

# How Does the Economic and Policy Uncertainty Affect the Crude Oil Market?

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# Motivations

- Uncertainty is a huge concern for the economy. Typical examples are 9/11 terrorism, the financial crisis etc.
- It will deter the consumption, investment and the hiring of new employees and so on. Thus, it will put pressure on the whole economy.
- Oil market is a crucial commodity market and financial market.
- Uncertainty information or fear would have big effect and influence on the crude oil market, according to the efficient market analysis.
- Therefore, I want to investigate how is the crude oil market in specific affected by uncertainty information?

# Literature review on measuring uncertainty

- Baker et al. (2016) use newspaper articles to construct an uncertainty index. They use the keywords from economic, policy and uncertainty in the newspaper to indicate the uncertainty level.
- Jurado et al. (2015) use econometric method to capture the difference between prediction and reality which reflects the uncertainty. They start from the premise that whether the economy has become more or less predictable; that is, less or more uncertain. If the expectation today (conditional on all variable information) of the squared error in forecasting  $h$ -period ahead value rises, uncertainty in the variable increases.

# Literature review on oil market

- Kilian (2009) disentangles the oil price shock to three components: crude oil supply shocks, aggregate demand shock and precautionary demand shock. Precautionary demand is triggered by uncertainty about future in many events, like wars and Iranian revolution. This is more important than the direct oil supply shocks in recent years.
- Yang (2019) finds oil price shocks have little effect on economic policy uncertainty but are significantly influenced by it. Policymakers should therefore devote more attention to economic policy uncertainty than to oil price shocks.
- Kang (2017) finds that oil price shocks explain 41% of the variation in economic policy uncertainty. The response of economic policy uncertainty is positive and statistically significant to shocks to US oil supply disruption and negative and not statistically significant to shocks to non-US oil supply disruption. To enhance domestic oil production in the US has consequences for political and economic security since positive shocks to US oil production are associated with lower US economic policy uncertainty.

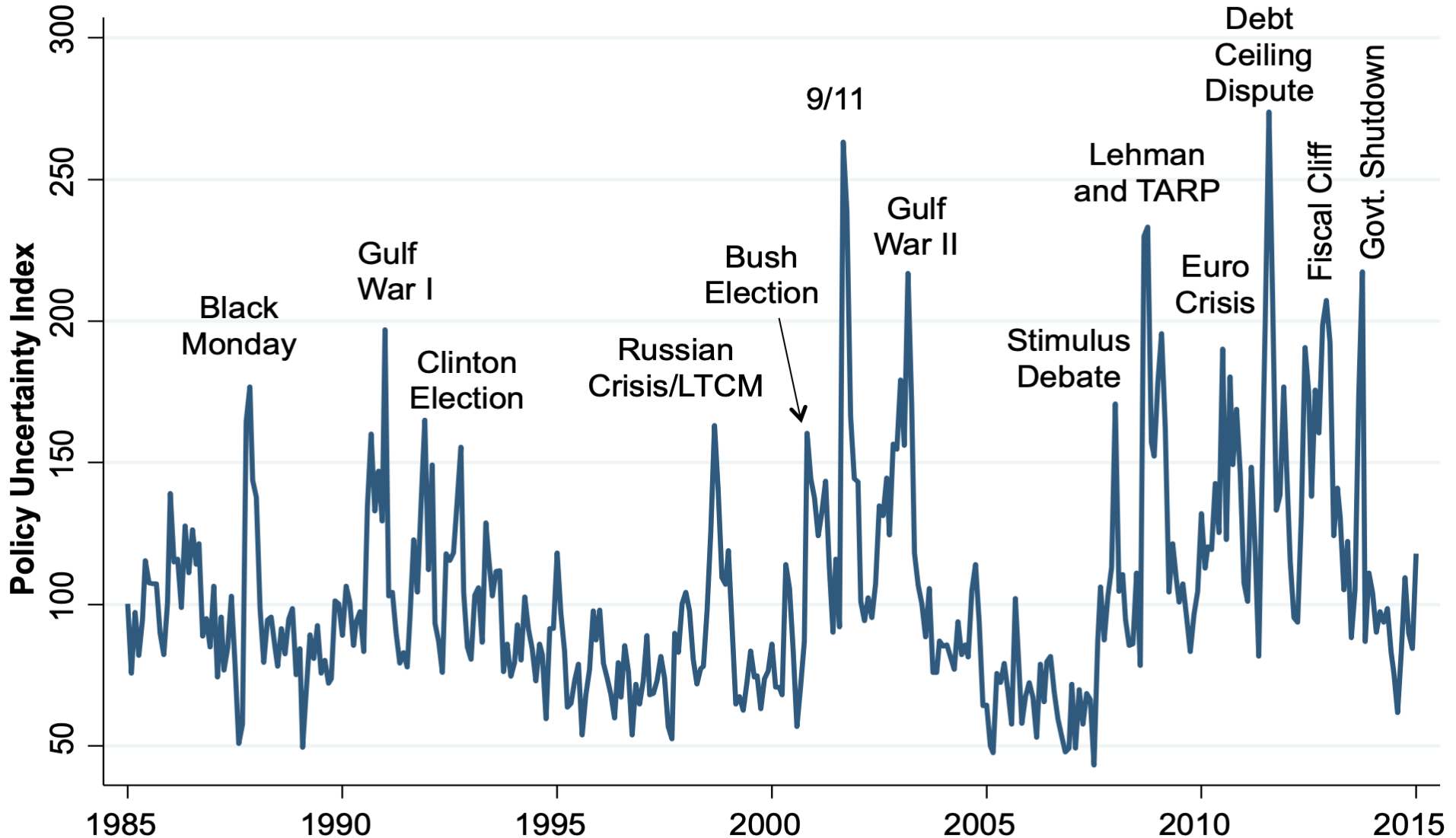
# Data

- It is difficult to measure uncertainty precisely. However, many researchers find ways to reflect it. I use 10 uncertainty indexes in this study.
- **They are** *US news-based uncertainty, US three-component uncertainty, financial stress indicator (FSI), geopolitical risk index (GPR), global economic policy uncertainty at PPP and current price level (GEPU), financial uncertainty, real uncertainty, macro uncertainty, and China economic and policy uncertainty.*
- Oil price, oil rig and oil inventory are used to represent oil market which are from EIA website. Oil rig represents the explorative activity. Other than oil production in the current literature, oil rig can follow closely to the change in uncertainty information. That is one of the new contributions of this research.

