due to the ease of licensing in doing business. The ease of

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licensing tries to attract investors to invest, causing the JCI to increase at the end of 2020 (bkpm.co.id 2020).

The industrial sector still makes the largest contribution to the national Gross Domestic Product (GDP) sector (Kemenperin.go.id 2020). Data from the Central Bureau of Statistics for Gross Domestic Product (GDP) also states that the industrial sector became the largest contribution to the Indonesian economy in 2018, which amounted to 19.82% or IDR 2,947.3 trillion of the national GDP which touched IDR 14,837 trillion (Databoks 2019).

The Consumer Non-Cyclicals sector, previously known as Consumer Goods, until the end of January 2021 contributed 16.4% to the JCI. Then in July 2021, the JCI's return to 6005.95 was mainly due to an increase in the Consumer Non-Cyclicals sector by 1.8% (beritasatu.com 2021). Continued in October 2021, the JCI increased by 0.78% to a position of 6,536,904, one of which was caused by an increase in the Consumer Non-Cyclicals sector by 1.75% (cnbcindonesia.com 2021a). If you look at the year before the pandemic, in November 2019, the JCI rose 0.72%, this was also due to the increase in stock prices in the consumer goods industry sector, which previously experienced a decline.

Even though stock prices have decreased, stocks in the Consumer Non-Cyclical sector are referred to as defensive stocks. This is because stocks in this sector tend to be strong enough to survive, because people continue to use products for bathing and eating purposes, so the products of Consumer Non-Cyclicals companies will continue to be sold (cnbcindonesia.com 2021b).

There are 7 companies in the Consumer Non-Cyclicals sector indexed LQ45 for the period August 2020-January 2021, namely companies with issuer codes CPIN, HMSP, GGRM, JPFA, UNVR, INDF, and ICBP. The seven companies included in LQ45, namely those with high liquidity and large market capitalization in the Consumer Non-Cyclicals sector for the 2016-2020 period have fluctuating stock prices. This is caused by several factors that can affect stock prices. These variables are EPS, ROA, ROE, QR, NPM, OPM, EPS, Market Capitalization, TATO, and DER can affect stock prices (Andari and Bakhtiar 2019; Cahyaningrum and Antikasari 2017; Fitriyana et al. 2020; Fajrian and Sumawidjaja 2018).

The number of independent variables that exist causes the influence of each variable to be difficult to control. Thus, the variable reduction is needed to determine new variables. The method that can be used to summarize these factors into the main components optimally is using the Principal Component Analysis (PCA) method. The results of research conducted by Mbona & Yusheng (2019) that the use of the PCA method provides the most significant unbiased ratio in assessing company performance.

Therefore, the novelty of this study is to find out what variables are forming the main factors in determining stock prices in the company that is the object of research, which is expected to be a reference for further research and an assessment for potential investors who want to invest in shares in the company.

II. Review of Literature

Principal Component Analysis (PCA) is a method used if the goal is to reduce data by involving not only correlated variables but all variables. PCA is a method used to reduce data from all variables owned without reducing the characteristics of the data to produce a new component (Santoso 2017).

The main purpose of PCA is to reduce several large variables into several smaller variables called the principal component and have almost the same variance as the original variables and to detect relationships between variables with the aim of classifying these variables based on similarity of characteristics (Sarwono 2017).

There are several previous researchers which have conducted similar research, such as Pasini (2017) who conducted a study that aims to identify ways to optimize portfolios to get maximum stock returns and controlled finances. The objects of this research are technology and telecommunications stocks, finance and credit stocks, and a combination of the two. The result of this research is that there is one component, namely Principal Component 1 which is proven to be the main component in the market because it always gives positive results in each study case.

Fitriyana et al. (2020) conducted a study with the aim of knowing what variables the most influencing factors on stock prices were using PCA with 18 variables. The object of this research is the five companies that have the highest market capitalization listed in the Consumer Goods Industry Sector on the Indonesia Stock Exchange. The results of this study indicate that the Profitability Ratio has a high contribution to determining stock prices.

The research conducted by (Mbona and Yusheng 2019) aims to find out how many ratios can be used from a total of 18 ratios tested to assess the company's financial performance well and with little loss of information using the PCA method. The results show that 12 ratios have the most important influence in assessing the performance of an industry and the use of the PCA method provides the most significant unbiased ratio in assessing company performance.

