

Rebalancing the oil market

Progress and prospects

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REUTERS
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(John Kemp is a Reuters market analyst. The views expressed are his own)

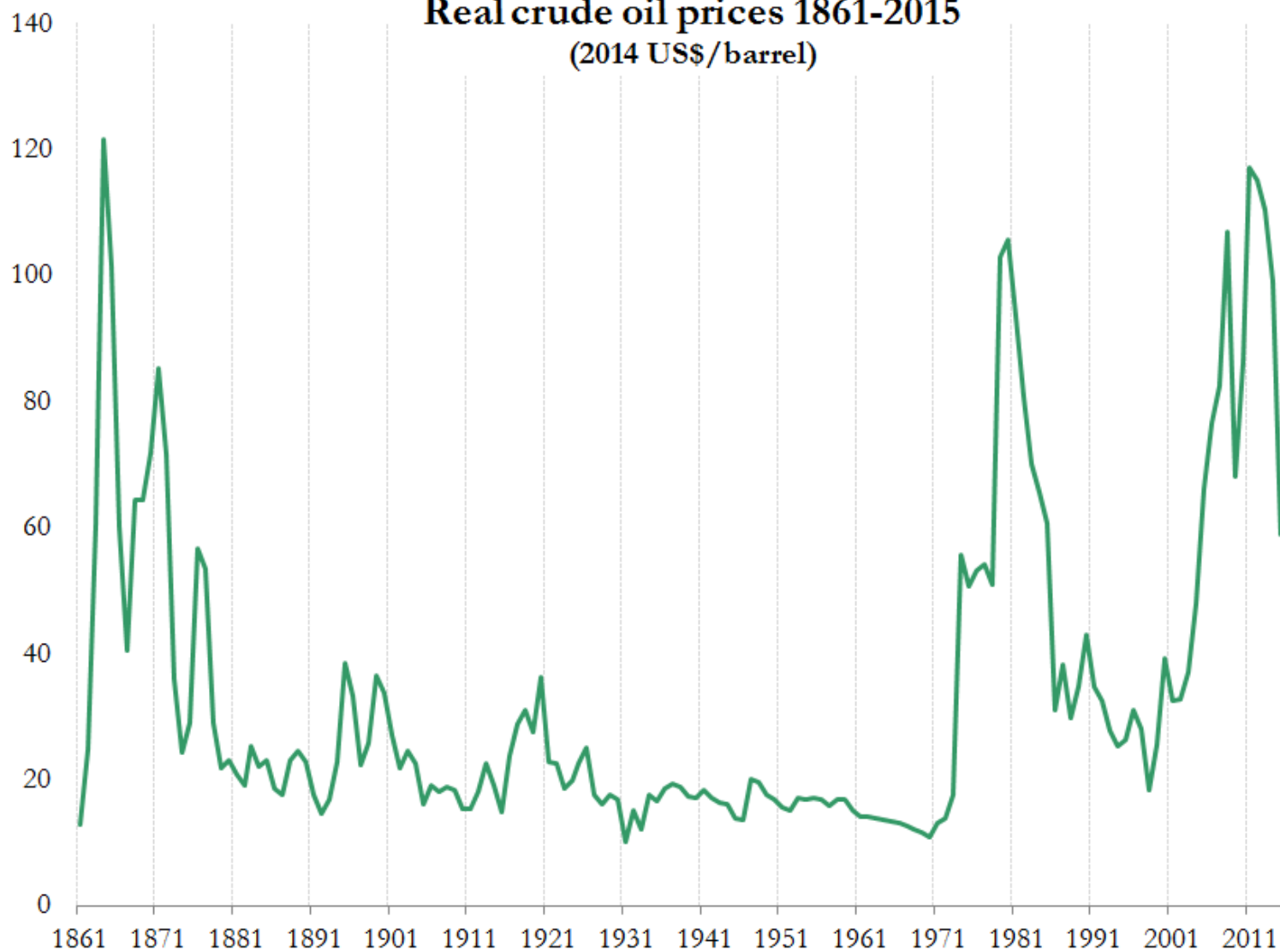


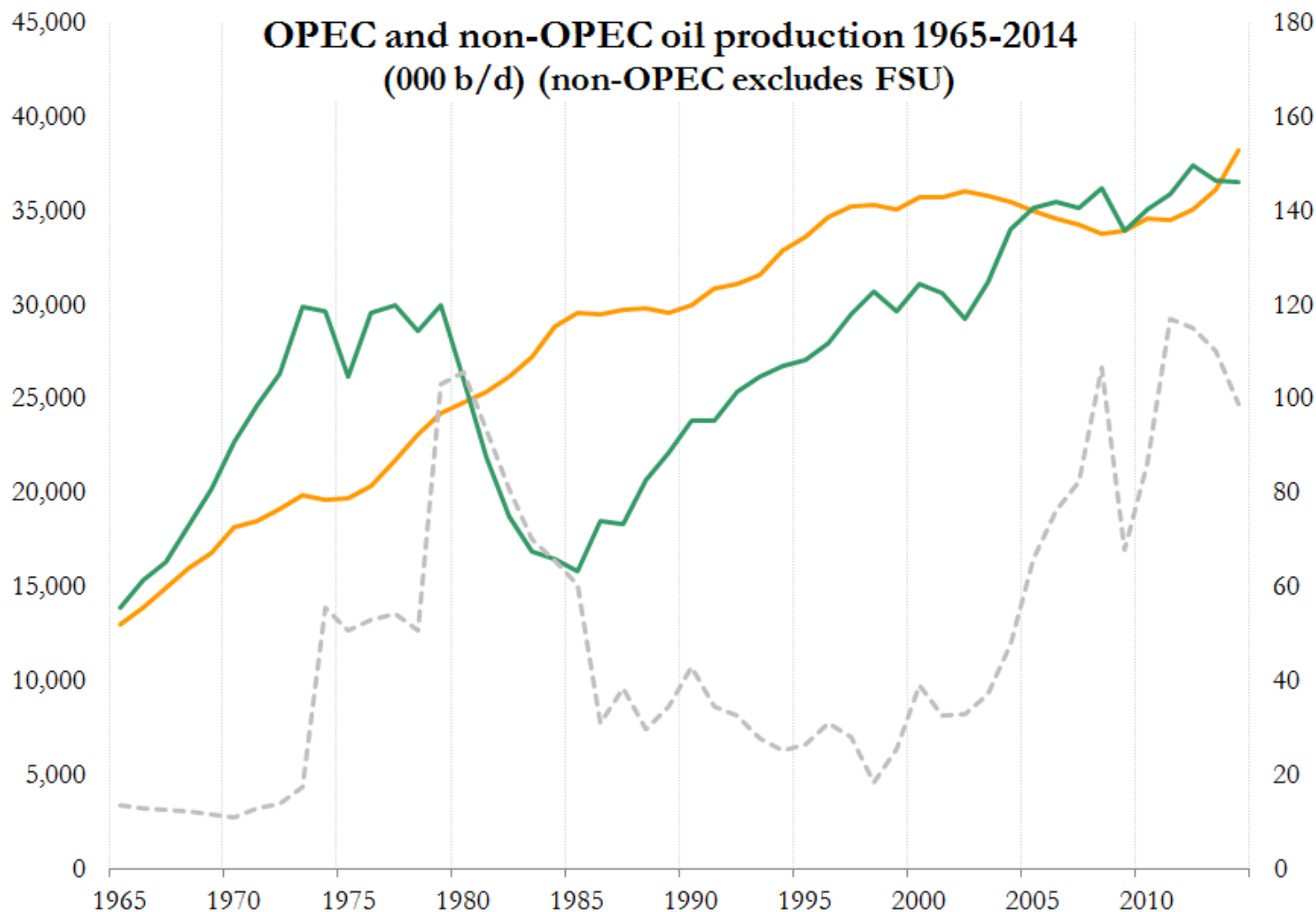
**“If something cannot go on forever, it will stop” —
Stein’s Law**

