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REGIONAL FORECASTING

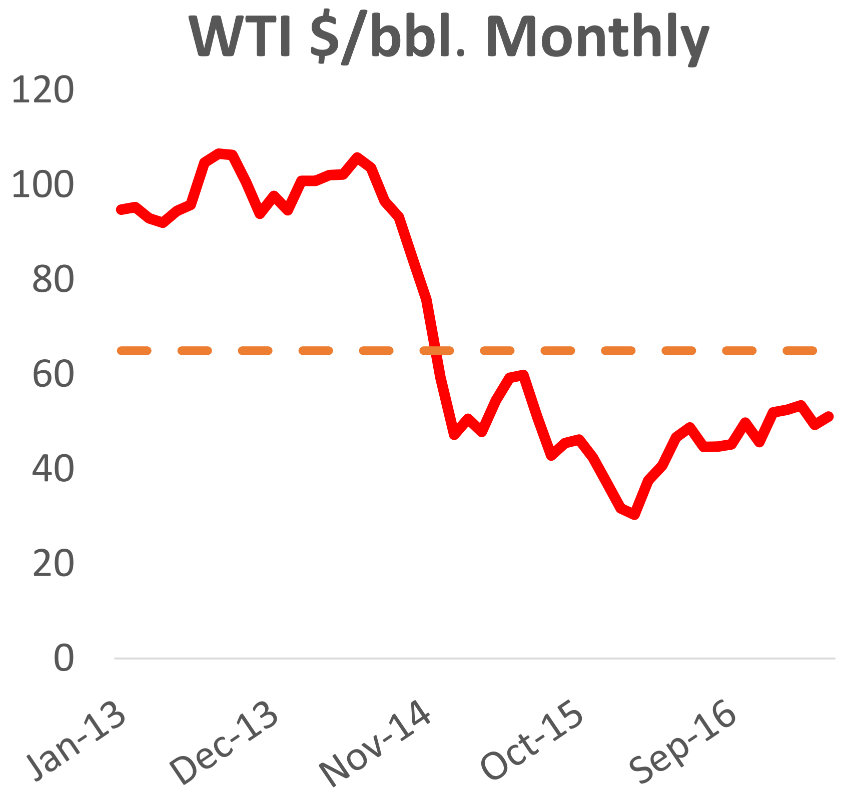
Is the Oil Bust Really Over?
And What Does It Mean for Houston?

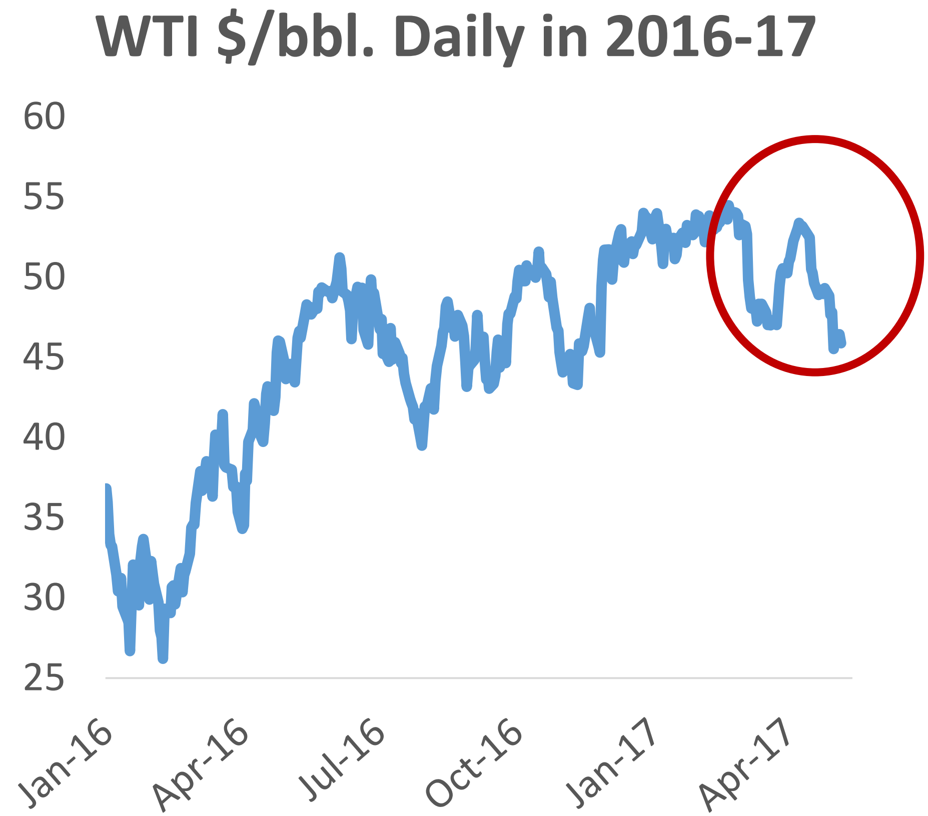
Robert W. Gilmer, Ph.D.
C.T. Bauer College of Business
May 11, 2017

Perilous Times for the Houston Economy: But Where Are We Now?

- Houston has slowed to no-growth for two years, but has seen no major economic reversal
- Where are we now?
  - We have probably put behind us the worst downturn ever for American oil
  - The U.S. economy continues to grow at a healthy rate
  - The East Side petrochemical boom is over
  - All forward momentum from the Fracking Boom is now lost, and it can only be rebuilt slowly
- Where are we going now? Is the recent job growth real? Can it continue? Just tell me the price of oil, please.

For Houston, Our Problems Are Still All About Oil Prices





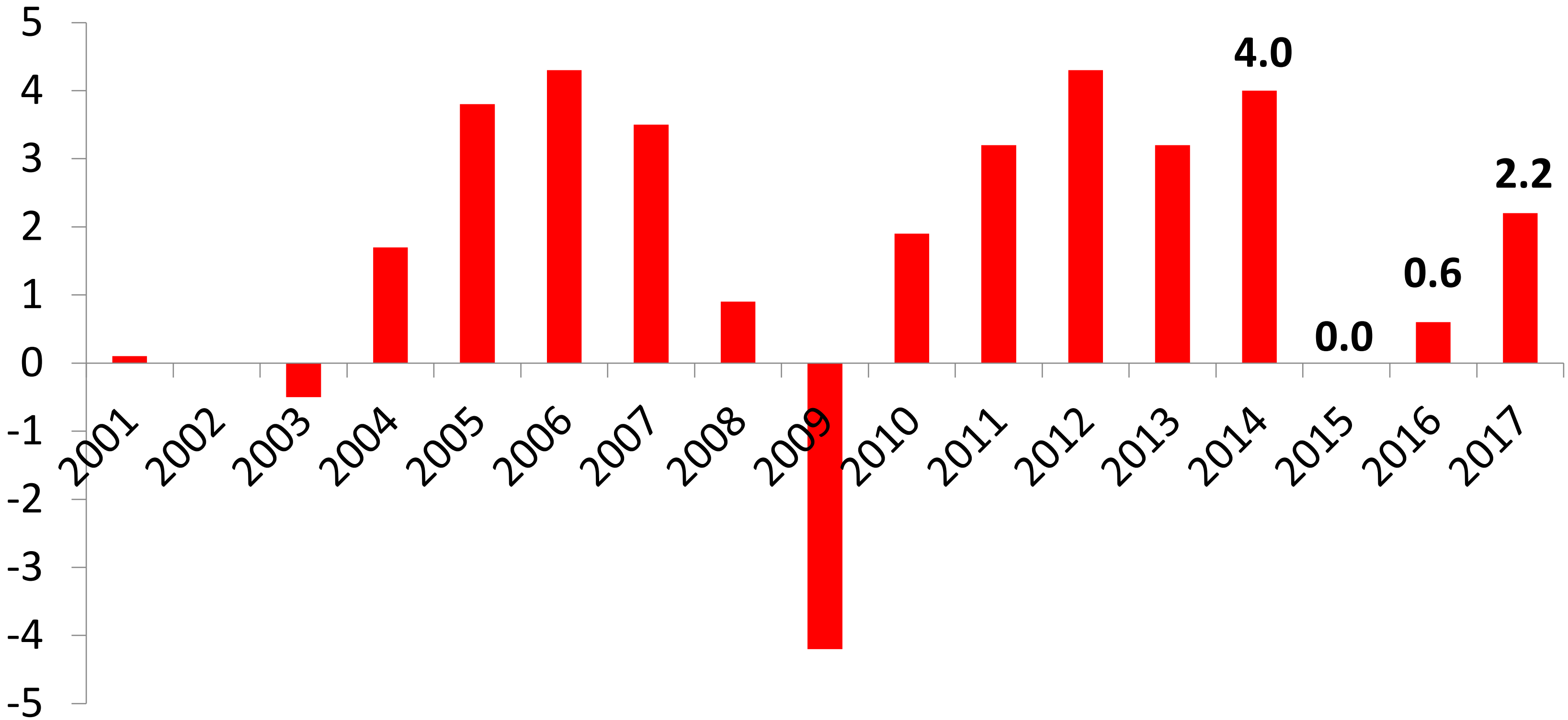
Houston Job Growth Rides Oil's Boom and Bust

Sector	Before Revision Dec to Dec	After Revision Dec to Dec	
	Jobs	Jobs	% Growth
2012	118,600	118,800	4.4%
2013	89,800	90,400	3.2%
2014	117,800	118,200	4.1%
2015	15,200	200	0.0%
2016	14,800	18,700	0.6%

Texas Workforce Commission

Current Slowdown Marked The End Of a Decade-Long Fracking Boom

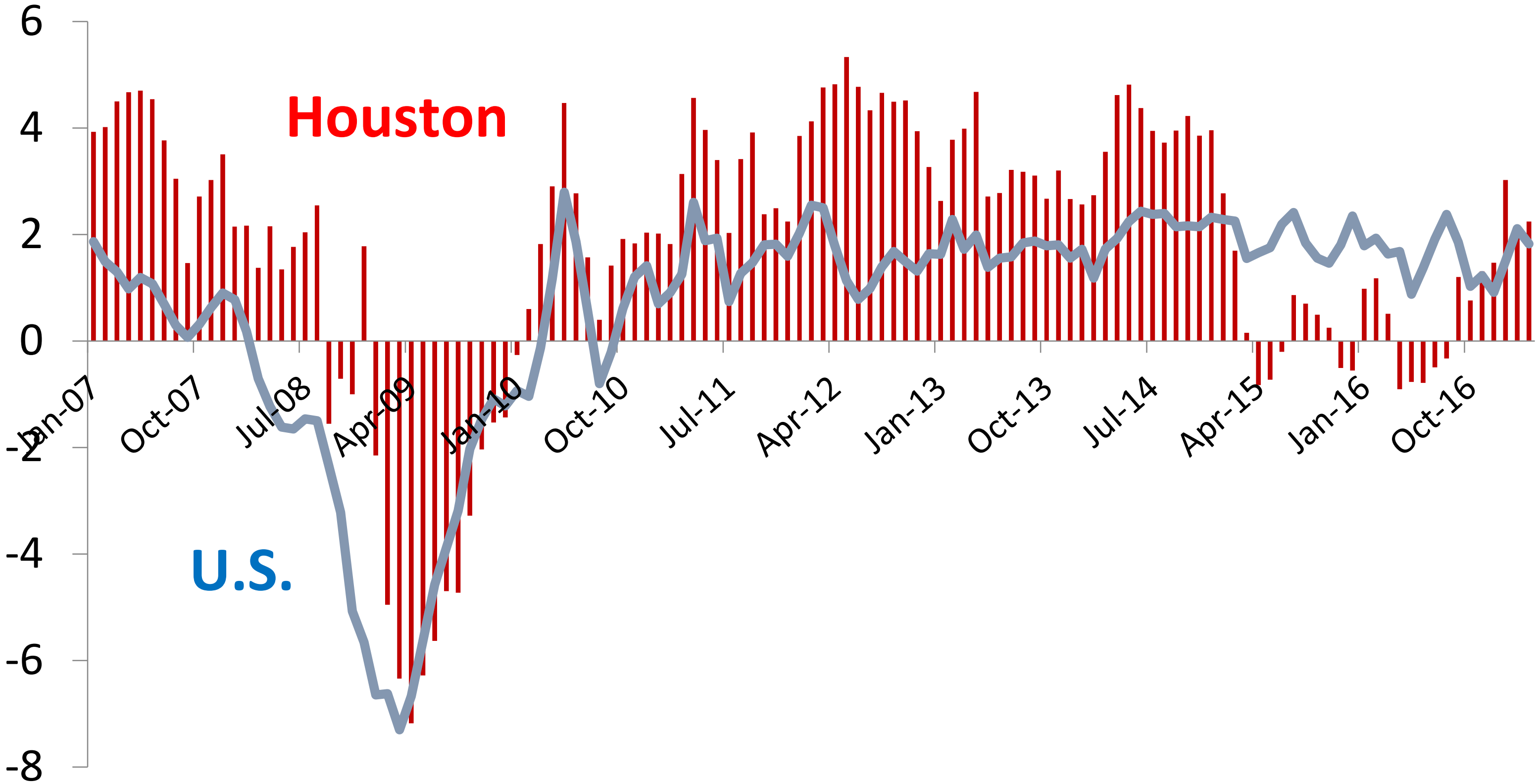
(annual percent change)



Note: December to December changes, except 2017 which is year-to-date, annualized, and seasonally adjusted. TWC estimates.

Slow But Positive Again : Houston Job Growth Revised Down to 18,500 Jobs In All of 2015-16

(3-month percent change at annual rates, s.a.)

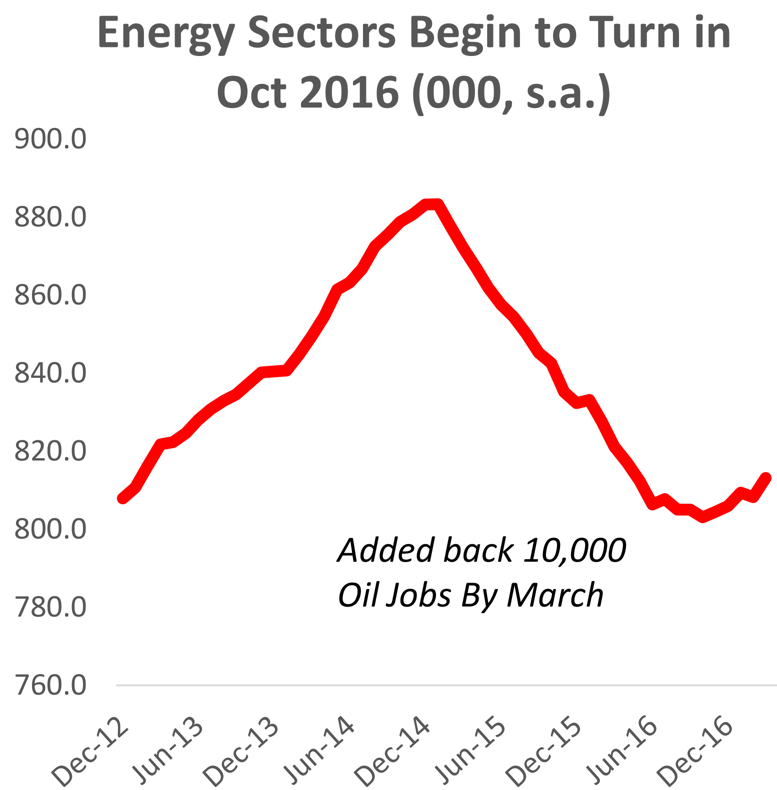


Texas Workforce Commission and Bureau of Labor Statistics

Oil-Related Job Losses Grow to 77,200 After Revisions

(Net Change in Jobs, Dec. to Dec.)

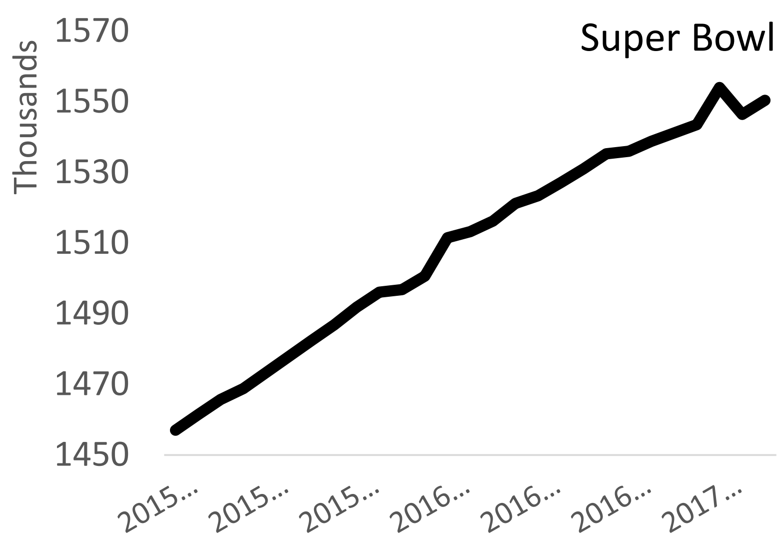
Sector	Dec '14 – Dec '16	
	New Jobs	Percent
Total Payroll	17,300	0.6%
Mining	-29,400	-25.7%
Construction	3,200	1.5%
Manufacturing	-40,300	-15.5%
Machinery	-18,700	-34.2%
Fab Metal	-20,500	-28.3%
Wholesale Trade	-5,700	-3.4%
Prof/Buss Services	-3,000	-0.6%



*Revised Texas Workforce Commission estimates. Oil-Related Jobs = Oil Producers and Services, Machinery and Fabricated Metal, Wholesale Trade, and Professional and Business Services.

Growth Of Selected Services Revised Down But Remains Strong

Number of Jobs in Key Services Revised Down, seas. adj.



Texas Workforce Commission

New Jobs Added Dec 2014 to Dec 2016 (with recent revisions)

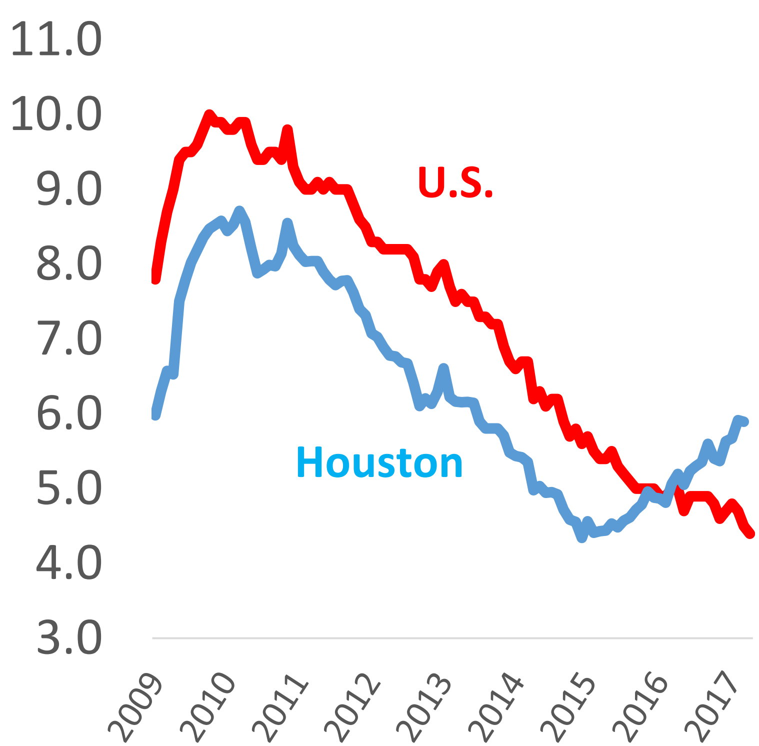
- 22,971 health care (-3,425)
- 20,836 food service (-7,850)
- 16,805 local government (+3,342)
- 10,756 retail trade (-8,679)
- 5,954 finance (+3,440)
- 4,207 arts/entertainment (-14)
- 4,148 private education (+394)
- 1,202 accommodation (-492)
- 86,026 all 8 sectors (-14,098)

Where Has 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 700,000 new jobs from 2004-2014
  - In-migration continues strongly for several quarters after job growth slows
  - Most direct damage is still confined to oil producers, oil services, and manufacturing … so far
- BUT … we are now 30 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 … and the renewed drilling activity. How strong will it be?

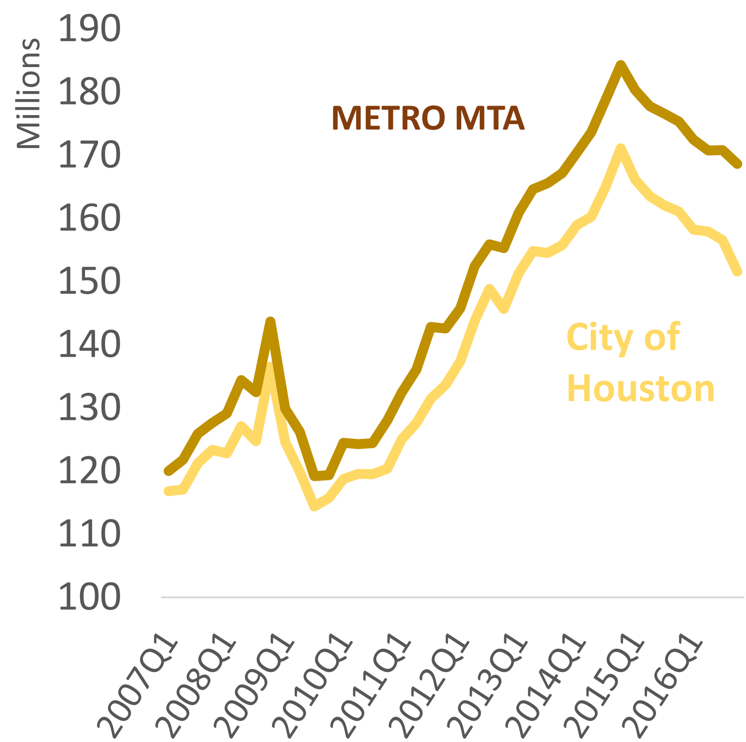
Plenty Of Other Signs Of A Big Slowdown Or Mild Reversal

Houston unemployment rate moves above U.S. to 5.9%



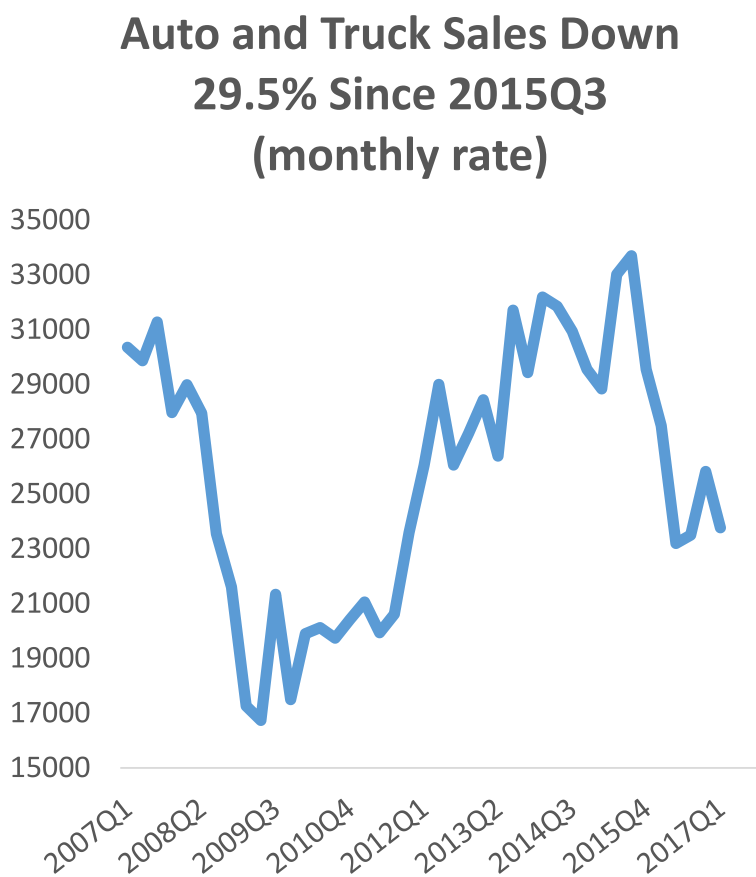
Bureau of Labor Statistics

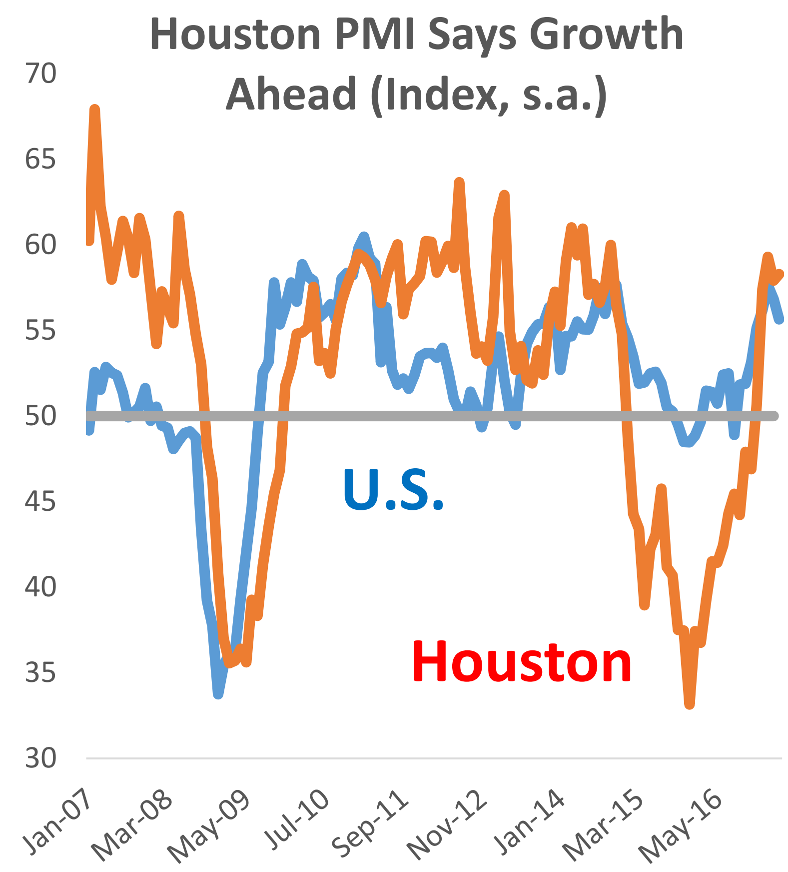
Quarterly Sales and Use Tax Collections Down 11.4 and 8.5 Percent for City & METRO MTA



Texas Comptroller, seasonally adjusted; To 2016Q4 by date of economic event

Auto Sales Struggle, While Purchasing Manager's Index Looks Forward

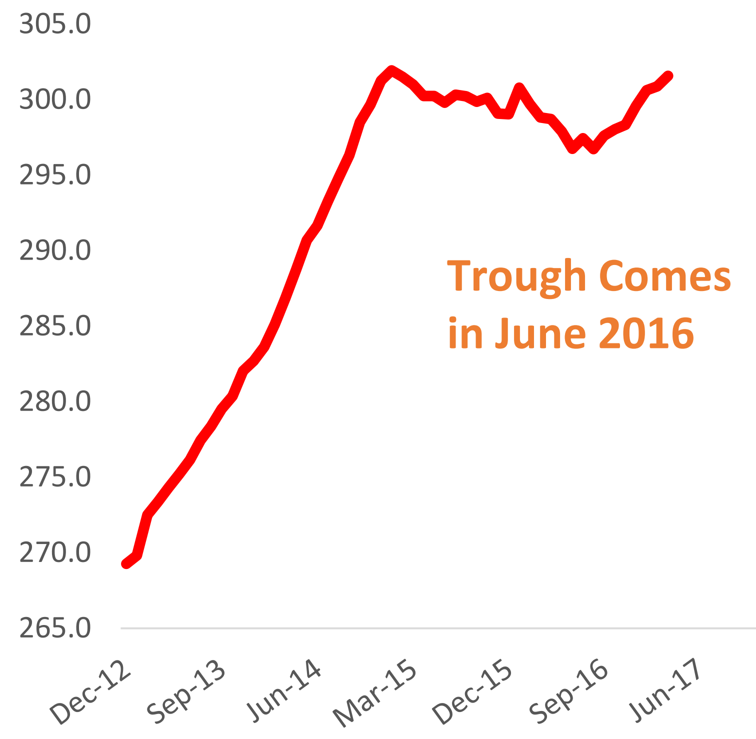




Was It Recession? Ask The Dallas Fed Business Cycle Index

Tracks local business cycle with four variables

We were on brink of recession in 2016, if not in It



Houston in Five Drilling Downturns: So Far, This One Is a Possible Mild Recession

Economic Event	% Decline Rig Count	% Loss Local Jobs	Dallas Fed BCI Quarters Decline	Dallas Fed BCI % Decline	U.S Economic Performance
1980's	-82.4	-13.3	20	-17.6	- +
Asian Financial Crisis	-46.0	None	No Recession		+ +
2001 Tech/Enron	-35.4	-1.3	9	-2.9	-
Great Recession	-50.9	-4.1	5	-7.5	- -
Fracking Bust … so far	-75.4	-0.5	6	-1.7	+

Note: In the first half of 2016, revisions show Houston lost 16,500 seasonally-adjusted jobs. These jobs were restored by year-end.

What Does Oil Mean for Houston's Economy?

