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A Method for Deriving High-Priority Financial Data Items that Must be Improved to Increase Market Capitalization

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Abstract

Market capitalization is one of the most important indicators for gauging the value of a company. Normally, improving financial data increases market capitalization. However, because there are numerous financial data, it is important to derive high-priority financial data items whose improvement can increase market capitalization. To achieve this, in this study, a method was developed using a remodeled customer satisfaction analysis model with financial data of the companies that make up the Nikkei 225. A graph was created with the correlation coefficient on the horizontal axis and the deviation value of each financial data item on the vertical axis, and then the financial data items plotted in the lower right corner of the graph were extracted. Using this method, it is possible to derive high-priority financial data items to increase market capitalization from numerous financial data.

Keywords: Company's value; Financial data analysis; Remodeled customer satisfaction analysis; Nikkei 225.

1. Introduction

There are various indicators for evaluating a company's value, such as stock price, market capitalization, and enterprise value. In listed companies, market capitalization rankings are created and compared (Statista, n.d.), and market capitalization is one of the most important indicators for determining a company's value. In addition, market capitalization is not only compared for each company but also for each country by calculating the total market capitalization of listed companies (World Bank, n.d.; World Federation of Exchanges, 2021). Therefore, it is important in understanding the economic status of countries globally. Market capitalization refers to a company's value as determined by the stock market. It is defined as the sum of the market values of all issued shares (Investopedia, n.d.). Although the market price of a stock can be either overestimated or undervalued, market capitalization can quickly estimate the value of a company with more accuracy. Therefore, recognizing that increasing market capitalization leads to an increase in the value of a company, it is imperative to consider methods to increase market capitalization. In general, it is clear that the greater the value of financial data, such as a company's assets and profits, the larger the market capitalization. Therefore, improving financial data leads to increase market capitalization.

Because there are numerous types of financial data, the assertion that "improving financial data will increase market capitalization" is too vague. Therefore, an analysis method is required that derives the financial data items that must be improved on a priority-basis. These can be termed "high-priority financial data items." In this study, using remodeled customer satisfaction (CS) analysis, we developed a method for prioritizing financial data items that require improvement to increase market capitalization. The CS analysis is a method commonly used in the field of marketing. It is a general term encompassing analysis methods that consider product development and management strategies that reflect customer needs. In general, CS analysis is conducted by using a questionnaire, investigating customer satisfaction, and analyzing the survey results. The CS analysis is intended to increase customer satisfaction while cross-referencing the analysis results to product development and management strategy (Matsumoto and Tsukamoto, 2004). While various types of CS analysis have been studied (Angilella *et al.*, 2014; Cicia *et al.*, 2010; Conklin *et al.*, 2004; Grigoroudis *et al.*, 2000; Mihelis *et al.*, 2001), we analyzed the financial data of stocks listed in the Nikkei Stock Average (Nikkei 225) using a remodeled method of CS analysis. A CS portfolio with the correlation coefficient on the horizontal axis and the evaluation of each item on the vertical axis was used.

2. Preparation of Data for Analysis

For the data analysis, we use the financial data of 225 stocks that make up Nikkei 225 (Nikkei Inc, n.d.), a representative stock price index of the Japanese stock market. Financial data for the past three years were obtained

from the Buffett Code (Buffet Code, n.d.). Therefore, the analysis is performed using 675 (=225 × 3) records (Table 1). Financial data can be downloaded from the Buffett code in comma separated value (CSV) file format and include 71 fields ranging from "sales" to "stock price," as described in the Appendix. Although there are 675 records, some items had missing data (missing values), indicated by "-" in Table 1. In addition, some items had a 0 value. Each may or may not actually have a 0 value. For example, in the 571st record in the "operating income / number of employees" field, although it is displayed as 0, it does not actually have a 0 value. This is because the data of "operating income" is a missing value.

