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Slow Growth Returns to Houston in 2017: Can We Bring Back the Oil Jobs in 2018?

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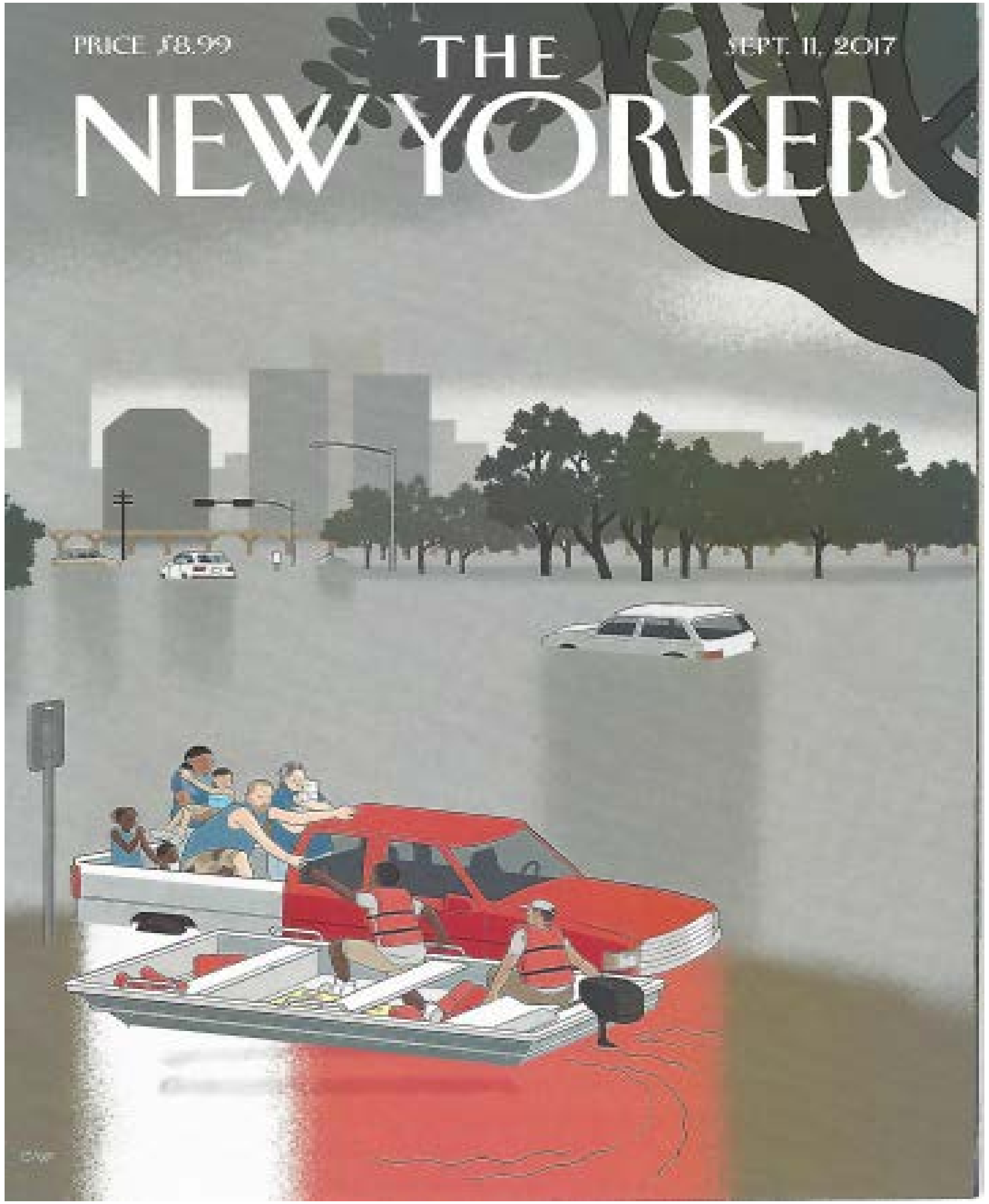
November 6, 2017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THE
NEW YORKER
SEPT. 11, 2017

Harvey: One More Tropical Storm?

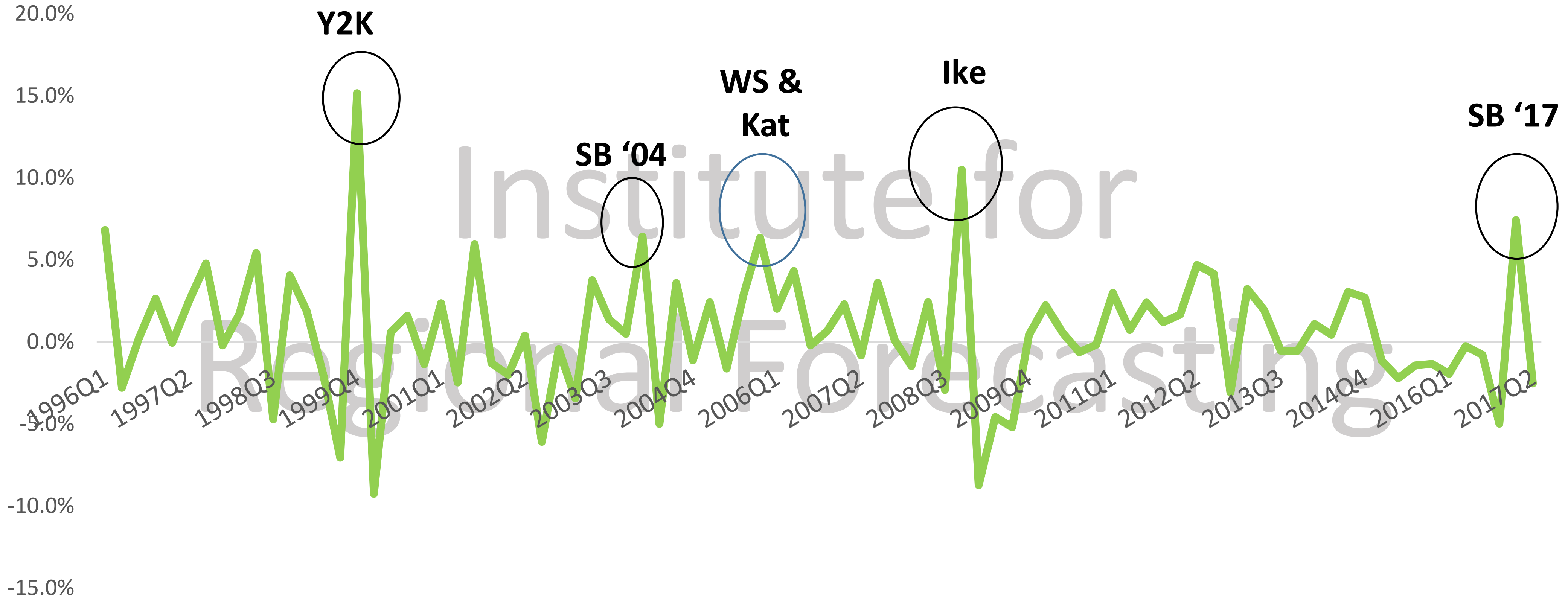
- This was another tropical storm – just less wind, more water. MUCH more water. It was a 1000-year flood event with no known precedent in North America according to the University of Wisconsin's Space Science and Engineering Center.
  - These storms do enormous property damage. Harvey shrank collective balance sheets across Texas by $87 billion. After Harvey, about 39,000 Houston homes left with major damage, and 300,000 vehicles totaled
  - *Tropical storms are usually neutral or good for most current economic measures like employment, income, or output*
  - We lose worktime as we shelter, but we come out to meet an intense mini-economic boom that quickly gets underway – and then fades just as quickly
  - If Ike is a model, we might see $2.6 billion in retail spending in the metro area in the next few months to replace autos, furniture, carpet, and buy wallboard and other construction materials. There will be a boom in construction and reconstruction. *Spending, income, production numbers briefly improve.*
- We are poorer because of property losses, but after three months the effect on employment and income is usually near neutral. Continuing economic effects are too small to register in an economy of 3 million workers