**Herbert Stein, Chairman of the Council of Economic Advisers
(1972-74)**

***What I Think: Essays on Economics, Politics and Life* (1998)**

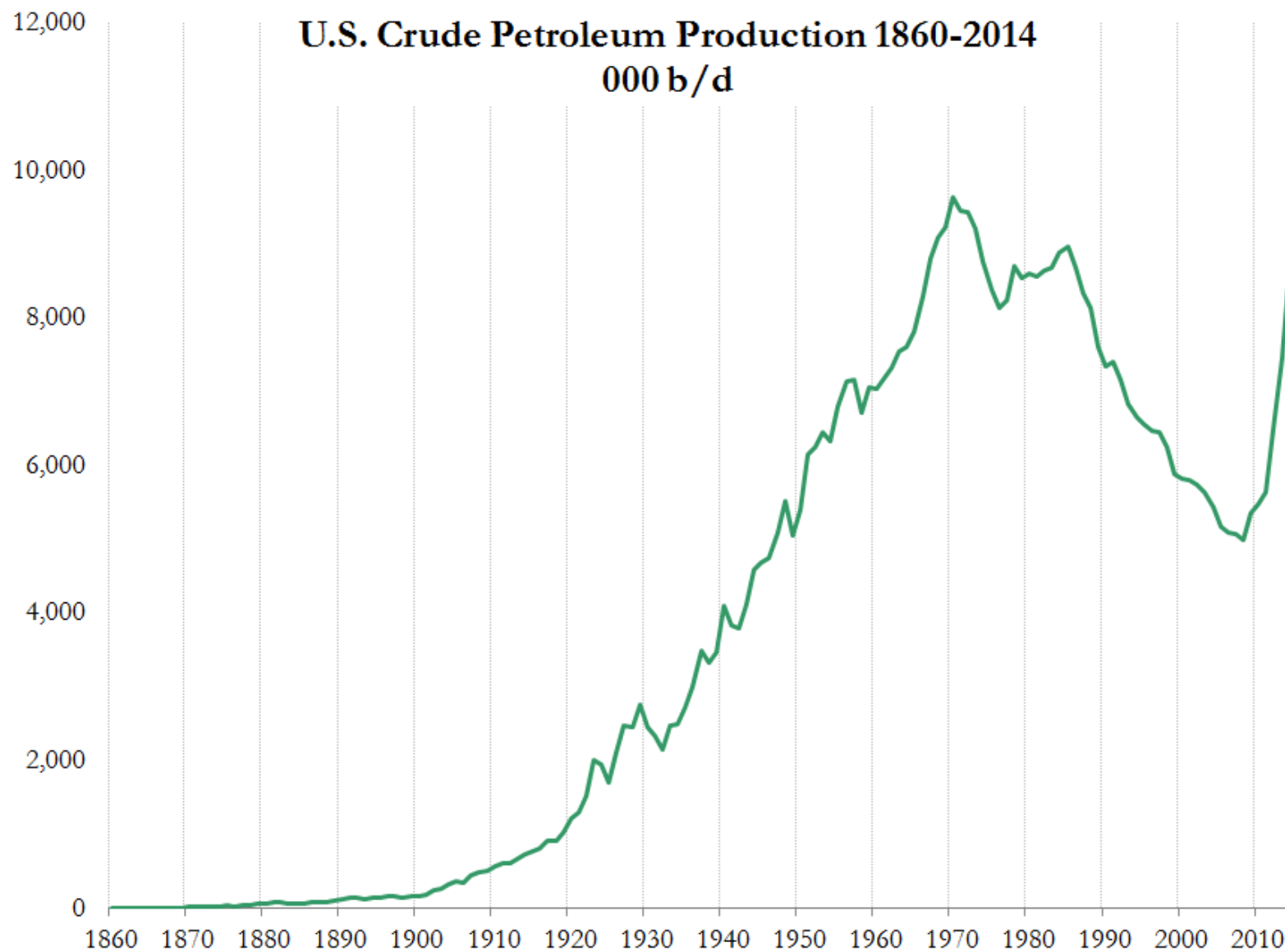
Real crude oil prices 1861-2015 (2014 US\$/barrel)





— Non-OPEC (left-axis)
— OPEC (left-axis)
- - - Real crude oil price (2014US\$/bbl) (right-axis)

Source: BP Statistical Review of World Energy 2015
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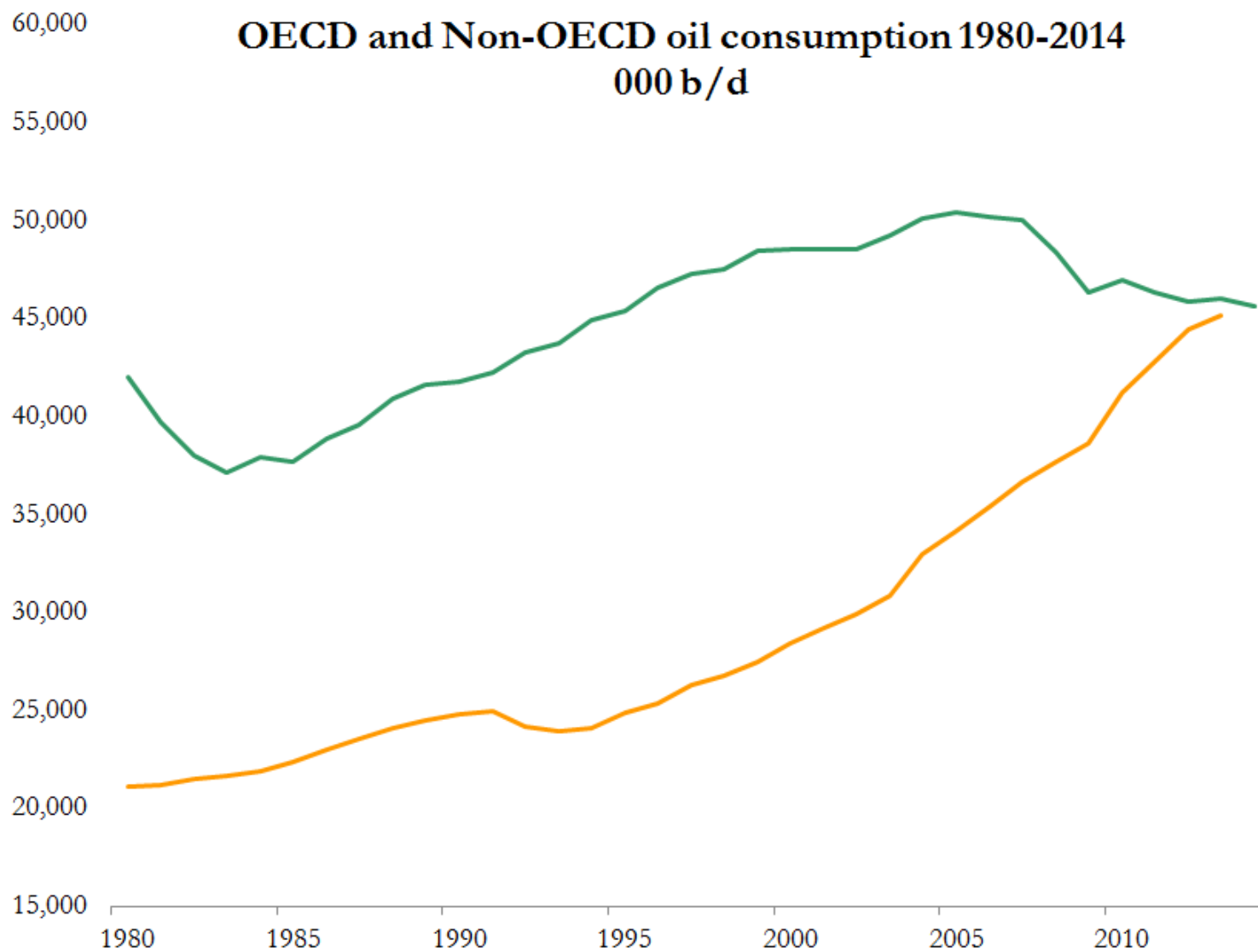


Source: US Energy Information Administration

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OECD and Non-OECD oil consumption 1980-2014

