Investment Projects Selection Problem under Hesitant Fuzzy Environment

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Abstract : In the present research, a decision support methodology for the multi-attribute group decision-making (MAGDM) problem is developed, namely for the selection of investment projects. The objective of the investment project selection problem is to choose the best project among the set of projects, seeking investment, or to rank all projects in descending order. The project selection is made considering a set of weighted attributes. To evaluate the attributes in our approach, expert assessments are used. In the proposed methodology, lingual expressions (linguistic terms) given by all experts are used as initial attribute evaluations, since they are the most natural and convenient representation of experts' evaluations. Then lingual evaluations are converted into trapezoidal fuzzy numbers, and the aggregate trapezoidal hesitant fuzzy decision matrix will be built. The case is considered when information on the attribute weights is completely unknown. The attribute weights are identified based on the De Luca and Termini information entropy concept, determined in the context of hesitant fuzzy sets. The decisions are made using the extended Technique for Order Performance by Similarity to Ideal Solution (TOPSIS) method under a hesitant fuzzy environment. Hence, a methodology is based on a trapezoidal valued hesitant fuzzy TOPSIS decision-making model with entropy weights. The ranking of alternatives is performed by the proximity of their distances to both the fuzzy positive-ideal solution (FPIS) and the fuzzy negative-ideal solution (FNIS). For this purpose, the weighted hesitant Hamming distance is used. An example of investment decision-making is shown that clearly explains the procedure of the proposed methodology.

Keywords : In the present research, a decision support methodology for the multi-attribute group decision-making (MAGDM) problem is developed, namely for the selection of investment projects. The objective of the investment project selection problem is to choose the best project among the set of projects, seeking investment, or to rank all projects in descending order. The project selection is made considering a set of weighted attributes. To evaluate the attributes in our approach, expert assessments are used. In the proposed methodology, lingual expressions (linguistic terms) given by all experts are used as initial attribute evaluations since they are the most natural and convenient representation of experts' evaluations. Then lingual evaluations are converted into trapezoidal fuzzy numbers, and the aggregate trapezoidal hesitant fuzzy decision matrix will be built. The case is considered when information on the attribute weights is completely unknown. The attribute weights are identified based on the De Luca and Termini information entropy concept, determined in the context of hesitant fuzzy sets. The decisions are made using the extended Technique for Order Performance by Similarity to Ideal Solution (TOPSIS) method under a hesitant fuzzy environment. Hence, a methodology is based on a trapezoidal valued hesitant fuzzy TOPSIS decision-making model with entropy weights. The ranking of alternatives is performed by the proximity of their distances to both the fuzzy positive-ideal solution (FPIS) and the fuzzy negative-ideal solution (FNIS). For this purpose, the weighted hesitant Hamming distance is used. An example of investment decision-making is shown that clearly explains the procedure of the proposed methodology.

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