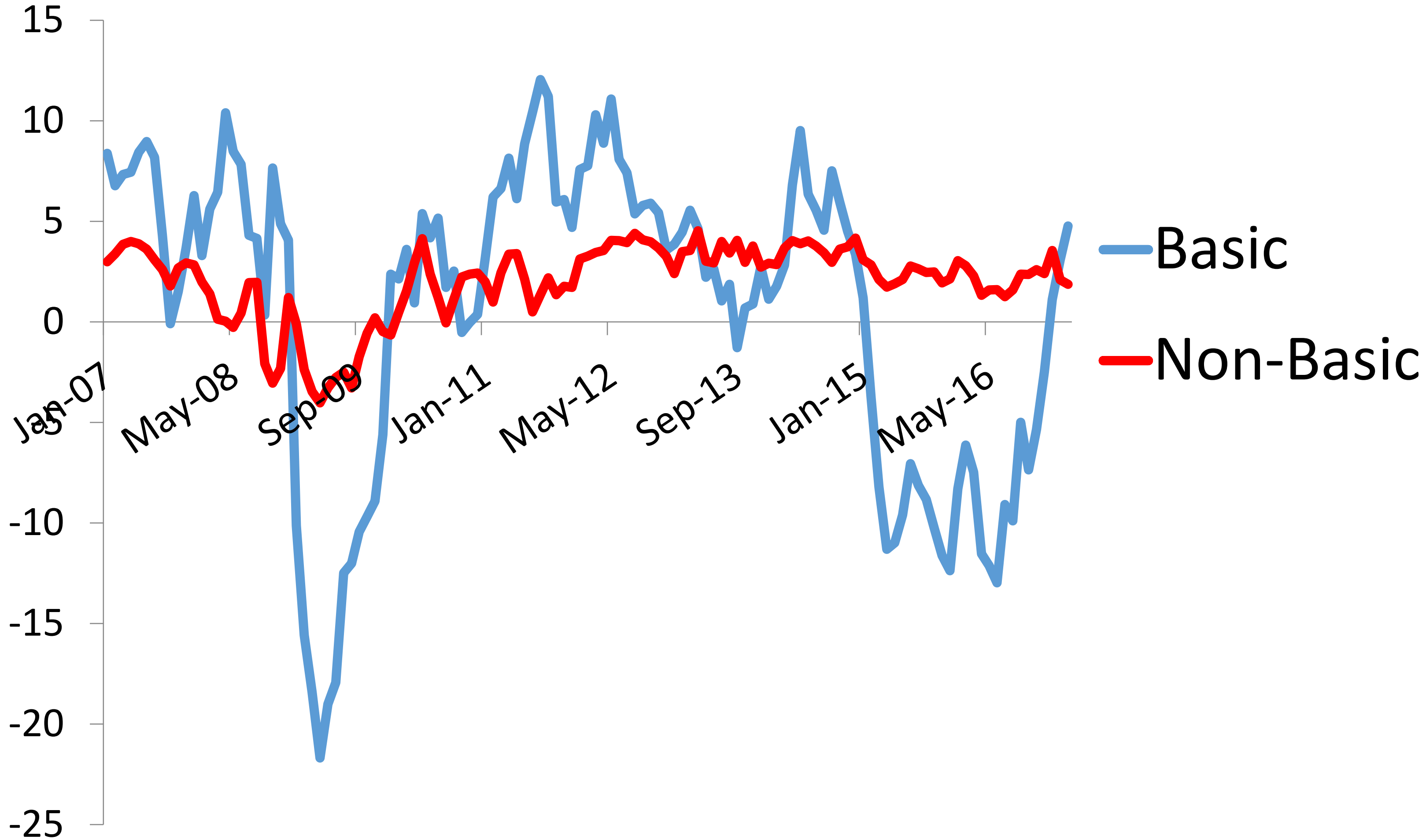
- It makes us a global engineering and technology center for one of the world's most important industries
- Makes a major machinery manufacturing center, a major national refining center, and a global producer of petrochemicals and plastics
- It is a major driver of our business cycle
  - For decades it has provided an edge in economic growth that has moved us to the fifth largest U.S. metro area
  - A volatile, commodity-driven industry, it has made the local economy highly cyclical
  - Diversification? It does not come free! To get stability you trade away a faster growth rate

Define the Economic Base as the Jobs that Drive Local Economic Growth

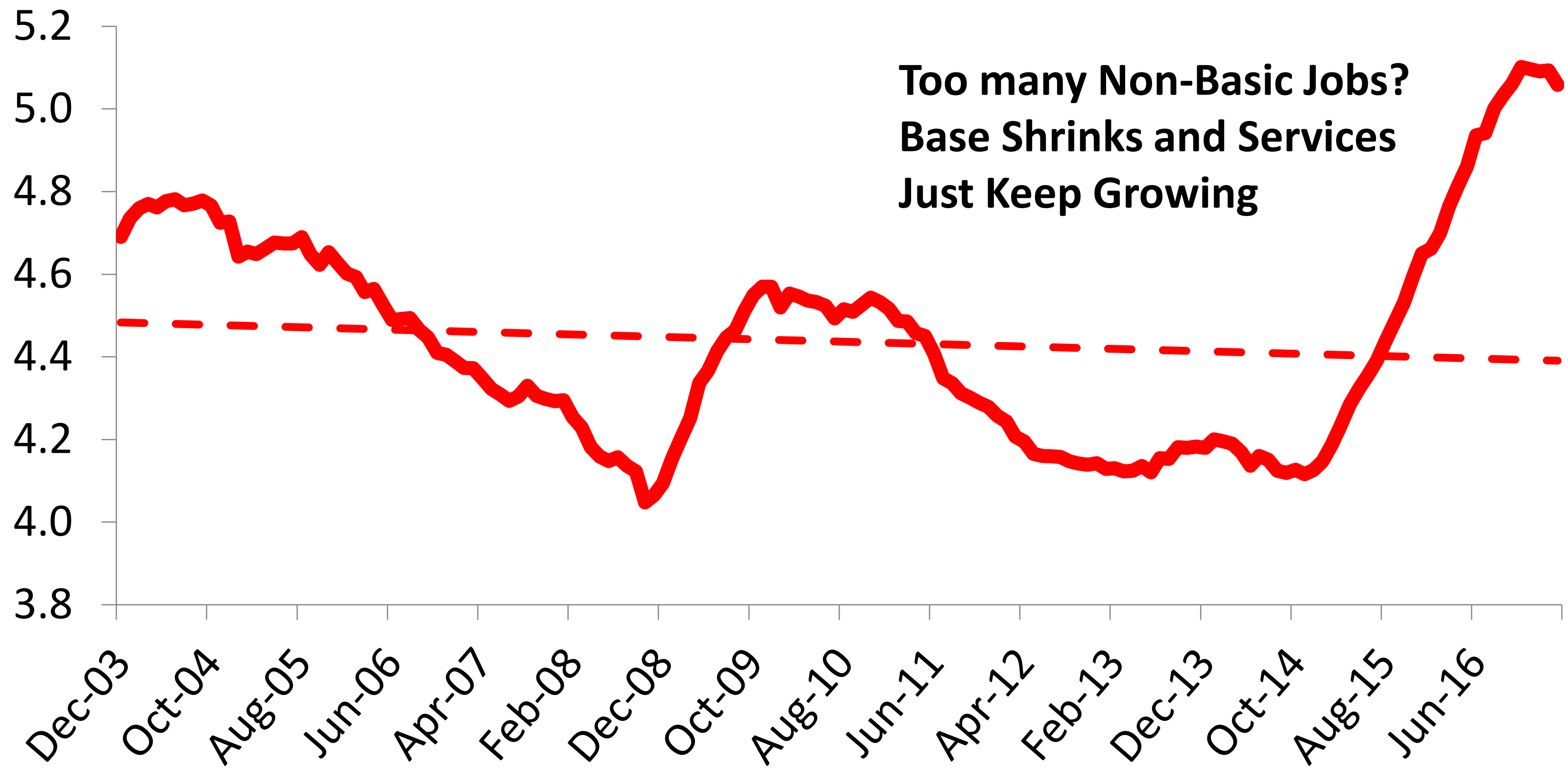
	Economic Base	Energy Base	Upstream	Downstream	Rest of Base
Oil Producers	x	x	x		
Oil Services	x	x	x		
Manufacturing	x				
Fab Metal		x	x		
Machinery		x	x		
Refining		x		x	
Chemicals		x		x	
Other Mfg.					x
Ex Air Transport	x				x
Ex Pipelines	x	x		x	
Ex Wholesale	x				x
Ex Prof Services	x				x
Ex Construction	x	x		x	

Houston's Economic Base Leads an Exciting Life! Non-Basic Follows Later

(3-mo percent change at annual rate)

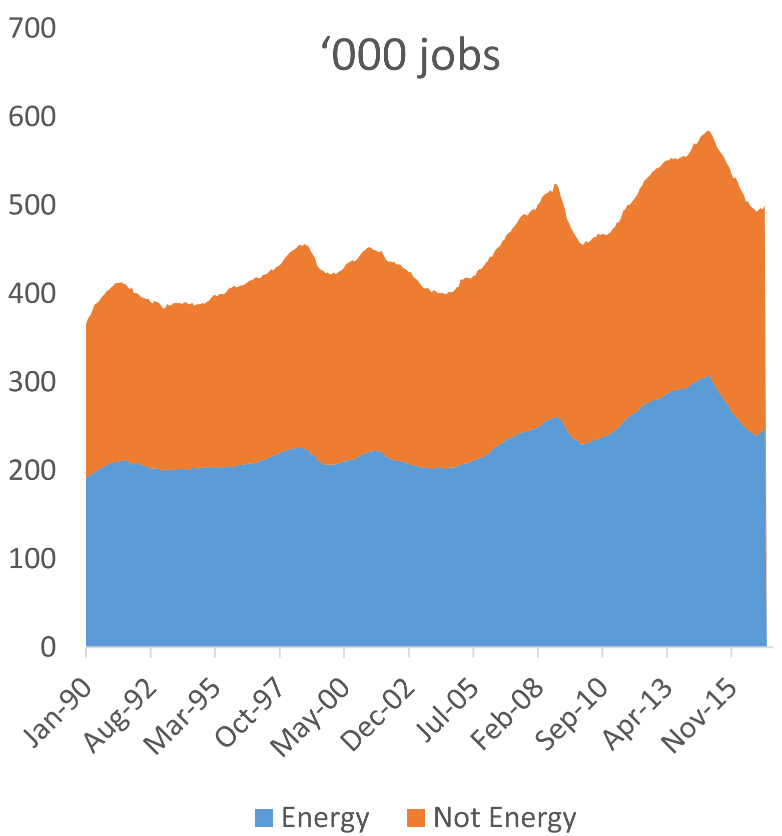


About Four Non-basic Jobs In Houston Supported By Each Base Job

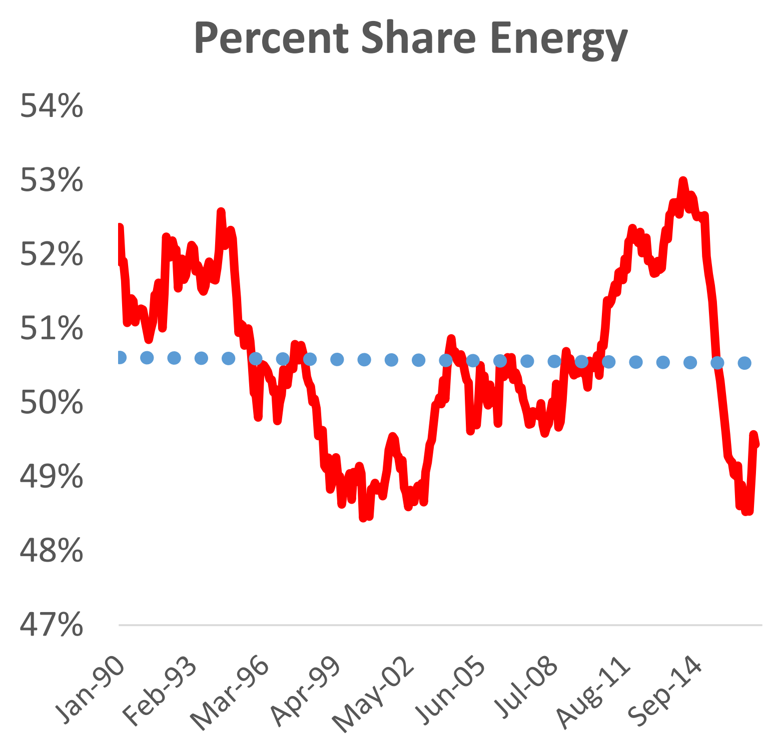


How Dependent Is Houston on Oil versus Other Factors?

Total Energy and Non-Energy Base Jobs?



Houston's Energy Share near 50% for Decades



There Are Some Problems Here!

- Nothing definitive can be said about the 1980's. The industry classifications system changed forever in 1990
- The level of detail from payroll employment (used in our example) is very limited and deficient.
  - More detailed data (like *County Business Patterns*) comes only annually and with a two year lag, and the regional definition changes over time.
  - Detailed data is counted very differently than payrolls. There is no accounting consistency between reports in some very important categories
- Out-sourcing crosses up the concept of counting energy base jobs
  - Outsource accounting, and workers move from the oil industry to financial services
  - What changed? Yes, it is true the energy base got smaller. But the energy multiplier got bigger. There was no diversification.

Let's Try A Statistical Approach: And Answer *Two* Questions

- How much of Houston's employment, measured *over the business cycle and measured from one quarter to the next*, is driven by the oil industry's drilling cycle? By the national business cycle?
- *Over longer periods of time* – which turn out to be 10 to 12 quarters, how do these factors – and others -- come into play?
  - Population growth, local labor force quality and quantity, infrastructure, regulations, pro-business attitudes, etc. These factors all evolve slowly over time
  - We share in broad economic growth trends along with the rest of the U.S. economy. Plus, we get special impetus from the success of the U.S. and global oil industry

The model used is an error correction model from 1990Q1 to 2016Q4 with total payroll employment as the dependent variable, and local upstream employment, U.S. employment, and a trend term as independent variables. Log first differences are stationary; there is no autocorrelation; and no serious inter-correlation among independent variables. There is a significant long-term relationship over about 10 quarters, and no evidence of structural change through the entire period. Percentage estimates shown in the next slide are based on the standardized coefficients from an unrestricted version of the ECM.

How Houston Withstood the Blow from Oil in 2015-16

- ***What drives quarter-to-quarter job growth?***
  - **Momentum** from the prior two quarters**: 36.2%**
  - **U.S.** economic expansion: **41.5**
  - Local **upstream** oil-related job growth: **22.4%**
- ***What drives growth over 10 or more quarters?***
  - **Long-term factors** that drive local population growth and productivity: **28.3%**
  - **U.S.** economic expansion: **38.6%**
  - Local **oil-related** job growth: **33.2%**

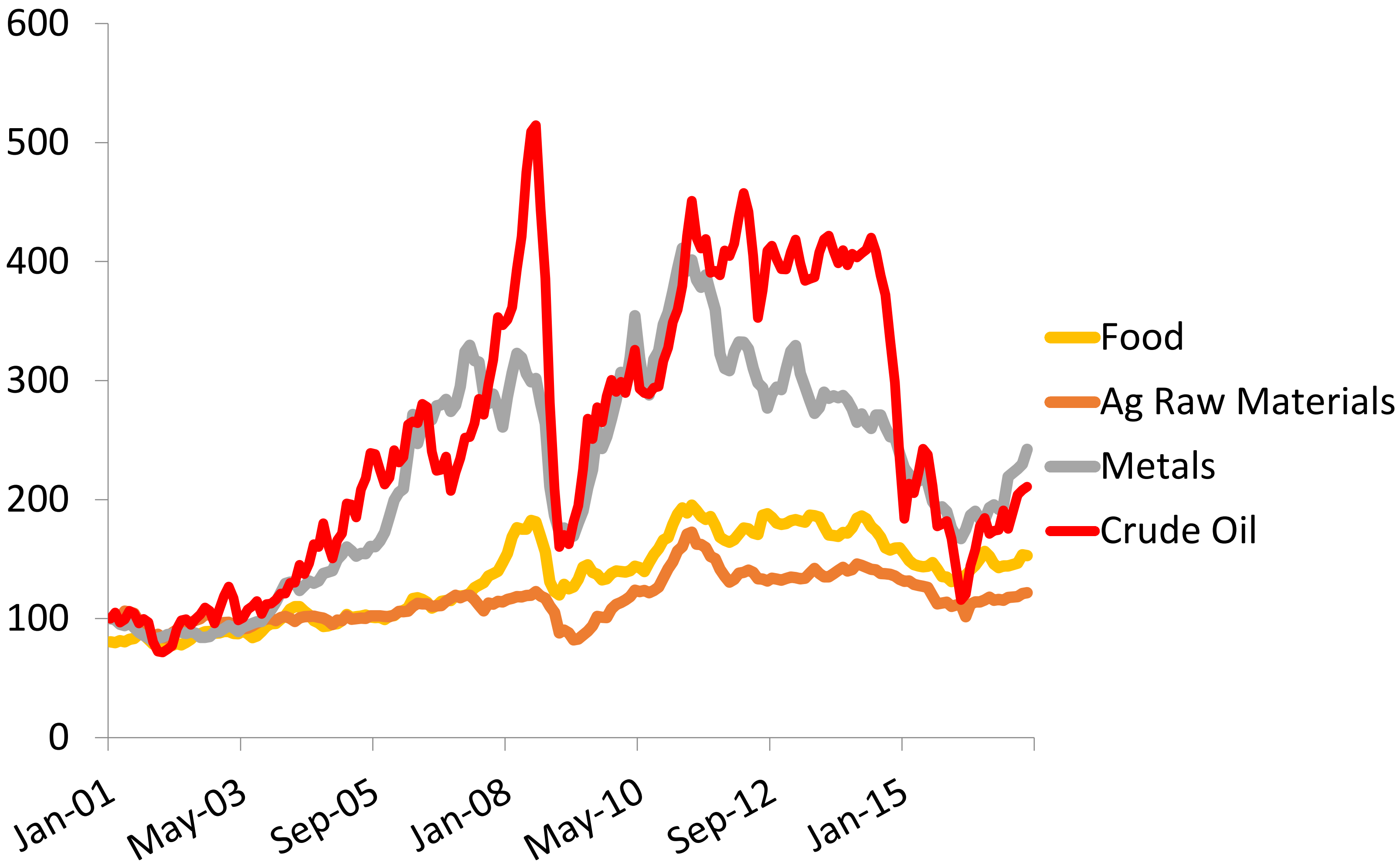
Taking a the Latest Shot from Oil

- Over the business cycle, 1/3 oil and 2/3 U.S. cycle.
- Over the longer-term, 1/3 is oil-driven, and the rest by non-oil factors
- Houston's response to oil or U.S. growth is stable and unchanged over the entire period, indicating *little diversification away from oil in the last 26 years*
- Remember these figures are on average! There are periods like 2009-2014 when oil booms, but U.S. economy performs poorly. Or the late 1990's when U.S. booms and oil lags badly.

Oil Markets and Oil Price

The Commodity Super-Cycle Is Over

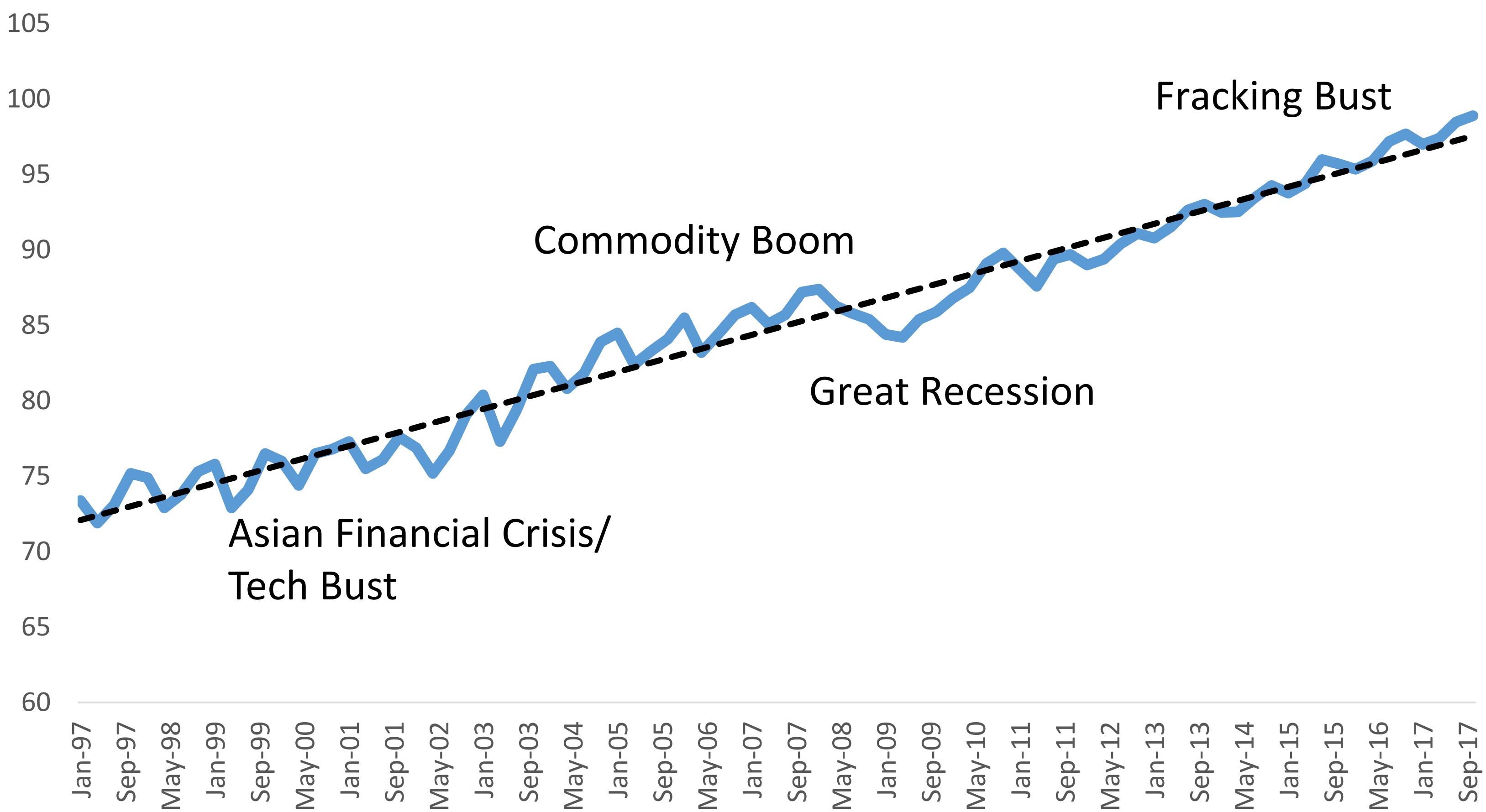
(price index: Jan 2001 = 100)



International Monetary Fund

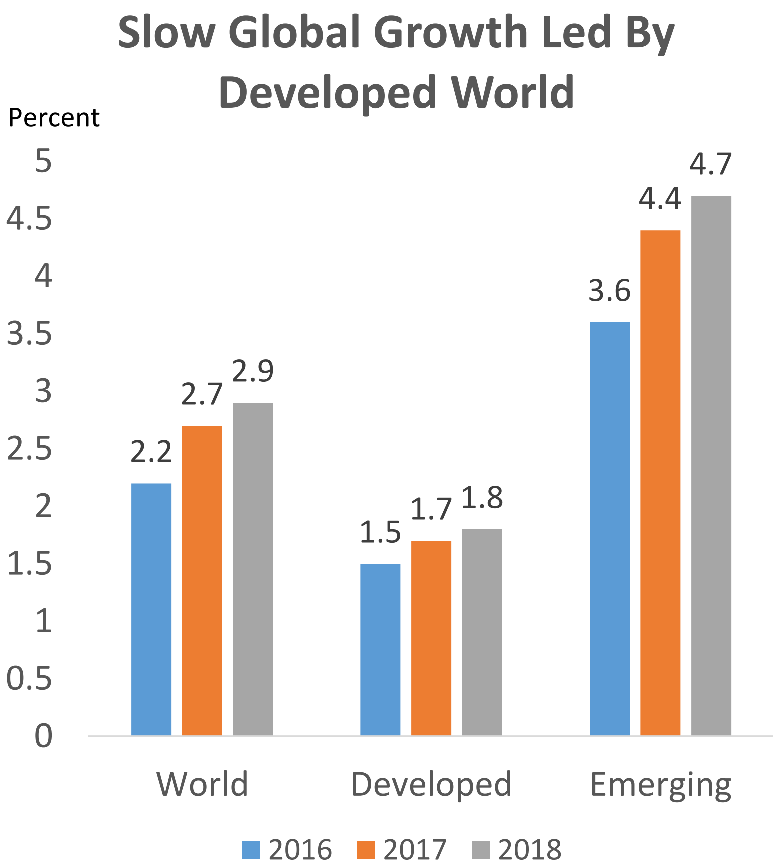
But Global Oil Demand Has Grown Steadily Since 2014: This Has Been a Supply Problem

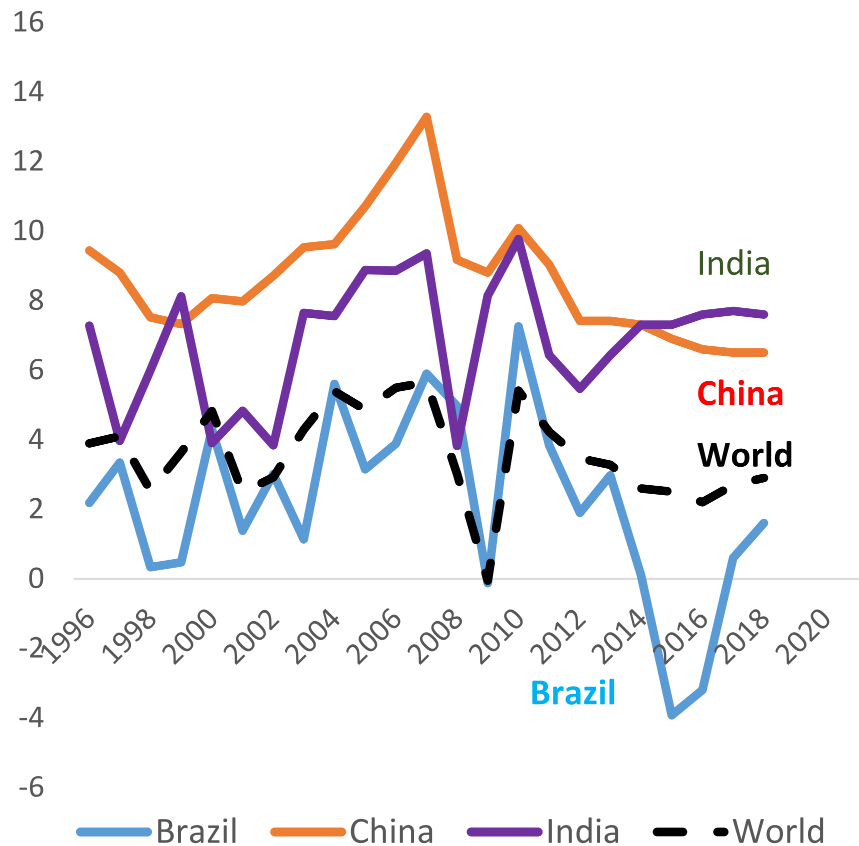
(million bbl./d)



Global Economy Still Trapped in Prolonged Period of Sub-Par Growth

(percent change in GDP)

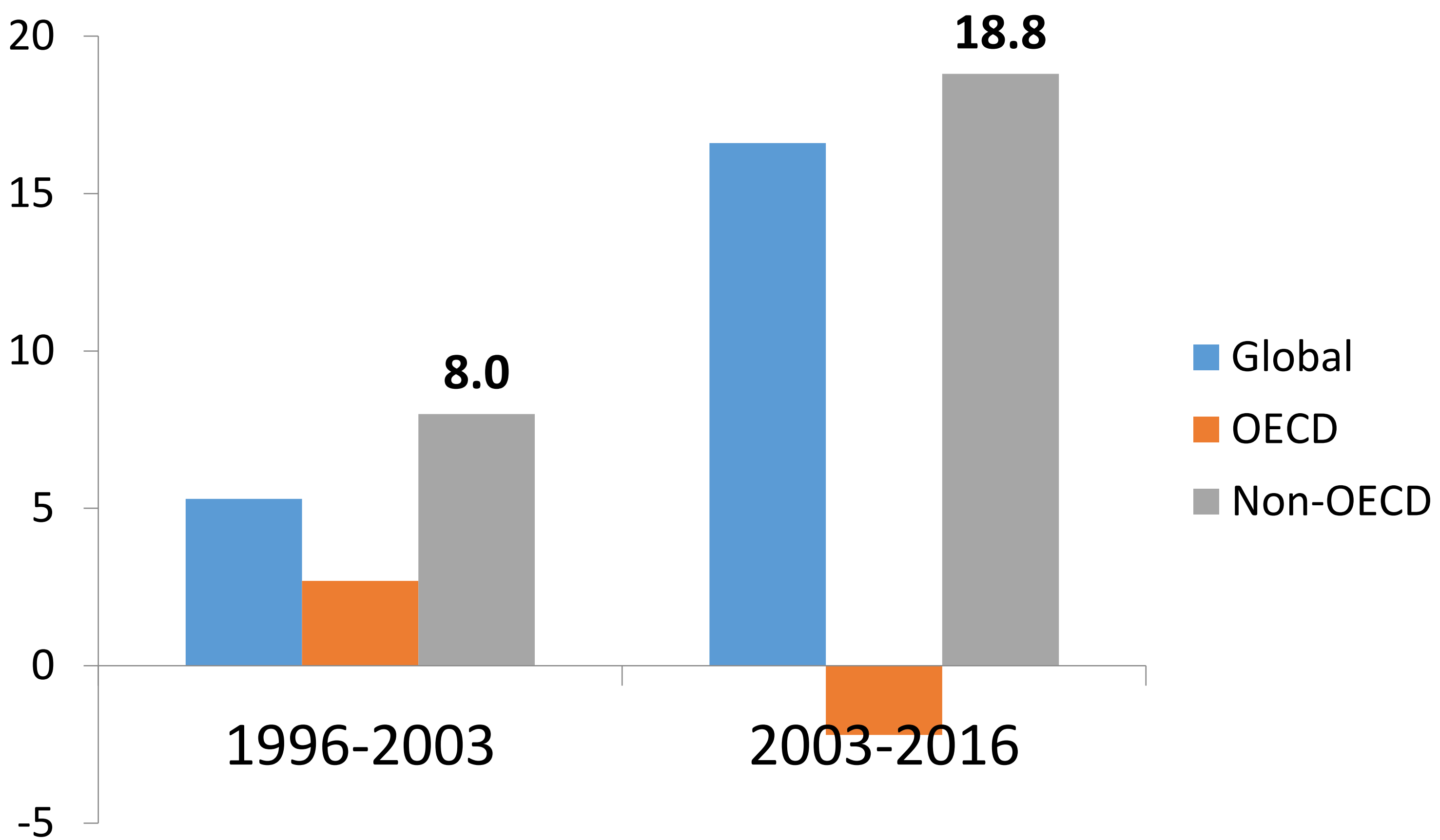




IMF *World Economic Outlook*, April 2017

Growth In The Demand For Oil Comes From Emerging Markets

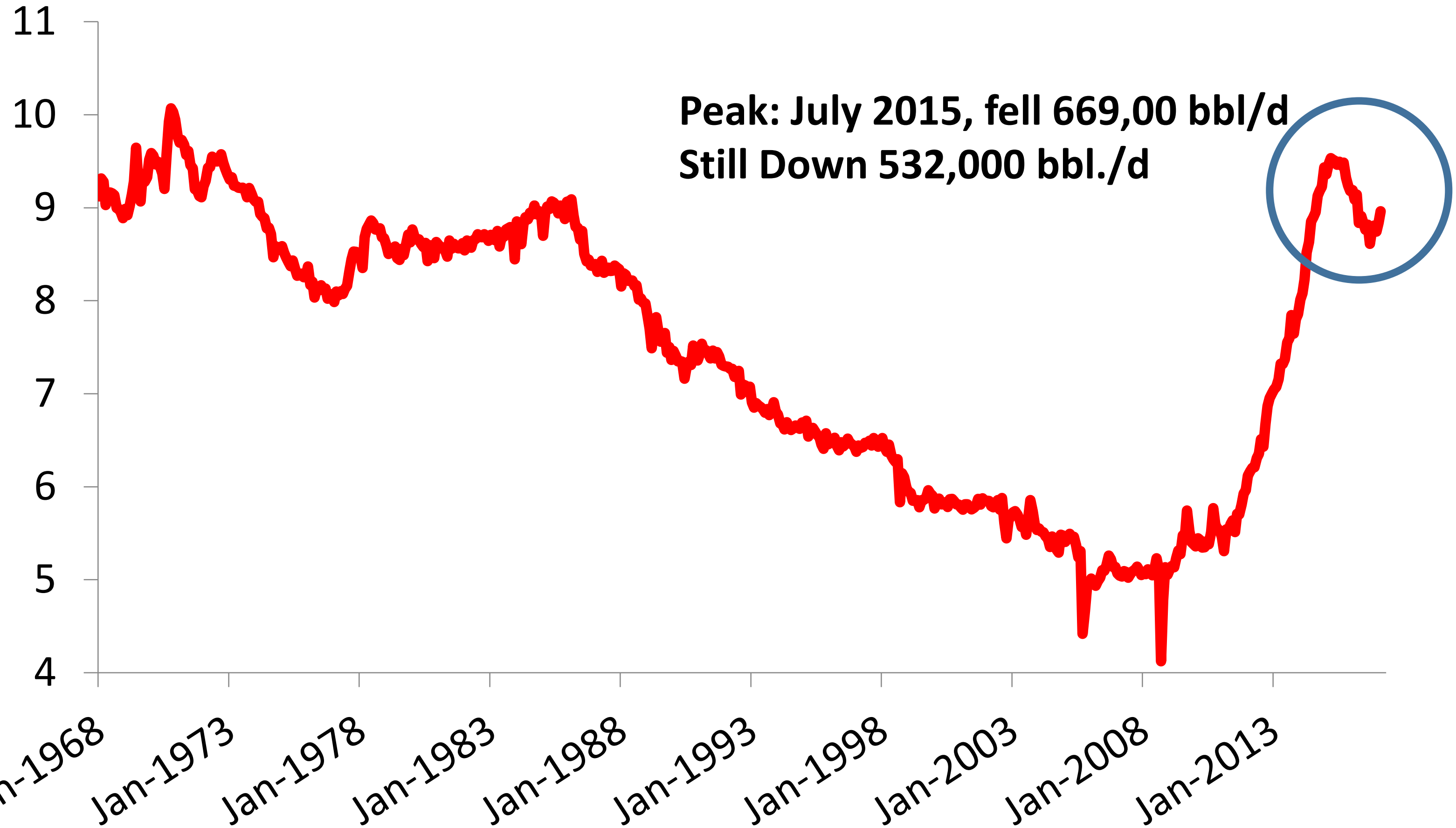
(million b/d)