## 10 Uncertainty indexes

No.	Name of uncertainty indexes	Source
1	US news-based	Baker et al. 2016
2	US three components	Baker et al. 2016
3	Financial stress indicator	Based on method of Baker et al. 2016, By Lukas Puttmann.
4	Geopolitical risk index	Based on method of Baker et al. 2016, By Dario Caldara and Matteo Lacoviello.
5	Global economic policy uncertainty PPP	Baker et al. 2016.
6	Global economic policy uncertainty current price	Baker et al. 2016
7	China economic and policy uncertainty	Based on method of Baker et al. 2016. By Steven J. Davis, Dingqian Liu and Xuguang S. Sheng
8	Real uncertainty	Jurado et al. 2015
9	Macro uncertainty	Jurado et al. 2015
10	Financial uncertainty	Jurado et al. 2015

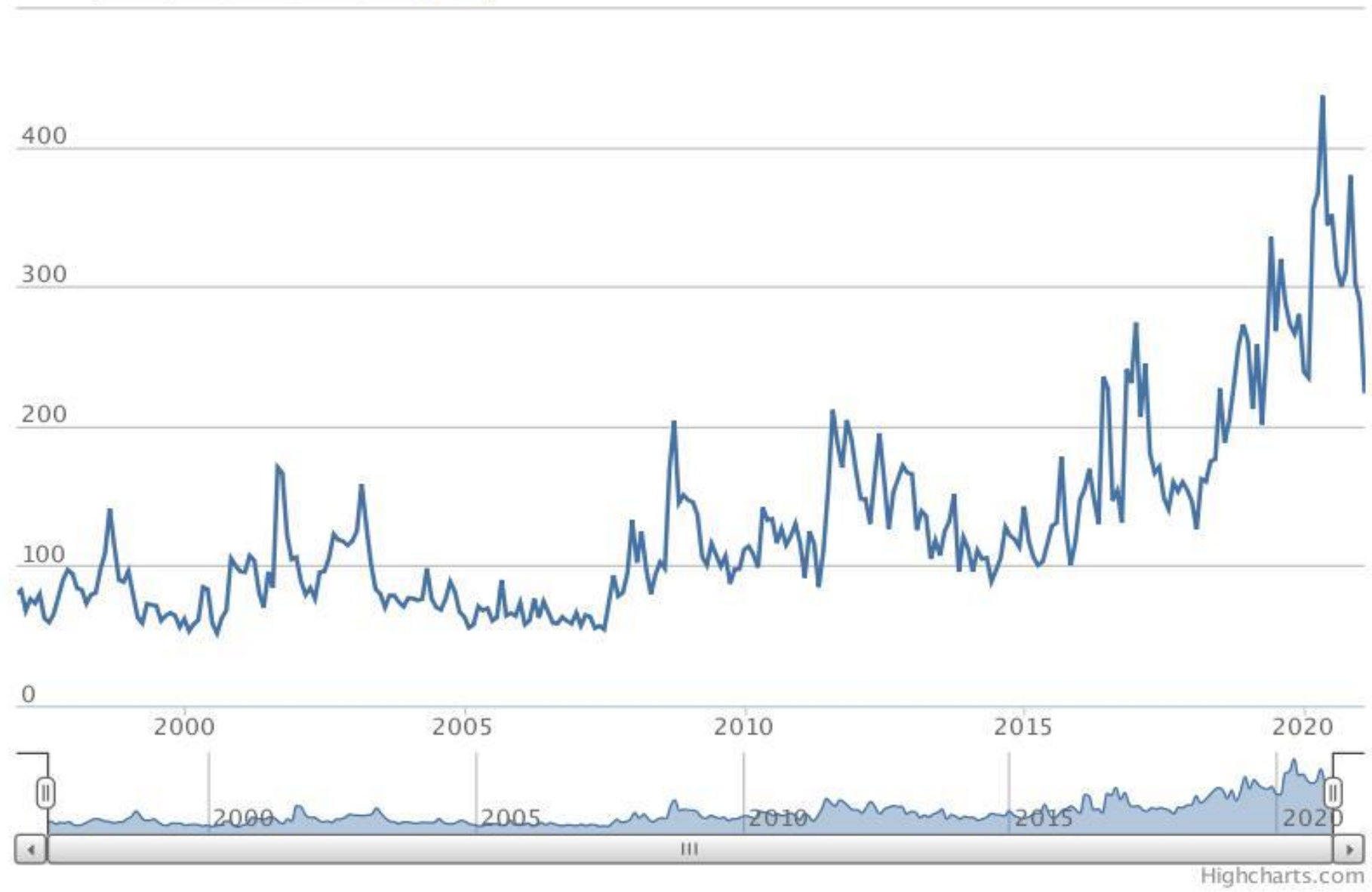
**Figure 1: Economic Policy Uncertainty Index for the US**



**Notes:** Index reflects scaled monthly counts of articles containing 'uncertain' or 'uncertainty', 'economic' or 'economy', and one or more policy relevant terms: 'regulation', 'federal reserve', 'deficit', 'congress', 'legislation', or 'white house'. The series is normalized to mean 100 from 1985-2009 and based on queries run on 2 February, 2015 for the USA Today, Miami Herald, Chicago Tribune, Washington Post, LA Times, Boston Globe, SF Chronicle, Dallas Morning News, NY Times, and the Wall Street Journal.

