

Application of Fuzzy Logic Approach in Financial Performance Evaluation: A Case Study of Consumer Product Sector in Malaysia

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Abstract

This paper aims to evaluate financial performance of companies from consumer product sector in Malaysia using fuzzy logic approach. Financial data of 23 companies in 2013 are retrieved from DataStream. The ultimate finding is the ranking of the companies. The ranking will suggest the investor on which companies to invest based on their financial performance. The results from this research are found to be consistent with the analysis by various investment agencies obtained from the DataStream. Thus, this approach can be used as an alternative to the traditional valuation that has been used before.

Keywords: financial performance, fuzzy logic, financial ratios.

1. Introduction

Investment can be defined as an action of investing money to gain profit. It is the action of putting funds in the financial assets such as shares and bonds. The profit or return can be generated if the selling price is higher than buying price. Shares are a security that signifies ownership in a corporation which enables the shareholder to claim on company's assets and earnings. The profit from shares investment is derived in two ways; dividend received and capital gain. Historically, shares or equity investment has outperformed other kinds of investment in the long run. However, it is not an easy task pick up good stock in one's portfolio.

The world most widely used strategies are fundamental analysis and technical analysis whereby both analyses aim to find the worth of the company and decide on which company to invest in. However, Tavakkoli et al. (2010) have used different method to evaluate financial performance of a corporation in the analysis. They used fuzzy logic approach to rank the companies with the utilization of financial ratios as factor analysis. The authors conclude the best companies and founds that their analysis were consistent with the financial experts in their home country. Another related research is by Othman et al.(2010) and Othman et al.(2012).

In Malaysia, shares are traded in Bursa Malaysia Stock Exchange where all companies are listed under either Main (for established companies) or ACE market (for technology and high-growth companies). According to Economic Report 2013/2014 by Bank Negara Malaysia, GDP has expanded by 4.7% in 2013 which was below than 2012's GDP as it recorded at 5.6% for that year.

Growth has been driven by services sector however; consumer products sector has remains as the most defensive sector. This paper aims to evaluate financial performance of public-listed companies under consumer products sector in Malaysia using fuzzy logic approach. Another objective of this paper is to recommend the investors on which companies to invest in according to the ranking result. The remainder of this paper is divided into four sections. Section 2 describes on the previous literature; Section 3 briefs on the data and methodology; Section 4 reports on the findings and analysis and Section 5 ends the paper with a brief discussion on the conclusion and future research directions.

2. Literature Review

2.1 Financial ratio as tool of measurement.

Financial ratios are designed to analyzed financial statement of a company. Financial ratios provide important information for both investor and analysts to identify the company's financial performance for specific period of time. Basically, the financial ratios can be classified into liquidity ratio, activity ratio, leverage ratio, profitability ratio, and market ratio. And, the analysis can be done through trend analysis or comparison with another company within similar industry.

2.2 Fuzzy Logic

Dr. Lotfi Zadeh introduced fuzzy logic in 1960s as a tool or model to solve the ensured of natural language. Fuzzy logic focused on the process of "fuzzification" as practice to generalize any specific theory from a crisp (discrete) to a continuous form. Evaluating financial performance deal with multiple indicator, attribute or index used to improve the result. However according to Zadeh (1965), by using the advancement of fuzzy system, optimum computerized model can be created to help investor or manager to evaluate stock and financial performance more efficient. Feldman at al. (1994) stated that fuzzy logic is a useful method when it related with mode of reasoning that is estimated rather than exact. On the other hand, Lombovska et al.(2011) has evaluated investment portfolios with theory of confidence intervals and theory of fuzzy subset. The author suggested fuzzy logic can be used as platform for comparison and/or ranking difference portfolios and stated that fuzzy could be universal tool to combine several methods.

2.3. Logic Application in Evaluating Financial Performance

There are a few studies related to financial performance using fuzzy logic approach. Tavakkoli et al (2010) has conducted a study focused on evaluation of financial performance on Iran drug industry. In their study the measurement criteria used is the financial ratios and the selected criteria were chosen based on the viewpoint by stock market experts such as brokers and investment companies. Thus, seven which is return on investment (ROI), debt ratio, quick ratio, return on equity (ROE), financial leverage index, current ratio, and price earnings ratio (P/E) are selected. According to Yalcin et al.(2012) focused on comparing and evaluating financial performance of seven Turkey manufacturing companies by used fuzzy model. The author also manages to measure effectiveness and productivities of the companies.

