Development Of Hedging Strategy For Exporters And Importers Succoured By Multi-Criteria Decision-Making Techniques (AHP And WASPA)

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Abstract: Hedging strategy decision for a firm is very challenging as it impacts the financials of the firm in multiple facets. This study aims to solve the real time problem by finding the criteria weights for various hedge influencing factors and ranking the best one using MCDM techniques like Analytic Hierarchal Process (AHP) and Weighted Aggregated Sum Product Assessment (WASPA) method. Snowball sampling technique was executed considering the sensitivity of the data. The respondents were finance executives and managers who play a crucial role in hedging decisions in their organisations and who are highly experienced in this domain. The total number of respondents were 83 and they belonged to firms which perform both import and export business activity. The findings reveal that, exposure coverage and firms policy decision influence 49 % of criteria weight. The best solution for hedging strategy would be the firm should equally be involved in both internal and currency derivative to mitigate the exposure, followed by currency derivatives methods and internal hedging strategy.

INTRODUCTION

In this dynamic business environment, the market variability causes foreign exposure for the exporters and importers. Management of these exposures is very important as it impacts the financial creditability of the firm. Hedging techniques like internal or operational hedging, currency derivatives and combination of both are the available exposure management techniques. Hence, decision making acts as a critical and a vital part of the management. Financial decision making are crucial as it impacts the business in many facets. In a decision making process both tangible and intangible criteria are involved. To deal with such qualitative and quantitative multiple criteria, Multi Criteria Decision Making (MCDM) technique Analytical Hierarchy Process (AHP) 1970, by Saaty is employed.

The key decision making challenge for a financial manager is choosing the best hedging technique for managing their foreign exchange exposure. The criteria for hedging decision are identified using various reviews of literature and also through content validity process from the financial experts. The criteria weight age is found using Pair-wise comparison matrices (PCM) using Analytical Hierarchy Process. Pair-wise comparison matrices values are obtained by developing questionnaire and the values are obtained from the financial experts. AHP is solved to obtain the criteria weight-age of hedging decision.

There are several MCDM techniques and one of the best MCDM technique is the Weighted Aggregated Sum Product Assessment (WASPA). This technique involves a combination of two MCDM techniques namely Weighted Sum Method (WSM) and Weighted Product Method (WPM).

REVIEW OF LITERATURE

Analytical Hierarchical Process and Weight Aggregated Sum Product Assessment WASPA

Saaty and Wind 1980, change serves as the father to illustrate the process of applying AHP in solving various deterministic problems for the firms in different context. This research change ends this process to prioritize the factors for a hedging decision. There has been several research framework model developed for risk modeling and hedging. Lee Younghwa, 2006 investigated the website quality effects on its e-business. The various influential factors of quality of website was proposed. Wu,Cheng et al 2009, evaluates an optimal choice of energy fund by using AHP-TOPSIS method. AHP helps to determine the optimal weights for the evaluating variable while TOPSIS helps to select the optimal solution. Ahmet, Calik 2019, proposed a methodology for the FDI investors to select the sectors to invest in an inflammatory economy like Turkey. AHP method is used for selecting the criteria weights for the factor by adding opinion weights from the decision making groups. Singh, Rohit Kumar, 2018 used AHP method for vendor rating model for a start-up firm. They criteria's were prioritized based on the firm product development. Anand, M.B et al, 2018 ranks the addictive manufacturing process on micro fabrication. There exists a list of manufacturing process for micro fabrication. The evaluation of the best process and ranking of it based on its preferences are evaluated using AHP-TOPSIS method.

Pamucar, D et al., 2020 examines the best mode of transport for the new constructed airport. The criteria weights are obtained by LBWA method and the WASPA traditional method was used to identify the best mode. Bid, S., & Siddique, G. 2019, developed a human risk assessment for a old dam project. They analyzed the risk priority using TOPSIS and WASPA ranking model. Dahooie, J. H et al 2020, examined and developed a performance model for export firm using mutli-criteria strategic technique and ARAS, SWARA MADM methods. Multi-criteria decision tools are highly effective in solving the real time problems Chakraborty et al. (2015). Hence we have employed AHP and WASPA for solving our real time challenge.