Only Short-Term Setbacks for the Big Drivers of the Houston Economy

- Most upstream oil production and oil services in Houston is mostly office-based, white-collar engineering activity. There was mostly disruption to the employee base.
- Upstream machinery and fabricated metals to support global drilling? Beyond big three – Schlumberger, Halliburton, Baker Hughes – it is a depressed industry. Even if there is damage, a lot of surplus capacity in the industry right now
- Refining, chemical and plastics? No wind or storm surge here. Never a threat to electric motors or control systems. This was mostly a routine, storm-related shut-down on the Ship Channel
- Most medical in Houston is just service to local residents. Key parts of the economic base are at the Texas Medical Center. About 10 percent of their patient care, billions in research, and educational role. No big problems: *Learned their lessons well from Allison.*
- NASA and its contractors? Mission control worked through the storm. Space station still up there. Found a safe place to store the replacement for the Hubble.

Mini-Boom in Retail Spending Followed Ike: Typical of Other Major Storms

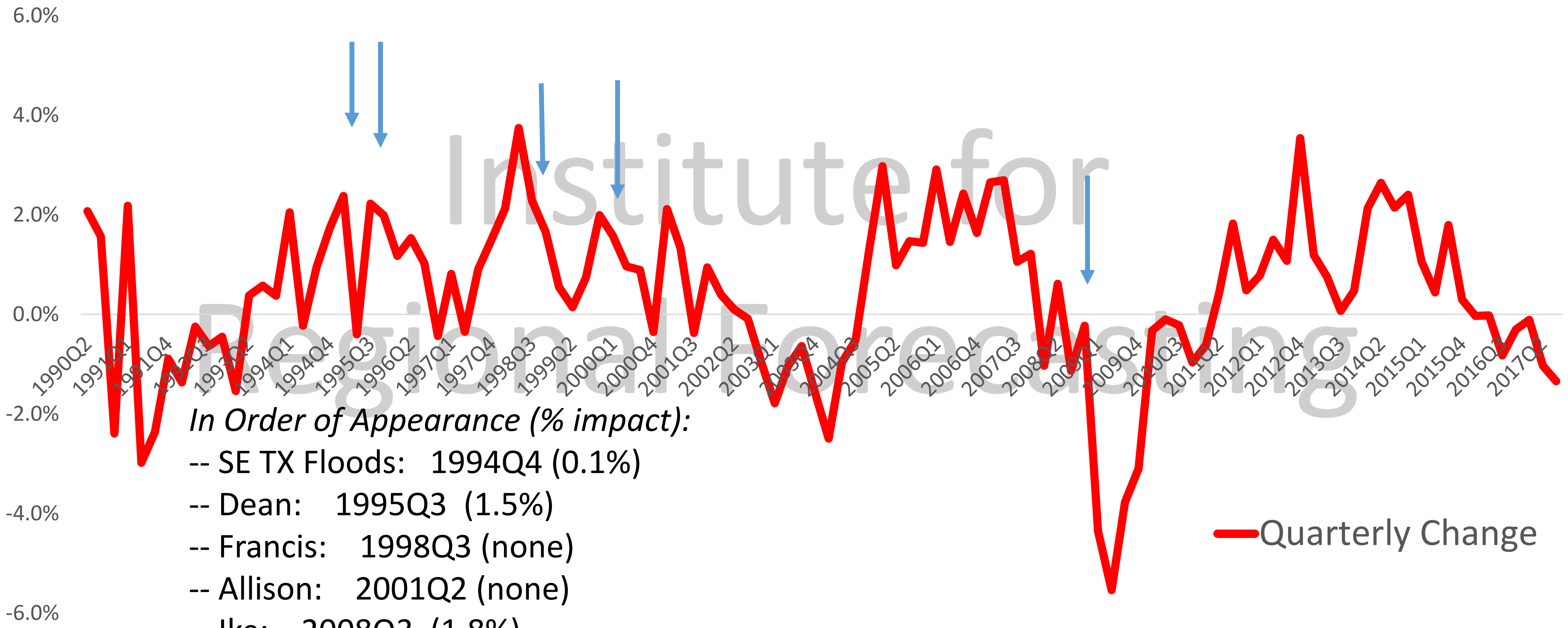
City of Houston Sales Tax Revenue, quarterly % change



No statistically significant impact from 1994 SE Texas floods, Dean, Francis or Allison

Net Weather Effects on Construction Are Significant, But Less Than You Think

Quarterly Percent Change in Construction Employment



In Order of Appearance (% impact):

-- SE TX Floods: 1994Q4 (0.1%)

-- Dean: 1995Q3 (1.5%)

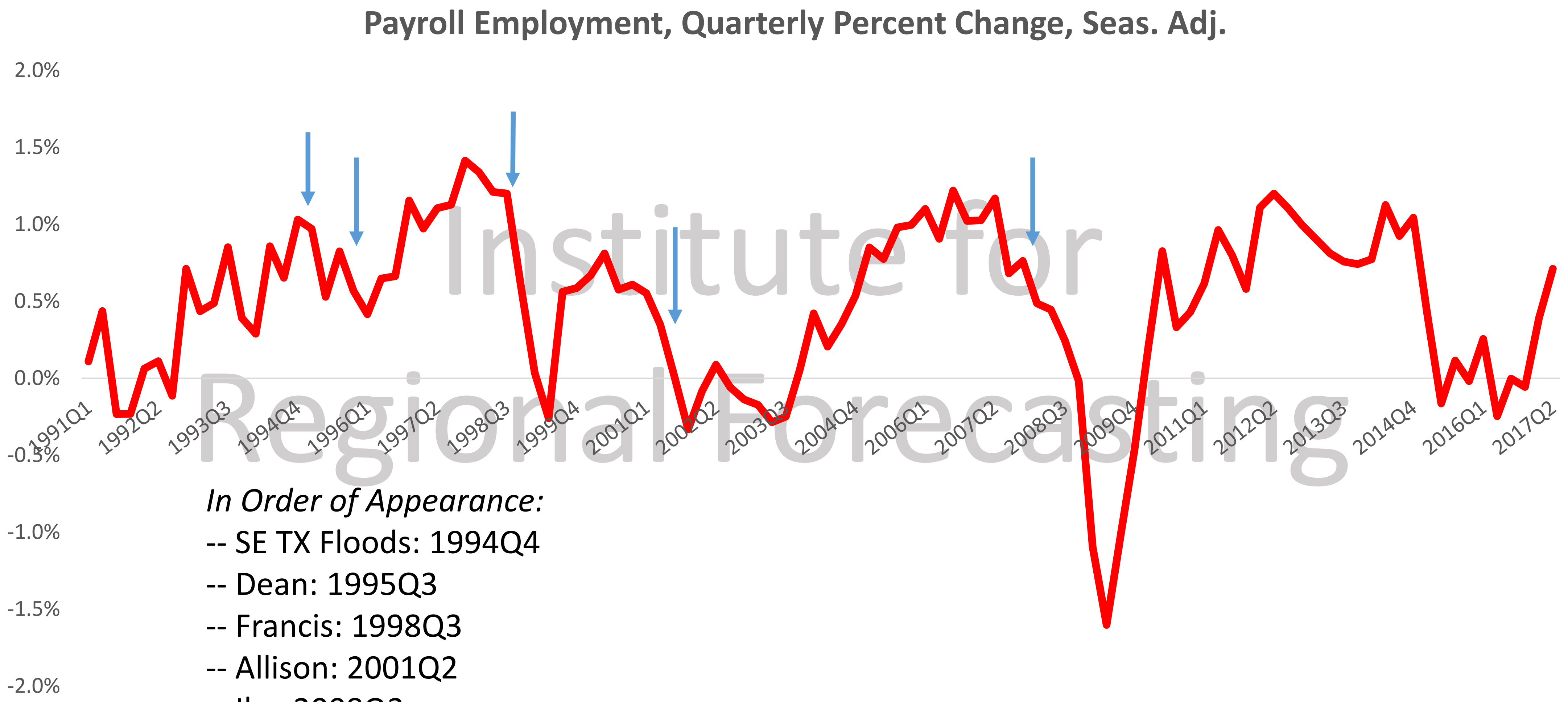
-- Francis: 1998Q3 (none)

