

Classifying of Companies listed in IDX LQ45

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Abstract

Selecting companies for investment is very important. This research want to group companies listed in IDX LQ45 by using factor analysis and cluster analysis. The variables will be analyzed are profit, revenues, capital, liabilities, *Net profit margin*, dividend, and closing price. There are two groups of variables according of factor analysis namely; Volume Company and Performance Company. Based on result of factor analysis we classify companies. There two groups companies; the first is the efficient companies (6 companies) and the second is not efficient companies (39 companies).

Keywords: classify, factor analysis, cluster analysis.

JEL: G11, G32

1. Introduction

LQ45 Index is an indicator of stock market indices Indonesia. LQ45 is a forum in which contains a company whose shares have liquidity and high market capitalization. Therefore, a company listed on LQ45 company is the reference point of investing in IDX. One benchmark is the selection of the company financial management, it can be seen from its financial reports.

This study is intended to create a grouping of companies listed in the LQ45 index is based on financial statements published by IDX any given period. The variables will be analyzed are profit, revenues, capital, liabilities, *Net profit margin*, dividend, and closing price. Dividend each year end, therefore, the data of this study using the company's financial report data in December 2015.

This study uses a multivariate analysis, therefore it is necessary to reduce the variables, the analysis used is factor analysis. The results of the analysis factors will be used in the grouping of companies listed in LQ45. The Clustering of company is started by selects the best grouping method. After that, the effectiveness of grouping selected is analyzed by Manova.

2. Research Methods

2.1 Factor Analysis

According to Johnson and Wichern (1988) the purposes of factor analysis is to describe, if possible, the covariance relationships among many variables in terms of a few underlying, but unobservable, random quantities called factors. Factors which obtained a smaller number of variables of origin, but he contains maximum information from the origin because of the variable formed from the variables are highly correlated with each other. It is an extension of principal component analysis.

2.2 Cluster Analysis

The basic objective of cluster analysis is to discover natural groupings of items. There is no assumptions are made concerning the number of groups or the the group structure. Grouping is done on the basis of

similarities or distances (dissimilarities) (Johnson and Wichern (1988)). In this research, we use the Euclidean Distance. The Euclidean distance between two p-dimensional observation $\mathbf{y} = (y_1, y_2, \dots, y_p)'$ and $\mathbf{x} = (x_1, x_2, \dots, x_p)'$ is

$$d(\mathbf{x}, \mathbf{y}) = \sqrt{\sum_{i=1}^n (x_i - y_i)^2} = \sqrt{(\mathbf{x} - \mathbf{y})'(\mathbf{x} - \mathbf{y})}.$$

Clustering methods is used is Hierarchical Clustering Methods. Hierarchical method is divided into two, namely:

- 1 Agglomerative hierarchical methods.
2. Divisive hierarchical methods.

The result of agglomerative hierarchical and divisive methods may be displayed in the form of a two-dimensional diagram known as **dendrogram**

This study concentrate on agglomerative hierarchical procedures, in particular linkage methods. We shall use Average Linkage, Centroid Linkage, Complete Linkage, Mc Quitty Linkage and Ward Linkage.

2.3 Multivariate Analysis of Variance (Manova)

MANOVA tests for the difference in vector means between two or more groups. The vector means are vector contains means all variables such as profit, revenues, capital, liabilities, *Net profit margin*, dividend, and closing price. If there are several groupings, we want to know the grouping which one is more efficient based vectors existing variable. The model for Manova is defined by:

$$\mathbf{y}_{ij} = \boldsymbol{\mu} + \boldsymbol{\tau}_i + \boldsymbol{\varepsilon}_{ij};$$

Where:

\mathbf{y}_{ij} = vector observation

$\boldsymbol{\mu}$ = vector overall mean

$\boldsymbol{\tau}_i$ =vector treatment effect

$\boldsymbol{\varepsilon}_{ij}$ =vector random error, and $i=1,2, \dots, k$ and $j=1,2, \dots, n_i$. k is number of groups and n_i number replication for each group.