International Energy Agency

On Supply Side? U.S. Shale Reversed 40 Years Of Declining Oil Production

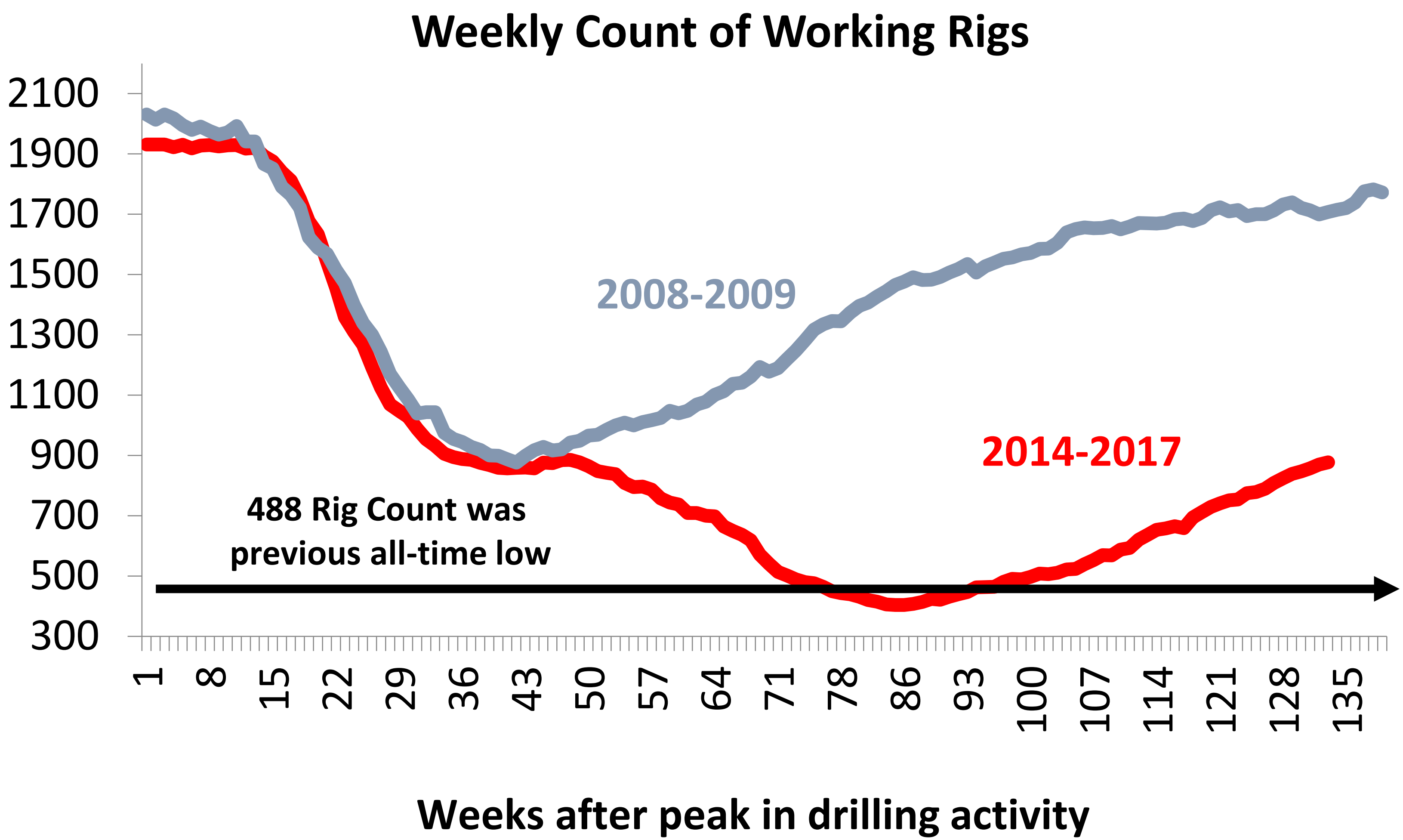
(million barrels/day)



DOE/EIA, Seasonally adjusted by IRF

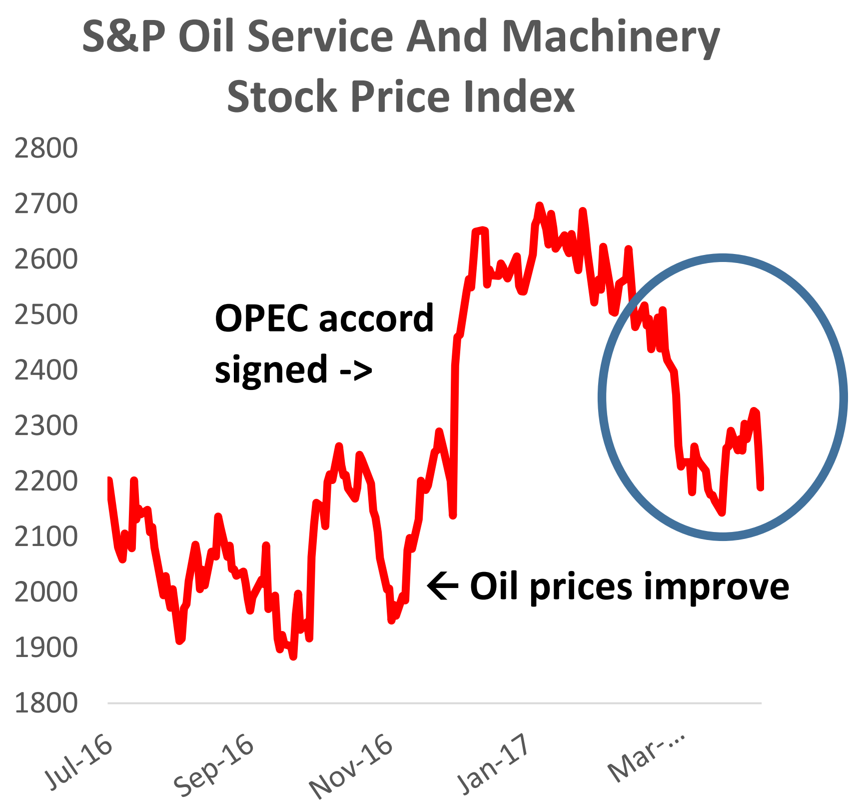
Thinking About Recovery In the Oil Patch

Drilling Has Definitively Turned Up from Historic Lows

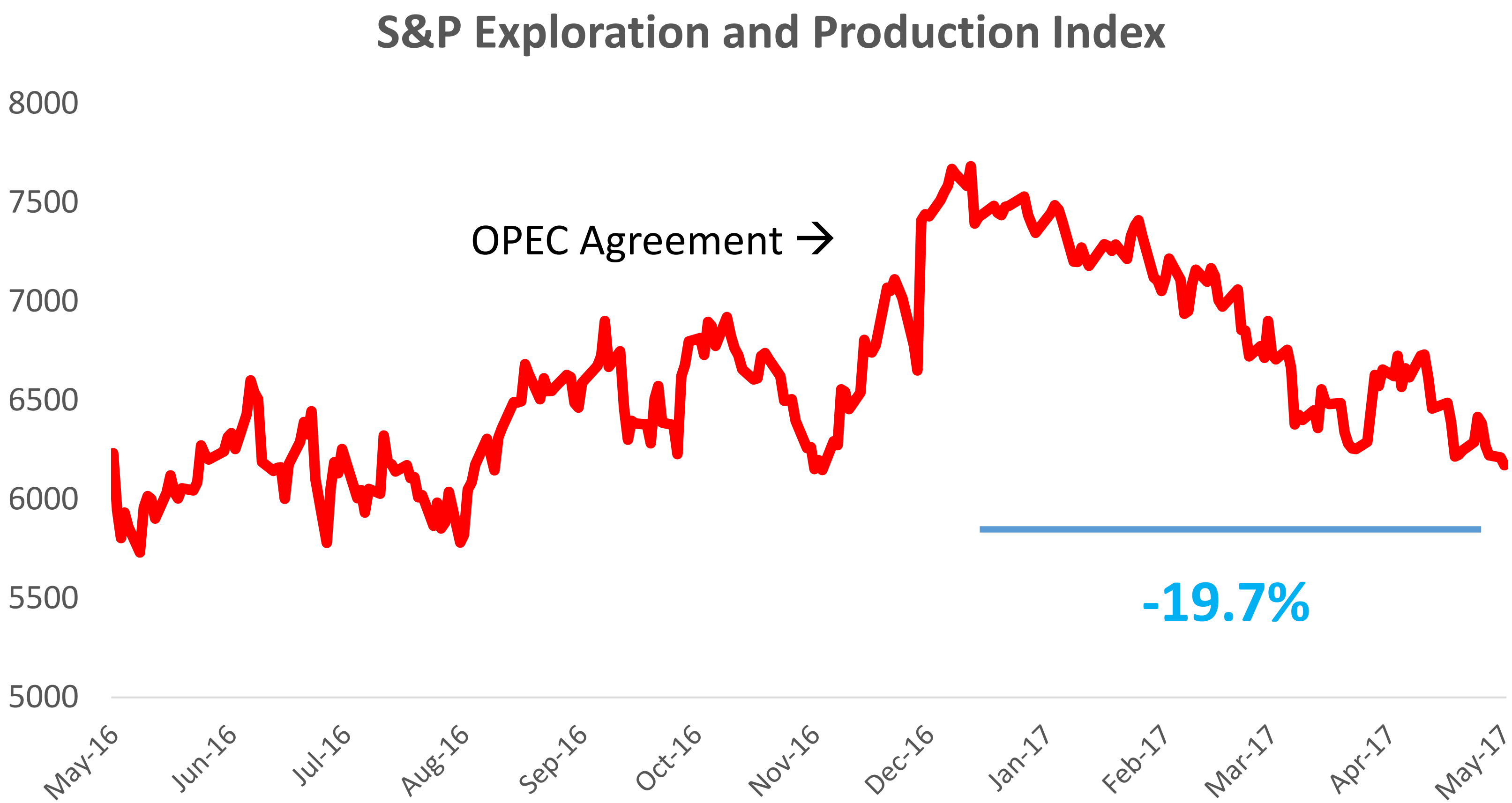


As Oil Prices Rose This Spring, Optimism Returned To The Oil Market

- The big three oil service companies all declared a bottom was in place for drilling in their 2016 earnings reports
- The rig count has more than doubled from the March 2016 low of 404
- Oil service and machinery stocks quickly rose 30% in February and March as the OPEC agreement fell into place. BUT then fell back in March and April with lower oil prices
- But did producers get ahead of themselves? Again trying to drive equity gains instead of profit over the oil-price cycle?

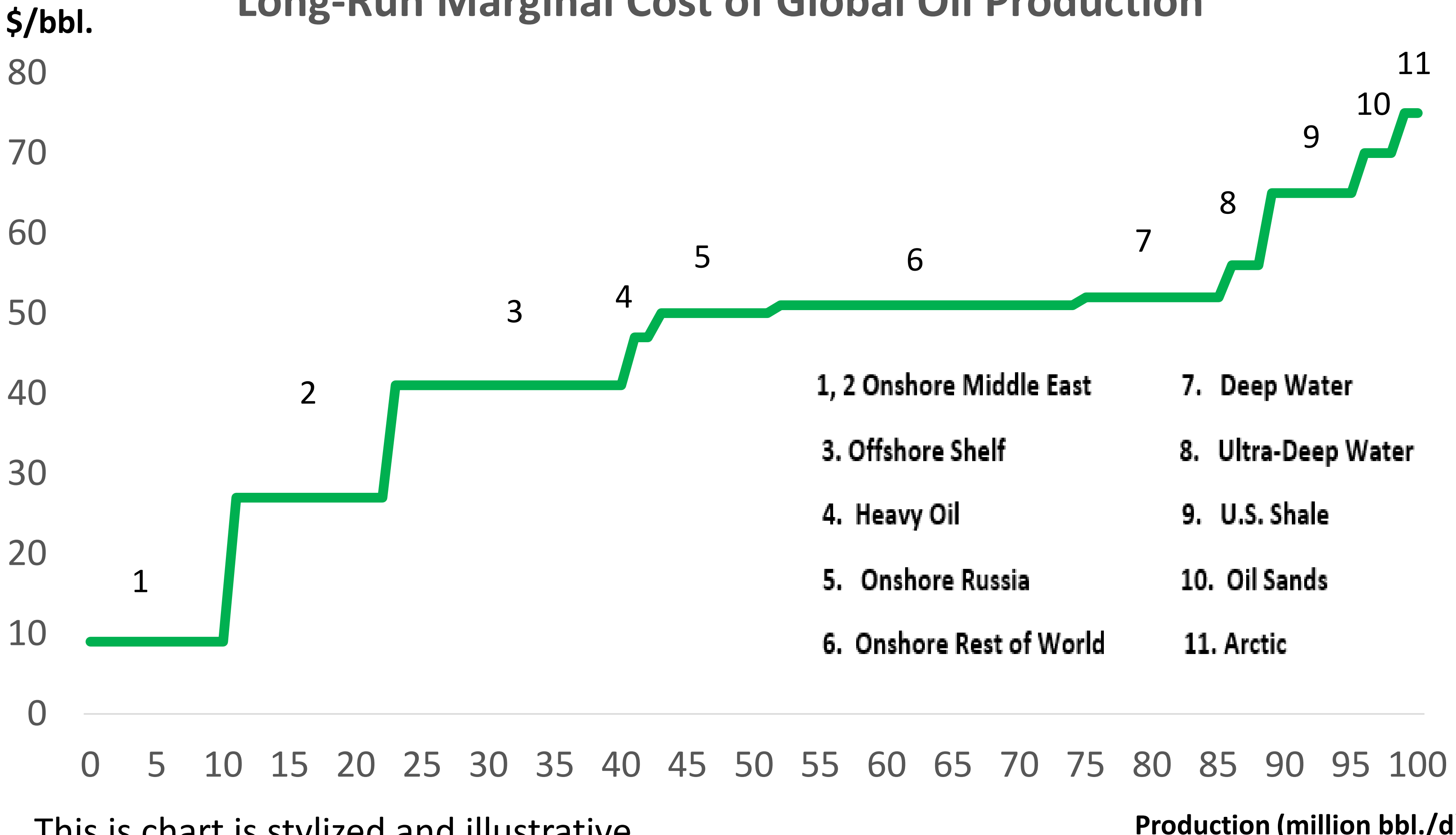


If Oil Producers Are Chasing Equity Gains … It Isn't Working



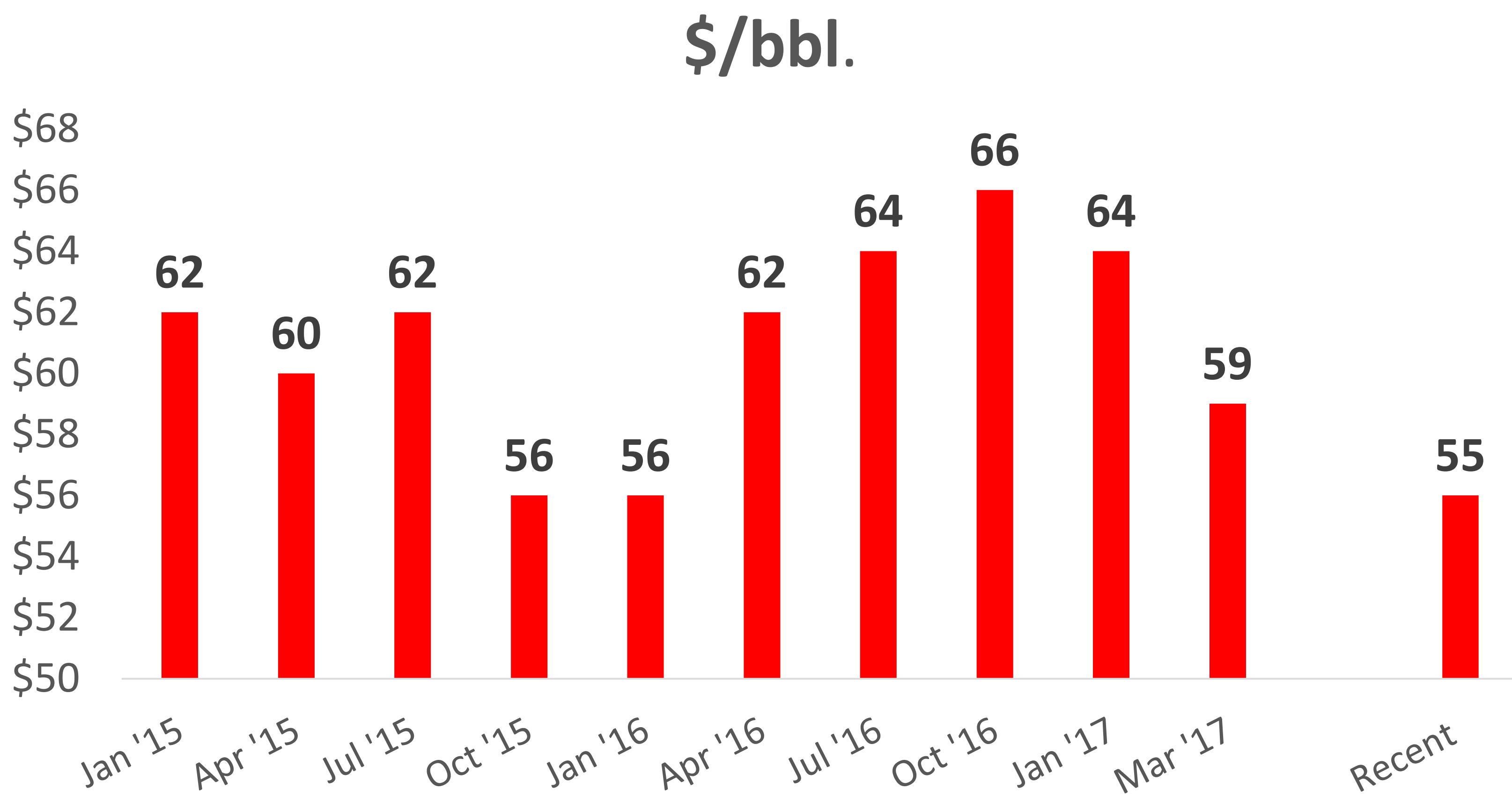
What We Really Need?: Drilling Recovery Means Oil Near $65/bbl.

Long-Run Marginal Cost of Global Oil Production



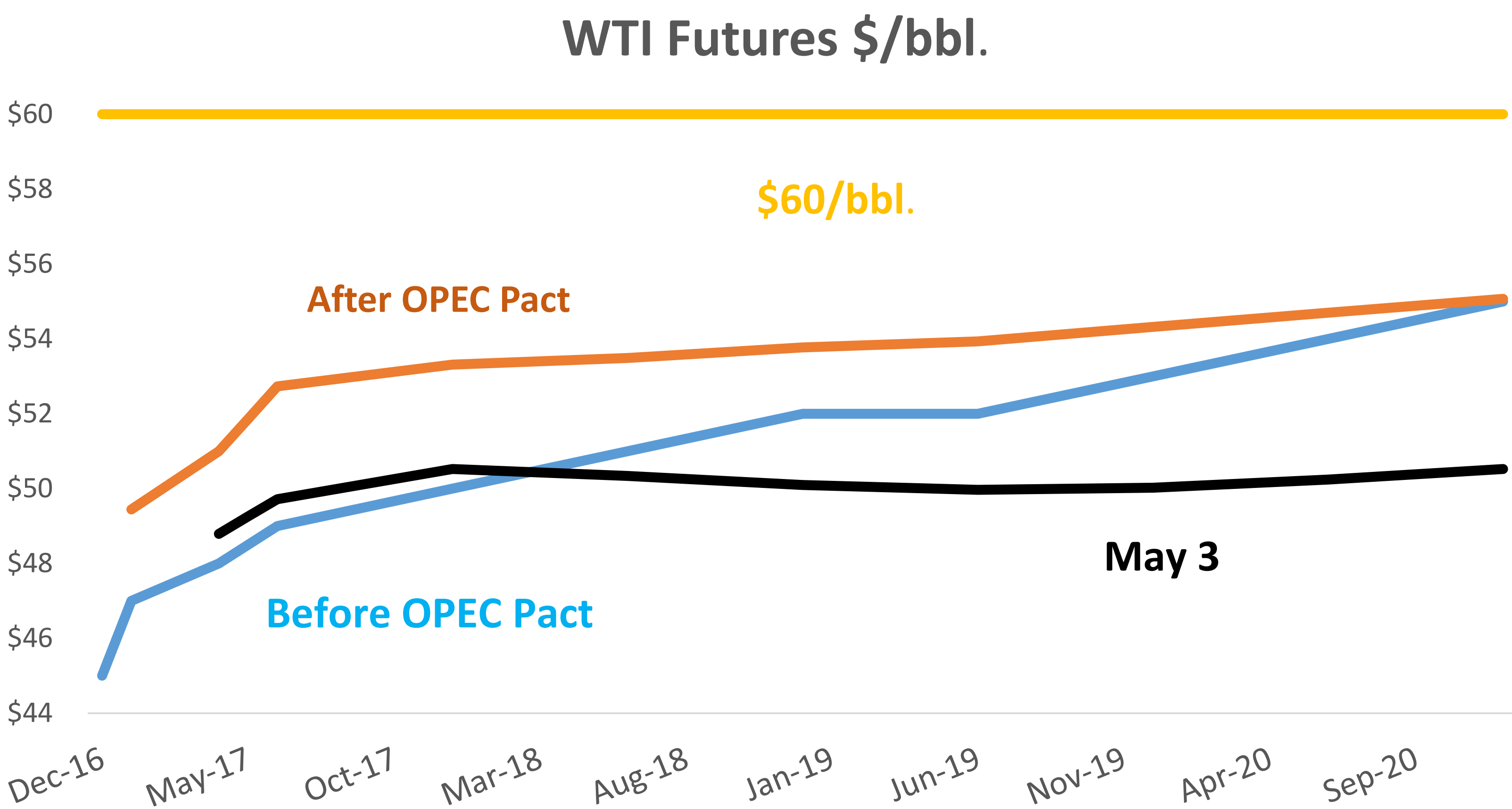
This is chart is stylized and illustrative

Price Of WTI Oil As Implied by Valuation Of The Stock of 40 Oil Producers



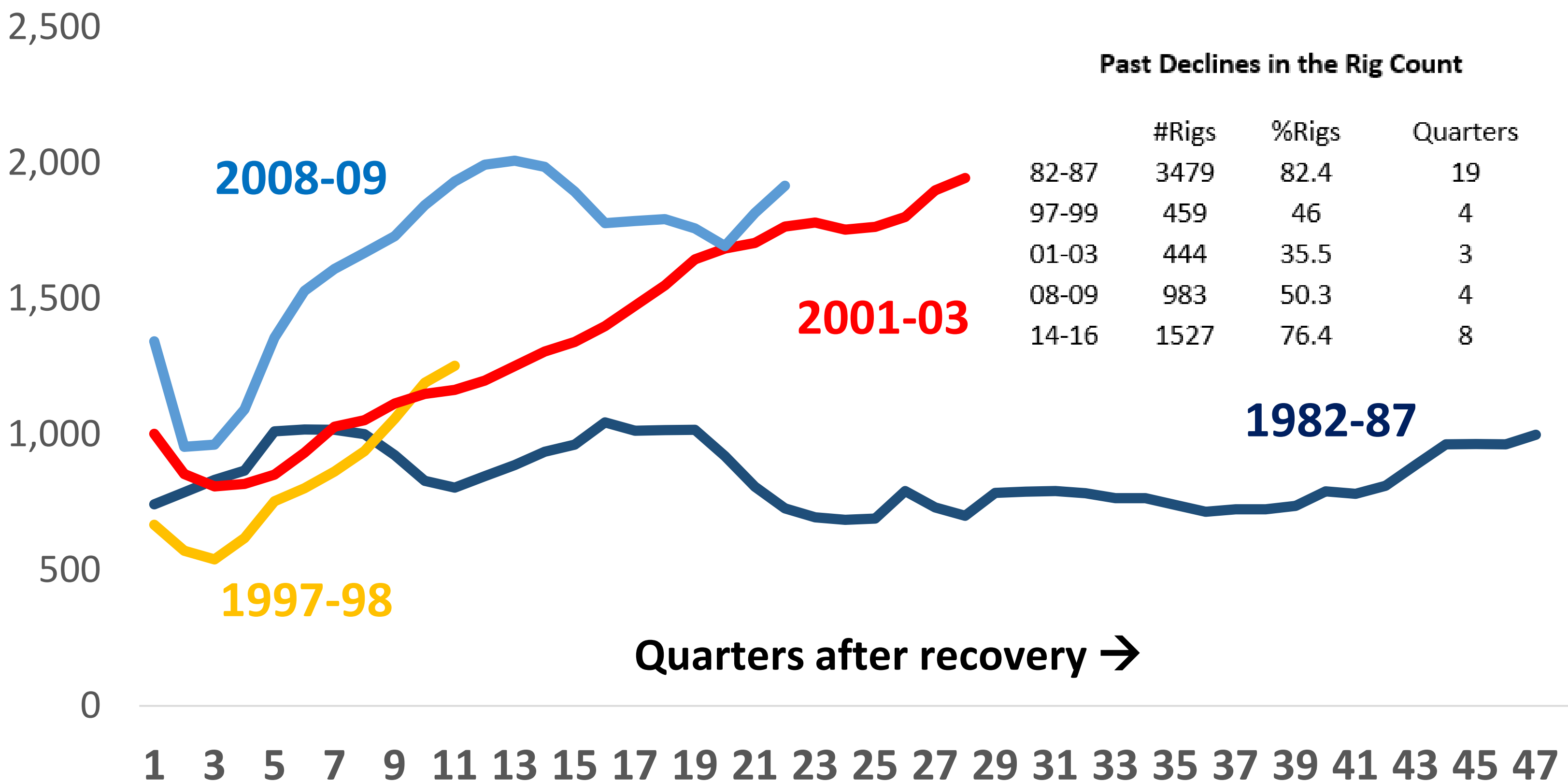
Goldman Sachs Research, at first week of each quarter

All OPEC's Efforts to Drive Higher Oil Prices Seem to Be Lost



Recovery In Rig Count After Oil Prices Definitively Move Up

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

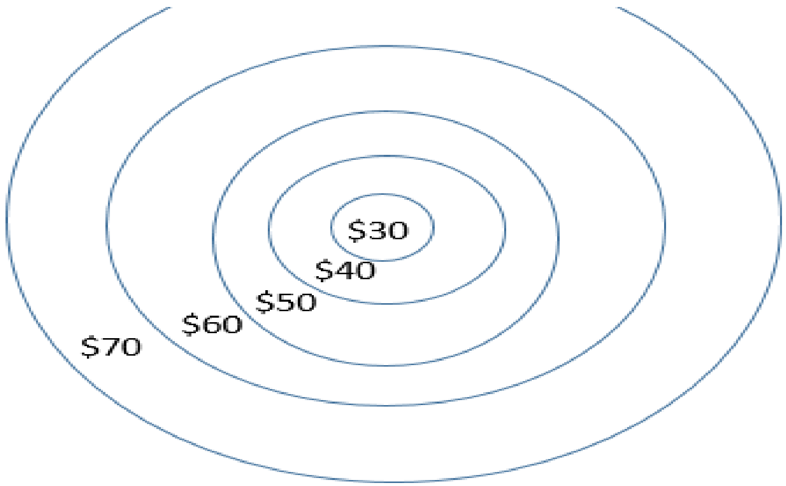


Past Declines in the Rig Count

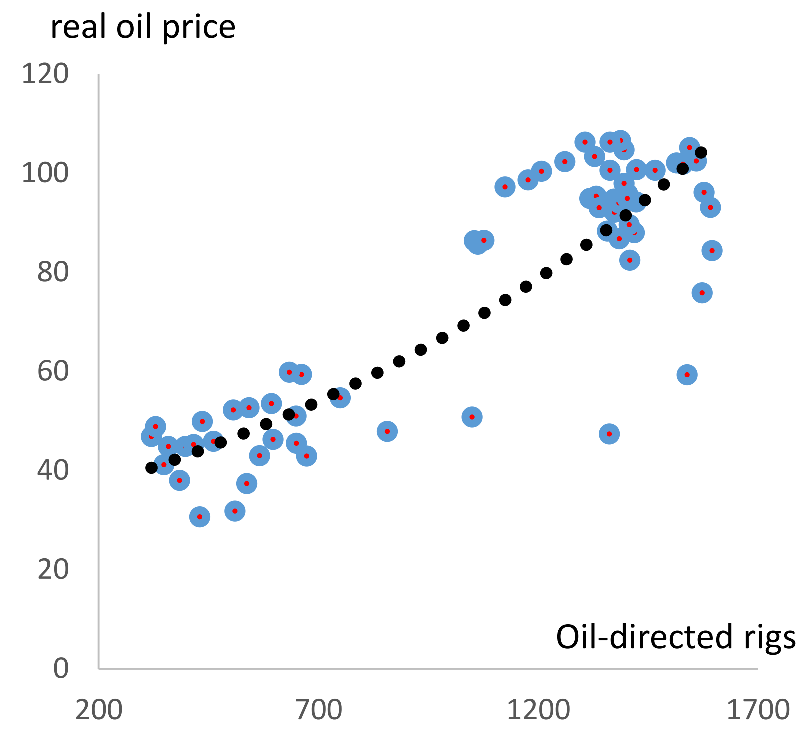
	#Rigs	%Rigs	Quarters
82-87	3479	82.4	19
97-99	459	46	4
01-03	444	35.5	3
08-09	983	50.3	4
14-16	1527	76.4	8

Baker Hughes, calculations of IRF

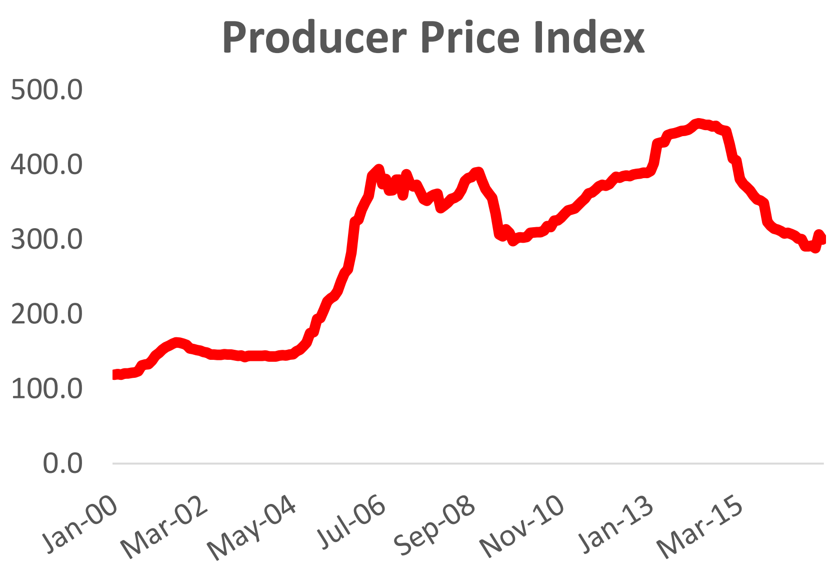
Producers Retreat to Low-Cost Prospects



No Recent Experience Relating $60-$80 Oil to Oil Rig Count



Drilling Costs Fall by Over a Third Since 2014



Building Scenarios For Recovery In Oil

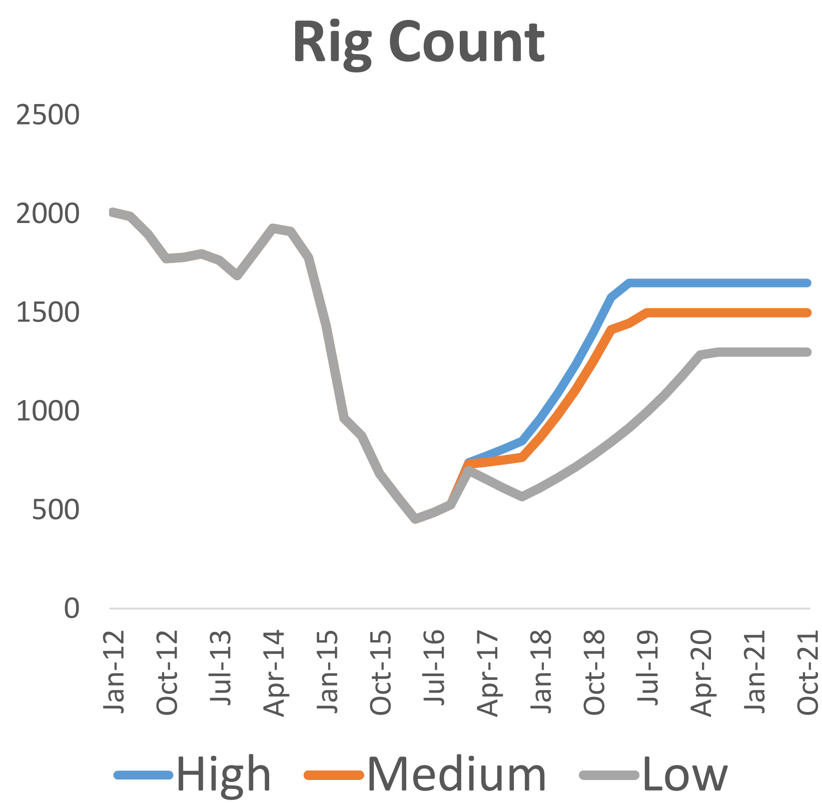
- When will oil prices hit bottom?
- When will the rig count turn up?
- When do energy jobs begin to come back?
- How high will the rig count go in this recovery?
- How long before the rig count reaches these highs?

