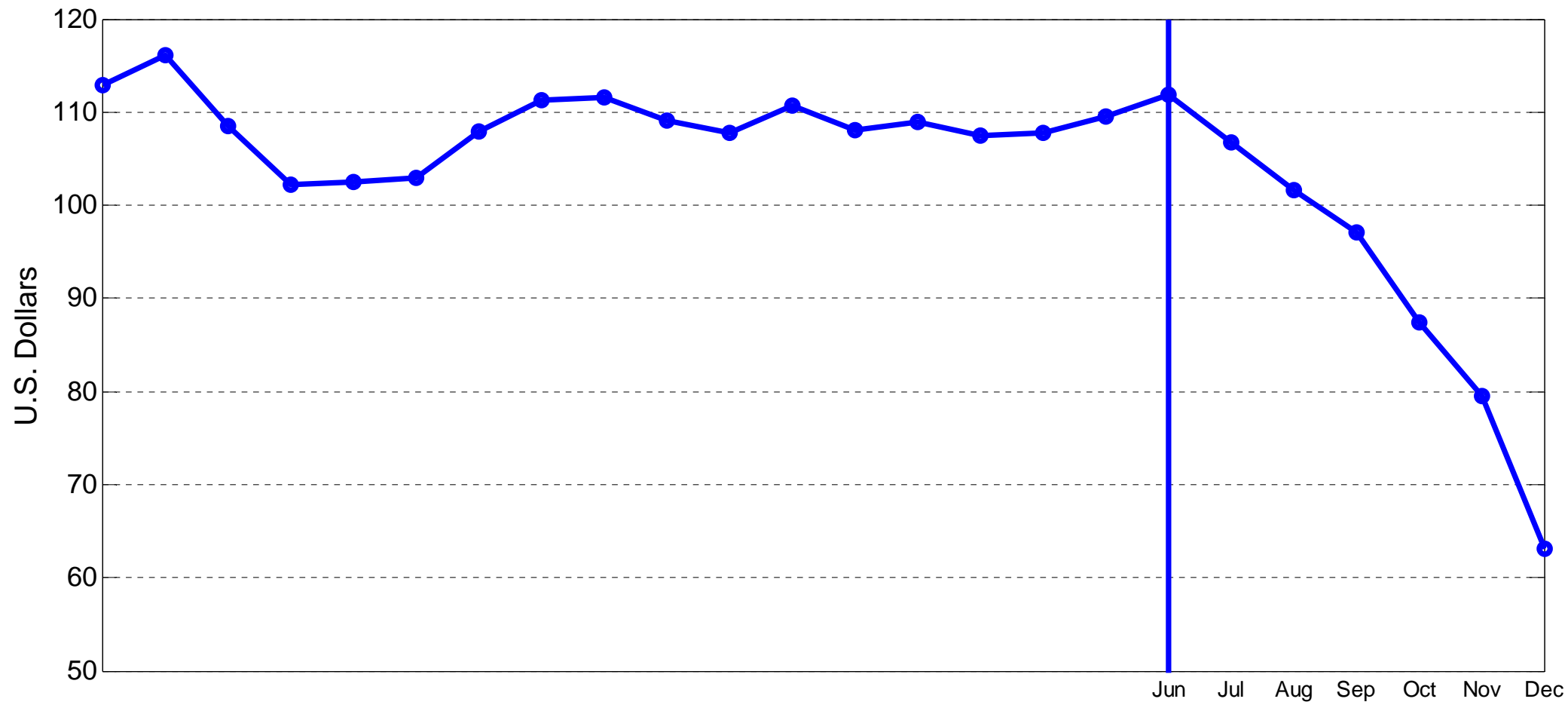


Causes and Consequences of the Decline in the Price of Oil since June 2014

Christiane Baumeister
University of Notre Dame

Lutz Kilian
University of Michigan
CEPR

Brent Price of Crude Oil in 2013 and 2014



What happened?

Arezki and Blanchard (IMF Blog 2014):

The decline was caused by oil price shocks associated with:

- An unexpected weakening of the global economy after June 2014 lower demand for oil (e.g., China, Japan, Euro area, Russia).
- Positive oil supply shocks after June 2014 (e.g., Iraq, Libya, Syria, United States, Russia)
- Lower demand for oil inventories due to lower oil price expectations, especially after the announcement in late November 2014 that OPEC would not reduce its oil output.

Two Key Questions

An oil price shock is the difference between what we expected the oil price to be and what it turned out to be.

⇒ To what extent was the oil price decline predictable?

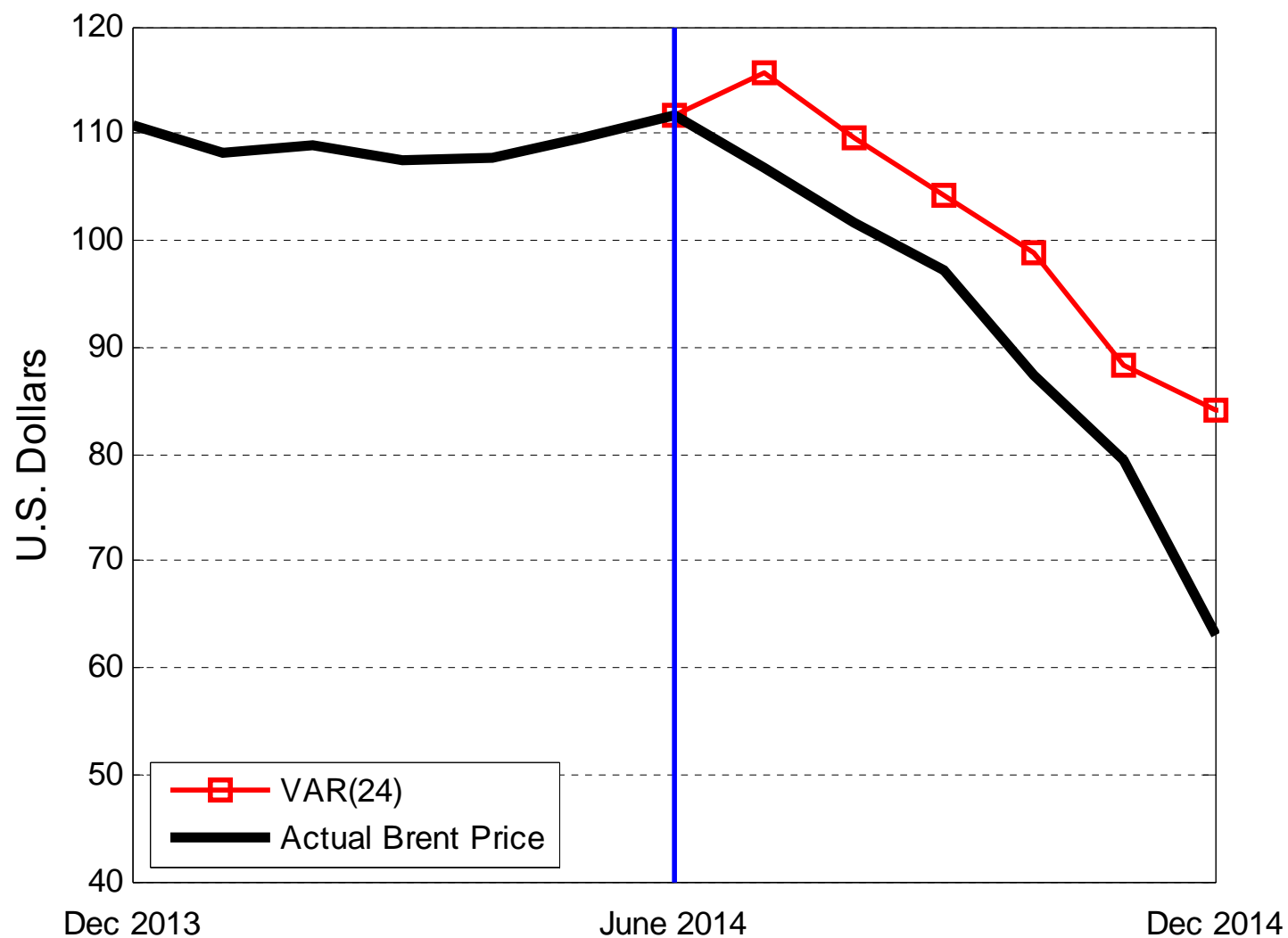
⇒ To what extent was it caused by shocks since June 2014?

