UNIVERSITÀ DEGLI STUDI DI PADOVA

What causes global recessions? A quantile regression approach

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Master's Degree in Economics and Finance MEF
Thesis Defence - Third Period A
A. Y. 2022/2023

16th October 2023

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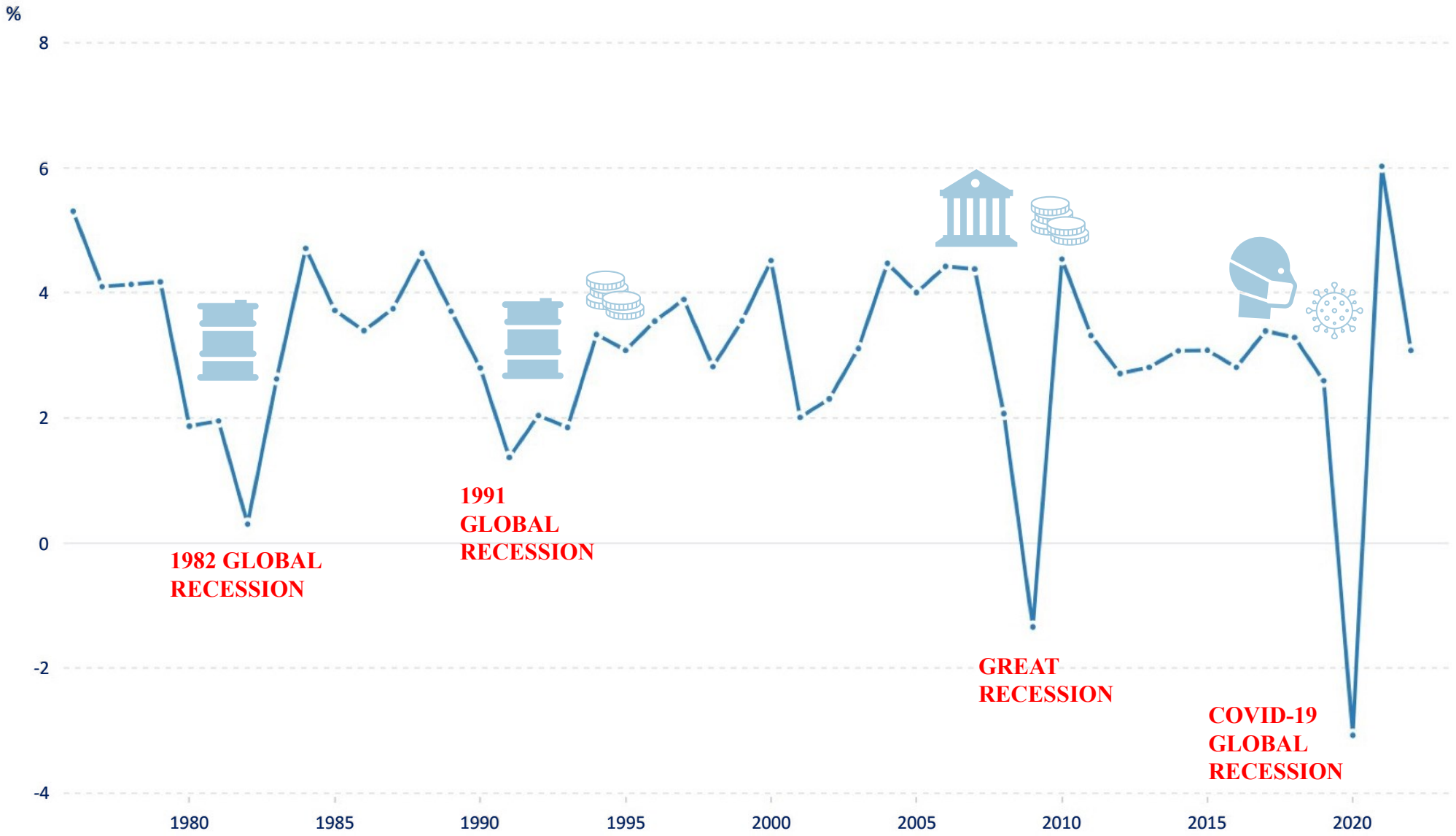
- Introduction
- Data and Methodology
  - Preselection of variables
  - Quantile regression approach
- Empirical results
- Conclusion

GDP growth (annual %) | Data (worldbank.org)



Which variables are *informative indicators* of **GLOBAL RECESSIONS**?

Framework

Monthly observations

First sample: **June 1976 – December 2019**

Second sample: **June 1976 – December 2022**

Forecast horizons: **one quarter** and **one year** ahead

Measure of **GLOBAL ECONOMIC ACTIVITY**: **WORLD INDUSTRIAL PRODUCTION GROWTH**

PREDICTORS suggested by the financial literature and economic theory:

- **VXO spliced**
- **Excess Bond Premium**
- **Effective Federal Funds Rate and Shadow Federal Funds Rate**
- **U.S. Term Spread**
- **WTI**
- **Oil Supply Shocks**
- **Oil Consumption Demand Shocks**
- **Oil Inventory Demand Shocks**
- **Real Commodity Price Factor**

Preselection of variables

OLS FORECASTING REGRESSION: $y_{t+i} = \beta_0 + \beta_1 x_t + e_{t+i}$ where $i = 3, 12$