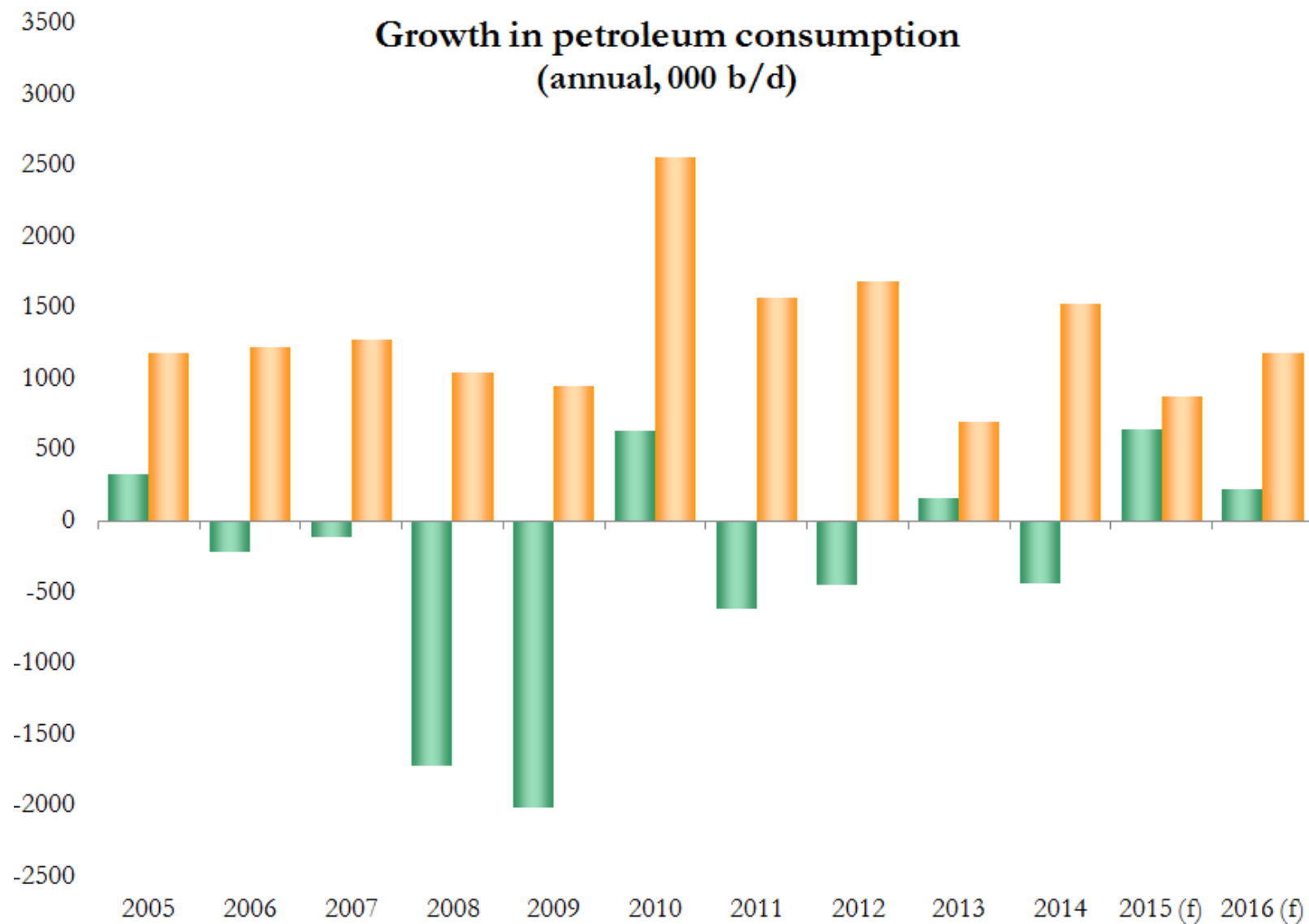
000 b/d



— OECD oil demand
— Non-OECD oil demand

Source: US Energy Information Administration
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Growth in petroleum consumption (annual, 000 b/d)



■ OECD
■ Non-OECD

Source: US Energy Information Administration
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Decade of high and rising oil prices 2004-2014

