

# Discussion

## Oil Volatility Risk

Brent Bundick  
Federal Reserve Bank of Kansas City

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I thank Trenton Herriford & A. Lee Smith for helpful discussions.

**The opinions expressed herein are those of the authors & do not reflect the views of the Federal Reserve Bank of Kansas City or Federal Reserve System.**

Interesting paper on a topical subject

I enjoyed reading the paper

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## **Comments**

1. More convincing to illustrate stylized facts using single VAR
2. Use model to support empirical identification strategy
3. Oil uncertainty shocks have nominal implications

# Show Stylized Facts Using Vector Autoregression

## Advantages

1. Easy to estimate dynamic effects of a OVX shock
2. Account for possible cointegrating relationships
3. Examine movements in OVX due to other shocks (VIX)

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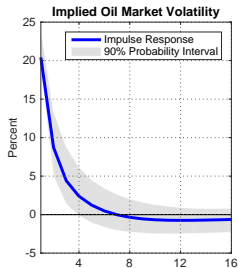
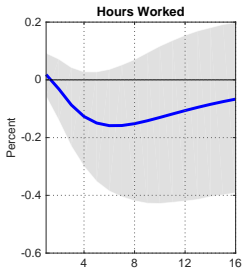
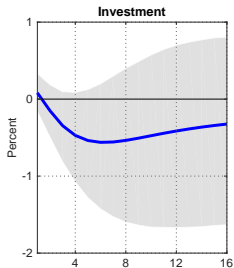
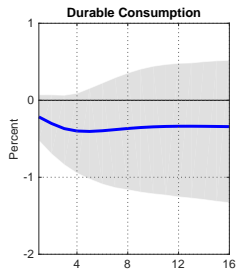
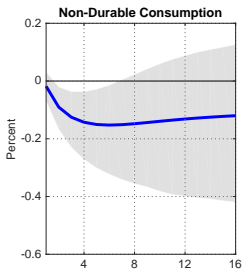
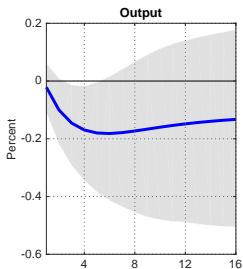
Estimate VAR(1) over the 1990Q1 – 2014Q1 sample period

VIX, OVX, Equity & Oil Prices,

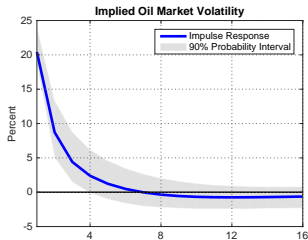
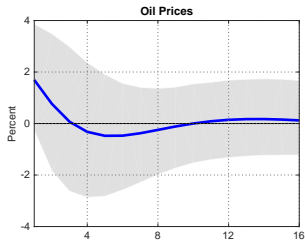
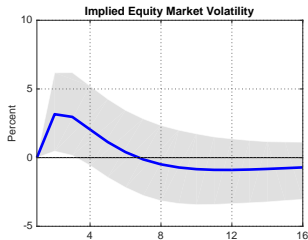
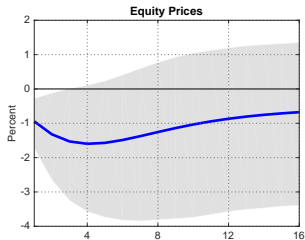
Output, Consumption, Investment, Hours Worked

Order: VIX, OVX, oil & equity prices, macro variables

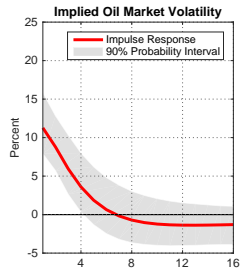
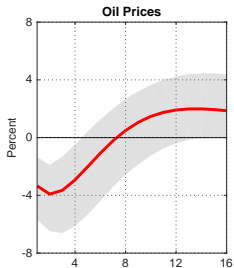
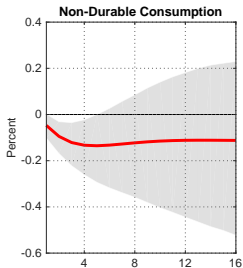
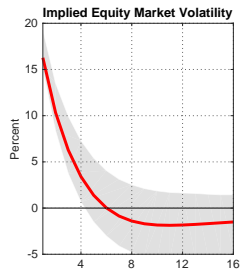
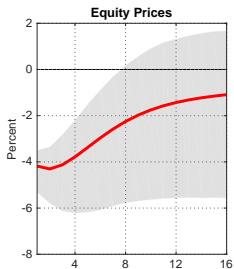
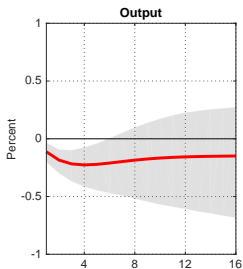
# Empirical Responses to Oil Uncertainty Shock



# VIX Rises After Oil Uncertainty Shock



# Oil Market Uncertainty Also Rises After VIX Shock





## Variance decompositions of 1-year ahead forecast errors

Variable	<b>OVX Shocks</b>	<b>VIX Shocks</b>
Output	6	17
OVX	58	33
VIX	5	79

Risk premia or the energy sector's weight in the S&P 500?

