Market Efficiency, Quantity of Information, and Oil Market Turbulence

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This paper: Oil market efficiency

- Measuring informational efficiency: quantitative vs qualitative approaches
- Lo and MacKinlay (1988), Kim and Shamsuddin (2008): Variance-ratio test
- Duan et al. (2021), Sattarhoff and Gronwald (2022): distance from random walk as measure of informational efficiency

This paper: Macroeconomics of crude oil markets

- Bornstein et al. (2023): Structural model of the oil industry, embedded in a general equilibrium model of the world economy. How does shale oil affect global macroeconomy
- Baumeister et al. (2022): New index of global economic conditions. Application: forecast real oil prices as well as global petroleum consumption.

This paper: Measuring uncertainty

- Jurado et al. (2015): Financial and economic uncertainty: based on data-rich environment
- Baker et al. (2016): Global Economic Policy Uncertainty: based on newspaper articles

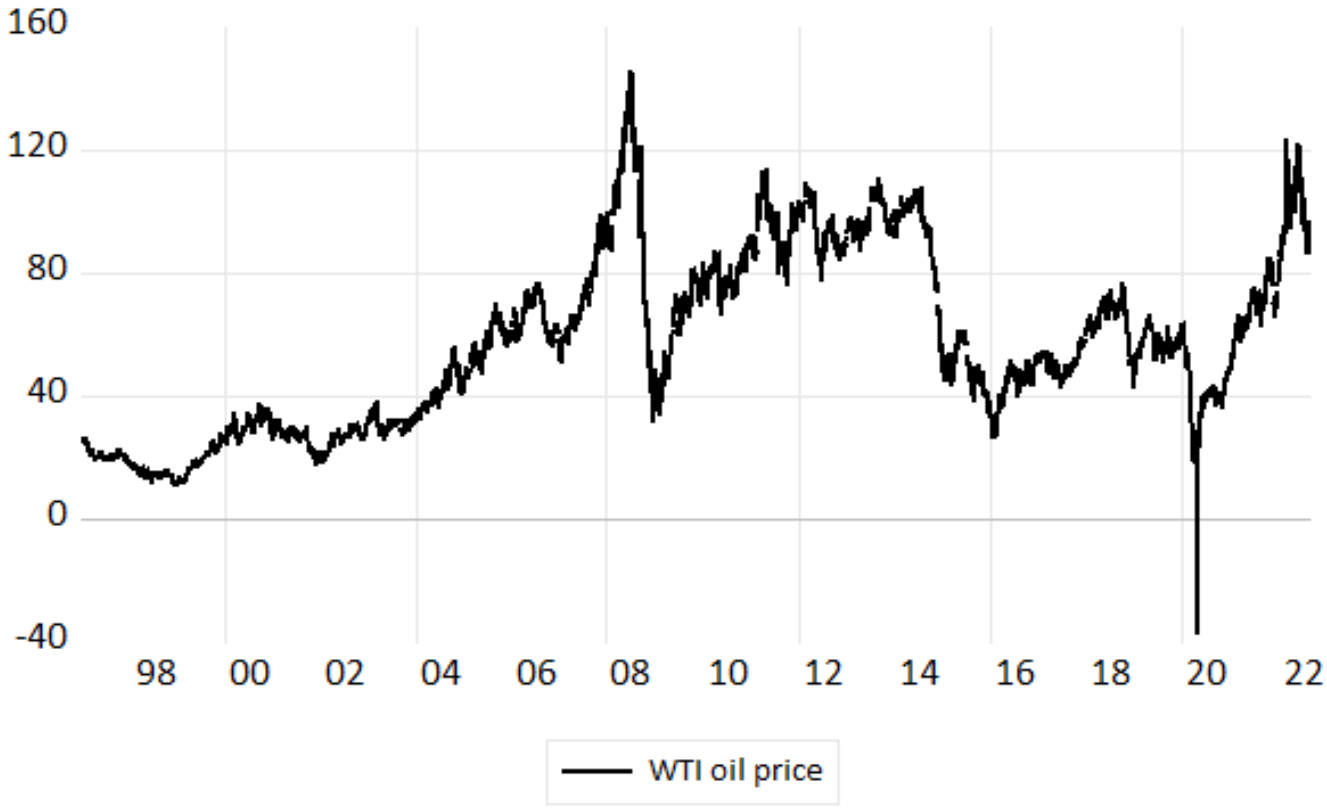
This paper: Demand for information and quantity of information

- French and Roll (1986): Stock price volatility and arrival of information
- Da et al. (2011): Google searches and investor attention
- Vlastakis and Markellos (2012): Google searches and demand for information
- Castelnuovo and Tran (2017): Google searches and uncertainty

This paper: Summary of results

- Crude oil markets are found to be more informationally inefficient during extreme episodes such as the price downturns witnessed in 2008, 2014, and early 2020
- Substantial oil price declines are rare events, but can be explained by economic fundamentals
- Proposal: interpret oil market inefficiency as oil market turbulence
- Oil market turbulence (or the drivers thereof) have negative macroeconomic effects