The null hypothesis is : $H_0: \tau_1 = \tau_2 = \dots = \tau_k = 0$

2.4 Ratio to Determine the Goodness of Grouping Method

To know the goodness which method has the best performance, it can be used the standard deviation within cluster (S_W) and standard deviation between (S_B).

Formula standard deviation within cluster (S_W):

$$S_W = K^{-1} \sum_{k=1}^K S_k$$

where ; S_k = standard deviation of k-th group/cluster

k = numbers of groups

S_W =standard deviation within group/cluster

And formula for standard deviation between cluster (S_B):

$$S_B = [(K - 1)^{-1} \sum_{k=1}^K (\bar{X}_k - \bar{X})^2]^{1/2}$$

Where: \bar{X}_k = mean of k-th group/cluster

\bar{X} = overall mean

The method has the smallest ratio is the best method. Ratio is defined by: $R = \frac{S_w}{S_B}$.

3. Analysis

This section will explain general information about the data, result of factor analysis, choosing the best clustering, and interpretation the cluster of the company listed in Lq45 index.

3.1 Data Description

Figure 1 give the general information about the data, the presentation use box-plot diagram. From the diagram, we seen almost all the variables homogenous, but any outliers present in variable revenues, capital and liabilities. Company number 8, 9, 12 and 12 have bigger liabilities than others.

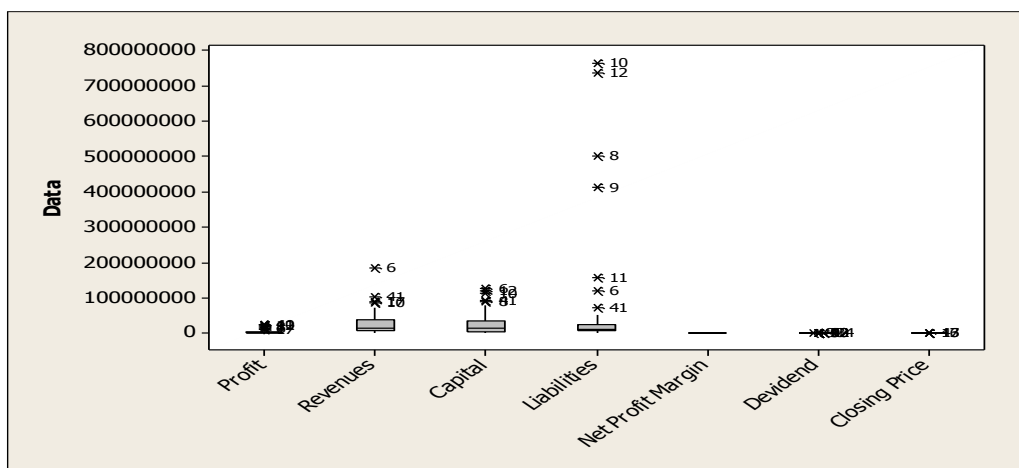


Figure 1. The Box-Plot Diagram for all Variables

3.2 Factor Analysis

The results of the factor analysis that there are two eigenvalues greater than 1, This means that there are two factors formed. Eigenvalues ordered from largest to smallest, with the criteria that the factors that have eigenvalues lesser than 1, there are not used in calculating the number of factors formed. The three first eigen values are 3.7712 1.2468 and 0.8757. The two factors is the most optimal amount can be obtained. Component factor shows the correlation between a variable with these two factors. The component factor after the rotation can be seen in Table 1.

Once it is known that two factors are the most optimal number, then Table 3 shows the distribution of seven variables on two factors formed. The numbres in this table are componentfactors that determine the correlation between a variable with factor 1 and factor 2. The process of determining which variables will include into the factors which, conducted by the comparison of the correlations for each variable. As seen from the table, the component factor can be interpretation. The Factor 1 consist of variables Profit, Revenues, Capital, Liabilities and Dividend. This factor can be named the performed company by internal indicator. The second factor formed from Net Profit Margin and Closing Price and it can be named the performed company by external indicator.