-- Allison: 2001Q2 (none)

-- Ike: 2008Q3 (1.8%)

% impact is after accounting for business cycle

Storm-Related and Other Spikes in Activity Don't Carry Over to the Economy as a Whole



In Order of Appearance:

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-- Dean: 1995Q3

-- Francis: 1998Q3

-- Allison: 2001Q2

-- Ike: 2008Q3

More on Housing and Real Estate Later On, But Meanwhile …

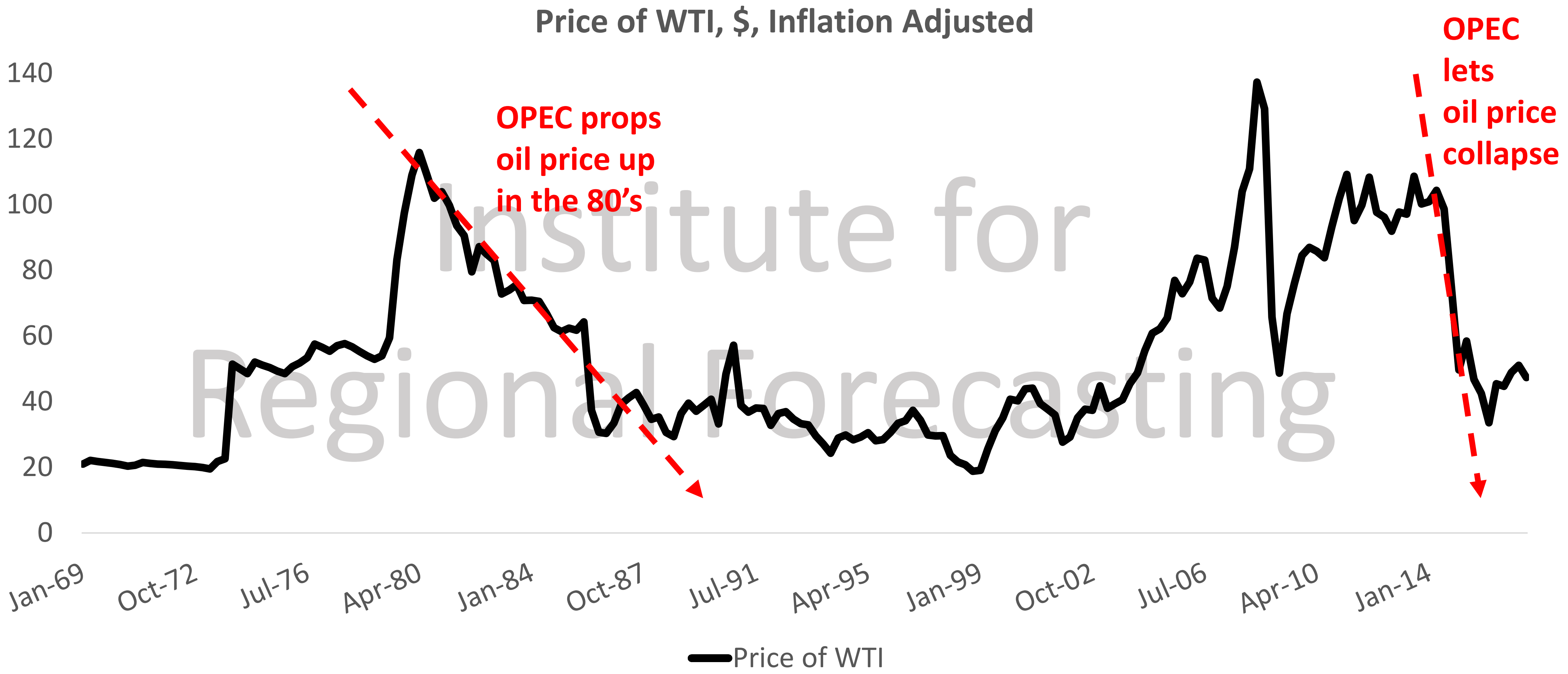
- The storm exposed major shortfalls in our flood control infrastructure and management, and how we respond will determine future reputational risks for business relocation into the region, home values, and metro-wide development patterns
- *Harvey was primarily a severe blow to single-family housing.* There is a problem of near-term repair in the face of labor shortages and lack of flood insurance. It raises long-term questions about home values and the future of existing neighborhoods; and whether there will their be adequate land for future land development
- Damage to multifamily and office was much less than expected, and less than other storms. Private mitigation from lessons learned in the past?
- Retail and industrial markets already tight, now a little tighter