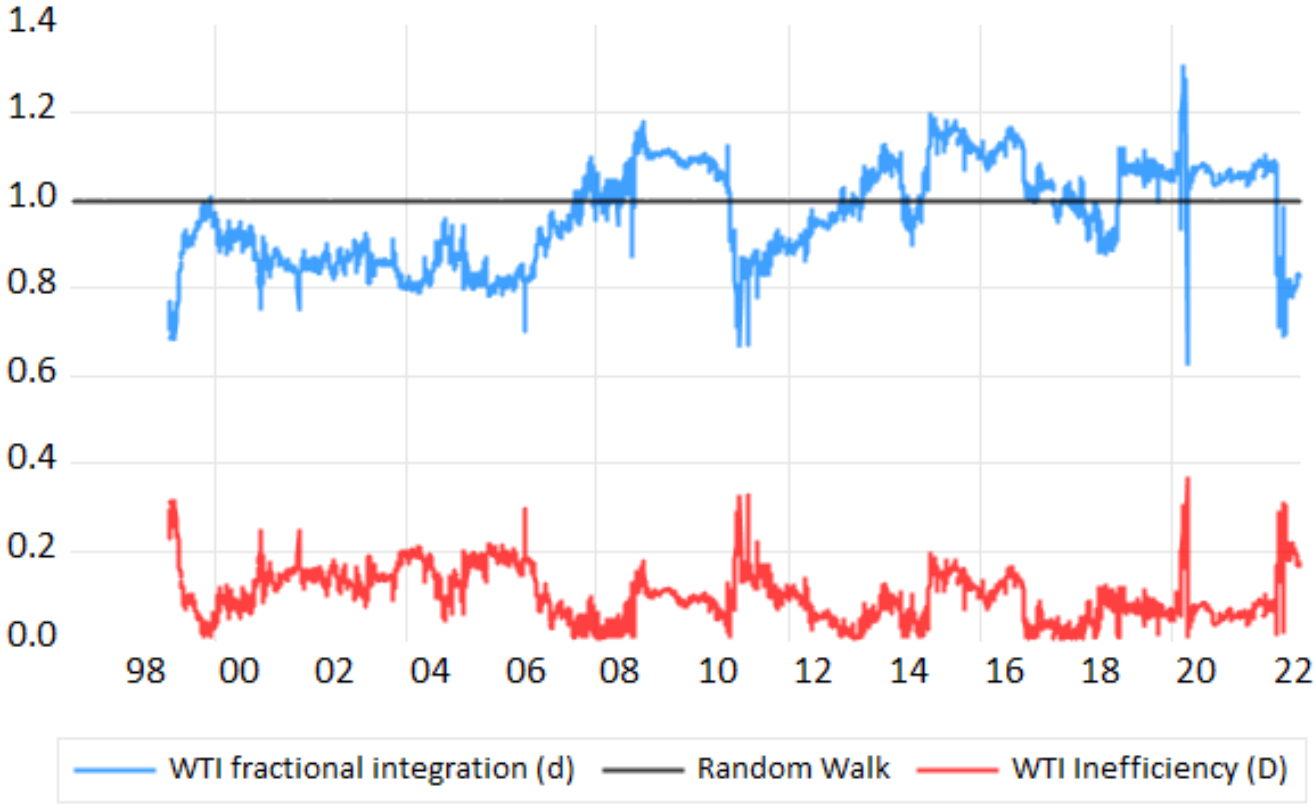
Let's take a look at the data



Dynamic efficiency

- Random walk and market efficiency
- Random walk: integrated of order 1.
- Fractional integration: integration order not restricted to integer values 0 or 1.
- Fractional integration: Long memory in time series
- Based on estimate of fractional integration parameter d, measure of market inefficiency $D = |1 - d|$
- Feasible Exact Local Whittle (FELW) Estimator, Shimotsu (2010)
- Rolling window approach: 250 observations

