ASEAN Journal of Management & Innovation
Vol. 9. No.2, 46 - 56

DOI: 10.14456/ajmi.2022.12
ajmi.stamford.edu
Received: March 11, 2022
Revised: May 2, 2022
Accepted October 11, 2022

Movements of Return on Equity of Thai Big Market Capitalization Companies: Revisiting the DuPont Ratio

Sumeth Tuvadaratragool
Postgraduate Studies, Stamford International University
Sumeth.tuvadaratragool@stamford.edu

Abstract
This study aims to examine the causal relationship between the net profit margin, total asset turnover, equity multiplier, and return on assets and the return on equity of big market capitalization companies listed on the Stock Exchange of Thailand (the SET). Due mainly to data availability, 93 big market cap companies listed on listed SET 100 index constituents are used as a sample set. The study period is between 2015 and 2019. Statistics used include mean, standard deviation, maximum, minimum, skewness, kurtosis, log transformation and multiple regression. The findings show that a combination of return on assets and equity multiplier outperforms a combination of net profit margin, total asset turnover, and equity multiplier (traditional components of return on equity) in explaining a movement of return on equity of the Thai big market cap companies. This study documents the use of DuPont analysis in the Thai context, where such analysis appears to be few. Moreover, its findings can provide useful insights to financial managers and/or investors regarding the optimal determinants of ROE of Thai companies and contribute to its greater impact on ROE, or shareholders' wealth.

Keywords: Return on Equity, Return on Assets, Net Profit Margin, Total Asset Turnover, Equity Multiplier

1. Introduction

When it comes to business finance and/or corporate financial management, a crucial expectation and key responsibility of managers is to maximize shareholders' wealth, rather than maximize profit and minimize costs. Also, there is a consensus among all stakeholders that shareholders' wealth can be measured by a company's market capitalization and/or common stock price. Management must ensure that the company performs well or, at least, better than in previous years. This requires management to have a useful financial tool to assess the financial performance of the company. Empirically, academics and researchers suggest that financial statement information can be used as a comprehensive financial analysis tool in evaluating future financial performance (Chen, Wang, & Qiao, 2014; Turner et al., 2015; Warrad & Nassar, 2017). In other words, financial ratios can be used to predict future the financial performance of a company. In the last few decades, there has been a great number of studies applying financial information to explain how well a company performs in different settings (Almazari, 2012; Kasilingam & Jayabal, 2012; Padake & Soni, 2015; Kim, 2016; Biplob, Alam, & Hossain, 2018). They have attempted to search for an optimal financial analysis tool that can help stakeholders identify what exactly is generating a company's earnings. As these previous studies show, it is indisputable that the DuPont analytical framework is widely used by the researchers.

The DuPont analysis was initially developed by Donaldson Brown in the early 1920s (Flesher & Previts, 2013). In its initial stage, the DuPont analysis focused only on the net profit margin and the total asset turnover (representing an internal activities-generated revenue), exclusive of the effect of financial leverage. Later, the DuPont analysis took financial leverage

into account, causing a conceptual change from return on assets (hereafter referred to as ROA) to return on equity (hereafter referred to as ROE) (Almazari, 2012). Specifically, the DuPont analysis breaks down the components of ROE into three different financial ratios, namely, net profit margin, total asset turnover, and equity multiplier. These three ratios are considered traditional ROE components. It should be noted that both net profit margin (hereafter referred to as NPM) and total asset turnover (hereafter referred to as TAT) are also key ROA components. The ROA ratio is also another component of the ROE ratio. The difference between these two ratios is that the latter incorporates the effect of financial leverage whereas ROA does not. Up until now, the DuPont analysis has been extensively used among academics and financial researchers in assessing the financial performance of a company by disaggregating a company' financial performance into three crucial dimensions: efficiency, profitability, and financial leverage.

