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COLLEGE OF BUSINESS  
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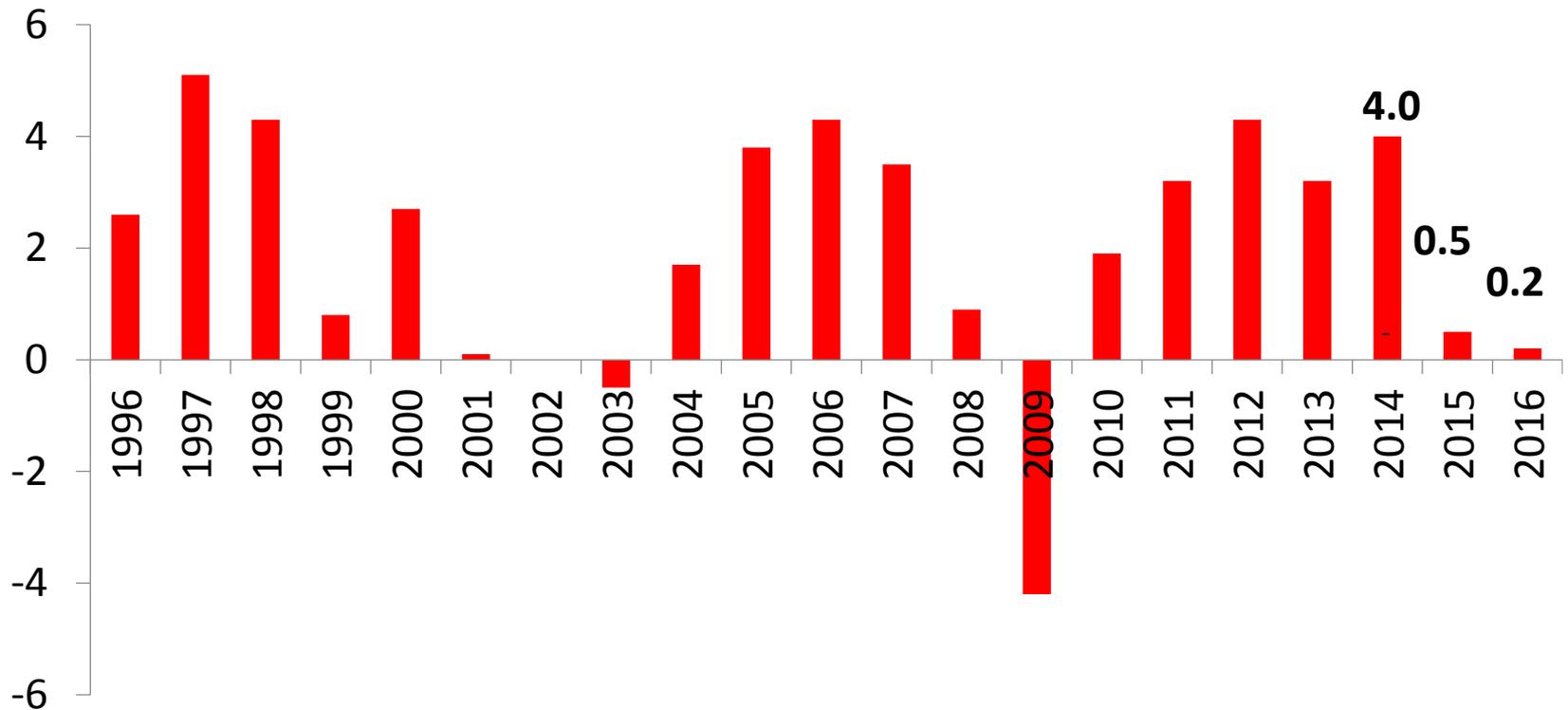
# **Waiting on Oil Markets: Houston's Economy Seeks Direction**

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November 2016

# Current Slowdown in Houston Has Been a Complicated Story

- Oil has been at the heart of Houston's recent problems, and this has been a brutal downturn for the drilling industry
- Unlike most recent downturns in drilling, this has not been accompanied by a U.S. or global recession. The U.S. economy continues to work for Houston
- A decade of rapid growth left tremendous forward momentum in place as the fracking bust started
- The collapse in natural gas prices kicked off \$50 billion in construction along the Ship Channel in east Houston
- The question about the local business cycle has always been how these plusses and negatives add up

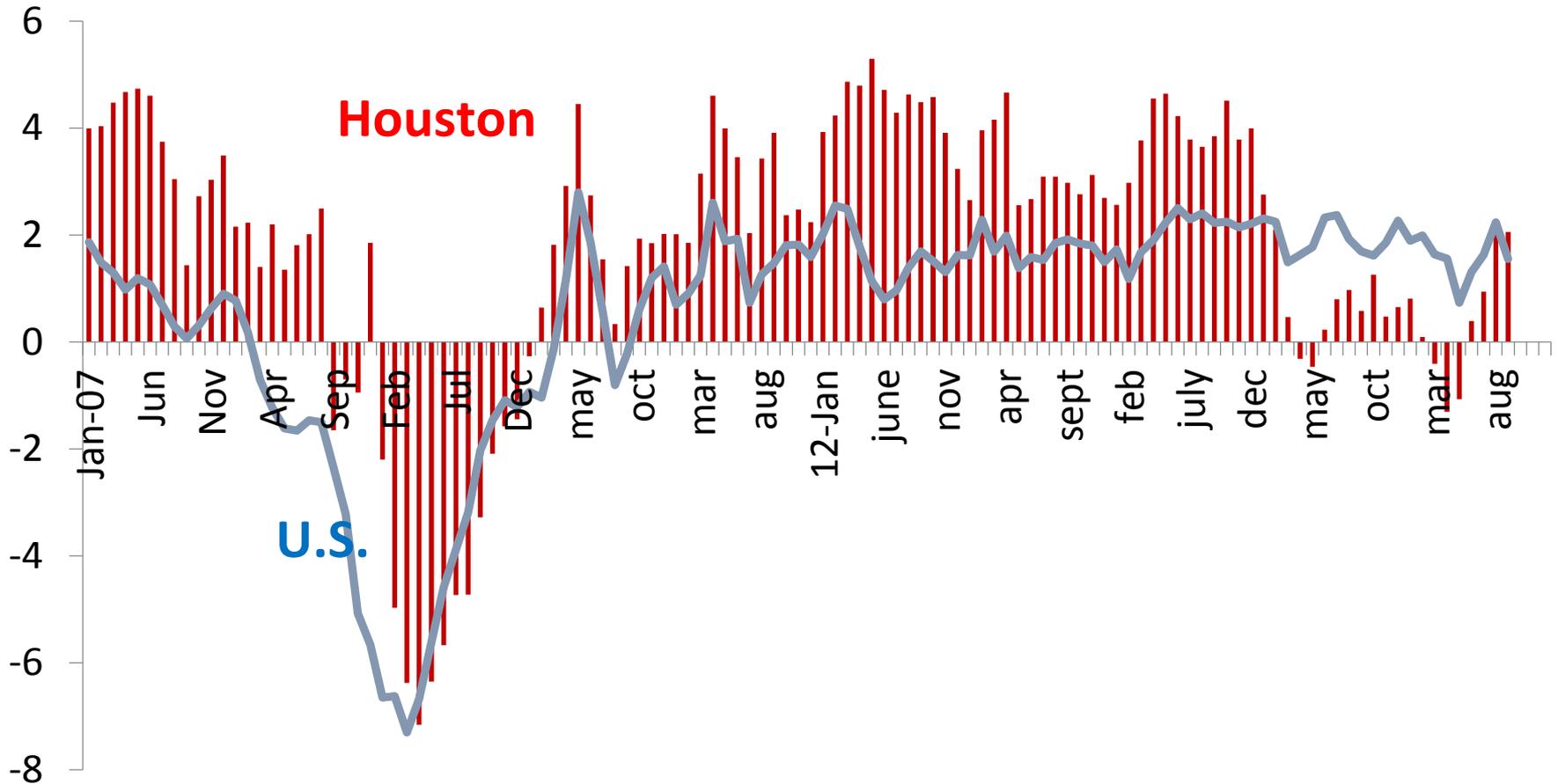
# Current Slowdown Marked the End of a Decade of Job Growth



Note: December to December changes, except 2016 which is year-to-date, annualized, and seasonally adjusted. TWC estimates.

