A Stochastic Differential Game Approach to Optimal Regulatory Policy in Dynamic Oligopolistic Markets

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Abstract. This paper explores the development of a stochastic differential game model to optimize regulatory policies in dynamic oligopolistic markets. By integrating advanced mathematical frameworks, we address the instability and non-cooperative behavior prevalent in such markets. Our model offers a novel methodological advancement by incorporating real-time data analytics, providing regulators with actionable insights to mitigate market volatility. Simulations demonstrate the model's efficacy in enhancing market stability and fostering competitive equilibrium.

Keywords: stochastic differential games, regulatory policy, oligopolistic markets, market stability, competitive equilibrium

Introduction

The complexity of modern oligopolistic markets presents significant challenges for regulatory authorities aiming to foster competition while mitigating inefficiencies. These markets, characterized by a limited number of large firms, often experience volatility due to strategic interactions that influence price setting, production levels, and market entry barriers. As global concerns about market power concentration and economic sustainability rise, understanding the nuances of regulatory policy becomes crucial. Recent advancements in stochastic modeling provide an unprecedented opportunity to refine regulatory approaches. This paper introduces an innovative stochastic differential game model designed to optimize regulatory interventions in oligopolistic environments. Our approach integrates cutting-edge mathematical techniques with real-time data analytics, enabling regulators to anticipate strategic moves by firms and adjust policies dynamically. The document is structured as follows: Section 2 details the theoretical underpinnings of the

stochastic differential game framework. Section 3 presents the model's application to a case study of a representative oligopolistic market. Section 4 discusses the implications of our findings for regulatory policy development. Finally, Section 5 offers conclusions and avenues for future research.

References

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