

Simultaneous Equations  
with Non Closed-form Distribution  
and Error Decomposition,  
with Application to Incumbency Advantage \*

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**Abstract**

In estimating incumbency advantage and campaign spending effect, simultaneity bias is present. In order to solve it, my model explicitly takes into account “analyst’s error” which analysts do not know but players know. Estimation by Markov Chain Monte Carlo, especially data augmentation, enables us to integrate analyst’s error out and employ a non closed-form likelihood function, which is the joint distribution of the five endogenous variables: vote margin, both parties’ campaign spending and candidate quality. I derive equilibrium of my game-theoretical model and plug it into my statistical model. I show superiority of my model compared to a conventional estimator by Monte Carlo simulation. Empirical application of this model to the recent

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U.S. House election data demonstrates that, as suspected, incumbency advantage is smaller, defender's campaign spending effect is larger and positive, and challenger's campaign spending effect is smaller than previously shown.