# Monthly Global Economic Policy Uncertainty Index

Zoom 1m 3m 6m 1y 7y All



Highcharts.com

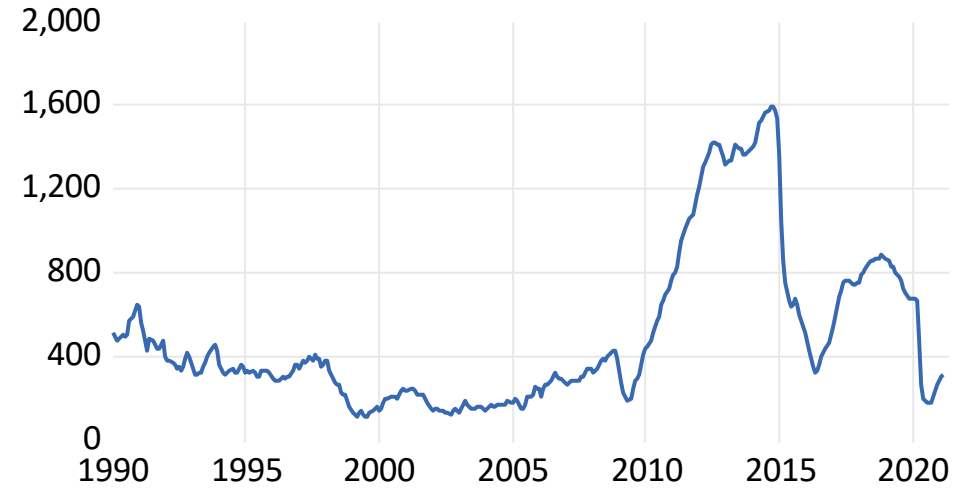
Source: Economic policy uncertainty website (<https://www.policyuncertainty.com/>)



