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A STUDY ON SFPM ANALYSIS USING FUZZY SOFT SET

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Abstract: Evaluating the financial performance of a company is a turbulent work. There are lots of financial performance measures circling around the field of evaluation. It is very essential to find out a model or tool to select the best financial performance measure which should tolerate the elusiveness in the companies' decision making problem. Fuzzy Set Theory and Fuzzy Soft Theory have proved to be a successful in handling imprecise and vague knowledge that characterize this kind of problems, and it has been applied in a variety of fields in the last decades. Based on earlier literature, four important parameters, Earnings Per Share (EPS), Price Earning Ratio (P/E Ratio), Economic Value Added (EVA), Market Value Added (MVA), have been selected. The first two measures are from Traditional Accounting Measures (TAM) and the latter two measures are from Value Based Measures (VBM). Selecting a Superior Financial Performance Measure (SFPM) of a company using fuzzy soft set is the target of this paper.

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1. Introduction

Constantly there is a hot debate in the area of corporate financial performance analysis. To evaluate the financial performance of a company, it is very vital to select an appropriate measure. There are several measures available in financial market. However, the researcher has selected the important four measures based on the earlier literature. The selected measures are Earnings Per Share (EPS), Price Earning Ratio (P/E Ratio), Economic Value Added (EVA), Market Value Added (MVA). The first two measures are from Traditional Accounting Measures (TAM) and the latter two measures are from Value Based measures (VBM). After Zadeh[5], many researchers[2, 4] using the fuzzy set for decision making. Here, authors intend to select the (SFPM) Superior Financial Performance Measure among the selected measures using the fuzzy soft set.

2. Research Objective

To identify the superior financial performance measure using the fuzzy soft set.

3. Methodology

3.1. Sample of the Study

To satisfy the objective, a sample of 50 investors has been selected using convenient sampling method around Madurai region.

3.2. Data Collection

Data were collected from the respondents through mailed questionnaire.

3.3. Parameters used in the Study

The researcher has identified some key parameters which have been used by the investors rapidly to analyze the financial performance of a company. They are as follows.

- Adjusted Profit

- Earnings

- Dividend

- Capital employed

- Share Prices

- Market Capital

3.4. Selected Measures

There is no evidence that single measure is superior to the other. Still it is a hot topic going for debate among the financial analyst. Based on their advancement stated by the Financial analysts four measures have been taken each two from TAM and VBM[1]. The selected measures are as given below.

3.4.1. Earnings Per Share (EPS):

Earnings Per Share (EPS) of a business is the portion of its net income of a period that can be attributed to each share of its common stock.

$$EPS = \frac{Net\ Income\ -\ Dividends\ on\ Preference\ Shares}{Number\ of\ Common\ Shares\ Outstanding}$$

3.4.2. Price Earning Ratio (P/E Ratio):

A valuation ratio of a company's current share price compared to its per-share earnings.It is calculated as follows,

$$P/E\ Ratio = \frac{Market\ Value\ per\ Share}{Earnings\ Per\ Share(EPS)}$$

3.4.3. Economic Value Added (EVA):

EVA is the Economic profit, which is excess of NOPAT over Capital Charge, the latter being the product of the weighted average cost of capital and the invested capital and it is calculated as

$$EVA = NOPAT - (Weighted\ average\ cost\ of\ capital \times Invested\ Capital)$$

where NOPAT is "Net Operating Profit After Tax."

3.4.4. Market Value Added (MVA):

Market Value Added (MVA) shows the difference between the market value of a company and the capital contributed by investors. It is calculated as

$$MVA = Companies\ Market\ Value - Invested\ Capital$$

4. Fuzzy Soft Sets and Fuzzy Soft Decision Set

In this section, we present the basic defnitions of fuzzy set and soft set. We also give definition of fuzzy soft set (FS-set) and fuzzy decision set of an FS-set to construct a decision method by which approximate functions of a soft set are combined to produce a single fuzzy set that can be used to evaluate each alternative.

Definition 4.1. Fuzzy subset:[5] A fuzzy subset μ in a non-empty set X is a function $\mu : X \rightarrow [0,1]$.