Real price of crude \geq \$100 for 4 years 2011-2014

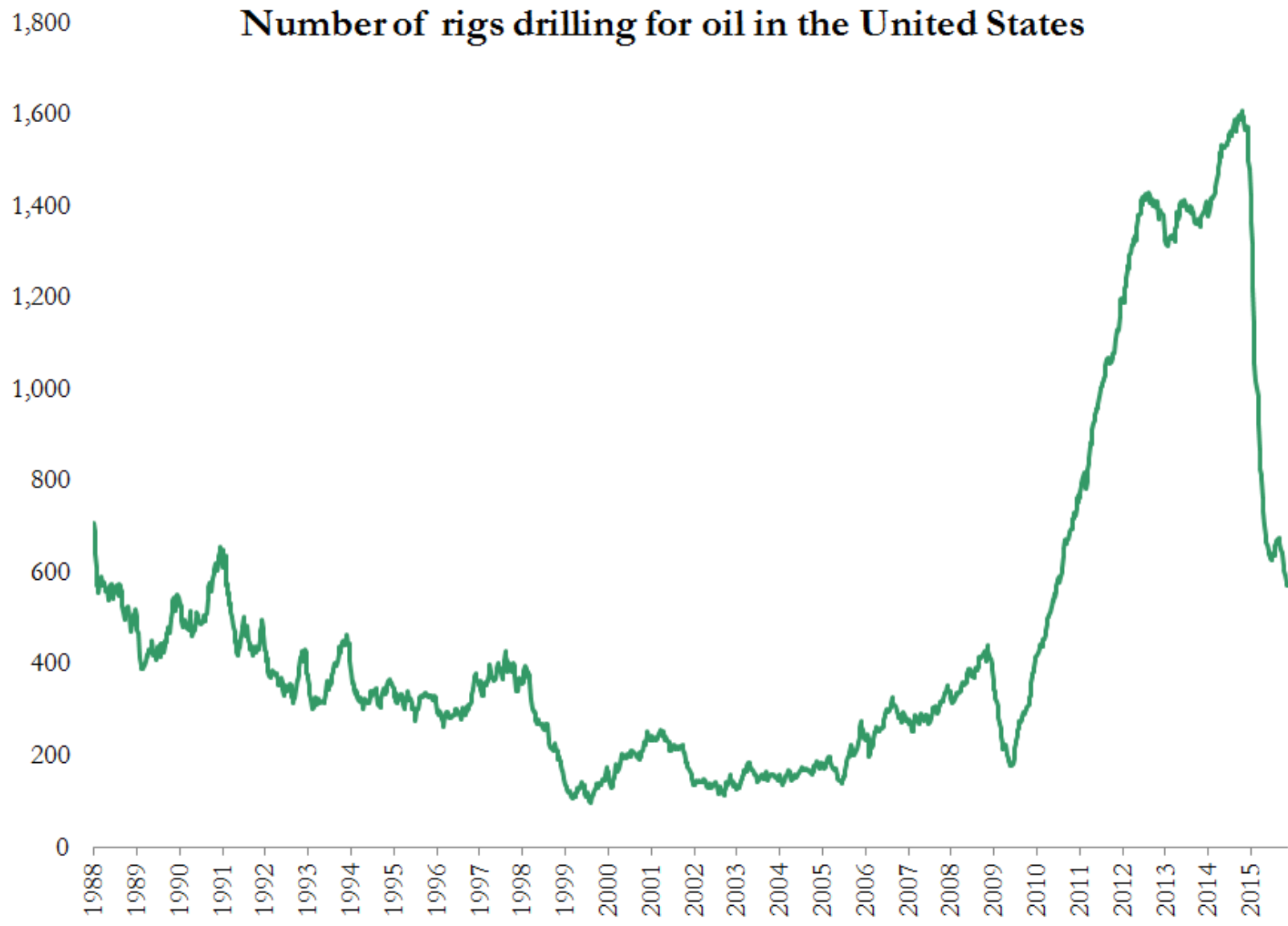
Oil supply accelerating

Oil demand decelerating

Emerging imbalance

Lower prices required to realign supply and demand

Number of rigs drilling for oil in the United States

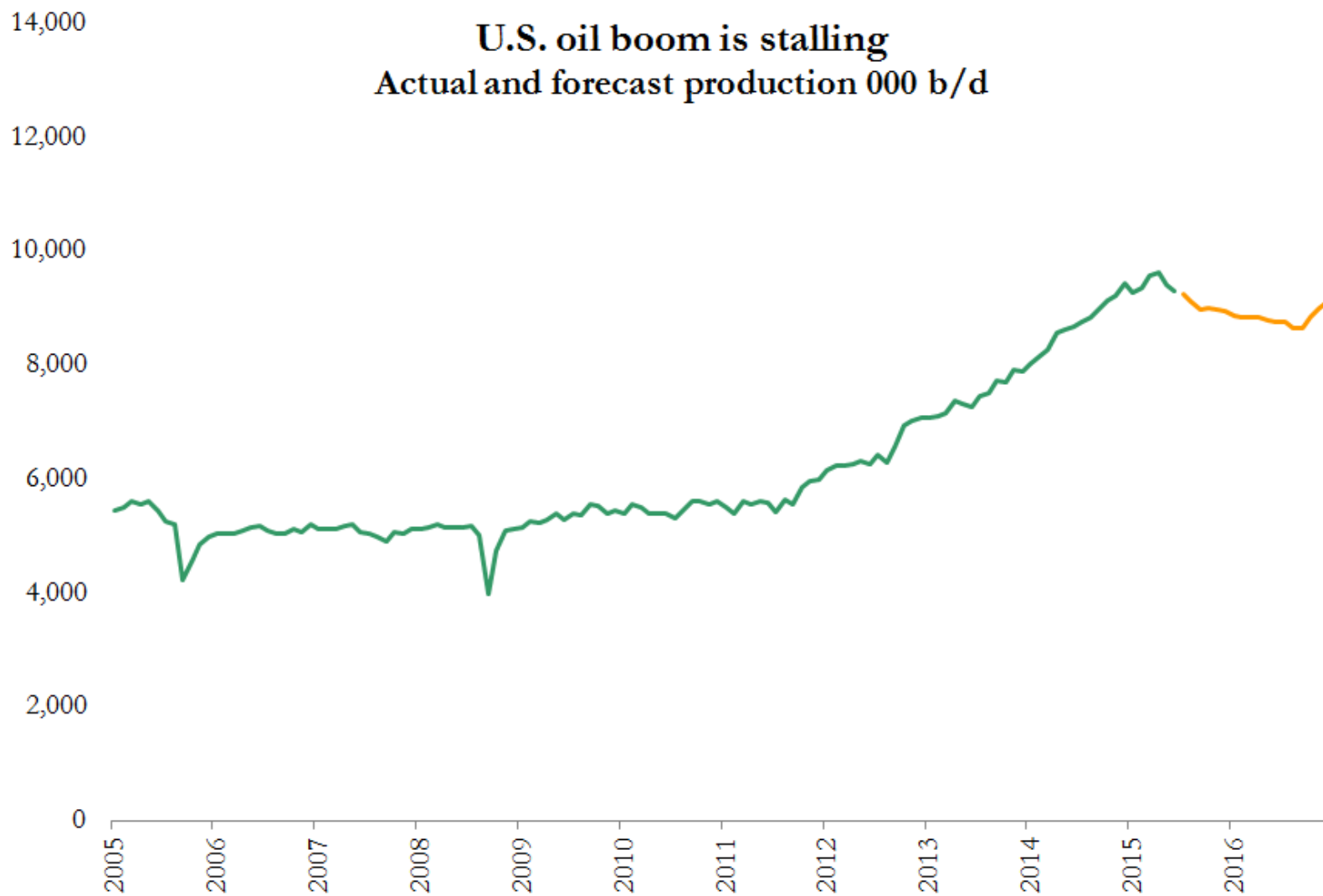


Source: Baker Hughes

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U.S. oil boom is stalling

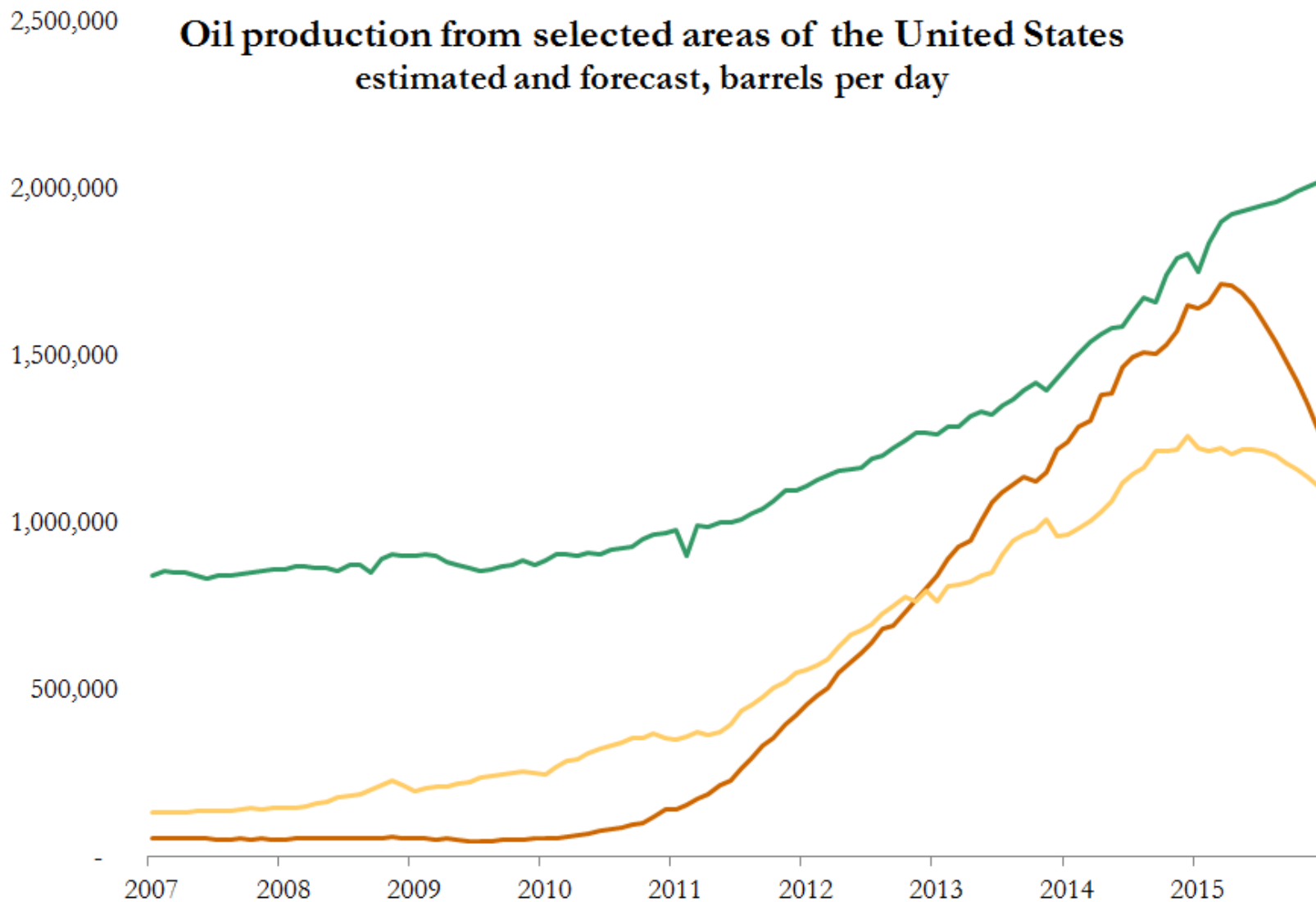
Actual and forecast production 000 b/d



— Crude and condensate production (actual)
 — Crude and condensate production (forecast)

Source: US Energy Information Administration "Short Term Energy Outlook" Sep 2015
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Oil production from selected areas of the United States estimated and forecast, barrels per day



— Permian Basin
— Eagle Ford
— Bakken

Source: US Energy Information Administration *Drilling Productivity Report* Nov 2015
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Adjusting oil supply involves three groups of producers

OPEC

Core Gulf

Iran (Iraq?)

African/Latin American members

U.S. shale

Core plays and counties

Marginal plays and counties

Non-OPEC non-shale (NONS)

North Sea

Deepwater

Arctic

Megaprojects

Frontier

Forecast growth in oil demand in 2015 (million b/d)

| | EIA | OPEC | IEA |
|------------------------|-----|------|-----|
| OECD | 0.4 | 0.4 | 0.5 |
| of which United States | 0.3 | 0.3 | 0.4 |
| Non-OECD | 0.7 | 1.1 | 1.1 |
| of which China | 0.3 | 0.4 | 0.4 |
| World | 1.2 | 1.5 | 1.7 |
| ex China | 0.9 | 1.1 | 1.3 |

Gasoline consumption rising strongly in the United States

Vehicle miles travelled (VMTs) are increasing

Employment gains

Income gains

Price effects

Motorists are opting for larger vehicles

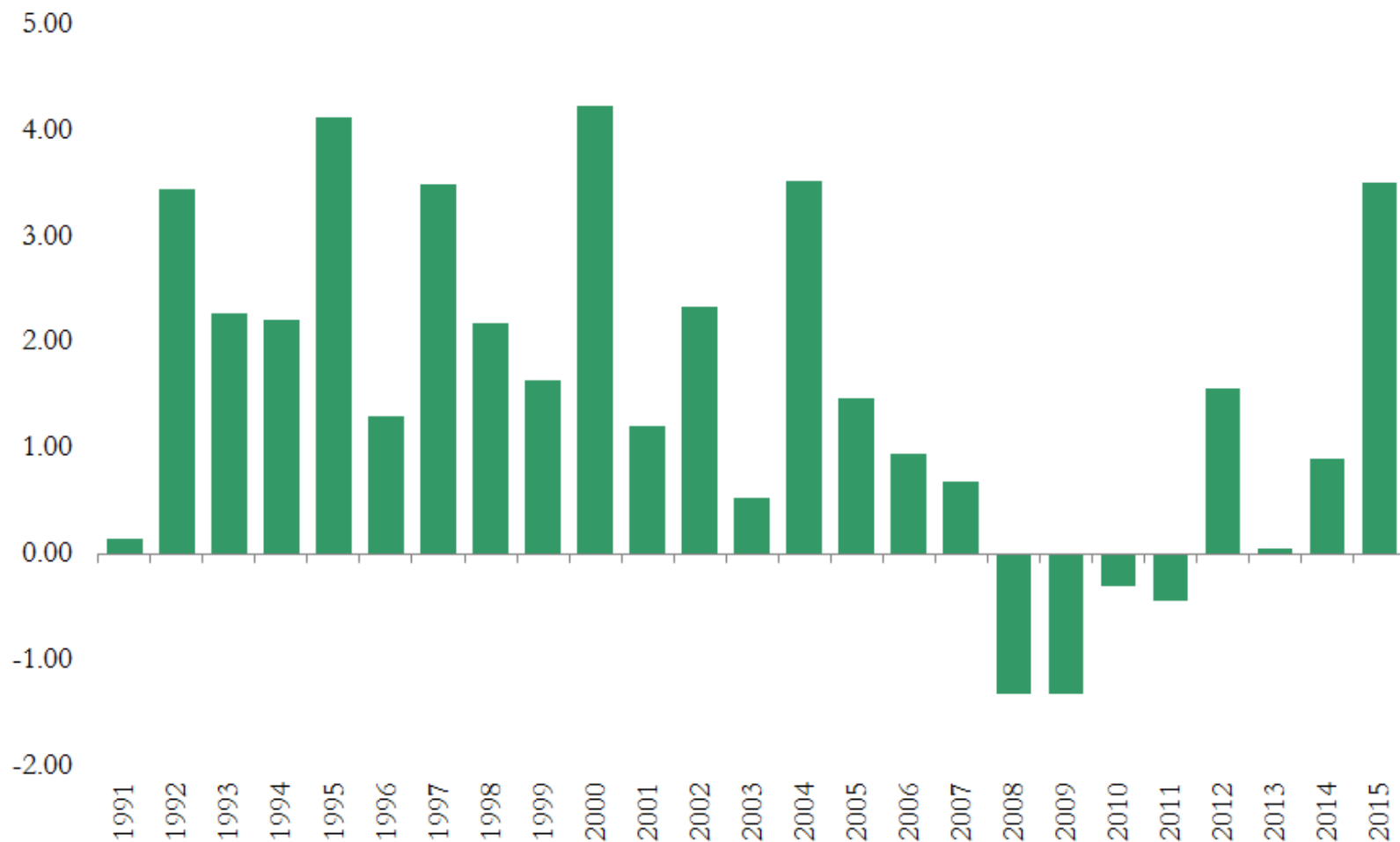
Selected indicators for U.S. gasoline demand 2015/2014