# Slow But Still Positive: Houston Nets 26,700 Jobs in Last 21 Months

(3-month percent change at annual rates)



# Official Figures Point to Houston Job Growth That Is Slow or Slightly Negative

	December to December Changes	
	Jobs	Change*
<b>2012</b>	118,600	4.3%
<b>2013</b>	89,800	3.2%
<b>2014</b>	117,800	4.0%
<b>2015</b>	14,500	0.5%
<b>2016 ... through Sept</b>	5,600	0.2%

Texas Workforce Commission estimates at seasonally adjusted annual rates

# Job Losses Are Driven By Energy

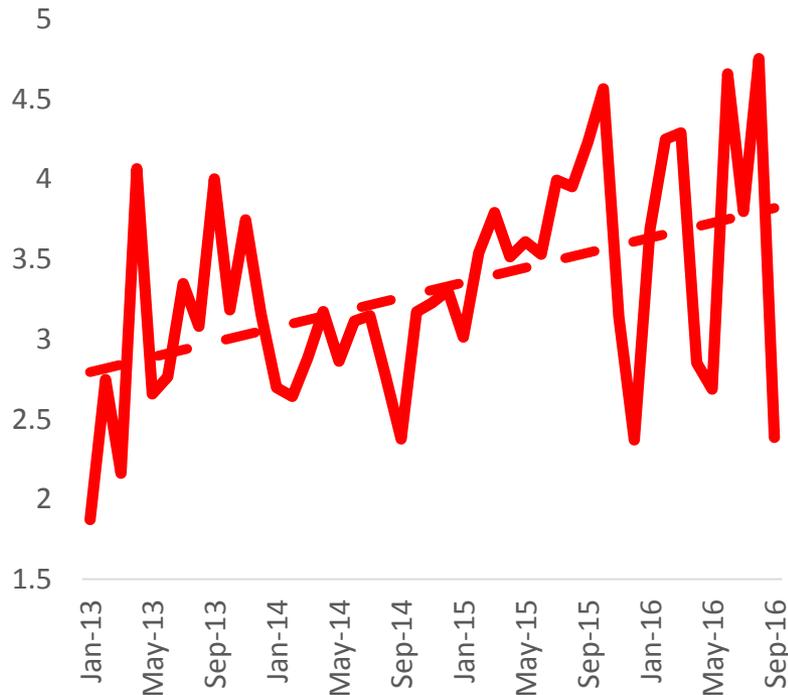
(Net Change in Jobs, seas. adj.)

Sector	In 2015 Dec '14 – Dec '15		So far in 2016 Dec 15 - Sep 16	
	New Jobs	Percent	New Jobs	Percent
<b>Total Payroll</b>	14,400	0.5%	5,600	0.2%
<b>Mining</b>	-17,600	-17.3%	-6,200	-9.1%
<b>Construction</b>	12,100	5.6%	-8,800	-5.6%
<b>Manufacturing</b>	-23,900	-9.6%	-6,000	-3.4%
<b>Machinery</b>	-11,600	-19.6%	-4,800	-13.9%
<b>Fab Metal</b>	-10,600	-17.5%	-1,800	-4.4%
<b>Wholesale Trade</b>	-1,200	-0.7%	-3,600	-2.8%
<b>Prof/Buss Services</b>	-6,700	-1.4%	-4,600	-1.3%

\*2016 TWC estimates at seasonally adjusted annual percentage rates

# Growth of Selected Services Remains Strong

Percent 3-month change at annual rates, seas. Adj.



New Jobs Added Since Oil Crisis Begins in Dec 2014

- 29,100 food service
- 25,500 health care
- 18,000 retail trade
- 10,500 public education
- 3,500 entertainment
- 2,000 finance
- 1,400 accommodation

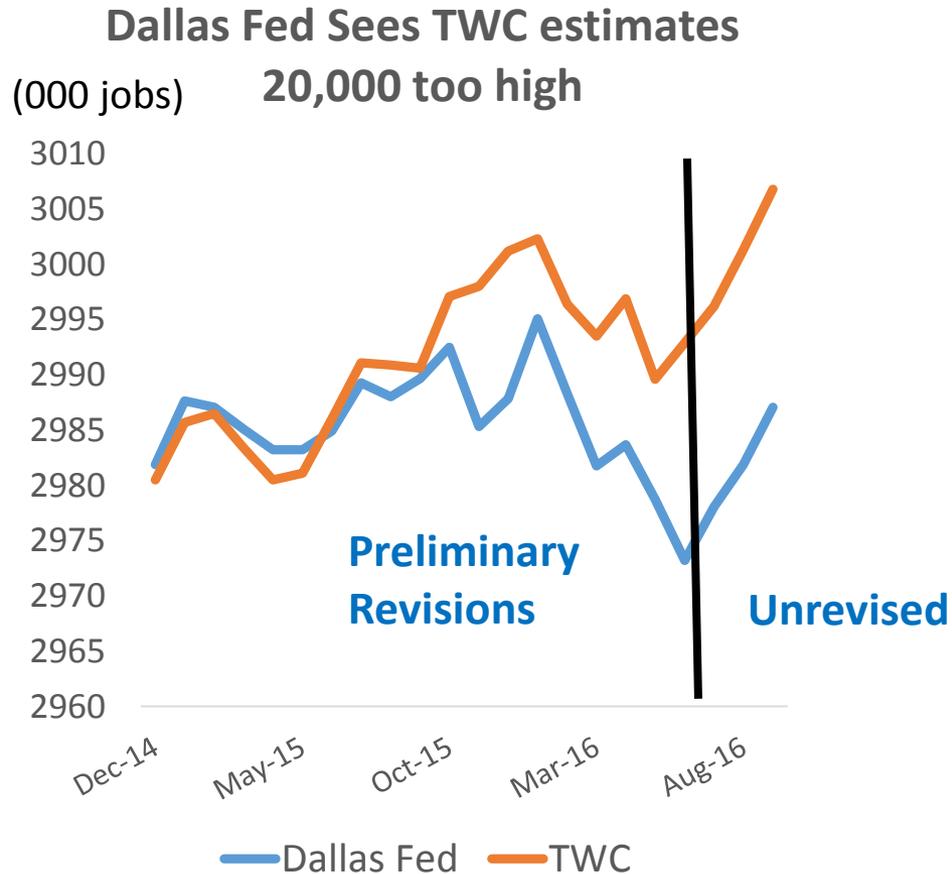
# Where Did This Service Sector Growth Come From?

- Where did this services growth come from?
  - Strong national markets: United Airlines, Sysco, AIG, HP
  - Petrochemical construction boom in East Houston
  - Past momentum, built on Houston's 680,000 new jobs from 2004-2014
  - In-migrations continues strongly for several quarters after job growth slows
  - Most direct damage is confined to oil producers, oil services, and manufacturing ... so far
- BUT ... we are now 23 months into this slowdown. The chemical boom is over, momentum has waned, population growth is evaporating. Only the U.S. economy left to help out ... until oil turns up.

# All That Said and Done ... The Jobs Numbers Are Subject to Revision

## (Change in Payroll Jobs)

Year	Period	TWC Official Number	Dallas Fed Revised
2015	Dec - Dec	20,700	6,000
2016	Dec - Sep	5,600	-800



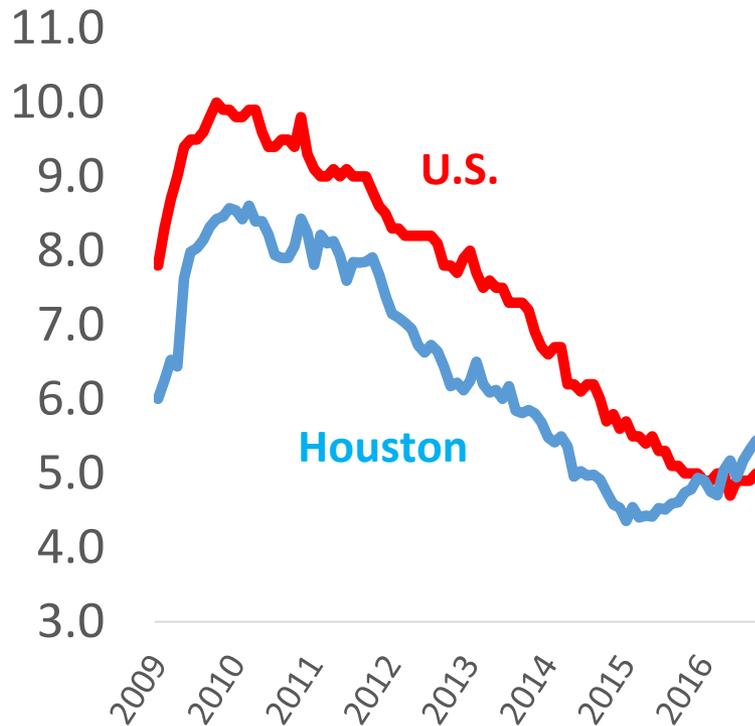
# Notable Sectors Where TWC Job Estimates Were High or Low By June

- Total Over-Estimate = 19,700
- Sectors Over-Estimated
  - Manufacturing = 10,400
  - Leisure and Hospitality = 7,100
  - Wholesale Trade = 6,500
  - Education and Health = 2,200
  - Retail = 2,000
- Sectors Under-Estimated
  - Professional and Business Services = 5,300
  - Transportation = 1,800
  - Information = 1,800
  - Construction and Mining = 1,400

Note: TWC estimate minus Dallas Fed preliminary re-benchmark

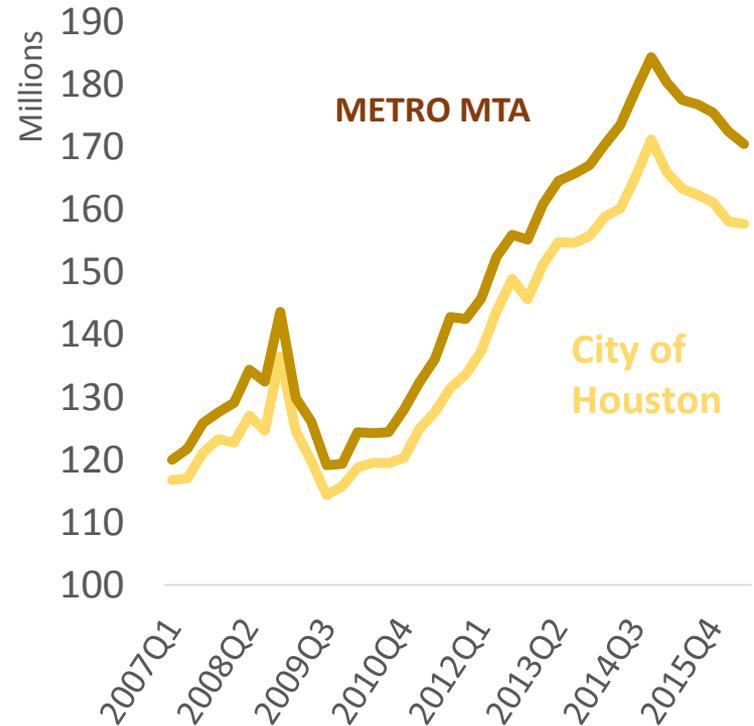
# Plenty of Other Signs of a Big Slowdown or Mild Reversal

