

## Belief-Based Games: An Appropriate Tool for Uncertain Strategic Situation

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**Abstract :** Game theory is a mathematical tool to study the behaviors of a rational and strategic decision-makers, that analyze existing equilibrium in interest conflict situation and provides an appropriate mechanisms for cooperation between two or more player. Game theory is applicable for any strategic and interest conflict situation in politics, management and economics, sociology and etc. Real worlds' decisions are usually made in the state of indeterminacy and the players often are lack of the information about the other players' payoffs or even his own, which leads to the games in uncertain environments. When historical data for decision parameters distribution estimation is unavailable, we may have no choice but to use expertise belief degree, which represents the strength with that we believe the event will happen. To deal with belief degrees, we have use uncertainty theory which is introduced and developed by Liu based on normality, duality, subadditivity and product axioms to modeling personal belief degree. As we know, the personal belief degree heavily depends on the personal knowledge concerning the event and when personal knowledge changes, cause changes in the belief degree too. Uncertainty theory not only theoretically is self-consistent but also is the best among other theories for modeling belief degree on practical problem. In this attempt, we primarily reintroduced Expected Utility Function in uncertainty environment according to uncertainty theory axioms to extract payoffs. Then, we employed Nash Equilibrium to investigate the solutions. For more practical issues, Stackelberg leader-follower Game and Bertrand Game, as a benchmark models are discussed. Compared to existing articles in the similar topics, the game models and solution concepts introduced in this article can be a framework for problems in an uncertain competitive situation based on experienced expert's belief degree.

**Keywords :** game theory, uncertainty theory, belief degree, uncertain expected value, Nash equilibrium

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