First sample: June 1976 – December 2019

Variables	(1) OECD + 6NME IP GR$_{t+3}$	(2) OECD + 6NME IP GR$_{t+12}$
VXO spliced$_t$	**-0.15003*****	-0.026976
	(0.017205)	(0.018305)
EFFR + SFFR$_t$	0.008997	**-0.082807*****
	(0.031092)	(0.030737)
WTI$_t$	**-0.012855****	**-0.038638*****
	(0.0051162)	(0.0048338)
OSS$_t$	**-0.18407***	0.017827
	(0.097494)	(0.098173)
OCDS$_t$	0.031858	0.049543
	(0.039415)	(0.039532)
OIDS$_t$	0.13975	-0.089917
	(0.12741)	(0.12731)
RCPF$_t$	**2.1495*****	**1.7023*****
	(0.3073)	(0.31121)
EBP$_t$	**-3.5594*****	**-1.3938*****
	(0.19421)	(0.23992)
T10Y2YM$_t$	-0.18498	**0.50305*****
	(0.15237)	(0.15082)

Second sample: June 1976 – December 2022

Variables	(1) OECD + 6NME IP GR$_{t+3}$	(2) OECD + 6NME IP GR$_{t+12}$
VXO spliced$_t$	**-0.1499*****	0.0099192
	(0.018025)	(0.019037)
EFFR + SFFR$_t$	0.0047134	**-0.082456****
	(0.032726)	(0.032557)
WTI$_t$	**-0.0097242***	**-0.042088*****
	(0.0053197)	(0.0052111)
OSS$_t$	-0.20492**	-0.040032
	(0.098132)	(0.098499)
OCDS$_t$	**0.087519****	0.020405
	(0.039601)	(0.04)
OIDS$_t$	0.04934	0.011116
	(0.1344)	(0.13511)
RCPF$_t$	**2.1942*****	**1.6972*****
	(0.31774)	(0.33185)
EBP$_t$	**-3.6295*****	**-1.235*****
	(0.21546)	(0.25925)
T10Y2YM$_t$	-0.024387	**0.58581*****
	(0.16448)	(0.16304)

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.10

QUANTILE REGRESSION approach

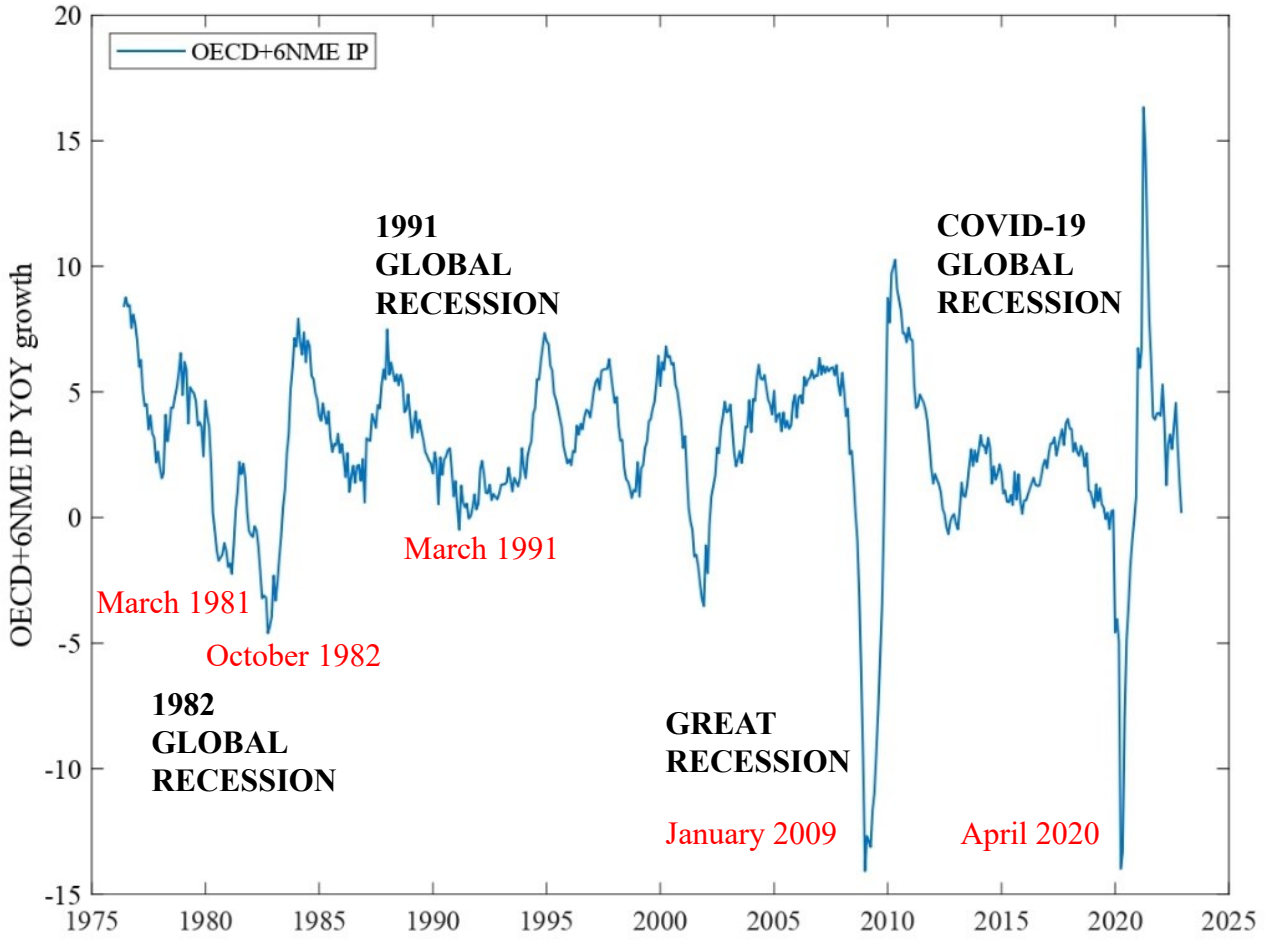
(1) $$\widehat{\beta_\tau} = \arg\min_{\beta_\tau \in \mathbb{R}^k} \sum_{t=1}^{T-h} (\tau \cdot \mathbf{1}_{(y_{t+h} \geq x_t\beta)} |y_{t+h} - x_t\beta_\tau| + (1-\tau) \cdot \mathbf{1}_{(y_{t+h} < x_t\beta)} |y_{t+h} - x_t\beta_\tau|) \quad \text{where } h = 3, 12$$