Oil Markets Worse Than the Eighties …
While Houston's Growth Just Stops

The Aftermath of the Oil Bust Drags On: It Was *Not* a Three-Hour Cruise

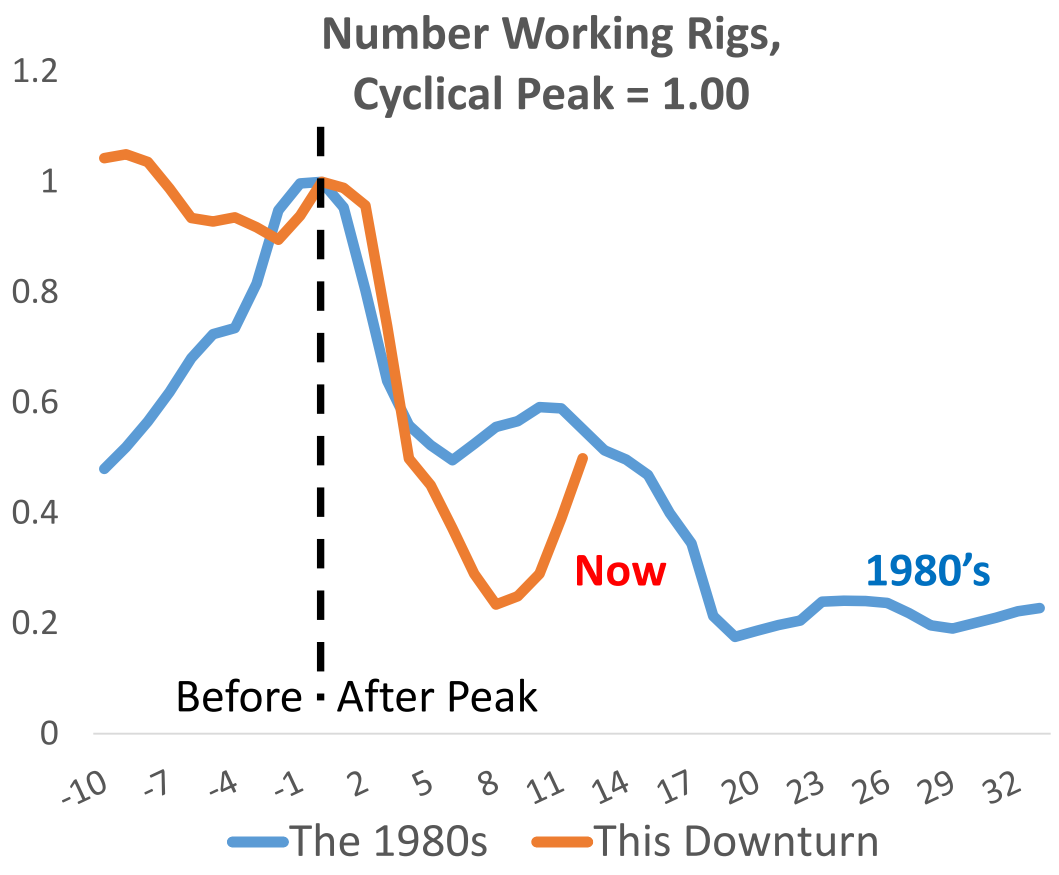
- In 2014, this was going to be a short downturn in oil markets,--a three-hour cruise. Oil markets were close to balance, fracking would quickly fold, … On November 27 we end the third year of the fracking bust
- This has arguably been the worst oil downturn ever of oil, worse that the eighties by a number of measures
- For Houston, comparisons to the 1980s are well off the mark. Despite 77,000 oil jobs lost, Houston has been resilient. Perhaps a very mild recession in 2016?
- While Houston has moved back on a slow to moderate growth track*, stronger growth requires that local oil jobs return in large numbers*

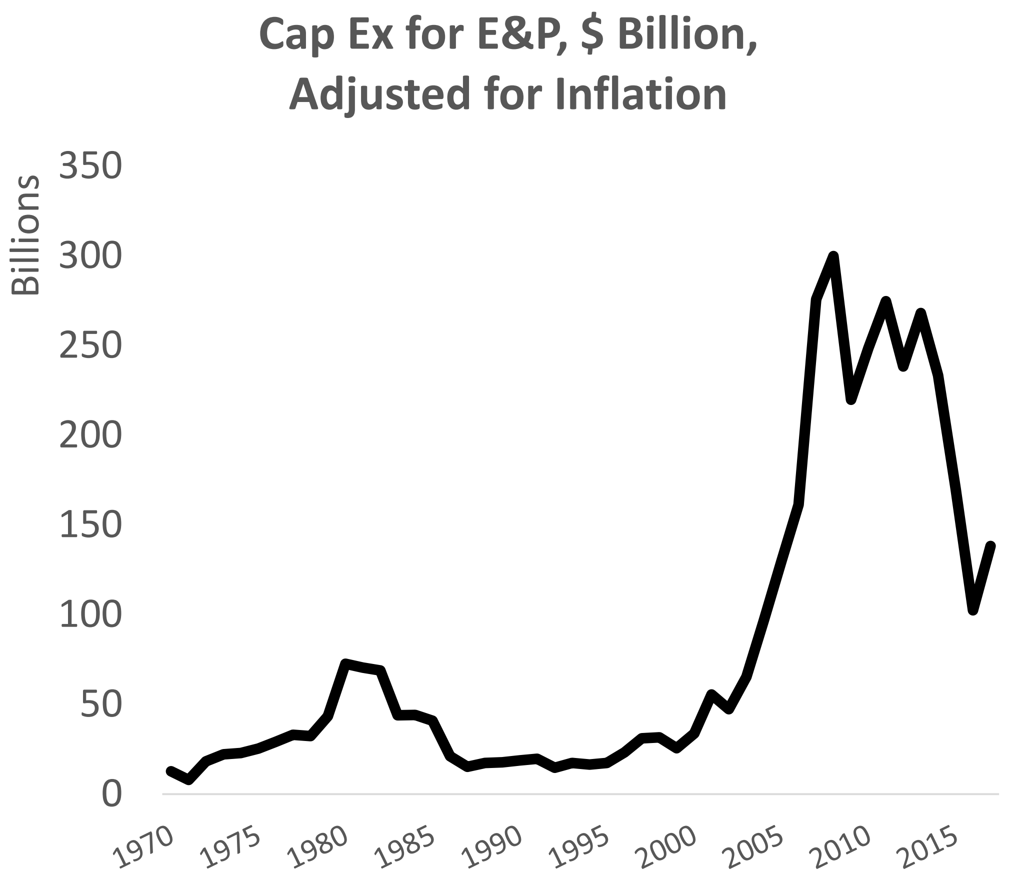
After OPEC Withdrew as Swing Producer, Oil Prices Fell Hard in 2014-16