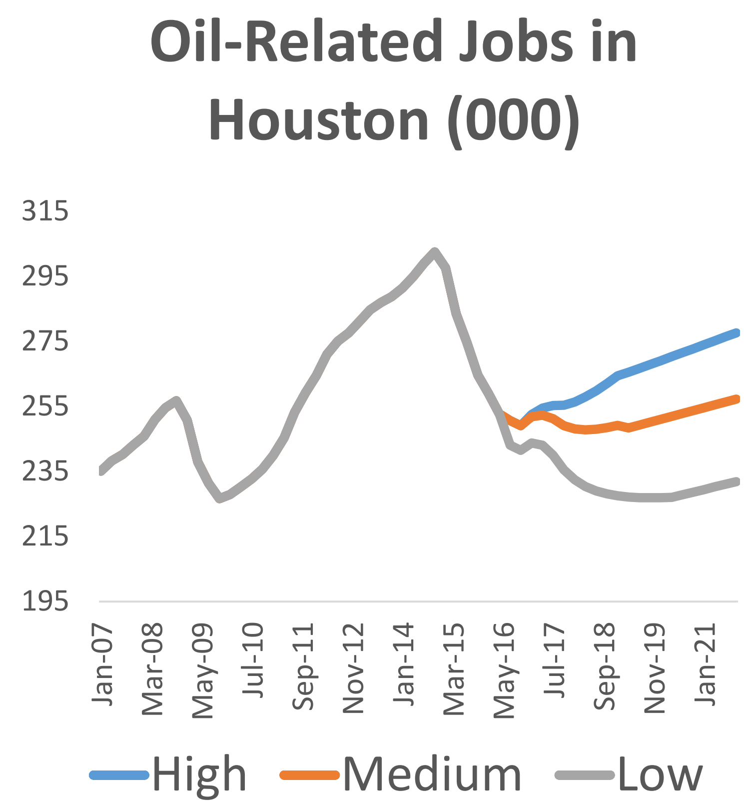
Three Scenarios for a Drilling Recovery

- **Rig Count?**
  - High Scenario: Strong recovery like 2008-09 continues to unfold
  - Medium Scenario: Slows in 2017Q2/Q3 but moderate recovery continues
  - Low Scenario falls back in 2017 Q2, remains low and slow trough 2018
- **Rig Count Max After Recovery?**
  - High Scenario: 1650
  - Medium Scenario: 1500
  - Low Scenario: 1300
- **Return of Drilling Jobs in Houston**
  - High Scenario: 2017Q1
  - Medium Scenario: 2017Q3
  - Low Scenario: 2018Q4

High scenario requires a quick rebound in oil prices to $55, and continued move to $60-$65 range; moderate requires a return to $55 or better; low scenario triggered by continued oil price near $45, and staying at that level through 2017 and into 2018.

Rig Count Scenarios and the Return Of Oil Employment In Houston





U.S. Economy Continues to Work for Houston

Good things come from Sysco™

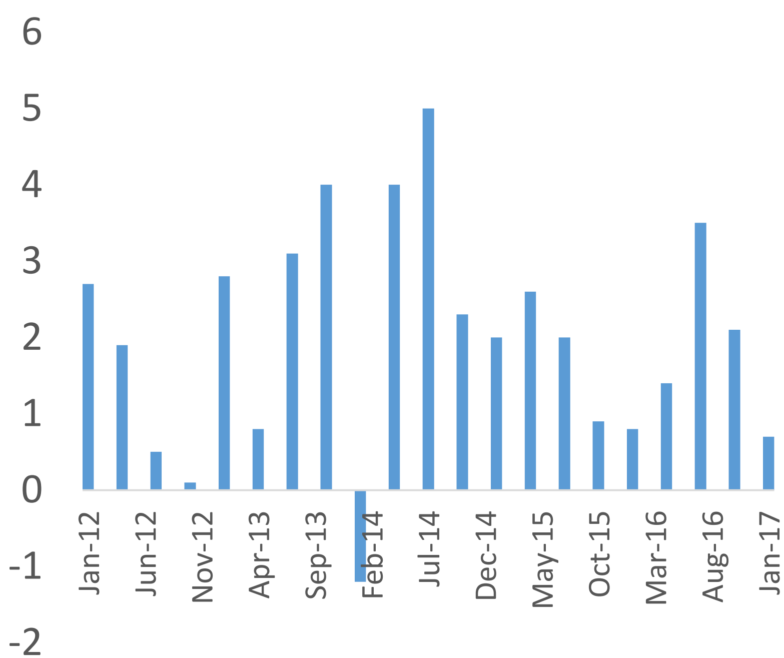
U.S. Economy Continues To Grow Strongly And Create Jobs

- 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

Last Year a Split Emerged Between Growth In Production And Jobs

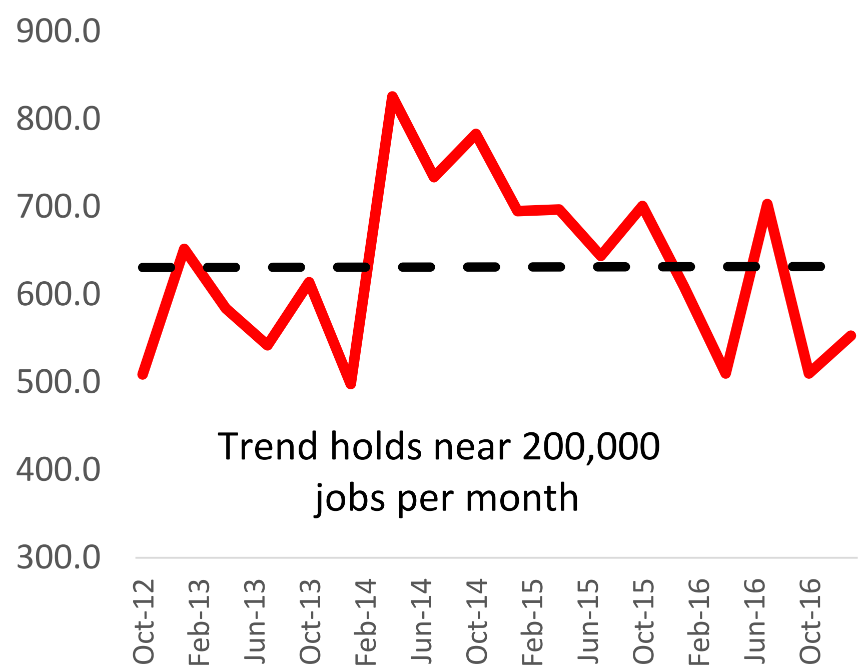
GDP Growth Has Slowed Sharply in Recent Quarters

% Change at Annual Rates



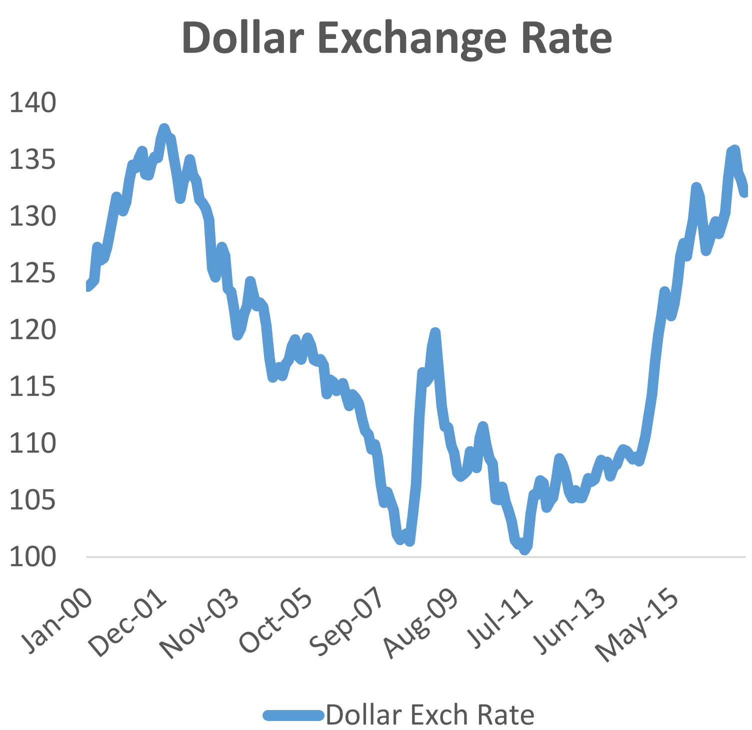
While U.S. Job Growth Remains Quite Strong

000 New Jobs Per Quarter

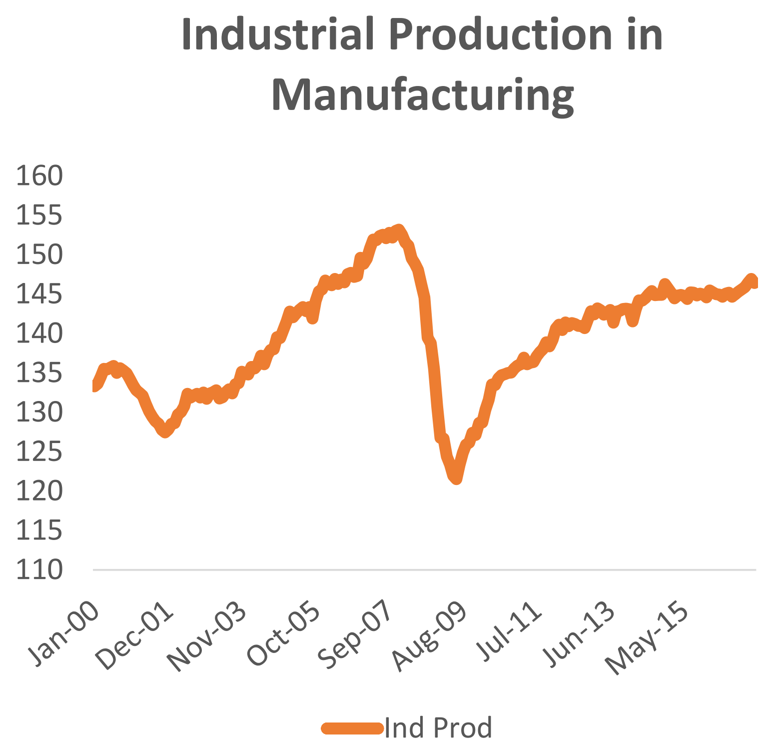


Strong Dollar Hurts Goods-Related Exports

Dollar at Asian Financial Crisis Highs

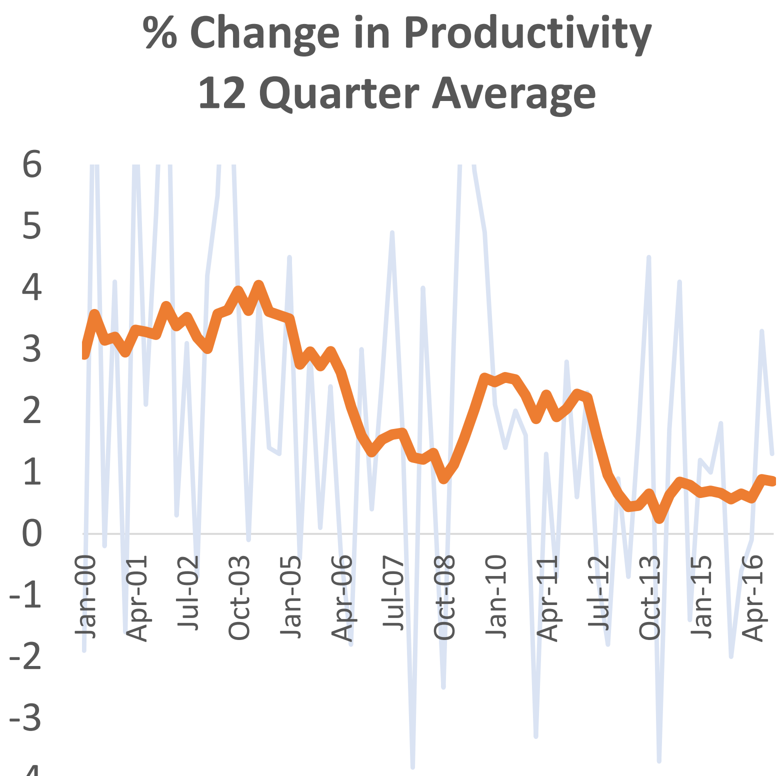


Dollar Strength Hurts Goods Production

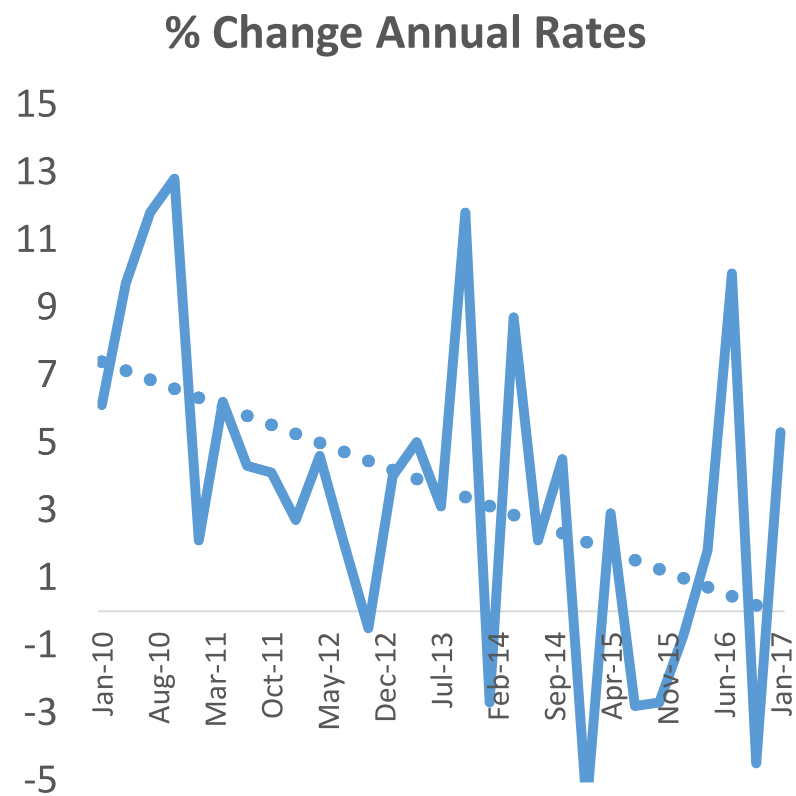


Recent Results Are Consistent With Robust Domestic Growth And Weak Exports

Productivity Growth Is Slow

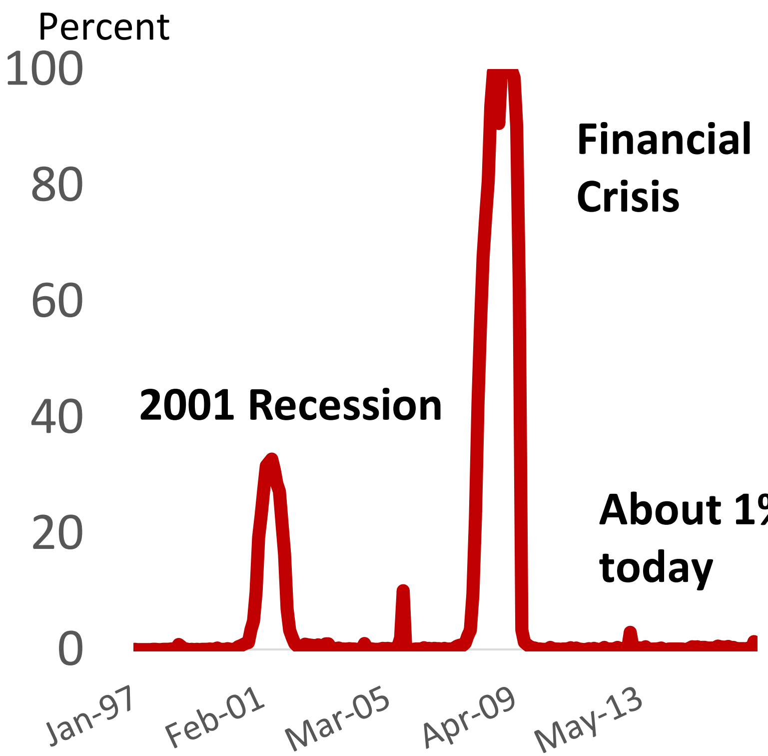


Weak Export Sector



Modest Recovery Continues

Percent Chance of Recession About One Percent Today



Consensus Forecast Says Not Too Hot, Not Too Cold

	Real GDP (%) (%)	Unempl. Rate (%)	Payroll Jobs (000/mo)
Quarterly data:			
2017:Q1	2.2	4.7	184.3
2017:Q2	2.3	4.6	167.0
2017:Q3	2.4	4.6	168.9
2017:Q4	2.4	4.5	160.3
2018:Q1	2.2	4.5	157.6
Annual Averages			
2017	2.3	4.6	180.3
2018	2.4	4.5	164.5
2019	2.6	4.5	N.A.
2020	2.1	4.6	N.A.

Source: Chauvet and Piger smoothed recession probabilities, FRED, St. Louis Fed; Philadelphia Fed, *Survey of Professional Forecasters*, February 2017.

Fed Funds Rate: What the Futures Market Says

Meeting Date	Range b.p.	Prob. of Increase	Change
Current	75-100		--
3-May	75-100	5.3%	--
14-Jun	100-125	78.5%	+
15-Jul	125-150	5.8%	--
20-Sep	125-150	36.2%	--
1-Nov	125-150	32.2%	--
13-Dec	125-150	54.4%	+
31-Jan	125-150	16.6 %	--

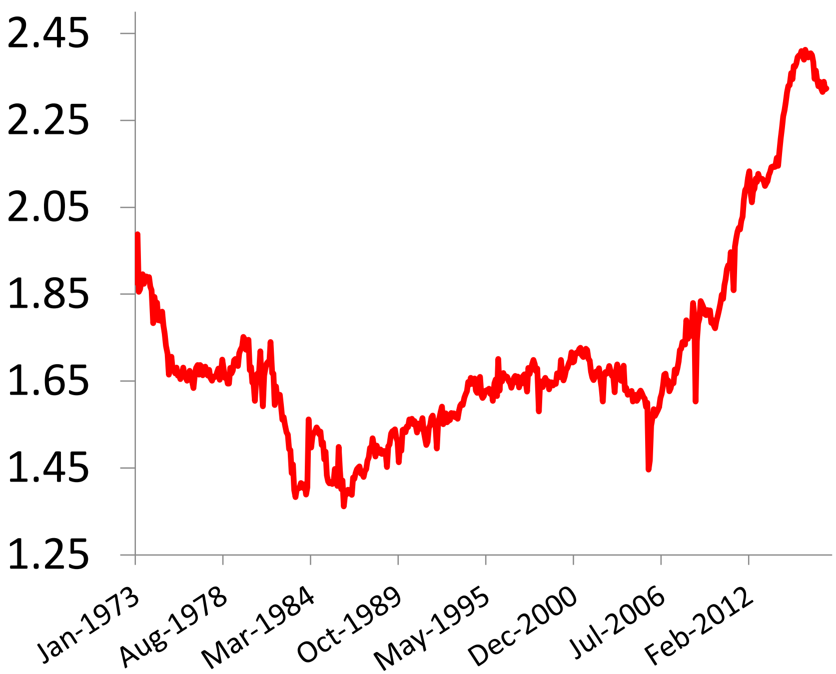
CME Group, May 7. Table assumes as soon as probability of a rate increase passes 50% an increase is triggered of 25 basis points.

Downstream Petrochemical Boom Is Over for Now

Hockey Stick Surge In Natural Gas Production Brings Collapse in Price

Marketed Production

Tcf/month, seas. Adj.



DOE/EIA

Natural Gas Prices Collapse

($/Mcf)

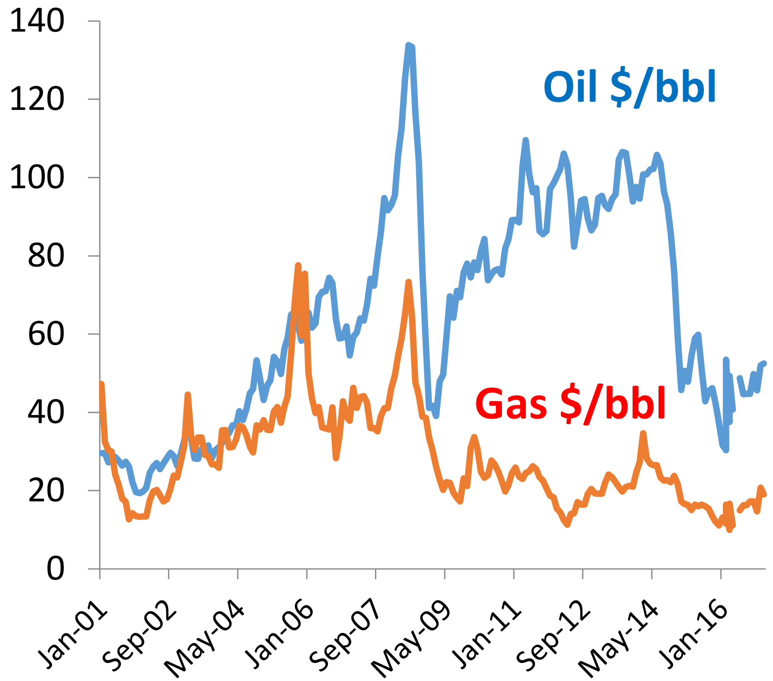
$179 Billion U.S. Construction Boom Is Based On Cheap Energy

- This $179 billion total includes many industries and the TX and LA Gulf Coast are the major beneficiaries.
- **Petrochemicals**: 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

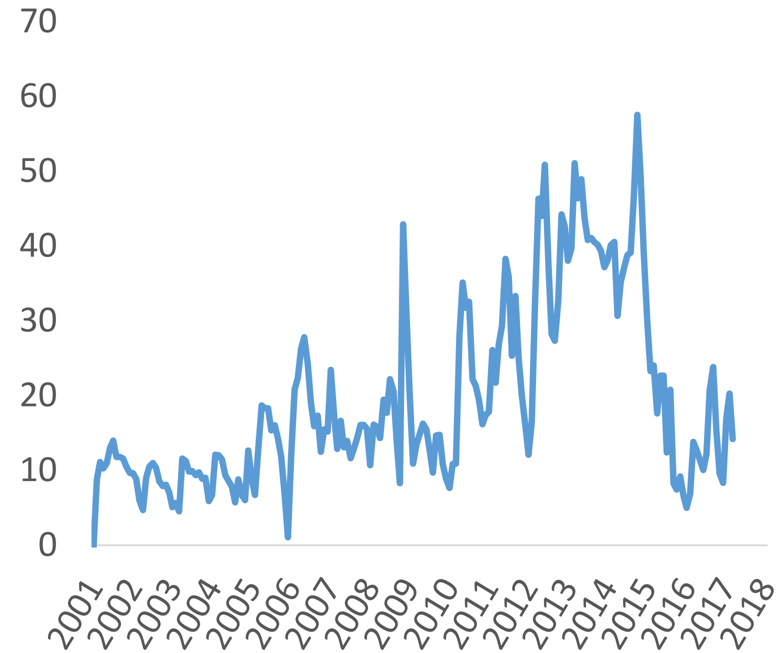
Note: The $179 billion figure is based on all U.S. shale-related expansion, estimated by the American Chemistry Council in March 2017

Natural Gas Energy Content Now Equivalent $16 per Barrel For Oil

Huge Feedstock Advantages for Oil Over Natural Gas



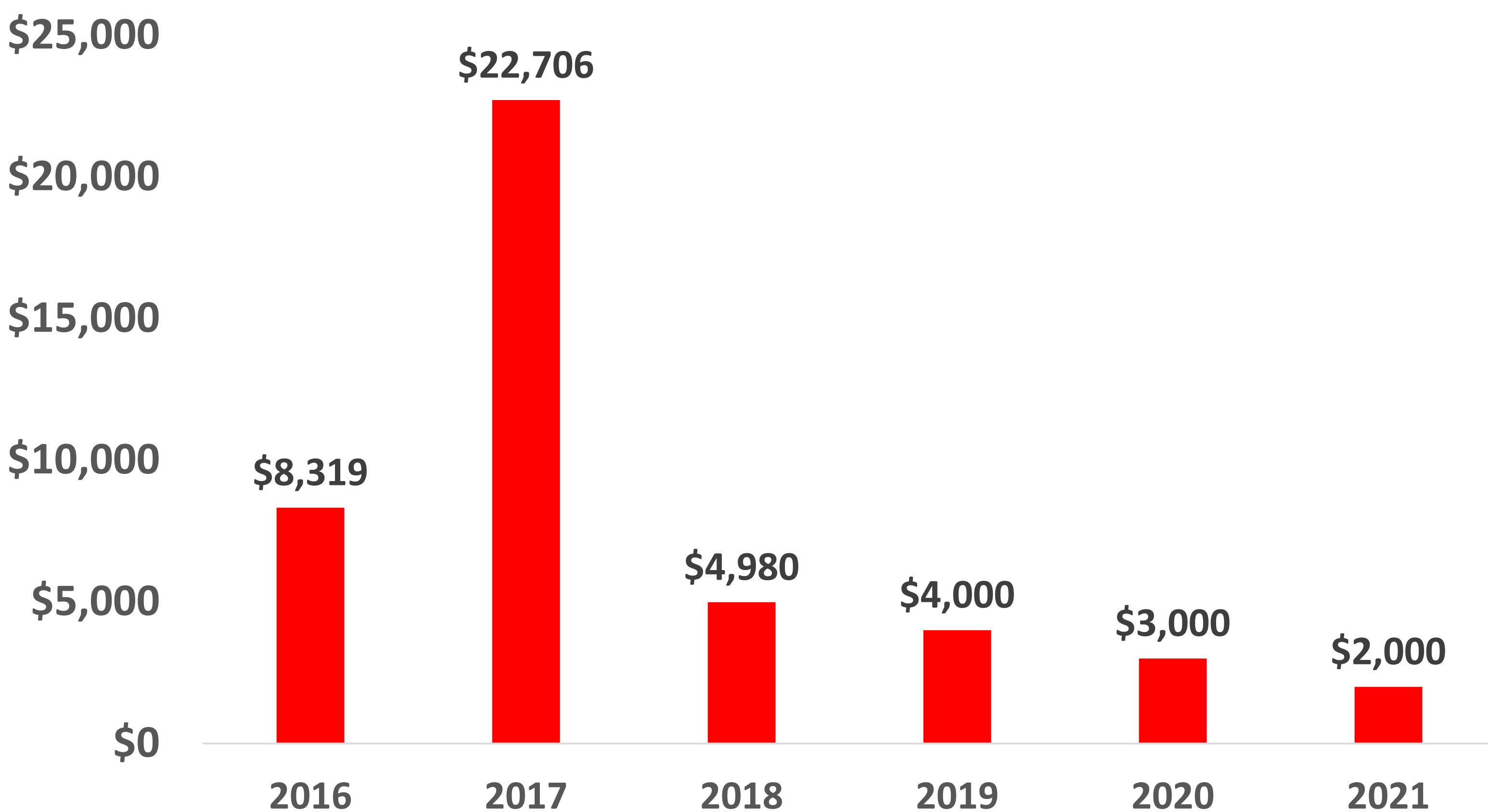
Margins Narrow for Ethylene With Collapse in Oil Price ($/lb)



DOE/EIA and calculations of the author

Projects Begin To Wind Down Rapidly After 2017

(Value of Projects Completed, $ million)



The Gulf Coast Petrochemical Boom Winds Down

Ethylene Finishes Up

Company	Where	Status
Houston area		
ChevronPhillips	Baytown	mid-2017
Dow	Freeport	Complete
ExxonMobil	Baytown	mid-2017
Ineos	Chocolate Bayou	Complete
Other Gulf Coast		
Formosa Plastic	Point Comfort	2017-2018
OxyChem/MexiChem	Ingleside	Complete
LyondellBassell	Corpus Christi	Complete
Ineos/Sasol	Lake Charles, La.	2018
Recent Announcements		
Total	Port Arthur	2020's
Exxon/SABIC	Corpus Christi	2020's
Next Wave?	???	2024-26

Polyethylene Is Right Behind

Company	Where	Status
Houston area		
ChevronPhillips	Sweeny	2017Q3
Dow	Freeport	2017Q3
ExxonMobil	Mont Belvieu	2017Q3
Ineos/Sasol	LaPorte	2017Q2
LyondellBassell	LaPorte	2019
Other Texas Gulf Coast		
Formosa Plastic	Point Comfort	2018
ExxonMobil	Ingleside	Complete
Exxon/SABIC	Corpus Christi	2020's

Pull 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 2018
- Continued U.S. expansion at moderate rates
- A drag from the end of the petrochemical construction on the East Side
- All forward momentum from the fracking boom is gone
- Data revisions that point to possible mild local recession in in early 2016.

