

## PRINCIPAL COMPONENT ANALYSIS (PCA) APPROACH IN ASSESSING FINANCIAL PERFORMANCE: CASE STUDY ON SOUTH-EAST ASIA TELECOMS INDUSTRY

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### ABSTRACT

*The telecommunications industry in South-East Asia (SEA) had evolved rapidly in the last couple of decades. Considered as a flourishing and promising business to invest in, an analysis of the financial performance is indispensable. However, it is challenging to convey how many financial ratios can be utilized best with minimum information loss. This paper aimed to discuss this subject and help stakeholders who observe the industries' financial performance efficiently. This analysis contributes to the above-mentioned who are attentive to the company's financial results by giving them a brief approach to evaluate their performance. It would also enable those formulating financial reports to sort out the figures that material to represent the success of their firms. The representativeness of 6 (six) enterprises from 5 (five) emerging countries in the region are relevant to catch the big picture of the industry's performance in South-East Asia. Eighteen ratios derived from financial statements of six flagship telco companies in South-East Asia were calculated for a period of 5 (five) years. The principal component analysis (PCA) was run to develop variables with a significance value above 0.5 for each component. Four components were extracted with a significant variance value of 87 percent, which means that the least information being lost in the analysis. The authors draw the conclusion that financial performance could be measured using 11 ratios reflecting liquidity, profitability, management efficiency, and total asset turnover instead of a perplexed measurement containing many ratios that could be complicated to interpret.*

Key words: Financial Ratios, Performance Analysis, Principal component analysis (PCA), South-East Asia, Telecommunication,

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### INTRODUCTION

The company's financial performance is a significant source of information for stakeholders, mostly investors and prospectus investors. It is generally known that the users can indicate the company's underlying financial position by using financial ratios. The company's board shall compile the financial accounts reports to present the financial results and status at a time. The general intent collection of the financial statements typically contains the balance sheet, the income statement, the equity statement, and the cash flow statement that are prepared to provide the users outside the company, such as analysts and creditors, with more detail on the financial status of the company (Rana, 2019).

In many years, using ratios in financial statement analysis is prevalent to assess business performance. The ratios also have been used to compare business performance in the same industry using specific models. According to Taylor (1986), in terms of correlation of the available ratios and the time efficiency of analyzing the financial statement, the number of ratios can be focused on to shrink with minimum loss data. The previous study conducted by Mbona and Yusheng (2019), who used principal component analysis (PCA), resolved 18 variables, becoming 4 component variables. Both studies conducted by Taylor (1986) and Mbona and Yusheng (2019) prove that the company's performance can be explored with fewer factors. In the same way, finding significant ratios with narrower ratios can be used to scrutinize companies' performance and the industry. Their research evaluated that the performance of telecom companies in China could be measured by focusing on 12 rather than 18 ratios. This study is time-efficient and less costly to represent the information by reducing duplication in data calculations.

The job and capacity of Information and Communication Technology (ICT) in promoting regional integration and connectivity, and the increasing value of the Internet for social and economic development and growth (Tay and Tijaja, 2017), is significantly enormous as a result of the advancement of the deepening and strengthening of the ASEAN Economic Community. It goes hand in hand with the penetration of the market using the internet in the SEA region has doubled from 2000 to 2015 (ITU, 2016). Moreover, the total subscribers of the six companies are boosted, reaching 1.3 billion at the end of 2019. This situation brings telco companies to grow and position their benefit existence in the world's third-largest market.

In 2019, SEA continued to be a growth engine in the region, which booked a record of foreign direct investment of \$156 billion or a 5% increase from the past year (AIR, 2019). Making ASEAN countries as a whole became a prominent destination for investors, primarily digital socio-economy whose backbone is the telecommunication industry.

These companies were heavily influenced by government policy through share ownership and investment policies. ASEAN strategy that expanded the ASEAN market is through cooperation between other countries and regions such as ASEAN plus three and ASEAN plus six (AIR, 2019). This is also meant to adapt some of its policies, including regulations on the ASEAN telecoms industry players. ASEAN is an open region to Foreign Direct Investment (FDI), but this industry's players are mostly state-owned companies. The companies which become our research object to represent the ASEAN region are Telkom Indonesia (TLK), TOT Thailand (TOT), Axiata Group Berhad - Malaysia (AXIATA), Telekom Malaysia (TM), Singapore Telecommunications (SingTel), and Philippine Long-Distance Telephone Company (PLDT).