Results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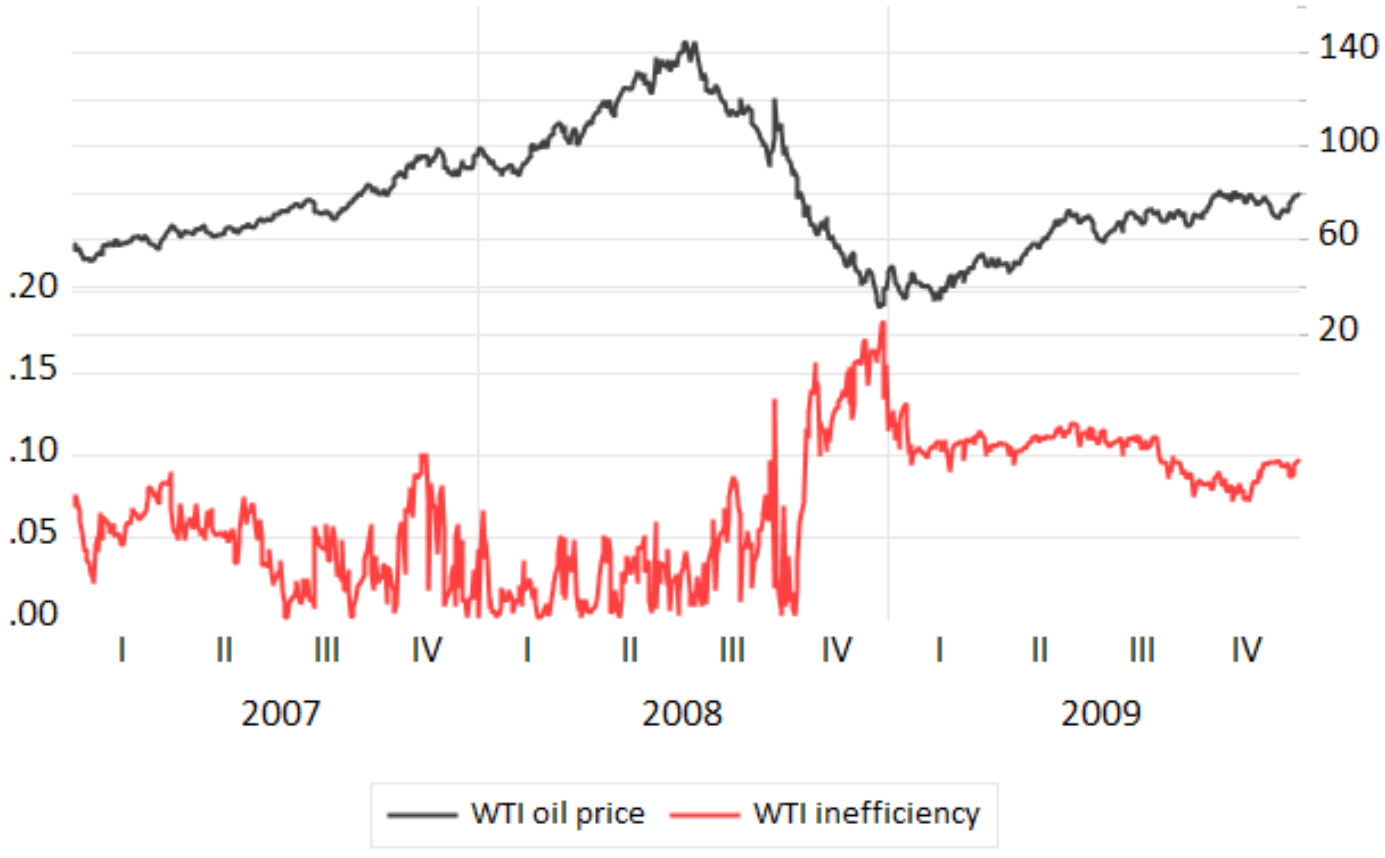
WTI fractional integration (d)
Random Walk