(2) $$\widehat{Q_{y_{t+h}|x_t}}(\tau|x_t) = x_t\widehat{\beta_\tau}$$

Date selection

Monthly year-over-year **WORLD INDUSTRIAL PRODUCTION GROWTH RATE** time series

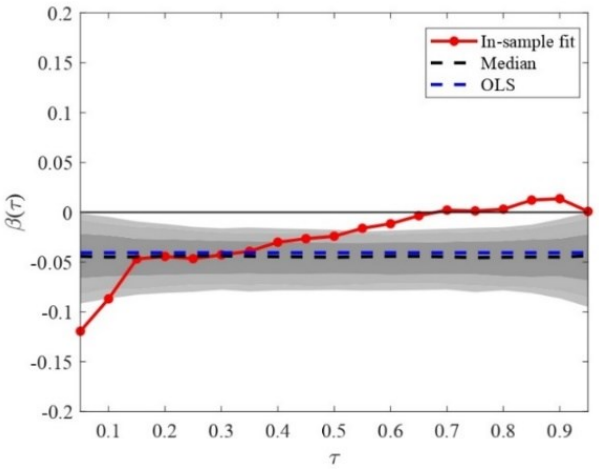
Selected **«trough» dates**:



VXO spliced

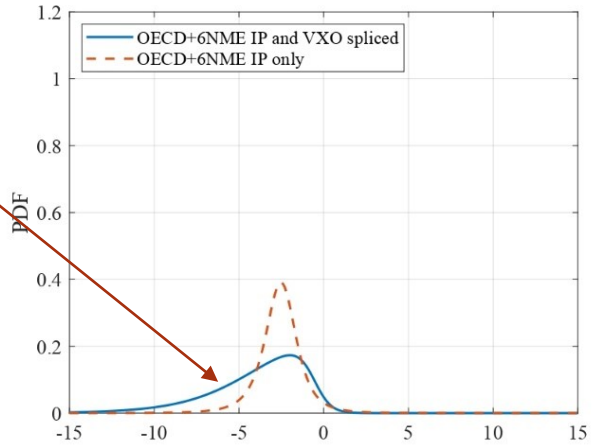
First sample: *one quarter ahead*

Estimated quantile regression coefficients



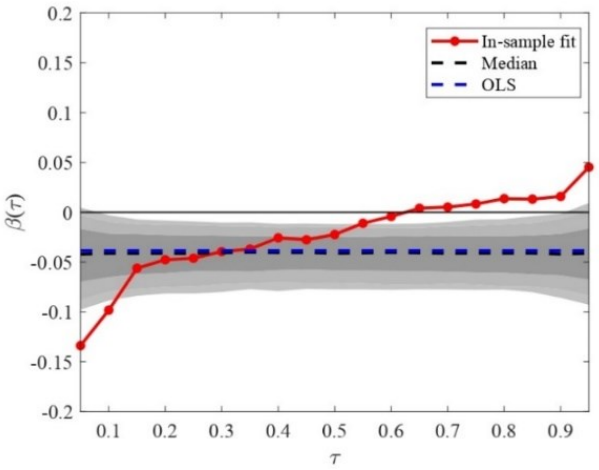
An increase in **financial stress** lowers the mean, expands the variance of the future world industrial production growth distribution, and even skews it to the left