FACTORS INFLUENCING THE HEDGING DECISION

The main concern for a decision maker while executing currency hedging are considered as estimation of exposure from the operations, knowledge on currency hedging, concerns about legal and tax issues, stabilizing the firms market value and trading for profit (Raghavendra R.H, 2014).Danijela Milo Sprcic 2012, estimates the determinants of hedging decisions are the financial distress cost, agency cost, costly external financing, taxes, and managerial utility and hedging substitutes. The decision to hedge is more inclined towards the investment and growth opportunities of the firm. Yadav and Rastogi 2009, seventy five percent of the surveyed firms were focussed on cost-center approach and are risk averse towards risk management. AmanChugh et al 2017, indicates the there is still a paucity in focusing on the determinants of foreign risk hedging strategies and the preference in various instruments used for forex risk hedging. There is observed a lack of understanding in the regulatory and legal framework in management of derivative market in India. Also, there is a lack of understanding in pricing and valuation models of derivatives (RuchikaGahlot). The hedging Approach adopted by the Indian Companies were mainly classified as Hedging coverage, Policy decision, Tenure of hedging, Instruments used, Number of Currencies used for hedging(Hiren Maniar).

OBJECTIVE:

The objective of the study is to estimate the best hedging alternatives using Multi-Criteria Decision Making (MCDM) process using AHP and Weighted Aggregated Sum Product Assessment (WASPA).

The criteria used in hedging decision making are

1-Exposure Coverage

2- Policy of the firm;

3- Number of currencies;

4- Tenure of hedging;

5- Hedging instrument used;

6- Hedging ratio;

7- Impact on Financial Performance.

The MCDM techniques are classified into three levels. The first level represents the Goal or objective of the decision making. The second level is the criteria involved in decision making process. The third level is the alternatives of solutions available for the objective. The alternative will be ranked using the MCDM techniques.
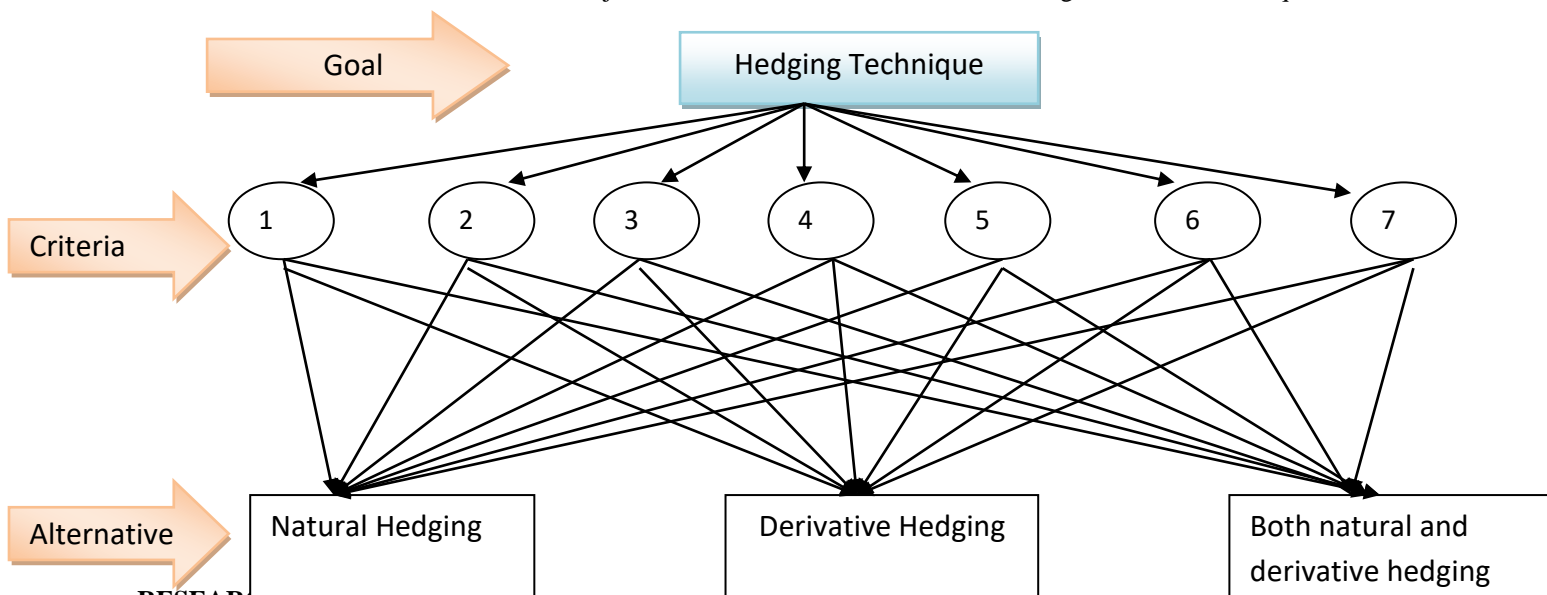
RESEARCH METHODOLOGY:

