Optimal Lottery for Fundraising: The Organizer’s Problem

Pulkit K. Nigam
University of South Carolina

EXTENDED ABSTRACT

A fixed-prize lottery (or a raffle) is a mechanism employed by many local and relatively small-scale charity organizations to raise money to fund public goods or charitable work. Examples might include neighborhood churches, local citizen groups like Lion’s or Rotary Club, or other not-for-profit organizations. In many such cases, the fixed-prize is donated by a generous sponsor or patron, and in all cases the organizer of such a lottery issues tickets for sale with the aim of maximizing the collection.

This study is an attempt to address a very basic problem faced by the organizer – namely, how many tickets should be issued for sale? Knowing exactly how many tickets to issue for sale also allows the organizer to advertise the number of tickets, which in turn lets the participants know of their odds of winning the prize. In modeling lotteries for provision of public good, the participants are associated with a certain marginal per capita return (MPCR) from the public good provision such that an individual’s decision to participate in the lottery is motivated not only by the prize, but also by the MPCR (or the marginal benefit) that accrues to that individual from the public good being provided through the lottery. While previous studies have considered the MPCR to be a constant and same for all participants, this study allows for the MPCR – be it in terms of the altruistic ‘warm glow’ or any other benefit – to vary from one individual to another, and for it to be private information and therefore unknown to the organizer. There is a trade-off; when few tickets are issued for sale, the collection from the sale of tickets is low, if too many tickets are issued for sale, then it could be the case that not all the tickets get sold implying a wastage of resources in issuing the unsold extra tickets.

The study of private provision of public goods through lotteries was brought to the fore by Morgan (2000) who demonstrated that fixed-prize lotteries result in a greater contribution to public good provision than voluntary contributions (charitable donations). A number of studies thereafter have considered and compared the performance of different contribution mechanisms, like auctions, lotteries, and voluntary contributions, see Morgan and Sefton (2000), Duncan (2002), Lange, List, and Price (2007), Orzen (2008), Corazzini, Faravelli, and Stanca (2010), Duffy and Matros (2013) amongst others. These studies explore private provision of public good and optimize an individual participant’s contribution. In the context of lotteries, which is the focus of this study, the optimization of an individual participant’s contribution, is akin to determining the optimal number of tickets from within the problem. Studies on lottery design have on the other hand, attempted to maximize collections from a lottery while drawing attention to different prize structures in a lottery; see Quiggin (1991), Walker and Young (2001) and Maeda (2008). This study differs significantly from such lottery design analyses as the focus here is exclusively on a
single-prize lottery with the prize being exogenously provided, and therefore does not deal with prize structures comprising multiple prizes of varying sizes.

There have been few prior studies that have allowed the MPCR to vary within a group of participants in public good games, amongst them Bliss and Nalebuff (1984) consider the private provision of a public good by a volunteer who faces a cost in providing the same, while the benefits are enjoyed by the rest of the population. Although the study differs significantly from this one, but the inclusion of cost as a motivation for a volunteer to provide (or not to provide) the public good is in some way similar to MPCR (albeit in the opposite manner), in that the authors allow for the cost to be distributed over [0, 1] rather than considering it to be constant and the same for the entire population. Additionally, Fisher et al. (1995) who conducted an experimental study of the voluntary contribution mechanism and documented the provision of the public good (in terms of aggregate contribution) when the MPCR is allowed to have a high value (0.75) for some, and low value (0.30) for others within a group of participants. The findings of this latter study are not relevant to this study as well. It is in this given context, that this study attempts to address a very basic problem faced by the organizer – namely, how many tickets should be issued for sale?

This paper provides, under certain conditions, a theoretical response to the organizer’s problem in conducting a fixed-prize lottery for public good provision regarding how many tickets should be issued for sale, considering that the organizer has no knowledge of the marginal per capita return to a participant from the provision of the said public good. This study proposes the conditions under which a participant decides how many tickets to buy. The study then describes the optimal number of tickets that the organizer should issue for sale.

References