While, Othman et al. (2012) has evaluated financial performance on healthcare companies in the USA also by using fuzzy logic model. The authors developed three stages of methodology in their research and the approach was adapted from Tavakkoli et al(2010) .First step was choosing the industry, the second step was choosing the right criteria and the final step was ranking the companies according to their financial performance.

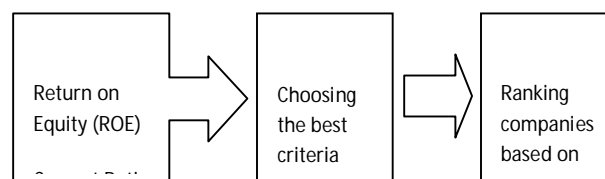


Fig. 1. The stages of methodology

3.0 Data and Methodology

This paper also utilizes the fuzzy logic approach adapted from Tavakkoli et al (2010) to rank companies based on their financial performance. The selected industry is consumer product industry since the industry is considered as defensive sector in the Malaysian economy. Twenty two companies from the services sector labelled as C1, C2, C3...C23 are used to determine their financial performance as shown in Table I. In this research four selected criteria as in Tavakkoli et al (2010) are used to evaluate their financial performance as in Table 2. The data which consist of financial ratios of the companies in 2013 was obtained from *DataStream* and has been summarized in Table 3.

Table 1: Selected Companies with Codes

	Code of Company
asia file	C1
bonia corporation	C2
cab cakaran	C3
cycle &carr. bintang	C4
cck consolidated hdg	C5
china stationery	C6
fraser&neave	C7
hwa tai industries	C8
kawan food berhad	C9
khind holdings	C10
latitude tree	C11
nestle (malaysia)	C12
ntpm holdings berhad	C13
padini holdings	C14
pohkong holdings	C15
rex industries berhad	C16
ssh resources holdings	C17
spritzer berhad	C18
umw holdings berhad	C19
yee lee corporation	C20
yen global	C21
upacorpberhad	C22
teo guan lee corporation	C23

Table 2: Selected

Indices

Criteria	Types of Fuzzy Number	SUP(x)	Fuzzy Number
ROE	Triangle	$0.7 \leq x < 1$	$\mu_{ROE} = \begin{cases} 1.42x & 0 \leq x < 0.7 \\ 1 & 0.7 \leq x < 1 \\ 0 & \text{others} \end{cases}$
Current Ratio	Tripezoid	$1 \leq x < 2$	$\mu_{CR} = \begin{cases} x & 0 \leq x < 1 \\ 1 & 1 \leq x < 2 \\ 3 - x & 2 \leq x < 3 \\ 0 & \text{others} \end{cases}$
Debt Ratio	Triangle	$x = 0.5$	$\mu_{DR} = \begin{cases} 2x & 0 \leq x < 0.5 \\ 2 - 2x & 0.5 \leq x < 2 \\ 0 & \text{others} \end{cases}$
P/E Ratio	Triangle	$0.5 \leq x < 2$	$\mu_{PE} = \begin{cases} 2x & 0 \leq x < 0.5 \\ 1 & 0.5 \leq x < 2 \\ 0 & \text{other} \end{cases}$

Table 3: Name of Company and Their Financial Performance for Year 2013

Name of Company	ROE	Current Ratio	Debt Ratio	P/E
asia file	0.11	3.1	0.04	0.09
bonia corporation	0.17	2.42	0.24	0.78
cab cakaran	0.09	0.73	0.31	0.06
cycle &carr. bintang	0.02	1.19	0.24	0.58
cck consolidated hdg	0.12	1.38	0.23	0.08
china stationery	0.14	18.5	0.02	0.01
fraser&neave	0.16	1.47	0.14	0.26
hwa tai industries	0.03	0.92	0.35	0.40
kawan food berhad	0.13	3.98	0.02	0.10
khind holdings	0.17	1.64	0.31	0.06
latitude tree	0.11	1.43	0.22	0.04
nestle (malaysia)	0.72	0.87	0.05	0.28
ntpm holdings berhad	0.17	1.37	0.22	0.11
padini holdings	0.24	3.54	0.07	0.15
pohkong holdings	0.08	3.75	0.34	0.06
rex industries berhad	0.02	2.67	0.15	0.21
ssh resources holdings	0.02	2.13	0.13	0.10
spritzer berhad	0.12	1.21	0.26	0.10
umw holdings berhad	0.12	2.14	0.21	0.22
yee lee corporation	0.11	1.21	0.18	0.07
yen global	0.02	1.68	0.16	0.31
upacorpberhad	0.07	4.1	0.08	0.08
teo guan lee corporation	0.12	2.17	0.01	0.08

4. Result

The ranking of the companies is presented in Table 4. Table 4 Situation of Each Company According To Selected Indices and Companies Final Ranking.