The financial performance of a company can be measured by its ROE, which tells the shareholders of that company how effectively their funds are being managed. The ROE can be calculated by dividing the net income by shareholders' equity. The higher a company's ROE, the better management uses shareholders' funds to generate profits. Moreover, an increasing ROE can signal that a company is able to grow profit without asking for new funds from shareholders, resulting in shareholders' wealth maximization. A number of prior studies focused on the components of the ROE to confirm whether the NPM, TAT, equity multiplier (hereafter referred to as EM) and ROA ratios could explain the ROE movement of companies. For instance, Weidman et al. (2019) determined that an increase of the NPM and TAT could increase the ROE ratio of manufacturing companies in Germany, the USA, and Japan. Also, Mubin, Iqbal, and Hussain (2014) concluded that, among the three components of the ROE ratio, while EM has a statistical relationship with ROE, the TAT ratio is the most influential component of multi-sector companies listed on the Karachi Stock Exchange. In their study of 28 Jordanian insurance companies listed on the Amman Stock Exchange, Kabajeh, Nu'aimat, and Dahmash (2012) found that ROA has a significant relationship with ROE. There are, however, very few similar studies in the Thai context, hence the relevance of this study, which aims to fulfil this research gap by revisiting the DuPont analysis framework in the Thai context

Focusing on the ROE component of big market cap companies listed on the Thai Stock Exchange Market (hereafter referred to as SET), this study seeks to determine which set of DuPont-based financial ratios is optimal in explaining the movement of the ROE of these companies. Specifically, it seeks to examine the causal relationship between the NPM, TAT, EM, ROA, and ROE ratios and determine optimal set of ROE components signaling financial performance. Since, shareholders' wealth maximization can be measured by the market capitalization of the firms they own shares of, this study selectively chose the top 100 big market cap companies as the sample set. This study contributes to the relevant literature in a Thai setting and emerging market as the use of a DuPont analysis framework in a Thai setting appears to be lacking.

2. Literature Review

- *NPM and ROE*

The net profit margin is one of the profitability ratios and also one of the three financial ratios used in the DuPont analysis. The NPM can be caculated by dividing a company's net profit by revenue from sales and service (Nariswari & Nugraha, 2020). The result is expressed as a percentage. If a company's NPM increases, its ROE will increase. An increasing NPM will raise the ROE since a higher NPM indicates that the company is able to effectively manage its operating costs, resulting in a higher profit to shareholders (Heikal, Khaddafi, & Ummah, 2014). Weidman et al. (2019) determined that a 10-percent increase of the NPM of

manufacturing companies in Germany, the USA, and Japan, augments their ROE by approximately 9.80 percent, 8.30 percent, and 6.90 percent, respectively. It can be inferred that a higher NPM can increase the ROE of a company and contribute to an increase of the shareholders' wealth. Therefore, this study proposes to examine whether NPM can help explain the ROE movement of big market cap companies listed on the SET.

- TAT and ROE

Total asset turnover is one of the key efficiency ratios. It indicates how efficiently a company manages its total assets to generate revenue from sales and service (CFI, n.d.). Along with the NPM, the TAT is one of the three financial ratios used in the DuPont analysis. The TAT is calculated by dividing the revenue from sales and service by the total assets (Nariswari & Nugraha, 2020). A higher TAT means that the company can use its total assets to generate revenue from sales and service. An increase in the TAT leads to an increase in operating profit (Biplob et al., 2018). This is because a company effectively utilizes its assets to generate revenue. As Patin, Rahman, and Mustafa (2020) stated, the TAT determines how efficiently a company manage its assets to generate larger sales. The higher the TAT, the better a company is at using its assets to generate income to shareholders. In terms of DuPont analysis, in their study of multi-sector companies listed on Karachi Stock Exchange, Mubin *et al.* (2014) found that among the three components of ROE, TAT is the most influential one. Weidman et al. (2019) determined that an increase of 10 percent in TAT of manufacturing companies in Germany, and Japan increases ROE by about 2.20 percent, and 1.50 percent, respectively. And according to Nariswari and Nugraha (2020), whose study focused on manufacturing companies listed on the Indonesia Stock Exchange, when simultaneously applied with the NPM ratio, TAT has a significant effect on profit growth. However, Warrad and Omari (2015) found that TAT has no significant effect on the ROE of Jordanian service companies. Based on the findings from these studies, it can thus be concluded that a higher TAT can increase ROE and positively impact shareholders' wealth. Therefore, this study proposes to determine whether TAT can help explain the ROE movement of big market cap companies listed on the SET.