| Statistic | Percent increase | Period | Source |
|--|------------------|-------------------|---|
| Gasoline consumption | 4.3 | H1 2015/2014 | <i>Energy Information Administration "Prime Supplier Report"</i> |
| Vehicle-miles travelled | 3.5 | H1 2015/2014 | <i>Federal Highway Administration "Traffic Volume Trends"</i> |
| Nonfarm payroll employment | 2.1 | Jun 2015/2014 | <i>Bureau of Labor Statistics "Current Employment Statistics"</i> |
| Civilian employment | 1.7 | Jun 2015/2014 | <i>Bureau of Labor Statistics "Current Population Survey"</i> |
| GDP (real) | 2.7 | Q2 2015/2014 | <i>Bureau of Economic Analysis "National Income and Product Accounts"</i> |
| PCE (real) | 3.1 | Q2 2015/2014 | <i>Bureau of Economic Analysis "National Income and Product Accounts"</i> |
| Personal income (nominal) | 4.2 | Q2 2015/2014 | <i>Bureau of Economic Analysis "National Income and Product Accounts"</i> |
| Workers compensation (nominal) | 4.1 | Q2 2015/2014 | <i>Bureau of Economic Analysis "National Income and Product Accounts"</i> |
| Disposable per capita income (nominal) | 2.6 | Q2 2015/2014 | <i>Bureau of Economic Analysis "National Income and Product Accounts"</i> |
| Disposable per capita income (real) | 2.4 | Q2 2015/2014 | <i>Bureau of Economic Analysis "National Income and Product Accounts"</i> |
| Population | 0.7 | Q2 2015/2014 | <i>Bureau of Economic Analysis "National Income and Product Accounts"</i> |
| Car sales | -2.8 | Jan-Aug 2015/2014 | <i>Wards.Auto</i> |
| Light truck sales | 10.0 | Jan-Aug 2015/2014 | <i>Wards.Auto</i> |
| Memo items: | | | |
| National gasoline sales (percent increase) | 2.9 | Jan-Apr 2015/2014 | <i>Federal Highway Administration "Monthly Motor Fuel Reported by States"</i> |
| California gasoline sales (percent increase) | 3.0 | H1 2015/2014 | <i>California Board of Equalization "Motor Vehicle Fuel Distribution Reports"</i> |
| Car/light truck mix (percent of total sales) | 47.7/52.2 | Jan-Aug 2014 | <i>Wards.Auto</i> |
| Car/light truck mix (percent of total sales) | 44.7/55.3 | Jan-Aug 2015 | <i>Wards.Auto</i> |

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Traffic growth in the United States in first 6 mths of the year

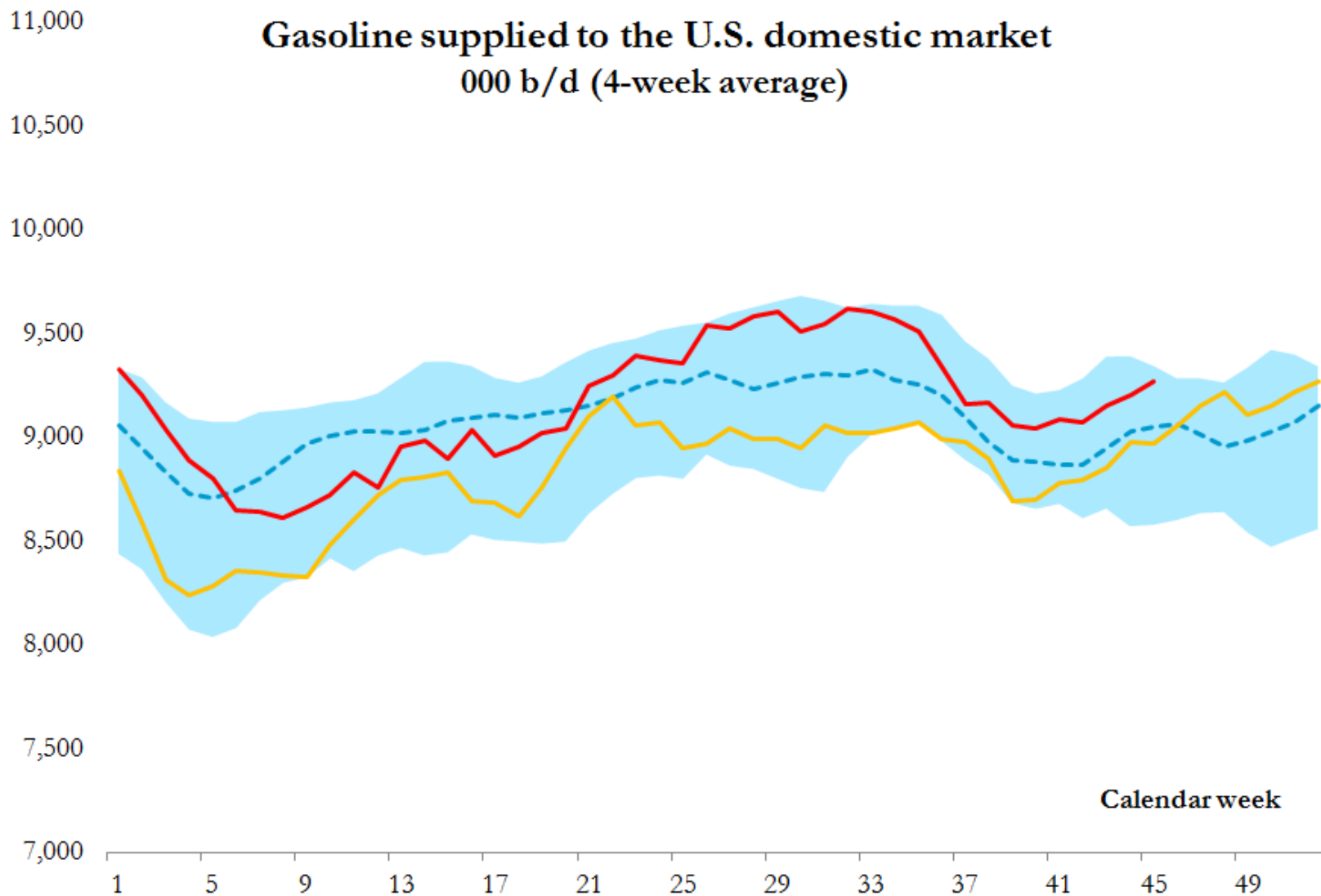
Vehicle-miles travelled, percent increase compared with prior year



Source: Federal Highway Administration

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Gasoline supplied to the U.S. domestic market 000 b/d (4-week average)