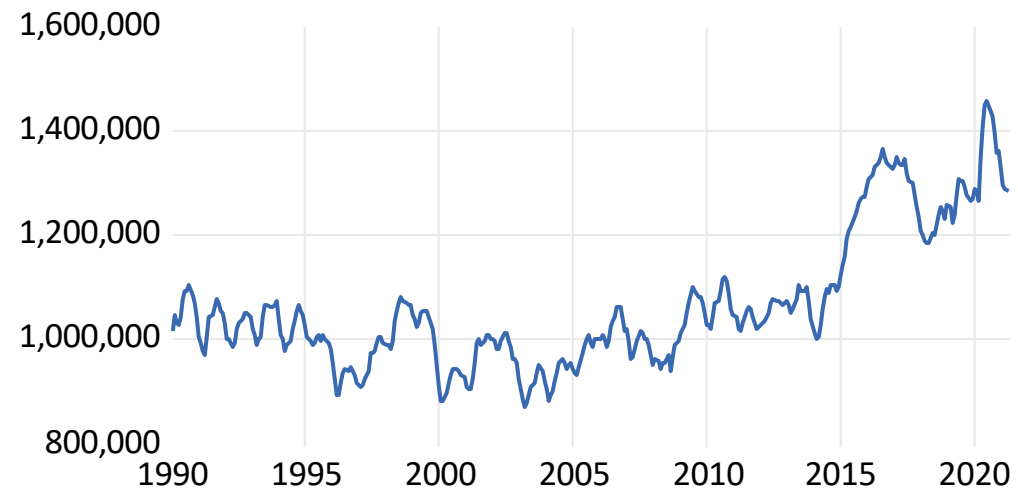
wti

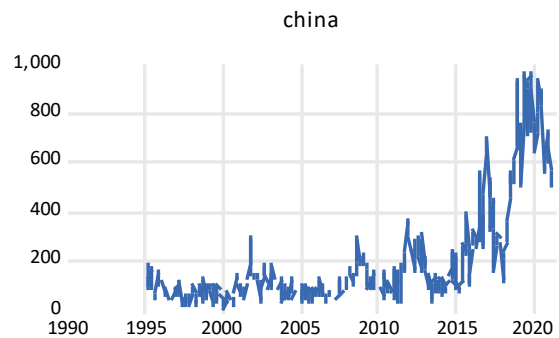
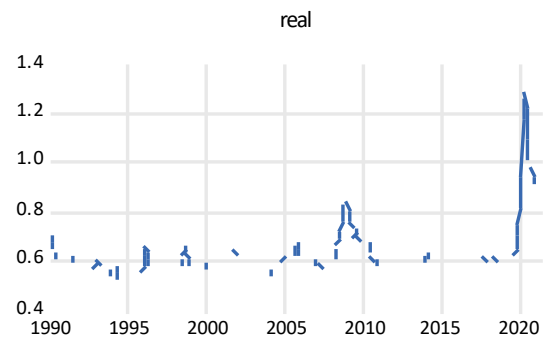
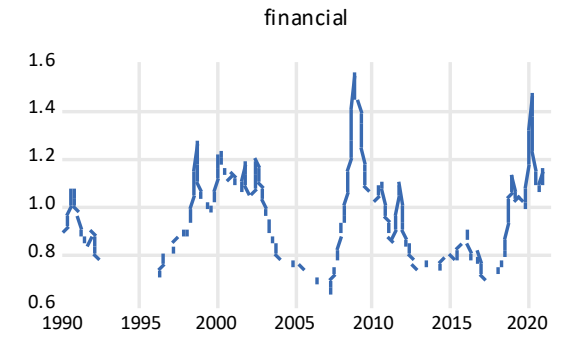
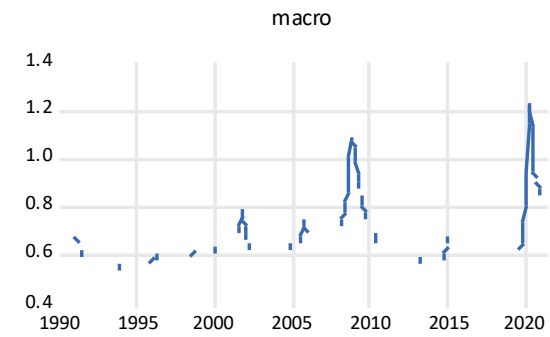
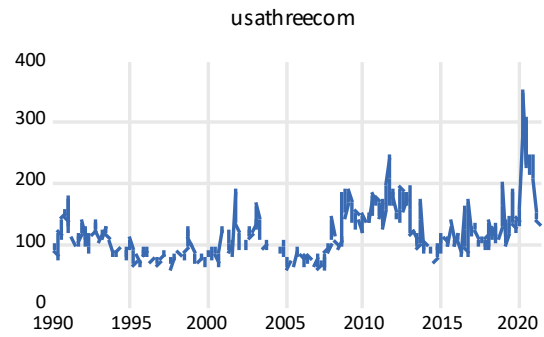
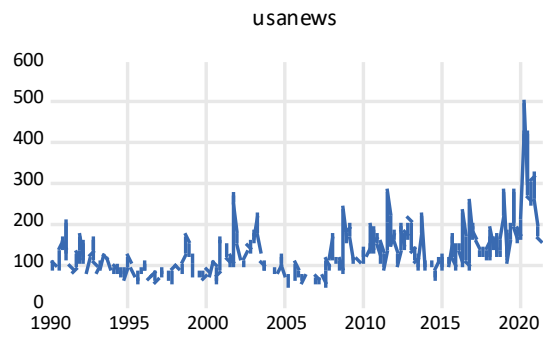
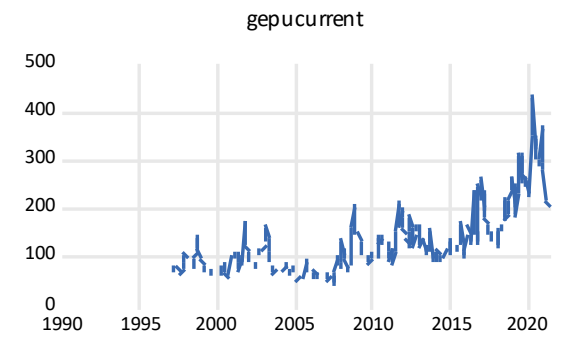
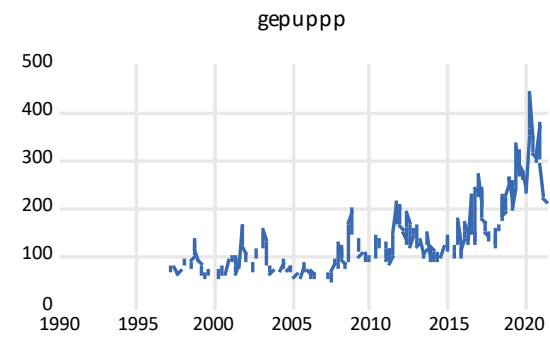
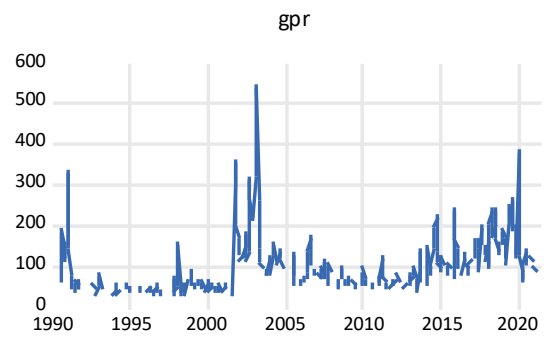
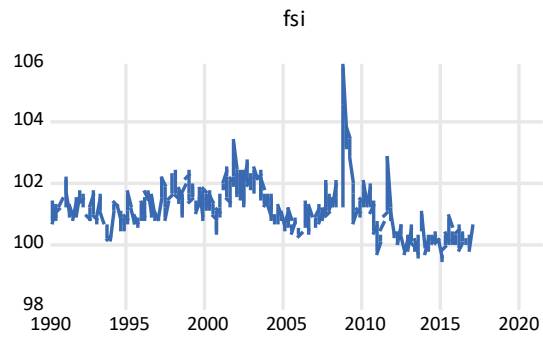


oilrig



oilinventory





# Methodology

- **Standard VAR**--dependent variables: oil price, oil inventory, oil rig and one uncertainty index.
- Granger causality, Impulse response and Variance decomposition analysis are also used to interpret the result.
- Diebold and Yilmaz spill-over index