A Simple Thought Experiment

What do state-of-the-art models of the global oil market such as Kilian and Murphy (2014) and Kilian and Lee (2014) tell us about this event?

- ⇒ Key variables that determine the real price of oil:
 - Global oil production
 - Global real economic activity
 - Change in global crude oil inventories
 - Real price of oil
- ⇒ Generate nominal Brent oil price forecasts from this model estimated on data actually available in June 2014.

Real-Time Forecast of the Price of Brent Crude Oil as of June 2014



NOTES: Source: Baumeister and Kilian (2015a).

Could the Success of the VAR Model be just Luck?

Plausibility Check 1:

Has the model always predicted large oil price declines and just happened to get it right in June 2014?

Cumulative 6-Month Percent Changes in the Brent Price of Crude Oil			
Starting in:	Actual	Brent Futures	Model Forecast
Feb 2014	-6.7	-2.1	+1.8
Mar 2014	-9.7	-1.7	-13.1
Apr 2014	-18.9	-1.6	-19.7
May 2014	-27.5	-3.1	-13.7
June 2014	-44.2	-2.3	-24.8

Plausibility Check 2:

Does this type of model predict large price declines by construction?

Industrial raw materials price index (excluding oil):

Observed decline	- 7%	
Predicted decline		
Price index + real economic activity	- 5 %	✓

Brent oil price:

Observed decline	- 44%	
Predicted decline		
Price of oil + real economic activity	- 9 %	✓
Price of oil + real economic activity + oil production + oil inventories	-25%	

What Caused the Model to Forecast Declining Oil Prices?

Economic models of the oil market:

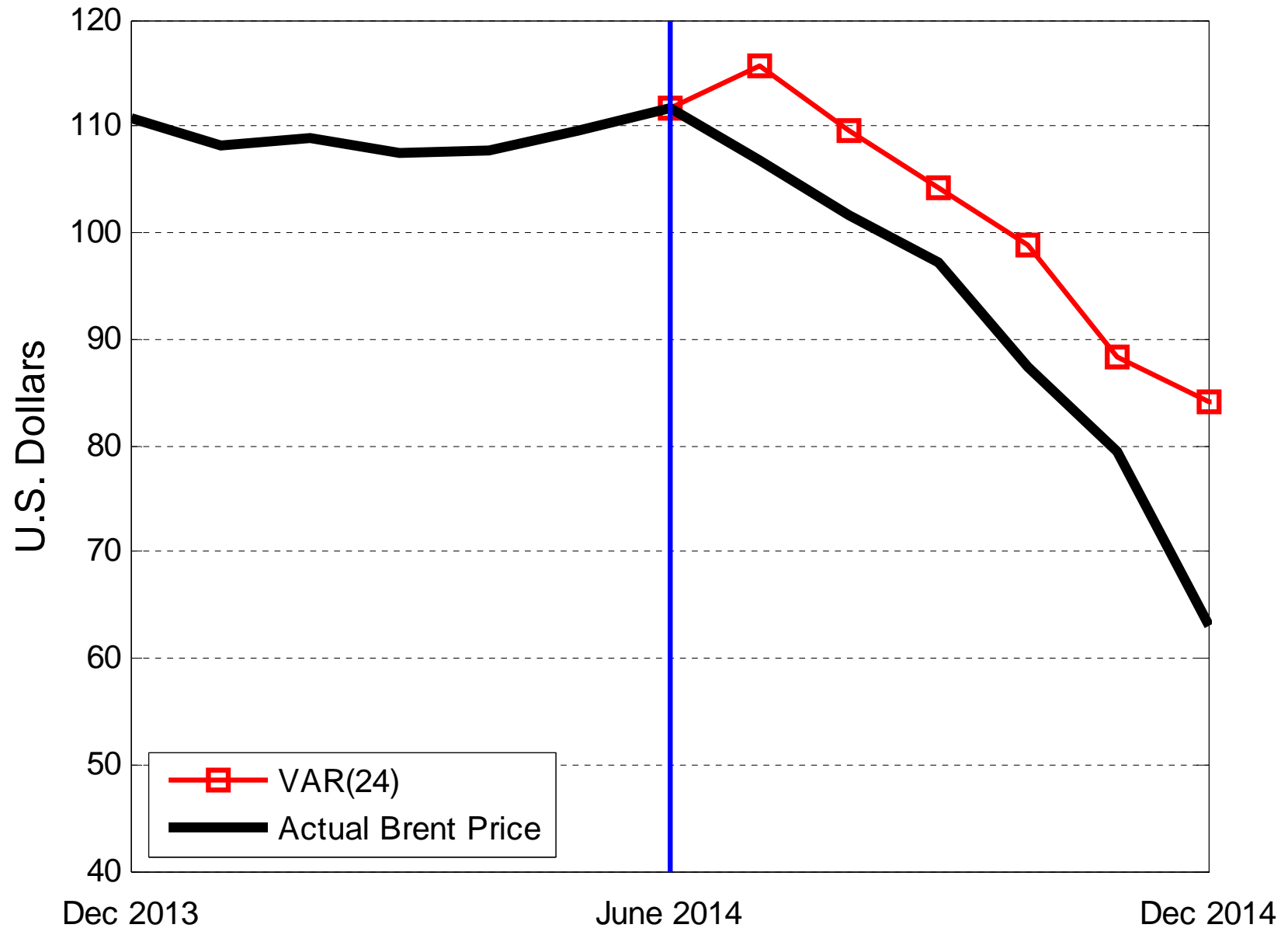
1. For the model to predict a disproportionate decline in the price of oil compared with other commodity prices, there must have been some combination of:

- a. Positive oil supply shocks
- b. Negative shocks to the demand for storage caused by expectations of higher oil production

prior to July 2014.

2. Given the absence of adverse shocks to oil supply, the predictable decline in non-oil commodity prices must reflect an unexpected weakening of the global economy, which also would explain a similar decline in the price of oil.

What Did the June 2014 Forecast Miss?



What Explains the 1-Step Ahead Forecast Error for July?

Economic models of the oil market suggest that an unexpected decline in the oil price can be explained as follows:

1. Positive oil supply shock:

Price ↓ Oil production ↑ Real activity ↑ Inventories ↑

2. Negative oil demand shock associated with an unexpectedly slowing global economy:

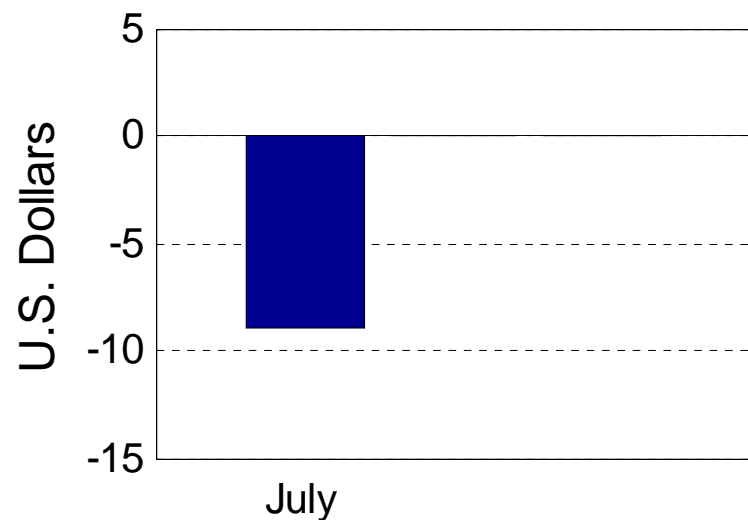
Price ↓ Oil production ↓ Real activity ↓ Inventories ↑

3. Negative shock to storage demand for oil associated with expectations of falling oil prices:

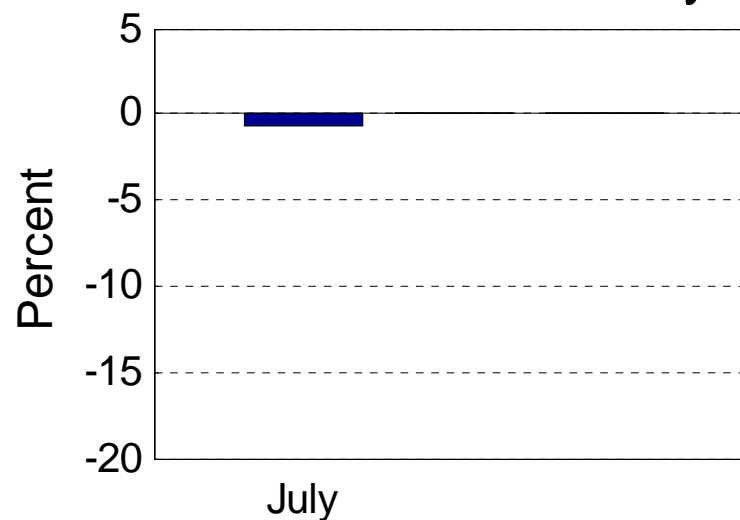
Price ↓ Oil production ↓ Real activity ↑ Inventories ↓

