

# **Dynamic Adjustment of Price Caps Based on Demand Fluctuations in Multi-Stakeholder Markets**

**Taisei Hishinuma**

Graduate School of Engineering, Kanagawa University  
3-27-1 Rokkakubashi, Kanagawa-ku, Yokohama, Kanagawa 221-8686, Japan  
r202570180ui@jindai.jp

**Kimitoshi Sato**

Faculty of Engineering, Kanagawa University  
3-27-1 Rokkakubashi, Kanagawa-ku, Yokohama, Kanagawa 221-8686, Japan  
k-sato@kanagawa-u.ac.jp

## **Abstract**

In recent years, dynamic pricing (DP), which enables firms to adjust prices flexibly, has been increasingly adopted across various industries due to technological advancements and changing market conditions. However, concerns over consumer backlash and mistrust—often driven by perceptions of unfairness—have prompted the establishment of regulatory frameworks, leading to a growing number of cases in which price caps are implemented. This study proposes a method for determining price caps in DP with the objective of maximizing social welfare, defined as the sum of consumer surplus and firms' profits, within a business environment involving three key stakeholders: consumers, vendors, and service providers. First, vendors design optimal pricing algorithms to maximize their revenue and share them with service providers. The service providers then use these algorithms to set price caps that mitigate customer attrition while aiming to maximize social welfare. This process is modeled as a Stackelberg game, which allows for the theoretical derivation of optimal price caps. Furthermore, the study introduces an extended model that dynamically adjusts price caps based on sales performance, suggesting that such adjustments can enable flexible pricing without significantly compromising vendor profitability during periods of high demand. Numerical experiments are conducted to validate the effectiveness of the proposed model and to examine the significance and challenges of implementing price caps for sustainable business operations.

## **Keywords**

Dynamic pricing, Price cap, Stackelberg Competition.

## **Biographies**

**Taisei Hishinuma** is a master's student at the Graduate School of Engineering, Kanagawa University. His research focuses on management engineering and revenue management.

**Kimitoshi sato** is an associate professor at the faculty of engineering Kanagawa University. He received his PhD degrees in Mathematical Sciences and Information Engineering in 2010 from Nanzan University. His research interests include revenue and pricing management, supply chain management and real options.