- Ten Year Max-Min Range
- - - Ten Year Median
- 2014
- 2015

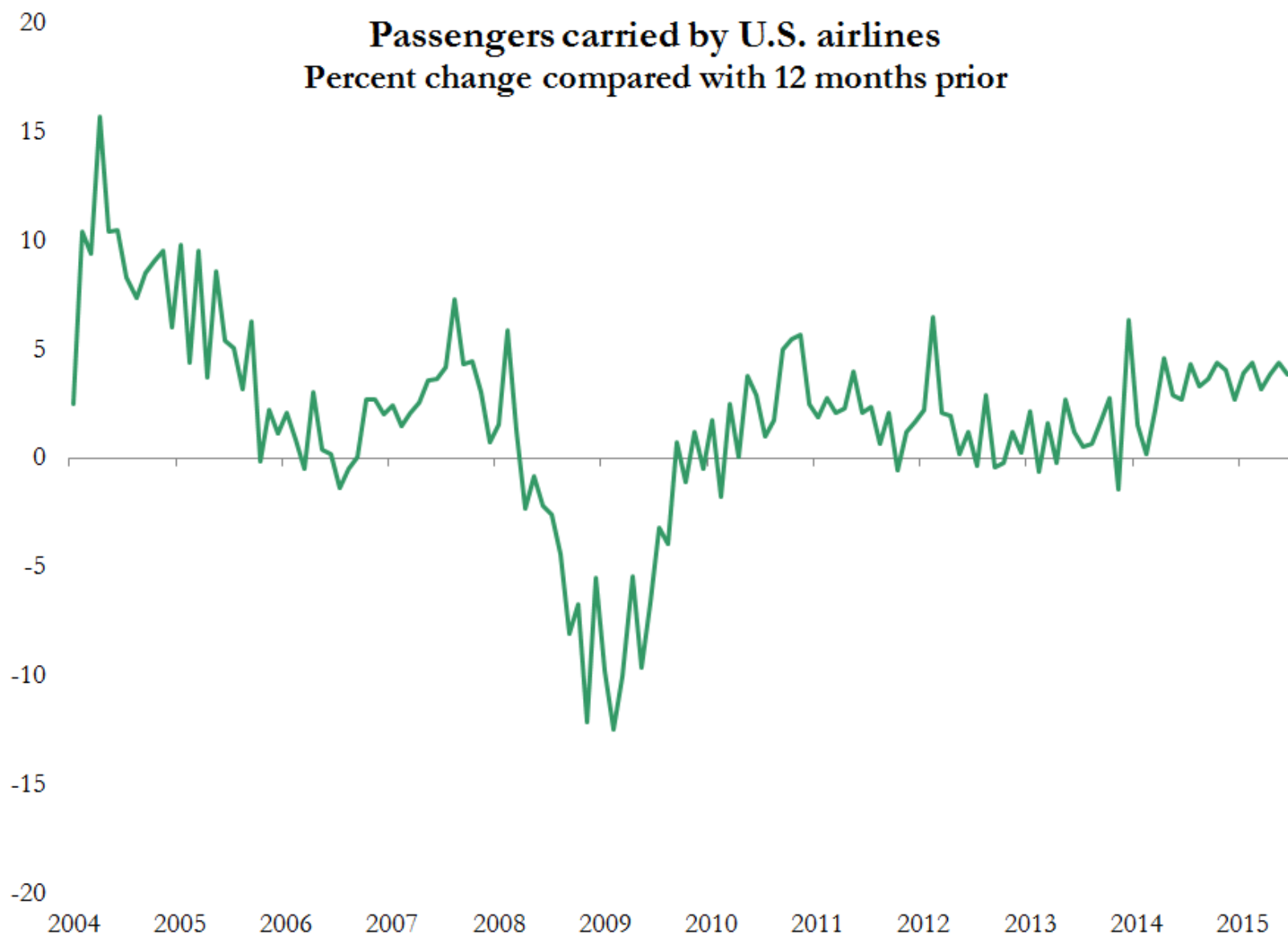
Source: EIA

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Product supplied = domestic production + imports - exports - inventory change