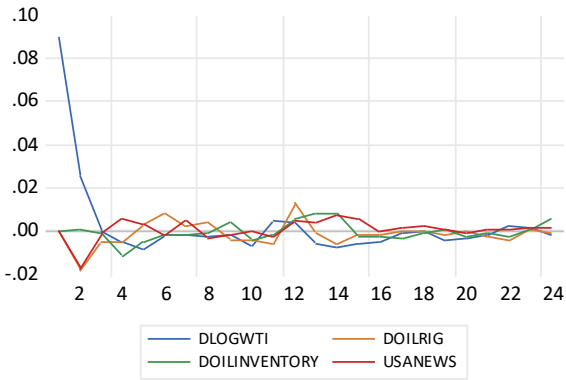
# Preliminary Results

- In all 11 models, oil price granger causes oil rig and oil inventory significantly. Oil price has relatively big impact on the crude oil rotary rigs in operation and the inventory level.
- Oil price granger causes US news-based, US three-components, GEPU current, GEPU PPP, financial uncertainty, and macro uncertainty significantly which indicates oil price is one source of uncertainty.
- Six uncertainty indexes granger cause oil price. (FSI, macro uncertainty, real uncertainty, US three-components, GPR, financial uncertainty)
- Oil inventory granger causes 4 uncertainty indexes: US news-based, US three-components, GEPU PPP and GEPU current.

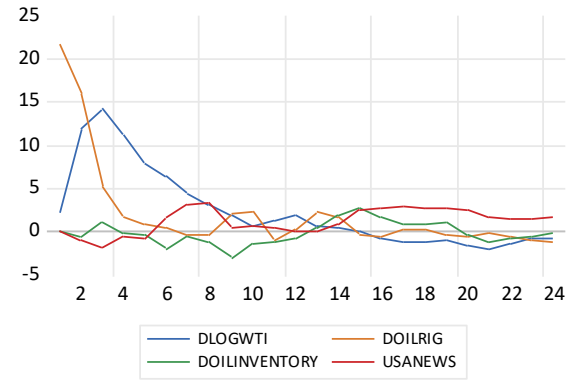
# Model with US news-based uncertainty index

Response to Cholesky One S.D. (d.f. adjusted) Innovations

Response of DLOGWTI to Innovations

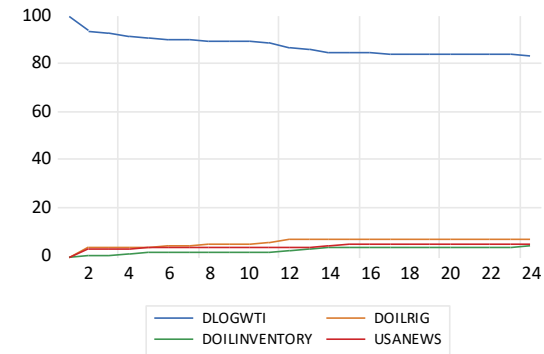


Response of DOILRIG to Innovations

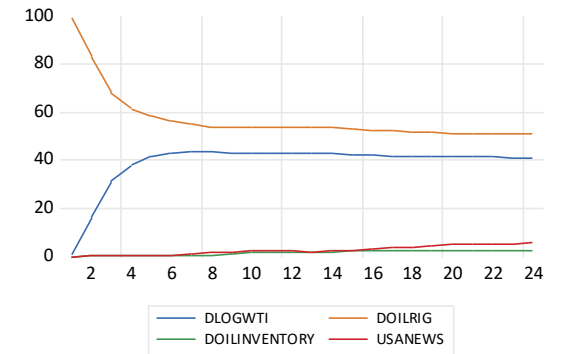


Variance Decomposition using Cholesky (d.f. adjusted) Factors

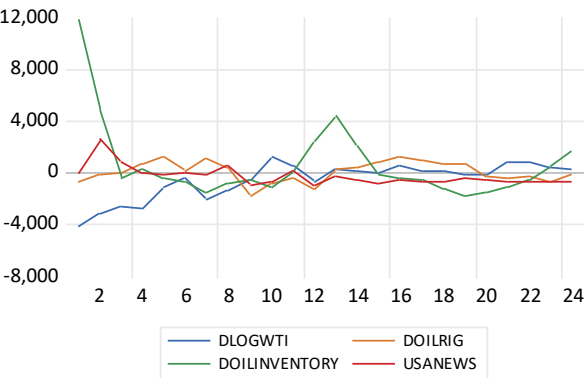
Variance Decomposition of DLOGWTI



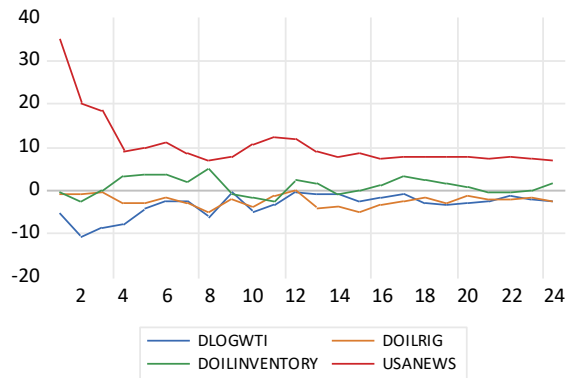
Variance Decomposition of DOILRIG



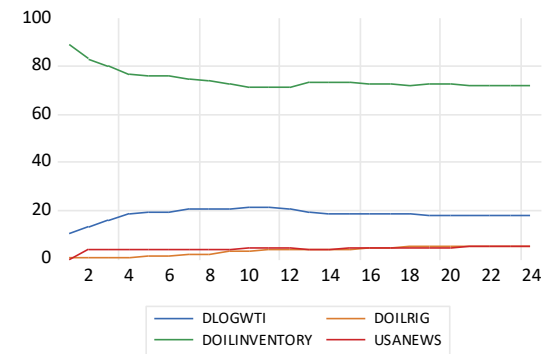
Response of DOILINVENTORY to Innovations