- EM and ROE

The equity multiplier is one of the leverage ratios that is used in the DuPont analysis. It measures how much a company depends on outsiders' funds (or debt) to finance its total assets and is calculated by dividing a company's total assets by its total equity (CFI, n.d.). A higher EM indicates that a company uses more debt than equity to finance its total assets, which, of course, in this case means that the company pauses a higher risk to creditors. However, to maximize shareholders' wealth, large companies must rely on funds from outsiders such as commercial banks. EM indicates a company's ability to raise funds for its operating activities, which established and large companies take advantage of to increase their financial performance (Abraham, Harris, & Auerbach, 2017). This is consistent with Kusi, Ansah-Adu, and Agyei's (2015) study, in which it was found that an increase in financial leverage can help a company improve its ROE when the borrowing costs are less than the return on investment. In their sudy of multi-sector companies listed on the Karachi Stock Exchange, Mubin et al. (2014) came to the conclusion that EM has a statistical relationship with ROE. Moreover, Weidman et al. (2019) found that an increase of 10 percent in EM leads to a 1.9 percent increase of the ROE of German manufacturing companies and a 1.5 percent increase of ROE of US manufacturing companies. In light of the aforementioned studies, it can therefore be assumed that a higher EM can increase ROE (and therefore the financial performance) when borrowing costs are below the ROE. This means, among other cosequences, that a higher ROE translates into a rise in shareholders' wealth. Therefore, this study proposes to explore whether EM can help explain the ROE movement of big market cap companies listed on the SET.

- ROA and ROE

ROA, unlike ROE, is one of the profitability ratios used to calculate the percentage of profit made by a company from its total assets. It is computed by dividing the net profit by the total assets (CFI, n.d.). Thus, as expressed in percentage. ROA measures a company's capability to use its assets to generate net profit. In theory, if a company's ROA increases, its ROE will increase as well. According to Jewell and Mankin (2011), ROA is used as the key financial factor of the DuPont analysis in an early period before ROA is disaggregated into NPM and TAT. In addition, Mcclure (2021) noted that ROA indicates how much profit a company's management earns from the total assets. The crucial component that differentiates ROA and ROE is financial leverage or debt. Take the accounting equation: assets = liabilities + owners' equity; if a company uses no debt, its ROA and ROE will be the same. Conversely, if a company uses debt to increase its assets, its ROE will inevitably rise above its ROA. When ROA is high, given reasonable financial leverage, ROE will increase. Focusing on 28 Jordanian insurance companies listed on the Amman Stock Exchange during the period 2002-2007, Kabajeh et al. (2012) found that there is a significant relationship between ROA and ROE.

Since the ROA ratio is once of the key components of a DuPont analysis and since empirically, ROA has a signficant relationship with ROE, this study will incorporate the ROA ratio with the EM one as an additional combination set of the DuPont analysis framework. In its search for a stronger predictor set of ROE, this study will therefore examine and compare the predictive ability of a ROA and EM combination on the one hand and a NPM, TAT, and EM combination on the other in terms of explaining the ROE movement of big market cap companies listed on the SET. Therefore, the following hypothesis can be developed:

H1: *A NPM, TAT, and EM combination (a traditional ROE set) outperforms a ROA and EM combination in explaining the ROE movement of big market cap companies listed on the SET.*

Based on this hypothesis and the above discussion of the variables considered in this study, a conceptual framework can be developed as shown in Figure 1.

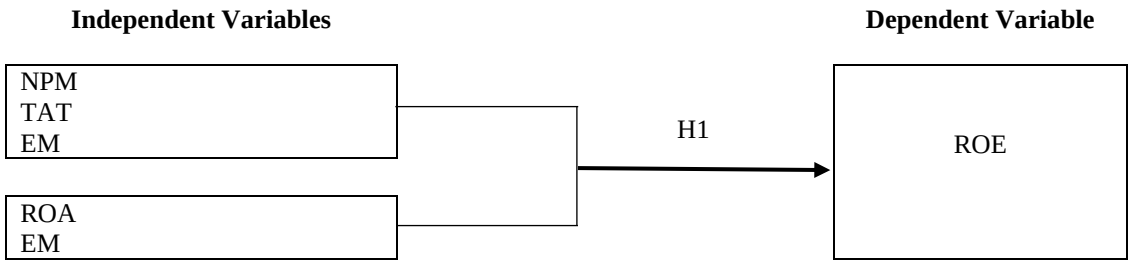

Figure 1: Conceptual Framework (Developed by the author for this study)

