

# GARCH-Copula-CoVaR를 기반으로 녹색채권에서 에너지 시장으로의 위험 전이효과 분석

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## *An Analysis of Dependence between Crude Oil Shock, Economic Uncertainty, and Investor Sentiment*

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### Abstract

This study analyzed the risk transmission effects between Green Bonds and the energy market, considering the energy transition for addressing environmental issues. The research findings are as follows:

First, according to the results of the dependence analysis between green bonds and the renewable energy market (Clean, New, SP), the dependence between green bonds and the renewable energy market is best represented by the Student's t copula model. For fossil fuel markets, dependence on WTI is observed to follow a Student's t distribution, while GAS and COAL exhibit a Clayton copula.

Second, the VaR and CoVaR analysis results demonstrate that extreme movements in Green Bonds have a significant impact on the energy market. In particular the conditional UU (UL) CoVaR values are higher than the upper VaR, and the conditional LL (LU) CoVaR values are lower than the lower VaR. This indicates that extreme risks associated with Green Bonds amplify the extreme risks in the energy market.

In conclusion this study confirms the complex dependence and risk transmission effects between green bonds and the energy market, underscoring their significance even in extreme scenarios. These findings provide valuable insights for investment strategies in the energy market and green bonds.

Keywords: Green bond, Energy market, CoVaR, Copula, Risk spillover

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