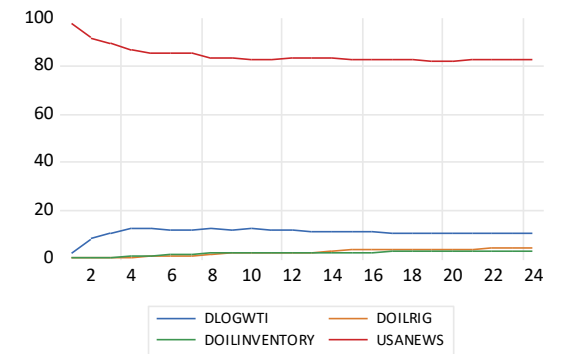
Response of USANEWS to Innovations



Variance Decomposition of DOILINVENTORY



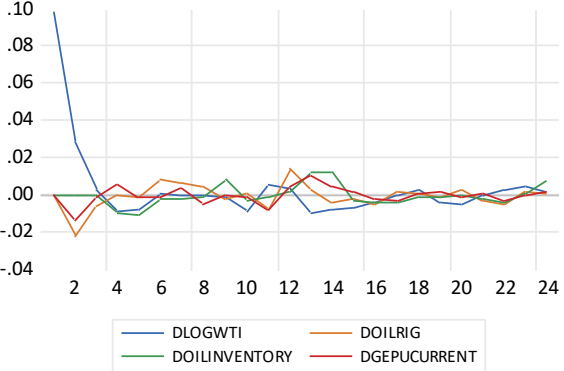
Variance Decomposition of USANEWS



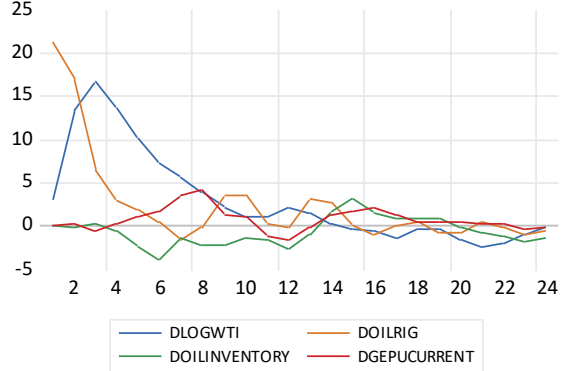
# Model with Global economic policy uncertainty index

