

Oil Price Elasticities and Oil Price Fluctuations

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INTRODUCTION

- Large swings in oil prices over last decade:
 - ▶ Run-up to \$140 per barrel through August 2008;
 - ▶ Subsequent decline to \$40 per barrel through Great Recession;
 - ▶ 65% decline from June 2014 to December 2015.
- Two classical questions in the literature:
 - ▶ What drives oil price movements?
 - ▶ What are the macroeconomic effects of oil price shocks?
- This paper provides new evidence on the causes and consequences of oil price fluctuations for the 1985–2015 period.

INTRODUCTION

Methodology and Preview of Results

- Structural VAR to analyze sources and macroeconomic effects of oil price movements
- Novel identification and data to disentangle supply and demand shocks:
 - ▶ **Joint** restrictions on oil supply and demand elasticities;
 - ▶ **Multiple** indicators of global demand for oil.
- Main findings:
 - ▶ Supply shocks main driver of oil prices;
 - ▶ Supply shocks boost activity in advanced economies while depress activity in emerging economies;
 - ▶ Selection of elasticities is important for inference.

MEASURING GLOBAL DEMAND FOR OIL

Coincident Indicator: Industrial Production

- Requirements for global economic indicators:
 - ▶ Capture key features of global business cycle;
 - ▶ Ability to explain oil prices.
- Construct IP indexes for 19 advanced and 33 emerging economies (90% World GDP):
 - ▶ Reliable and widely available business cycle indicator;
 - ▶ Oil important input in industrial sector;
 - ▶ Advanced economies net oil importers;
 - ▶ Emerging economies use more oil and oil independent.

MEASURING GLOBAL DEMAND FOR OIL

Leading Indicator: Metals Prices

- IMF Metal Price Index.
- Metals crucial inputs in many industrial sectors.
- Captures shifts in current and expected global activity:
 - ▶ Academic literature
Pindyck & Rotemberg (1990); Labys & al. (1999), Barsky & Kilian (2001).
 - ▶ Popular blog entries
Arezki and Blanchard (2014), Hamilton (2014), Bernanke (2016).
- Results from **forecasting regressions**:
 - ▶ Metal prices help predict global activity and oil prices.

THE VAR MODEL

- VAR model of the oil market and the global economy with 5 variables
(Jan 1985 - Dec 2015):
 - ▶ Log of IP for advanced economies;
 - ▶ Log of IP for emerging economies;
 - ▶ Log of IMF metals price index;
 - ▶ Log of Brent price of crude oil (deflated by U.S. CPI);
 - ▶ Log of global supply of crude oil.

IDENTIFICATION OF THE SVAR

The Oil Market

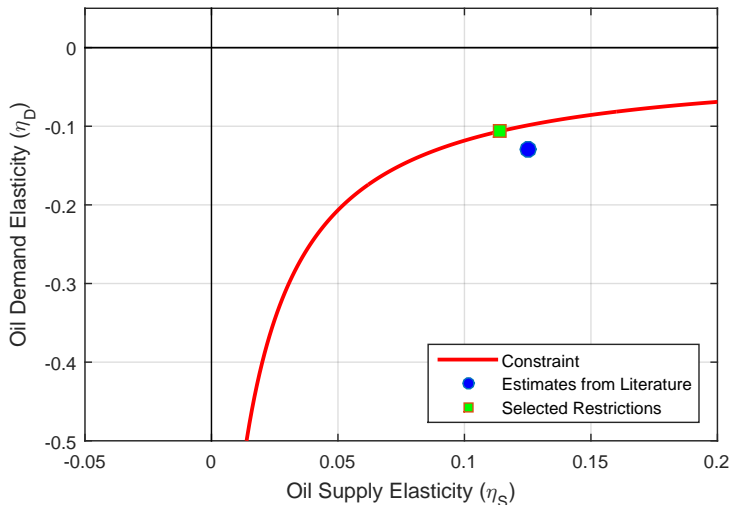
- A simple 2-equation model of the oil market:

$$\begin{aligned}q_t &= \eta_S p_t + u_{s,t}, \\q_t &= \eta_D p_t + u_{d,t}.\end{aligned}$$

- **Consensus** is that η_S and η_D both small:
 - ▶ Estimates from meta-analysis: $\eta_S = 0.13$; $\eta_D = -0.13$;
 - ▶ η_S possibly even smaller: 0.02.
[Kilian & Murphy\(2012\)](#)
- Insight from analytics of structural VARs: VCV matrix of VAR residuals and restriction on supply elasticity imply value for demand elasticity.