WTI Inefficiency (D)

Results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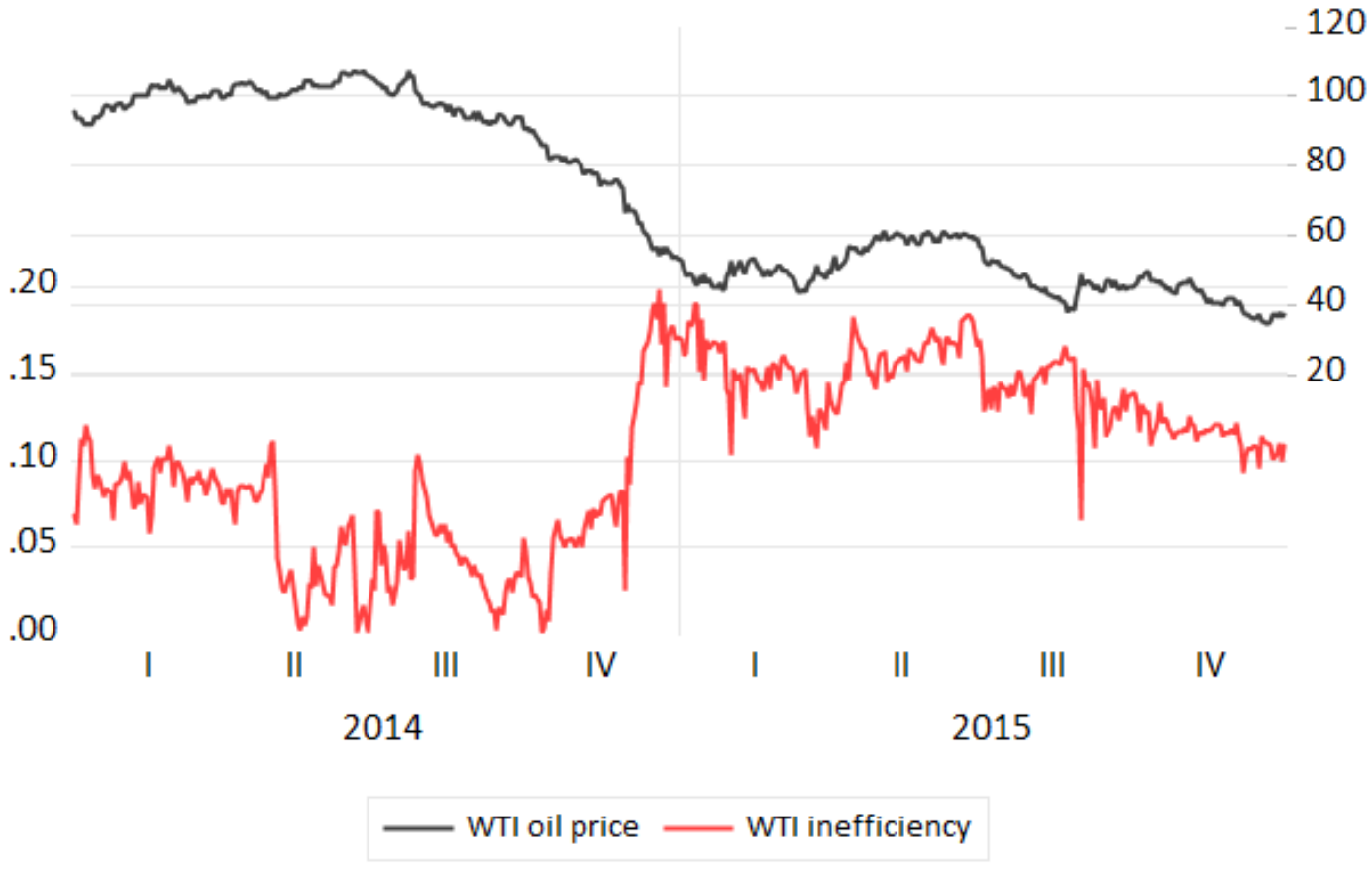
WTI oil price
WTI inefficiency