Response to Cholesky One S.D. (d.f. adjusted) Innovations

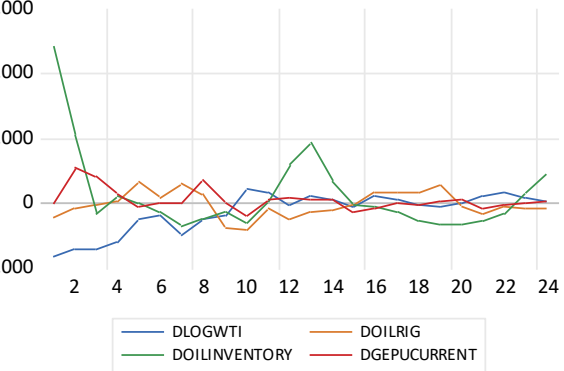
Response of DLOGWTI to Innovations



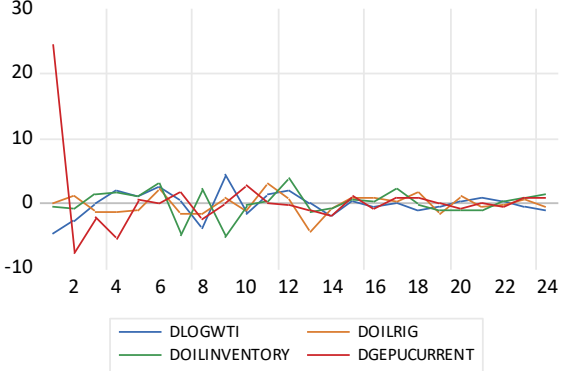
Response of DOILRIG to Innovations



Response of DOILINVENTORY to Innovations

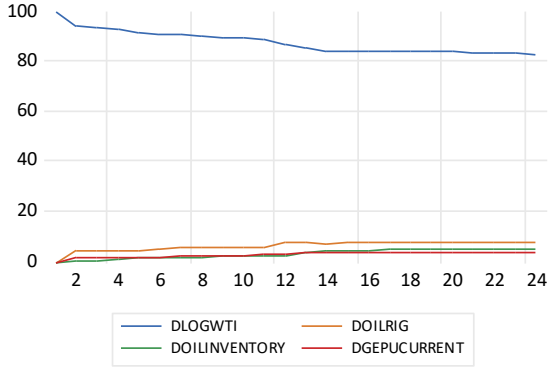


Response of DGEPUCURRENT to Innovations

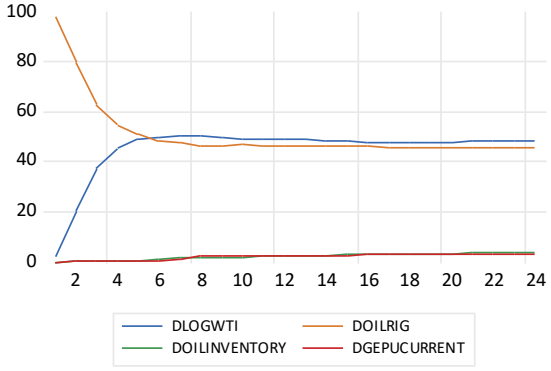


Variance Decomposition using Cholesky (d.f. adjusted) Factors

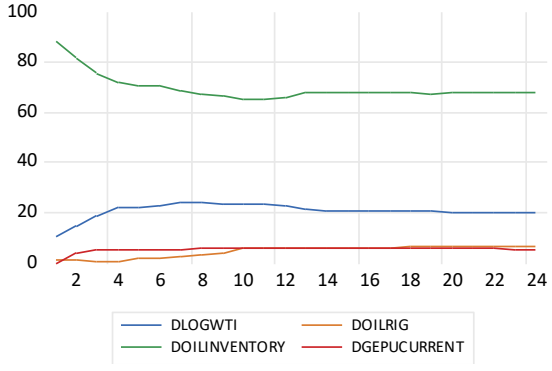
Variance Decomposition of DLOGWTI



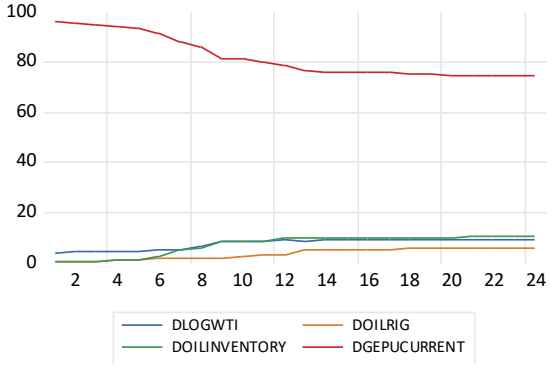
Variance Decomposition of DOILRIG



Variance Decomposition of DOILINVENTORY



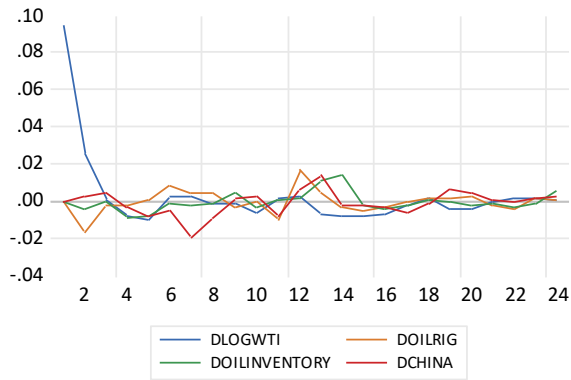
Variance Decomposition of DGEPUCURRENT



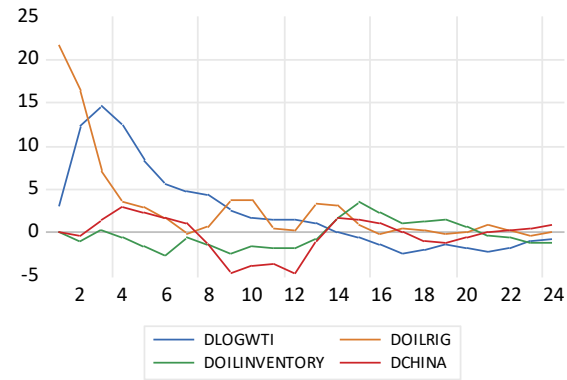
# Model with China economic and policy uncertainty index

