Business Application of Agent-Based Simulation: Complex and Dynamic Interactions of Motion Picture Market

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Abstract

Movie is naturally a new product and has short life-cycle from one week to several months. With huge initial investment and high uncertainty of the market performance, all constituents of the movie supply chain, from a writer with an idea to theater managers with screens to allocate, face very difficult decision problems. Given a movie to sell, a distributor has to decide how much marketing budget to spend, when to release it, how many screens to secure. These decisions should be based on the projected market performance, which, in turn, would be influenced by the decisions themselves and many other uncontrollable factors, notably the early performance of the movie itself.

Existing literature ranges from simple statistical forecasting models to a complex dynamic Markov chain model with behavioral parameter estimation. Some agent-based models have been proposed to describe the near-chaotic market behavior in terms of market share change. To our knowledge, no existing model is comprehensive enough to be useful for decision makers in motion picture industry. In agent-based simulation community, there is a tendency to prefer simple models. From practitioners' viewpoint, however, it does not help much to confirm the fact that the market is too complex and anything is possible. In this paper we expand the scope of the movie market model by including diverse sources of movie quality information and competition effect.

A movie is a cultural product, the quality of which can only be determined by experiencing, and therefore subjective. When a moviegoer has to decide whether she goes to a particular movie or not, however, she needs at least some information on the movie quality. The consumers receive information of movie quality and attractiveness from diverse sources: expert critique reviews; suppliers' marketing signals including theater trailers, previews, and advertisements; initial box office performances; and words of mouth (WOM) from friends. The quality information distribution is not

uniform across the market. Some can be considered as universal and some can be partially available, and WOM is local. Also the contents can be contradictory. A moviegoer exposed to the information and with her own preference and constraints, has to decide what to do. She cannot go to all the attractive movies in a limited time period, where comes in the competition effects. We model the complex consumer decision behavior using agent-based simulation.

The simulation experiments were carried out in two ways. First we developed a baseline model and tried several scenarios to examine the propositions suggested in existing researches of motion picture industry. Second, we estimated the model parameters from actual movie data, and then we compared the actual and projected market performances. Several interesting results followed. We discuss the impacts of inherent movie quality, WOM, critique reviews, and marketing efforts to movie performances contingent upon the market competition. Next we discuss the strategic implications for movie distributors regarding to marketing intensity and release timing. Finally, the empirical validation using Korean market data show that the model generates quite close projections for both opening market shares and final market shares for four different data sets.

The model discussed in this paper is one focusing on the complex consumer dynamics. When applying agent-based simulation to a real and complex decision situation, it is more important that every additional variable and agent should be justified by increased insights and relevance. We discuss the issues by comparing model results and existing literature. Discussion on the model extension to add the theater objects and overlapping release strategies will close the paper.