WASPA Weighted Aggregated Sum Product Assessment is combination of two MCDM techniques WSM and WPM. WASPA technique propounded by Zavadskas et al. in 2012 is one of the best MCDM techniques and often used techniques to evaluate the best alternatives available. The criteria weightage are estimated using AHP method. The MCDM problem stated is "estimating the best hedging technique for the firm". There are 7 decision criteria denoted as n and three alternatives available denoted as m. The data are obtained using primary questionnaire survey method by constructing questionnaire for criteria decision using AHP Saaty 1980 method. Also, the data of usage of hedging techniques are obtained using survey questionnaire method from the financial experts of Exporting and Importing firms. The sampling techniques followed us snowball sampling. The numbers of respondents were 83.

DATA ANALYSIS
The data analysis for the objective follows the below order.
1. Estimation of Criteria Weight using AHP -PCM
2. Estimating the best alternative for hedging using WASPA technique and obtaining the rank.

Estimation of Criteria Weight using AHP (Analytic Hierarchical Process)
The analytic hierarchy process is a MCDM (Multi-Criteria Decision Making) method which allows the decision maker to model their complex problem in a hierarchical structure. It integrates both importance criteria and the alternatives into a single score for decision alternatives. There are seven major factors pondered for an effective hedging strategy. Among these the most influencers of hedging decision considered by the decision makers are to be investigated.
Using the relative importance scale, the expert's opinions are mapped into the judgment vector. Further pairwise comparison matrix is used to determine the criterion weights. Extended analysis methods of Chang's has been used for determining the weights for pairwise comparison. The random consistency index for seven criteria RI is 1.35 (Nazem et al).
Scale of Relative importance

Intensity of importance	Degree of Importance
1	Equal importance
3	Moderate importance of one over the other
5	Essential or Strong importance
7	Very Strong importance
9	Extremely important.
2,4,6,8	Are the intermediate values between the two adjacent judgements

The detailed comparative analysis is done using the AHP matrices and the respective weight for each criterion is calculated. The length of the criteria matrix involves the number of criteria into consideration. A normalized pair wise matrix is obtained by dividing all the elements of columns divided by the sum of the respective columns and we get the criteria weights by calculating the average of the rows. After obtaining the criteria weights, consistency is calculated to validate the findings.
The consistency index (C.I) is calculated using the formula $(\lambda_{max} - n)/(n-1)$ is 0.1183, Further we calculate the Consistency Ratio,
Consistency Ratio = Consistency Index (C.I)/Random Index (R.I), Where R.I for n =7 is 1.32
Consistency Ratio is 0. 0876, which is less than 0.10 (standard), hence our matrix is consistent, and we may progress our decision making using AHP based on the criteria weights for the variables.

Pair-wise Comparisons of evaluation criteria							
	Exposure	Policy Decision	Tenure of Hedging	Instruments used	Impact on Financial Performance	Number of Currencies used	Hedging Ratio	Criteria Weight-age
Exposure	1.00	2.42	2.06	2.20	2.83	3.99	4.12	0.27
Policy Decision	0.41	1.00	2.01	3.09	2.90	3.85	3.61	0.22

Tenure of Hedging	0.49	0.50	1.00	2.58	3.07	4.28	4.25	0.18
Instruments used	0.45	0.32	0.39	1.00	2.87	3.99	4.02	0.14
Impact on Financial Performance	0.35	0.34	0.33	0.35	1.00	2.48	4.42	0.09
Number of Currencies used	0.25	0.26	0.23	0.25	0.40	1.00	3.88	0.06
Hedging Ratio	0.24	0.28	0.24	0.25	0.23	0.26	1.00	0.04

2. Estimation of WASPA MCDM technique and obtaining the rank

The Weighted Sum Model involves three phases-

    a. Normalizing the decision matrix

    b. Assigning the weight vector

    c. Calculating the overall score of each alternative.