3. Research Methodology

Like previous studies adopting a secondary data research approach, this study uses the financial ratios of public companies, in this case big market cap companies in the SET 100 Index Constituents published on February 20, 2020, by the SET. The cutoff date for calculating the SET 100 Index is between January 1 and June 30, 2020. Due to data availability, 93 out of 106 big market cap companies are used as a sample set, accounting for 88 percent of the companies listed on SET 100 index constituents, and 16 percent of the companies listed on the SET. As of 23 November 2021, there are 590 listed companies on the SET. The big market cap companies used in this study are from seven industries as shown in Table 1.

Table 1: Industry Groups of the Big Market cap companies

Industry Group Name	Number of Companies
Agro and Food Industry [AGRO]	7
Financials [FINCIAL]	14
Industrials [INDUS]	2
Property and Construction [PROPCON]	16
Resources [RESOURC]	20
Services [SERVICE]	25
Technology [TECH]	9
Total	**93**

As determined by Kabajeh et al. (2012), this study collected yearly data from the annual financial reports of these companies for the 5-year study period (between 2015 and 2019 right before the COVID-19 pandemic broke out). The financial ratios observed include the NPM, TAT, EM, ROA, and ROE ratios. In total, the observations amounted 2,325. The statistical used include means, standard deviations, maximums, minimums, skewness, kurtosis, log transformation and multiple regression.

4. Research Results

Descriptive statistics are used to illustrate the characteristics of the ratios used in this study, which are shown in Table 2.

Table 2: Mean, Standard Deviation, Maximum, and Minimum of the ratios

Financial Ratio	Mean	Standard Deviation	Maximum	Minimum
NPM (%)	17.17	21.74	157.24	(26.01)
TAT (x)	0.80	1.61	14.97	0.05
EM (x)	3.73	4.96	44.96	1.19
ROA (%)	6.56	5.61	38.11	(3.09)
ROE (%)	15.46	12.36	61.87	(41.36)

Table 2 indicates that, during the period 2015-2019, the NPM mean of the companies was 17.17 percent with a 21.74 percent standard deviation. The NPM maximum and minimum are 157.24 percent and (26.01) percent, respectively. The T mean was 0.80x with a 1.61x standard deviation and the TAT maximum and minimum are 14.97x and 0.05x, respectively. The EM mean is 3.73x with a 4.96x standard deviation and a maximum and minimum of 44.96x and 1.19x, respectively. The ROA mean is 6.56 percent with a 5.61 percent standard deviation and its maximum and minimum 38.11 percent and (3.09) percent, respectively. Finally, the ROE mean is 15.46 percent with a 12.36 percent standard deviation and a maximum and minimum of 61.87 percent and (41.36) percent, respectively. There is not a noticeable difference between the NPM and ROE ratios but there is much difference between the ROA and these two ratios. However, the NPM ratio deviates more than the ROE and ROA ratios. NPM, ROE, and ROA have to do with profitability, but the TAT ratio represents efficiency, 0.80x (or 0.80 to 1) in this study, which is less than 1x (or 1 to 1), indicating that management in these companies has low efficiency managing the companies' total assets to generate revenue from sales and services. In other words, during the period covered in this study, the companies generated only 0.80 Baht of sales and services for every Baht they carried in total assets. Finally, on average, the companies' EM was 3.73x (or 3.73 to 1), a clear indication that the companies depend more on debt than equity to finance their assets. The EM is known as the financial leverage ratio.

To answer the hypothesis developed for this study, a multiple regression was used. Thus, to comply with the basic assumption of a multiple regression, the distribution normality of the data was initially checked by calculating the skewness and kurtosis of the data. The value of these two parameters should be zero if the data are normally distributed (Ghasemi & Zahediasl, 2012). In addition, Pek, Wong, and Wong (2017) determined that data transformations are required to address a preliminary qualification of data symmetrically distributed with no skew, and, more importantly, to enhance the interpretation of the study results for non-statisticians. Following what was done in Aminu and Shariff's (2014) study, the researcher in this study applied skewness values comprised between 3 and -3, and kurtosis value comprised between 10, and -10 as an acceptable range.

