Abstract

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Construction Bidding and the Winner’s Curse: Game Theory Approach

In the construction industry, competitive bidding has long been used as a method for contractor selection. Because the true cost of construction is not known until the completion of the project, adverse selection is a major concern. Adverse selection is when the winner of the contract has underestimated the project’s true cost. Thus, the winning contractor will most likely earn negative at least below normal profits. The winner’s curse is when the winning bidder submits an underestimated bid and is thus cursed by being selected to undertake the project. In the multistage bidding environment, where subcontractors are hired by a general contractor, the winner’s curse may be compounded. In general, contractors suffer from the winner’s curse for a variety of reasons including inaccurate estimates of project cost, new contractors entering the construction market minimizing losses in case of recession of the construction industry, strong competition within the construction market, differential opportunity costs, which can affect the behavior of contractors and the intention to win the project and then remedy the losses through change orders, claims, and other mechanisms. Using a game theory approach, this paper aims to analyze—and potentially reduce—industry exposure to the effects of the winner’s curse in construction bidding. To this end, the authors identify the degree of the winner’s curse in two common construction bidding environments namely, single-stage bidding and multistage bidding. The objective is to compare the aforementioned two construction bidding environments and determine how learning from past bidding decisions and experiences can mitigate the winner’s curse. To this end, and through defining the relationship between the construction bidding and auction theory, the authors utilized a three-step research methodology that involved (1) presenting the symmetric risk neutral Nash equilibrium (SRNNE) as an optimal bid function (2) developing simulation models for single and multistage construction bidding processes and (3) analyzing the results of the simulation models, which is based on an actual dataset of projects provided by the California Department of Transportation. This research demonstrated that the majority of general contractors and subcontractors suffer from the winner’s curse in both single-stage and multistage bidding environments. Moreover, from a winner’s curse perspective, the multistage bidding environment incurs more losses than the single-stage bidding environment. However, through learning from past experiences, the multistage bidding environment provides contractors with a better opportunity to avoid the winner’s curse if compared with the single-stage bidding environment. This research should be beneficial for the profession to better understand the bidding decision-making processes. For future work, cooperative game theory can be applied with the integrated project delivery principles to help all associated parties mutually achieve their project objectives.