Table-1. Financial data of Nikkei 225 (3 years)

No.	Stock code	Fiscal year	Sales	Cost of sales	• • •	Operating income / Number of employees	Stock price
1	1332	2019	6.90E+11	5.56E+11		2.47E+06	478
2	1332	2018	7.12E+11	5.73E+11		2.39E+06	845
3	1332	2017	6.77E+11	5.37E+11		2.58E+06	552
•							
•							
•							
571	8795	2019	2.20E+12	-		0	884
572	8795	2018	2.14E+12	-		0	1164
573	8795	2017	1.92E+12	-		-	1689
•							
•							
•							
623	9984	2019	6.19E+12	3.49E+12		-1.69E+07	3788
624	9984	2018	6.09E+12	3.57E+12		2.70E+07	5373
625	9984	2017	9.16E+12	5.53E+12		1.74E+07	3975

Source: Buffet Code, https://www.buffett-code.com/, March 22, 2021.
stock code 1332; Nippon Suisan Kaisha, Ltd.
stock code 8795; T&D Holdings, Inc.
stock code 9984; SoftBank Group Corp.

Various data science methods exist to handle missing values. These include deleting a record with a missing value, complementing the record with the central tendency value (mean value, median value, or mode value), or complementing the record using the previous record. In the "amortization of goodwill" field, 460 out of 675 records are missing values, and some other fields contain numerous missing values. In these cases, it is meaningless to complement the central tendency of the values or the previous records since there are multiple missing values that impact the calculations. Therefore, we processed the missing values using a less complicated method, which was deleting 605 records containing missing values to ensure a clean data set.

After deleting the records with any missing values, 70 records which include 71 financial data items ranging from "sales" to "stock price" were ready for analysis. Adhering to this study's objectives, Table 2 was created with the "market capitalization" field moved to the far left, while the fields of "stock code" and "fiscal year" in Table 1 were deleted. Thus, we consider "market capitalization" as the response variable and the remaining financial data items (70 fields from "sales" to "stock price," excluding "market capitalization") as the explanatory variables. The analysis is explained in the next section.

Table-2. Cleansed financial data

No.	Market capitalization	Sales	Cost of sales	• • •	Operating income / Number of employees	Stock price
1	1.19E+11	9.05E+11	7.87E+11		1.54E+06	2258
2	2.08E+11	9.22E+11	7.99E+11		1.93E+06	3960
•						
•						
•						
70	2.07E+12	1.01E+12	6.921E+11		2.29E+06	9482

Source: *Buffet Code, https://www.buffett-code.com/, March 22, 2021.*
No. 1 record; stock code 1333, Maruha Nichiro Corp., 2019
No. 2 record; stock code 1333, Maruha Nichiro Corp., 2018
No. 70 record; stock code 9735, SECOM Co., Ltd., 2018

3. Analysis and Discussion

In this section, we analyze the financial data items that need to be prioritized and improved on by each company to increase market capitalization. Although improving all financial data items will increase market capitalization, the concept of improving "all items" is too vague. Consequently, we conduct an analysis aimed at deriving only the high-priority financial data items that need to be improved to raise market capitalization.