Table 3: Skewness and Kurtosis of the ratios before transformation

Financial Ratio	Skewness	Kurtosis
NPM	3.08	18.09
TAT	7.64	66.52
EM	6.60	52.84
ROA	2.37	10.62
ROE	0.23	6.87

Table 3 indicates that the NPM, TAT, EM, and ROA ratios are positively skewed. Their skewness values range from 2.37 to 7.64. In addition, their kurtosis values are above 10, the critical point, indicating that these ratios have heavy tails or outliers. As to the ROE ratio, even though its skewness value is nearly zero, its kurtosis value indicates that this does not change the fact that all these ratios are somewhat outliers. Consequently, all of them were transformed by applying log transformation, a method commonly used for positively skewed data and one recommended in various prior studies (Menaje, 2012; Taani, 2012; Smulders et al., 2018; Nariswari & Nugraha, 2020).

Table 4: Skewness and Kurtosis of the Ratios after Transformation

Financial Ratio	Skewness	Kurtosis
NPM	(0.49)	0.41
TAT	0.01	0.32
EM	1.53	3.50
ROA	(0.58)	0.25
ROE	(1.16)	4.82

Table 4 shows the skewness and kurtosis values of the five ratios considered in this study after transformation. The data moved closer to zero, indicating that they are somewhat perfectly symmetrical and have fewer outliers compared to the data before transformation. The values of skewness and kurtosis are within the range recommended and used by Aminu and Shariff (2014). Next, a multiple regression estimation was conducted:

Table 5: Estimation of Multiple Regression Model

	NPM, TAT, and EM Set				ROA and EM Set			
	B	Beta	Collinearity Statistics		B	Beta	Collinearity Statistics	
			Tolerance	VIF			Tolerance	VIF
NPM	1.006*	1.591	0.364	2.744				
TAT	0.970*	1.575	0.282	3.547				
EM	0.932*	0.856	0.532	1.879	0.998*	0.901	0.584	1.711
ROA					1.037*	1.288	0.584	1.711
Constant	0.011				0.076			
Durbin-Watson	1.983				1.910			
R^2	0.939				0.975			
Adjusted R^2	0.937				0.974			
F	437.476				1,684.410			
P-value of F	0.000*				0.000*			

Note: * = 0.05, ROE as Dependent Variable

Table 5 shows the results of a multiple regression of both a NPM, TAT, and EM set and a ROA and EM set.

- NPM, TAT, and EM Set

The Durbin-Watson value is 1.983, which is nearly 2.00, indicating that there is no autocorrelation problem among NPM, TAT, and EM observations. This is consistent with VIF values of less than 4 and indicates that the three independent variables are not highly correlated with one another or that there is no multicollinearity issue. Therefore, one can distinguish between the individual effects of NPM, TAT, and EM on ROE or, to put it another way, the multiple regression is reliable. The R^2 and Adjusted R^2 values are 0.939 and 0.937, respectively, suggesting that the NPM, TAT, and EM set can account for approximately 94 percent of the ROE movement of big market cap companies listed on the SET. The F value of 437.476 and 0.000 p-value of F confirm that NPM, TAT, and EM in this multiple regression model improve the fit. The values of both Unstandardized Coefficients B and Standardized Coefficients Beta indicate that the NPM ratio (B = 1.006 and Beta = 1.591) contributes the most to the ROE ratio, followed by the TAT ratio (B = 0.970 and Beta = 1.575), and the EM ratio (B = 0.932 and Beta = 0.856). The estimation of the ROE prediction model, based on a NPM, TAT, and EM set can be written as follows:

$$\text{In (ROEpredicted)} = 1.006\ \text{In(NPM)} + 0.970\ \text{In(TAT)} + 0.932\ \text{In(EM)} \quad (1)$$