Definition 4.2. Soft set: Let U refers to an initial universe, E is a set of all parameters, $P(U)$ is the power set of U, and $A \subseteq E$.
A soft set F_A over U is a set defined by a function f_A representing a mapping $f_A : E \rightarrow P(U)$ such that $f_A = \phi$ if $x \notin A$. Thus a soft set over U can be represented by the set of ordered pairs $F_A = \{(x, f_A x) : x \in E, f_A x \in P(U)\}$

Definition 4.3. Fuzzy Soft(FS) set:[3] Let U refers to an initial universe, E is a set of all parameters, $P(U)$ is the power set of U, and X be a fuzzy set over E.
An FS-set on U, is defined by the pair,
$F_X = \{(\mu_X(x)/x, f_X x) : x \in E, f_X x \in P(U), \mu_X(x) \in [0,1]\}$ where the function
$f_X : E \rightarrow P(U)$ is called approximate function such that $f_X(x) = \phi$ if $\mu_X(x) = 0$ and $\mu_X : E \rightarrow [0,1]$ is called membership function of FS-set F_X. The value of $\mu_X(x)$ is the degree of importance of the parameter x, and depends on the decision makers requirements. The sets of all FS-sets over U will be denoted by FPS(U).

Definition 4.4. Fuzzy Soft Decision (FSD) set: Let $F_X \in FPS(U)$. Then a fuzzy soft decision(FSD) set of F_X denoted by F_X^D and is defined by
$F_X^D = \left\{ \mu_{F_X^D}(u)/u : u \in U \right\}$ which is a fuzzy set over U, its membership function $\mu_{F_X^D}$ is defined by $\mu_{F_X^D} : U \rightarrow [0,1]$ and $\mu_{F_X^D}(u) = \frac{1}{|E|} \sum_{x \in E} \mu_X(x)$

5. Analysis of SFPM using FSD Set

In this section using FSD-set , we are going to choose best single measure from the alternatives and the following algorithm is introduced .

1. Design a Soft set F_A over U.

2. Design a FS-set F_X over U.

3. Construct the FSD-set F_X^D.

4. Choose the maximum membership value $\mu_{F_X^D}(u)$.

By considering the selected parameters, the researcher has to identify the superior financial performance measure using fuzzy soft technique.

Step 1: To apply Fuzzy Soft Decision Set in Financial decision making problem, the Selected measures are as the universal set $U = \{M_1, M_2, M_3, M_4\}$ and the parameters used for analyzing financial performance evaluation by the investors as the set of Constraints as $X = \{x_1, x_2, x_3, x_4, x_5, x_6\}$, where

- $M_1 =$EPS

- $M_2 =$P/E Ratio

- $M_3 =$EVA

- $M_4 =$MVA   and

- $x_1 =$Adjusted Profit

- $x_2 =$Earnings

- $x_3 =$Dividend

- $x_4 =$Capital employed

- $x_5 =$Share Prices

- $x_6 =$Market Capital

The Soft set F_A is designed as

$$F_A = \left\{ \begin{array}{c} ((x_1),(M_3)) ; ((x_2),(M_1, M_2)) ; ((x_3),(M_1, M_3)) ; \\ ((x_4),(M_3, M_4)) ; ((x_5),(M_2)) ; ((x_6),(M_4)) \end{array} \right\}.$$

Step 2: The constraints are ranked according to the ranks given by the 50 respondents. The sums of ranks with respective constraints are given in the following Table.

Constraints	x_1	x_2	x_3	x_4	x_5	x_6
Sum of Ranks	96	120	249	210	133	242
Rank based values	6	5	1	3	4	2

Ranks reported by the respondents are sum up and values are assigned in the descending order. Maximum value(6) is given to the least number and the remaining values are given with respect to the sum of ranks. Then the fuzzy membership values have been assigned by dividing the rank value (RV) with the number of respondents as follows.

The FS-set F_X is designed as

$$\left\{ \begin{array}{l} ((0.12/x_1),(M_3)) ; ((0.10/x_2),(M_1,M_2)) ; ((0.02/x_3),(M_1,M_3)) ; \\ ((0.06/x_4),(M_3,M_4)) ; ((0.08/x_5),(M_2)) ; ((0.04/x_6),(M_4)) \end{array} \right\}$$

Step 3: The FSD-set F_X^D has been attained using the definition 4.4.

$$F_X^D = \{0.020/M_1,\ 0.030/M_2,\ 0.033/M_3,\ 0.017/M_4\}$$

Step 4: It is clear that $\mu_{F_X^D}(M_3) = 0.033$. i.e, EVA, has the maximum membership value among the four selected mesures.

6. Conclusion

Hence we concluded that EVA is the appropriate measures with the consideration of important constraints in the financial performance analysis using Fuzzy soft decision set. This means EVA act as a Superior Financial Performance Measure in Corporate world.

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