Great Recession, $t + 3$ = January 2009



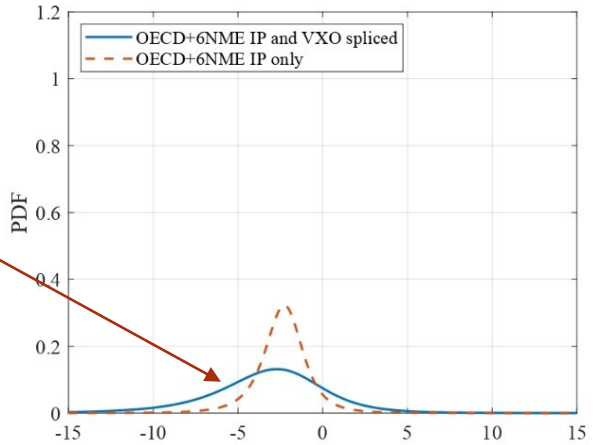
Second sample: *one quarter ahead*

Estimated quantile regression coefficients



- *First moment* effect
- Strong *second moment* effect
- No asymmetries

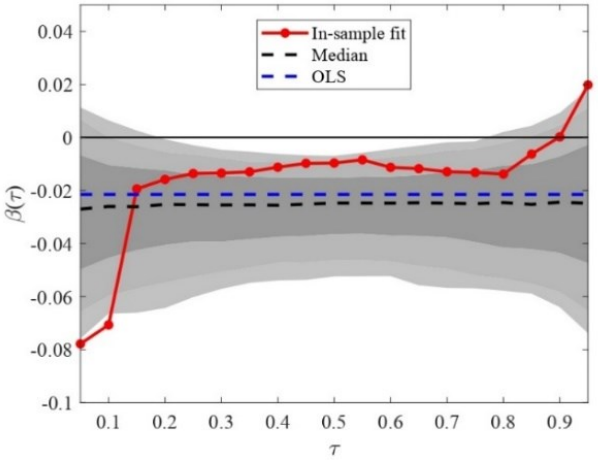
Great Recession, $t + 3$ = January 2009



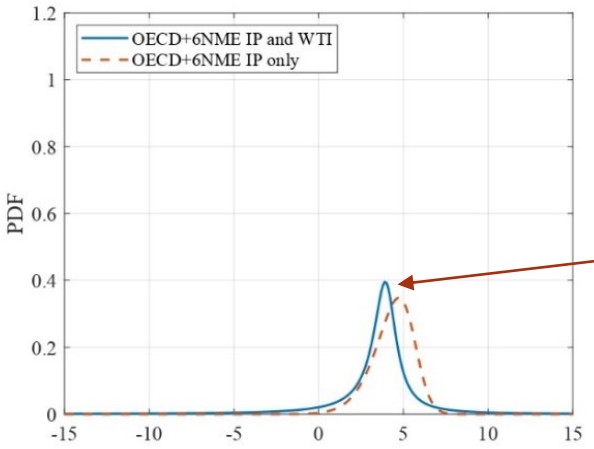
WTI

First sample: *one year ahead*

Estimated quantile regression coefficients

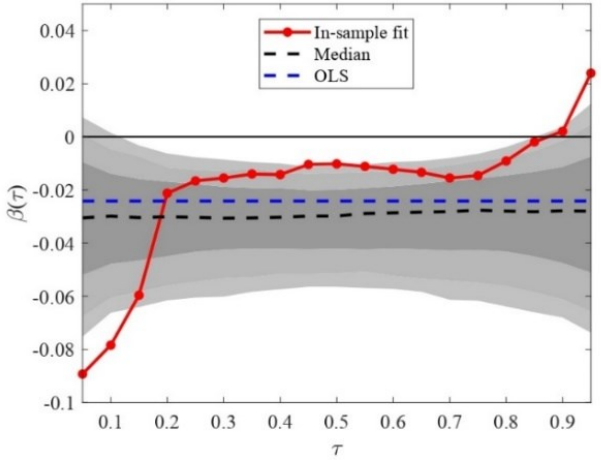


Great Recession, $t + 12$ = January 2009



Second sample: *one year ahead*

Estimated quantile regression coefficients



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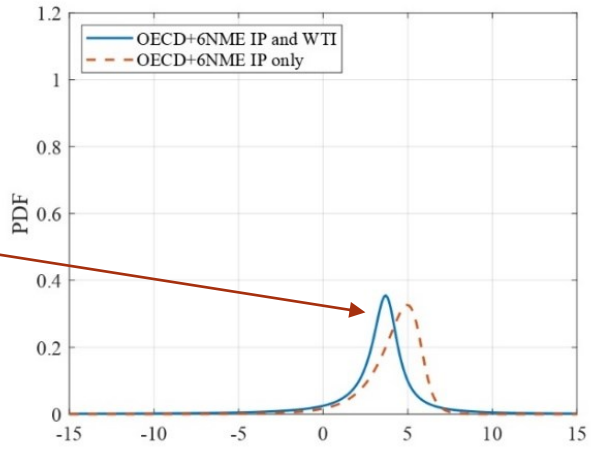
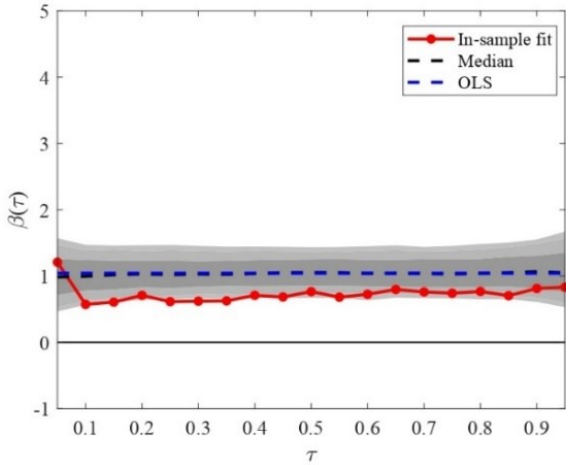


First moment effect

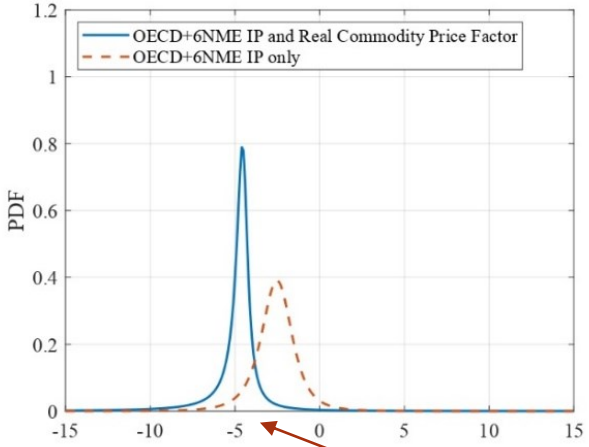
Real Commodity Price Factor

First sample: *one quarter ahead*

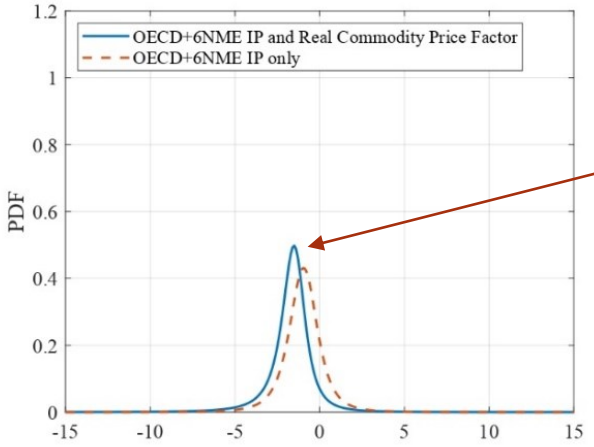
Estimated quantile regression coefficients