One-Step Ahead Forecast Errors for July 2014

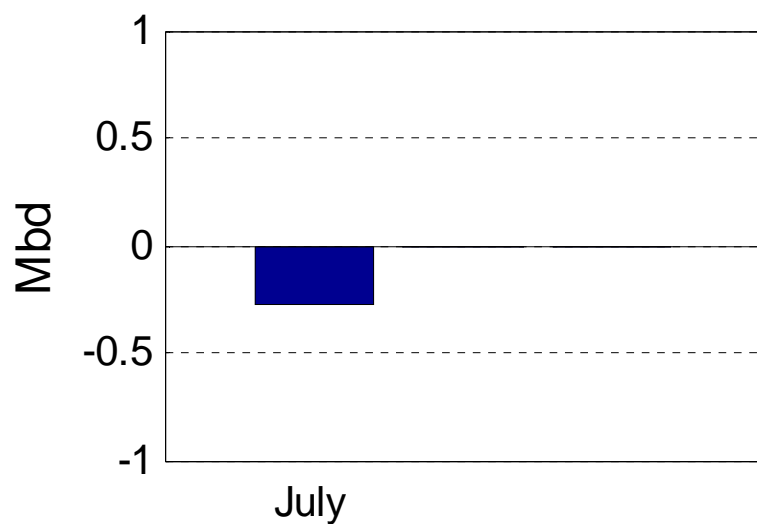
Brent Price



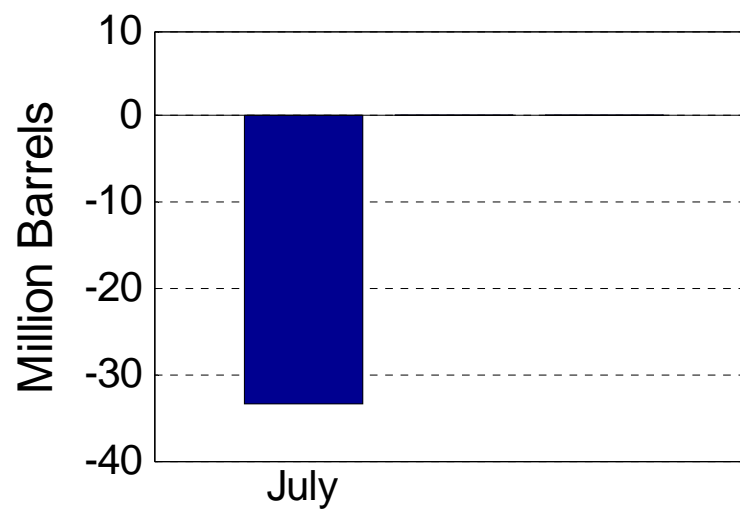
Global Real Activity



Global Oil Production



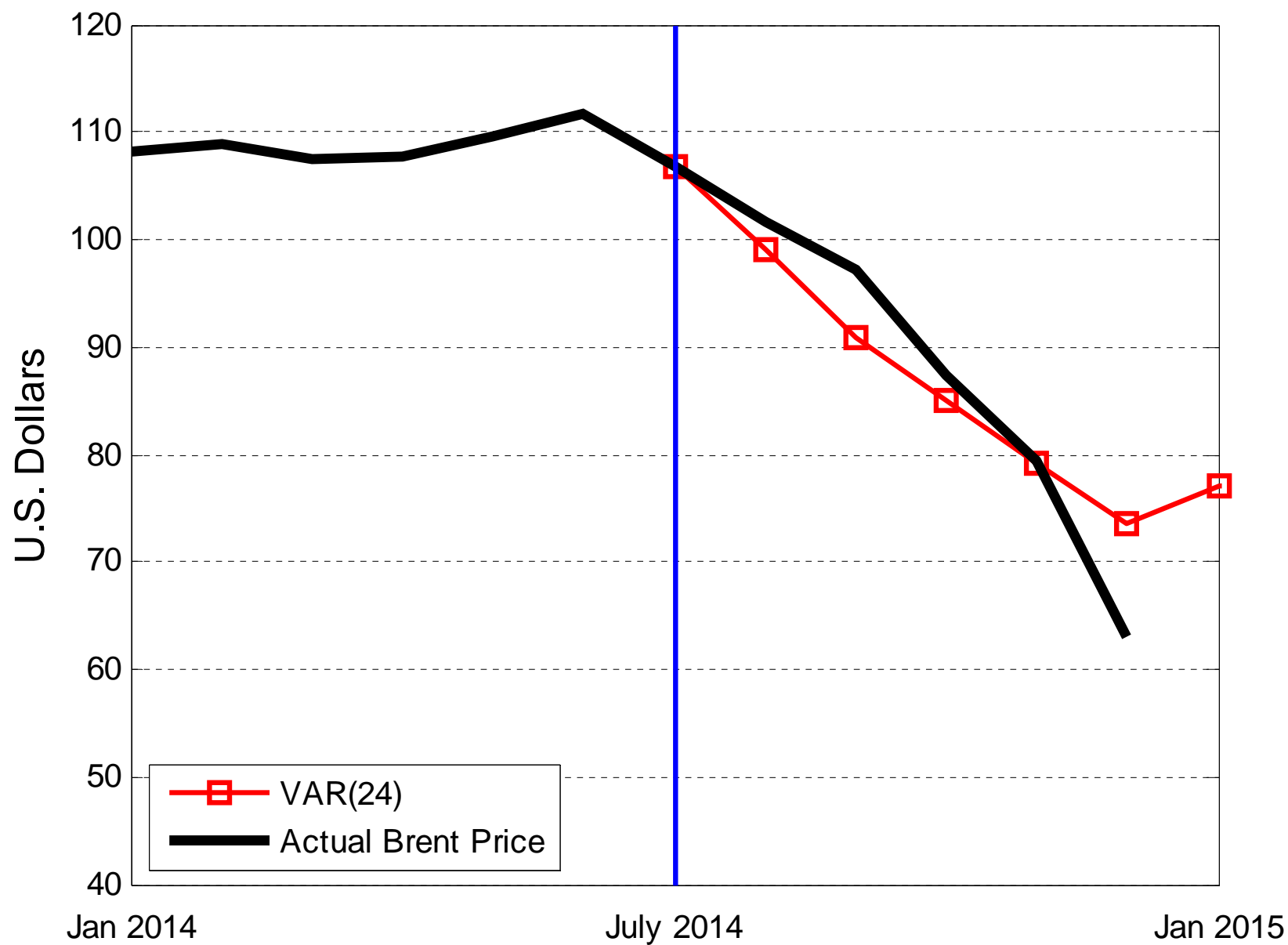
Oil Inventories



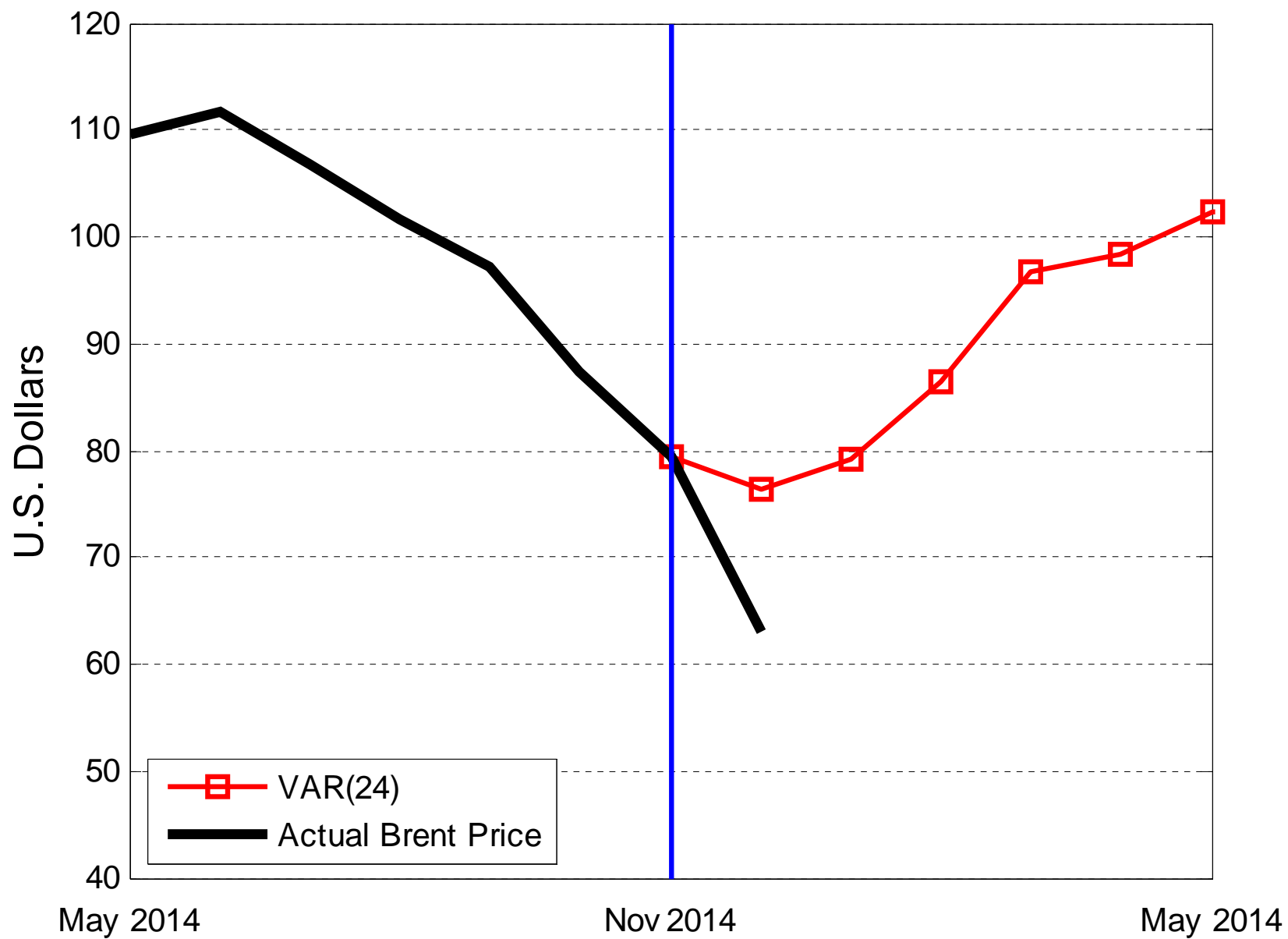
Summary of the Forecast Error Analysis for July

1. Oil production: Unexpected decline amounts to 0.35% of global production (large oil supply shocks involve reductions in global production between 7% and 10%) + sign is wrong.
2. Real activity: Unexpected decline amounts to 1.7% of the level of real activity
3. Change in inventories: Unexpected decline amounts to 3.4% of OECD industry oil stocks
 - ⇒ This pattern suggests a negative shock to storage demand caused by expectations of rising oil production and/or a weakening global economy.
 - ⇒ How does this affect the updated forecast as of July 2014?