- ROA and EM Set

The Durbin-Watson value is 1.910, which is close to 2.00, indicating that there is no autocorrelation problem among ROA and EM observations. This is consistent with VIF values of less than 2 and indicates that the two independent variables are not highly correlated with one another or that there is no multicollinearity problem. Therefore, one can distinguish between the individual effects of ROA and EM on ROE. In other words, the multiple regression is reliable. The R^2 and Adjusted R^2 values are 0.975 and 0.974, respectively, suggesting that a ROA and EM set can approximately explain 98 percent of the movement of the ROE of big market cap companies listed on the SET. The F value of 1,684.410 and 0.000 p-value of F confirm that ROA and EM in this multiple regression model improve the fit. Both Unstandardized Coefficients B and Standardized Coefficients Beta values indicate that the ROA ration (B = 1.037 and Beta = 1.288) is the main ROE contributor, followed by the EM ratio (B = 0.998 and Beta = 0.901). The estimation of the ROE prediction model based on a set of ROA and EM can be written as follows:

$$\text{In(ROEpredicted)} = 1.037\ \text{In(ROA)} + 0.998\ \text{In(EM)} \quad (2)$$

As can be seen in models (1) and (2) above, whereas a NPM, TAT, and EM set explains approximately 94 percent of the ROE change, a ROA and EM set can account for approximately 98 percent change of the change. Moreover, the F value of the ROA and EM set significantly increases from 437.476 to 1,684.410. This confirms that a ROA and EM set outperforms a NPM, TAT, and EM set in explaining the movement of the ROE of big market cap companies listed on the SET. As a result, when it comes to the optimal determinants of the ROE of Thai big market cap companies, the ROA and EM set has a greater impact on ROE or shareholders' wealth. Therefore, H1 is rejected. Since, in order to address the hypothesis, this study transforms original data into log transformed data, it is necessary to convert the log transformed data back to original data for stakeholders' practical applications. Consequently, the ROE predictive model based on a ROA and EM set after taking the natural logarithm out can be written as follows:

$$\text{ROEpredicted} = 1.751(\text{ROA}) + 0.010\ (\text{EM}) \quad (3)$$

Referring to the model in (3), the sequence of the key contributor to the ROE ratio remains unchanged. The most influential predictor is still the ROA ratio (B = 1.751) and the least influent predictor the EM ratio (B = 0.010). In their practice, stakeholders, such as management investors and financial analysts, can thus apply the ROE prediction model in (3) to forecast the future earnings of start-ups, small and medium enterprises, and/or listed companied on the SET.

5. Discussion and Conclusion

It is apparent that predictive modelling uses statistics to forecast outcomes and/or determine the probability of an optimal set of data belonging to another set. As exemplified by the studies of Wang, Sharma, and Cao (2016), Mafini and Muposhi (2017), Maqbool and Zameer (2018), and Sardo, Serrasqueiro, and Alves, (2018), a model might be used to forecast financial performance or the ROE of a company. As with these prior studies, this research study seeks to explore the causal relationship between the NPM, TAT, EM, ROA, and ROE of public companies, in this case, big market cap companies listed on the SET. While shareholders' wealth maximization can also be measured by market capitalization, this study selectively chose top 100 big market cap companies as a sample set, specifically, big market cap companies in the SET 100 Index Constituents published on 20 February 2020 by the SET. The cutoff date for calculating the SET 100 Index was between January 1 and June 30, 2020. However, because of data availability, only 93 big market cap companies were used as a sample set, accounting for 88 percent of the companies listed on the SET 100 index or 16 percent of the companies listed on the SET.

The study period is 2015-2019 right before COVID 19 pandemic broke out. Yearly data were collected from the annual financial reports of these companies, bringing the total observations to 2,325. Since the data used are not normally distributed, a natural logarithm was applied to transformed original data into log transformed data before running multiple regressions. The comparative analysis of a NPM, TAT, and EM set on the one hand and a ROA and EM set on the other indicates that the ROA and EM set outperforms the NPM, TAT, and EM set in explaining the ROE movement of these big Thai market cap companies. In other words, a ROA and EM set has a greater impact on the ROE of these firms. The result of this study offers practical managerial implications: Regarding internally generated funds, Thai company management should focus more on ROA rather than on NPM and TAT since ROA is a greater contributor and also positively affects ROE, which represents company profitability. In addition, external funds such as debts should be used to finance the firm's assets to enhance its profitability as EM significantly and positively affects ROE. Finally, Thai management should be rational about using debt heavily as part of the company's capital structure since higher cost of debt can eat profit.