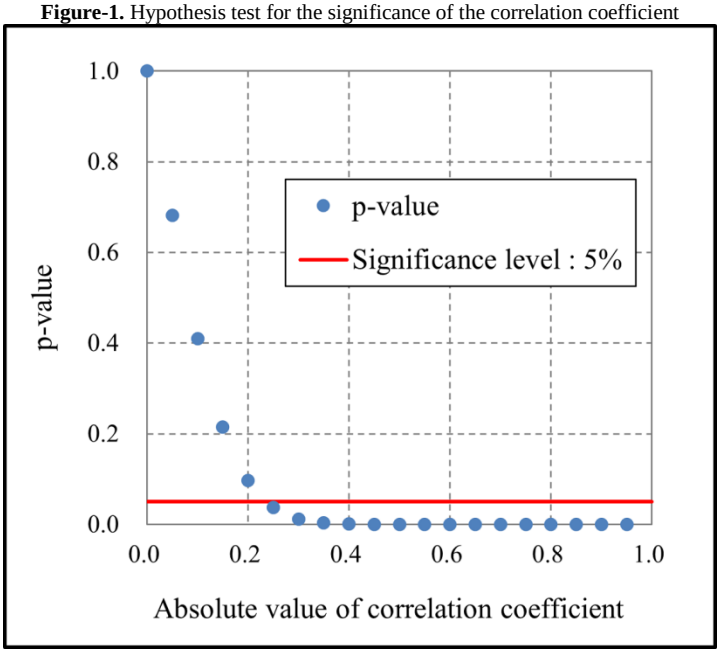
Table 3 shows the results of calculating the correlation coefficient between market capitalization and 70 financial data items without market capitalization. A hypothesis test is conducted to determine the significance of the calculated correlation coefficient. Figure 1 shows the results of calculating the p-value for the absolute value of the correlation coefficient when the number of data samples is 70. When the significance level is set to 5%, the absolute value of the correlation coefficient is significant when it is greater than approximately 0.25. Therefore, the 14 items whose absolute value of the correlation coefficient in Table 3 is smaller than 0.25 are not significant.

Table-3. Correlation coefficient between market capitalization and financial data items

No.	Financial data items	Correlation coefficients
1	enterprise value (EV)	0.95
2	profit attributable to owners of parent	0.88
3	gross profit	0.80
4	cash flow	0.79
5	stock price	0.77
6	operating income	0.74
7	ordinary income	0.74
8	EBITDA	0.73
9	retained earnings	0.72
10	cash and deposits	0.71
•		
•		
•		
51	capital stock	0.27
52	total number of issued shares	0.26
53	interest-bearing liabilities	0.24
54	cash / monthly sales	0.23
55	trade accounts payable and notes	0.23
56	operating income / number of employees	0.22
57	current ratio	0.21
58	net debt	0.21
59	cash / total assets	0.15
60	price earnings ratio (PER) (predictive value)	0.12
61	sales / number of employees	0.06
62	real effective tax rate	-0.01
63	dividend payout ratio	-0.08
64	net debt / net worth	-0.14
65	total assets turnover	-0.18
66	dividend yield (performance)	-0.22
67	debt equity ratio	-0.35
68	treasury stock adjusted debt ratio	-0.37
69	financial leverage	-0.38
70	cash / market capitalization	-0.40

Note: Sorted in descending order of correlation coefficient; the top 10 items and the bottom 20 items out of 70 items have been listed.

Figure-1. Hypothesis test for the significance of the correlation coefficient



Items with higher correlation coefficients are more relevant to market capitalization. Therefore, it is likely that the higher the correlation coefficient of the financial data item, the higher the priority should be given to it to increase market capitalization. In other words, the enterprise value with the highest correlation coefficient (0.95) in Table 3 reflects the highest priority of any item to achieve an improvement. However, this interpretation is facile. If there is ample room to improve enterprise value, the interpretation is correct; however, enterprise value may already be sufficiently high so as to exclude further improvement. In other words, it is clear that the higher the correlation coefficient, the higher the importance of raising market capitalization; however, if there is little room for improvement, the priority for improvement placed on the item is lower. Therefore, the higher the importance of raising the market capitalization and the greater the room for improvement, the higher the priority of improvement. Deriving such financial data items is required.

Here, the argument rests on what kind of index should be used to assess room for improvement in the financial data items. For example, in the sales in Table 2, how should we judge whether the No. 1 record has significant room for improvement? Sales often vary depending on the size of the company. Even if the value of sales is small, it does not necessarily follow that there is significant room for improvement. Hence, the value of each financial data item is divided by each market capitalization to calculate the normalized value. This normalized value is then converted into a deviation value (Table 4). In this way, it can be judged that the smaller the deviation value, the greater the room for improvement.