Houston unemployment rate moves above U.S. to 5.4%



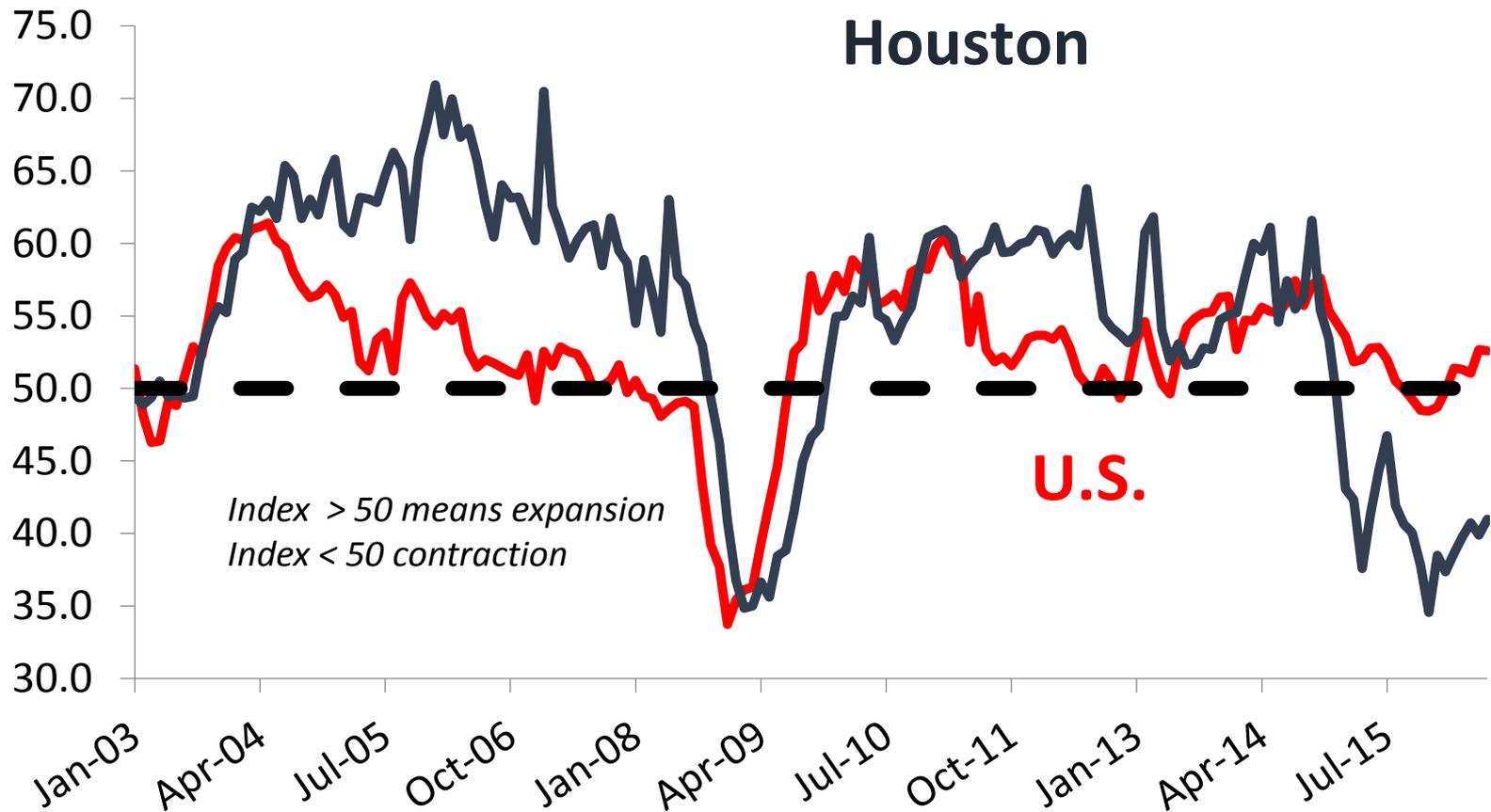
Bureau of Labor Statistics

Quarterly Sales and Use Tax Collections Down 8% for City & METRO MTA



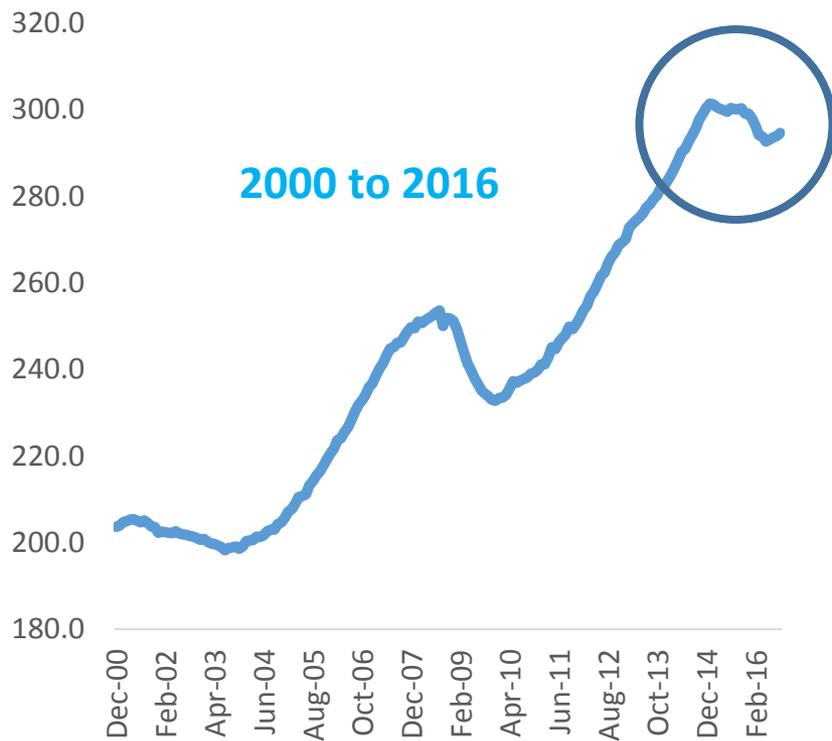
Texas Comptroller, seasonally adjusted

# Purchasing Managers' Index U.S. and Houston Compared (s.a.)

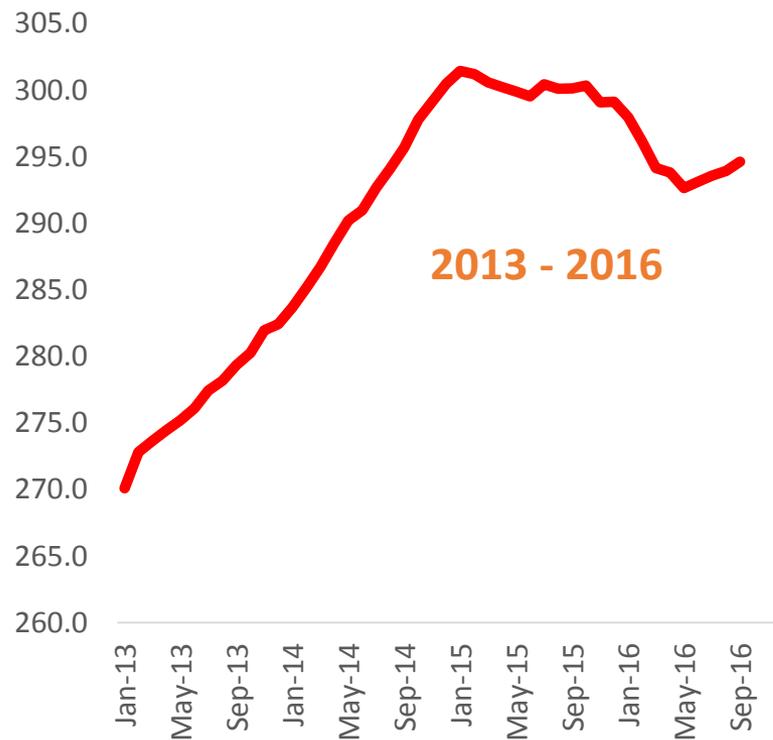


# Recession? Ask the Dallas Fed Business Cycle Index

Tracks local business cycle with four variables



