Dynamic price competition market for retailers in the context of consumer learning behavior and supplier competition: Machine learning-enhanced agent-based modeling and simulation

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ABSTRACT

This study analyzes the impact of consumer learning behavior and supplier price competition on retailer price competition in a complex adaptive system. Using machine Learning-enhanced agent-based modeling and simulation, the study applies fuzzy logic and genetic algorithms to model price decisions, and reinforcement learning and swarm intelligence to model consumer behavior. Simulations reveal that different learning behaviors result in different retailer competition patterns, and that supplier price competition affects the strength of retailer price competition. Simulation results demonstrate that consumer learning behavior influences retailer competition, with self-learning consumers leading to higher-priced partnerships, and collective-learning consumers leading to a shift in price competition among retailers. In contrast, perfect rationality consumers result in low-price competition and the lowest average margin and profit. Additionally, the competitive price behavior of suppliers impacts retailers' price competition patterns, with supplier price competition reducing retailer price competition in the perfect rationality consumer market and enhancing it in the self-learning and collective-learning consumer markets, leading to lower average prices and profits for retailers. This study presents a simulated market for price competition among suppliers, retailers, and consumers that can be expanded by subsequent scholars to test related hypotheses.

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