Table-4. Deviation value of financial data items normalized by market capitalization value

No.	Market capitalization	Sales	Cost of sales	• • •	Operating income / Number of employees	Stock price
1	-	81.20	82.35		77.05	60.94
2	-	62.84	63.91		77.05	52.32
•						
•						
•						
70	-	40.20	40.82		46.42	42.28

Source: Buffet Code, https://www.buffett-code.com/, March 22, 2021.
No. 1 record; stock code 1333, Maruha Nichiro Corp., 2019
No. 2 record; stock code 1333, Maruha Nichiro Corp., 2018
No. 70 record; stock code 9735, SECOM Co., Ltd., 2018

Following the CS portfolio in CS analysis (Hamada *et al.*, 2013; Mihelis *et al.*, 2001; Osman, 2009; Zamami *et al.*, 2016), graphs of the correlation coefficient in Table 2 on the horizontal axis and the deviation value in Table 3 on the vertical axis are shown in Figure 2. Company No. 1 in Table 4 is shown in Figure 2 (a), and company No. 70 in Table 4 is shown in Figure 2 (b). Since the correlation coefficient is placed on the graph's horizontal axis, the further to the right side the financial data items are plotted, the more important they are for increasing market capitalization. In addition, because the deviation value is taken on the vertical axis, the further to the bottom the financial data items are plotted, the greater the room for improvement. As a result, financial data items plotted in the lower right of this graph have higher priority for improvement for increasing market capitalization. For example, enterprise value has the highest correlation coefficient and is the most important factor in increasing market capitalization. In case of company No. 1 in Table 4, in Figure 2 (a), the deviation value of the enterprise value is high and there is little room for improvement; therefore, improving enterprise value is a low priority for increasing market

capitalization. In contrast, the enterprise value of company No. 70 in Table 4, in Figure 2 (b) is considered to have significant room for improvement because of a low deviation value. Subsequently, it can be concluded that improving enterprise value is of a high priority for increasing market capitalization.

Figure-2. Graph of deviation value for correlation coefficient of financial data items