Investors increasingly need information in making investment decisions, this is due to fluctuations in stock prices due to ups and downs in transactions and stock trading volume. Company performance indicators are reflected by ratios, for public companies this indicator will be one of the references in making decisions and assessing stock prices (Kamaludin and Indriani 2018).

III. Research Method

This study uses a quantitative method that has the nature and purpose of research which is categorized as conclusive research. Quantitative research methodology is research that tends to involve defining variables first and then quantifying observations of these variables and this method generally reports data in the form of diagrams and charts (Hair et al. 2016).

3.1 Measurement

In this study, the measurement indicators came from previous research conducted by (Fitriyana et al. 2020). The independent variables in this study are Volume, Market Capitalization, Current Ratio, Quick Ratio, Debt to Equity Ratio, Debt to Asset Ratio, Total Asset Turnover, Inventory Turnover, Account Receivables Turnover, Net Profit Margin, Operating Profit Margin, Book Value per Share, Return on Assets, Return on Equity, Earnings per Share, Revenue Growth Rate, Earning per Share Growth Rate, and Net Income Growth Rate. While the dependent variable used in this study is stock prices.

3.2 Data Collection and Sampling Technique

The collection of Jakarta Composite Index data, Sectoral Index Movements, the market capitalization of the Consumer Non-Cyclicals sector, and quarterly stock prices of

the Consumer Non-Cyclicals sector obtained through the Yahoo! Finance (finance.yahoo.com), the Indonesian Stock Exchange (idx.co.id), and the websites of each company.

In this study, the sampling technique used is the Non-Probability Sampling technique which means that the sampling does not provide equal opportunities for each element of the population to be selected as a sample. Purposive sampling itself is carried out with certain considerations (Sugiyono 2016).

In this study the sample criteria are companies that are included in the Consumer Non-Cyclicals sector and indexed LQ45, so the research sample is 7 companies, namely companies with issuer codes CPIN, HMSP, GGRM, JPFA, UNVR, INDF, and ICBP.

3.3 Data Analysis

This research is assisted by using R software to perform Principal Component Analysis modeling. The advantage of Software R is that it is free and open source, so it is very easy to download and access.

According to (Sarwono 2017) the steps to perform an analysis with PCA are as follows:

1. Prepare the variables to be reduced in number
2. Finding the eigenvalue of the correlation matrix (R)
3. Determine the principal components of the eigenvalue
4. Interpretation of the factors that have been formed

IV. Result and Discussion

The result of this research consists of 2 parts; 1) result of eigenvalue, 2) result of main factor determination.

4.1 Result of Eigenvalue

After the process of finance ratio data is conducted, eigenvalue of each component is resulted. The following is Figure 1 which shows the proportion of eigenvalue from each company.

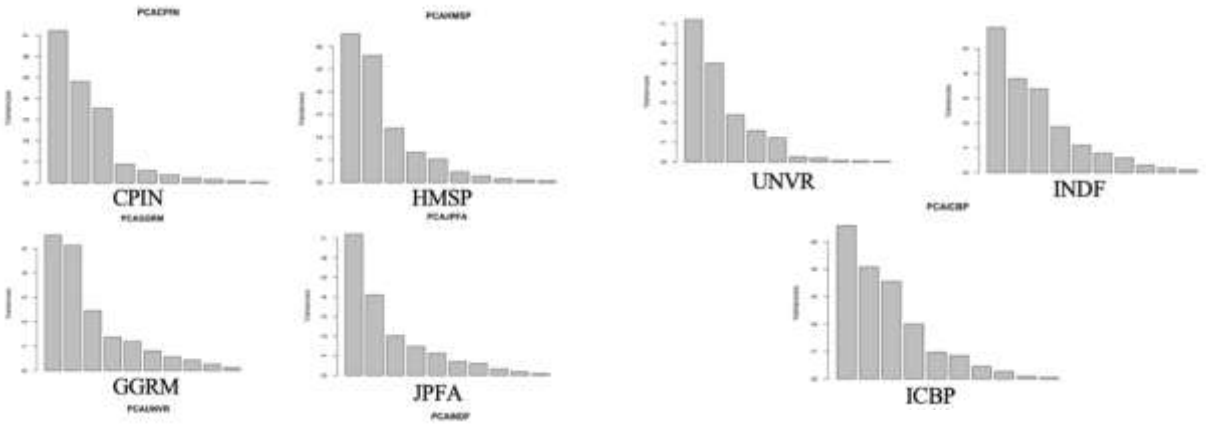

Figure 1. *Result of Eigenvalue (by researcher)*

The number of components is the same as the initial variable, but the determination of the main component (factor) is selected based on the component that has an eigenvalue greater than 1. Figure 1 only shows 10 of the total 18 components formed (Component 1 to