Results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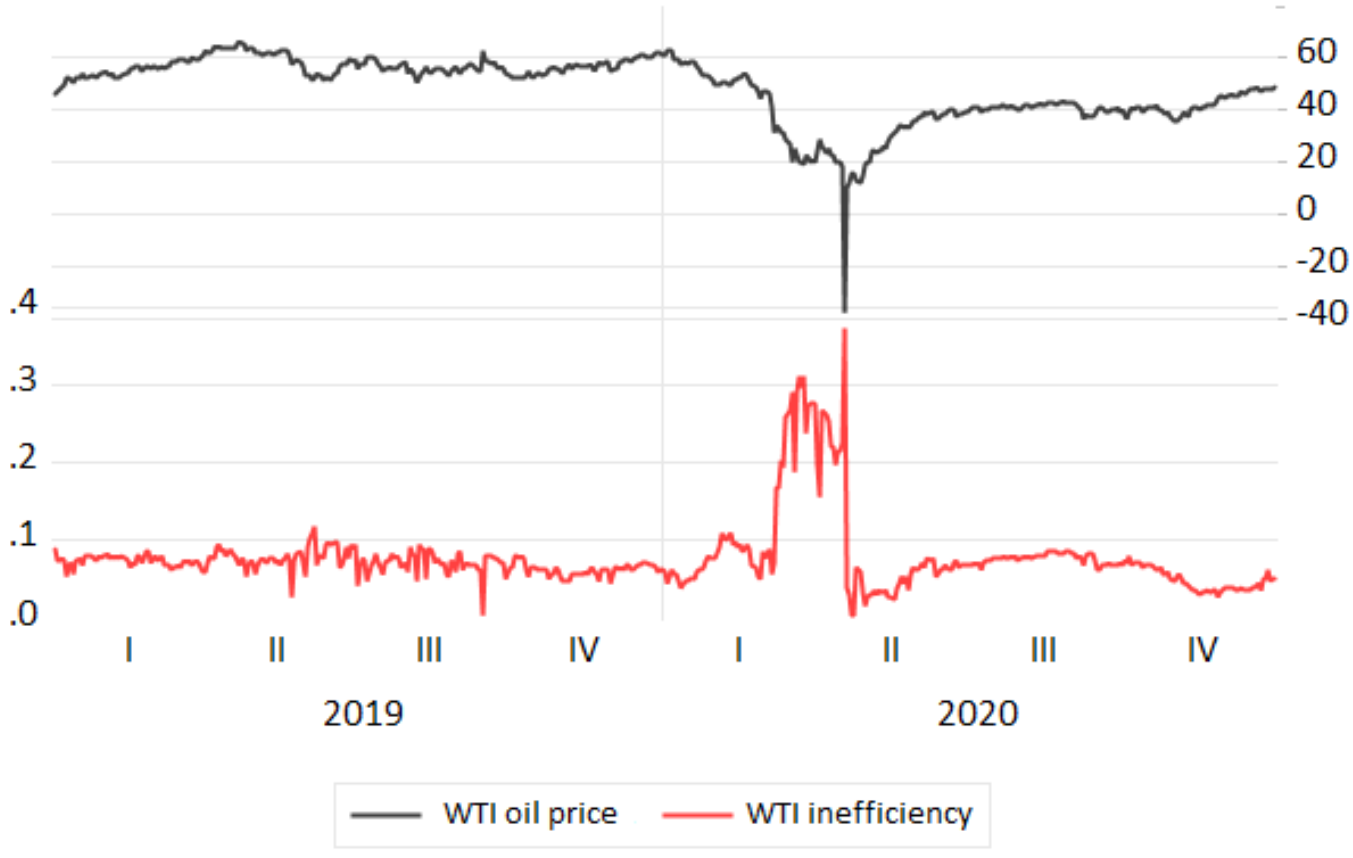
Results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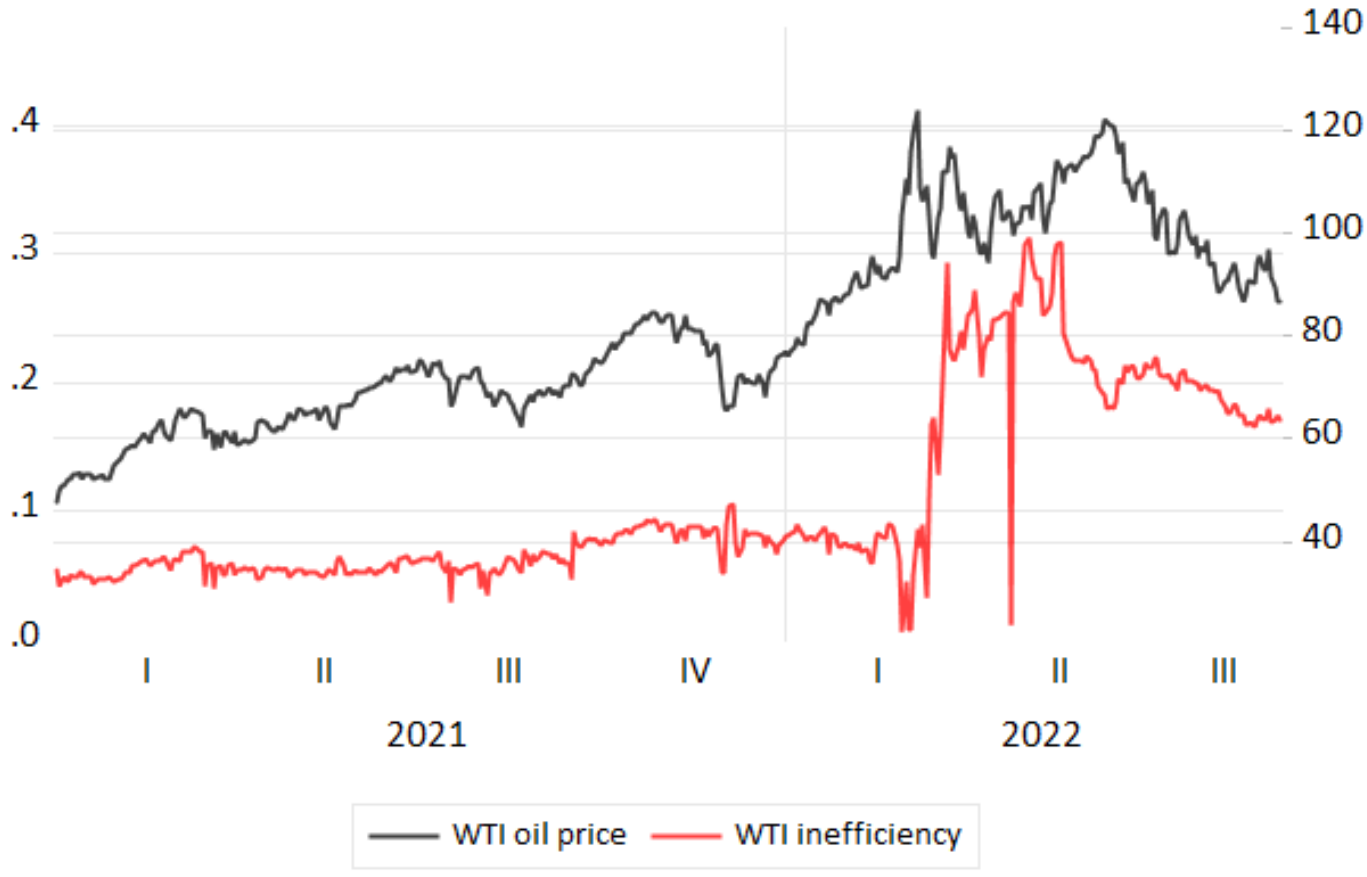
WTI inefficiency