Great Recession, $t+3$ = January 2009

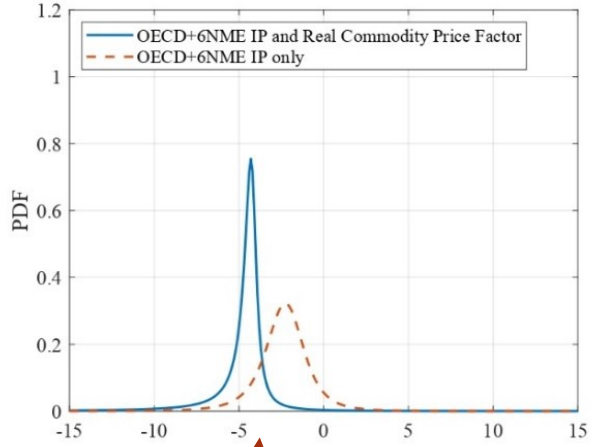


1982 global recession, $t+3$ = March 1981

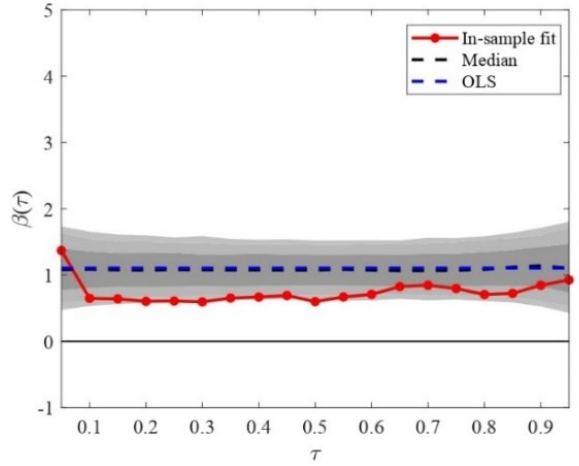


Second sample: *one quarter ahead*

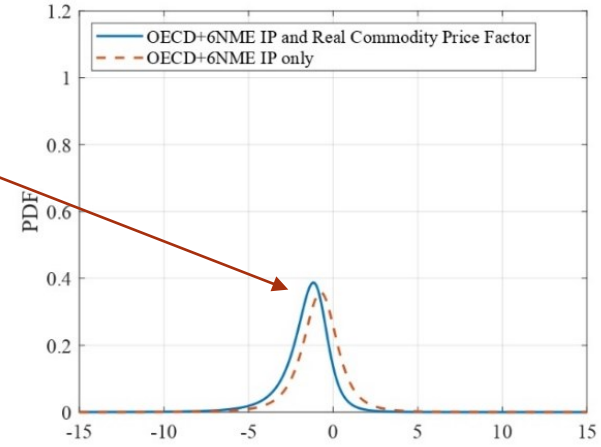
Great Recession, $t+3$ = January 2009



Estimated quantile regression coefficients



1982 global recession, $t+3$ = March 1981

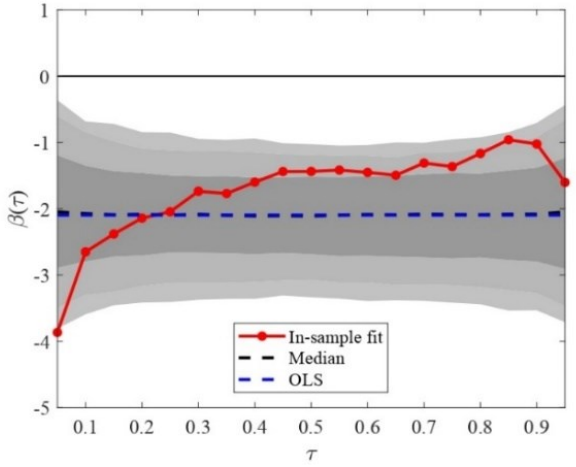


First moment effect

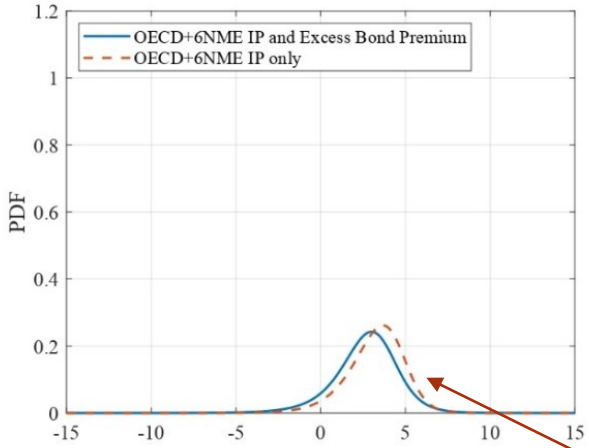
Excess Bond Premium

First sample: *one year ahead*

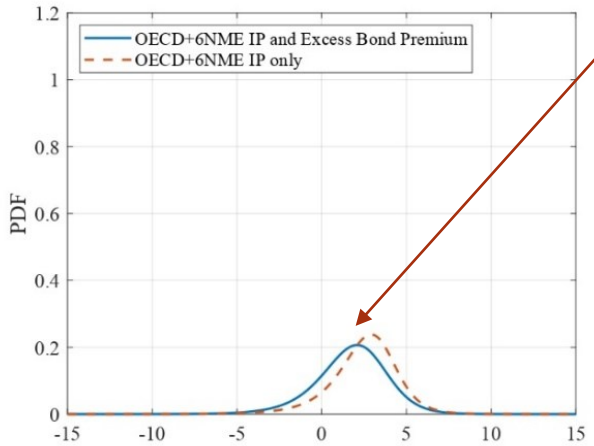
Estimated quantile regression coefficients