#### Telkom Indonesia

PT Telkom Indonesia (Persero) Tbk is a state-owned information and communications infrastructure and telecommunications network in Indonesia. Indonesia's government is the controlling shareholder with 52.09% shares, and the remaining 47.91% shares held by the state. In the Indonesian Stock Exchange (IDX), Telkom's stocks are listed as "TLKM," and in the New York Stock Exchange (NYSE), named as "TLK." Telkom divides its business into 3 Digital Business Streams, such as Digital Connectivity, Digital Platform, and Digital Services.

#### TOT Thailand

TOT Public Company Limited operated as the Telephone Organization of Thailand since February 24, 1954, before being transformed into TOT Public Company Limited on July 31, 2002. TOT remains a state enterprise under the Ministry of Digital Economy and Society, of which the Ministry of Finance is the sole shareholder. The main objective is to carry on any trading business and provide all services of telecommunications, telecommunications network, radio communications, and delivery or transmission of images and voice-over radio, television, radio broadcast, including any other related businesses and similar hereof, domestically, internationally and abroad.

#### Axiata Group Berhad

As one of Asia's leading telecommunications companies in search of a mission to be the Next Generation Global Leader by 2022, Axiata has turned itself from a holding firm with a portfolio of pure-play network properties into a Triple Core Strategy focused on Digital Telco, Digital Sector, and Infrastructure. Located in Malaysia, Axiata Group Bhd is recognized to be one of the largest Asian networks, covering Malaysia, Indonesia, Sri Lanka, Bangladesh, Cambodia, Nepal, Myanmar, Thailand, and Pakistan under a range of brand names, such as XL Axiata, Dialog, Celcom, Smart, Robi, NCell.

#### Telekom Malaysia

Telekom Malaysia Berhad (TM) is Malaysia's converged telecom service provider supplying a wide variety of communications facilities and solutions in fixed (telephone and broadband), mobility, content, wifi, and smartphones. As a market leader, TM is driven by value development by customers in a highly competitive environment. Given the pace at which Malaysians embrace digital technologies, Telekom Malaysia is one of the largest government-linked companies in the region, with more than 28,000 employees and a market capitalization of more than RM25 billion as of December 31, 2019.

#### Singtel Group

The Singtel Group is Asia's leading communications group providing a wide variety of services, including fixed, mobile, data, internet, TV, info comms technology (ICT), and digital solutions. Headquartered in Singapore, Singtel has 140 years of operational experience and played a crucial role in the country's growth as a global communications center. Optus, a subsidiary in Australia, is a pioneer in integrated telecommunications, continuously raising the benchmark for creative goods and services. They are also strategically involved in industry leaders not only in Asia but also in Africa, including Globe Telecom (Philippines), Telkomsel (Indonesia), Bharti Airtel (India, South Asia, and Africa), and Advanced Info Service (Thailand).

#### Philippines Long Distance Telephone (PLDT)

Established on November 28, 1928, the Philippine Long-Distance Telephone Company (PLDT) is the largest telecommunications and internet service provider in the Philippines. Via its three major market divisions, such as fixed-line, wireless, and information and communication technologies, PLDT provides the most significant and most diverse array of telecommunications facilities in the Philippines, with the most massive fiber-optic infrastructure and fixed-line, cellular and satellite networks. PLDT and its American Depository Account are listed on the Philippine Stock Exchange. PLDT has one of the highest market capitalizations among the Filipino-listed stocks.

This research objective is to perform a PCA of 18 (eighteen) financial ratios for the South-East Asia Telecoms Industry in order to trim the number of variables and to ponder how the elements are connected to each other. In addition, the purpose of this paper is to suggest a mixture or blend of ratios that better test and interpret the output in the field and to analyze the ratios with the greatest heterogeneity to determine their effect on this in the business. By giving them a shorter way to evaluate results, this study will benefit various stakeholders who are interested in each company's financial performance. It will also benefit those who report on the collection of the ratios that matter to represent the success of their businesses. The use of PCA gives objective ratios that are most important in the measurement of results.