IDENTIFICATION

VAR-Implied Demand and Supply Elasticities



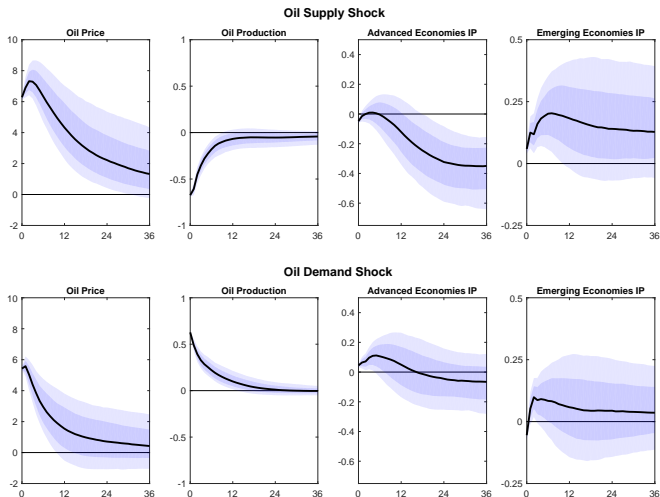
IDENTIFICATION

The Oil Market and the Macroeconomy

- Macroeconomy → oil market:
 - ▶ Global demand can shift the oil demand curve;
 - ▶ Global demand cannot shift the oil supply curve;
 - ▶ **NOTE:** Oil production moves in response to global demand shocks because supply curve is elastic.
- Oil market → macroeconomy:
 - ▶ IPs respond directly to changes in oil production;
 - ▶ Metals prices respond to changes in both oil prices and oil production.

IMPULSE RESPONSES

Oil Price Shocks



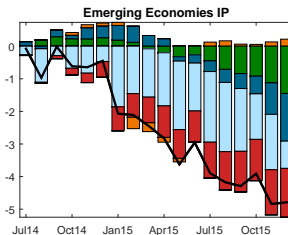
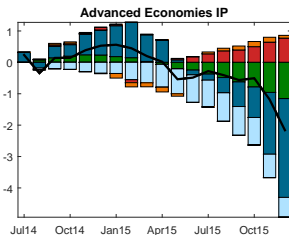
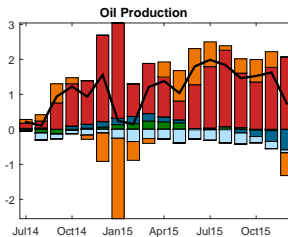
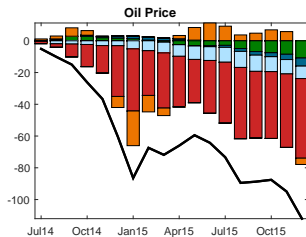
FORECAST ERROR VARIANCE DECOMPOSITION

24-Month Ahead

Shock	Oil Supply	Oil Demand	AE Activity	EE Activity	Metal
Oil Prices	47.6 [34.7; 59.5]	14.3 [9.5; 22.3]	2.2 [0.8; 5.3]	13.4 [6.2; 23.0]	16.8 [8.3; 28.3]
AE Activity	5.5 [1.8; 12.9]	1.8 [0.7; 4.5]	63.8 [51.7; 74.3]	10.7 [6.7; 15.5]	14.6 [6.6; 25.4]
EE Activity	5.8 [1.7; 13.5]	1.7 [0.5; 5.1]	8.4 [4.8; 13.7]	52.0 [40.2; 65.5]	29.1 [16.6; 41.1]

HISTORICAL DECOMPOSITION

2014–2015 Oil Price Slump



— Actual ■ Metal Price ■ AE Activity ■ EE Activity ■ Oil Supply ■ Oil Demand

CONCLUDING REMARKS

- Identify SVAR of oil market and the global economy with plausible joint restrictions on oil supply and oil demand elasticities.
- Show that oil supply shocks are key drivers of oil prices and have an economically modest effect on global real activity.
- Also in the paper:
 - ▶ With low supply elasticity \rightarrow large demand elasticity:
 - Oil-specific demand shocks key drivers of oil prices;
 - Oil supply shocks associated with large oil price multiplier on advanced economies activity.
 - ▶ With only one indicator of global activity:
 - Small contribution of global demand to oil prices.

IMPULSE RESPONSES

Oil Price Shocks