Results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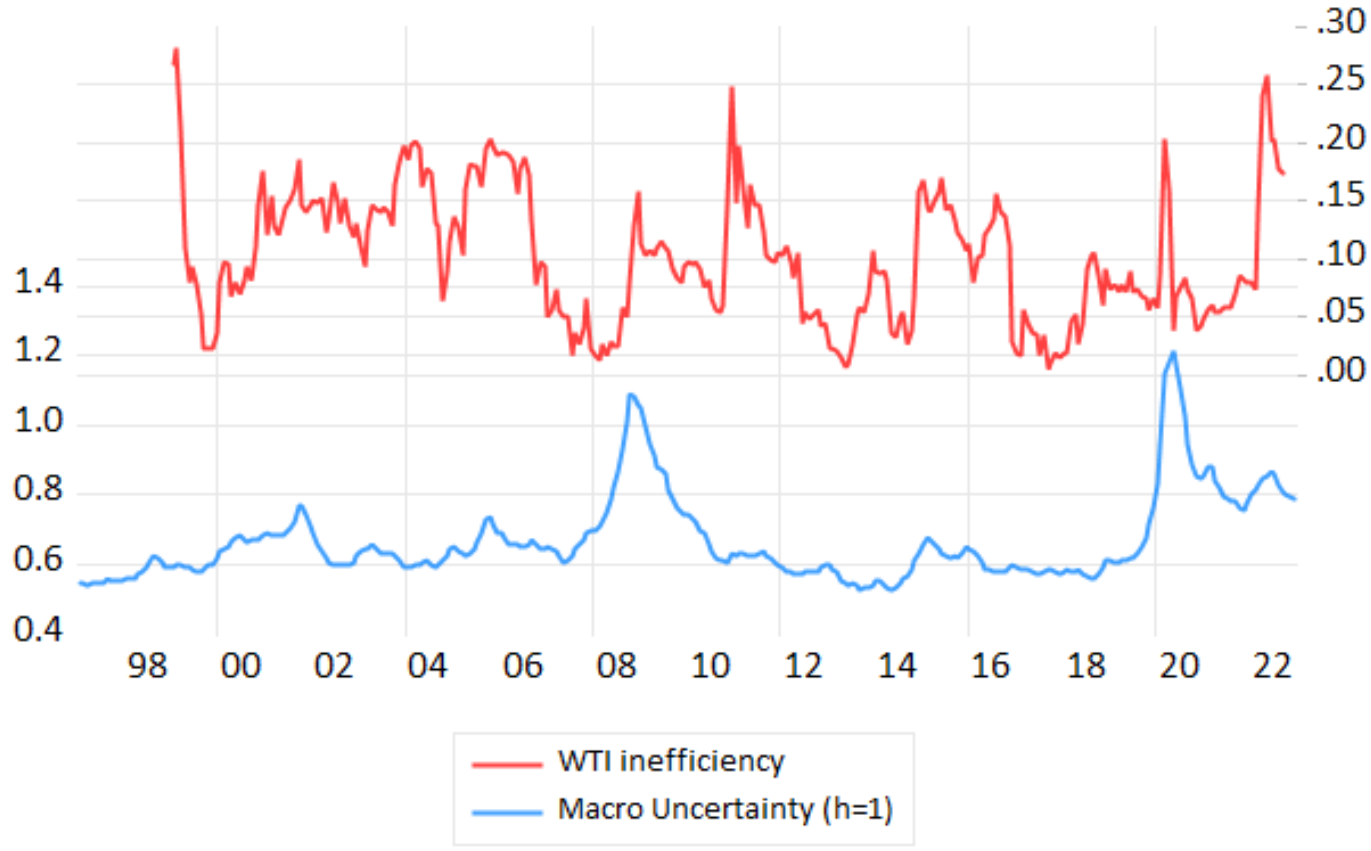
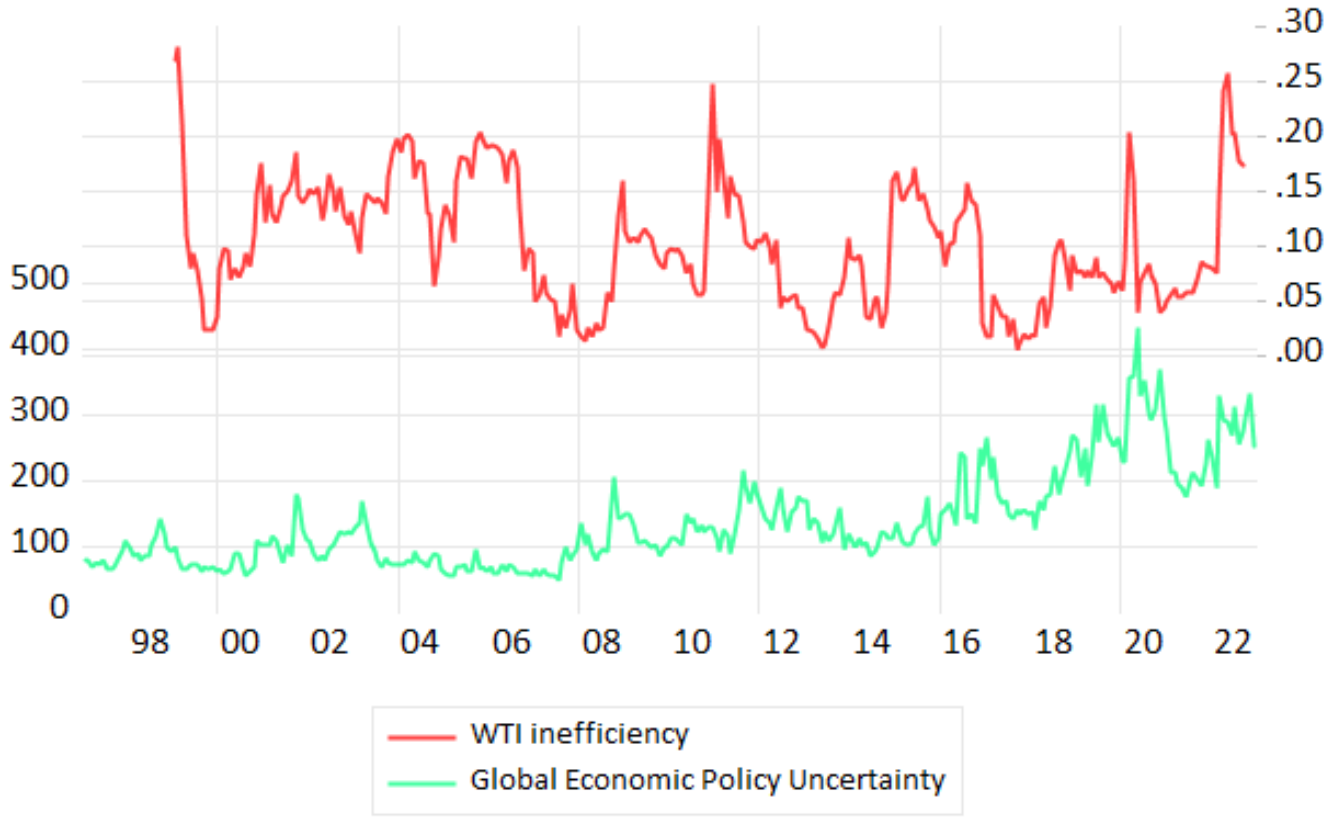
WTI oil price
WTI inefficiency