## **LITERATURE REVIEW**

The financial analysis uses quantitative information from the financial statements, which consists of the statement of profit and loss or income statement, statement of financial position (balance sheet), and the statement of cash flows, aims to determine the relationship between the information reported by the organization in compliance with the accounting principles. In doing so, the corporation is able to assess its decisions over a financial year or a period of time to see the strength, deficiencies, and areas that require attention within the organization (Marsha and Murtaqi, 2017; Bhargava, 2017). Further, analysis of financial statements also offers hints as to where the management might find more funding to boost its revenue (Mahajan and Yadav, 2016). In a case study on the Indian telecommunications industry, Bhargava (2017) accomplished that the financial stability of the industry is essential to the economy as a whole due to the increased contribution of this industry. It is also important to calculate this continuously to track the economic output of the entire sector. The telecommunications sector is exceptionally capital-intensive,

and investors would be interested in understanding the "financial status and worthiness" of the business accomplished by financial research.

While ratios have been seen as less perilous due to the advent of more advanced statistical analysis methods, writers still reckon that they are still a valuable method for calculating performance. For example, the research carried out by Liang et al. (2016) explains how ratios are still favorable in forecasting bankruptcy in the case of manufacturing firms. Other research on the significance and utility of the ratios by Myšková and Hájek (2017) and Arkan (2017) depicted that investment ratios are useful in predicting market share prices.

With this in mind, this study probes internal performance determinants as in the Zainudin *et al.* (2018) and Melwani (2019) research. There are considerations under management authority and may be able to affect them by their decisions. Meanwhile, external influences include population trends, GDP, inflation, and other external environmental factors. However, in addition to quantitative aspects, management also has to evaluate qualitative factors internally and externally, even as they do not have a standard set for measuring them, since their assessment can be extremely subjective.

Many other case studies on financial results measurement using ratios have been published (Myšková and Hájek, 2017; Batchimeg, 2017; Zainudin and Hashim, 2016; Bhargava, 2017). For instance, Al-Jafari and Al Samman (2015) investigated profitability determinants for industrial firms in Oman. By applying the Ordinary Least Squares (OLS) model to 7 (seven) ratios, conclusions were taken on the relationship between the profitability ratios and other measured non-profitability ratios. They identified that there is a positive relationship between profitability, firm size, growth, fixed assets, and working capital. Moreover, they also argue that the management productivity of these big companies gives them higher returns on profits.

While Weber (2017) concentrated only on the micro or internal atmosphere in its regression study of financial results, Budi and Mulyana (2018) conducted an internal and external environment investigation to see if this affects the viability of the business. This was notable research, which involved both internal and external variables in the regression analysis.

In a case study on the banking sector, Berthilde and Rusibana (2020) and Okanta (2018) carried out a thorough review of the company's report to support the stakeholders or investors for investment decisions. Their research focused on taking together financial ratios from financial statements and statistics from capital markets to see how equity indexes are affected by the results of various ratios on the published report. The case study by Arbelo *et al.*, 2020 studied the ratios for the financial accounts of the Spanish multi-industry. Using a variety of statistical approaches, including standard deviation, mean, and even RBV analysis, the relationship between benefit measurement and other performance measures were developed.

Tshabalala *et al.* (2010) stated that the economic rate of return (ERR) is a crucial ratio in the study of the financial statements since it was acknowledged as a measure of the company's economic success. Based on their report, ERR was taken as an extensive ratio that looks at the organization's return and contribution, taking into account both internal and external factors influencing the company.

Ali and Haque (2017) brought an analogous analysis but used multiple regressions to acknowledge the sustainability of telecommunications for a four-year period in Saudi Arabia. In his study, the main goal was to provide a relationship between the two core statements, which is why he viewed them independently. The research by Jakob (2017) observed the comparison between SOE and private corporations within a competitive environment and concentrated on how the management style, labor cost, and competitiveness affect the efficiency and profitability in four respective countries, China, India, Russia, and Saudi Arabia.

Although the literature examined includes a variety of case studies on ratio-based financial statements, several differences remain. Inline with Mbona and Yusheng (2019), it was declared that none of them has so far concentrated on Chinese telecommunications, particularly after the Chinese government invited the globe to invest in their businesses. Second, PCA has been used by a few academic studies to find out which ratios provide the best value analysis with the least data loss from the pool of all ratios. From the study of preceding research, we found that different ratios have been utilized, and others have corresponded because they both come from the same reports.