Real-Time Forecast of the Price of Brent Crude Oil as of July 2014

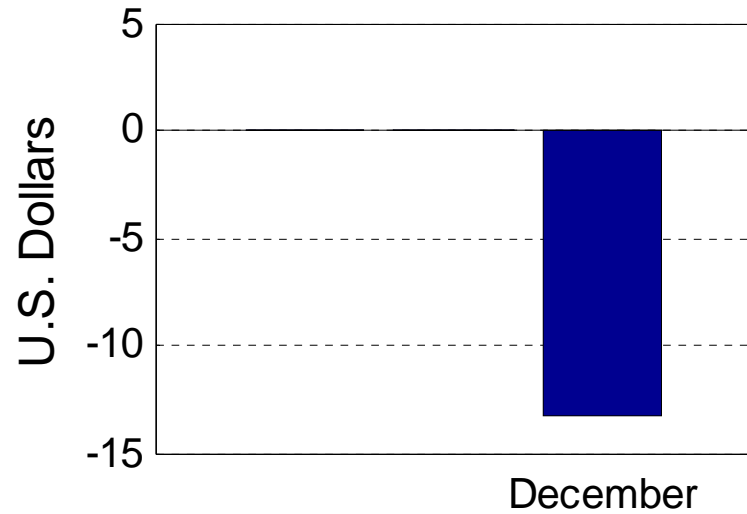


Real-Time Forecast of the Price of Brent Crude Oil as of November 2014

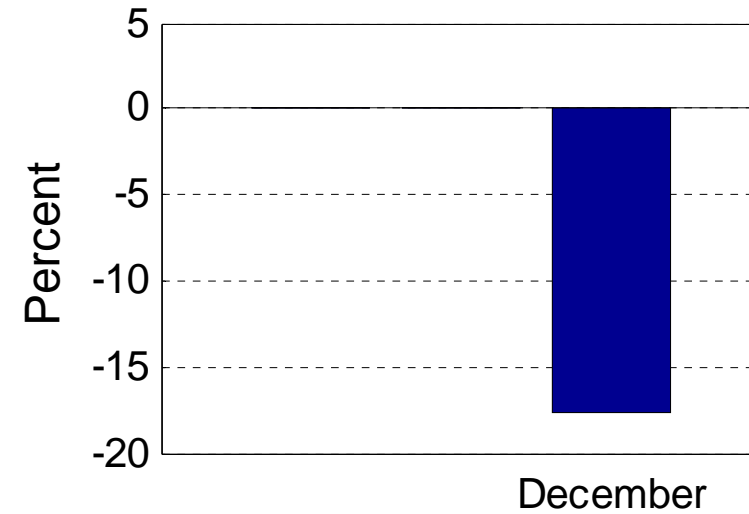


Forecast Errors for December 2014

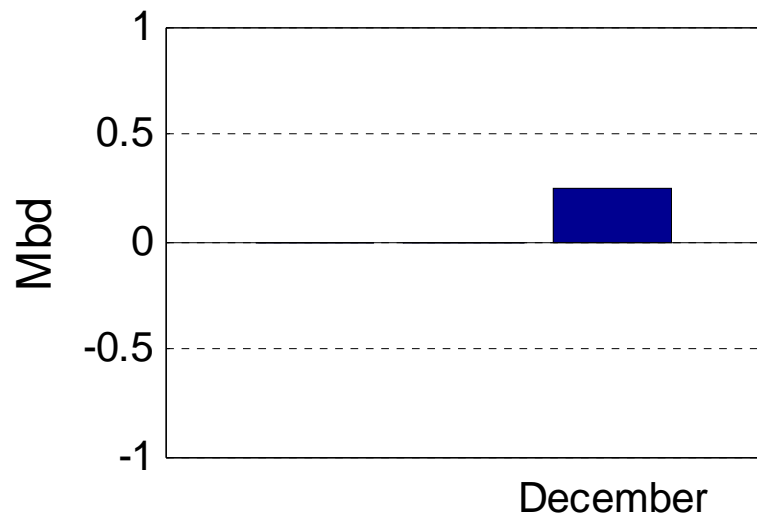
Brent Price



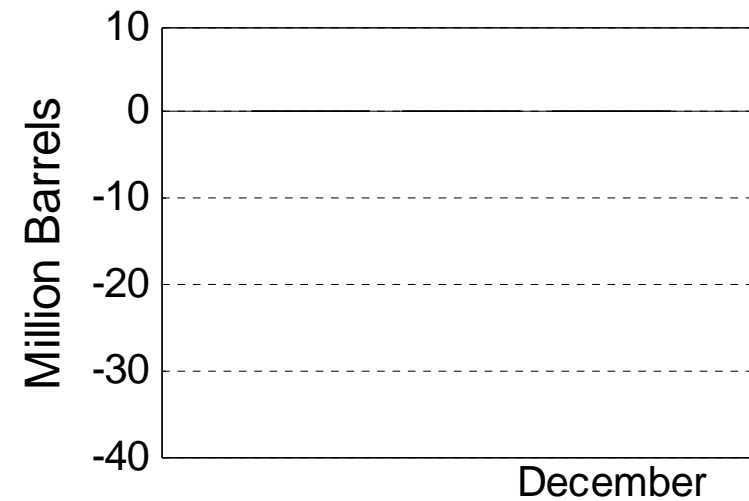
Global Real Activity



Global Oil Production



Oil Inventories



Forecast Error Analysis for December

1. Oil production: Unexpected increase by 0.24% of global production.
2. Real activity: Unexpected decline amounts to 2/3 of the level of real activity
3. Change in inventories: Data not yet available.
 - ⇒ This pattern suggests a negative shock to oil demand associated with an unexpected reduction in global real activity.
 - ⇒ The data are inconsistent with a negative storage demand shock caused by the OPEC announcement because the forecast error for real activity is strongly negative.

In fact, data released later show that the forecast error for inventories is of the wrong sign for the OPEC story.

Summary of What Explains the Oil Price Decline

Predictable component:

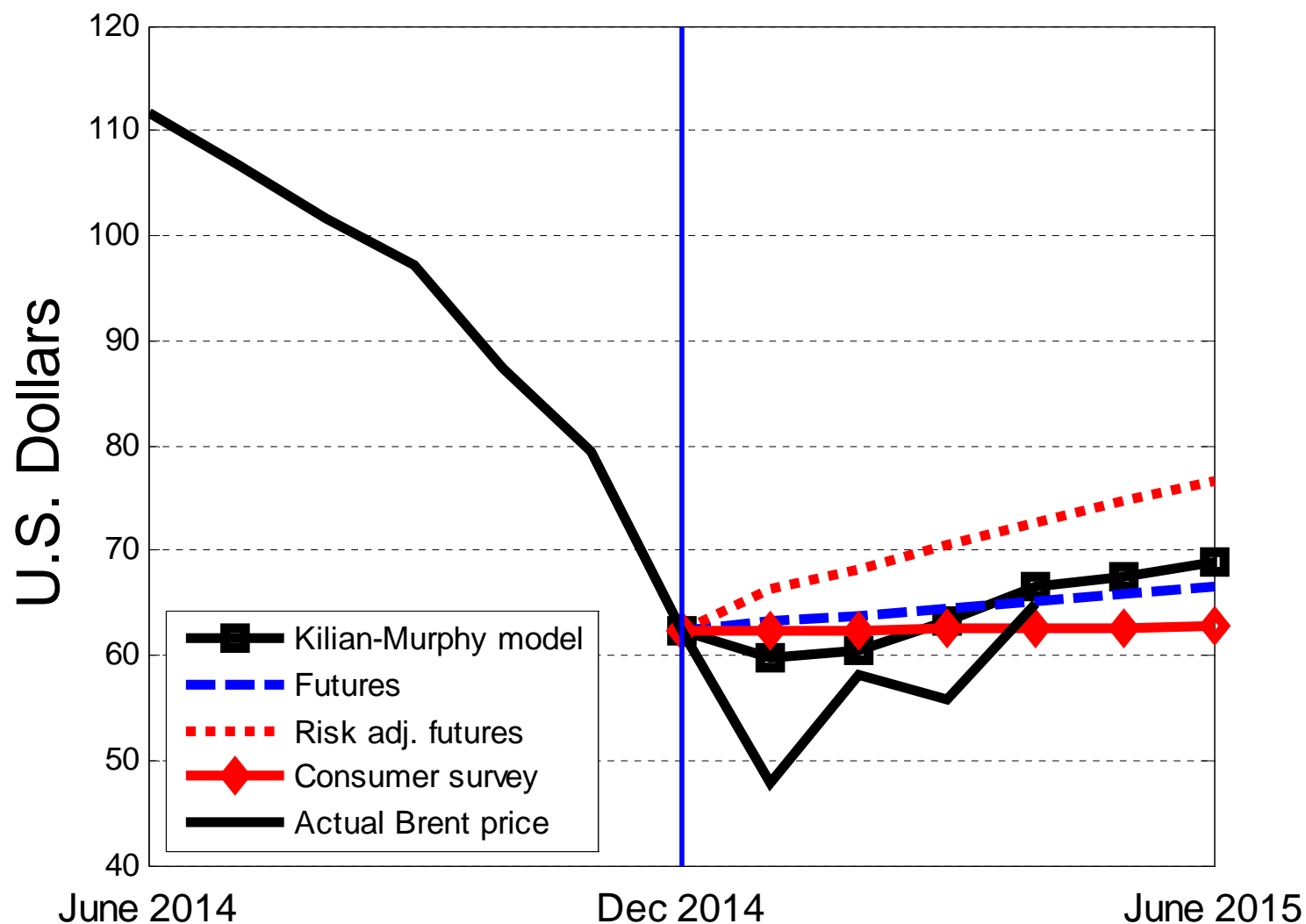
- \$11 Predictable decline in real activity as of June 2014
- \$16 Positive surprises about the supply side of the oil market before July 2014

Unpredictable component:

- \$9 Unexpected reduction in storage demand in July 2014 due to lower oil price expectations
- \$13 Unexpectedly weakening global economy in December 2014