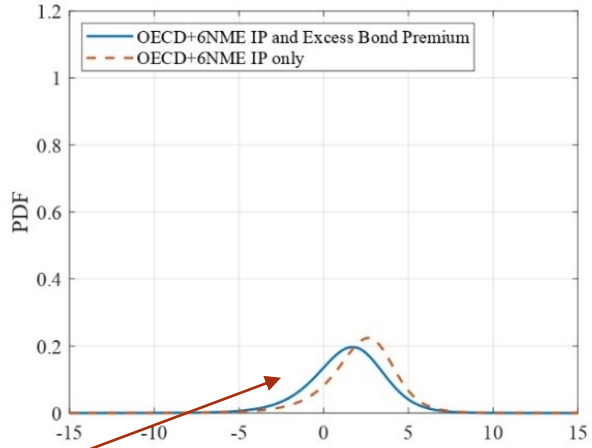
1982 global recession, $t + 12$ = March 1981



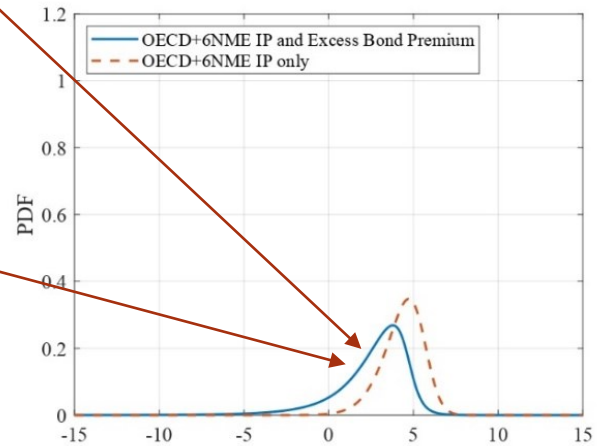
1991 global recession, $t + 12$ = March 1991