Passengers carried by U.S. airlines

Percent change compared with 12 months prior

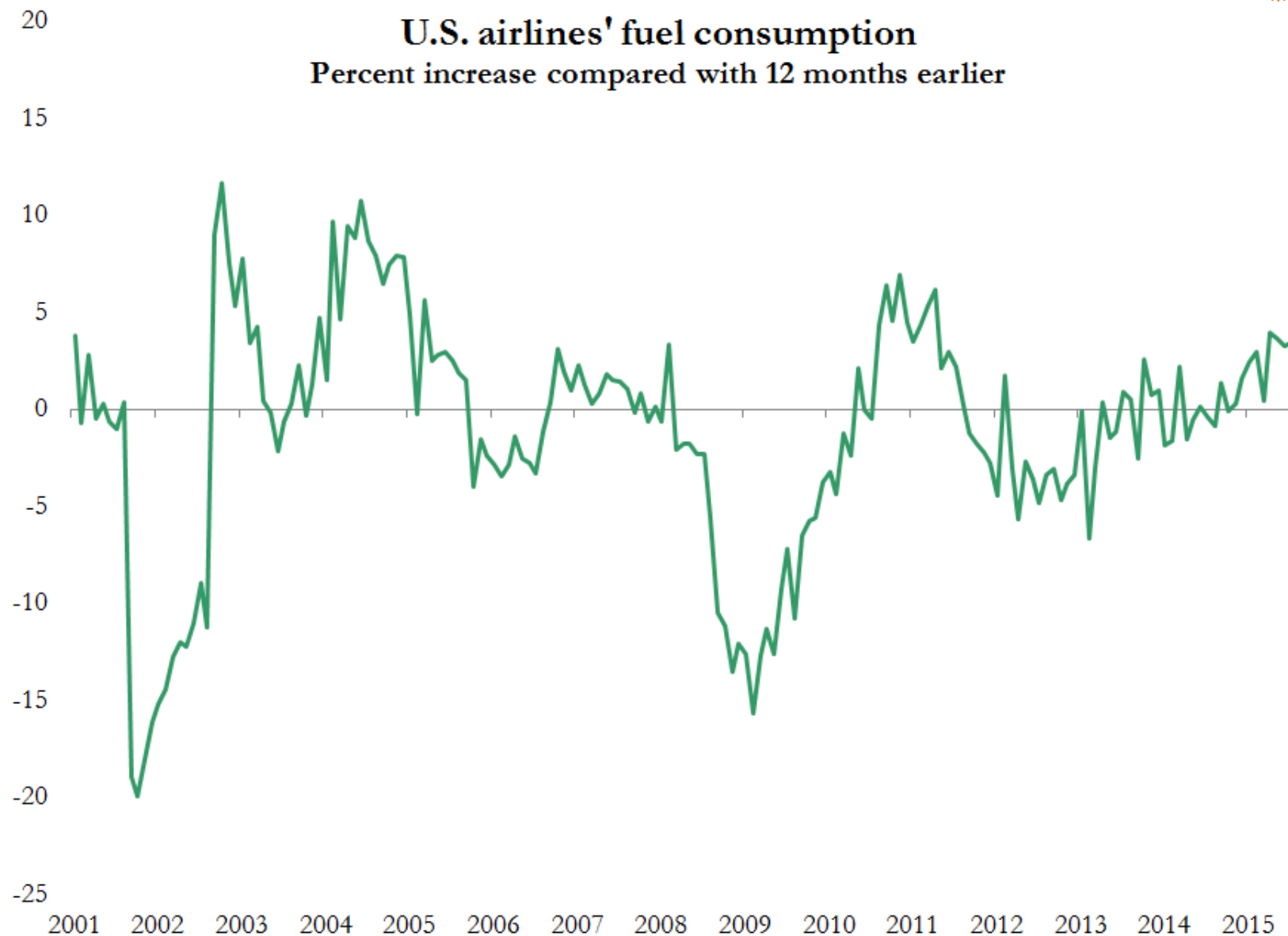


Source: US Bureau of Transportation Statistics

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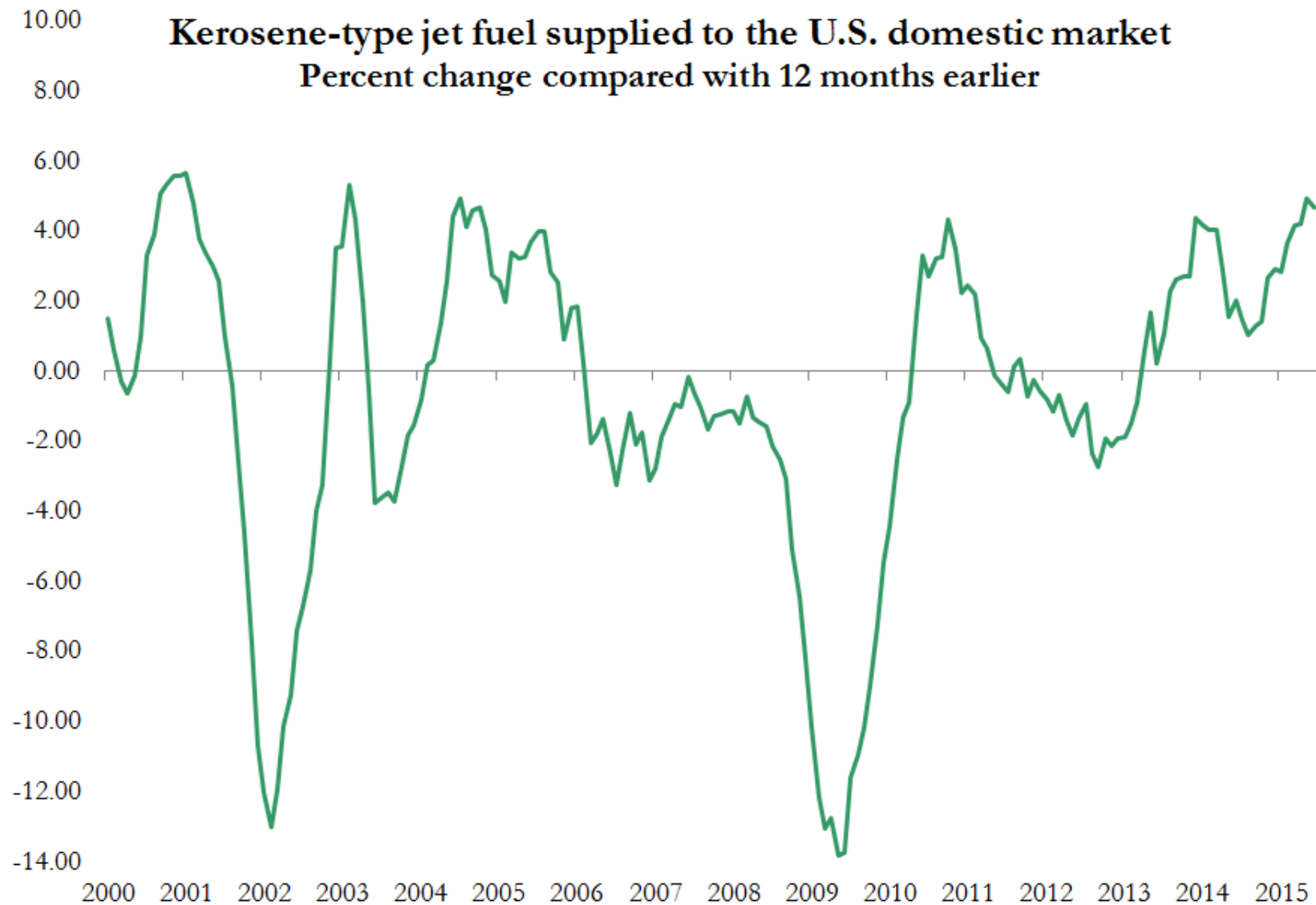
U.S. airlines' fuel consumption

Percent increase compared with 12 months earlier



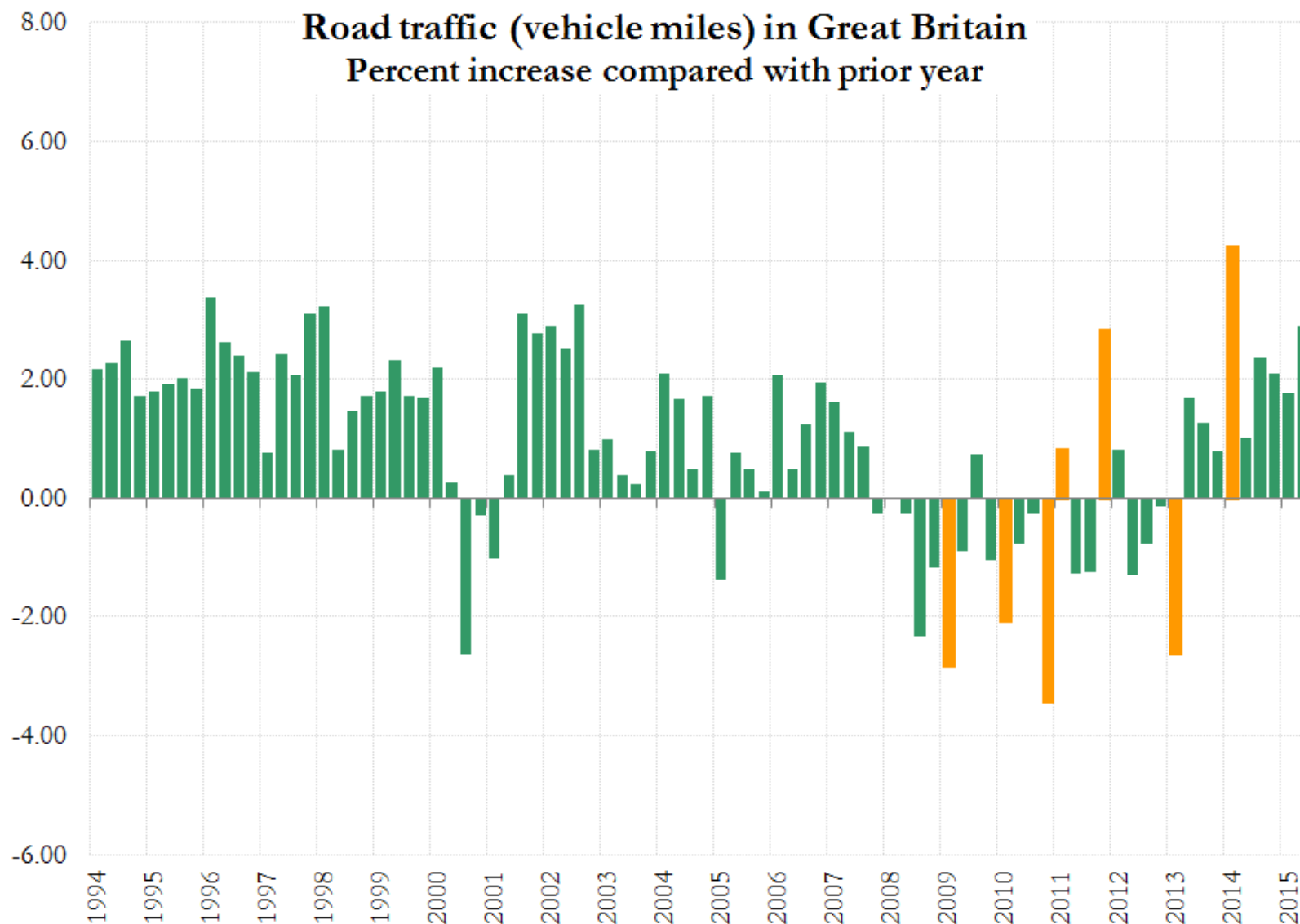
Source: US Bureau of Transportation Statistics

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Source: US Energy Information Administration

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Source: UK Department for Transport
(highlighted quarters affected by heavy snowfall/baseline effects)

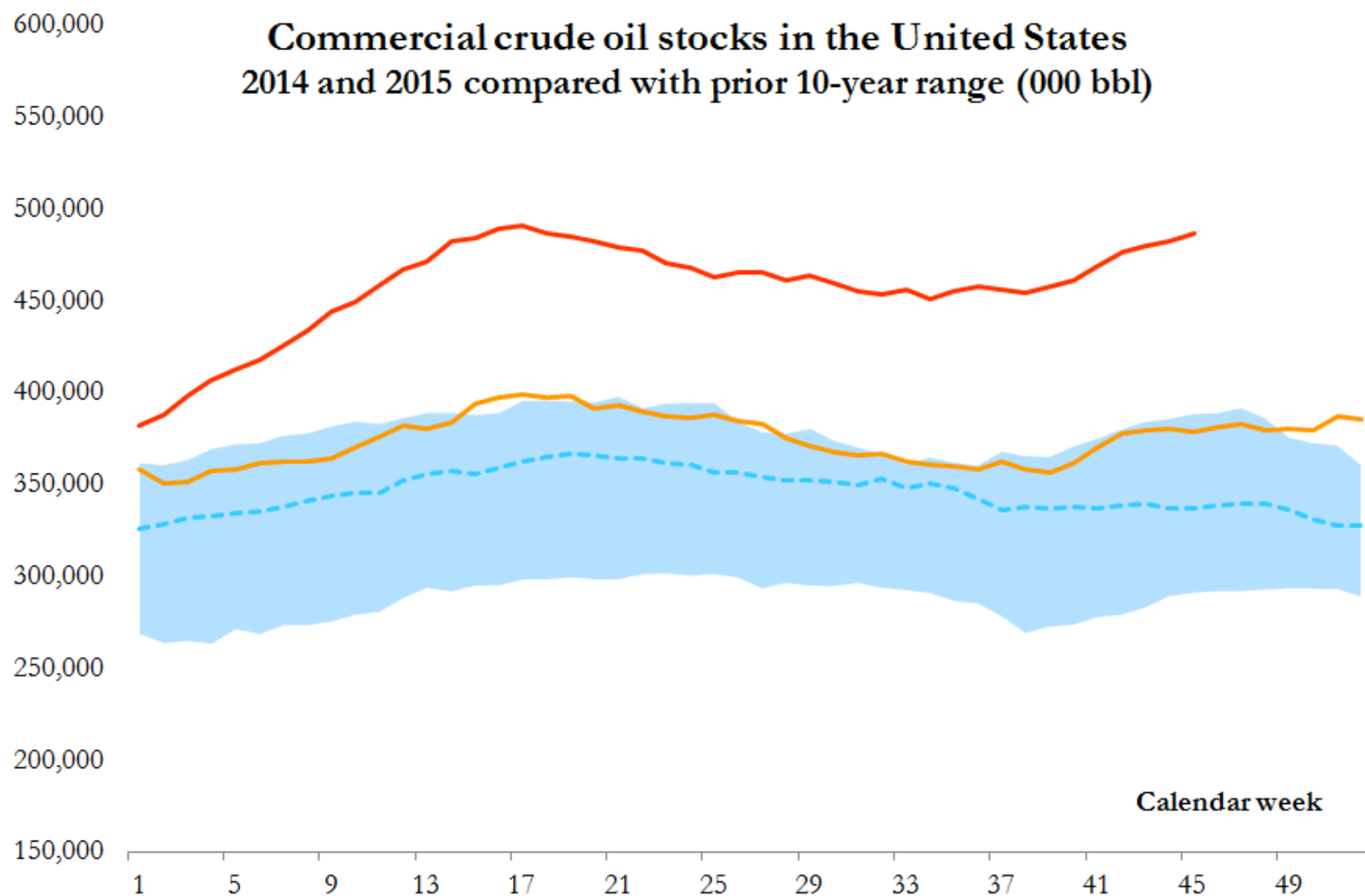
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Fuel demand responds to changes in prices as well as the economy:

“In this paper, we have shown that the growth in electricity and gasoline demand can be attributed to rising incomes and falling relative prices during the 1960’s. The role of falling prices in this period has often gone unrecognized. Preliminary indications from simulations for the first two quarters in 1973 indicate that rising prices are already reducing demand substantially. Thus we conclude that the arguments made for energy rationing by many politicians and some economists are unfounded. The market mechanism by itself appears to be capable of bringing about the necessary adjustments in demand. Consequently, there are also limits to the price increases that a producer cartel can extract.”

“Dynamic demand analyses for gasoline and residential electricity”
Houthakker, Verleger and Sheehan (1974)

Commercial crude oil stocks in the United States 2014 and 2015 compared with prior 10-year range (000 bbl)



- 2015
- 2014
- - - Prior 10-yr median

Source: *Weekly Petroleum Status Report*, US Energy Information Administration
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U.S. gasoline stocks

Days worth of current consumption

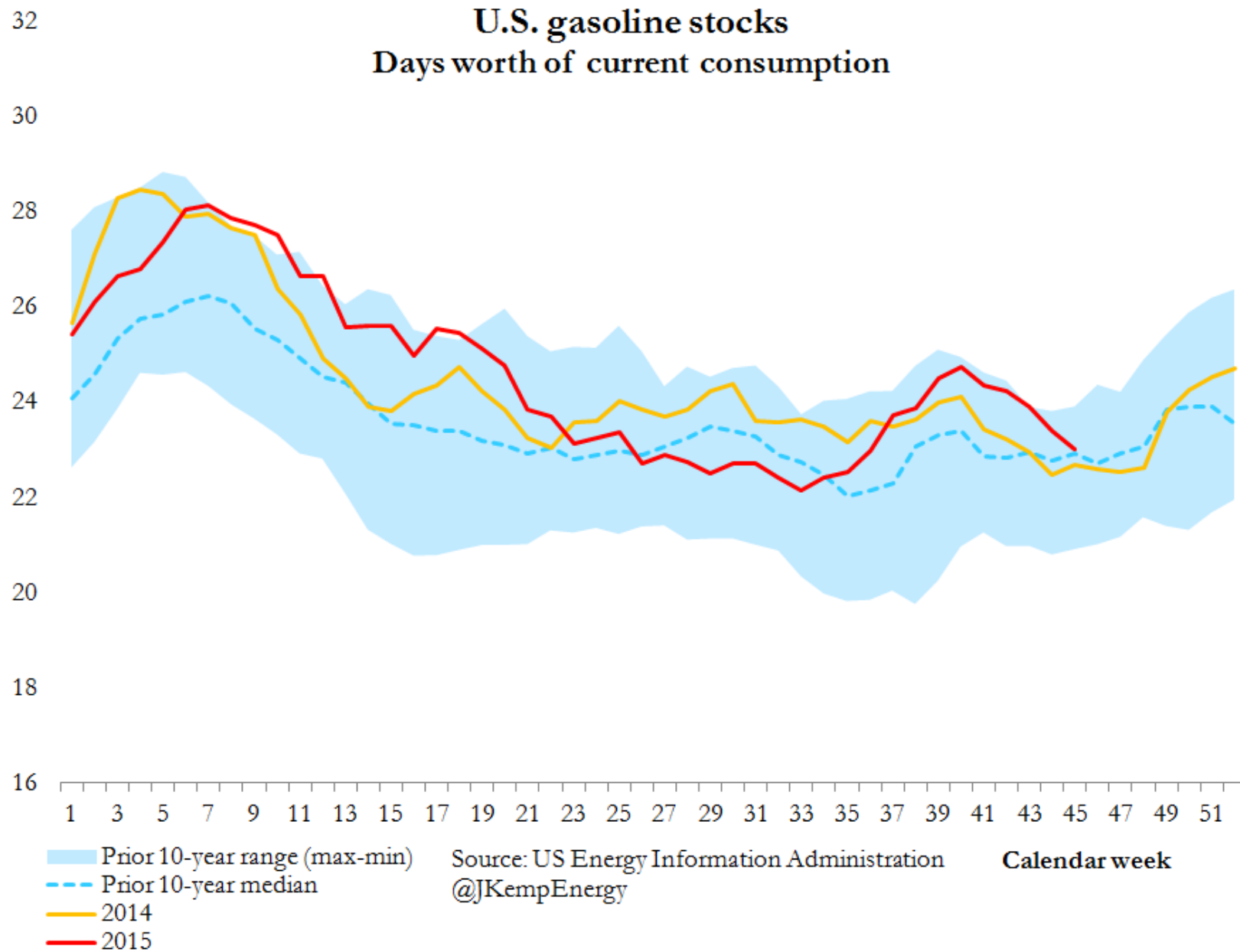


Table 11: Dates of Commodity Price Booms & Busts for Energy Products

Panel A: Booms

| Commodity | Start | Peak | End | Years to peak | Boom length | Deviation from trend (%) |
|-------------|-------|------|------|---------------|-------------|--------------------------|
| Petroleum | 1860? | 1865 | 1866 | 5? | 6? | 82.30 |
| Petroleum | 1916 | 1920 | 1920 | 4 | 4 | 131.54 |
| Petroleum | 1974 | 1980 | 1985 | 6 | 11 | 195.39 |
| Natural gas | 1978 | 1982 | 1985 | 4 | 7 | 110.85 |
| Natural gas | 2003 | 2008 | 2008 | 5 | 5 | 109.21 |

Panel B: Busts

| Commodity | Start | Trough | End | Years to trough | Bust length | Deviation from trend (%) |
|-------------|-------|--------|------|-----------------|-------------|--------------------------|
| Petroleum | 1891 | 1892 | 1893 | 1 | 2 | -53.31 |
| Petroleum | 1931 | 1931 | 1933 | 0 | 2 | -54.21 |
| Natural gas | 1968 | 1972 | 1974 | 4 | 6 | -40.42 |
| Natural gas | 1994 | 1995 | 1999 | 1 | 5 | -42.08 |
| Petroleum | 1994 | 1998 | 2003 | 4 | 9 | -63.45 |
| Natural gas | 2012 | - | - | - | - | -39.06 |

“From boom to bust: a typology of real commodity prices in the long run”
 Jacks (2013)

Price forecasting is notoriously difficult and many predictions are not useful from a commercial perspective (humility needed)

Oil prices are inherently cyclical which means forecasts produced at peak/trough always wrong (extrapolating present)

Behaviour has revealed a potential price envelope

U.S. shale producers struggle to breakeven WTI < \$50

Shale firms want to grow production when WTI > \$60-70

Super-majors struggle to grow output with Brent < \$60-70

The crude oil market would probably balance in the medium term with Brent somewhere in the range \$55-75 (WTI \$50-70)

Biggest potential shocks to the oil market in 2016?

Reintegrating Iran as a major crude + condensates exporter

China's uncertain economic outlook

Emerging markets under pressure from commodity slump

Last word: there is nothing new about the boom and bust nature of the industry

Prices have fluctuated wildly from the moment the first modern well was drilled in 1859

“The fact that [crude oil] sold for 50 and 25 cents per gallon proves nothing. It sold for that in 1859 but the first day’s production of the first well “broke the market.” There was no demand for it because its uses were unknown – or at least not definitely understood.”

The Early and Later History of Petroleum, Henry (1873)