FRED, St. Louis Fed

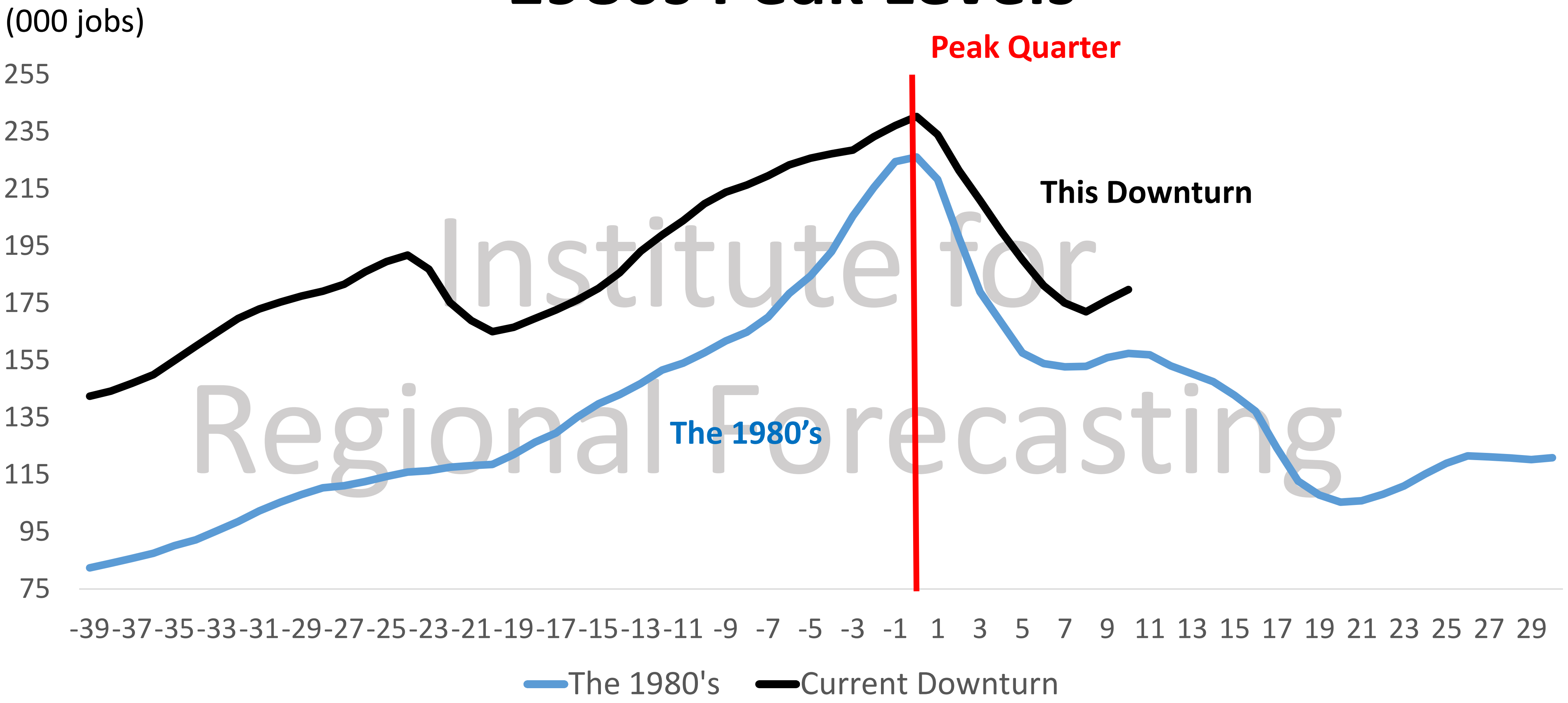
Working Rigs Fell Faster/Further than the 1980s, Cap Ex for E&P Collapsed from Far Higher Levels





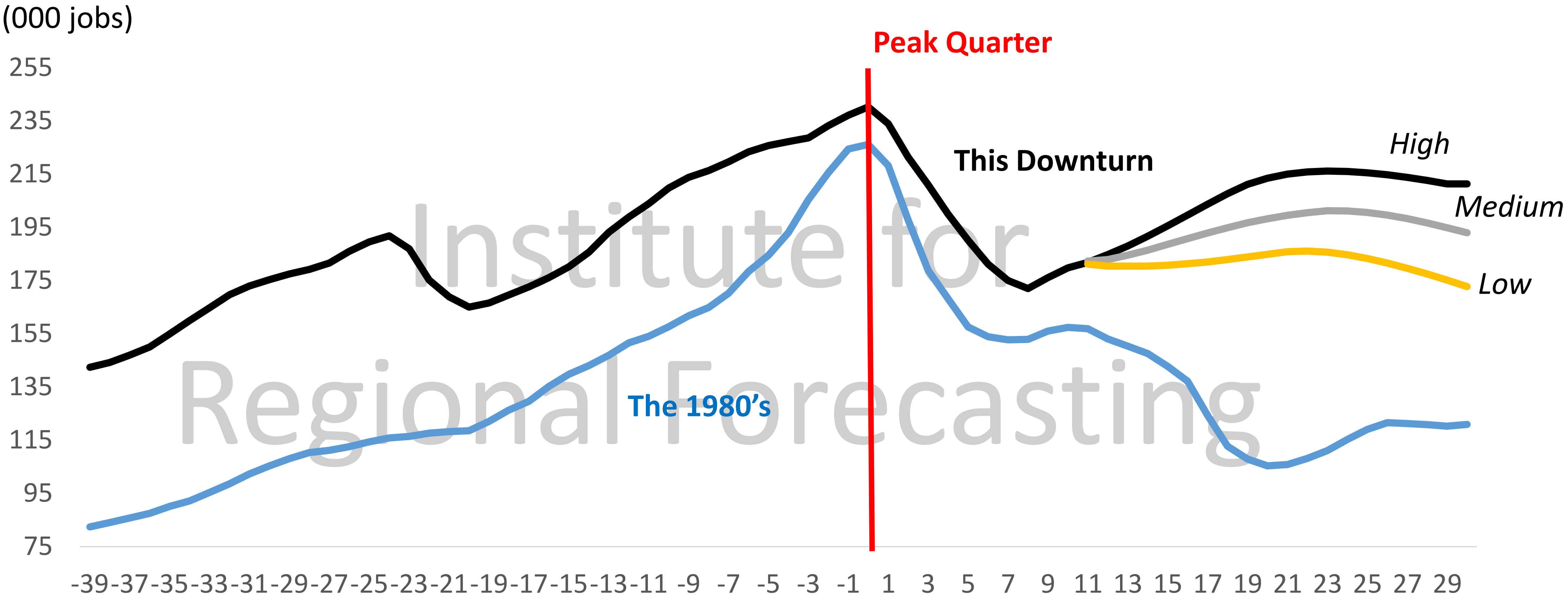
Baker Hughes, *Oil & Gas Journal*

In 2014, Houston Jobs in Oil Production, Oil Services, Machinery and Fab Metals Briefly Returned to 1980s Peak Levels



Bureau of Labor Statistics, Calculations of IRF

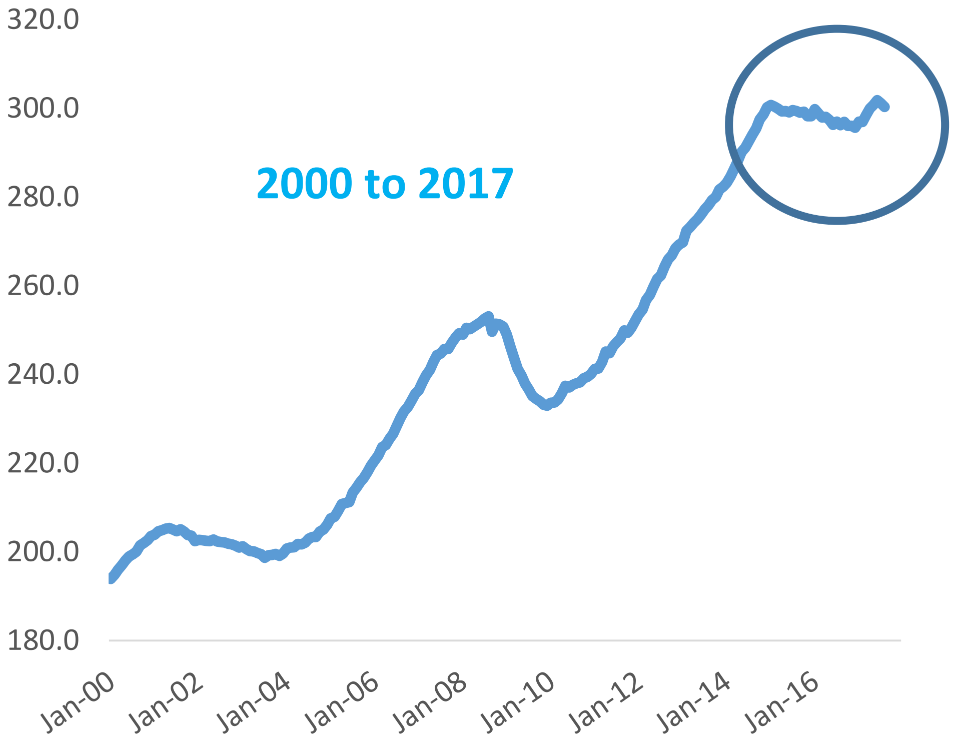
In 2014, Houston Jobs in Oil Production, Oil Services, Machinery and Fab Metals Briefly Returned to 1980s Peak Levels