Forecast Job Growth In Houston: A Likely Slow Start

(000 New Jobs, Q4/Q4)

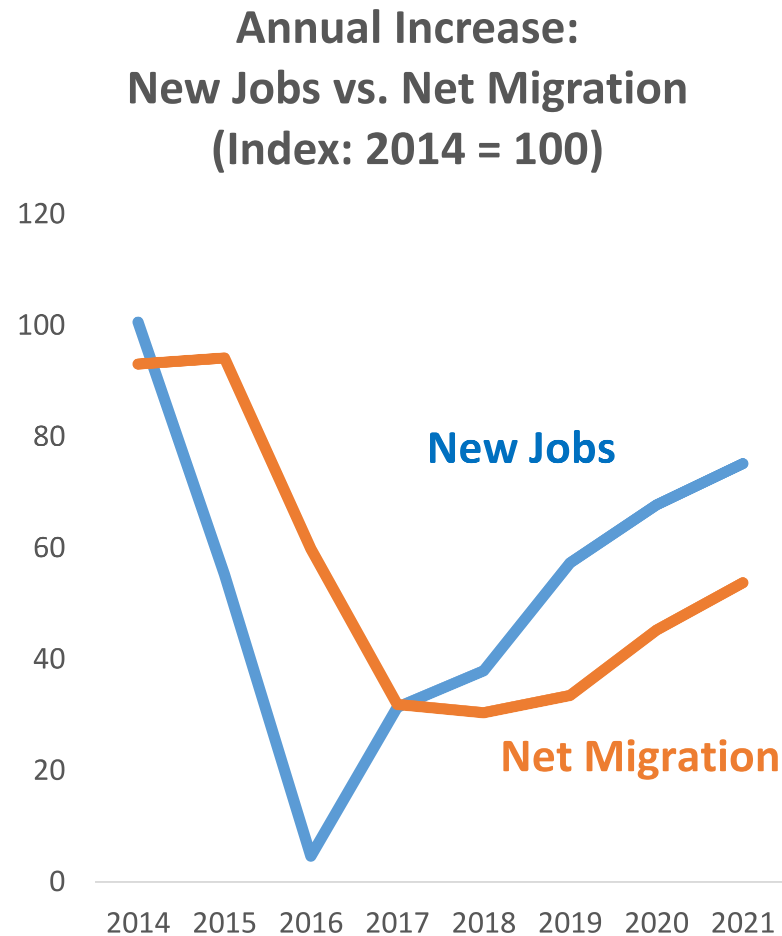
By Scenario

Year	High	Medium	Low	25/60/15
2014	112.7	112.7	112.7	112.7
2015	11.0	11.0	11.0	11.0
2016	10.8	10.8	10.8	10.8
2017	54.3	35.2	21.2	37.9
2018	79.6	52.6	22.8	54.9
2019	91.4	68.0	42.8	70.1
2020	89.6	74.1	56.8	75.4
2021	91.6	78.8	67.7	80.4

Calculations of IRF, based on drilling scenarios above. Figures are Q4/Q4. The 2016 calculations include benchmark revisions of March 2017.

Net Migration Follows Job Growth in Houston

- When population grows, net migration gives the biggest economic stimulus
- As job growth rises, net migration begins to rise a year later
- In recovery, net migration falls a year behind
- Data at right matches 25/60/15 weighted employment forecast, sees a 2018/19 trough with about 30,000 net migrants



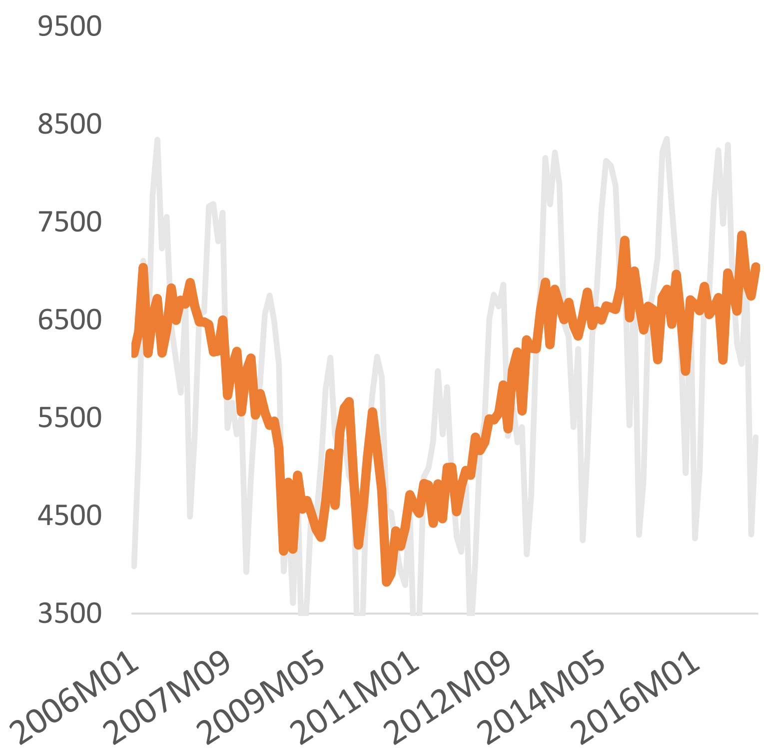
Houston Single-Family Housing: A Long, Strange Journey Ends Well

The Fracking Boom Brought Lot Shortages … Then the Oil Bust Did the Same

- The sub-prime Implosion in 2006 left Houston with 50,000 small and scattered lots – and not much other inventory
- By 2012, the Fracking Boom generated strong demand for large homes for high-end engineers/executives
  - Existing home supply was quickly exhausted, and there were no lots on the ground to build large homes. Pressure grew on existing homes
  - Low inventories and sharply rising home prices slowly squeezed 100,000+ families out of the housing market
- By 2015, the large lot supply caught up – in time for the drilling bust to abruptly end the demand for upscale housing
- The last two years have been spent on lot development for low- to moderately-priced homes with 45-60 foot frontages. The traditional, moderately-priced heart of the Houston housing market is finally back in business

A Strong Existing Home Continues On Despite the Oil Bust

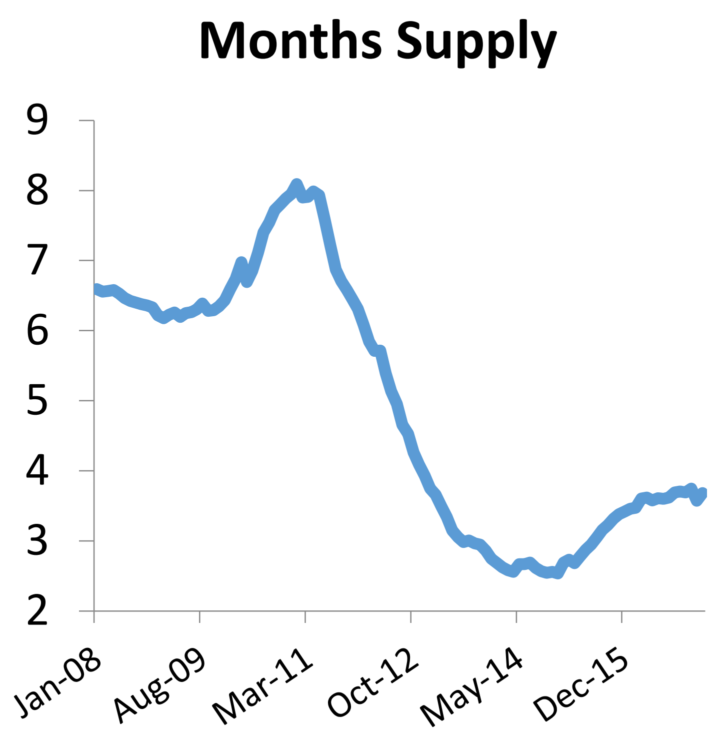
(sales, s.a.)

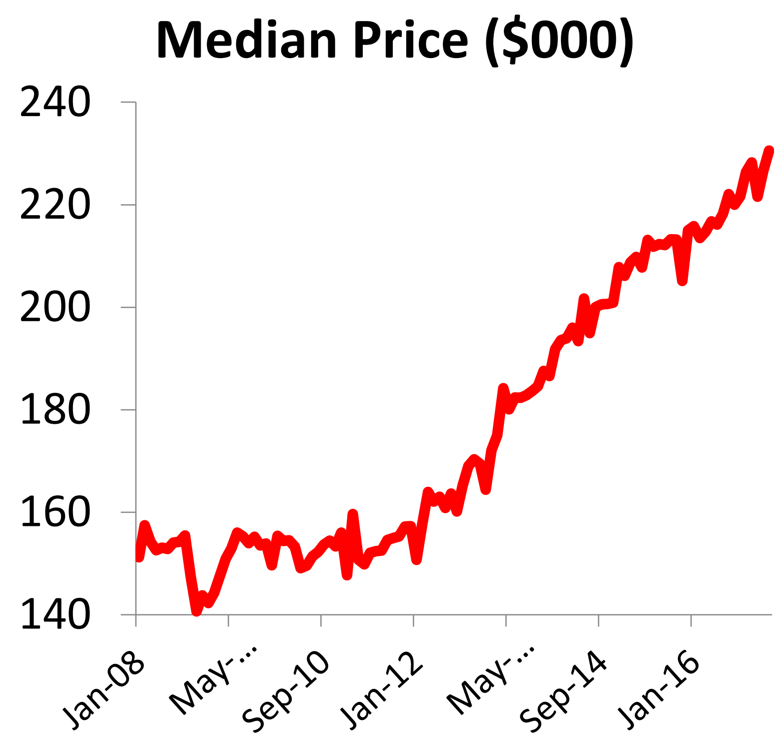


Source: Texas A&M Real Estate Center

- Flat since 2012? First, sales flat due to a lack of existing and new home supply. There was nothing left to sell.
- But oil bust drives changes beneath the surface, as existing home market moved downscale in price and home size
- Starter homes and price levels cited above did fine, while expensive and close-in properties faltered

Oil Boom and Lot Shortages from 2012-2014 Distorted Single-Family Housing Market

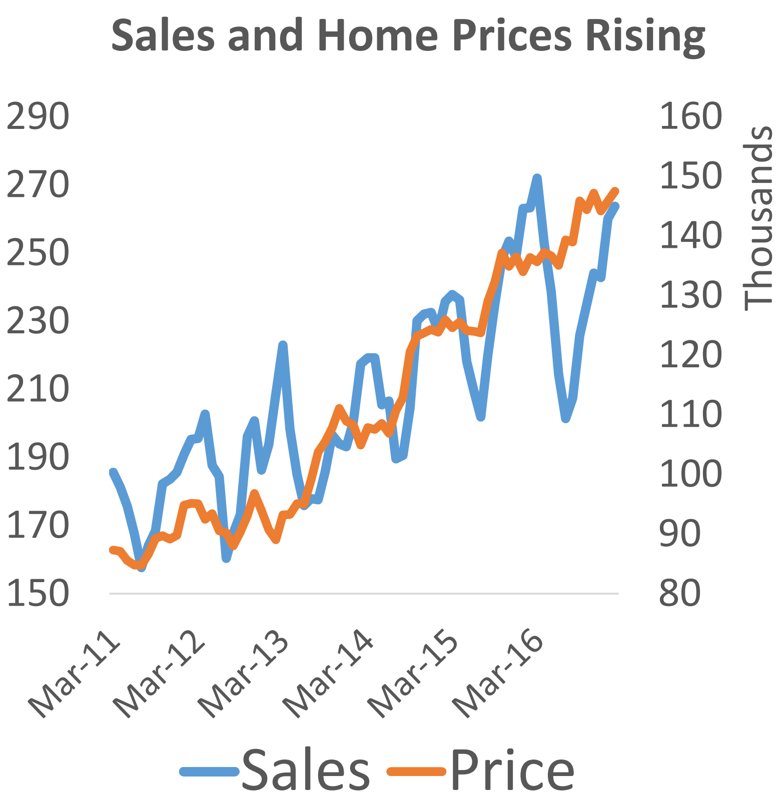


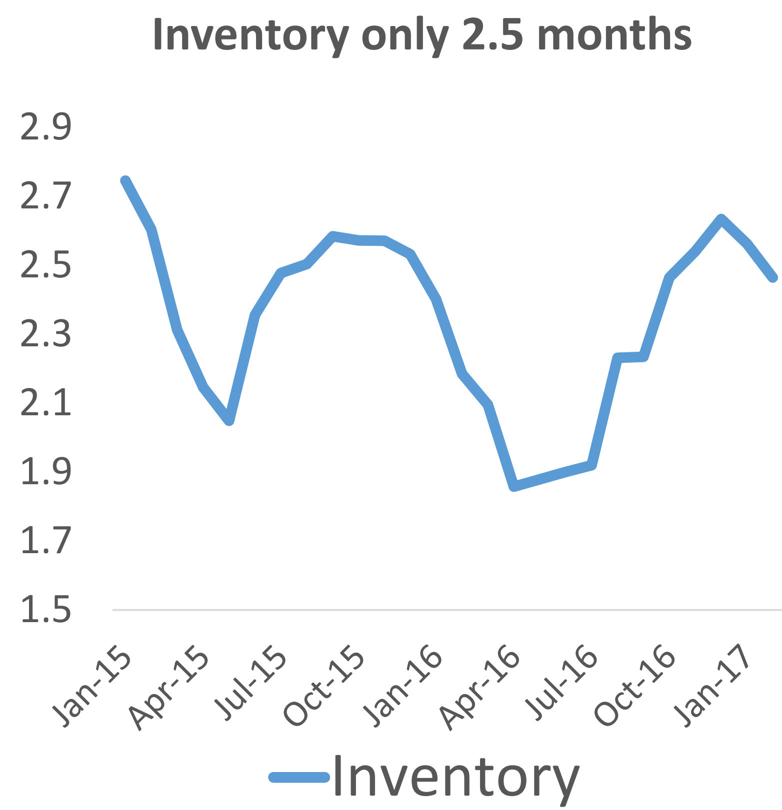


Source: Texas A&M Real Estate Center, seasonal adjustment by IRF

Ship Channel Cities

Baytown, Channelview, Pasadena

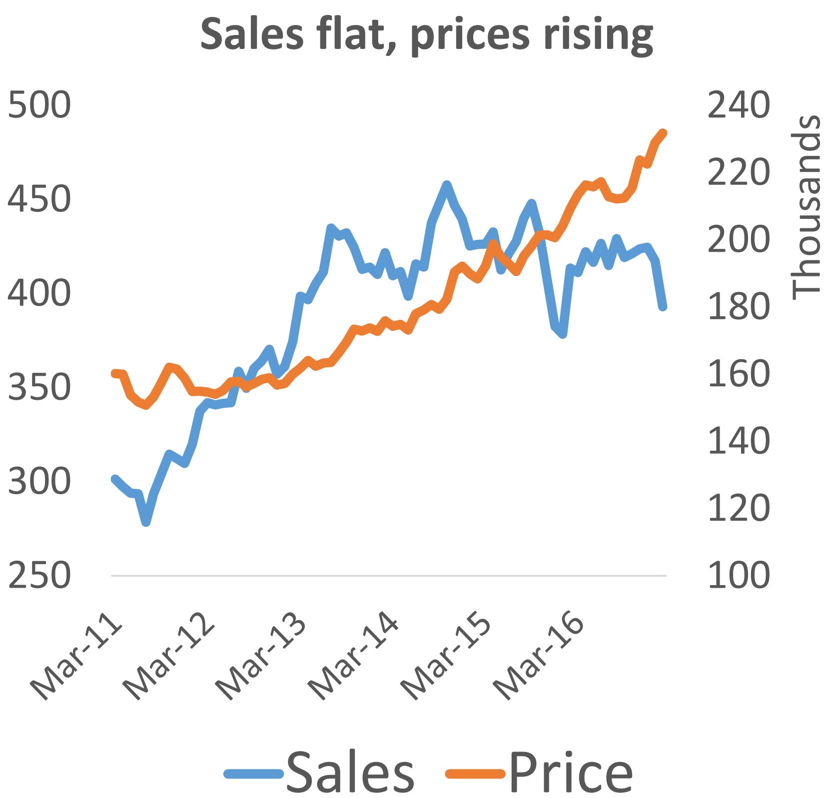


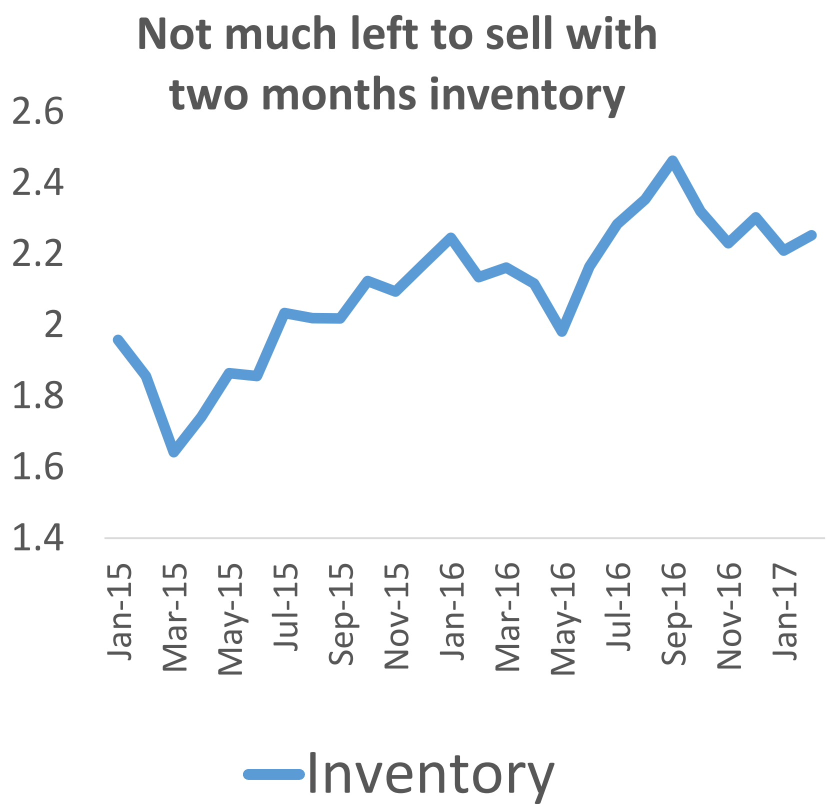


Source: Texas A&M Real Estate Center, calculations of IRF

South Houston

South Belt, Clear Lake, League City

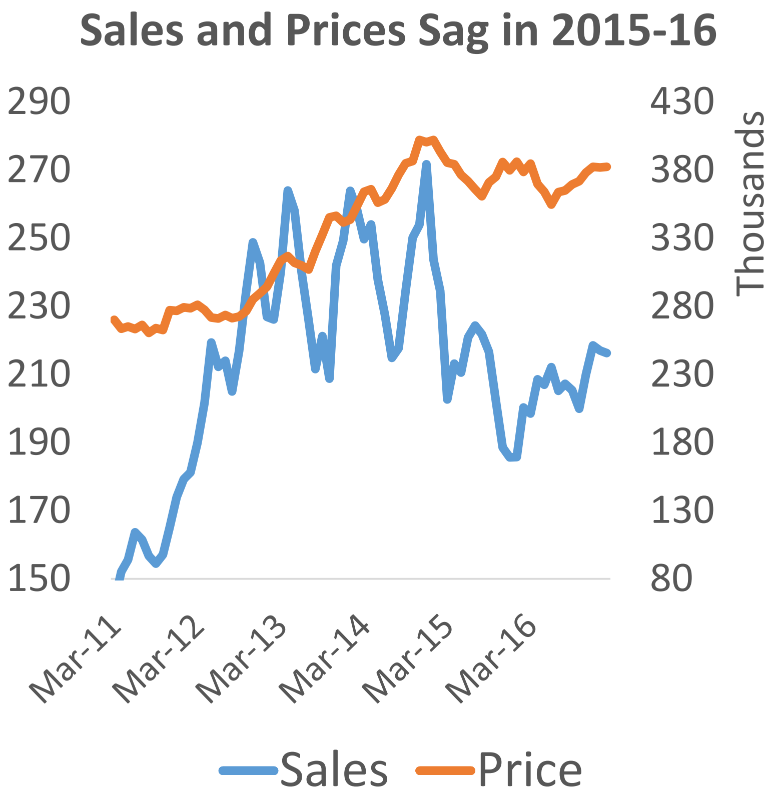


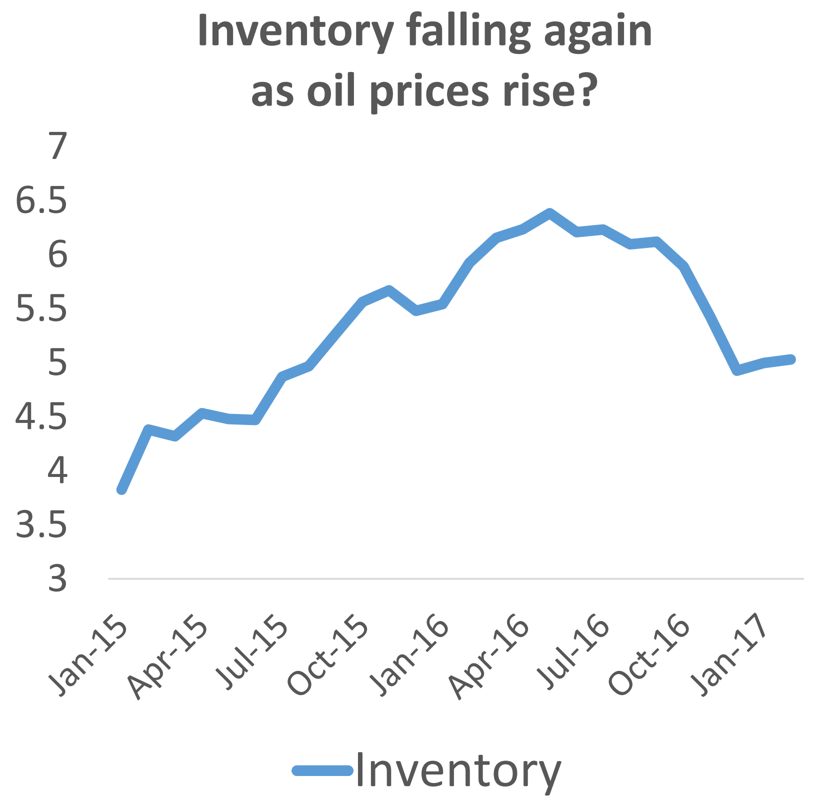


Source: Texas A&M Real Estate Center, calculations of IRF

Close-In and Upscale

Rice Military, Heights, Galleria

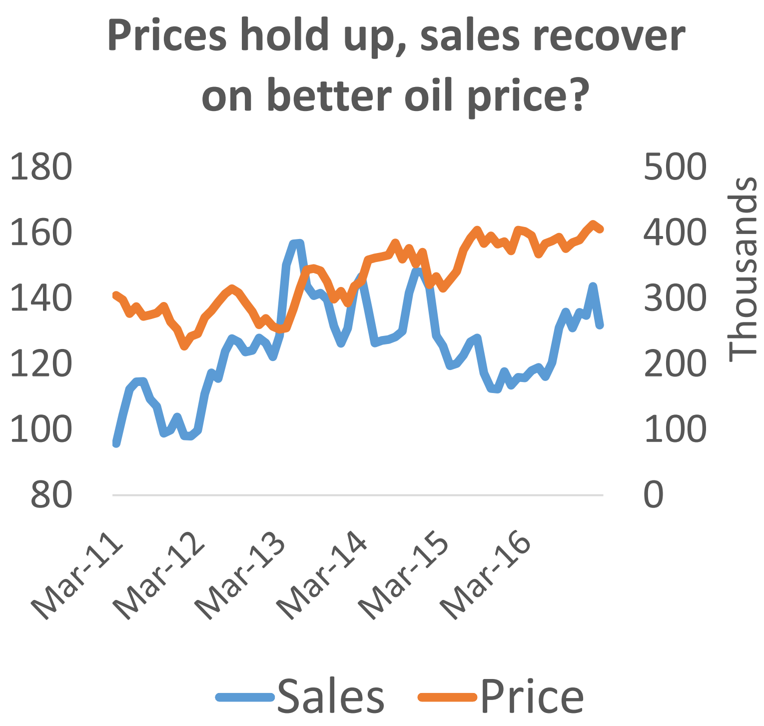


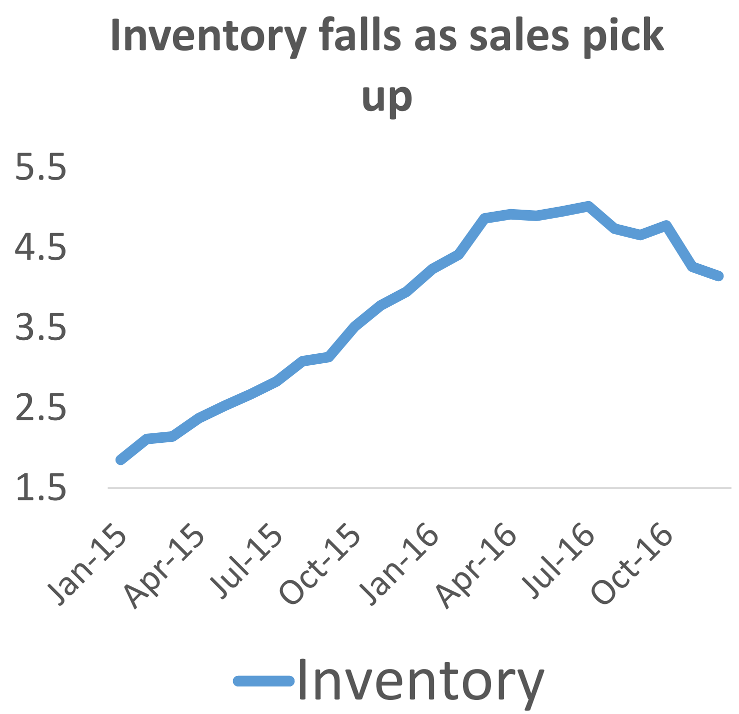


Source: Texas A&M Real Estate Center, calculations of IRF

South Of I-10 West

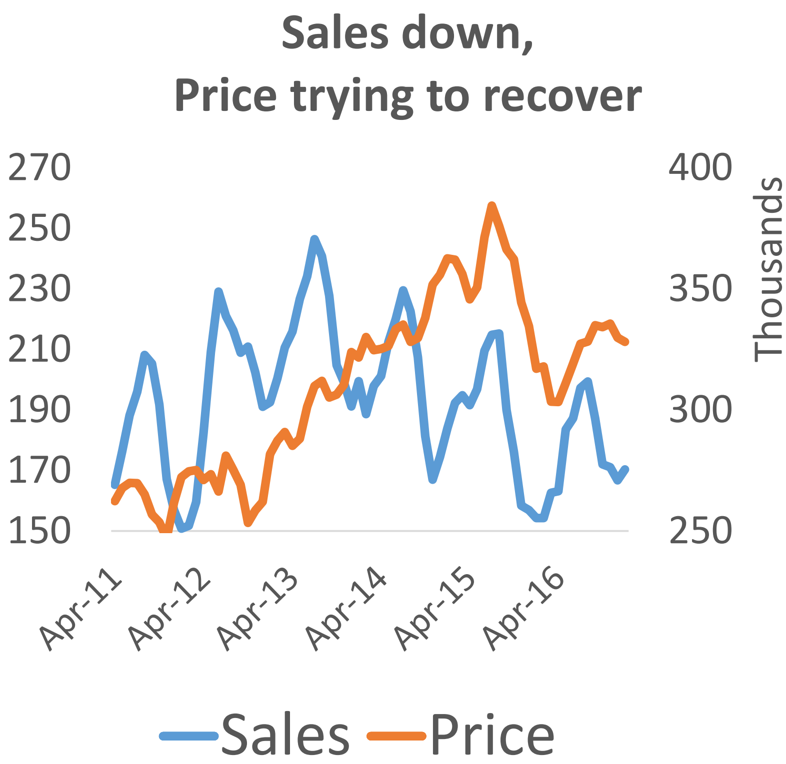
Memorial and Energy Corridor





Source: Texas A&M Real Estate Center, calculations of IRF

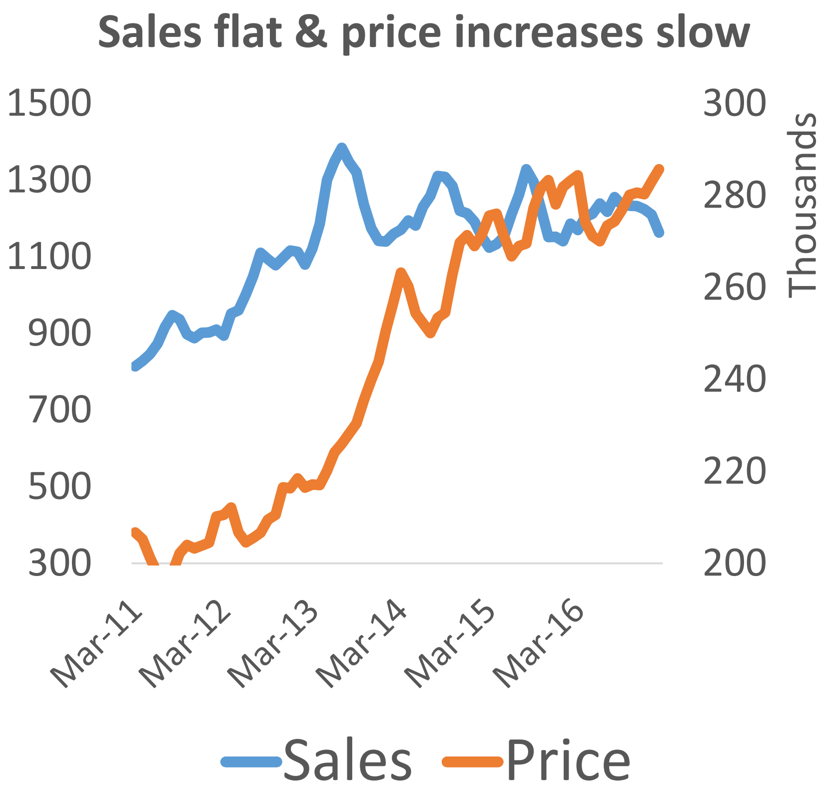
The Woodlands Cools Off

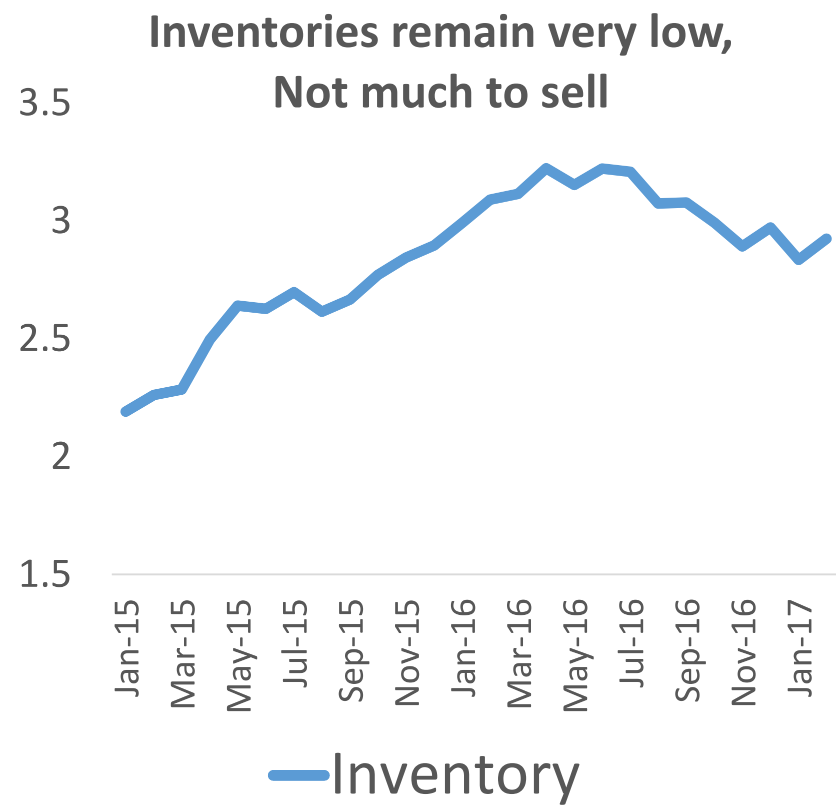


Source: Texas A&M Real Estate Center, calculations of IRF

Other Distant Suburbs

Pearland, Sugar Land, Kingwood, Katy

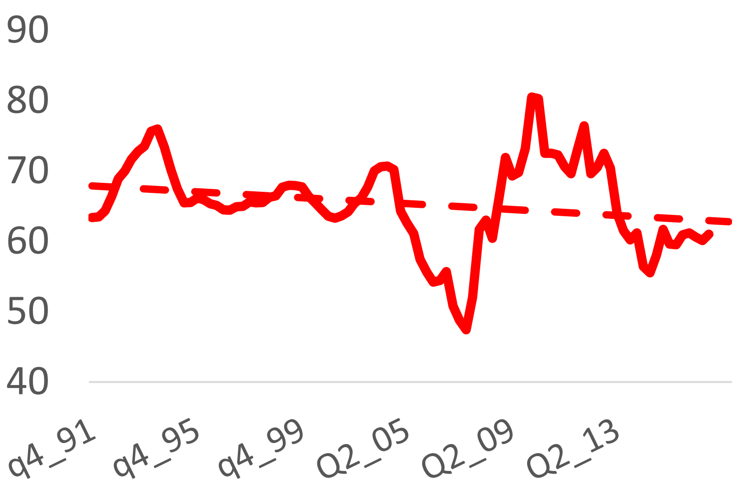




Source: Texas A&M Real Estate Center, calculations of IRF

Shouldn't Houston Be Better Than Just Average Affordability?