Code company	Return on Equity (ROE)	μ_{ROE}	Current Ratio	μ_{CR}	Debt Ratio	μ_{DR}	P/E	μ_{PE}	Min (Degree)	Rank
C2	0.17	0.24	2.42	0.58	0.24	0.48	0.78	1.00	0.24	1
C7	0.16	0.23	1.47	1.00	0.14	0.29	0.26	0.52	0.23	2
C13	0.17	0.24	1.37	1.00	0.22	0.45	0.11	0.22	0.22	3
C19	0.12	0.17	2.14	0.86	0.21	0.41	0.22	0.43	0.17	4
C18	0.12	0.17	1.21	1.00	0.26	0.53	0.10	0.19	0.17	5
C5	0.12	0.17	1.38	1.00	0.23	0.46	0.08	0.15	0.15	6
C20	0.11	0.16	1.21	1.00	0.18	0.37	0.07	0.13	0.13	7
C3	0.09	0.12	0.73	0.73	0.31	0.61	0.06	0.13	0.12	8
C10	0.17	0.24	1.64	1.00	0.31	0.62	0.06	0.12	0.12	9
C12	0.72	1.00	0.87	0.87	0.05	0.10	0.28	0.57	0.10	10
C11	0.11	0.16	1.43	1.00	0.22	0.44	0.04	0.08	0.08	11
C8	0.03	0.04	0.92	0.92	0.35	0.70	0.40	0.81	0.04	12
C17	0.02	0.03	2.13	0.87	0.13	0.27	0.10	0.21	0.03	13
C21	0.02	0.03	1.68	1.00	0.16	0.32	0.31	0.63	0.03	14
C4	0.02	0.03	1.19	1.00	0.24	0.48	0.58	1.00	0.03	15
C23	0.12	0.17	2.17	0.83	0.01	0.02	0.08	0.15	0.02	16
C16	0.02	0.02	2.67	0.33	0.15	0.31	0.21	0.43	0.02	17
C6	0.14	0.20	18.5	0.00	0.02	0.04	0.01	0.02	0.00	18
C9	0.13	0.18	3.98	0.00	0.02	0.04	0.10	0.21	0.00	19
C1	0.11	0.16	3.1	0.00	0.04	0.08	0.09	0.19	0.00	20
C14	0.24	0.34	3.54	0.00	0.07	0.14	0.15	0.29	0.00	21
C22	0.07	0.10	4.1	0.00	0.08	0.16	0.08	0.17	0.00	22
C15	0.08	0.12	3.75	0.00	0.34	0.69	0.06	0.11	0.00	23

5. Discussion

The result in Table 4 indicate ranking of the companies based on their financial performance using fuzzy logic approach. Based on the table the top five companies are Bonia Corporation, Fraser & Neave, NTPM, UMW Holdings Berhad and Spritzer. The researchers have compared the result with the analyses from the *Data stream* and from the analysis, it can be concluded that our methodology is rather reliable. To illustrate, the number one rank is Bonia and its market price is RM0.98 while its mean target price is RM1.15. The recommendations by Am Research Sdn Bhd and Affin Hwang Investment Bank are 'hold' while CIMB Research recommends to 'add' the stock in the portfolio. On the other hand, NTPM which ranked as number three is recommended as 'neutral' by RHB Research Institute. For UMW Holdings Berhad which ranked as number four is recommended as 'hold' by most of the analysts. While, Spritzer's current recommendation is 'buy' since its market price is RM2.12 while the target price is RM2.35. According to this study, the ranking of the five last companies which are Kawan Food Berhad, Asia File, Padini Holdings, UPA Corp Berhad and Poh Kong Holdings have also been verified by the *Datastream*. There is no recommendation by the analysts except for Asia File Corporation Bhd and Padini Holdings Berhad.

6. Conclusion

As a conclusion, this research has answer both objectives as been outlined at the beginning of this paper. This study manages to evaluate the financial performance and subsequently rank the companies using fuzzy logic approach. The results from this research are also consistent with the analysis by other investment agencies obtained from the *Data stream*.

Thus, this approach can be used as an alternative to the fundamental and technical valuation which is widely used by the investment analysts. However, further research should be done to another sector to test the viability of the model/method and subsequently improve the model/method used in this study.

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