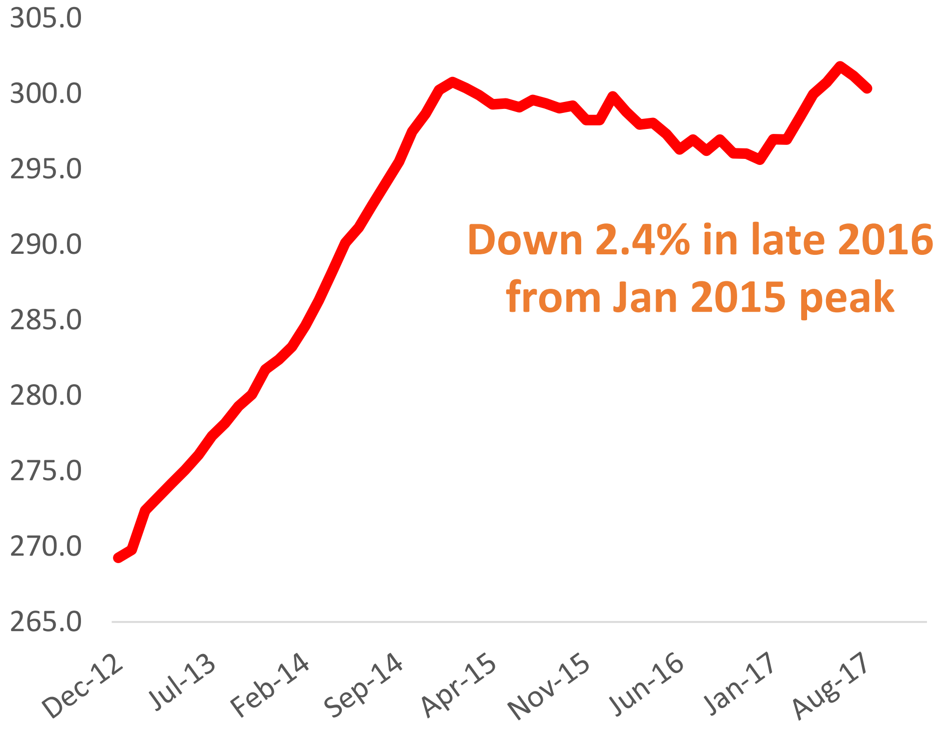
This is a narrower definition of oil jobs than used in the rest of the presentation, so comparisons can be made To the 180s. The change in industry classification from SIC to NAICS makes this necessary.

But for Houston, Just a Rough 2015-17: No Major Economic Reversal

Tracks local business cycle with four variables



If we had a recession, the trough was Dec 2016 after Jan 2015 peak



Dallas Fed, through August, excludes Hurricane Harvey effects

Recent Data Show a Houston Economy that Has Passed the Worst – And Is Now Growing Moderately

Four Factors Have Driven the Houston Economy Since 2014: But Only One Is Left Helps Us Out in 2018

	2014	2015	2016	2017	2018
Oil and Gas Jobs	+ +	--	--	+ -	0
U.S. Economy	+ +	+ +	+ +	+ +	+ +
Petrochemical Boom	+ +	+ +	+ +	+ -	-
Boom-time Momentum	+ +	+ +	+	0	0

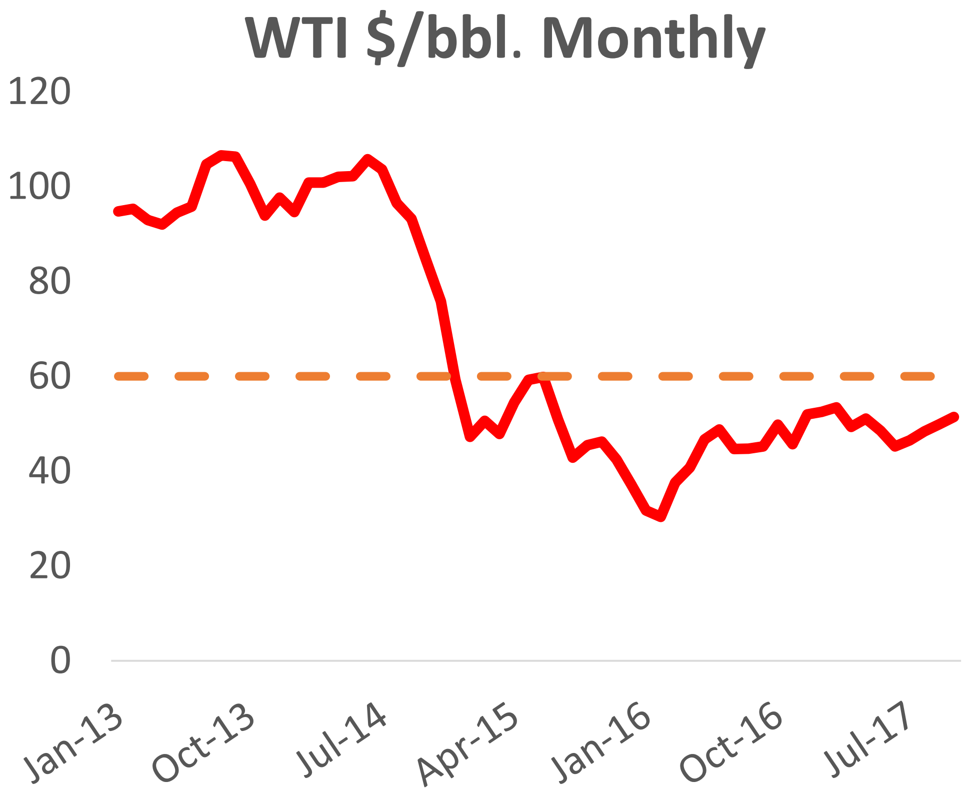
Three Key Questions Going Forward:

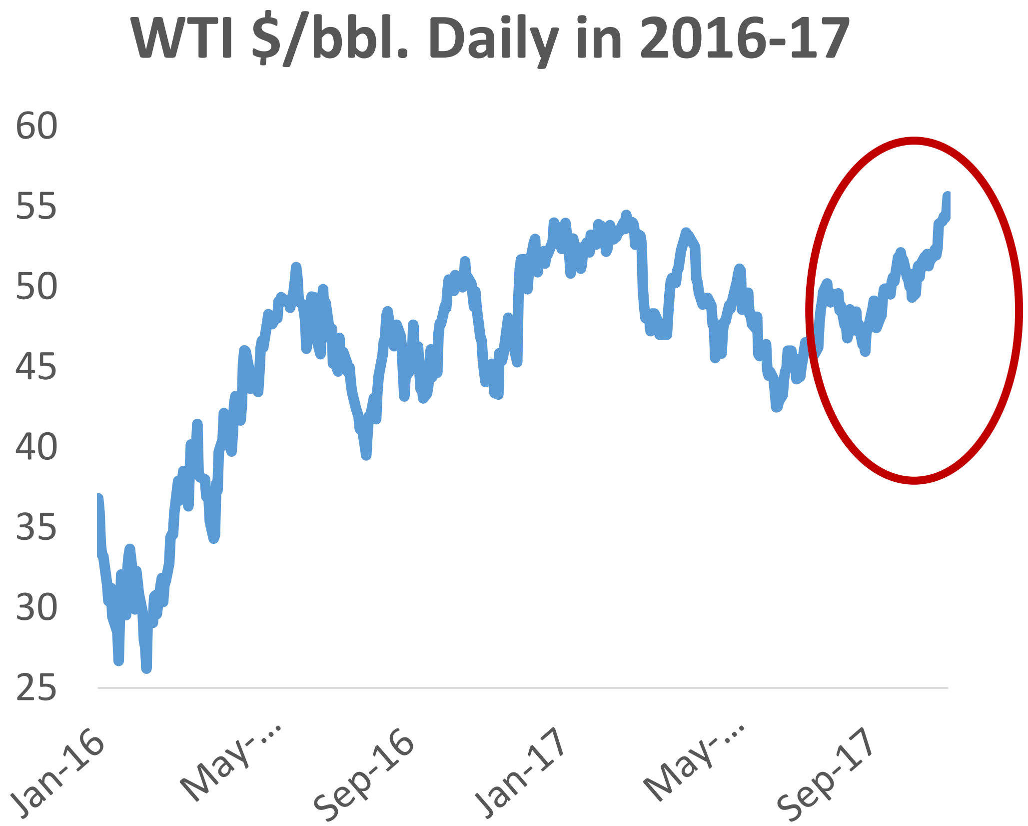
-- When do the Oil jobs come back? How many come back?

-- Can the U.S. fracking industry learn to pay attention to fundamentals?

-- Are recent Houston employment figures over-estimated?

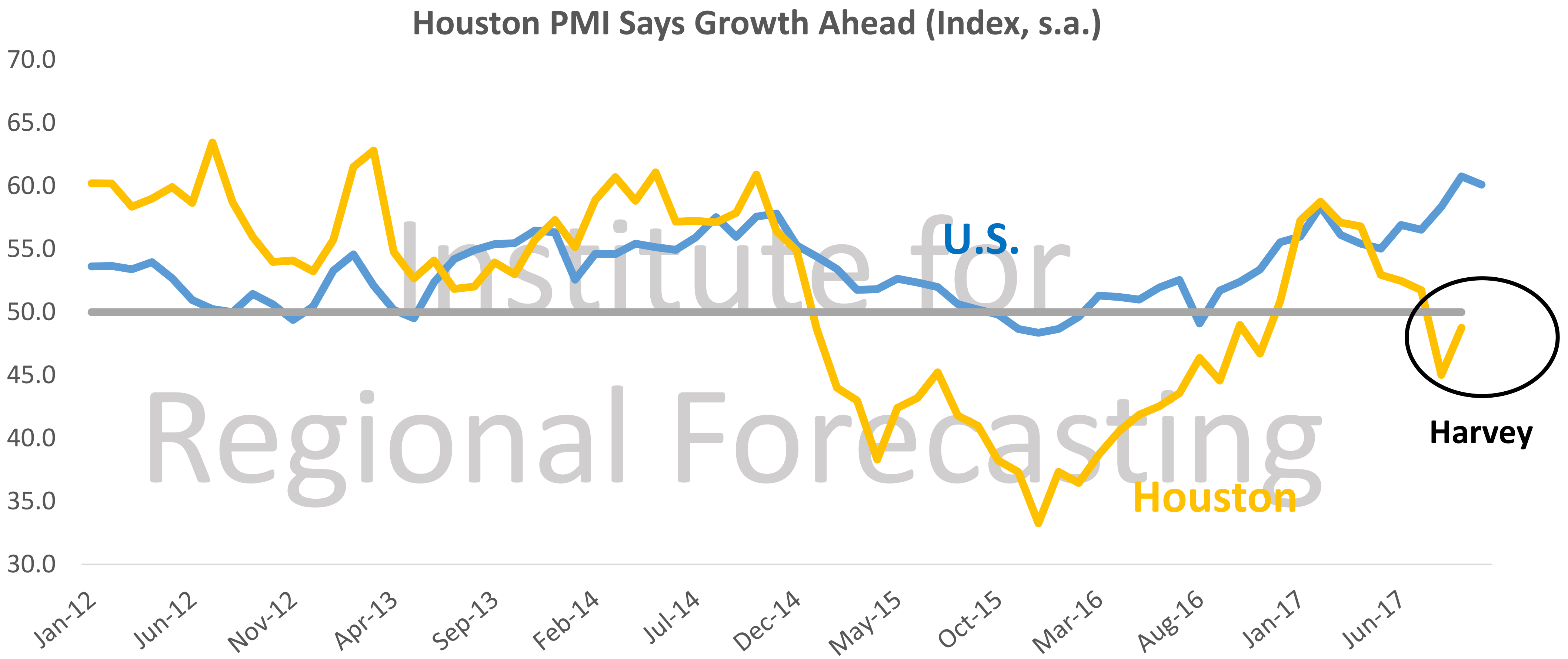
Oil Disappoints Again in 2017: Price Misses Expectations Set By OPEC





FRED, St. Louis Fed, Bloomberg to Nov 3

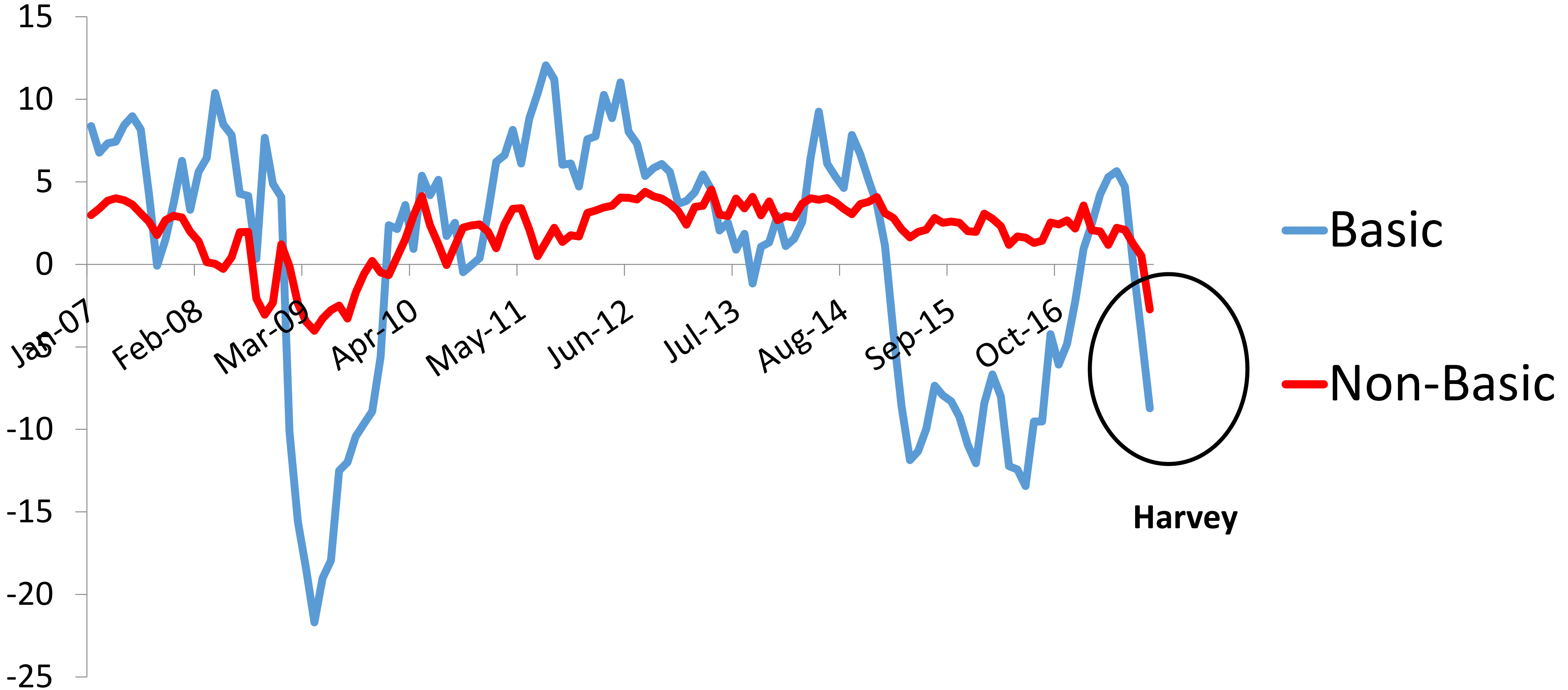
Purchasing Managers' Index Jumps Up in December, Peaks in February and Then Declines