Affordability Index: Percentage of Houston homes for sale within in reach of median income family



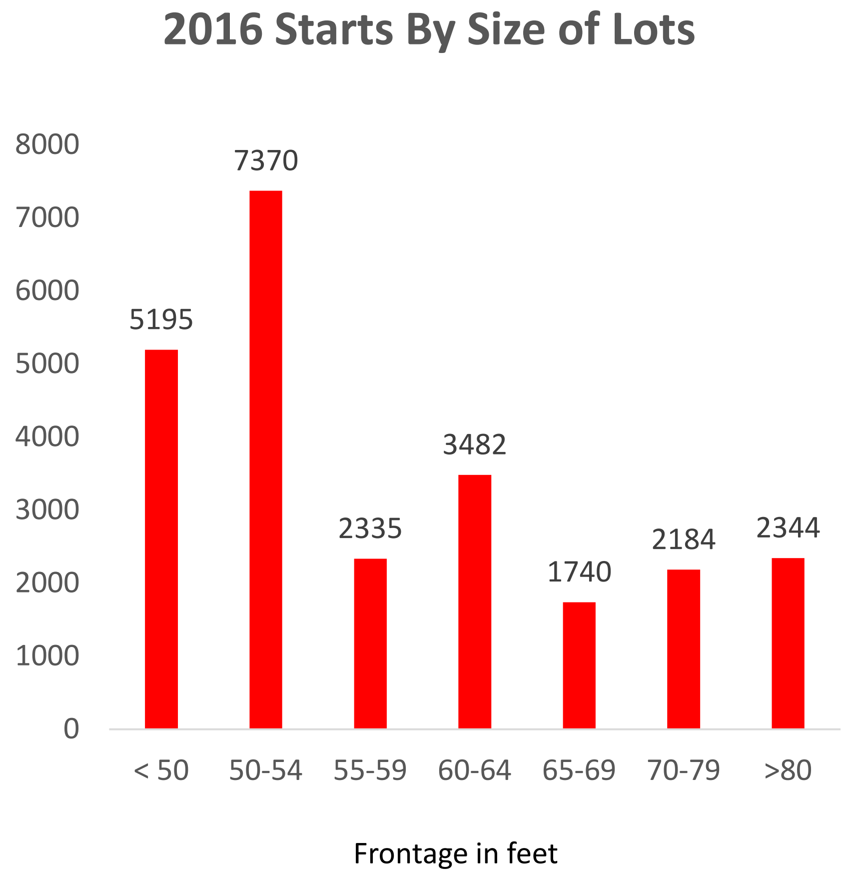
Wells Fargo Housing Opportunity Index

Largest 10 U.S. Metros and Affordability

- New York 35.4%
- Los Angeles 12.5%
- Chicago 61.1%
- Dallas-Fort Worth
  - Dallas 50.1%
  - Fort Worth 64.2%
- Houston 61.8%
- Washington, D.C. 64.1%
- Philadelphia 70.1%
- Miami 33.2%
- Atlanta 69.9%
- Boston 51.2%

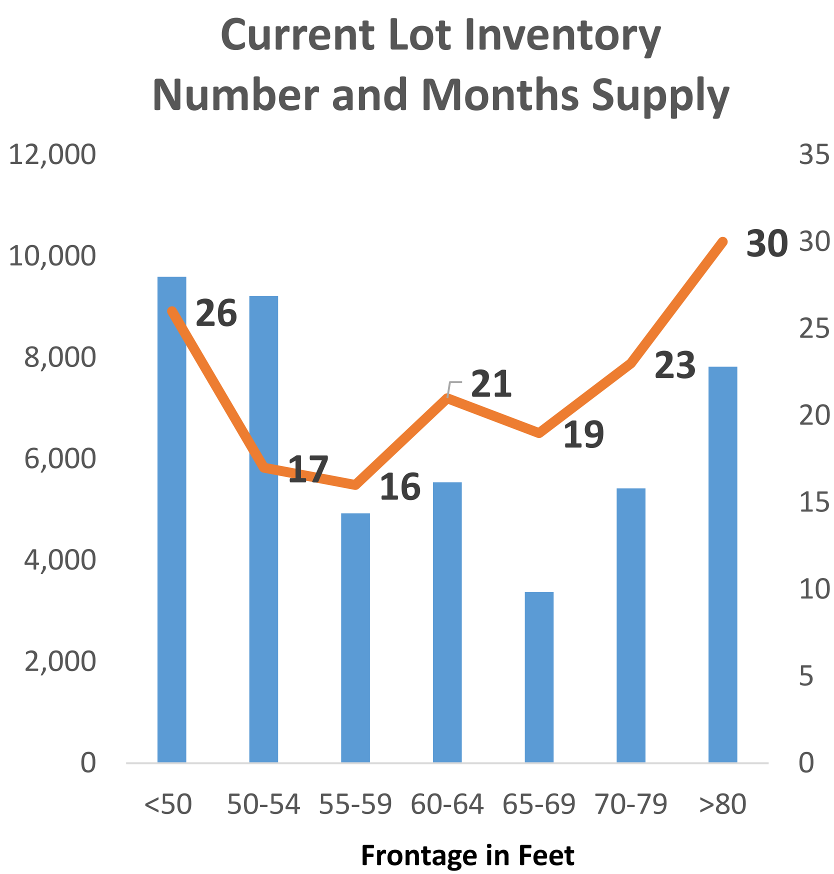
Houston's Homebuilders Rediscover Houston's Traditional Moderate-Income Market

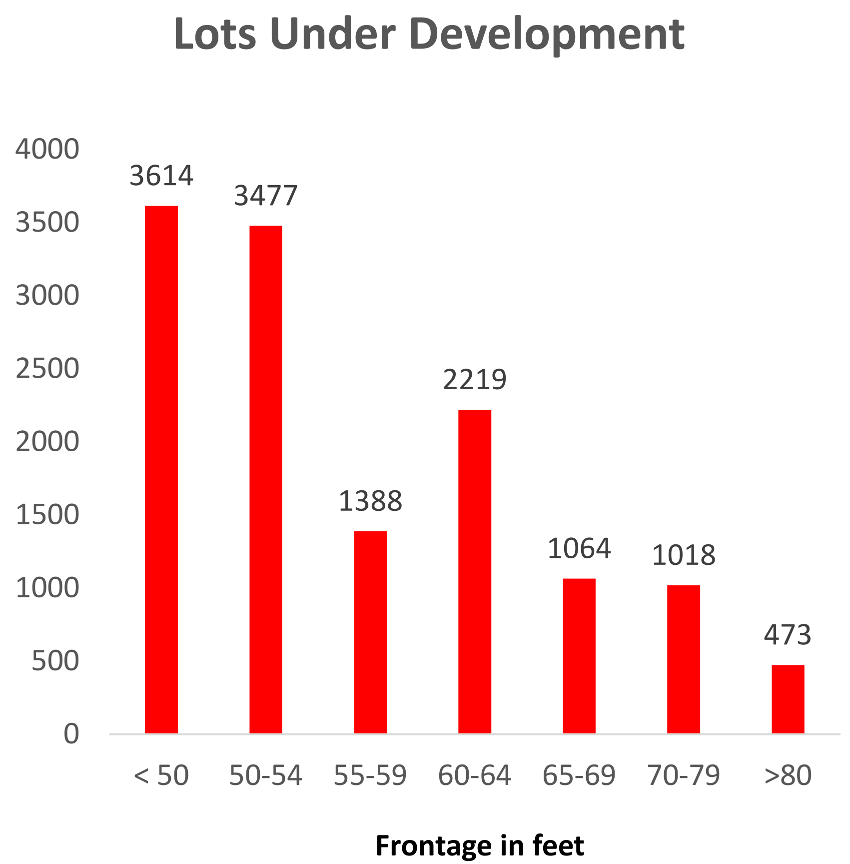
New Home Market Shifts To Moderate Priced Homes On Smaller Lots



MetroStudy

Lot Supply Is Finally Finding an Equilibrium in Houston

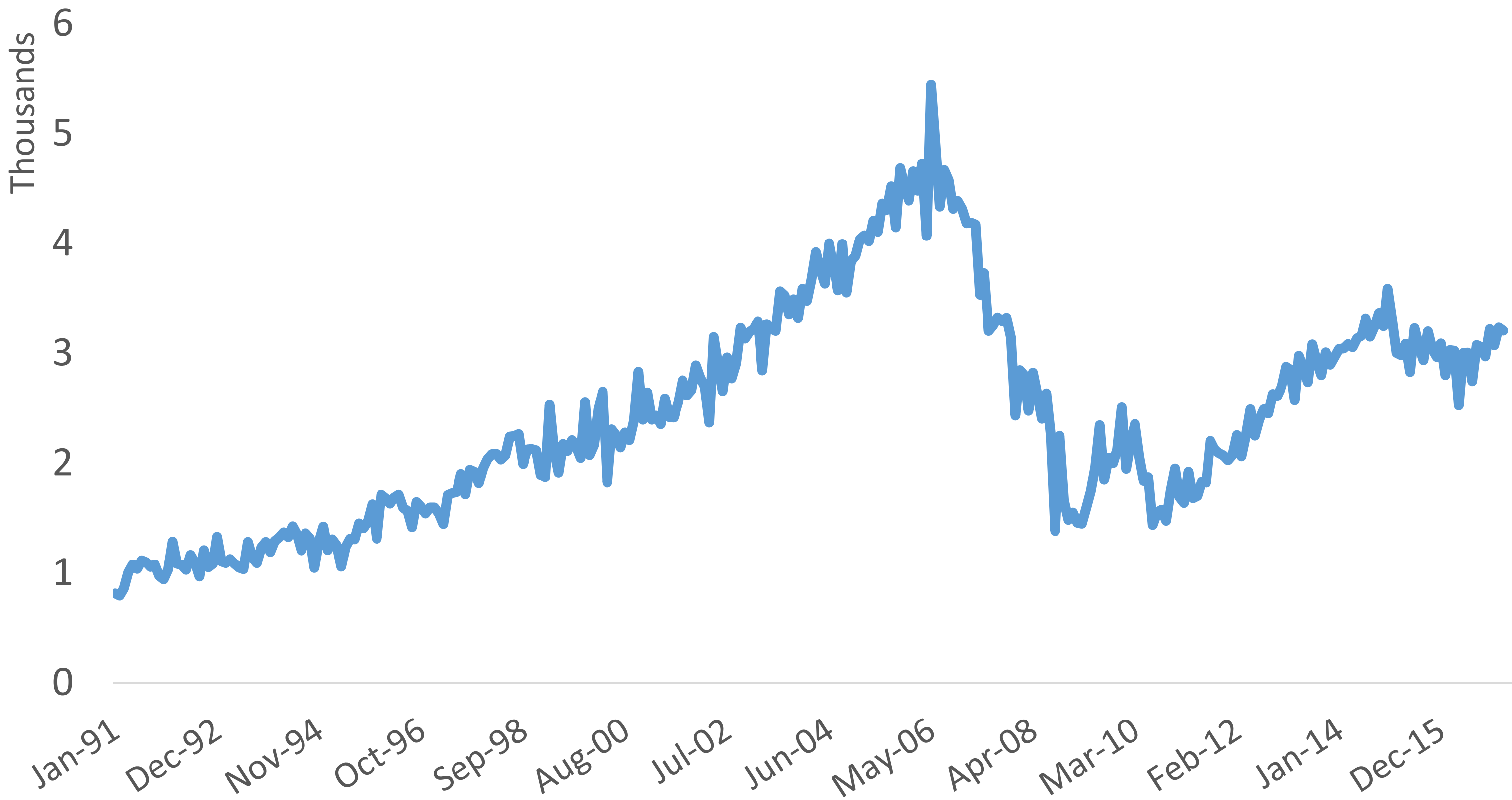




MetroStudy

Single-Family Permits Softer in 2016 But May Have Room to Grow in 2017

(monthly permits at annual rates, s.a.)



Texas A&M Real Estate Center

Apartment Market Keeps on Building

Class A Apartment Market Suffers From Self-inflicted Wounds

Class A Rents and Occupancy Under Growing Pressure			
	Stable	In Lease Up	All Class A
No. of Units	114,963	26,886	141,849
Monthly Rent	$1,416	$1,501	$1,432
Occupancy	89.7%	27.4%	77.9%

Apartment Data Services through February

- Damage is felt first in the rest of Class A, in similar product
- Class A is struggling with rent under pressure from widespread concessions and falling occupancy rates
- There are 27,000 units in lease-up with only 27.4% occupancy, another 15,000 units still in the construction pipeline

Class A Apartment Construction Finally Peaks In 2017?

-- Metro-wide Class A apartment construction continues at a high pace in 2017

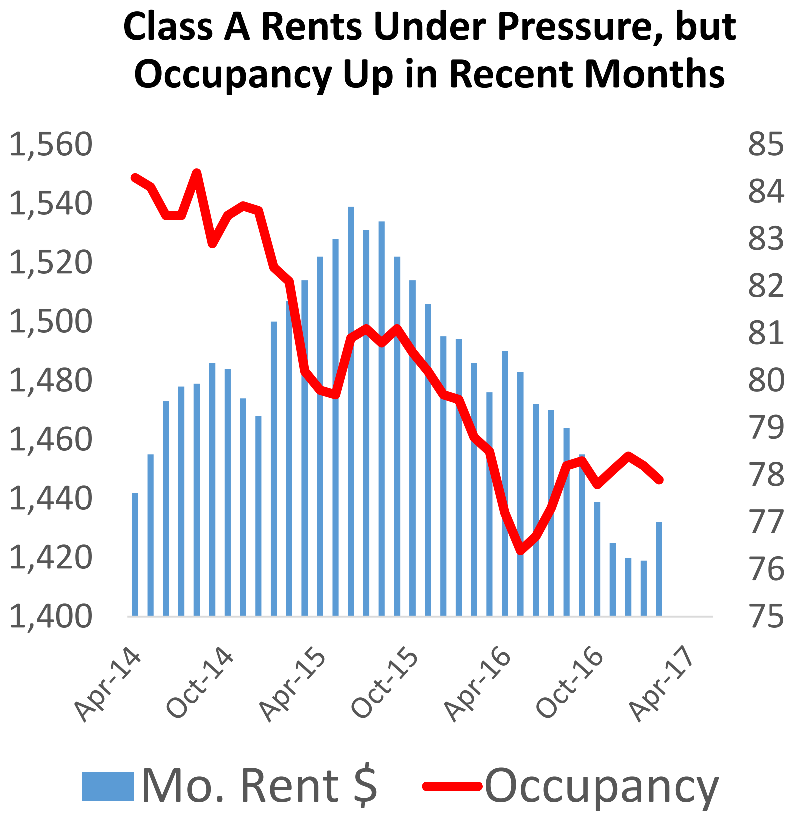
-- We thought it peaked last year? Surprise!

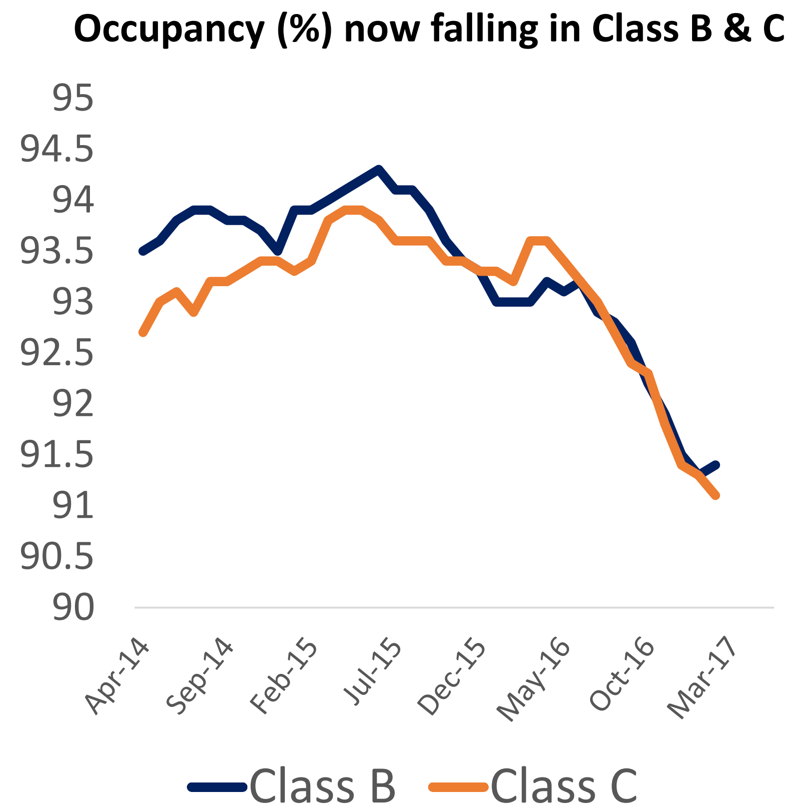
-- By 2018, the local Class A apartment market will have expanded by 30.8% since 2014, when oil bust began

	Number of Units	Percent of 2018 Units
2014 existing	120,390	69.2
2015 delivery	18,300	10.5
2016 delivery	17,500	10.1
2017 delivery	>17,700	10.2
2018 existing	173,890+	100.0

CoStar

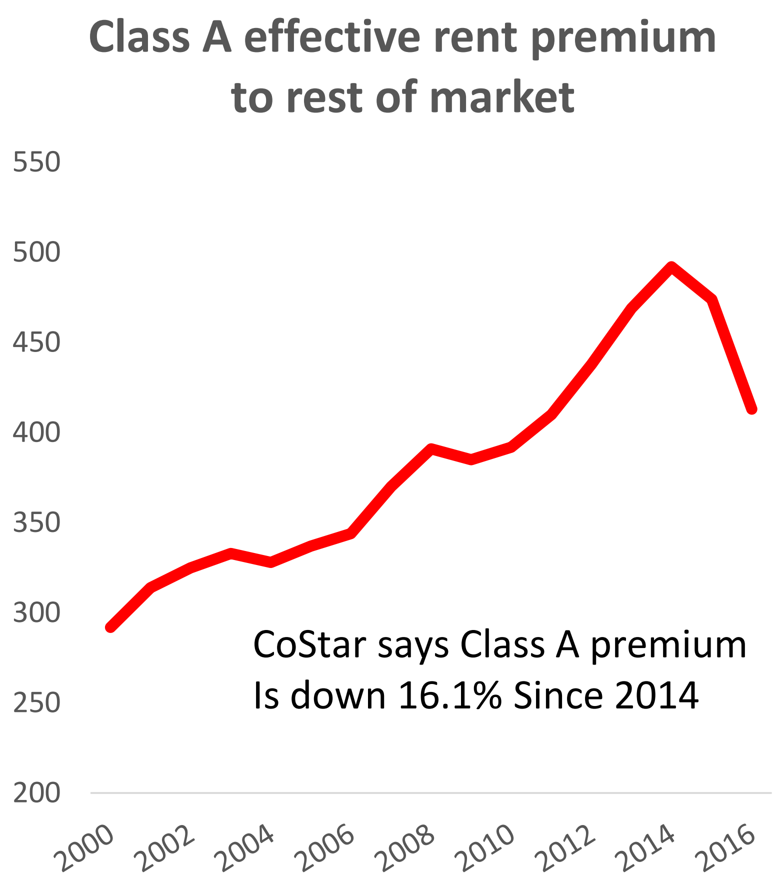
New Product Puts Class A Under Pressure, But Damage Spreading





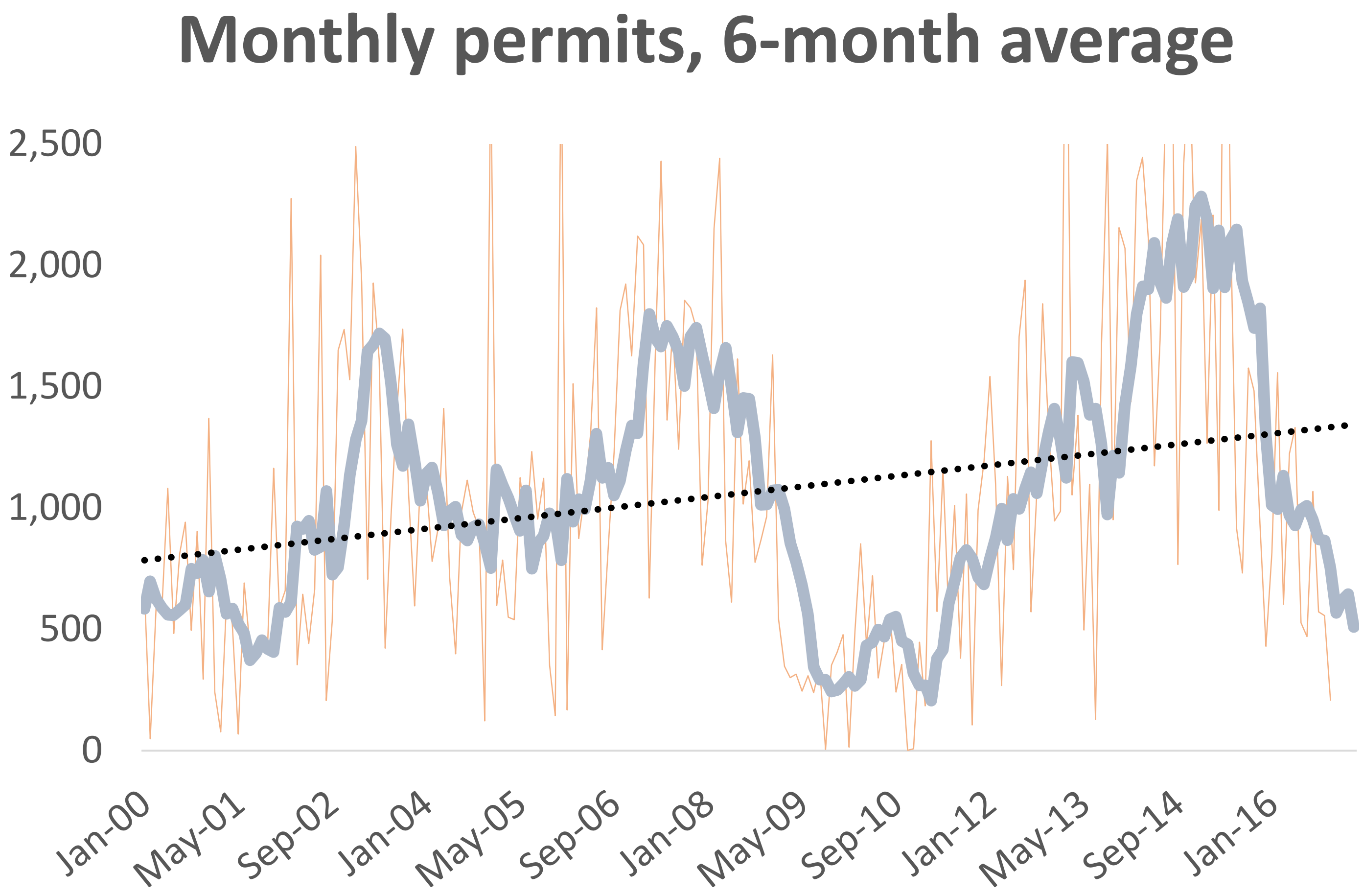
Apartment Data Services

Entire Market Suffers as Class A Continues to Build



- No job growth, and population growth is falling rapidly
- Where are the new Class A tenants? Living in Class B, of course
- Widespread incentives cut the effective rents in Class A to compete with B,C product

Multifamily Permits Finally Slip Under Long-Run Trends



TAMU Real Estate Center

Where Rental Rates Are Under Pressure
(12-mo. changes, all classes)

Largest 12-Month Declines

- Medical Center -7.8%
- Woodlands -6.4%
- Upper Kirby -5.9%
- Galleria -5.5%
- Montrose -4.9%
- Lake Hou/KW -3.5%
- Jersey V/Cypress -3.5%

Other Notables

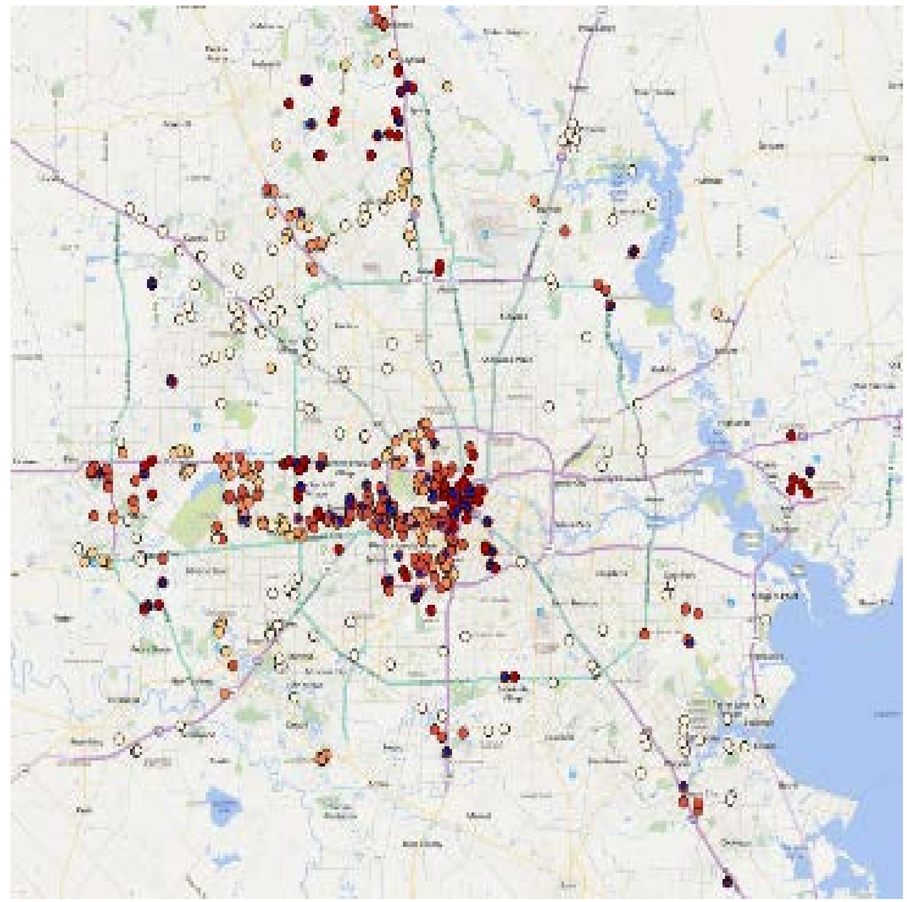
- Energy Corridor -3.0%
- Westchase -3.0%
- Heights -2.9%
- Downtown -1.2%
- Memorial/Spr Br -0.7%
- Baytown +0.5
- I-10 East +4.7

Note: These are 12-month changes; many of these areas improved substantially in 17Q1