The decision matrix for the MCDM problem is represented as D= x_{ij} be the decision matrix and weight vector may be expressed as $w_j = [w_1 \dots w_n]$, where $\sum_{j=1}^{n} (w_1 \dots w_n) = 1$

The decision matrix is

	DECISION MATRIX- Dataset						
	exposure coverage	**Policy decision**	**Hedging impact on financial performance**	**Hedging ratio**	**Tenure of hedging**	**Instruments used for hedging**	**Number of currencies used**
Internal Hedging	1.75	1.55	1.85	1.65	1.6	1	1.85
Derivatives	2.5	1.31	2.96	2.79	2.58	2	1.76
Both	2.34	1.43	2.94	2.815	2.35	2.5	1.98
	B	B	B	B	NB	NB	NB

The normalised decision matrices (n_{ij}) are obtained from the maximum and minimum of x_{ij} in th j^{th} column of benefit (B) and cost criteria(NB), using

$$n_{ij} = \begin{cases} \dfrac{x_{ij}}{max.x_{ij}} & | j \in B \\ \dfrac{min.x_{ij}}{x_{ij}} & | j \in C \end{cases}$$

Normalisation decision matrix							
	exposure coverage	Policy decision	Hedging impact on financial performance	Hedging ratio	Tenure of hedging	Instruments used for hedging	Number of currencies used
Internal Hedging	0.7	1	0.625	0.5861	0.6201	0.4	0.9343
Derivatives	1	0.8451	1	0.9911	1	0.8	0.8889
Both	0.936	0.9225	0.9932	1	0.9108	1	1

Criteria Weights from AHP method

exposure coverage	Policy decision	Hedging impact on financial performance	Hedging ratio	Tenure of hedging	Instruments used for hedging	Number of currencies used
0.27	0.22	0.18	0.14	0.09	0.06	0.04
0.27	0.22	0.18	0.14	0.09	0.06	0.04
0.27	0.22	0.18	0.14	0.09	0.06	0.04

The weighted normalised matrices are obtained and the preferential ranking for WSM and WPM methods are obtained from the formula

$$S_i^{WSM} = \sum_{j=1}^{n} w_j n_{ij}$$

$$S_i^{WPM} = \prod_{j=1}^{n} (n_{ij})^{w_j}$$

The WASPA ranking score is can then be computed using the formula, where The λ value is 0.5

$$S_i^{WASPAS} = \lambda S_i^{WSM} + (1 - \lambda) S_i^{WPM} = \lambda \sum_{j=1}^{n} w_j n_{ij} + (1 - \lambda) \prod_{j=1}^{n} (n_{ij})^{w_j}$$

Preference Score Si (WSM)	Preference Score Si (WPM)	Alternatives	WASPAS	Rank
0.71911	0.69874	Internal Hedging	0.7089	3
0.94886	0.94582	Derivative hedging	0.9473	2
0.95627	0.95562	Both	0.9559	1

DISCUSSION:

The complex decision making on hedging the foreign exchange exposure are determined using the AHP- WASPA MCDM method. The Pair-wise comparison of evaluation criteria table interprets the importance of selected each criteria among the financial experts. Out of the seven main criteria selected and analysed. The maximum weight-age was given for exposure coverage 27%. The exposure coverage helps to select which are the exposures to be covered like foreign asset, foreign debt, foreign liabilities etc. Policy decision of the firm is given 22% weight-age as the risk policy should be barred by the management. Tenure of hedging is given 18% importance. The duration of hedging impacts the business and also time value of money is most important in financial terms. Selection of instrument for hedging engages 14% weight-age. The choice of instrument might change the estimated risk levels. Impact on financial performance of the firm involves 9% importance and the number of currencies used for hedging is given 6% and finally hedging ratio which is the degree of exposure the firm should hedge is given a weight age of 4%.

There are three alternative decisions available for the export and importing firm during the hedging decision. The alternatives 1 is to choice internal hedging strategy against the exposure, alternative 2 is to choose a derivative instrument from the currency market and alternative 3 is to use a combination of both internal and derivative instruments.

The criteria weights are evaluated against the three alternatives available using WASPA MCDM technique. The interpretation table shows that, the best method of hedging technique is to use a combination of internal hedging and derivative. The second best alternative is to choice derivative instrument and the third option would be the internal hedging strategy.

CONCLUSION

Hedging strategy for an exporting/importing firm is crucial and time bound. The decision should be taken quick and wise. This decision is very critical as it has a greater impact in their business. Hence, we choose one of the best Multi-Criteria Decision Making technique WASPA to solve this problem and provide the solution.

The criteria weight age for the linguistics was solved using AHP proposed by Saaty 1970. Based on the result we find that exposure coverage and policy decision of the firm covered 49% criteria weight-age or importance. Combined strategy of internal hedging and currency hedging scored the highest in decision ranking, followed by currency derivative hedging and pure internal hedging.

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