Variance decompositions of 1-year ahead forecast errors

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**Suggestion: Estimate VAR at monthly frequency**

Numerous monthly proxies for GDP and its components

Identify cleaner series of oil uncertainty shocks

# Correct Ordering in the Vector Autoregression?

**Use model to support empirical identification strategy**

Generate OVX and VIX in the model

$R_{t+1}^M$  = Market Equity Return

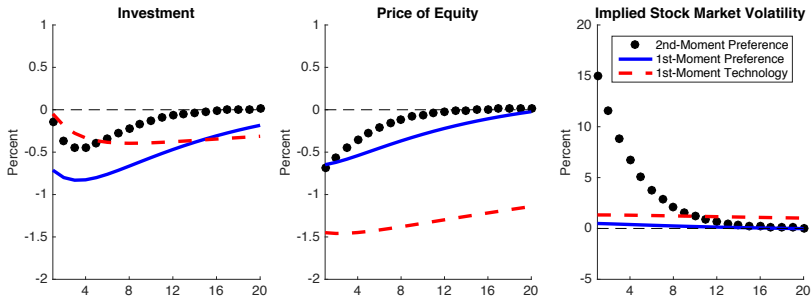
$$VIX_t^M = 100 * \sqrt{4 * \text{VAR}_t \{ R_{t+1}^M \}}$$

$$\text{VAR}_t \{ R_{t+1}^M \} = \mathbb{E}_t \{ (R_{t+1}^M)^2 \} - \left( \mathbb{E}_t R_{t+1}^M \right)^2$$

Similar for oil market using oil market return  $R_{t+1}^S$

# Model-Implied OVX & Ordering in the VAR

First-moment shocks should not move OVX or VIX in model



Source: Basu & Bundick (2016)

Model implies uncertainty measures first

Before equity prices, oil prices, and macro variables

# Comovement Between VIX & OVX in the Model

Equity return is average of macro sector and oil market

⇒ Oil uncertainty shock likely affect model-implied VIX

Replicate conditional OVX-VIX correlations in the data

Downside: Model doesn't fully support Choleksy identification

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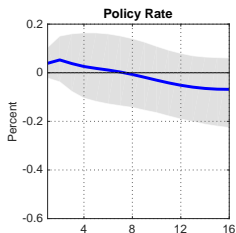
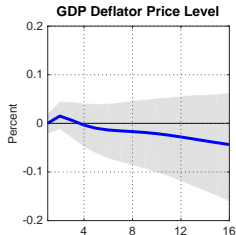
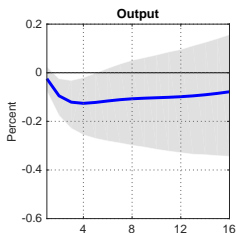
**Suggestion: Use model to quantify bias from Choleksy**

Simulate model & run VAR on simulated data

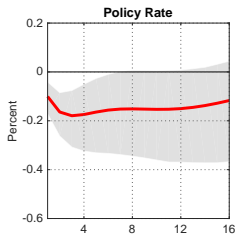
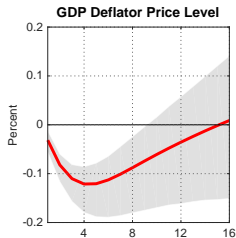
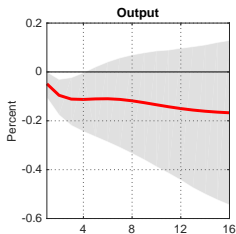
Compare estimated responses with true model responses

# Oil Uncertainty Shocks Have Nominal Implications

## OVX Shock



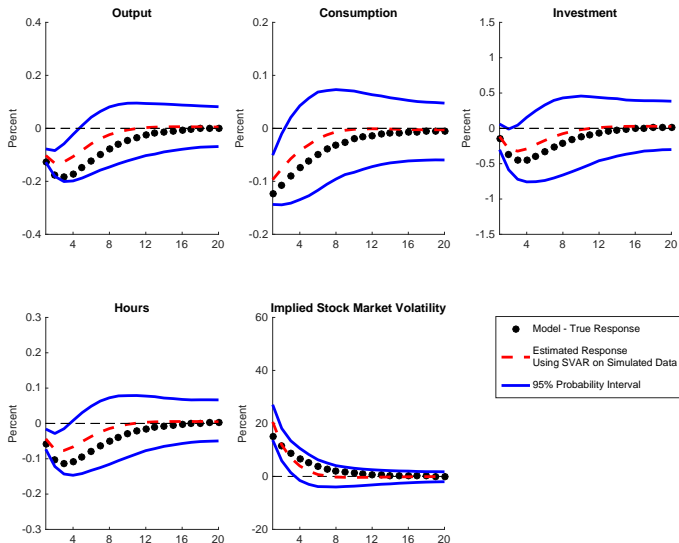
## VIX Shock



Additional Details



# Estimating VAR on Simulated Model Data



Source: Basu and Bundick (2016)