DYNAMICS OF REGIONALIZATION IN JET-FUEL MARKETS: EVIDENCE FROM GLOBAL SHOCKS

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Overview

This study explores how global shocks influence the regionalization of jet fuel markets, focusing on structural changes in market integration. Global events such as the COVID-19 pandemic and the Russia-Ukraine war have disrupted supply chains, leading to regionalized market dynamics. Drawing on Vina and Liu (2023), who explain how global shocks temporarily fragment supply chains, and Shrestha and Sato (2021), who demonstrate that economic structures mediate the effects of such shocks, this study examines the mechanisms by which global disruptions foster localized behaviors. By analyzing four distinct periods of global shocks, the research evaluates their impact on jet fuel market structures and provides actionable policy recommendations. These insights are particularly relevant for air-freight-dependent nations like South Korea, where resilience against global supply disruptions is essential for economic stability.

Methods

This study analyzes monthly jet fuel price data from four markets—Northwest Europe (Rotterdam), Mediterranean Europe, the U.S. Gulf Coast, and Singapore—spanning October 2001 to August 2024. The price data for the Gulf Coast market is sourced from the U.S. Energy Information Administration (EIA), while data for Rotterdam, Mediterranean Europe, and Singapore is obtained from the International Energy Agency (IEA) Oil Market Report. The data is divided into four periods aligned with major global shocks:

Period 1 (2001–2006): Rapid Economic growth in China and India driving global oil demand.

Period 2 (2007–2013): The global financial crisis and the early stages of the shale revolution.

Period 3 (2013–2017): Oversupply and low oil prices induced by the shale revolution.

Period 4 (2019–2024): COVID-19 pandemic and Russia-Ukraine war.

This analysis builds on the methodological frameworks of Heo et al. (2007), which employed cointegration (Johansen, 1991) and causality tests (Engle & Granger, 1987) to analyze market regionalization. The Vector Error Correction Model (VECM) is applied to evaluate both short-term dynamics and long-term equilibrium relationships between markets. The following Vector Error Correction Model (VECM) represents the applied framework:

$$\Delta price_t = \Pi price_{t-1} + \sum_{i=1}^{k-1} \Gamma_i \Delta price_{t-i} + \epsilon_t$$

Granger causality tests assess short-term directional influences between markets, identifying whether past values of one market price (x_t) improve preidictions of another market price (y_t):

$$y_t = \alpha + \sum_{i=1}^{p} \beta_i y_{t-i} + \sum_{j=1}^{q} \gamma_j x_{t-j} + \epsilon_t$$

Results

The analysis reveals distinct patterns of integration and regionalization. Period 1 (2001–2006) showed gradual integration driven by rising demand in China and India. Period 2 (2007–2013) marked the peak of market integration, despite the financial crisis and early shale revolution. Period 3 (2013–2017) saw regionalization emerge due to

oversupply and low prices. Period 4 (2019–2024) demonstrated intensified regionalization under external shocks, with certain market pairs lacking both long-term and short-term linkages. The US Gulf Coast consistently acted as the central hub for global stability across all periods.

Conclusions

Global shocks significantly influence the balance between market integration and regionalization in jet fuel markets. While Period 2 demonstrated the potential for synchronized global markets, later periods, particularly Period 4, highlighted the fragility of integration under external disruptions. Policymakers should enhance resilience through supply chain diversification, regional capacity building, and multilateral cooperation to mitigate the risks of regional fragmentation. For air-freight-dependent nations like South Korea, establishing robust emergency response systems and fostering international collaboration are critical to maintaining market stability and securing energy supply chains during crises.

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