Kountur and Aprilia (2020) carried out a related analysis concentrating on Indonesian companies. The analysis did not refer to any particular industry; thus, with variations in industry, the model could not be one-size-fits-all, particularly given the differences in the operating environment between China and Indonesia. Third, the use of PCA requires the use of at least 18 (eighteen) ratios to minimize the impact of subjectivity on which ratios can be used for further study, including performance regression analysis. Finally, as seen in our matrix correlation, we can imply that both ratios are linked, which means that there is no flexibility to carry out the regression. This connection stems from the evidence that these ratios use input from the same report. By implementing PCA, we build new independent variables that make for an efficient further study of even smaller variables.

## RESEARCH METHODOLOGY

In this research, secondary data is used as the data collection method. Analysis of secondary data is the analysis of the data gathered by someone else for another primary purpose (Johnston, 2017). The data that is used is the financial statements that are published by the company from their official website from 2015 - 2019. Financial statements are used to assess the performance of telecommunication companies in South-East Asia.

The PCA method was then introduced to propose the most acceptable ratios that could better describe the success of the companies. PCA used to reduce the dimension and isolate the function with a minimal error rate than other dimensional reduction methods (Jafarzadegan *et al.*, 2019) and with limited loss of initial data (de Almeida *et al.*, 2020). In a variety of sectors, it has been used to minimize the scale of huge data volumes and compact images. (Arab *et al.*, 2018; Polyak and Mikhail, 2017). The use of PCA in minimizing variables, as already noted in the literature review, makes it a valuable method in modern times where vast quantities of data are compiled and compared for its utility.

The first key factor blends the X-variables that have the highest variation between all the variations. Most of the data variance is taken from this first component. The second also considers the maximum residual difference in the data given that the association between the first and the second components is 0. This will proceed until the "i-th" part, which would account for the last gap that the other components did not account for, with the condition remaining that its association with the other components is 0. This condition is what produces the flexibility of the variable used.

In estimating the factors, the eigenvectors method is used with the following equations:

$$Y_1 = \hat{e}_{11}ZX_1 + \hat{e}_{12}ZX_2 + \hat{e}_{13}ZX_3 + \dots + \hat{e}_{1i}ZX_i, \tag{1}$$

$$Y_2 = \hat{e}_{21}ZX_1 + \hat{e}_{22}ZX_2 + \hat{e}_{23}ZX_3 + \dots + \hat{e}_{2i}ZX_i, \tag{2}$$

$$Y_i = \hat{e}_{i1}ZX_1 + \hat{e}_{i2}ZX_2 + \hat{e}_{i3}ZX_3 + \dots + \hat{e}_{ii}ZX_i, \tag{3}$$

Y is the principal component; e is the eigenvector; ZX the standardized value of the ratios. Using the data as defined in Table 2, we use standardized ratio values for the extraction of the main variables.

*Variables*

A total of 18 ratios are used in this study as a representation of several accounting ratios that are frequently used as a measure of profitability, liquidity, leverage, management efficiency, cash flow indicator, valuation, and effective tax rate. From the list in Table 1, we can see every ratio name that represents each of the ratio classes.

**Table 1: Accounting ratios used as variables**

Ratio Class	Ratio Name	Notation	Formula
Profitability ratios	Return on Asset	ROA	Net income/Total Assets
	Return on Shareholder Equity	ROSE	Net income/Shareholders' equity
Liquidity ratios	Profit Margin	PM	Net income/net sales revenue
	Current Ratio	CR	Current assets/Current liabilities
	Net Working Capital Ratio	NWCR	(Current assets - current liabilities)/total assets
Management efficiency ratio	Total Asset Turnover	TAT	Revenue/total assets
	Revenue per worker wage	R/W	Revenue/salary expense
	Revenue per fixed asset	R/FA	Revenue/fixed assets
	Working Capital Turnover	WCT	(Current assets - current liabilities)/revenue
Leverage ratios	Debt Ratio	DR	Long term liabilities/total assets
	Equity Ratio	ER	Shareholder's equity/total assets
	Debt Equity Ratio	DER	Long term debt/shareholder's capital
	Times interest cover	TI	EBIT/interest expense
Valuation and growth ratio	Earnings per share	EPS	Net profit/average number of shares
	Customer revenue	CRev	Revenue/number of subscribers
	Customer Growth	CG	Yearly change in customers/customer in the base year
Cash flow indicator	Cash flow indicator	CI	Operating cash/sales
	Effective tax rate	ETxR	Tax/income before tax

Source: Mbona and Yusheng (2019)

*Data*

The research used financial statements as the main resources. The data used in this paper was secondary data which assembled from the official website of 6 (six) telecommunication companies in South-East Asia from 2015 until 2019. All of the numbers used were derived from the company's annual financial reports as published on their websites. In processing the data, the applications that we used were SPSS (Statistical Package for Social Sciences) version 25 and Microsoft Excel 365. Considering each ratio has different units of measurement, we used the standardized data instead of using the original one.