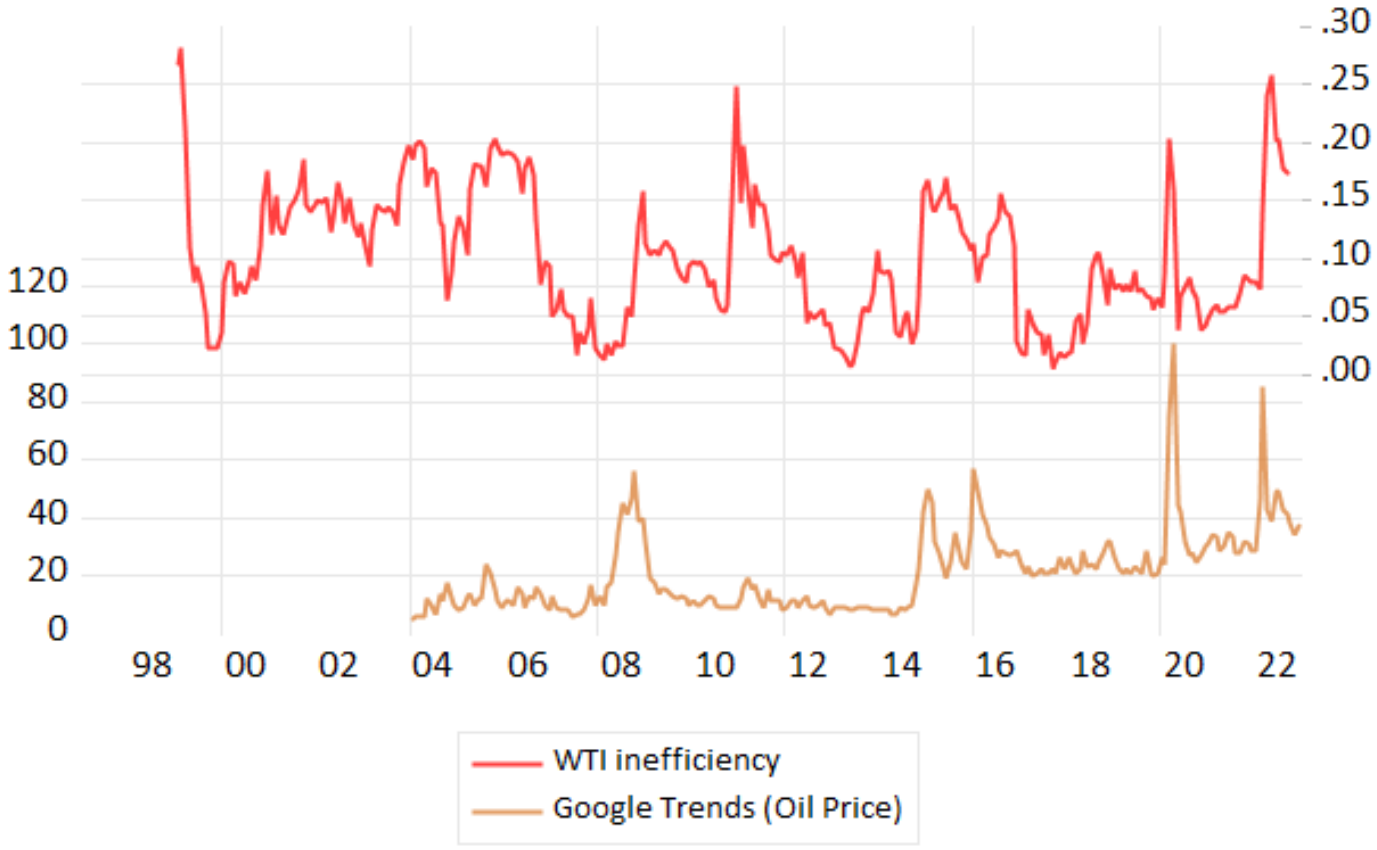
Jurado et al's (2015) Macro Uncertainty



Baker et al.'s (2016) Economic Policy Uncertainty



Demand for information



Google, Uncertainty, and Information

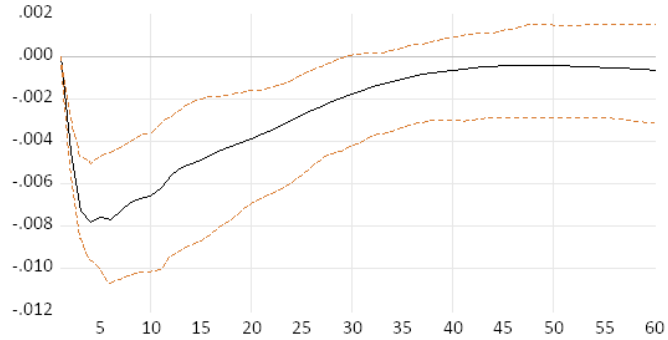
- French and Roll (1986): Stock price volatility and arrival of information
- Discusses potential link between arrival of information and increased stock market volatility
- Is there a link between arrival of information and deviation from random walk?
- During oil price downturns: more or less information?

Macroeconomics of Oil Market Turbulence

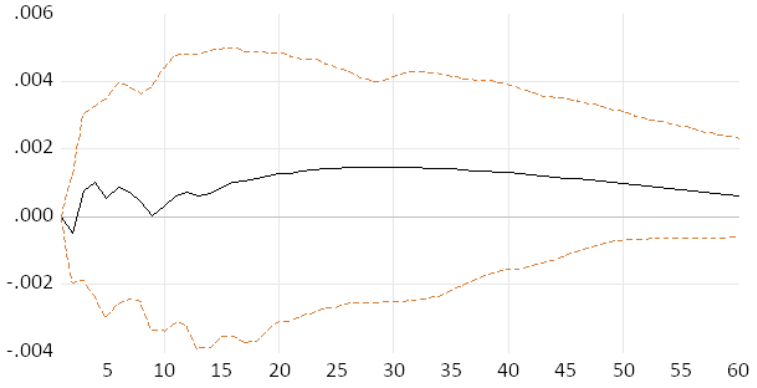
- Small version of Christiano et al.'s (2005) VAR
- Log(real IP), federal funds rate, log(S&P index), growth rate of M2