-\$49 Total oil price decline between June and December 2014

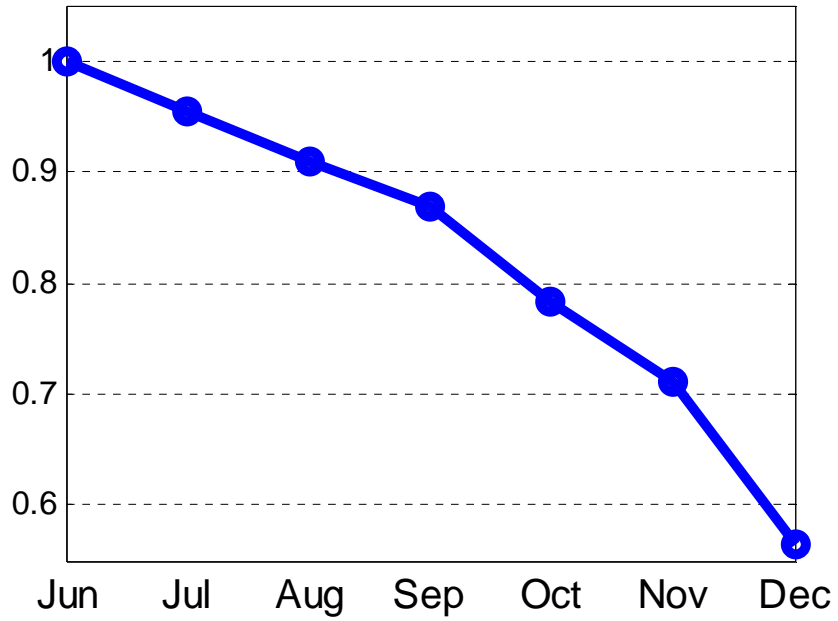
Real-Time Outlook for the Brent Price as of December 2014



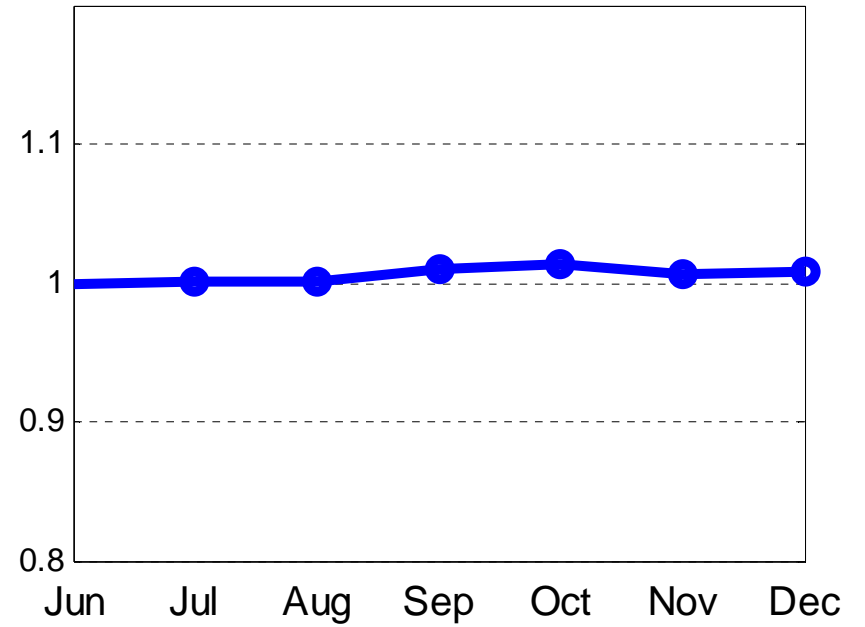
NOTES: The May 2015 spot price is a preliminary estimate. Source: Baumeister & Kilian (2015b)

No Response from Oil Producers?

Brent Price

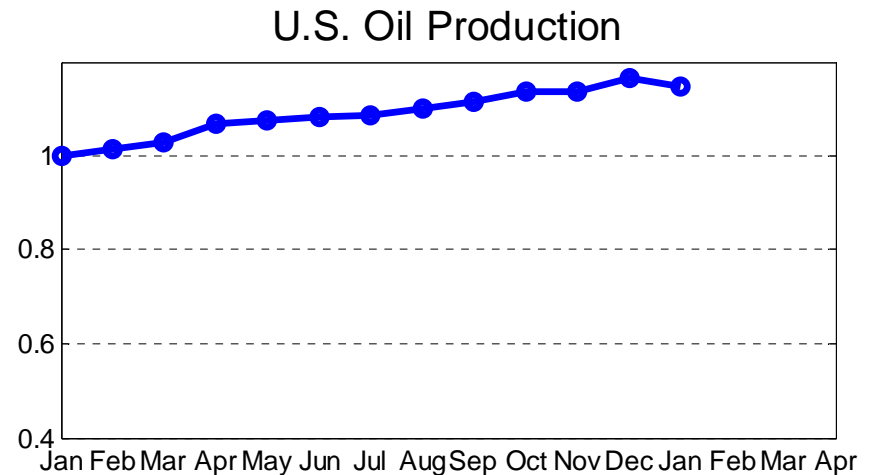
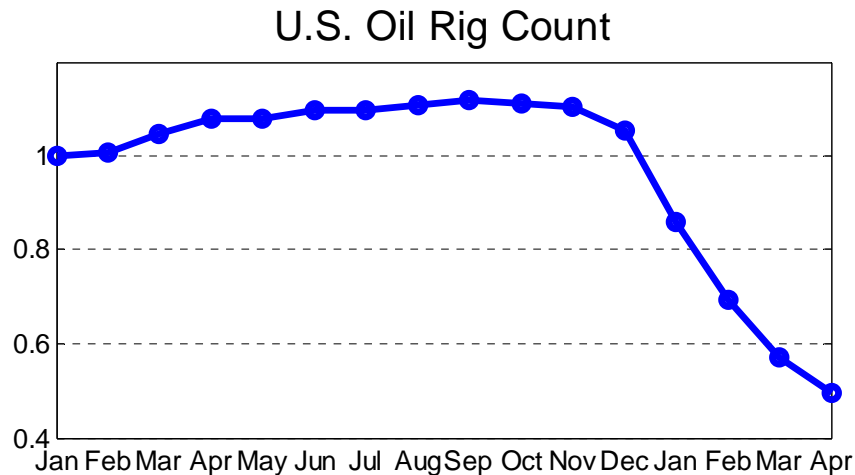


Global Oil Production



Why is the Response of Oil Production so Sluggish?