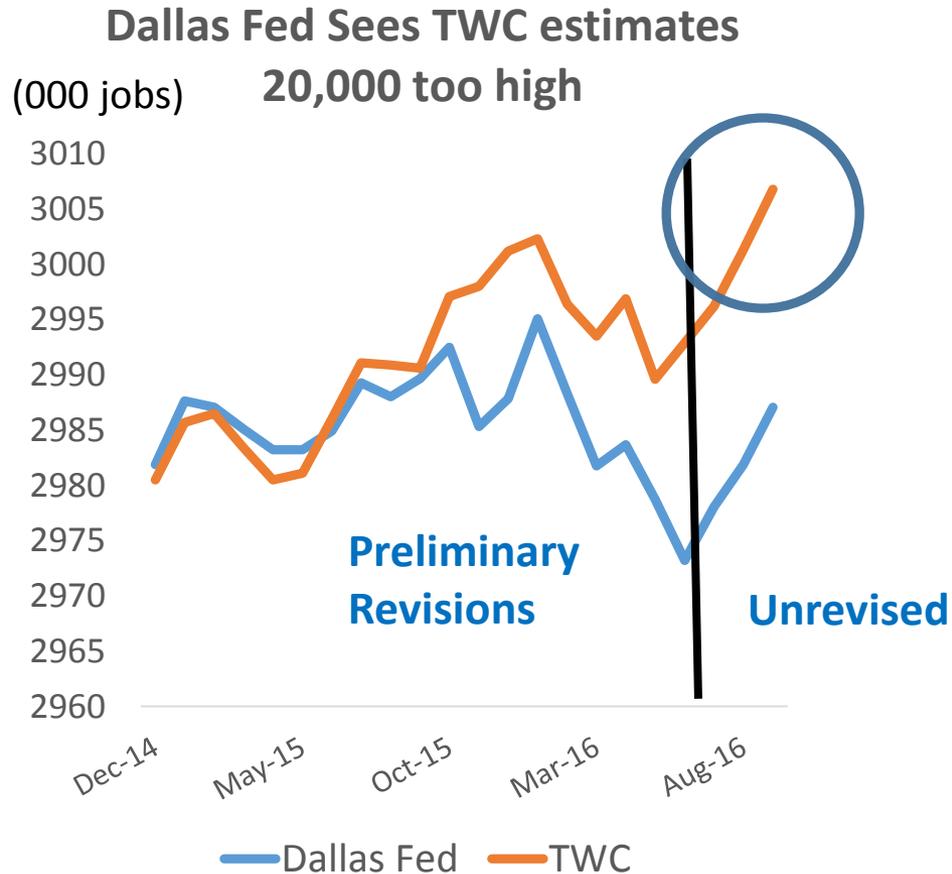
Now on brink of recession, if not in it



# What Drove the Big Upturn in the Third Quarter?

## (Change in Payroll Jobs)

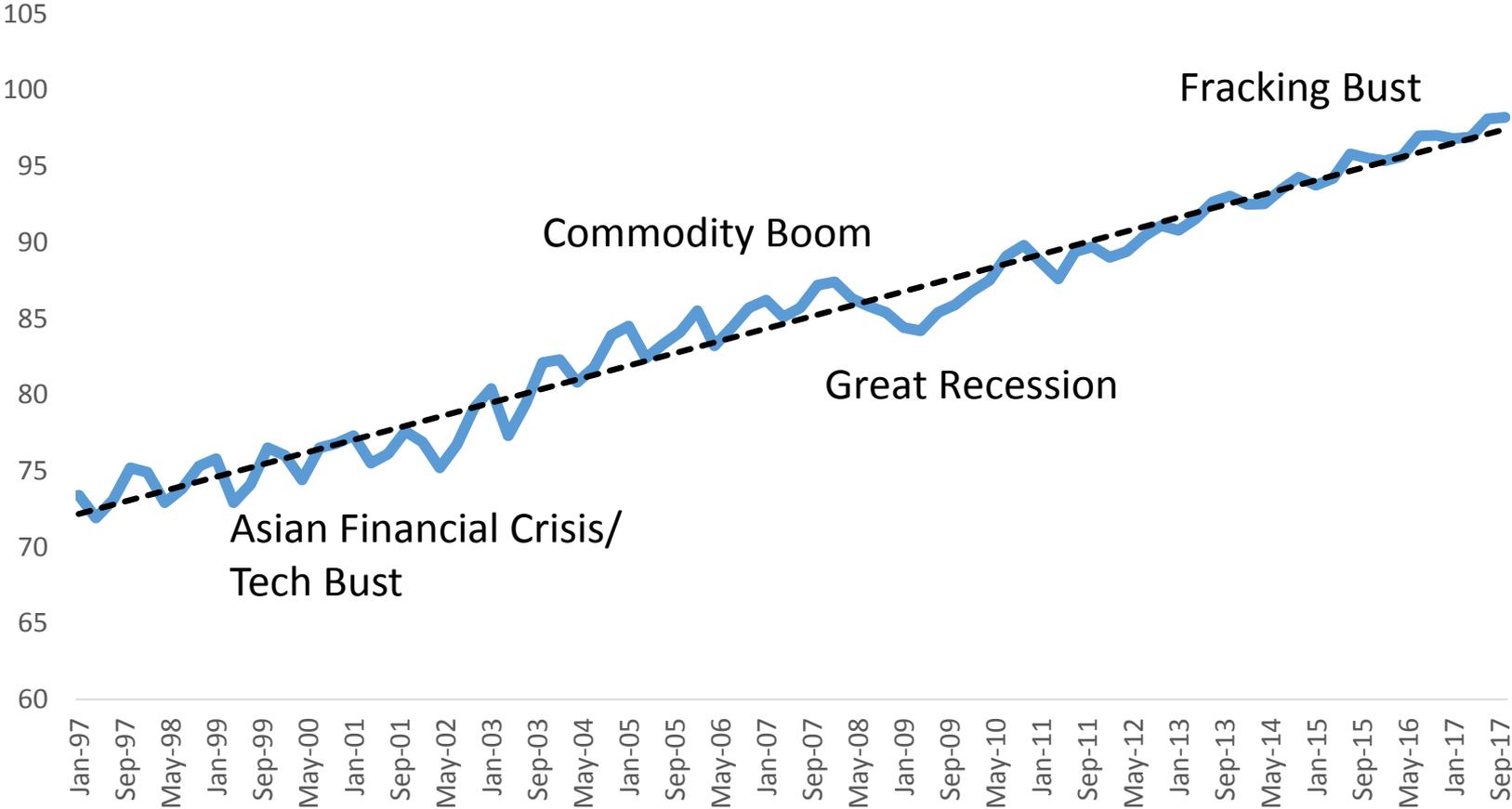
Year	Period	TWC Official Number	Dallas Fed Revised
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# Oil Markets and Oil Price



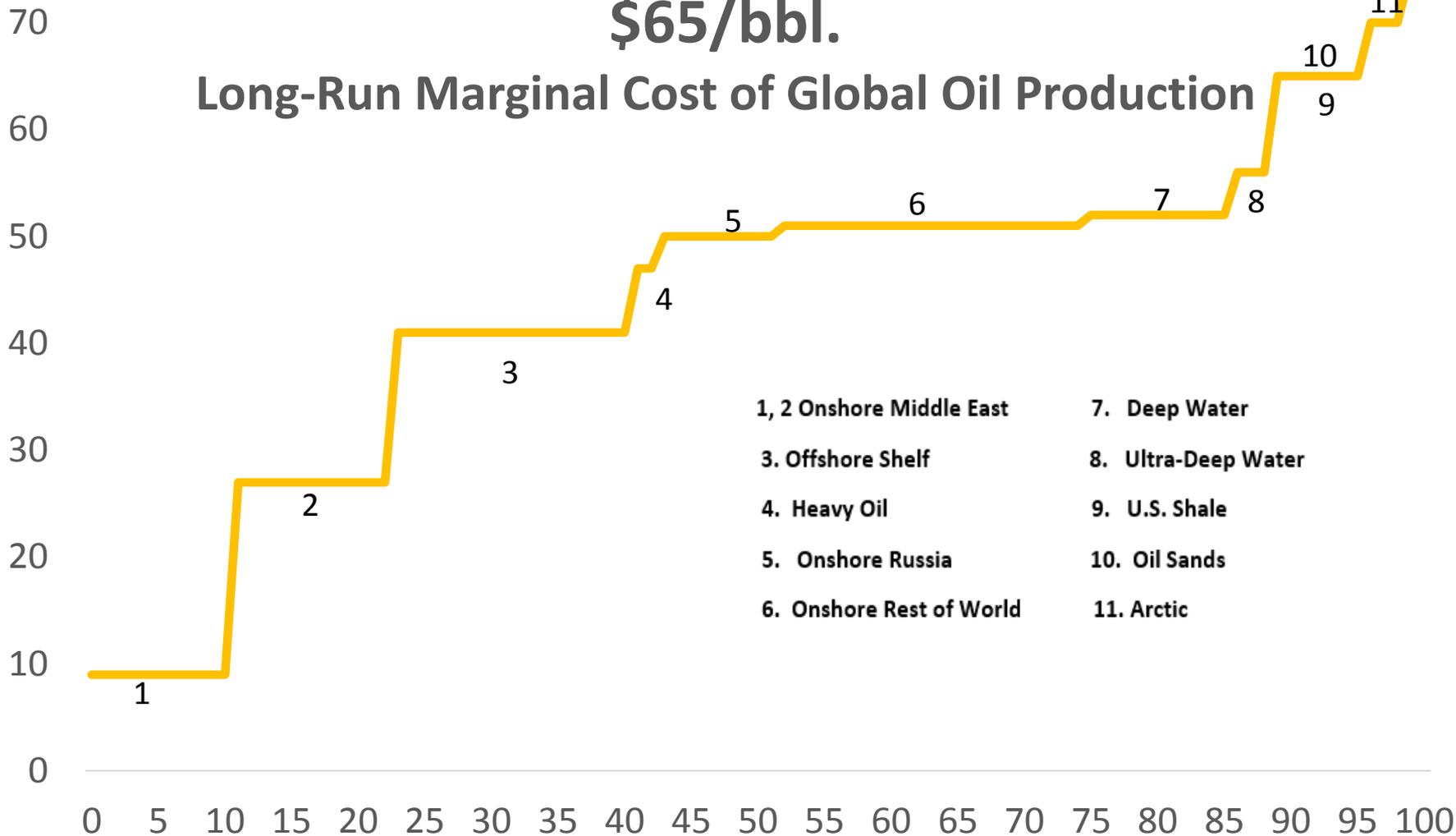
# Over the Long-Term the World's Demand for Oil Has Grown Steadily (million bbl./d)



80 \$/bbl.