Furthermore, Table 3 depicts the relationship between the ratios, which illustrates that we cannot have any independent ratios. These correlations implied that regression would not work for these ratios. As a result, we need to create new variables using PCA.

## RESULTS AND DISCUSSION

The financial statements of the companies were used to measure the performance of these firms. Hence, we endorsed PCA to propose the preferable ratios in explaining the performance. At the same time, the combination of ratios was confirmed to have minimum data reduction.

To proceed, the first test performed was the Kaiser-Mayer-Olkin Measure of Sampling Adequacy (KMO MSA) and Bartlett's Test of Sphericity (*Sig*), where the results of the tests carried out on 18 ratios found that the KMO MSA value was 0.592 with the significance amounting to 0.000. Because the KMO MSA value was greater than 0.5 and the *Sig* lower than 0.05, the research could be continued to the next stage.

Unfortunately, the Anti-Image matrices test result at the 18 ratios we formerly determined were showing the results values of less than 0.5 ( $MSA < 0.5$ ). This means that the ratios must be reduced to proceed to the next calculation. Therefore, from the 18 variables, we excluded variables with  $MSA < 0.5$  starting from the smallest value, and so on until the overall MSA value for the remaining variables had a value  $> 0.5$ . After eliminating 3 (three) variables, there are 15 variables left for calculation since their MSA values reached  $> 0.5$ .

After finding the new-fifteen variables from Anti-Image metrics result, we redid the calculation from the start. The new KMO MSA resulted in a value of 0.653 instead of 0.592 compared to the beginning result and the significance of 0.000 ( $< 0.05$ ). From these results, the data could be continued for further testing.

Corresponding to Table 4 about Total Variance Explained, then we found out that the 15 ratios we tested can be elicited into four components. It can be seen from the results of the eigenvalues with a score  $> 1$ . The first component with the highest variation has an eigenvalue of 6.147, representing 40.982 percent of the variant. Coupled with the other three factors, the total of these four components will cover 87.314 percent variations. This exhibit indicates a significant level of data coverage. The bigger the percentage means that there is less data leakage from those four components.

Table 5 shows the results of the performance analysis component extraction in the telecommunications industry in South-East Asia. If we relate to the ratios in Table 5, we will find that each component contains the ratio:

- a. Component 1: Current Ratio, Net Working Capital Ratio, Working Capital Turnover, and Customer Revenue.
- b. Component 2: Return on Asset, Return on Stockholders Equity, Profit Margin, and Customer Growth.
- c. Component 3: Revenue per Wage, Equity Ratio
- d. Component 4: Total Asset Turnover

Liquidity in the industry is considered critical, as presented by component 1 with the addition of the efficiency of management and growth. The study concluded the value of working capital and the efficiency of management have significant positive relationships (Al-Jafari and Al Samman, 2015). The current ratio has the greatest worth of component 1 representing liquidity, followed by the working capital turnover (WCT). The combination of how management runs the company to manage the capital cannot be separated from the liquid assets at the disposal of the firms. The growth of sales needs a lot of resources that are flexible in allocating. Furthermore, this finding of combination is suitable to measure performance in the same industry since it reflects the capital used to finance daily business that can be expected to be back in a short time over the sale. As mentioned in the literature that the industry is capital intensive (Abraham, 2004), high value in working capital turnover will supply information to the investors that businesses have a competitive edge over similar companies.

The second component displays the profitability ratio to measure the company's financial performance. With a significant value above 0.9, it means that the profitability ratio is a pivotal component that should be calculated in the telecommunication industry financial performance analysis. This is backed by most literature that uses the profitability of a company as one of the key measures of its success or as a dependent variable in most of the regression analysis, such as the ROA asset return used by Al-Jafari and Al Samman (2015). Moreover, profit maximization should be one of the key priorities of the management in order to obtain the high return required for their shareholders. This is accomplished by retaining a high and steady profit margin over the overall business's activity, with a balance being maintained between revenues and gaining more customers.