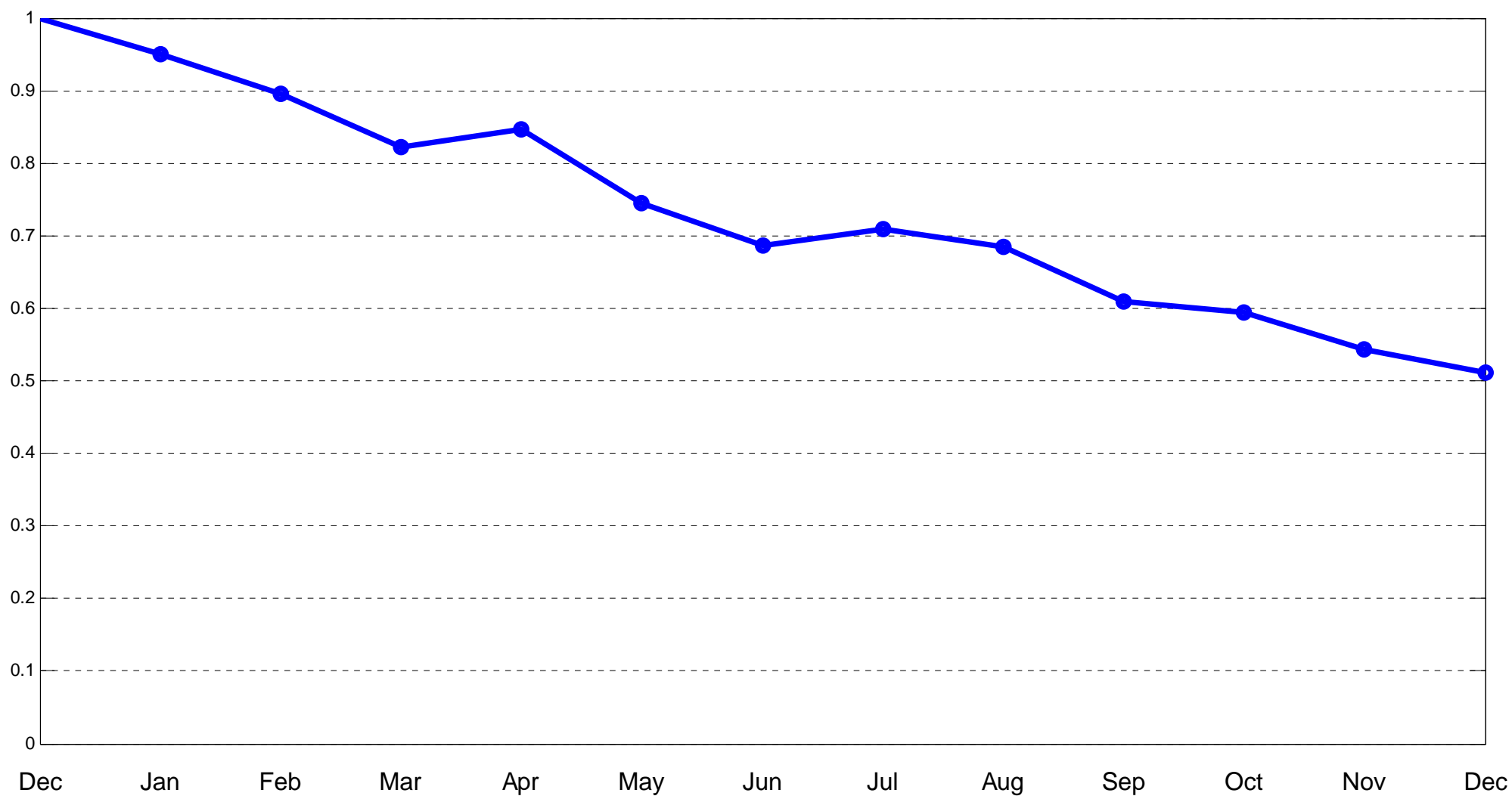
Example: United States



NOTES: The monthly U.S. oil production data are from the EIA's *Monthly Energy Review*. The end-of-the-month U.S. rotary oil rig count is from Baker Hughes.

- ⇒ The behavior of oil producers is consistent with economic theory (e.g., Anderson, Kellogg and Salant 2014).
- ⇒ No special role for Saudi Arabia

Chinese Spot Price of Iron Ore: 2013.12-2014.12



Effects of Lower Oil Prices on the Global Economy

- For oil exporters that are heavily dependent on oil export revenues, the recent oil price decline will cause a severe contraction (e.g., Venezuela, Russia, Iran, Iraq).
- For the U.S. and Canada, lower oil prices are a mixed blessing. The reduced profitability of the oil sector has to be traded off against the stimulus provided by lower oil prices.
- For oil importers the oil price decline represents a much-needed stimulus, but that stimulus should not be overstated:
 1. Some of the decline reflects a weakening global economy.
 2. The dollar exchange rate and high taxes on gasoline dampen the effect of lower oil prices on the European economy.
 3. The importance of oil for the economy is bounded by how much oil the economy uses.

Effects on Growth in Oil Importing Economies

Will we see a revival of industries that are oil-intensive in production or in use?

- The aggregate demand effects of lower oil prices are likely to be modest, given the small share of oil-products in consumption.

Crude oil accounts for about half the cost of gasoline, so the oil price dropping by 44% causes the gas price to drop by 22%.

Given a 3.5% share of fuel expenditures, this 22% reduction in the gas price yields a 0.77% increase in discretionary spending:

$$\underbrace{(1 - 0.035)}_{\text{Other items}} \times 1 + \underbrace{0.035}_{\text{Fuel}} \times 0.78 = 0.9923,$$

which in turn has to be weighted by the share of consumption in GDP, yielding an increase in real GDP of about 0.5%.

Other Considerations

- One would not expect large-scale investments to take place in industries using oil products as an input, given their small share in the economy, the lack of pass-through to product prices, and the uncertainty about the future oil price.
- If there are allocative effects associated, for example, with increased demand for larger automobiles at the expense of smaller cars with better mileage, these effects if anything will lower the growth stimulus.

Punchline: Don't overestimate the stimulus!

What about Deflation?

Definition: Deflation is a sustained decline in the price level.

1. A one-time decline in the oil price (all else equal) causes a one-time decline in the price level of oil-importing economies.

2. Even repeated declines in the price of oil for half a year are unlikely to cause expectations of deflation, unless they are expected to become a regular occurrence.

⇒ Declines in the price of oil cannot persist because oil producers would have to shut down production, once their marginal cost exceeds the price of oil. Hence, the quantity of oil produced would fall, and (all else equal) the price of oil would stabilize.

Punchline: No additional deflation risks.