# Drilling Recovery Means Oil Near \$65/bbl.

## Long-Run Marginal Cost of Global Oil Production



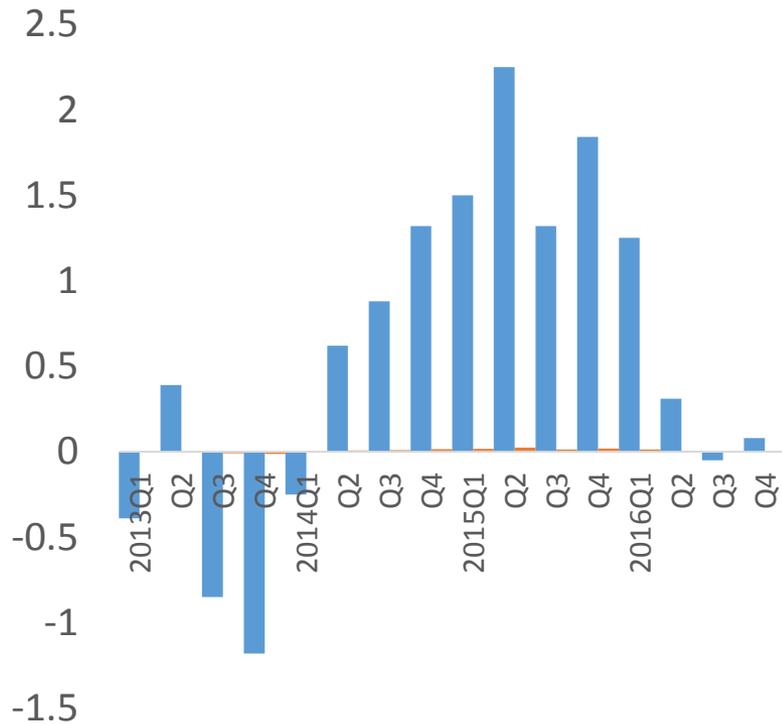
- 1, 2 Onshore Middle East
- 3. Offshore Shelf
- 4. Heavy Oil
- 5. Onshore Russia
- 6. Onshore Rest of World
- 7. Deep Water
- 8. Ultra-Deep Water
- 9. U.S. Shale
- 10. Oil Sands
- 11. Arctic

This is chart is stylized and illustrative

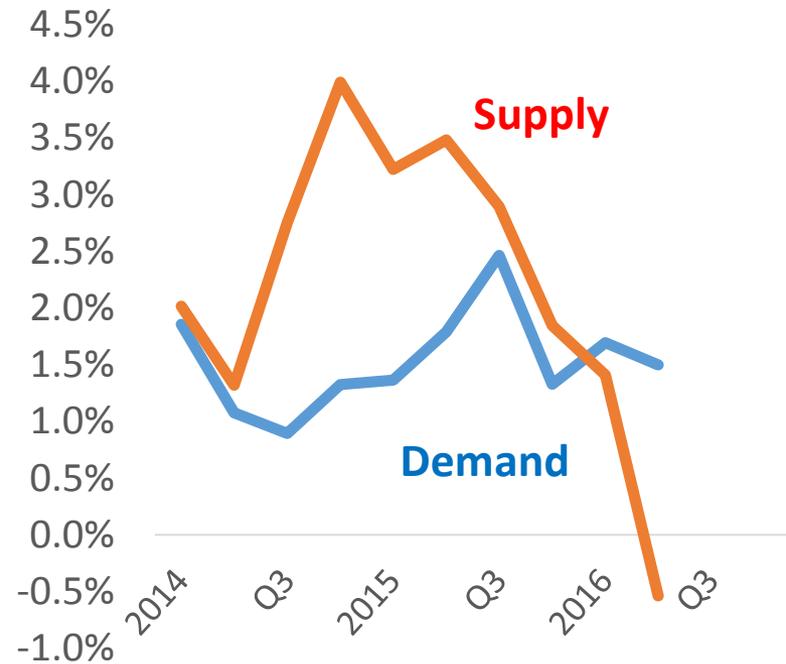
Production (million bbl./d)

# Global Crude Surplus Was Never Large, Gap Now Closing?

Supply Minus Global Demand  
(million b/d)



Growth of Demand Holds  
While Supply Shrinks  
(4-Q Percent Change)



# As Oil Prices Rose This Spring, Mild Optimism Returned to the Oil Market

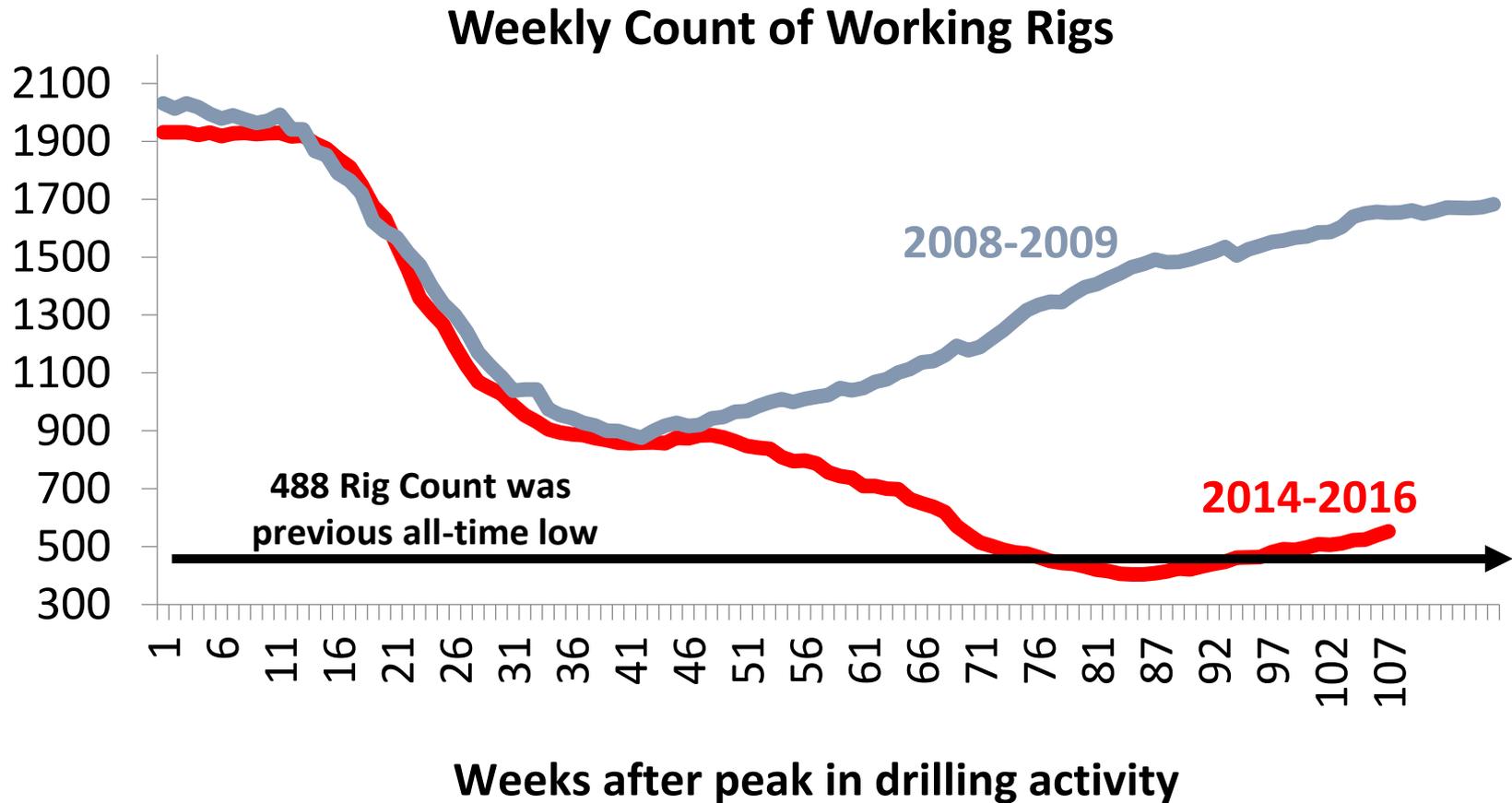
- The big three oil service companies all declared a bottom was in place for drilling in Q2/Q3 earnings reports
- Oil service and machinery stocks quickly rose 30% in February and March as oil prices moved off \$30/bbl., and are up 10% since then
- The rig count has steadily added back over 150 rigs from the March low
- But ahead: “a long, slow grind ahead,” “no V-shaped recovery in sight,” and “land recovering, but not yet international and offshore”