Third, we could not ignore revenue per wage as the two points above emphasize liquid resources. Management also has to be selective in allocating its resources to become personnel expenses, as this ratio is vital in this telecommunication industry. Maintaining the worker's reward to be positively related to the company's output will be promising to increase or just keep the rate of return per worker for the industry. A study by Havran (2018) depicts that growing the amount of capital spent on transfers and salaries ensures higher revenues for the industry. However, there is no specific and accurate measure of the output in the service industry. Revenue paid to the worker will relate to seeing the connection with the turnover (Mbona and Yusheng, 2019).

The last component is represented by total assets turnover (TAT), which of particular interest in our findings has a significant value of around 0.685. In accordance with Mbona and Yusheng (2019), the telecommunication industry is highly capital intensive, and investors are required to examine this to see the firm's worthiness. Empirical research by Patin and Mustafa (2020) resulted in the effect of total asset turnover rates on the investment returns of US public companies in various categories of industries. Stock values are greatly affected by the company's financial success in the productive utilization of its properties. Operating efficiency (as calculated by the total asset turnover ratio) plays a part in portfolio investment decisions. Another study also supports that the

asset structure of telecommunication companies in Indonesia tends to be larger because it still requires high fixed assets due to the required long-term assets, which is quite a lot for investment purposes (Andriyani, 2015).

**Table 2: Descriptive statistics for the telecoms industry**

	N	Minimum	Maximum	Mean	Std. Deviation	Variance
ROA	30	-7.80	16.50	4.6467	5.98243	35.789
ROSE	30	-28.50	29.20	10.1267	12.06685	145.609
PM	30	-20.80	31.10	9.4033	12.61005	159.013
CR	30	.40	3.70	1.0400	.67292	.453
NWCR	30	-.20	.30	-.0100	.13481	.018
TAT	30	.30	.60	.4100	.11250	.013
RWW	30	.60	18.00	10.1000	4.20509	17.683
WCT	30	-1.10	.70	-.1000	.45788	.210
DR	30	.10	.50	.2800	.12704	.016
ER	30	.20	.80	.4533	.19070	.036
DER	30	.30	1.90	.8900	.55420	.307
EPS	30	-9.80	104.00	21.5000	33.43934	1118.190
CRev	30	.00	560.30	60.5133	120.48476	14516.578
CG	30	-1.30	.20	-.0367	.28826	.083
CI	30	.10	.60	.3100	.13983	.020
Valid N (listwise)	30					

**Table 3: Inter-item Correlation Matrix**

	ROA	ROSE	PM	CR	NWCR	TAT	RWW	WCT	DR	ER	DER	EPS	CRev	CG	CI
ROA	1.000	.904	.934	-.050	-.075	.650	.418	-.070	-.169	.275	-.416	.048	-.197	.537	.404
ROSE	.904	1.000	.903	-.194	-.251	.455	.269	-.290	.046	.019	-.134	.342	-.266	.689	.618
PM	.934	.903	1.000	-.182	-.216	.440	.196	-.244	-.031	.134	-.296	.245	-.238	.622	.487
CR	-.050	-.194	-.182	1.000	.886	.190	.080	.797	-.458	.633	-.364	-.353	.863	-.099	-.616
NWCR	-.075	-.251	-.216	.886	1.000	.234	.017	.939	-.455	.706	-.444	-.541	.635	-.063	-.708
TAT	.650	.455	.440	.190	.234	1.000	.391	.248	.014	.167	-.231	-.307	-.172	.224	.015
RWW	.418	.269	.196	.080	.017	.391	1.000	.088	-.464	.323	-.424	-.372	.076	-.087	.014
WCT	-.070	-.290	-.244	.797	.939	.248	.088	1.000	-.551	.766	-.567	-.712	.545	-.099	-.786
DR	-.169	.046	-.031	-.458	-.455	.014	-.464	-.551	1.000	-.880	.888	.502	-.538	.252	.400
ER	.275	.019	.134	.633	.706	.167	.323	.766	-.880	1.000	-.892	-.539	.541	-.089	-.512
DER	-.416	-.134	-.296	-.364	-.444	-.231	-.424	-.567	.888	-.892	1.000	.601	-.306	-.002	.380
EPS	.048	.342	.245	-.353	-.541	-.307	-.372	-.712	.502	-.539	.601	1.000	-.133	.144	.741
CRev	-.197	-.266	-.238	.863	.635	-.172	.076	.545	-.538	.541	-.306	-.133	1.000	-.249	-.502
CG	.537	.689	.622	-.099	-.063	.224	-.087	-.099	.252	-.089	-.002	.144	-.249	1.000	.292
CI	.404	.618	.487	-.616	-.708	.015	.014	-.786	.400	-.512	.380	.741	-.502	.292	1.000

