Categorical Economic Policy Uncertainties and Tail Energy Markets

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Categorical Economic Policy Uncertainties and Tail Energy Markets

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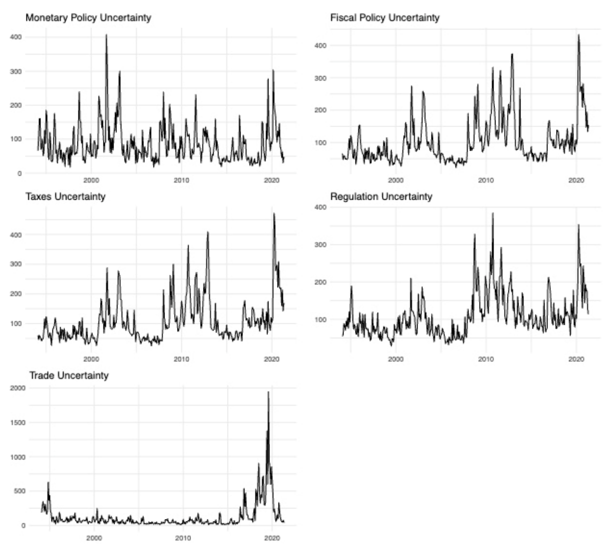
Introduction

- Energy markets often subject to extreme price fluctuations
  - Oil price (WTI) dropped by more than 300% on April 20th, 2020.
- Important to manage tail risks in energy sector
- In addition to demand/supply factors, Economic Policy Uncertainty (EPU) also plays a role in energy price volatility.
- Dr. Faith Birol, the Executive Director of the International Energy Agency, noted that *"...over 70% of global energy investments will be government-driven," and "....the world's energy destiny lies with government decisions* (IEA, 2018)."

Monthly categorical EPU, January 1994–April 2021



Objectives

- This paper investigates information transmission between US economic policy uncertainties and energy prices under extreme market conditions (tail risks)
- Examine uncertainties in monetary, fiscal, tax, regulation, and trade policies and analyze how they are linked to extreme losses (tail risk) in the US oil and natural gas markets.
- Help practitioners, regulators, and policymakers better manage energy price risks and, consequently, protect them from catastrophic losses

Methodology – 2 Steps

1) Conditional Value-at-Risk

- Tail risk - maximum potential loss in value of an asset given probability over a certain horizon.
- CAViaR proposed by Engle and Manganelli (2004) to model tail risk using quantile regression from Koenker and Bassett (1978).

$$\mathrm{VaR}(p) = \beta_0 + \sum_{i=1}^{q} \beta_i VaR_{(t-1)}(p) + \sum\nolimits_{j=1}^{r} \beta_j\, l(y_{t-j})$$

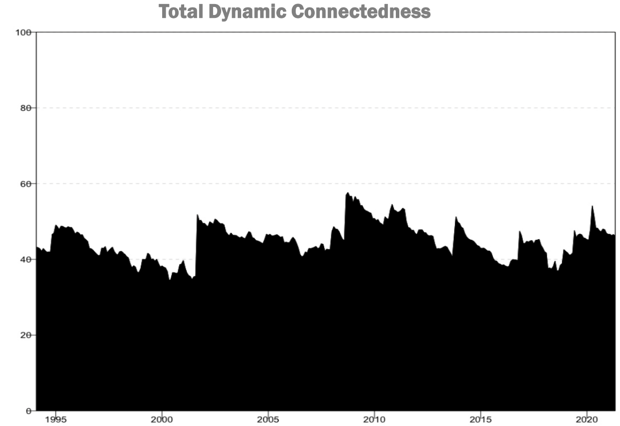
- Consider 4 models (Adaptive, Symmetric Absolute Value, Asymmetric slope, and indirect GARCH.)

2) Dynamic Connectedness

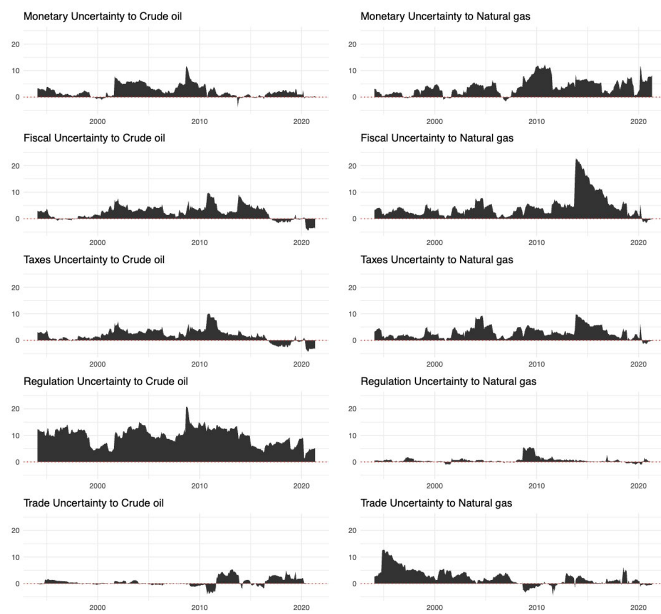
- Based on Time-varying parameter Vector Autoregressive model (TVP-VAR).
- VAR with time-varying parameters and variance-covariance matrix via a Kalman filter.
- Estimate Generalized Forecast Error Variance Decomposition (GFEVD).
  - Decomposes variance of forecast error into contributions from specific exogenous shocks – Diebold and Yilmaz (2014)
- Construct two indexes:
  1. Total system connectedness;
  2. Net pairwise directional connectedness

Results

Total Dynamic Connectedness



Dynamic Net Pairwise Directional Spillover, January 1994–April 2021



Conclusion

- Large information transmission across EPUs & energy tail risks (45%).
- Energy tail risk net receiver of information from categorical EPU.
- **Crude oil tail risk:**
  - Regulation, Fiscal and Monetary transmit the most information
  - More recently, it become a net information transmitter to Fiscal & Taxes policy uncertainties due to increment in market risks
- **Natural gas Tail Risk:**
  - Fiscal and Monetary contribute the most information
  - Largest effect between 2013-2015 - Fiscal Cliff.
- Policymakers could anticipate the impact of EPU on energy markets--mitigate turbulent moments in the energy market.

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