Addressing The Nonlinear Dynamics of Inflationary Pressure on Global Supply Chains: An Optimal Control Framework

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Abstract. The study explores the nonlinear impact of inflationary pressures on global supply chains, employing a sophisticated optimal control framework. By leveraging advanced econometric modeling, the research identifies critical parameters influencing supply chain disruptions. Findings suggest targeted policy interventions can stabilize market fluctuations, ensuring supply chain resilience. The paper's insights contribute to existing economic literature by providing a quantitative analysis of inflation's role in supply chain dynamics.

Keywords: Inflationary Dynamics, Supply Chain Resilience, Optimal Control Framework, Econometric Modeling, Global Trade, Market Fluctuations, Policy Interventions

Introduction

Inflationary pressure has emerged as a paramount challenge in the global economy, significantly impacting supply chain dynamics and posing intricate challenges for policymakers and businesses alike. In recent years, fluctuations in inflation rates have disrupted supply chains, leading to inefficiencies and increased operational costs. The problem is exacerbated by globalization and the interdependencies in international trade, where inflation in one region can have ripple effects across the globe. This paper aims to address this critical issue by developing an optimal control framework to model the nonlinear dynamics of inflationary pressure on global supply chains. The optimal control framework provides a robust tool for understanding how inflation interacts with economic variables such as interest rates and exchange rates, influencing supply chain stability. By utilizing high-frequency data and employing advanced econometric techniques, this study offers a comprehensive analysis of inflation's role in supply chain disruptions. The findings will inform policymakers and business leaders on the optimal strategies to mitigate the adverse effects of inflation, ensuring more resilient and efficient supply chains. The structure of the paper is as follows: Section 2 reviews the existing literature on inflation and supply chain dynamics. Section 3 elaborates on the methodology and data used in the analysis. Section 4 presents the empirical results and discusses their implications. Finally, Section 5 concludes with policy recommendations and potential areas for future research.

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