To the best of the researcher's knowledge and, based on a thorough review of the body of relevant literature in the past ten years, this study is at the forefront of the research in Thailand revisiting a traditional DuPont analysis framework. It contributes to the relevant body of literature in a Thai setting and/or an emerging market in at several ways: (i) as noted in the introduction, it revisits the use of the DuPont analysis framework in a Thai setting, where this kind of studies appears to be lacking; (ii) it expands the use of the DuPont analysis to another emerging market; (iii) it confirms the relevance and effectiveness of the DuPont analysis as applied to an emerging market; and (iv) it provides empirical evidence that, in a Thailand setting, the ROA ratio is the most influential determinant of the ROE ratio. Therefore, financial managers, investors, and shareholders of Thai companies should look at the ROA and financial leverage as essential tools to raise the ROE of their companies and, as a result, maximize shareholders' wealth. This study, however, has limitations. For one, data was collected from 100 companies listed on the SET 100 index constituents, considered to be less informative compared to those listed companies on the SET. For another, this study covers only five years (2015-2019) before the COVID 19 pandemic broke out. In addition, this study employed panel data to analyze the results and focused on Thai companies only. All these limits generalizability of this study. Future research should therefore expand the scope of the investigation.

References

Abraham, R., Harris, J., & Auerbach, J. (2017). Earnings yield as a predictor of return on assets, return on equity, economic value added and the equity multiplier. *Modern Economy, 8*, 10-24.

Almazari, A. A. (2012). Financial performance analysis of the Jordanian Arab Bank by using the DuPont System of financial analysis. *International Journal of Economics and Finance, 4*(4), 86-94.

Aminu, I. M., & Shariff, M. (2014). Strategic orientation, access to finance, business environment and SMEs performance in Nigeria: Data screening and preliminary analysis. *European Journal of Business and Management, 6*(35), 124-131.

Biplob, M., Alam, S., & Hossain, M. (2018). DuPont analysis of return on common stockholder's equity in the pharmaceutical industry of Bangladesh. *Global Journal of Management and Business Research, 18*(1), 8-15.

CFI. (n.d.). *Asset turnover ratio*. Retrieved March 18, 2022, from Corporate Financial Institute: https://corporatefinanceinstitute.com/resources/knowledge/finance/asset-turnover-ratio/

CFI. (n.d.). *Equity multiplier*. Retrieved March 18, 2022, from Corporate Financial Institute: https://corporatefinanceinstitute.com/resources/knowledge/finance/equity-multiplier/

CFI. (n.d.). *Return on assets & ROA Formula*. Retrieved March 24, 2022, from Corporate Financial Institute: https://corporatefinanceinstitute.com/resources/knowledge/finance/return-on-assets-roa-formula/

Chen, L., Wang, S., & Qiao, Z. (2014). DuPont Model and product profitability analysis based on activity-based costing and economic value added. *European Journal of Business and Management, 6*(30), 25-35.

Flesher, D. L., & Previts, G. J. (2013). Donaldson Brown (1885-1965): The power of an individual and his ideas over time. *Accounting Historians Journal, 40*(1), 79-102.

Ghasemi, A., & Zahediasl, S. (2012). Normality tests for statistical analysis: A guide for non-statisticians. *International Journal of Endocrinology and Metabolism, 10*(2), 486-489.

Heikal, M., Khaddafi, M., & Ummah, A. (2014). Influence analysis of return on assets (ROA), return on equity (ROE), net profit margin (NPM), debt to equity ratio (DER), and current ratio (CR) against corporate profit growth in automotive in Indonesia Stock

Exchange. *International Journal of Academic Research in Business and Social Sciences, 4*(12), 101-114.

Jewell, J. J., & Mankin, J. A. (2011). What is your ROA? An investigation of the many formulas for calculating return on assets. *Academy of Educational Leadership Journal, 15*(special issue), 79-91.

Kabajeh, M., Nu'aimat, S., & Dahmash, F. (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, 2*(11), 115-120.