1982 global recession, $t + 12$ = October 1982



Great Recession, $t + 12$ = January 2009

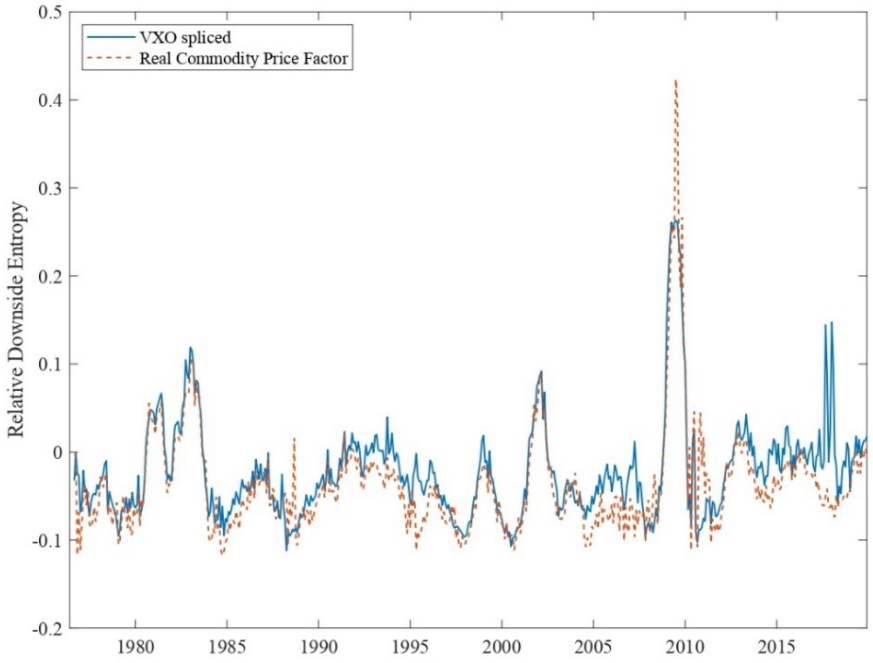


Slightly lower mean and higher variance

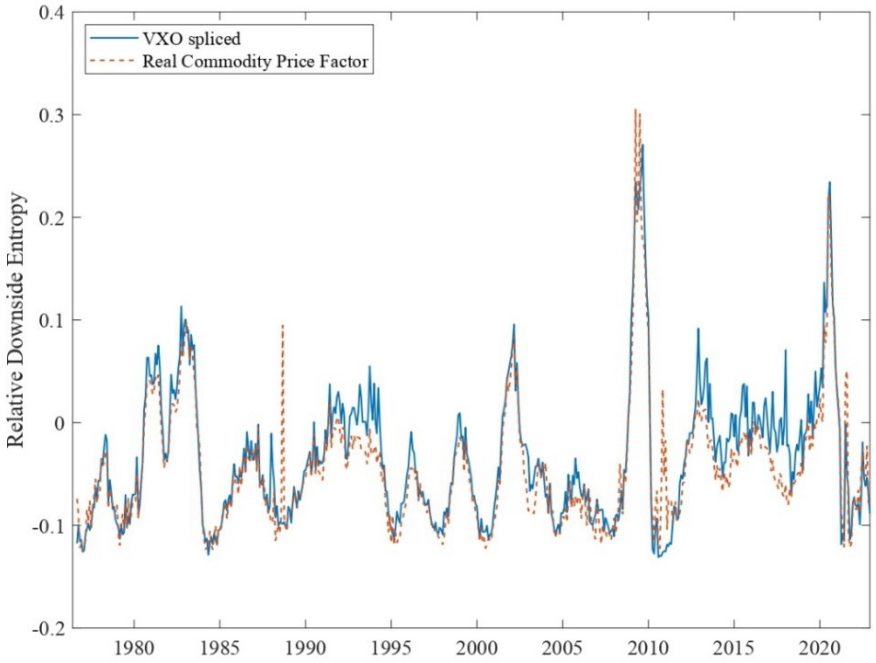
Third moment effect

RELATIVE DOWNSIDE ENTROPY

First sample: *one quarter* ahead



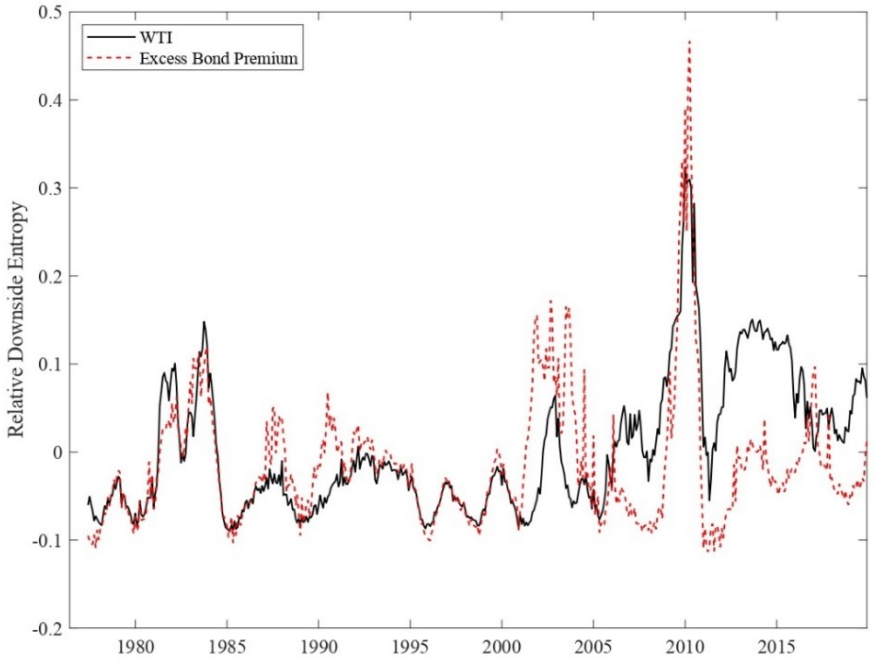
Second sample: *one quarter* ahead



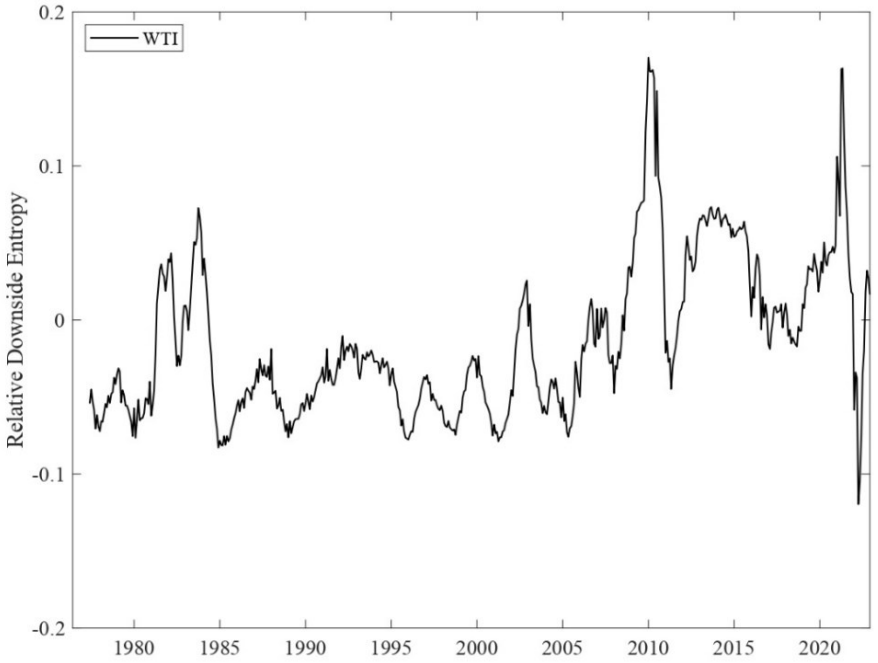
$$L_t^D\left(\widehat{f_{y_{t+3}|x_t}};\ \widehat{g_{y_{t+3}}}\right) = -\int_{-\infty}^{\widehat{F^{-1}_{y_{t+3}|x_t}}(0.05|x_t)} \left(\log \widehat{g_{y_{t+3}}}(y) - \log \widehat{f_{y_{t+3}|x_t}}(y|x_t)\right) \widehat{f_{y_{t+3}|x_t}}(y|x_t)\, dy$$

RELATIVE DOWNSIDE ENTROPY

First sample: *one year ahead*



Second sample: *one year ahead*



$$L_t^D\left(\widehat{f_{y_{t+12}|x_t}};\ \widehat{g_{y_{t+12}}}\right) = -\int_{-\infty}^{\widehat{F^{-1}_{y_{t+12}|x_t}}(0.05|x_t)} \left(\log \widehat{g_{y_{t+12}}}(y) - \log \widehat{f_{y_{t+12}|x_t}}(y|x_t)\right) \widehat{f_{y_{t+12}|x_t}}(y|x_t)\, dy$$

Financial uncertainty

Credit market frictions

Policy implications

- Monitoring of global financial market developments
- Appropriate regulations to mitigate the recessionary effects of uncertainty shocks

Oil and Commodity prices

Future research…

- Alternative forecasting approaches
- Extend the set of predictors
  - → global Total Factor Productivity
  - → supply chain

What causes global recessions? A quantile regression approach

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Thank you for your attention