component 10). For each company, the main component with an Eigenvalue greater than 1 has different results. CPIN makes up 3 components, HMSP, GGRM, JPFA, and INDF makes up 5 components, and ICBP makes up 4 components.

4.2 Result of Main Factor Determination

4.3

Table 1. Proportion of Each Component

CPIN									
PC1				**PC2**				**PC3**	
EPS	-0,3122			NETGR	0,3491			NPM	-0,3658
DAR	0,3055			OPM	0,3467			EPSGR	-0,3556
DER	0,3025			ROE	0,3318			TATO	0,3290
ARTO	-0,3024			ROA	0,2923			ITO	0,3290
Market Capitalization	-0,3022			Volume	-0,2604			RGR	0,3072
BVS	-0,2771							QR	-0,2710
CR	-0,2473								
Cummulative Proportion							86,40%		
HMSP									
PC1		**PC2**		**PC3**		**PC4**		**PC5**	
DAR	0,3525	ITO	-0,4025	EPS	0,5742	EPSGR	0,7289	QR	0,5412
RGR	-0,3236	ARTO	-0,3964	BVS	0,5402			NETGR	-0,4197
CR	-0,3196	TATO	-0,3955	Market Capitalization	-0,4424				
OPM	-0,2910	ROE	-0,3834						
Volume	0,2564	ROA	-0,3563						
		NPM	0,2669						
Cummulative Proportion							93,85%		
GGRM									
PC1		**PC2**		**PC3**		**PC4**		**PC5**	
ITO	0,3187	ROE	0,3739	NPM	0,5213	RGR	0,6857	Volume	-0,5083
QR	0,3016	ROA	0,3246	OPM	0,5213	CR	-0,2859	Market Capitalization	0,4001
DER	-0,2819	EPS	0,3204					EPSGR	-0,3674
		TATO	0,3180					NETGR	-0,3579
		DAR	0,2847					ARTO	-0,3454
								BVS	-0,3431
Cummulative Proportion							87,23%		
JPFA									
PC1		**PC2**		**PC3**		**PC4**		**PC5**	
EPS	-0,3618	EPSGR	0,3791	CR	0,5924	BVS	-0,5515	DAR	-0,5890
ROA	-0,3462	ITO	-0,3734	Volume	-0,4161	Market Capitalization	-0,4925	NETGR	0,3650
ROE	-0,3329	TATO	-0,3154	QR	0,4155				
OPM	-0,3139	RGR	0,3055	DER	-0,3219				
NPM	-0,3028	ARTO	-0,2769						
Cummulative Proportion							88,41%		
UNVR									
PC1		**PC2**		**PC3**		**PC4**		**PC5**	
ROE	-0,3556	NPM	0,4070	Market Capitalization	-0,5502	EPSGR	-0,4091	RGR	0,5689
TATO	-0,3348	OPM	0,3985	Volume	0,5501	DER	-0,3747	NETGR	0,5483

ARTO	-0,3323	BVS	0,2814			DAR	-0,3301		
ITO	-0,3246								
ROA	-0,3083								
CR	0,3035								
EPS	-0,2939								
QR	0,2916								
Cummulative Proportion							96,62%		
INDF									
PC1		**PC2**		**PC3**		**PC4**		**PC5**	
ARTO	-0,4035	QR	0,4503	BVS	-0,4601	DAR	0,5091	RGR	-0,7526
EPS	-0,4006	CR	0,4308	OPM	-0,4505	DER	0,5063	Volume	0,3291
ROE	-0,3992	NETGR	0,3869	EPSGR	-0,4101	Market Capitalization	0,3084		
ROA	-0,3953			NPM	-0,3716				
ITO	-0,3826								
TATO	-0,3569								
Cummulative Proportion							88,72%		
ICBP									
PC1			**PC2**			**PC3**		**PC4**	
ARTO	0,4060	ROA	-0,3320	DER	-0,4496	CR	-0,4269		
TATO	0,3431	RGR	0,3250	DAR	-0,4396	QR	-0,3931		
EPS	0,3367	Volume	0,2546	BVS	-0,3664	NETGR	-0,3473		
ITO	0,3356			EPSGR	-0,3130	NPM	-0,3220		
ROE	0,3176					OPM	-0,3163		
Market Capitalization	0,2592								
Cummulative Proportion							84,66%		