Tabel 1. Componen Matrix After Varimax Rotaion

	Factor-1	Factor-2
Profit	0,953302	0,118954
Revenues	0,736358	0,551838

Capital	0,927212	0,135995
Liabilities	0,877785	-0,23914
Net Profit Margin	0,409869	-0,60777
Devidend	0,675139	-0,03739
Closing Price	0,179607	0,718004

3.3. Cluster Analysis

In this study, the distance matrix used the Euclidean distance and and agglomerative hierarchical procedures. For the linkage methods used Average Linkage, Centroid Linkage, Complete Linkage, Mc Quity Linkage and Ward Linkage. Performance cluster can be seen from the smallest ratio (R). If the ratio is less than 1 means that the diversity in the cluster is much smaller than the variation among clusters. It means the cluster is efficient. The value of ratio can be seen in Tabel 3.

Tabel 2 Cluster Analysis Recapitulation

No	Linkage Methods	Number s of Cluster	Members of Cluster			Ratio Sw/Sb
			1st-Cluster	2nd-Cluster	3rd-Cluster	
1	Average Linkage	2	39(others)	6(6,8,9,10,12,41)	-	0,387
3	Centroid Linkage	3	37(others)	2(16,17)	6(6,8,9,10,12,41)	0,334
4	Complete Linkage	3	38(others)	3(6,16,17)	5(8,9,10,12,41)	0,521
5	Mc Quity Linkage	2	39(others)	6(6,8,9,10,12,41)	-	0,387
6	Ward Linkage	2	39(others)	6(6,8,9,10,12,41)	-	0,387

Table 2 shows that the ratio of centroid linkage is the smallest (0.334). This value almost the same with three methods linkage (average, mc Quity and ward), it is 0.387. The highest ratio is 0.521 is from complete linkage. The last method is rejected. Therefore there are two candidates for clustering can be used for decision making grouping of companies listed in LQ45 index. The first clustering consist of 3 clusters and the second one 2 clusters. The dendogram for two clustering can be seen in Figures 2 and 3.

To make the accurate decision on the selects of clustering, we compare the performance clustering by Manova. This analysis tests the grouping which has a higher level of significance. The result of Manova shows that in Table 4.

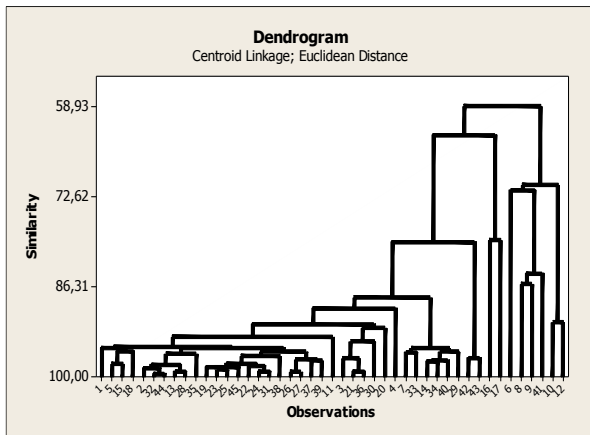


Figure 2. Dendrogram of Centroid Linkage(3 Clusters)