16th October 2023

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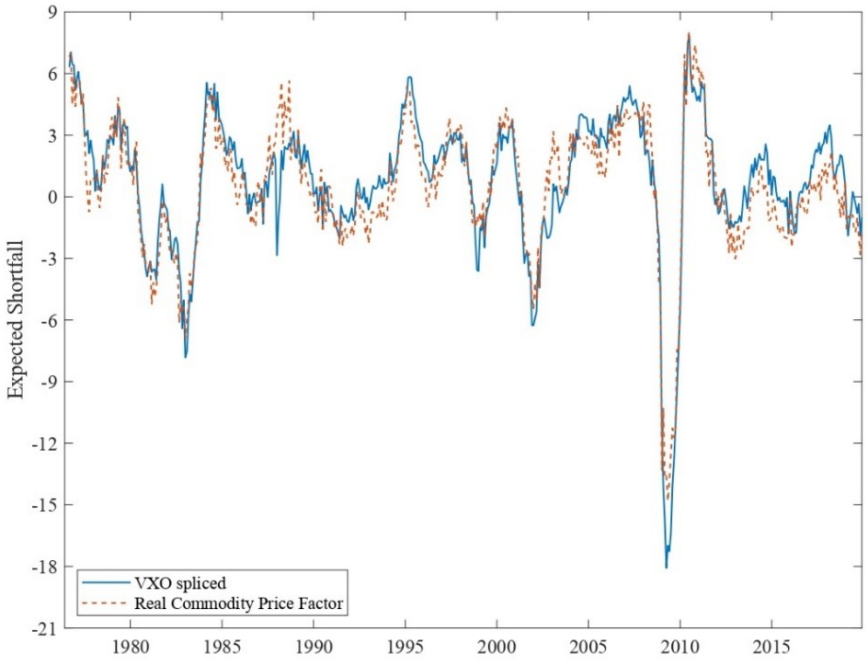
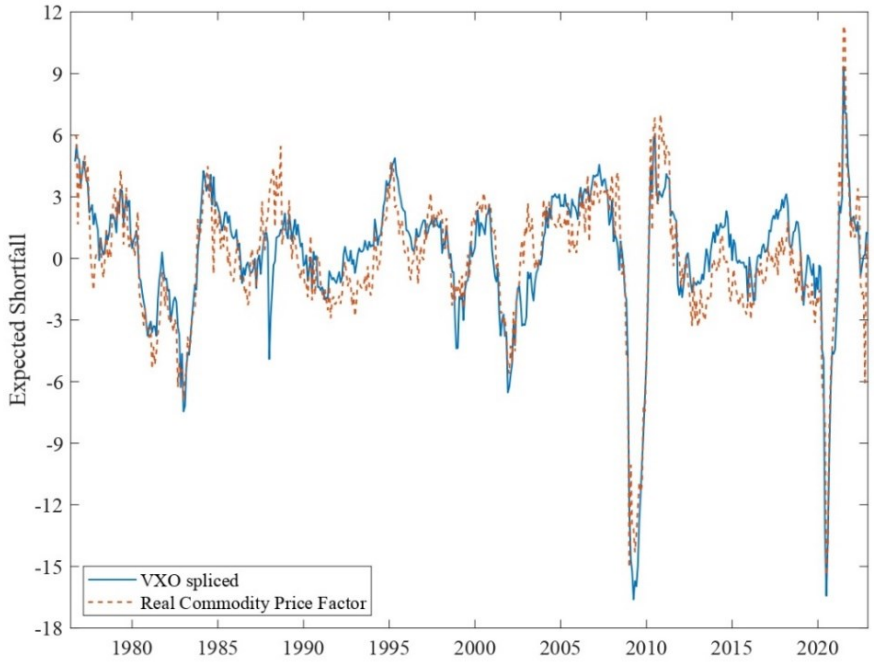
5% EXPECTED SHORTFALL

First sample: *one quarter ahead*



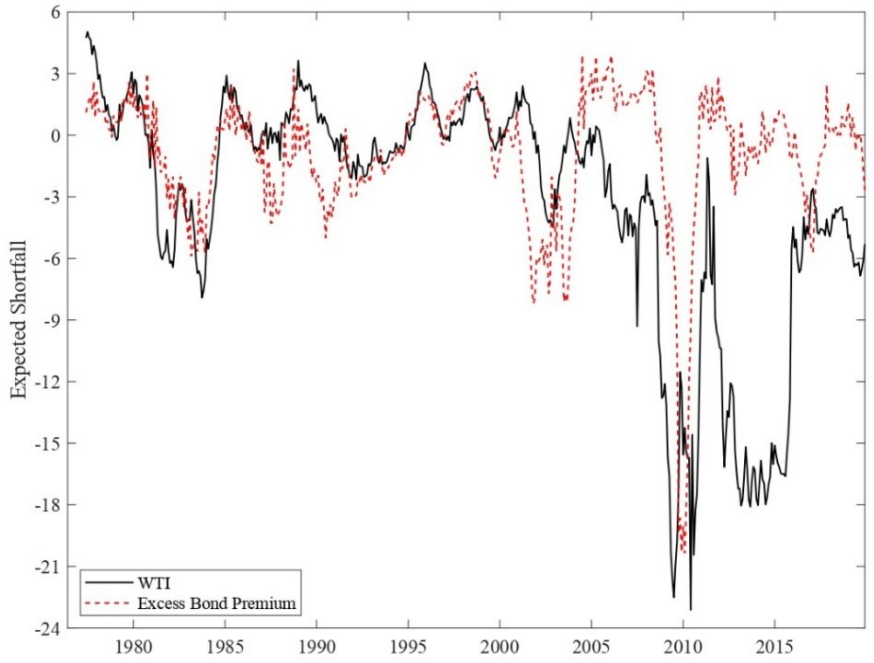
Second sample: *one quarter ahead*



$$SF_{t+3} = \frac{1}{0.05} \int_0^{0.05} \widehat{F^{-1}_{y_{t+3}|x_t}}(\tau|x_t)\, d\tau$$

5% EXPECTED SHORTFALL

First sample: *one year ahead*



Second sample: *one year ahead*

$$SF_{t+12} = \frac{1}{0.05} \int_0^{0.05} \widehat{F^{-1}_{y_{t+12}|x_t}}(\tau|x_t)\, d\tau$$