Kasilingam, R., & Jayabal, G. (2012). Profitability and solvency analysis of a manufacturing company using Dupont and Altman model. *BVIMR Management Edge, 5*(2), 53-64.

Kim, H.-S. (2016). A study of financial performance using a DuPont analysis in food distribution market. *Culinary Science & Hospitality Research, 22*(6), 52-60.

Kusi, B. A., Ansah-Adu, K., & Agyei, A. (2015). Evaluating banking profit performance in Ghana during and post profit decline: A five-step Dupont approach. *Emerging Markets Journal , 5*(2), 29-40.

Mafini, C., & Muposhi, A. (2017). Predictive analytics for supply chain collaboration, risk management and financial performance in small to medium enterprises. *Southern African Business Review, 21*, 311-338.

Maqbool, S., & Zameer, N. (2018). Corporate social responsibility and financial performance: An empirical analysis of Indian banks. *Future Business Journal, 4*(1), 84-93.

Mcclure, B. (2021). *How ROA and ROE give a clear picture of corporate health*. Retrieved 20 November, 2021, from Investopedia Web site: https://www.investopedia.com/investing/roa-and-roe-give-clear-picture-corporate-health/

Menaje, P. M. (2012). Impact of selected financial variables on share price of publicly listed firms in the Philippines. *American International Journal of Contemporary Research, 2*(9), 98-104.

Mubin, M., Iqbal, A., & Hussain, A. (2014). Determinant of return on assets and return on equity and its industry-wise effects: Evidence from KSE (Karachi Stock Exchange). *Research Journal of Finance and Accounting, 5*(15),148-157.

Nariswari, T. N., & Nugraha, N. M. (2020). Profit growth: Impact of net profit margin, gross profit margin and total assets turnover. *International Journal of Finance & Banking Studies, 9*(4), 87-96.

Padake, V., & Soni, R. (2015). Measurement of efficiency of top 12 banks in India using DuPont analysis. *UPI Journal of Bank Management, 14*(4), 59-68.

Patin, J.-C., Rahman, M., & Mustafa, M. (2020). Impact of total asset turnover ratios on equity returns: Dynamic panel data analysis. *Journal of Accounting, Business and Management, 27*(1), 19-29.

Pek, J., Wong, O., & Wong, A. (2017). Data transformations for inference with linear regression: Clarifications and recommendations. *Practical Assessment, Research, and Evaluation, 22*(9), 1-11.

Sardo, F., Serrasqueiro, Z., & Alves, H. (2018). On the relationship between intellectual capital and financial performance: A panel data analysis on SME hotels. *International Journal of Hospitality Management, 75*, 67-74.

Smulders, F. T., Oever, S. T., Donkers, F. C., Quaedflieg, C. W., & Ven, V. V. (2018). Single-trial log transformation is optimal frequency analysis of resting EEG alpha. *European Journal of Neuroscience, 48,* 2585-2598.

Taani, K. (2012). Impact of working capital management policy and financial leverage on financial performance: Empirical evidence from Amman Stock Exchange-listed companies. *International Journal of Management Sciences and Business Research, 1*(8), 10-17.

Turner, J., Broom, K., Elliott, M., & Lee, J.-F. (2015). A decomposition of hospital profitability: An application of DuPont analysis to the US Market. *Health Service Research and Managerial Epidemiology, 2*, 1-10.

Wang, Z., Sharma, P. N., & Cao, J. (2016). From knowledge sharing to firm performance: A predictive model comparison. *Journal of Business Research, 69*(10), 4650-4658.

Warrad, L. H., & Nassar, M. (2017). Could profitability, activity, and use of equity finance increase the DuPont Model of return on equity? Jordanian Case. *International Review of Management and Marketing, 7*(3), 35-41.

Warrad, L., & Omari, R. A. (2015). The impact of turnover ratios on Jordanian services sectors' performance. *Journal of Modern Accounting and Auditing, 11*(2), 77-85.

Weidman, S. M., McFarland, D. J., Meric, G., & Meric, I. (2019). Determinants of return-on-equity in USA, German and Japanese manufacturing firms. *Managerial Finance, 45*(3), 445-451.