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Research Paper

Investigating of Systematic Risk Contagion Effect among Industries listed in Tehran Stock Exchange: the Tail Event Driven Network[1]

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INTRODUCTION

The Tehran Stock Exchange and its associated industries have been susceptible to tail events in recent years, including U.S. and European sanctions against Iran and the COVID-19 pandemic. These crises have heightened interconnections among affected industries, leading to increased risk spread within the financial system. During crisis episodes, risks are rapidly transmitted among industries through a contagion mechanism, resulting in fluctuations across the entire system. Consequently, promoting financial stability has become a priority for regulators and academic researchers. Analyzing systemic risk contagion and tail risk interconnectedness among industries is crucial for enhancing the stock market's safety and developing relevant macroprudential policies.

While the stock market serves a vital role in resource allocation and price discovery, the Tehran Stock Exchange remains relatively immature, posing a higher

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risk of contagion throughout the entire market. For instance, the collapse of stock price bubbles in the Tehran Stock Exchange in the past two decades led to significant investor losses and subsequent economic downturns. This financial turbulence underscores the importance of measuring systemic risk within the stock market.

Interconnections among industries in a network imply that shocks in one industry can propagate risk transmission to related industries, potentially causing contagion across the entire stock market. Therefore, investigating risk interrelationships among industries and identifying systematically linked industries is essential for effectively predicting systemic risks and controlling risk propagation within the stock market.

This study aims to analyze the risk interdependence among the main industries listed on the Tehran Stock Exchange, particularly focusing on the contagion effects during extreme market conditions.

MATERIALS AND METHODS

For these purposes, a tail event-driven network is constructed to analyze 29 major industries, including 196 active companies, spanning from 2019 to 2023. Specifically, the study utilizes the CoES (Conditional Expected Shortfall) as a measure of risk profile and constructs time-varying asymmetric adjacency matrices based on similarities in risk profiles between paired nodes in the network. This approach enables the investigation of contagion effects of systemic risk among industries during tail events.

To identify industries that contribute most to risk contagion, the study employs systemic risk scores and a systemic risk decomposition technique.

Furthermore, to explore the contributions of different industries in systemic risk transmission and diversification across different quantiles, the study utilizes the Tail Event-driven Network Quantile Regression Model (TENQR).

Daily closing prices of selected industries and active companies are used in this study. The calculation of Value at Risk (VaR) is performed using four systemic risk factors proposed by Fama and French (1993) and Carhart (1997).

RESULTS AND DISCUSSION

The analysis of similarity matrices and adjacency matrices reveals an increasing trend in similarities between industries from 2019 to 2023, indicating a rise in interdependence among industries over time. Notably, the Bank and Bimeh industries do not exhibit negative correlations with any other industries. Undirected graphs derived from adjacency matrices for 2020 and 2023 underscore the significant role of all industries, both financial and non-financial, in risk transmission. Systemic risk decomposition findings indicate that non-financial industries are the primary contributors to risk within the network. Specifically, industries such as Dastgahayebargi in 2018, Shimiyaee in 2019 and 2021, Chandreshtesanati in 2020, and Kashivaseramik in 2022 emerge as key contributors to risk contagion. Finally, the results from the TENQR model estimation highlight the substantial role of both financial and non-financial industries in risk transmission, suggesting that risk diversification efforts are less significant compared to risk transmission efforts across industries.

CONCLUSION

The empirical findings highlight the interdependence of all selected industries, with their risk profiles exhibiting positive correlations. This suggests that all 29 industries have contributed to risk contagion, indicating a lack of effective control over systemic risk contagion within the Tehran Stock Exchange. Particularly noteworthy is the absence of negative correlations between the Bank and Bimeh industries and other sectors throughout the sample period, indicating a deficiency in the ability of financial industries to mitigate systemic risk.

Furthermore, the risk decomposition results underscore the significant role of non-financial industries as primary risk transmitters within the network. This emphasizes the importance of regulatory authorities implementing policies to enhance legal transparency, stabilize market expectations, and bolster confidence, ultimately mitigating risk-taking behaviors.

The findings from the TENQR model further support previous conclusions, indicating that all 29 industries predominantly contribute to risk transmission rather than risk diversification.

Given these findings, regulatory authorities should prioritize understanding the relationships among systemically important industries and intervene to improve the risk transfer and diversification functions across industrial sectors. Moreover, industries can foster sustainable market value growth by enhancing innovation performance. Investors can leverage cross-industry relationships to effectively predict future price movements, enabling informed asset allocation and investment decisions.

Keywords: CoES; Industry Sectors; Network Analysis; Risk Contagion; Systemic Risk.

JEL Classification: C58, G1, G32.