S&P Oil Service And Machinery Stock Price Index



# Definitive Turn in Drilling? Or Just a Dead Cat Bounce?

## Drilling Has Turned Up from Historic Lows

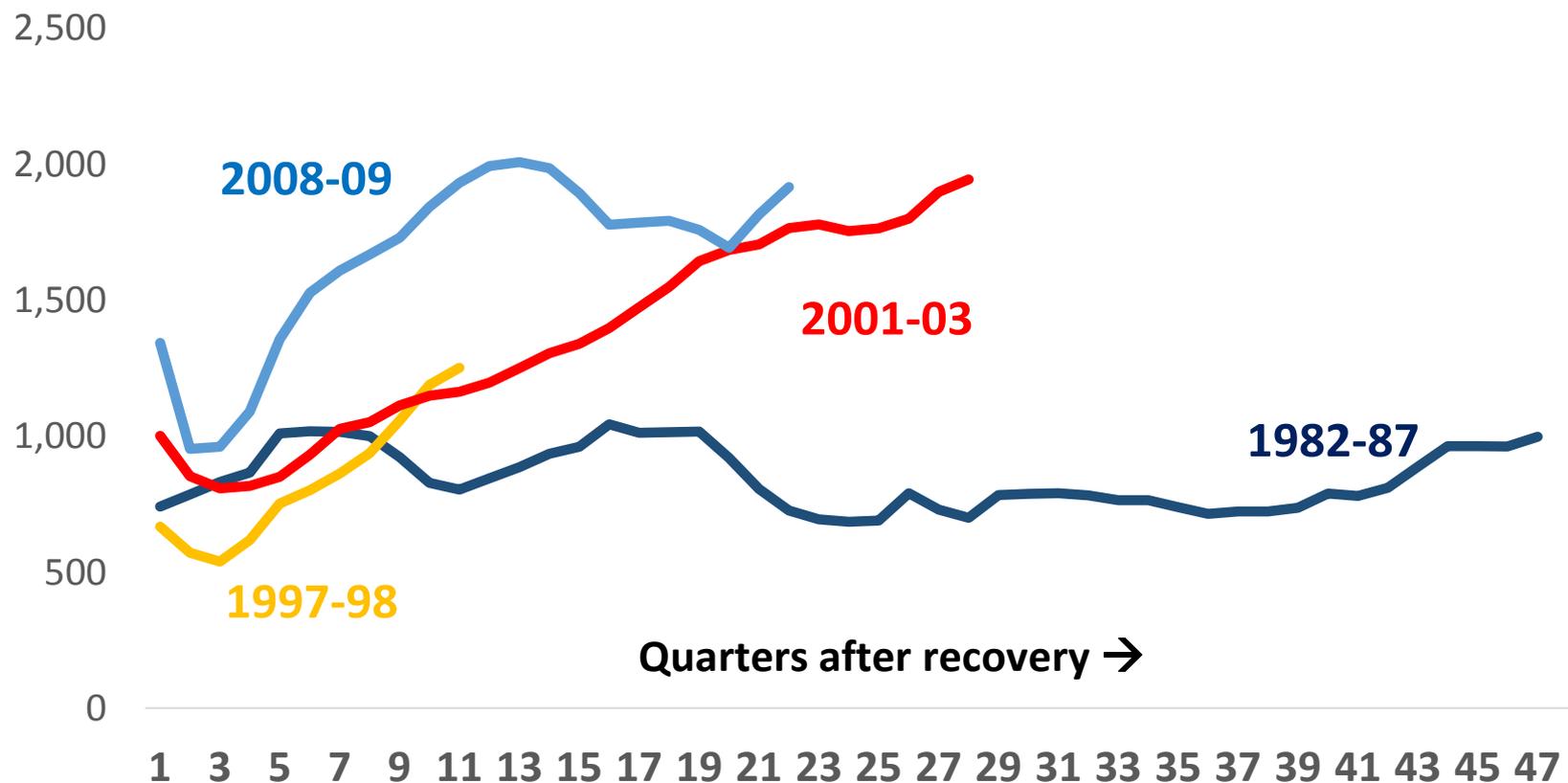


# Building Scenarios for Recovery in Oil

- When will oil prices hit bottom?
- When will the rig count turn up?
- When do energy jobs begin to come back?
- How high will the rig count go in this recovery?
- How long before the rig count reaches these highs?

# Recovery in Rig Count After Oil Prices Definitively Move Up

(working rigs by quarter after oil prices begin to rise, s.a.)



Baker Hughes, calculations of IRF

# Drilling Recovery After the Price of Oil Hits a Low

## Past Recoveries

## Forecast

Quarters Until:	1982-87	1997-98	2001-03	2008-09	High	Medium	Low
<b>Rig Count Begins Definitive Turn Up</b>	0	2	2	1	2	2	6
<b>Energy Jobs Make a Low</b>	2	4	4	3	4	6	11
<b>High Rig Count</b>	never	8	8	11	10	12	16

Note: For the high, medium and low forecasts, it is assumed that the rig count returns to 1650, 1500, and 1300, respectively. Given the complexity of modern and future rigs, think of this as future activity based on “current equivalent” rigs.

# Other Key Assumptions for Houston Recovery

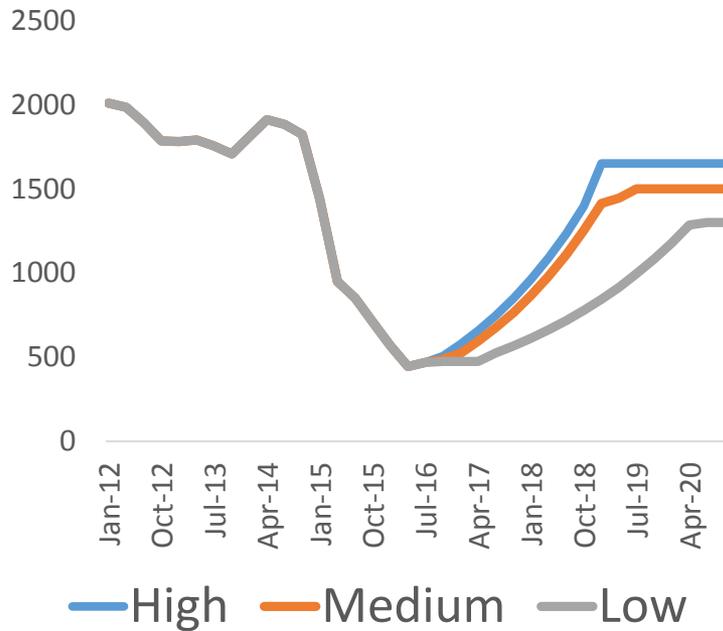
- **Rig Count *Accelerates?***
  - High Scenario: 2016 Q4
  - Medium Scenario: 2017 Q1/Q2
  - Low Scenario 2017 Q3/Q4
- **Rig Count Max After Recovery?**
  - High Scenario: 1650
  - Medium Scenario: 1500
  - Low Scenario: 1300
- **Return of Energy Jobs**
  - Follow the rig count
  - Allow for complexity of fracking, productivity trends
  - Never returns to previous highs in any scenario



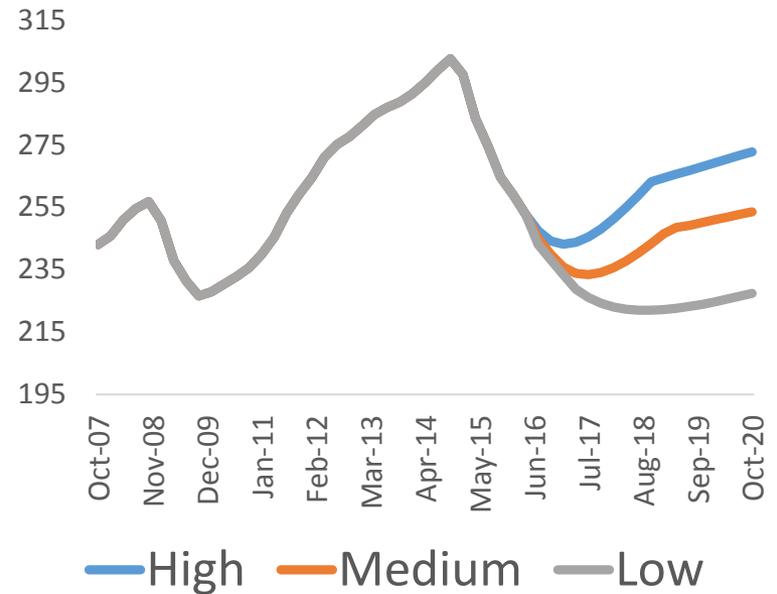
Note: Rig count accelerates refers to point where “long slow grind” ends and normal pace of recovery in drilling sets in.