Response to Cholesky One S.D. (d.f. adjusted) Innovations

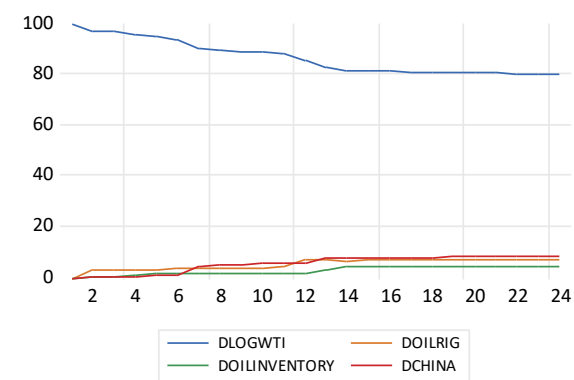
Response of DLOGWTI to Innovations



Response of DOILRIG to Innovations

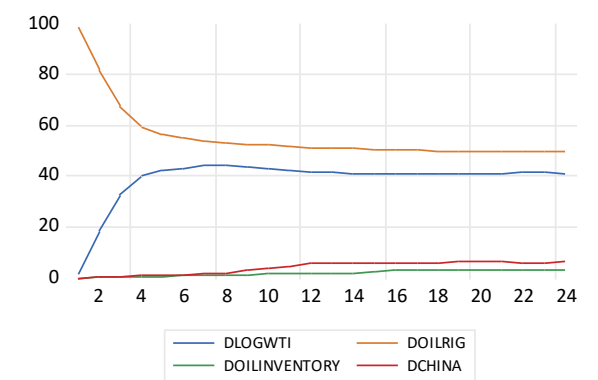


Variance Decomposition of DLOGWTI

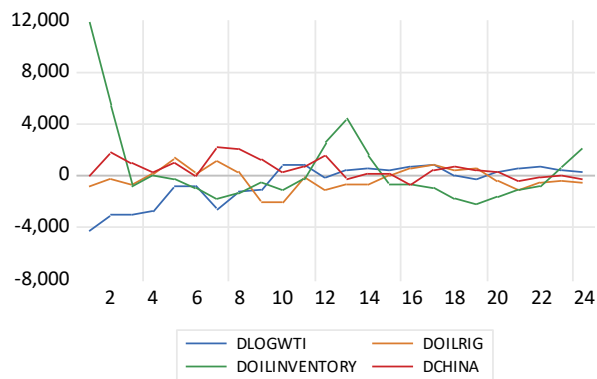


Variance Decomposition using Cholesky (d.f. adjusted) Factors

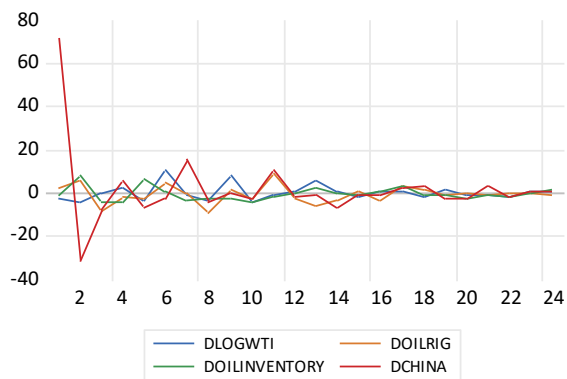
Variance Decomposition of DOILRIG



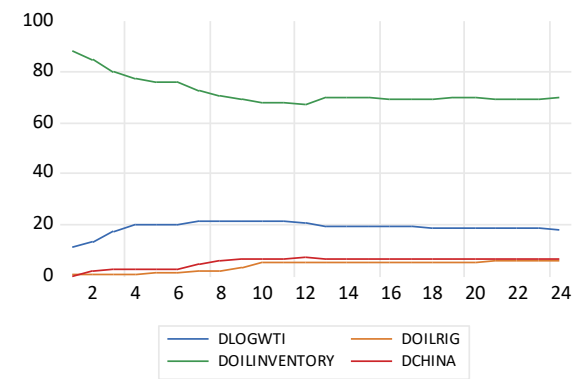
Response of DOILINVENTORY to Innovations



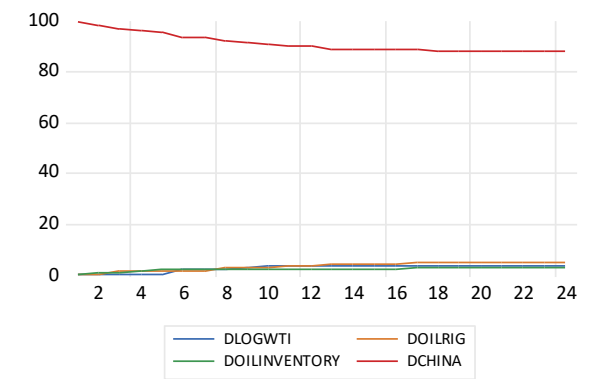
Response of DCHINA to Innovations



Variance Decomposition of DOILINVENTORY



Variance Decomposition of DCHINA



# Diebold and Yilmaz spill-over index

Spillover (Connectedness) Table

	dlogwti	doilrig	doilinventory	usanews	usathree...	fsi	gpr	dgepuppp	dgepucur...	financial	real	macro	dchina	From Others
dlogwti	30.0	7.9	6.2	6.7	6.2	5.0	3.7	2.8	4.8	5.7	8.5	7.9	4.7	70.0
doilrig	14.5	20.1	7.9	5.5	4.7	5.1	7.8	1.3	7.6	4.6	4.4	13.1	3.4	79.9
doilinventory	13.9	5.4	35.9	3.5	6.1	8.1	4.7	3.6	3.1	4.0	6.1	2.5	3.2	64.1
usanews	3.4	4.8	7.1	24.0	9.8	3.7	10.6	3.8	2.0	17.2	4.3	6.4	3.0	76.0
usathreecom	7.6	6.3	5.1	14.1	21.8	3.8	8.6	2.8	2.0	20.6	1.9	3.5	2.0	78.2
fsi	5.9	4.2	6.0	12.7	6.4	20.6	7.3	2.6	4.0	12.5	6.5	9.2	2.1	79.4
gpr	5.4	3.4	4.7	3.0	7.3	4.8	48.0	3.2	1.6	4.2	4.0	7.2	3.1	52.0
dgepuppp	2.0	3.3	6.0	24.4	6.2	5.4	14.5	13.7	3.0	5.7	2.2	7.9	5.7	86.3
dgepucurrent	1.9	3.0	6.2	25.2	6.6	5.2	15.1	12.4	3.1	5.7	2.4	7.4	5.6	96.9
financial	5.9	1.9	5.2	1.4	6.2	3.2	18.5	5.1	1.9	38.1	3.5	5.3	3.8	61.9
real	19.6	4.3	6.7	2.1	5.0	5.1	16.1	2.0	0.8	9.2	17.5	7.7	3.9	82.5
macro	22.7	2.9	5.0	4.0	4.6	3.5	14.0	0.9	1.1	10.4	10.7	17.8	2.4	82.2
dchina	6.5	6.7	4.2	11.1	7.3	6.4	7.4	12.9	6.6	1.6	2.6	10.0	16.7	83.3
Contribution to others	→ 109.4	54.1	70.4	→ 113.7	76.3	59.3	→ 128.4	53.5	38.4	101.3	57.1	88.2	42.8	992.9
Contribution including own	139.4	74.1	106.3	137.7	98.1	79.8	176.4	67.2	41.5	139.4	74.6	106.1	59.5	→ 76.4%



# Conclusions

- Overall, the connection between uncertainty and oil market is significant, but varies by different uncertainty indexes.
- The overall connection is 76.4% from connectedness table. The biggest contributors to others are GPR, USA news-based and oil price. The biggest receivers from others are GEPU current, GEPU PPP and China economic and policy uncertainty.
- Uncertainty information is a negative shock to oil price in the short time, later it becomes positive.
- There is a strong relationship among oil price, oil rig and oil inventory.
- China EPU is a positive shock to oil price at first. After 4 months, it becomes negative. USA oil inventory responses positively to China EPU.
- However, China EPU can only explain few changes of variance in oil market.

Thank you