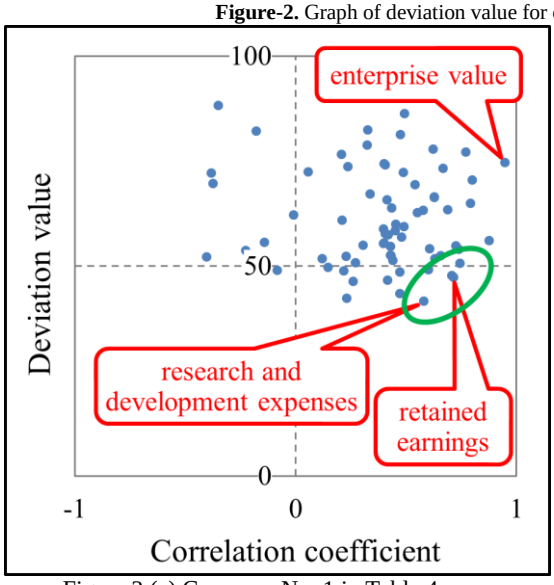


Figure 2 (a) Company No. 1 in Table 4

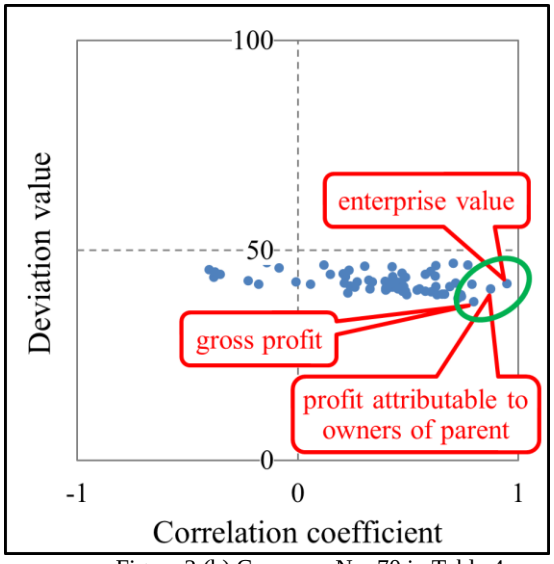


Figure 2 (b) Company No. 70 in Table 4

Next, we discuss whether it is possible to rank the financial data items plotted on the lower right of the graph (items with high priority). Conceivably, one can perform CS analysis regarding the graph in Figure 2 similarly to a CS portfolio. In other words, the graph in Figure 2 is classified into four fields: priority maintenance areas, maintenance areas, improvement areas, and priority improvement areas (Hamada *et al.*, 2013; Zamami *et al.*, 2016). It is also possible to define an Improvement Level Index and evaluate the rank order of the financial data items quantitatively (Dohi *et al.*, 2012; Matsumoto and Tsukamoto, 2004; Minami, 2007). However, some financial data items are highly correlated with each other (e.g., enterprise value and stock price) and 14 financial data items whose absolute value of the correlation coefficient is less than 0.25 are not significant. Therefore, it is difficult to rank the financial data items appropriately in order of importance. It is more suitable to state that improving the financial data items plotted in the lower right corner of the graph, surrounded by green in Figure 2, have a high priority status for increasing the market capitalization of the company.

4. Conclusion

Using a modified method of CS analysis, we created a method to derive high-priority financial data items that need to be improved to increase market capitalization. Specifically, we created a graph of the deviation values for the correlation coefficients of the financial data items. The financial data items plotted at the bottom right of the graph have a high priority for improvement to increase market capitalization. For example, if the financial data item "sales" is given high priority for improvement, and it is found that the market capitalization will increase if the sales are improved, this analysis method still does not show us exactly how to improve sales. In other words, simply allocating high priority to an item does not explain how to improve the status of the item. However, for increasing market capitalization, this analysis method can specifically derive the financial data items that should be given high priority for improvement.

In this study, using market capitalization as the response variable, we conducted an analysis to increase market capitalization. This was used as an example of the method. Analyses using enterprise values or stock prices as response variables can also be performed in a similar method. In addition, we analyzed the Nikkei 225 as sample data. Since different results will be obtained depending on the circumstances of the country and the size of the company, analyses using sample data from specific contexts will be necessary for further generalization.

Appendix

The following 71 financial items are the financial data that can be downloaded from the Buffett Code in CSV file format:

sales, cost of sales, gross profit, gross profit ratio, selling, general and administrative expenses, operating income, operating income ratio, EBITDA, ordinary income, income taxes, real effective tax rate, profit attributable to owners of parent, net income ratio, earnings per share (EPS), book value per share (BPS), enterprise value (EV), market capitalization, net debt, price earnings ratio (PER) (predictive value), price book-value ratio (PBR), PER × PBR, EV / EBITDA (predictive value), price sales ratio (PSR), price cash flow ratio (PCFR), dividend per share (DPS), dividend yield (performance), dividend payout ratio, dividend on equity (DOE), return on equity (ROE), total assets turnover, financial leverage, real ROE, return on invested capital, return on assets, total assets, current assets, cash and deposits, cash / total assets, cash / monthly sales, cash / market capitalization, trade accounts receivable and trade notes receivable, finished goods and work in process, current ratio, non-current assets, liabilities, current

liabilities, trade accounts payable and notes, not current liabilities, interest-bearing liabilities, debt equity ratio, net debt / net worth, treasury stock adjusted debt ratio, net assets, capital stock, net worth, ratio of net worth, capital stock, retained earnings, cash flow, depreciation expense, amortization of goodwill, investment cash flow, financing cash flow, free cash flow, amount of capital investment, research and development expenses, total number of issued shares, number of employees, sales / number of employees, operating income / number of employees, stock price.

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