# Rig Count Scenarios and the Return of Oil Employment in Houston

## Rig Count



## Oil-Related Jobs in Houston (000)



# U.S. Economy Continues to Grow Strongly and Create Jobs

- Assume in all scenarios that the U.S. economy has put the Great Recession behind it
- Consumer has deleveraged; state and local governments are collecting revenues at a healthy rate and spending; the housing market has returned to close to normal
- U.S. job growth is at 1.7 percent or about 200,000 jobs per month throughout the forecast horizon
- We see the export sector, especially manufacturing struggling with the strong dollar, but domestic growth is robust

# \$164 Billion U.S. Construction Boom is Based on Cheap Energy

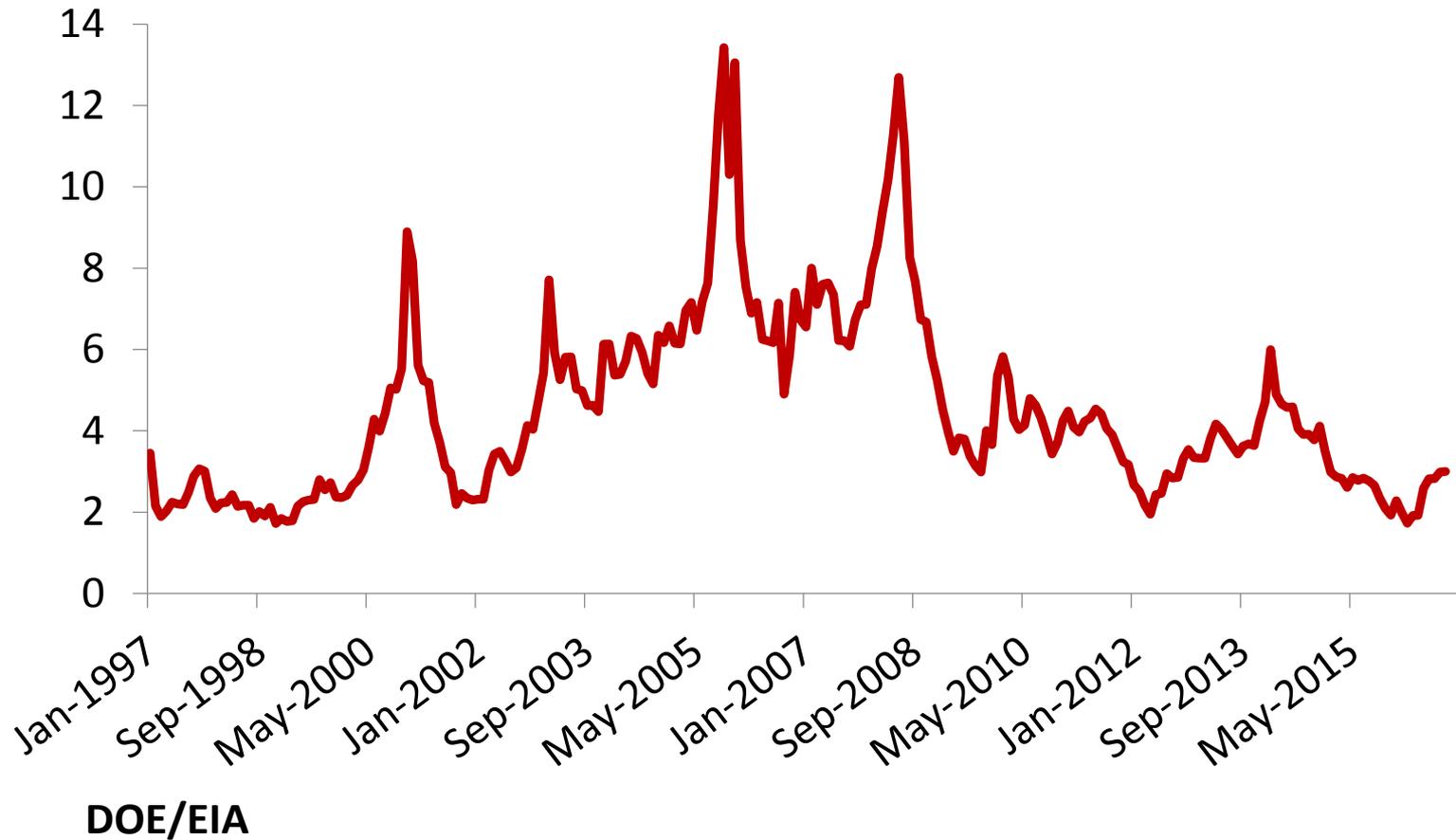
- This \$164 billion total includes many industries and all of the U.S.
- New ethylene crackers, more ethylene-related expansion in PE, PVC and other derivative plants
- LNG export terminals to sell surplus natural gas into global markets
- Refiners have joined in with additional expansions



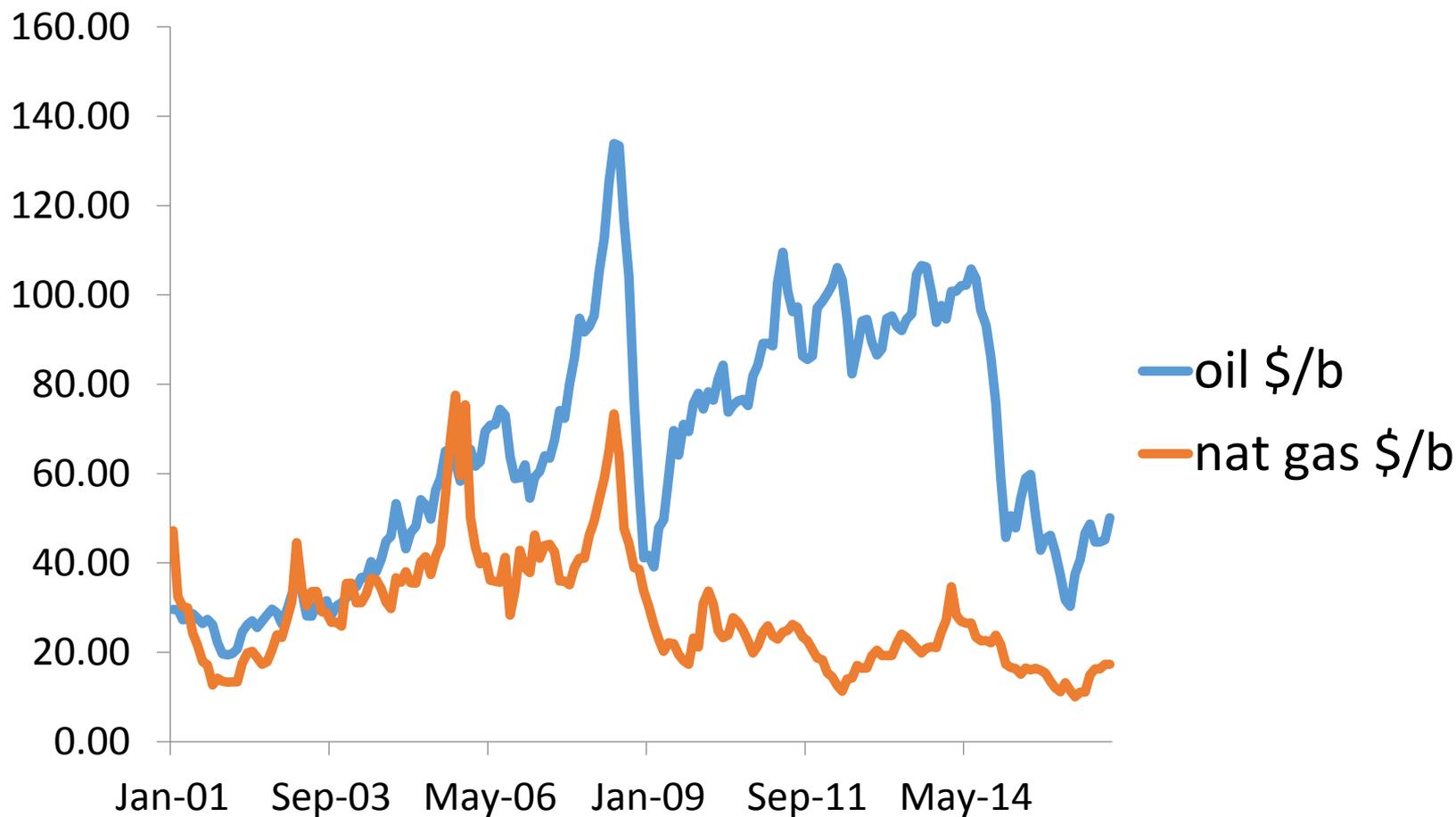
**Note: The \$164 billion figure is based on all U.S. shale-related expansion, estimated by the American Chemistry Council in April, 2016**

# Natural gas prices collapsed in late 2011

(\$/mcf)



