

# How Good is a Two-Party Election Game?

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## Abstract

In this talk, we introduce simple and intuitive models to investigate the efficiency of the two-party election system, especially regarding the nomination process. Each of the two parties has its own candidates, and each of them brings utilities for the people including the supporters and non-supporters. In an election, each party nominates exactly one of its candidates to compete against the other party's. The candidate wins the election with higher odds if he or she brings more utility for all the people. We model such competition as a two-party election game such that each party is a player with two or more pure strategies corresponding to its potential candidates, and the payoff of each party is a mixed utility from a selected pair of competing candidates.

By looking into the three models, namely, the linear link, Bradley-Terry, and the softmax models, which differ in how to formulate a candidate's winning odds against the competing candidate, we show that the two-party election game may neither have any pure Nash equilibrium nor a bounded price of anarchy. Nevertheless, by considering the conventional egoism, which states that any candidate benefits his/her party's supporters more than any candidate from the competing party does, we prove that the two-party election game in both the linear link model and the softmax model always has pure Nash equilibria, and furthermore, the price of anarchy is constantly bounded.

We will also talk about extensions of the election game, such as policy making, project proposal, etc., in terms of competition of two entities.