Dynamic Duopolistic Competition with Market Capturing Opportunities

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Extended Abstract

In this paper, we apply a stochastic model to a situation of price competition between duopolists. We look at the situation in which a price reduction not immediately leads to a capturing of the entire market and an increase in immediate profits, as is the case in a traditional Bertrand model. Instead, we assume that in the one shot situation, a lower price directly causes lower profits, as firms are not immediately able to attract more consumers. However, setting a lower price than the opponent leads to a certain probability of increasing the market share in the next period. This way, lowering price can be seen as a short term investment with an uncertain, but possibly positive long term outcome. This situation is one that can be observed in real market situations and can be explained by economic theories like consumer loyalty, switching costs, word-of-mouth or demand stickiness.

The model we use is a stochastic game, with transition probabilities between the states, depending on the actions performed in each state. We allow differences between states in the number of firms or actions, and we also allow states to be absorbing. The model's parameters can be chosen in such a way that a variety of economic situations can be analyzed. No assumptions about homogeneity or heterogeneity of the products have to be made, as the effects of price differences can be included in the model's state payoffs and transition probabilities directly. The model can therefore be seen as a generalization of the standard repeated game framework to a stochastic game in which oligopolists may find themselves in a dynamically changing situation dependent on their actions. We use known methods and techniques from the stochastic game framework to analyze the equilibria of the different parameter settings.

We derive results for the model with three states and five states. Firms act in competitive states that are repeated with certainty as long as firms choose similar actions but they might go to different a different state when they choose different actions. We are able to fully derive analytical results for the three states situation. A complete equilibrium specification is provided with the following interesting results. If firms are very much focused on the short term, the only equilibrium is one in which both play the passive strategy (collusion). If the firms instead have

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high discount factors, the only remaining equilibrium is one in which they play aggressively. For average discount factors, a variety of (a)symmetric pure and mixed equilibria are found. Even strategies under which monopoly and bankruptcy will arise with probability 1 in the long run can be sustained in such a stationary equilibrium. Interestingly, these different forms of behavior are a direct consequence from the parameter settings in our model and are realized in an equilibrium with stationary strategies. More specifically, no trigger strategies or other more sophisticated strategies need to be employed to find these extreme types of behavior. As parameter settings can be seen as indicators of market characteristics, predictions are made about the likely outcome of certain (extreme) market situations.

For the five states situation, we present numerical results using different parameter settings. We are able to provide equilibrium conditions for any kind of symmetric stationary strategy in these five states, including a collusive one in which firms always allow the market situation to go back to a symmetric state in which both firms play passively. We find that, similar to the three states situation, we always leave the strategy profile in which both firms always play the passive strategy as unique equilibrium for low discount factors, and the strategy profile in which both firms always play aggressively as unique equilibrium for high discount factors. For mixed equilibria, we look at the expected time for monopoly to arise. Predictions on the market circumstances under which firms will behave either collusively or competitively are made on the basis of our analytical and numerical results and we extend the analysis of the parameter values of the three states situation. Furthermore, we prove that if we extend the number of states to infinity, only the passive strategy equilibrium remains.