# Natural Gas Energy Content Equivalent to \$15 - \$30 per Barrel for Oil



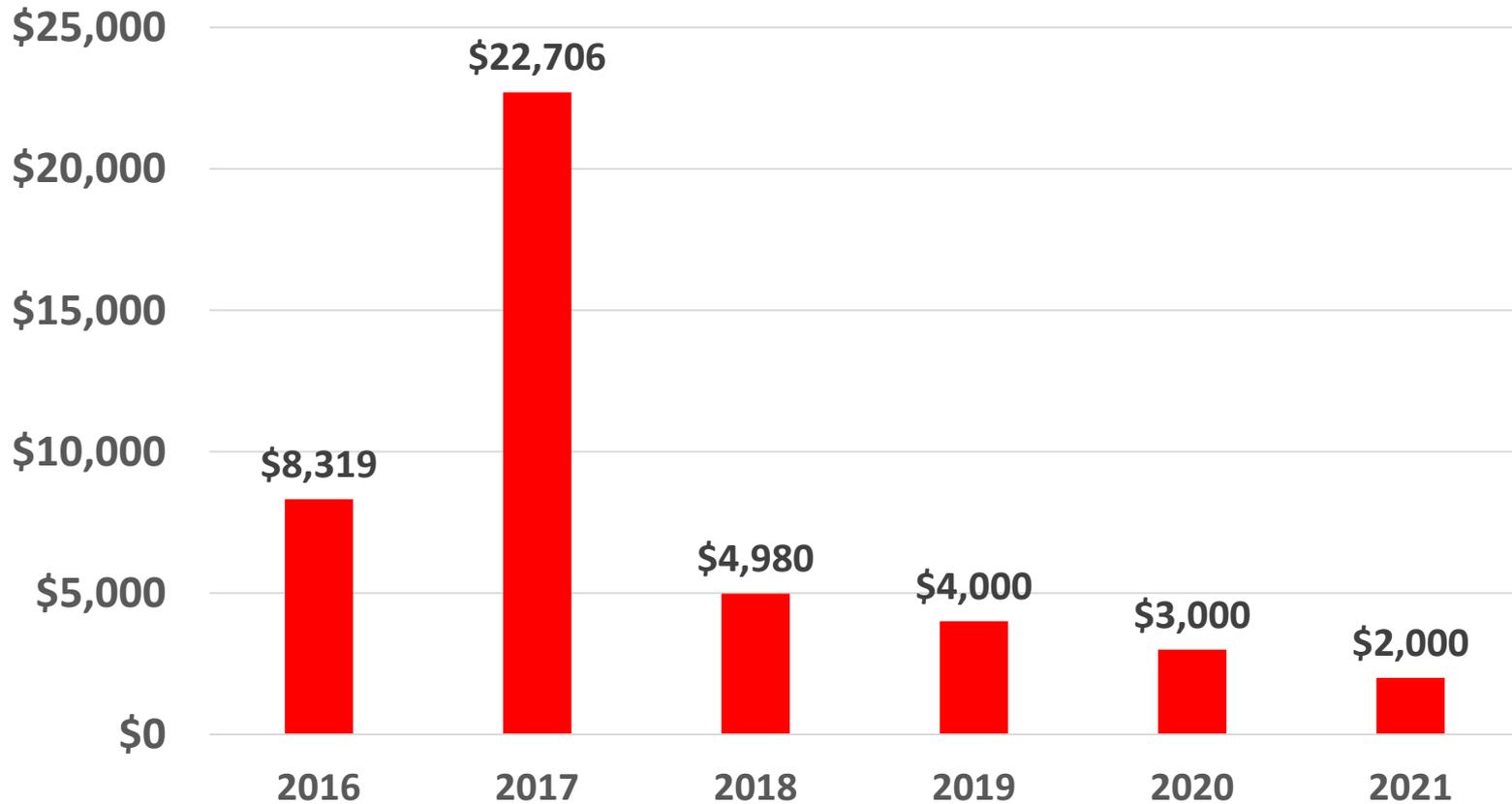
DOE/EIA and calculations of the author

# Large Projects Headline Over \$50 Billion in East Houston Construction

Company	Location	Project	Completion	Value (\$ mil)
Exxon	Baytown	Ethylene	2017	\$5,000
Chevron	Freeport	Ethylene	2017	\$4,000
Dow	Baytown	Ethylene	2017	\$3,500
BASF	Freeport	Ethylene	2017	\$3,000
Freeport LNG	Freeport	LNG Export	2019	\$3,000
Freeport LNG	Freeport	LNG Export	2020	\$3,000
Bayer	Baytown	PUR Facility	2021	\$2,000
CPV	Freeport	Gas to Polypropylene	2017	\$1,500
Freeport LNG	Freeport	Methane to Propylene	2018	\$1,400

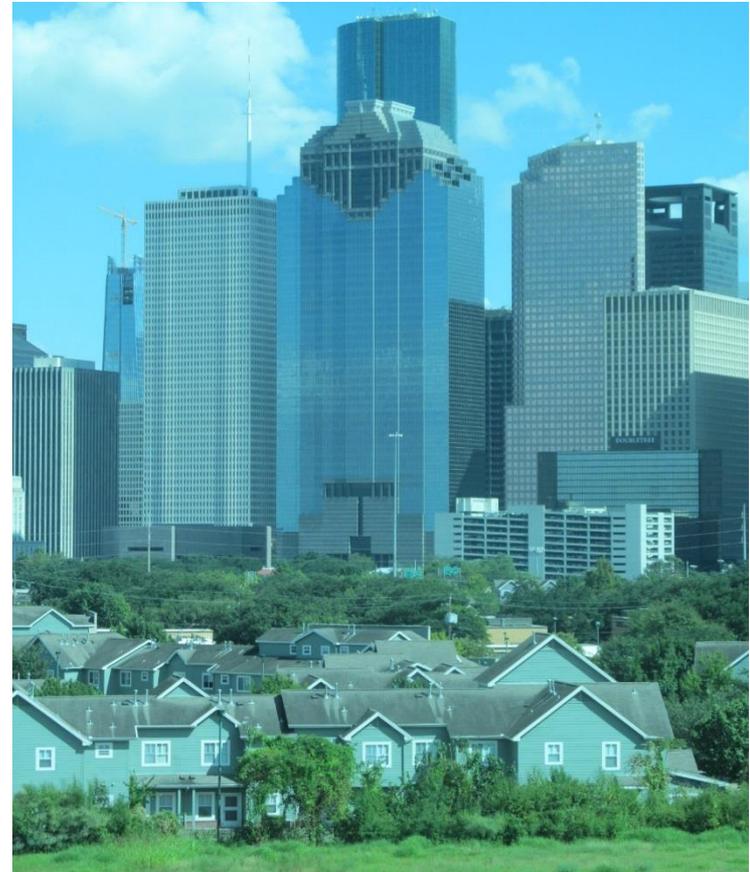
# Projects Begin to Wind Down Rapidly After 2017

(Value of Projects Completed, \$ million)



# Put It All Together

- Three oil scenarios: high, medium, or low. High sees solid recovery now underway in drilling; medium sees strength delayed until early 2017; low until late 2017
- Continued U.S. expansion at moderate rates
- The end of most of the petrochemical construction on the East Side. Some new construction, but nothing to replace the boom-time construction that finishes
- Data revisions that point to possible mild local recession in in early 2016.



# Forecast Job Growth in Houston 2013-2020

(000 New Jobs, Q4/Q4)

## Scenario

<b>Year</b>	<b>High</b>	<b>Medium</b>	<b>Low</b>	<b>30/60/10</b>
2013	90.3	90.3	90.3	90.3
2014	112.3	112.3	112.3	112.3
2015	117.1	10.4	10.4	10.4
2016	-18.2	-23.0	-27.1	-22.0
2017	27.0	-2.8	-19.2	4.5
2018	95.7	71.2	33.8	74.8
2019	91.3	87.3	53.4	85.1
2020	87.1	81.7	69.9	81.1

Calculations of IRF, based on drilling scenarios above

# Compared to What We Were Saying Before? Flip Forecast 2017 Recession Into 2016

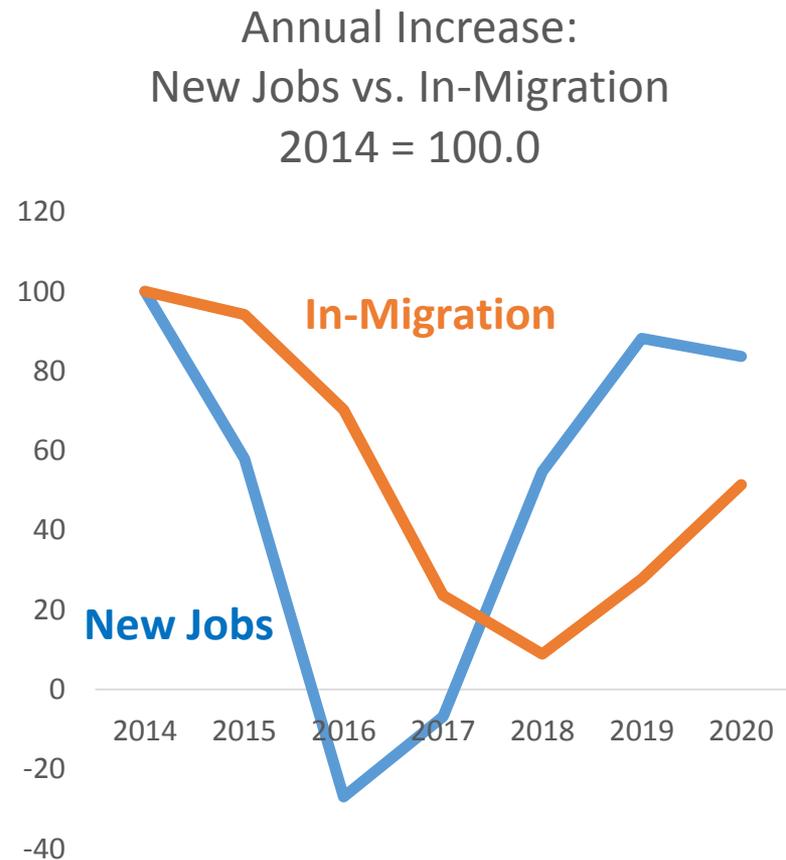
(Thousands of Jobs)

	Current 30/60/10	May 2016 30/50/20	November 2015 40/40/20
2014	112.3	112.1	103.6
2015	17.1	23.4	14.0
2016	-22.0	-10.8	20.1
2017	4.5	-30.0	74.4
2018	74.8	62.9	86.8
2019	85.1	97.1	73.6

Calculations of Institute for Regional Forecasting

# In-Migration Follows Job Growth: Forecast In-Migration for Houston

- When population grows, in-migration gives biggest economic stimulus
- As job growth rises, in-migration begins to rise a year later
- In recovery, in-migration falls a year behind
- Data at right matches 30/60/10 weighted employment forecast, sees a 2018 bottom for in-migration





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