- Plus one uncertainty / demand for information / oil market turbulence measure

Macroeconomics of Oil Market Turbulence

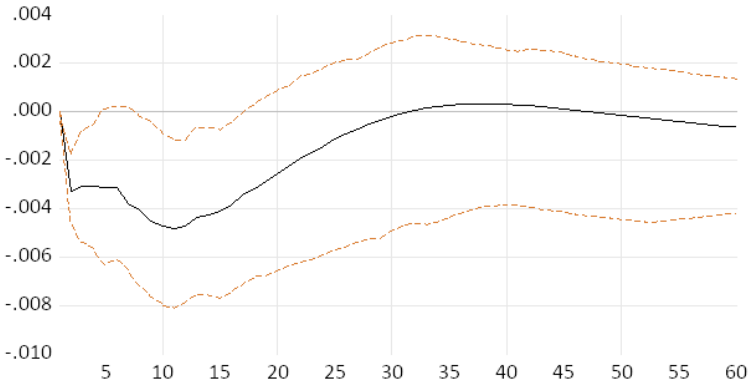
Impulse Response of Production to Shock in Jurado et al.'s (2015) Macro Uncertainty (h=1)



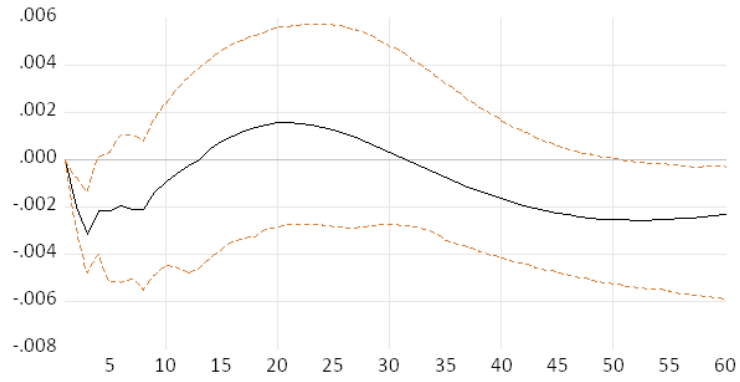
Impulse Response of Production to Shock in Baker et al.'s (2016) GEPU



Impulse Response of Production to Shock in Google Measure



Impulse Response of Production to Shock in this paper's oil inefficiency measure



Concluding remarks, not a summary

- 2014 oil price decline has been predictable
- Prior to June 2014: oil price follows random walk
- Oil price downturn: oil price deviates from random walk behavior
- Information that has been available is priced in during that period
- Crude oil markets seem to defy characterisation