**Table 4: Total Variance Explained**

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	6.147	40.982	40.982	6.147	40.982	40.982
2	4.140	27.598	68.581	4.140	27.598	68.581
3	1.511	10.071	78.652	1.511	10.071	78.652
4	1.299	8.662	87.314	1.299	8.662	87.314
5	.868	5.788	93.102			
6	.475	3.167	96.269			
7	.241	1.609	97.878			
8	.120	.799	98.677			
9	.065	.434	99.110			
10	.053	.355	99.465			
11	.030	.198	99.663			
12	.022	.150	99.813			
13	.015	.099	99.912			
14	.010	.065	99.977			
15	.003	.023	100.000			

Extraction Method: Principal Component Analysis.

**Table 5: Rotated Component Matrix**

	Component			
	1	2	3	4
Zscore: ROA	-.083	<b>.913</b>	.334	.149
Zscore: ROSE	-.198	<b>.953</b>	.099	-.063
Zscore: PM	-.152	<b>.926</b>	.187	-.046
Zscore: CR	<b>.942</b>	-.025	.106	-.002
Zscore: NWCR	<b>.930</b>	-.071	.100	.242
Zscore: TAT	.099	.540	.082	<b>.685</b>
Zscore: RWW	-.142	.154	<b>.713</b>	.278
Zscore: WCT	<b>.856</b>	-.139	.236	.371
Zscore: DR	-.420	.067	-.877	.101
Zscore: ER	.659	.099	<b>.691</b>	.049
Zscore: DER	-.385	-.178	-.824	-.150
Zscore: EPS	-.360	.279	-.440	-.715
Zscore: CRev	<b>.785</b>	-.173	.219	-.395
Zscore: CG	.040	<b>.762</b>	-.289	.080
Zscore: CI	-.673	.496	-.143	-.365

Extraction Method: Principal Component Analysis.  
Rotation Method: Varimax with Kaiser Normalization.<sup>a</sup>  
a. Rotation converged in 6 iterations.

## LIMITATIONS AND FURTHER STUDIES

This research contributes to the literature on the implementation of PCA in the field of financial performance measurement using secondary data. A future study is proposed to be carried out with a more extended time period from the same industry to capture generalized results. While the hefty attention is on 15 ratios in the industry, it is advantageous to inspect wider ratios and find out if different inputs yield a different outcome. In addition, the study only focuses on financial aspects, and it is suggested that calculating other aspects interfering with the industry, such as government policies and other economic associations in the region, can be measured.

Conforming to Jakob (2017), state-owned companies are often believed to be less profitable and less productive than private corporations. A distinction may be made within the context of both private and public companies. Data processing using complex data mining tools such as RStudio is highly recommended since the more specific result could be reaped.

## CONCLUSION AND RECOMMENDATION

This research presents the PCA analysis carried on 15 ratios (from 18 ratios) of six telecommunication companies in South-East Asia from 2015 to 2019. By using the PCA analysis approach, this study finds that there are four main financial ratio categories in the telecommunications industry in South-East Asia; liquidity, profitability, management efficiency, and total asset turnover, as the primary performance indicators for the industry. The liquidity ratio will describe the ability of the company to meet its short-term obligations in line with the commitment of companies in the telecommunications sector to innovate continuously, where innovation is a costly investment. The profitability ratio is closely related to the company's ability to seek profit or net income for the company. Furthermore, this ratio can be used in assessing the viability of the company (going concern). Keeping an eye on management efficiency will save or reduce the use of resources in carrying out activities and maximize the use of all available resources to be wasted. Moreover, the efficiency of the management will improve the performance of a work unit so that the output is getting maximal. Meanwhile, the total asset turnover needed to measure the effectiveness of all assets in supporting sales. Sustain these will proceed in propitious yields to the shareholders of the industry.

The factors we delve into this research are correlated, and they are all combined when measuring the overall performance of the industry. Looking at the performance in a single view of certain ratios will ignore the other and lead to mismatch analysis. To conclude, a judgement about the industry or firms will valuably be analyzed by a set of 11 ratios that reflect the four financial ratio categories (liquidity, profitability, management efficiency, and total asset turnover).

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