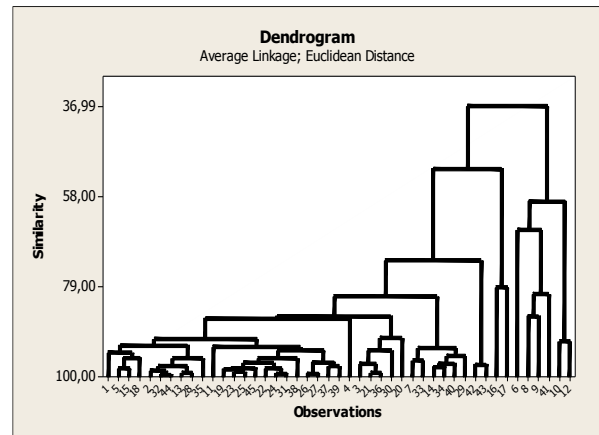


Figure 3. Dendrogram of Average Linkage(2 Clusters)

Table 3. The manova Results for Two Clustering

	Test		F statistic
First cluster	Wilks'	0,0872	48,92
Second Cluster	Wilks'	0,17927	96,143

The F statistic of second clustering (2 cluster) is 96,143, higher than the first cluster (3 cluster), it means the second clustering better than first clustering. To more explore the performance the both clustering is used the line chart of mean all variables for two clustering. The line chart in Figures 4 and 5 show that the second clustering sharper than the first, so it can be concluded that that the second clustering which produces 2 cluster better than the first clustering.

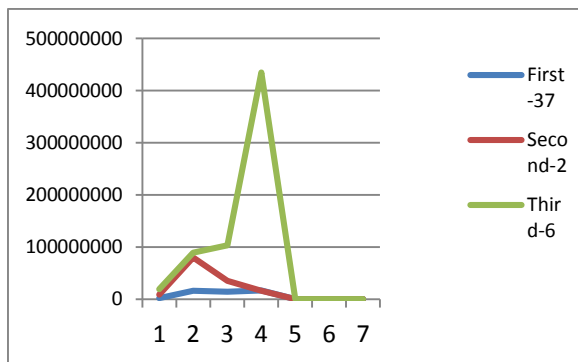


Figure 4. Line Chart First Clustering (3 clusters)

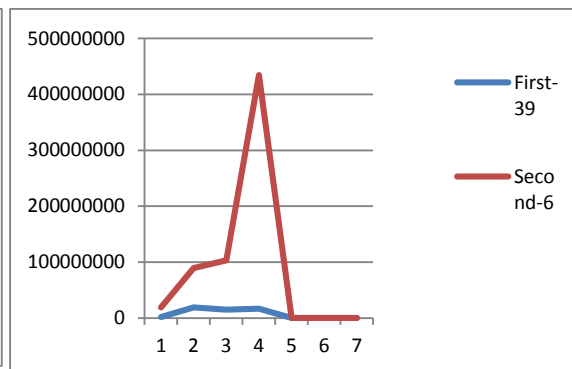


Figure 5. Line Diagram Second Clustering (2 cluster)

Based on all analysis has been done, it was decided that there are two cluster companies listed in LQ45 index. Members of the clusters are shown in Table 5. From the line chart is seen that the performance of the second cluster consists of 6 companies better and more efficient than the first cluster that consisting of 39 companies. Almost all of the financial performance for the average value of the second cluster is much higher.