Source: data processed by researchers

Based on Table 1, the number of components formed in each company has a different number of components. Each component has different constituent variables and has a Cumulative Proportion above 80%. This shows that the need to predict the company's stock price has been fulfilled. So, the benefits that potential investors will get in the future will also be explained.

V. Conclusion

Based on the research, it is found that the main factor determining the company's stock price has a number of different components. The first component has a higher proportion than component 2, component 3, and other components.

In companies with CPIN code issuers, the results of the study show that the main factors determining the stock price of companies with CPIN code issuers are 3 new components. The first component consists of EPS, DAR, DER, ARTO, Market Capitalization, BVS, and CR. The second component consists of NETGR, OPM, ROE, ROA, and Volume. The third component consists of variables NPM, EPSGR, TATO, ITO, RGR, and QR.

In companies with HMSP code issuers, the results show that the main factors determining the stock price of companies with HMSP code issuers are 5 new components. The first component consists of DAR, RGR, CR, OPM, and Volume. The second component consists of ITO, ARTO, TATO, ROE, ROA, and NPM. The third component

consists of variables EPS, BVS, and Market Capitalization. The fourth component consists of the EPSGR variable. The fifth component consists of QR and NETGR variables.

In companies with GGRM issuer code, the results of the study show that the main factors determining the stock price of companies coded as issuers GGRM there are 5 new components. The first component consists of ITO, QR, and DER. The second component consists of ROE, ROA, EPS, TATO, and DAR. The third component consists of NPM and OPM variables. The fourth component consists of RGR and CR. The fifth component consists of Volume, Market Capitalization, EPSGR, NETGR, ARTO, and BVS variables.

In companies with JPFA issuer code, the results of the study show that the main factors determining the stock price of companies coded as JPFA issuers are 5 new components. The first component consists of EPS, ROA, ROE, OPM, and NPM. The second component consists of EPSGR, ITO, TATO, RGR, and ARTO. The third component is formed from the variables CR, Volume, QR, and DER. The fourth component consists of BVS and Market Capitalization variables. The fifth component consists of variables DAR and NETGR.

In companies with UNVR issuer code, the results showed that the main factors determining the stock price of the UNVR issuer coded company were 5 new components. The first component consists of ROE, TATO, ARTO, ITO, ROA, CR, EPS, and QR. The second component consists of NPM, OPM, and BVS. The third component consists of Market Capitalization and Volume variables. The fourth component consists of variables EPSGR, DER, and DAR. The fifth component consists of variables RGR and NETGR.

In companies with INDF issuer code, the results of the study show that the main factors determining the stock price of companies coded for issuer INDF there are 5 new components. The first component consists of ARTO, EPS, ROE, ROA, ITO, and TATO. The second component consists of QR, CR, and NETGR. The third component is formed from the variables BVS, OPM, EPSGR, and NPM. The fourth component is formed from the variables DAR, DER, and Market Capitalization. The fifth component consists of variables RGR and Volume.

In companies with ICBP issuer code, the results of the study show that the main factors determining the stock price of companies with ICBP coded issuers are 4 new components. The first component consists of ARTO, TATO, EPS, ITO, ROE, and Market Capitalization. The second component consists of ROA, RGR, and Volume. The third component is formed from the variables DER, DAR, BVS, and EPSGR. The fourth component is formed from the variables CR, QR, NETGR, NPM, and OPM.

For potential investors who want to invest their capital in the form of shares, can see the main components that have been analyzed by researchers, namely Component 1, Component 2, Component 3, Component 4, and Component 5, each of which consists of variables forming variable. So, by looking at the main components that are formed, potential investors can predict future investment returns.

For further research, the Principal Component Analysis method can be used to find the main determinants of stock prices by adding new variables to get more accurate results such as adding other financial ratios.

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