Formation of monopolies in a bipartite market

Formación de monopolios en un mercado bipartita

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Abstract

We study the formation of monopolies in a simplified economic model where two brands compete in the market, using an agent based model. Each agent represents a company that uses one of the two available brands and interacts with other companies. The brands continually improve their product in order to compete for market share. In the innovation process companies can decide to change to the other brand if the move is beneficial. There is a cost for the company if it decides to switch to the other brand, and another cost if it stays with its current brand but only upgrades to a new enhanced version of the product. Our simulations show that the system always reaches a state when all companies end using a single brand, which is equivalent to a monopoly. We study the time span needed to reach the single brand final state for different parameters of the model.

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Resumen

Estudiamos la formación de monopolios en un modelo de economía simplificada donde dos marcas compiten por el mercado, usando un modelo basado en agentes. Cada agente representa una compañía que utiliza una de dos marcas disponibles e interactúa con las otras compañías. Las marcas continuamente mejoran su producto para poder competir en el mercado. En el proceso de innovación, las compañías pueden decidir cambiar a la otra marca si esto representa un beneficio. Existe un costo para la compañía asociado con el cambio de marca, y otro costo asociado si se queda con la misma marca pero decide adquirir una nueva versión del producto. Nuestras simulaciones muestran que el sistema siempre llega a un estado donde las

compañías terminan utilizando una misma marca, lo que equivale a un mercado monopolístico. Estudiamos el tiempo requerido por el sistema para llegar al estado de monopolio para diferentes parámetros del sistema.

Introduction

Economic markets are very complex entities that display a rich variety of behaviors that result from the interaction of all the actors present in the economy; in fact, they are one of the classic examples in complexity theory. The use of models and computer simulations helps to shed some light in the underlying causes that create the market forces and can be used as a tool for decision making. Many economic problems can be studied with this technique, for example the shape and distribution of price changes (Ghashghaei, Breyman, Peinke, Talkner, & Dodge, 1996), portfolio selection and optimization (Baviera, Pasquini, Serva, & Vulpiani, 1998; Venegas Martínez & Rodriguez Nava, 2009), the distribution of wealth (Burda et al., 2002; Hayes, 1990) and financial market models (Bouchaud & Cont, 1998; Caldarelli, Marsili, & Zhang, 1997; Mosqueda Almanza & Guillén, 2012), among other subjects.

Competition can be found not only in economics but also in several disciplines. The first theoretical studies on competition were those devoted to population dynamics that investigated the competition of two species sharing the same ecosystem using the well-known Lotka–Volterra equations (Murray, 2002; Neal, 2004). In fact, the same methodology with little modifications has been extrapolated to study economic and financial problems (Kim, Lee, & Ahn, 2006; Michalakelis, Sphicopoulos, & Varoutas, 2011; Wijeratne, Yi, & Wei, 2007). In addition to Lotka–Volterra equations and other types of differential equation systems (Dubois & Jodar-Rosell, 2010; Guha & Chowdhury, 2013), competition in the economy has been recently studied using computer simulation models (Carpenter & Lehmann, 1985; Tousi, Ghazanfari, & Makui, 2015). However, there is little research on competition using the technique of agent-based models (Chiappori & Salanie, 2008; Fu & Szeto, 2009; Saracco, Di Clemente, Gabrielli, & Pietronero, 2015). Simulation with agent-based models is a powerful method that allows the researcher to fine-tune the characteristics of the agents (companies, traders etc.) and of the interactions among them and is well suited to the study of the rivalry in an economy.

This paper deals with several basic concepts that will be defined before we go on. The monopoly, which arises in our simulations, is a situation where a person or enterprise is the only supplier of a particular good or service; therefore there is a lack of economic competition which may result in a high price well above the marginal cost of the good or service that results in a high monopoly profit (Friedman, 2002). Monopolistic competition is a type of imperfect competition where several producers sell products that are differentiated from one another (e.g. cereals) and hence are not perfect substitutes (Krugman & Obstfeld, 2008). An oligopoly is a market dominated by a few sellers (oligopolists) that can lead to reduced competition and higher prices for consumers. A duopoly is a specific type of oligopoly where only two producers exist in a market.

In this paper we are interested in the study of brand competition in a bipartite market. We focus our study on industries where there is a large number of companies that have access to a