Table 5. Classifying Companies

First Cluster (39 Companies)	1	AALI	Astra Agro Lestari Tbk	25	LPPF	Matahari Department Store Tbk	
	2	ADHI	Adhi Karya (Persero) Tbk	26	LSIP	PP London Sumatera Tbk	
	3	ADRO	Adaro Energy Tbk	27	MNCN	Media Nusantara Citra Tbk	
	4	ANTM	Aneka Tambang (Persero) Tbk	28	MPPA	Matahari Putra Prima Tbk	
	5	AKRA	AKR Corporindo Tbk	29	MYRX	Hanson International Tbk	
	7	ASRI	Alam Sutera Realty Tbk	30	PGAS	Perusahaan Gas Negara (Persero) Tbk	
	11	BBTN	Bank Tabungan Negara (Persero) Tbk	31	PTBA	Tambang Batubara Bukit Asam (Persero) Tbk	
	13	BMTR	Global Mediacom Tbk	32	PTPP	Pembangunan Perumahan (Persero) Tbk	
	14	BSDE	Bumi Serpong Damai Tbk	33	PWON	Pakuwon Jati Tbk	
	15	CPIN	Charoen Pokphand Indonesia Tbk	34	SCMA	Surya Citra Media Tbk	
	16	GGRM	Gudang Garam Tbk	35	SILO	Siloam International Hospitals Tbk	
	17	HMSA	Hanjaya Mandala Sampoerna Tbk	36	SMGR	Semen Indonesia (Persero) Tbk	
	18	ICBP	Indofood CBP Sukses Makmur Tbk	37	SMRA	Summarecon Agung Tbk	
	19	INCO	Vale Indonesia Tbk	38	SRIL	Sri Rejeki Isman Tbk	
	20	INDF	Indofood Sukses Makmur Tbk	39	SSMS	Sawit Sumbermas Sarana Tbk	
	21	INTP	Indocement Tunggak Prakasa Tbk	40	TBIG	Tower Bersama Infrastructure Tbk	
	22	JSMR	Jasa Marga (Persero) Tbk	42	UNTR	United Tractors Tbk	
	23	KLBF	Kalbe Farma Tbk	43	UNVR	Unilever Indonesia Tbk	
	24	LPKR	Lippo Karawaci Tbk	44	WIKA	Wijaya Karya (Persero) Tbk	
				45	WSKT	Waskita Karya (Persero) Tbk	
	Second Cluster (6 companies)	6	ASII	Astra International Tbk	10	BBRI	Bank Rakyat Indonesia (Persero) Tbk
		8	BBCA	Bank Central Asia Tbk	12	BMRI	Bank Mandiri (Persero) Tbk
		9	BBNI	Bank Negara Indonesia (Persero) Tbk	41	TLKM	Telekomunikasi Indonesia (Persero) Tbk

5. Conclusions

Classifying of companies listed in LQ45 resulted in two cluster. The first is the efficient company, which consists of six companies, namely; Astra International Tbk, Bank Central Asia Tbk, Bank Negara Indonesia (Persero) Tbk, Bank Rakyat Indonesia (Persero) Tbk, Bank Mandiri (Persero) Tbk dan Telekomunikasi Indonesia (Persero) Tbk. The second is not efficient companies; that are Astra Agro Lestari Tbk, Adhi Karya (Persero) Tbk, Adaro Energy Tbk, Aneka Tambang (Persero) Tbk, AKR Corporindo Tbk, Alam Sutera Realty Tbk, Bank Tabungan Negara (Persero) Tbk, Global Mediacom Tbk, Bumi Serpong Damai Tbk, Charoen Pokphand Indonesia Tbk, Gudang Garam Tbk, Hanjaya Mandala Sampoerna Tbk, Indofood CBP Sukses Makmur Tbk, Vale Indonesia Tbk, Indofood Sukses Makmur Tbk, Indocement Tunggak Prakasa Tbk, Jasa Marga (Persero) Tbk, Kalbe Farma Tbk, Lippo Karawaci Tbk, Matahari Department Store Tbk, PP London Sumatera Tbk, Media Nusantara Citra Tbk, Matahari Putra Prima Tbk, Hanson International Tbk, Perusahaan Gas Negara (Persero) Tbk, Tambang Batubara Bukit Asam (Persero) Tbk, Pembangunan Perumahan (Persero) Tbk, Pakuwon Jati Tbk, Surya Citra Media Tbk, Siloam International Hospitals Tbk, Semen Indonesia (Persero) Tbk, Summarecon Agung Tbk, Sri Rejeki Isman Tbk, Sawit Sumbermas Sarana Tbk, Tower Bersama Infrastructure Tbk,

United Tractors Tbk, Unilever Indonesia Tbk, Wijaya Karya (Persero) Tbk, and Waskita Karya (Persero) Tbk

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