Apartment Data Services

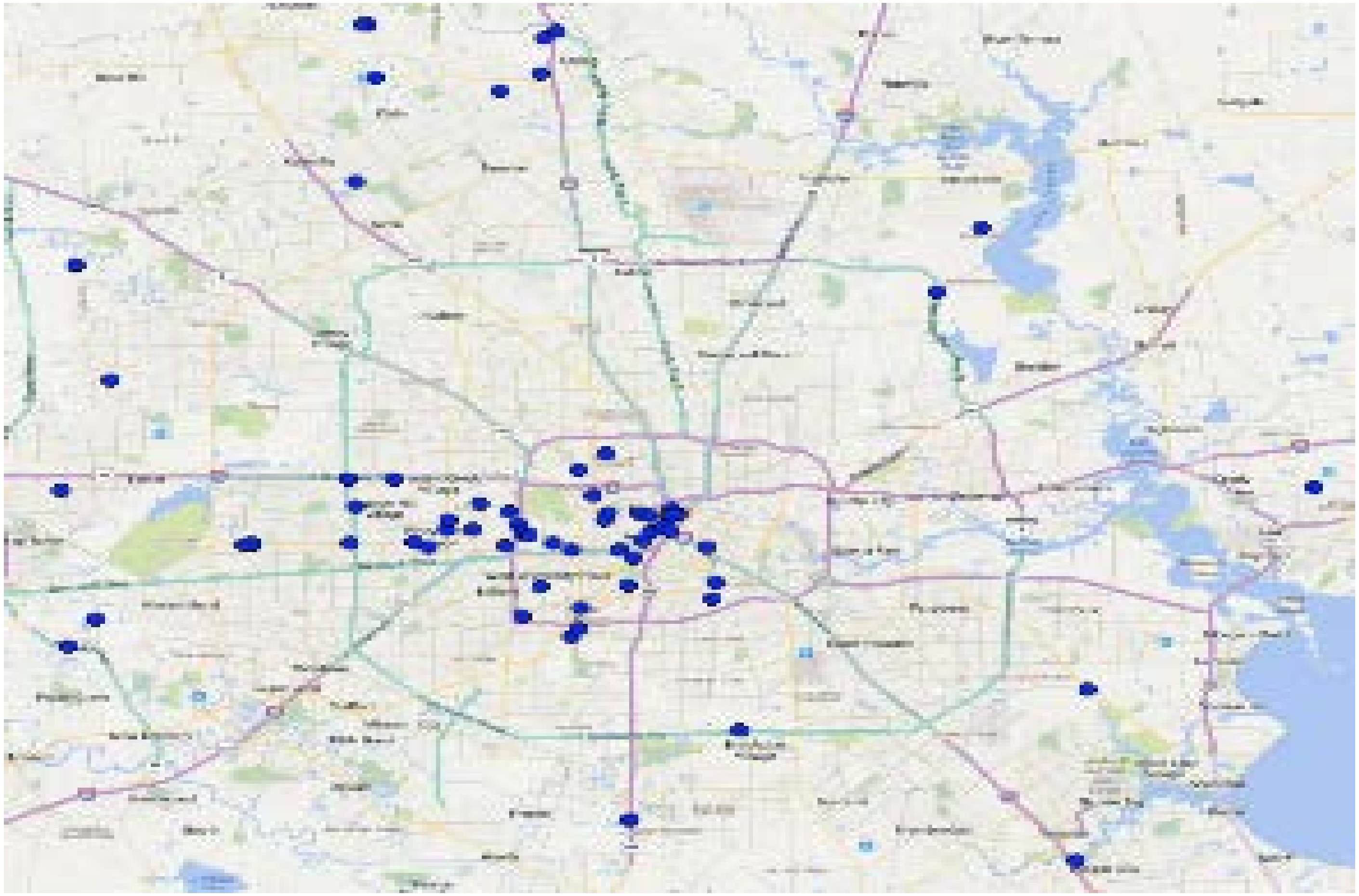
Damage Also Spreads Geographically From Complex To Complex

- Look at all Class A apartment complexes in metro area at end of 2016
- Look at all the other Class A complexes in circle of radius of 2 miles
- Compute the resulting vacancy rate in its market area after new units completed in 2017
- Each dot an A apartment, the darker the spot, the higher the vacancy rate in its market area

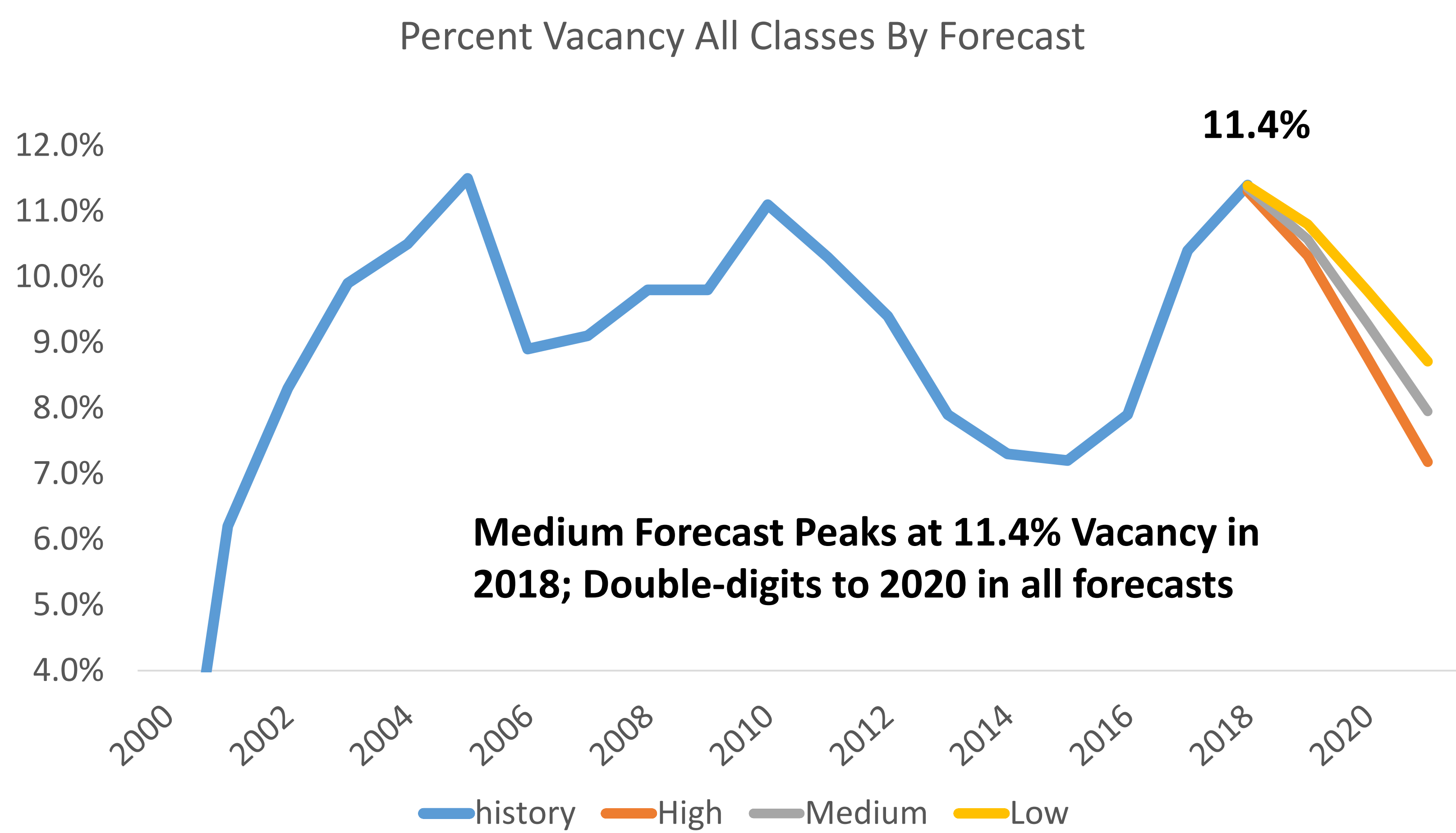


CoStar, IRF

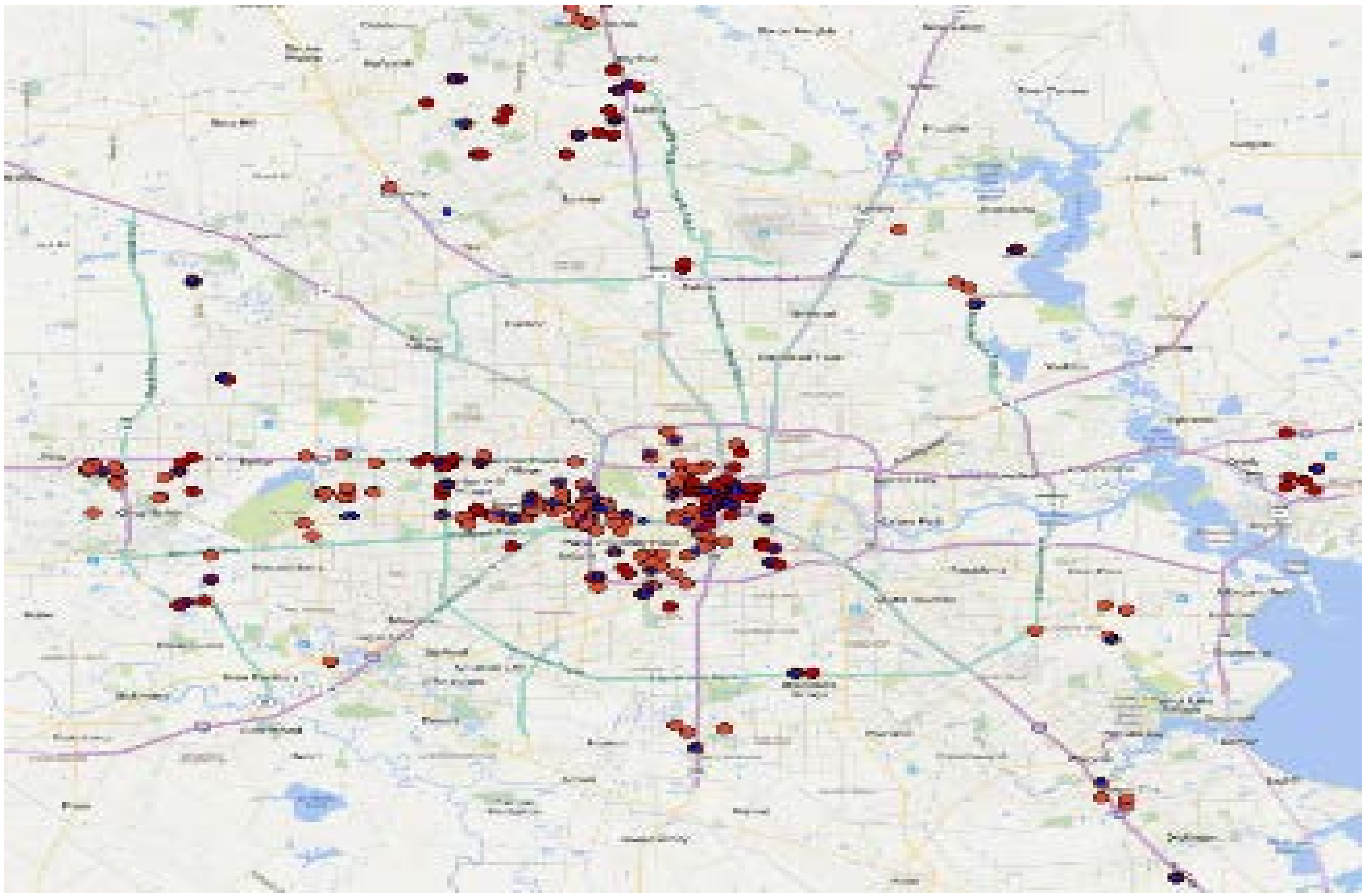
Delivered or In Pipeline for 2017



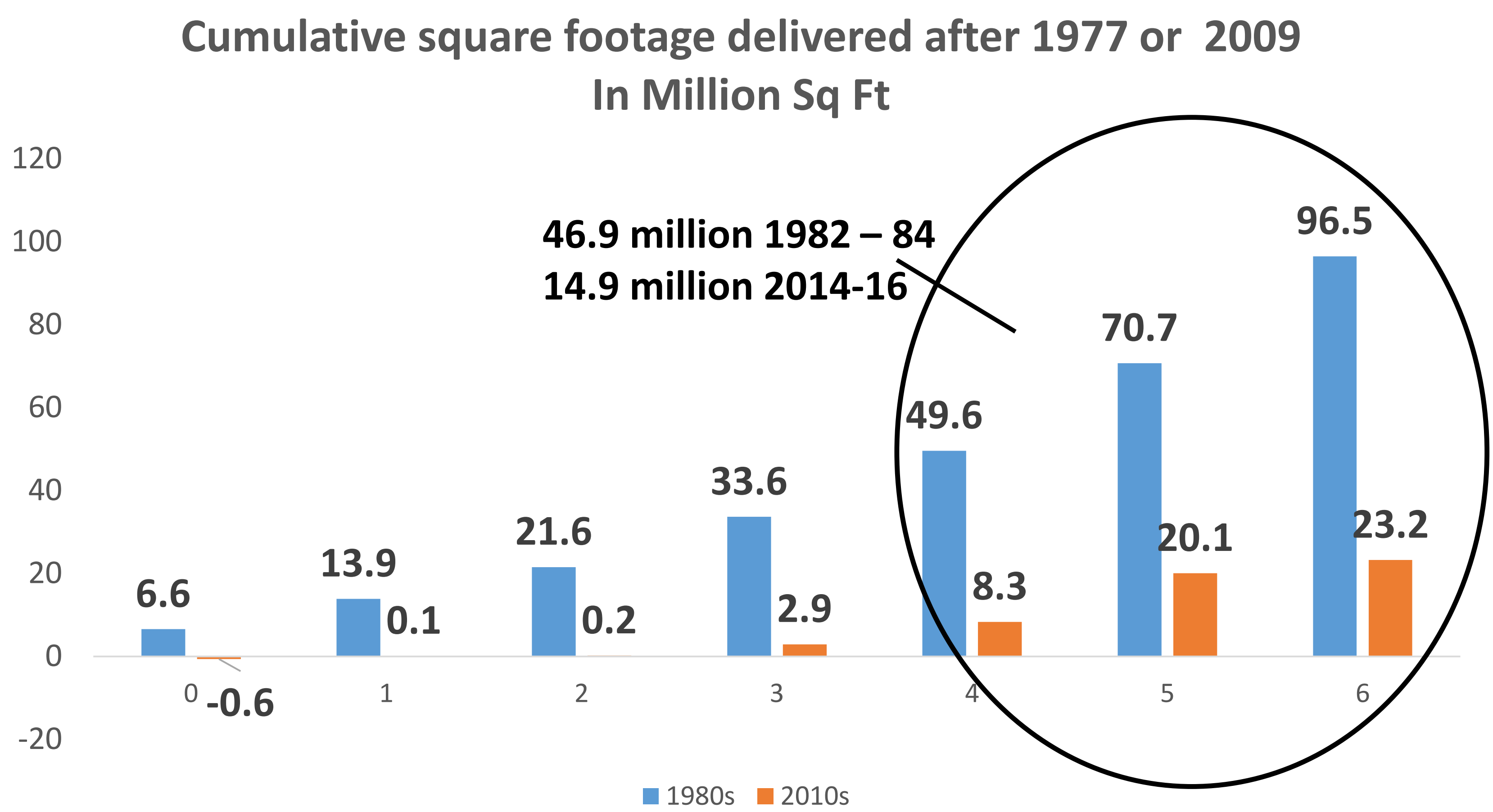
These Multi-Family Vacancy Rates Approach Worst of Modern Times



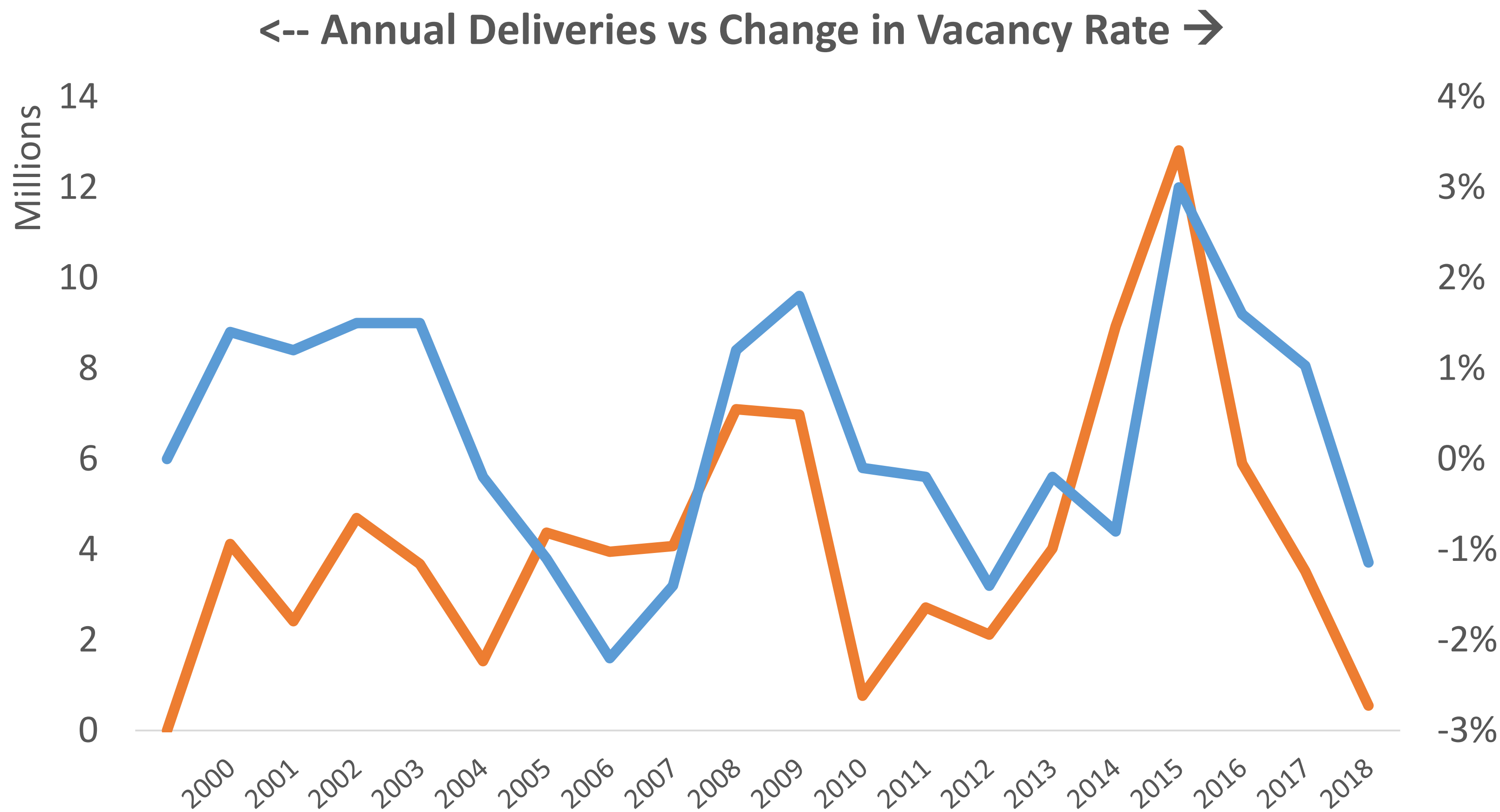
Where Class A Vacancy Rates Are Above 20 Percent By Year End



Ugly As The Office Market Is Today, This Is Not The 1980's

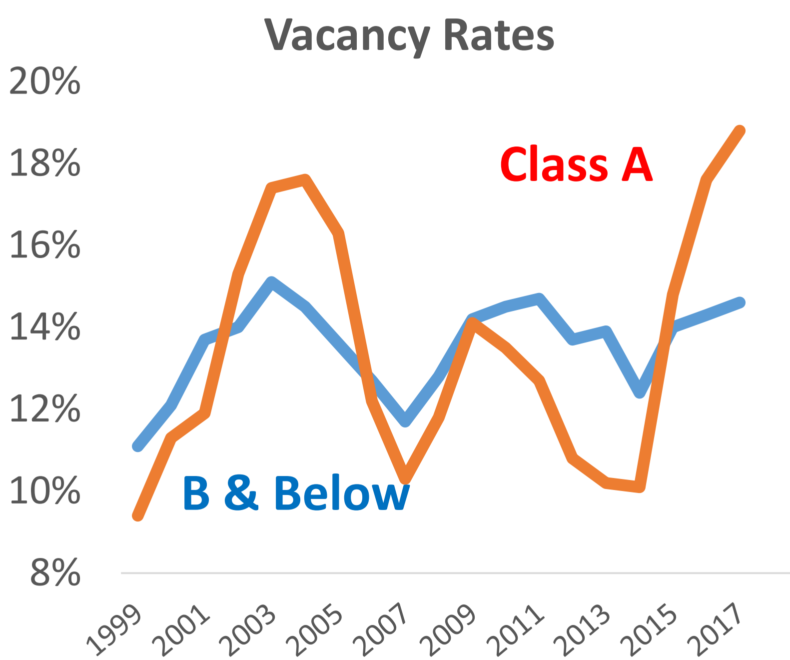


Sure, There Is an Oil Bust, But Vacancy Mostly a Product of Deliveries

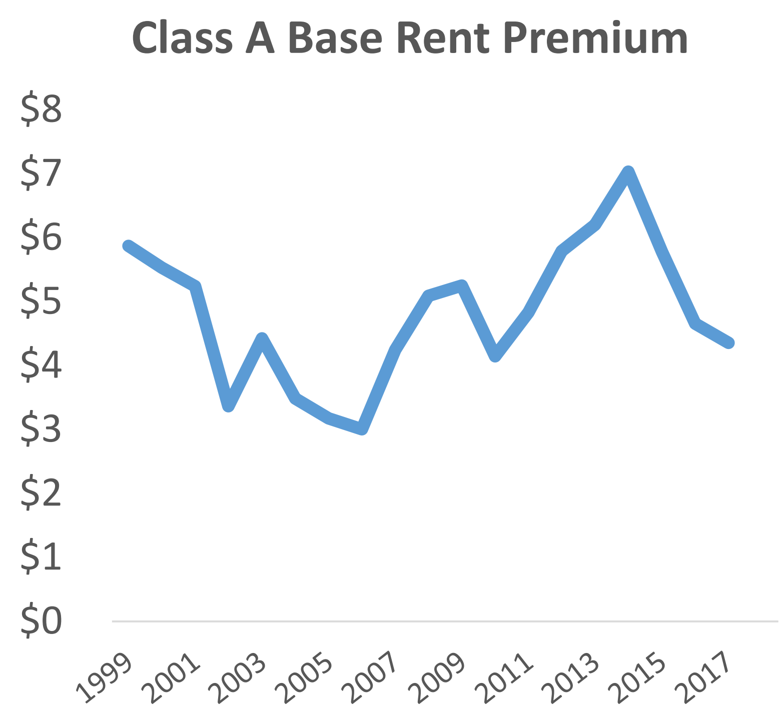


Class A Office Market: Feeling a Lot of Pain Right Now?

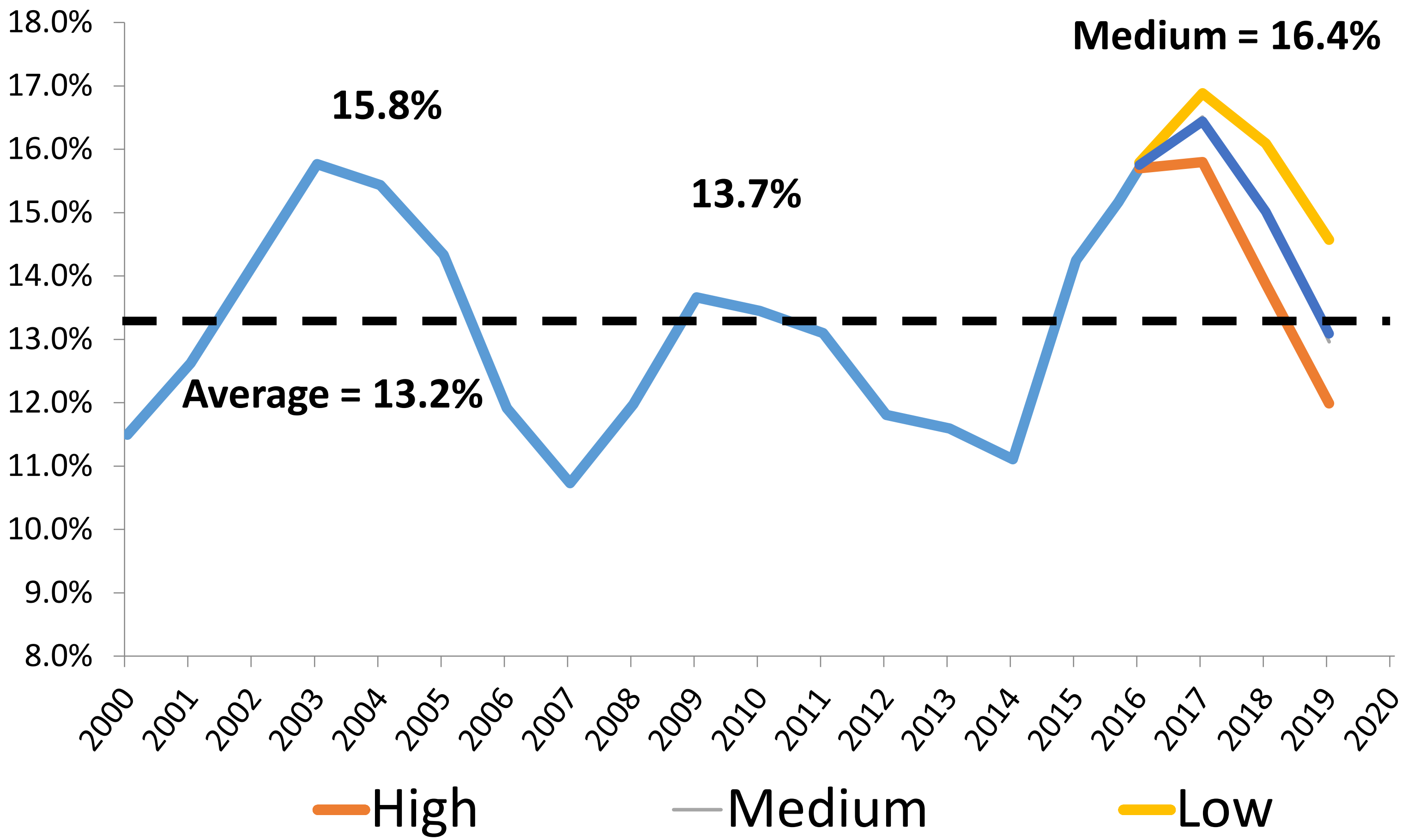
Class A Vacancy Rates Nearly Double, Head for Modern Highs



Class A Rent Premiums Approach 2010 Lows



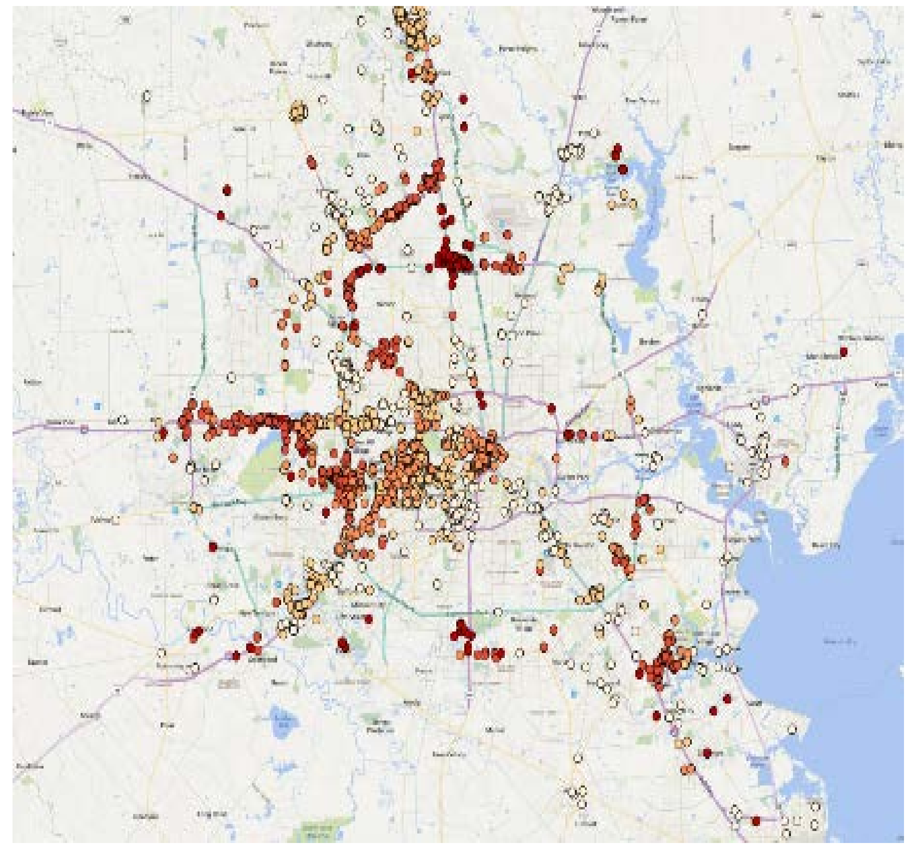
Across All Classes of Buildings: Office Vacancy Rate Nears A Peak



Source: CoStar, IRF Forecast

Damage Spreads Geographically From Building To Building

- Look at all buildings in metro area at end of 2016
- Look at all the other buildings in circle of radius of 2 miles
- Compute the resulting vacancy rate in its market area with new deliveries
- Each dot a building. The darker the spot, the higher the vacancy rate in its market area



CoStar, IRF

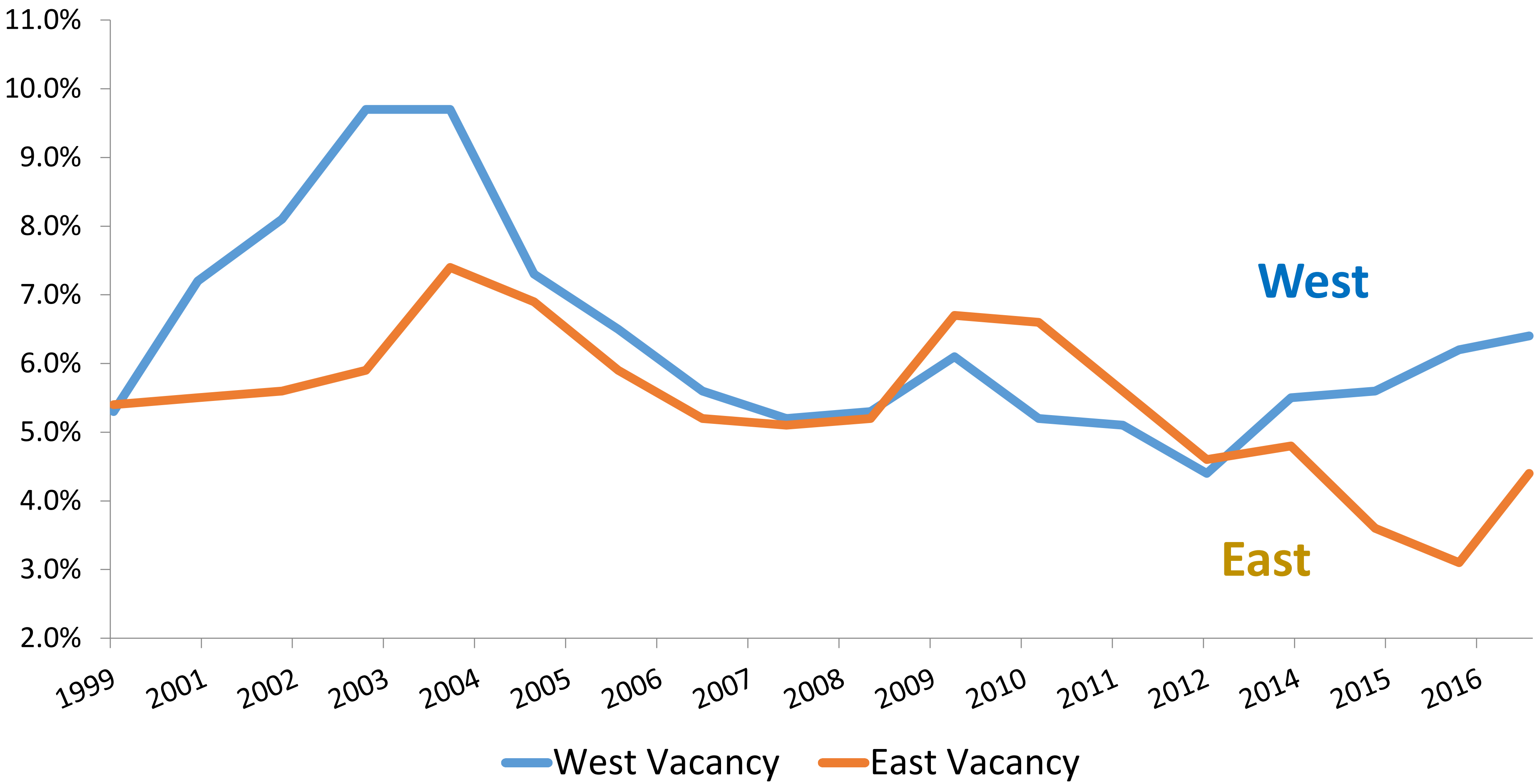
Local Office Markets With Vacancy Rate Headed Above 20 Percent in 2017

CoStar, IRF

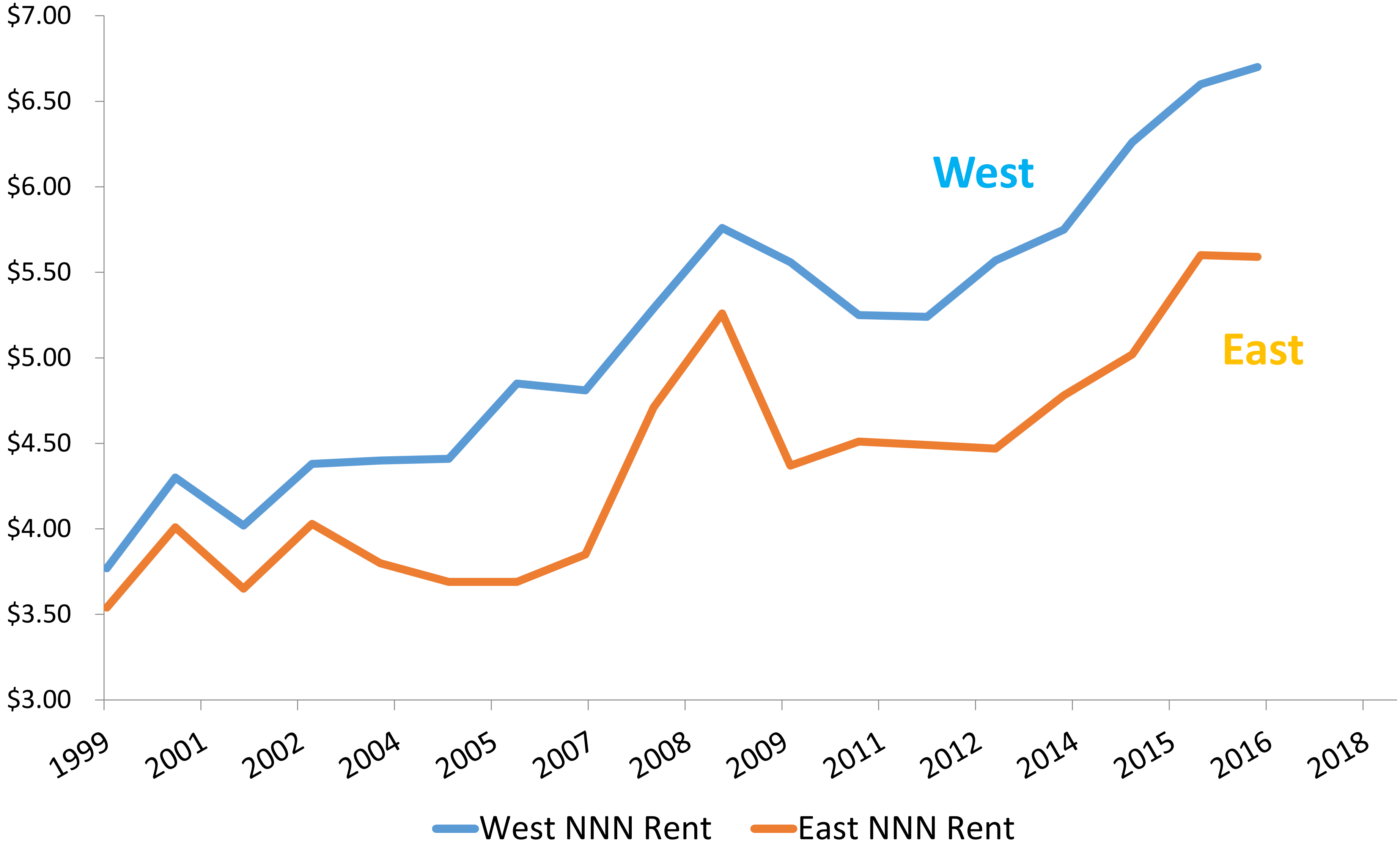
Industrial and Retail?
No Real Excitement Here!

East versus West: Houston's Economy Split by Energy

Industrial East And West Vacancy: East Side Boom Fading?

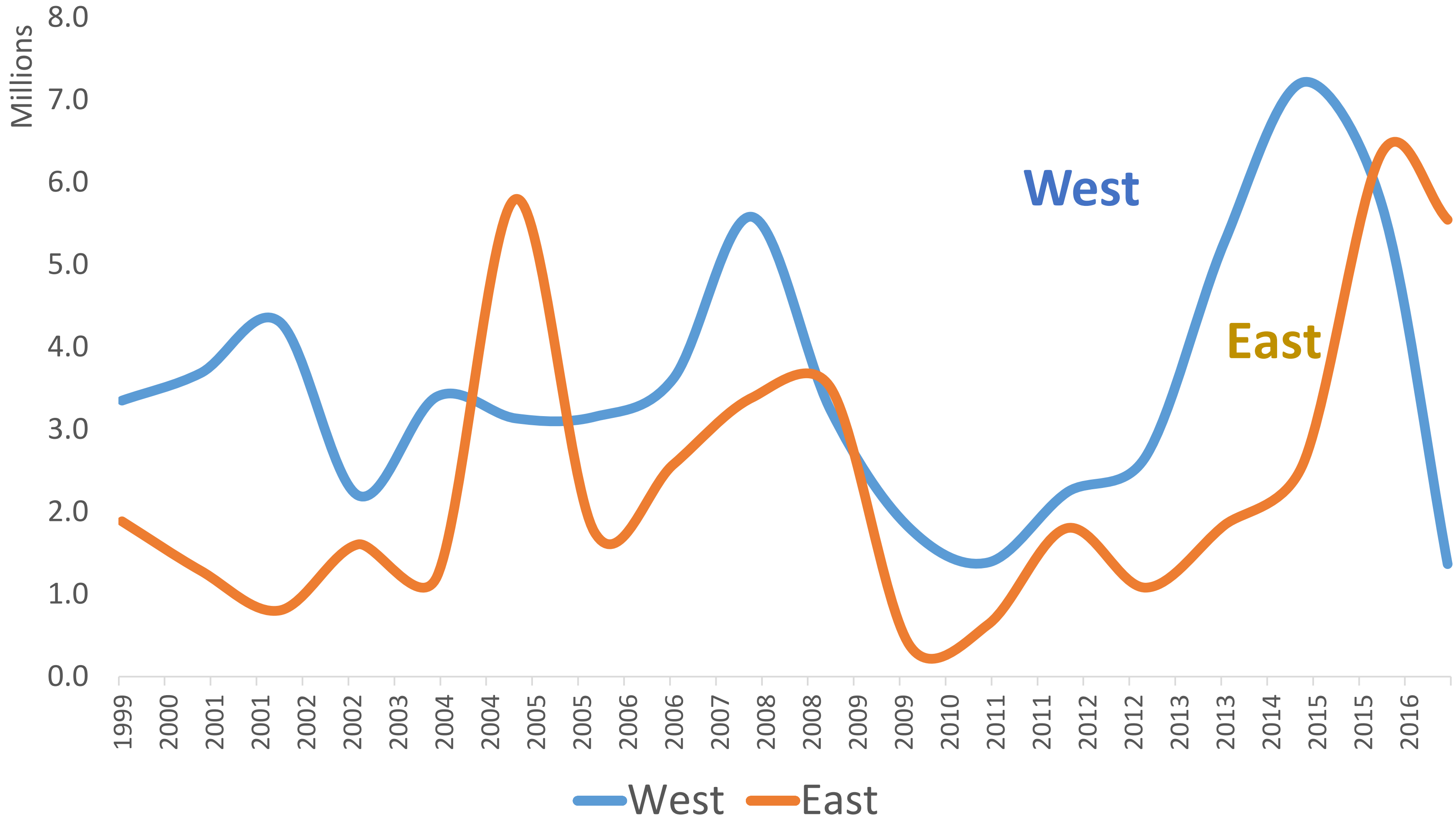


Industrial East And West Rent



Industrial Construction Slows In East And West Houston

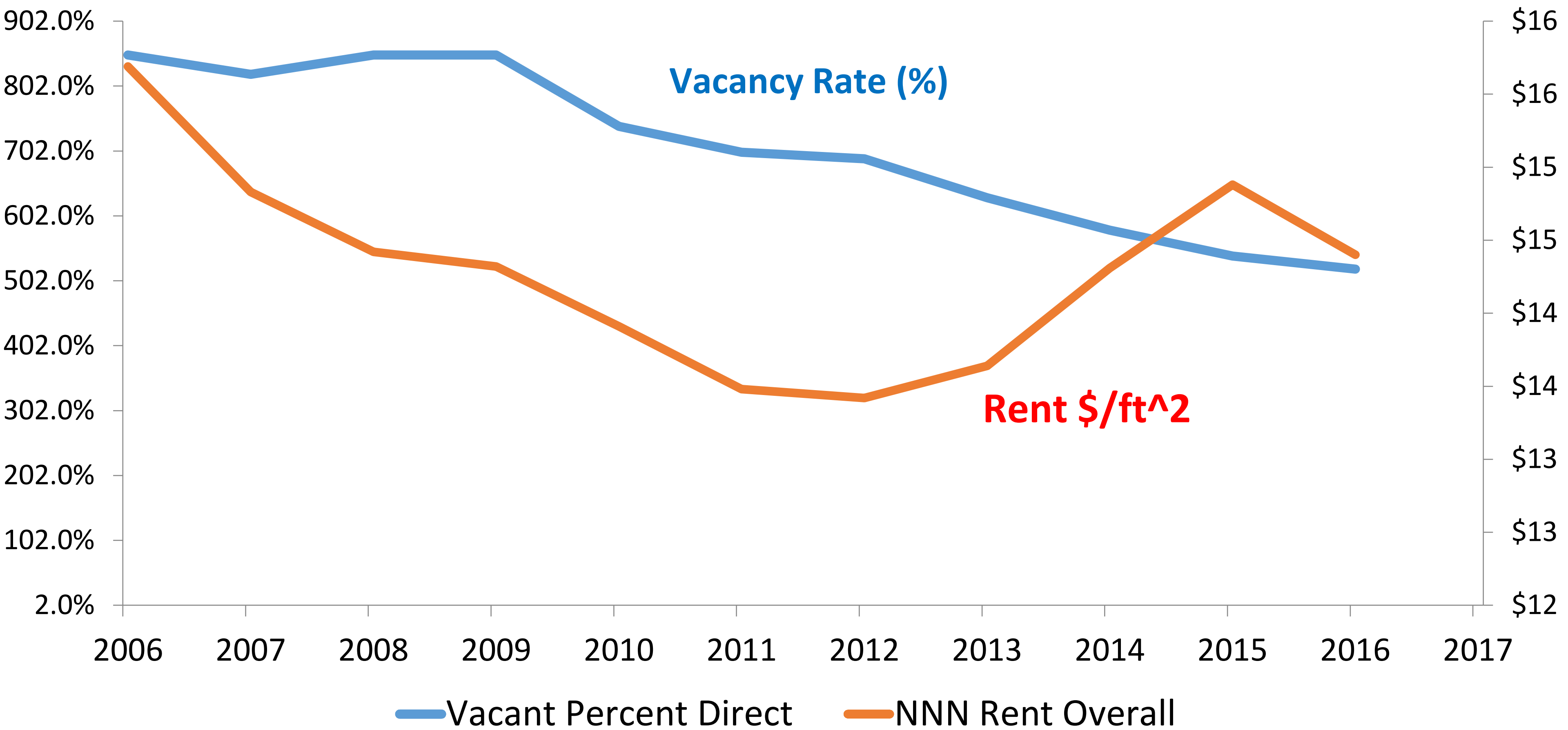
(million square feet)



Retail: Still Waiting for Better Times

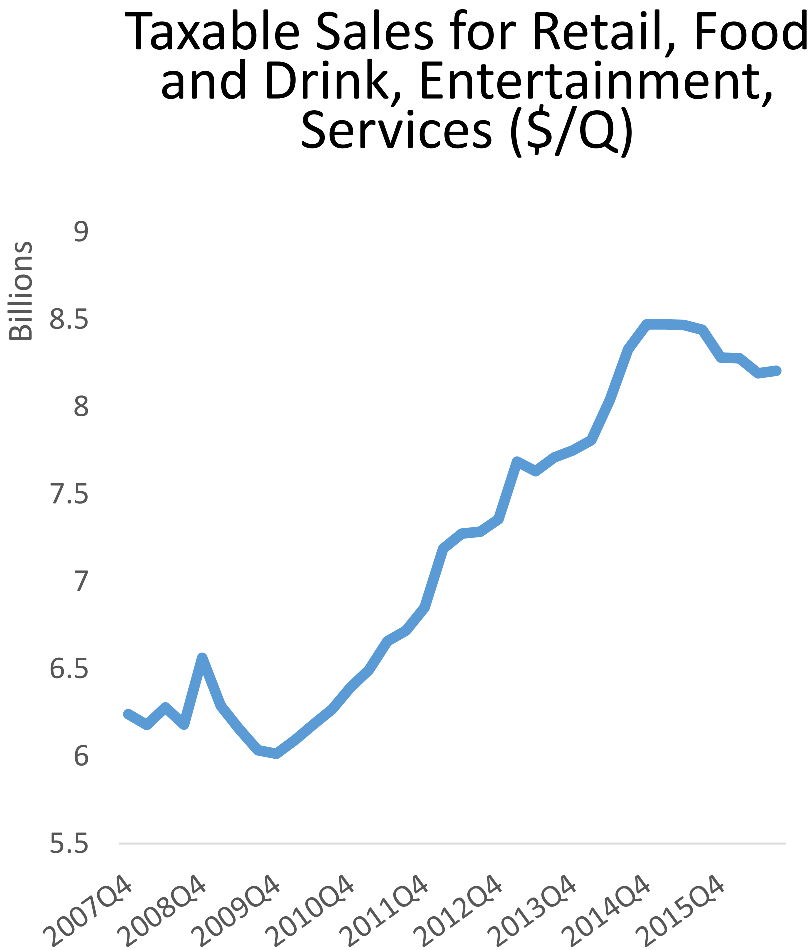
- Retail missed the boom of recent years after delivering 16 million square feet in 2006-07, leaving a glut of space that lasted to 2014
- Local growth caught up with retail space needs in 2013-14, and vacancy rates show tightness, and rents are quite healthy
- Retail is still primarily relegated to following the grocery store anchored shopping centers, chasing new home construction around the Grand Parkway
- The current construction pipeline is no threat to the market, growing more slowly than population.
- But be careful – consumer purchases of retail, food service, entertainment and other services have been flat or falling for two years

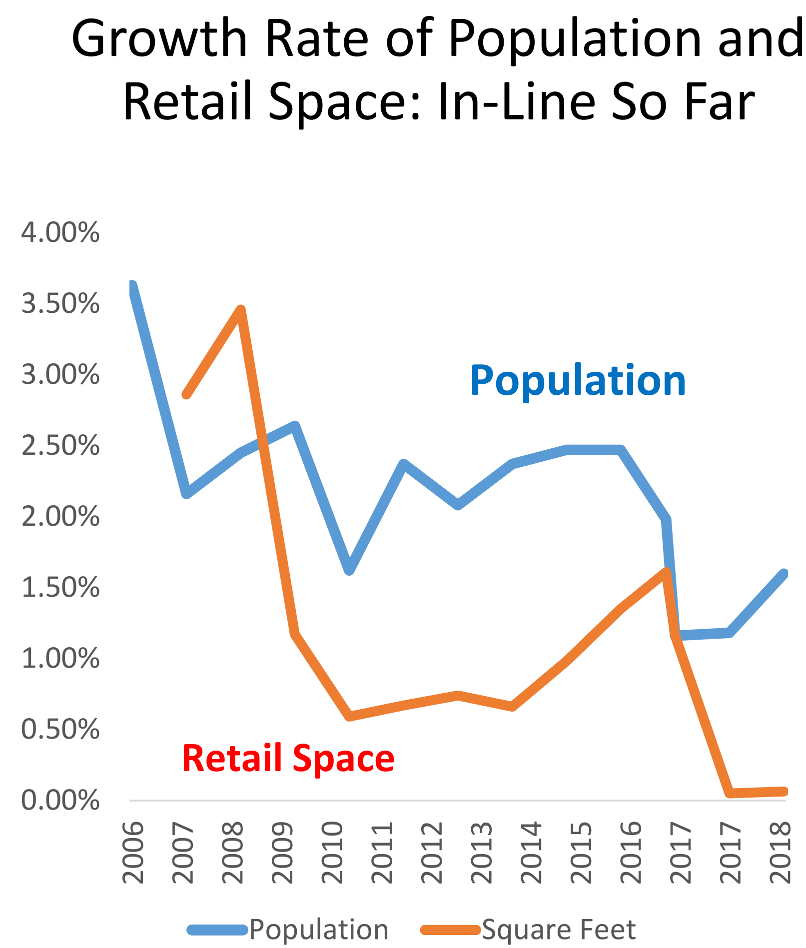
Retail Rent And Vacancy Began to Tighten In 2014



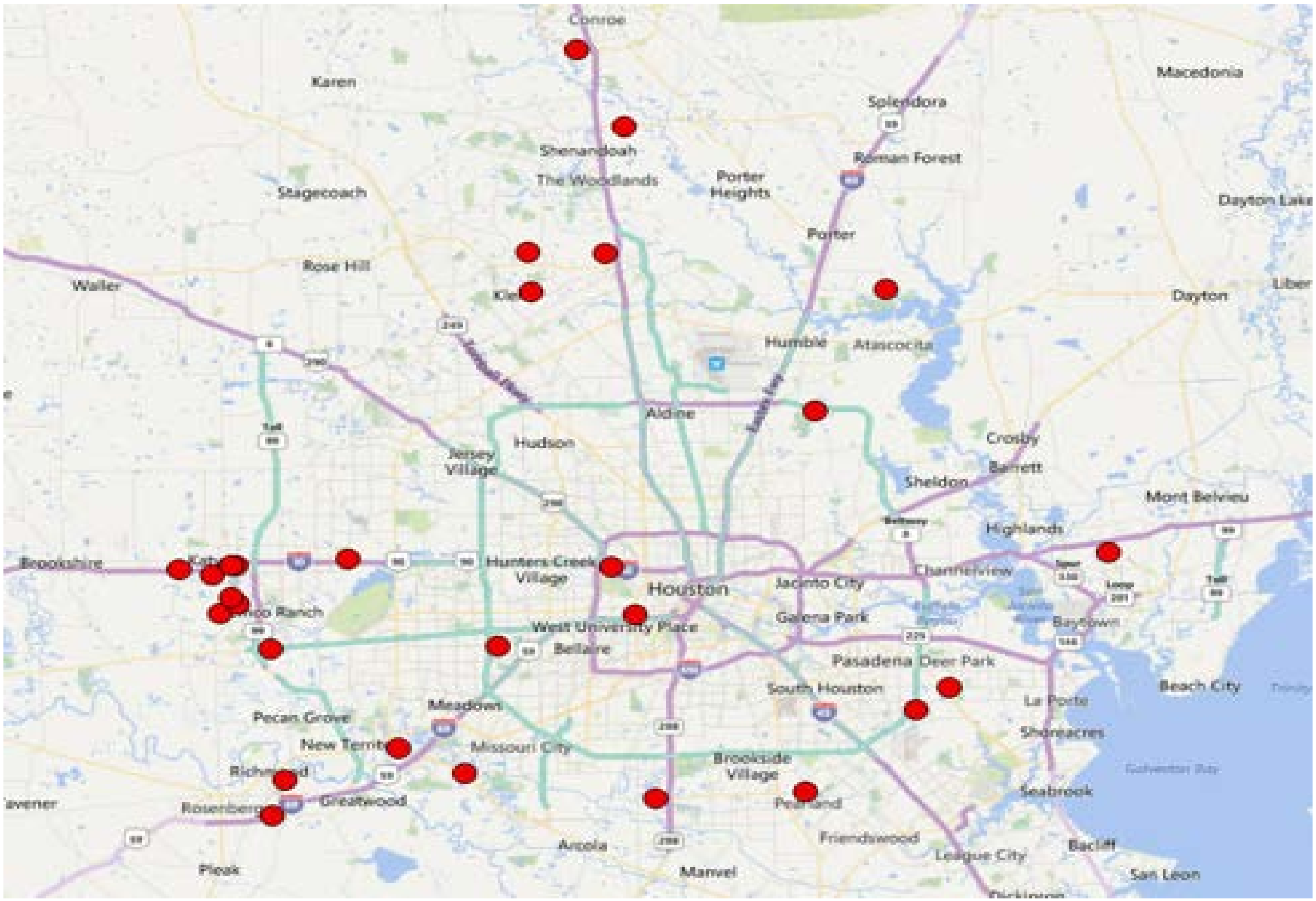
Source: CoStar

Retail Pipeline Is Okay – Despite a No-Growth Retail Market





Retail Construction Is *Still* Mostly Chasing Rooftops In The Far Suburbs



Close-In and West See Single-Family Sales Sag, Inventories Rise, Prices Flat

	Monthly Sales		Median Price(000)		Inventory	
	2014 Peak	**Feb 2017**	**2014 Peak**	**Feb 2017**	**2014 Peak**	**Feb 2017**
Metropolitan Area	7298	7112	200.9	228.4	2.7	3.9
Close-in*	272	216	402.1	382.4	3.8	5.0
Rice Mil/WashAve.	67	45	453.3	423.1	3.2	5.3
Heights	147	120	445.2	430.0	4.3	4.5
Galleria	66	51	312.1	294.1	3.0	5.8
South of I-10*	148	132	384.8	405.9	1.8	4.4
Energy Corridor	80	63	299.4	328.2	1.6	4.3
Memorial West	75	69	471.3	483.7	2.0	4.4
Spring Branch	103	111	320.8	371.8	2.8	5.4
Woodlands	229	167	355.8	326.2	3.1	4.8
Alief	87	83	123.7	147.9	1.8	2.9

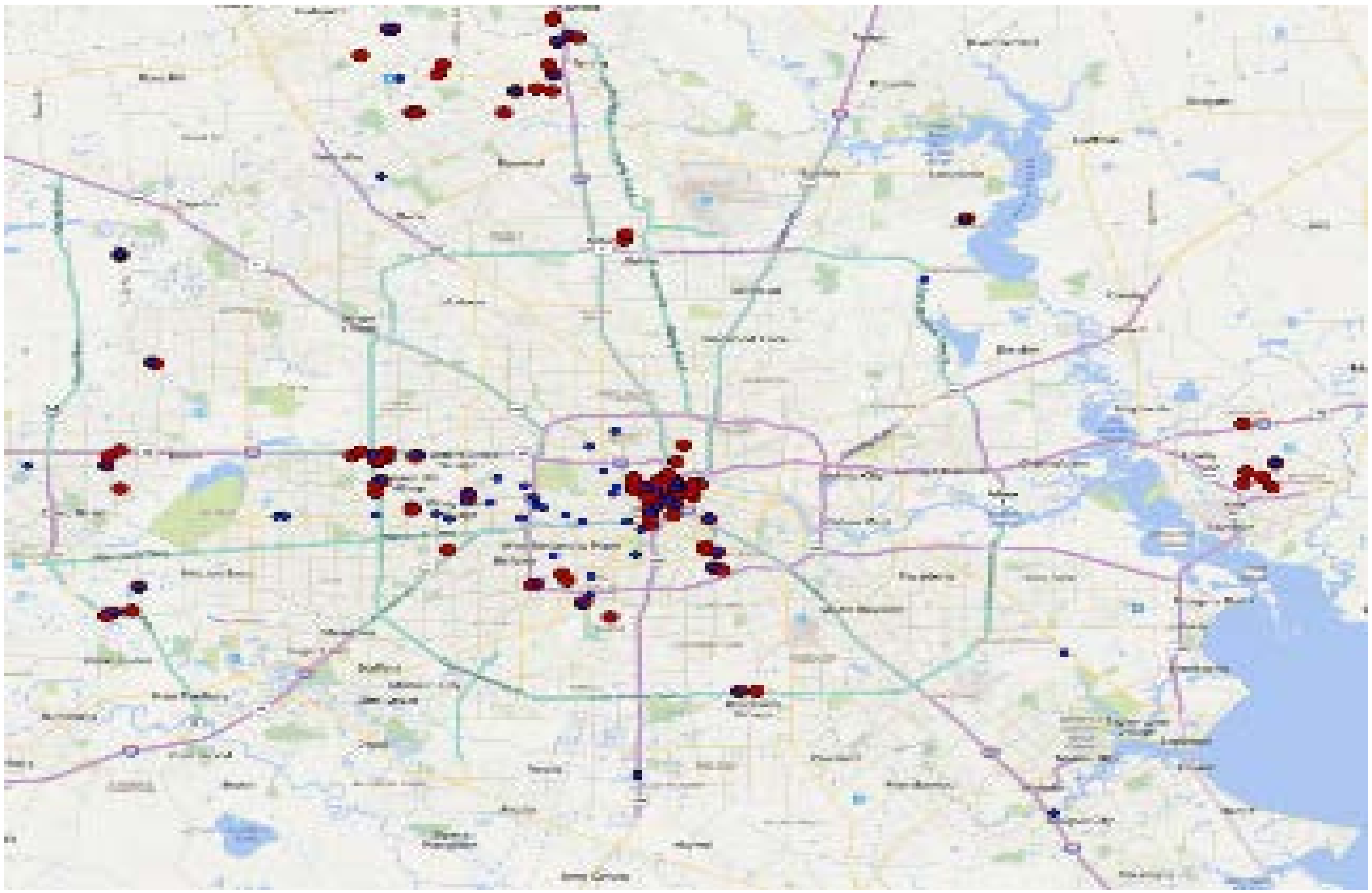
(*) denotes the sum of the sub-categories; all data seasonally adjusted and may not add to totals; sales and price are 3-month moving averages

Rest of Metro Single Family: Little Left to Sell, Prices Still Rise

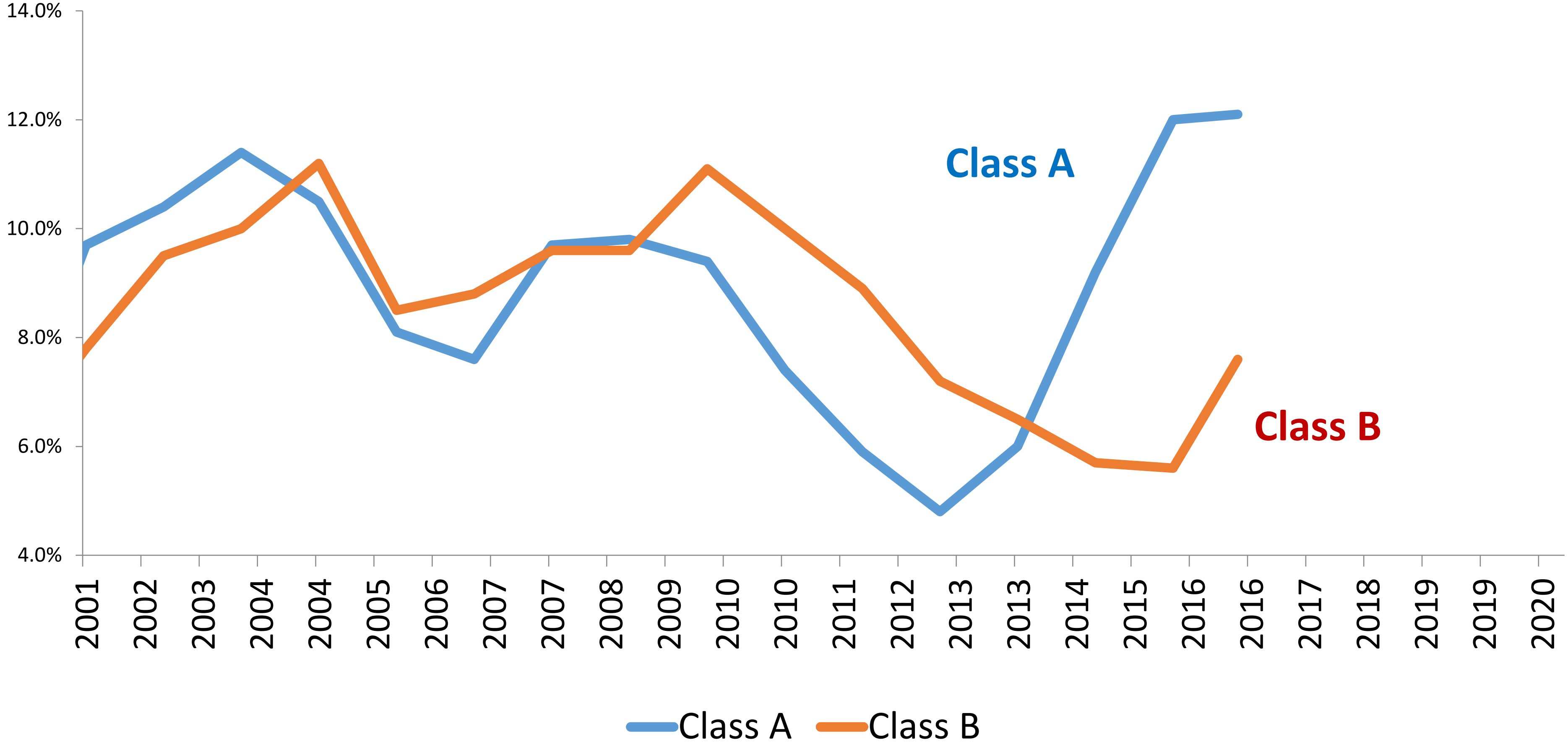
	Monthly Sales		Median Price		Inventory	
	2014 Peak	Feb 2017	2014 Peak	Feb 2017	2014 Peak	Feb 2017
Metropolitan Area	7298	7112	200.9	228.4	2.7	3.9
Ship Channel*	233	264	124.3	147.4	2.7	2.5
Baytown	85	86	139.5	150.8	2.6	2.3
Pasadena	77	78	118.4	148.6	2.3	1.7
North Channel	78	99	116.5	142.9	3.1	2.9
South Houston*	458	393	192.2	231.7	2.0	2.3
Friendswood	74	62	219.1	246.3	1.6	2.2
Clear Lake	131	125	193.5	229.1	2.0	2.1
League City	190	171	216.6	264.4	2.2	2.4
South Belt	75	59	142.8	178.5	1.3	2.0
Suburbs*	1,311	1,163	253.4	285.7	2.2	2.9
Kingwood	124	95	230.0	240.6	1.5	2.9
Katy	510	425	261.5	264.0	2.5	3.3
Cypress	300	296	245.8	266.9	2.2	2.6
Pearland	214	195	231.8	265.1	1.5	1.8
Sugarland	178	153	390.3	392.0	2.1	3.9

(*) denotes the sum of the sub-categories; all data seasonally adjusted and may not add to totals; sales and price are 3-month moving averages

Where Class A Vacancy Rates Are Above 30 Percent By Year End



Vacancy Rate For Class A and B Climb From Low Levels



Source: CoStar

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Thank you for attending

Our Fall 2017 Symposium is scheduled for Monday, November 6, 2017