ISM Houston and IRF calculations

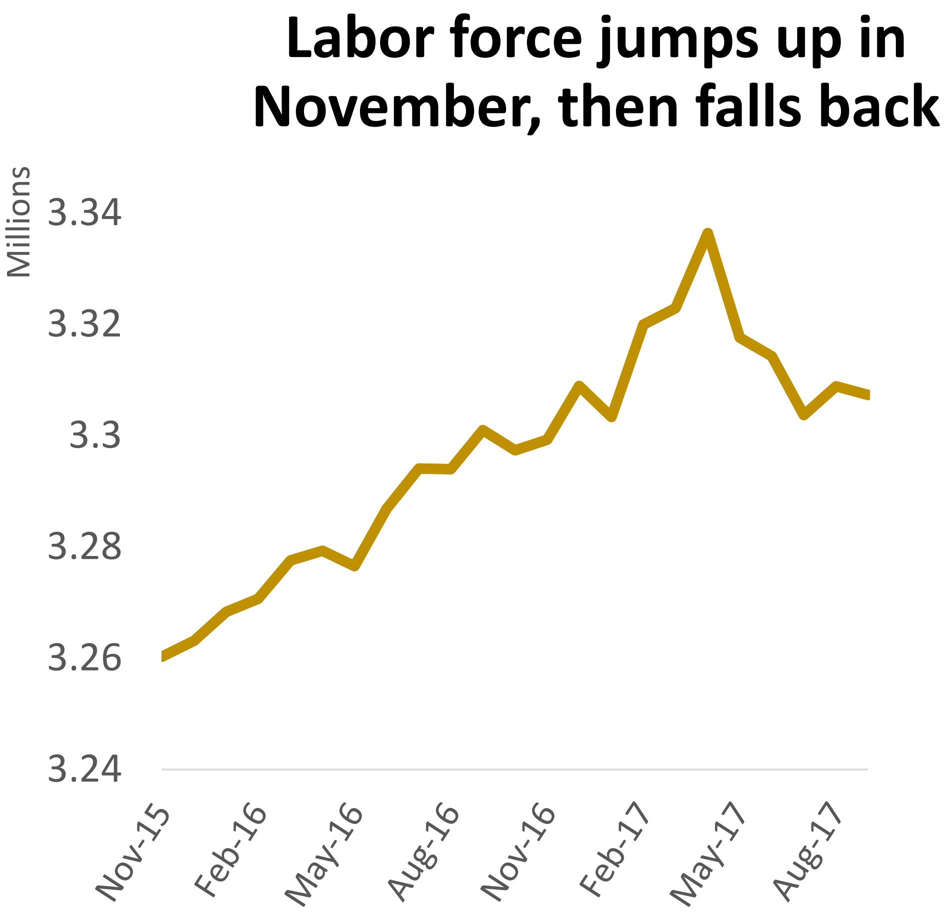
Houston's Economic Base Bounces Back On OPEC Accord, Peaks, and Declines

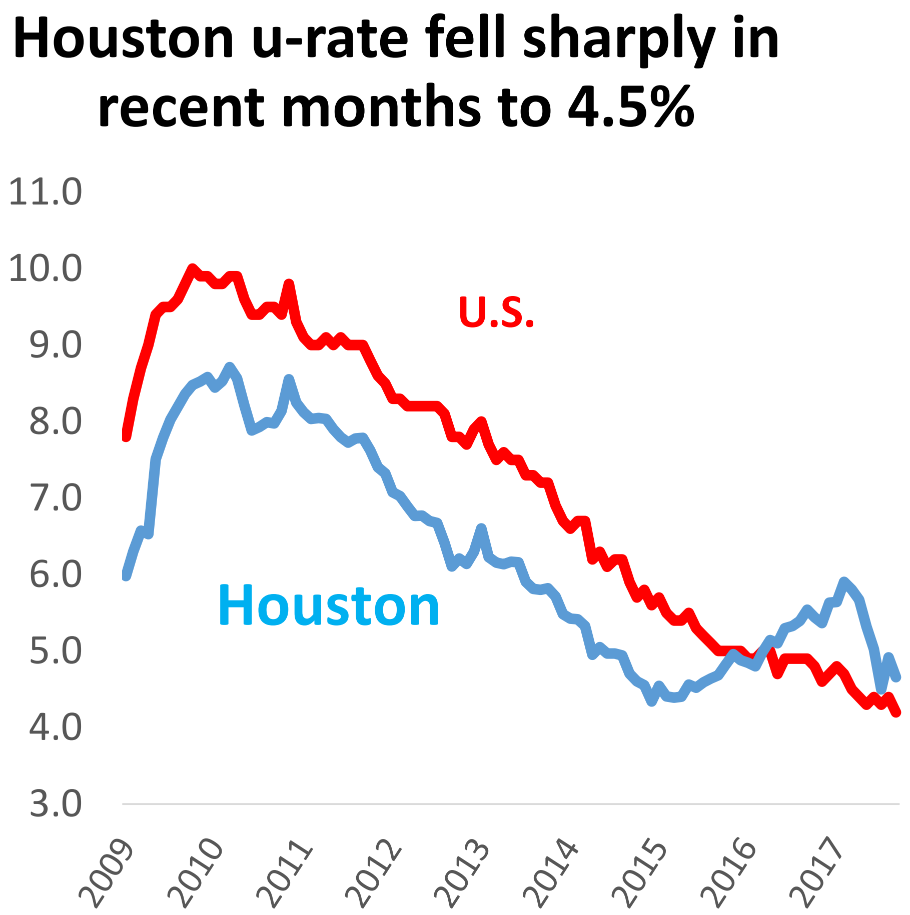
(3-mo percent change at annual rate)



Texas Workforce Commission and IRF calculations

OPEC Euphoria Drives Local U-Rate Up? Disappointment Drives It Down?

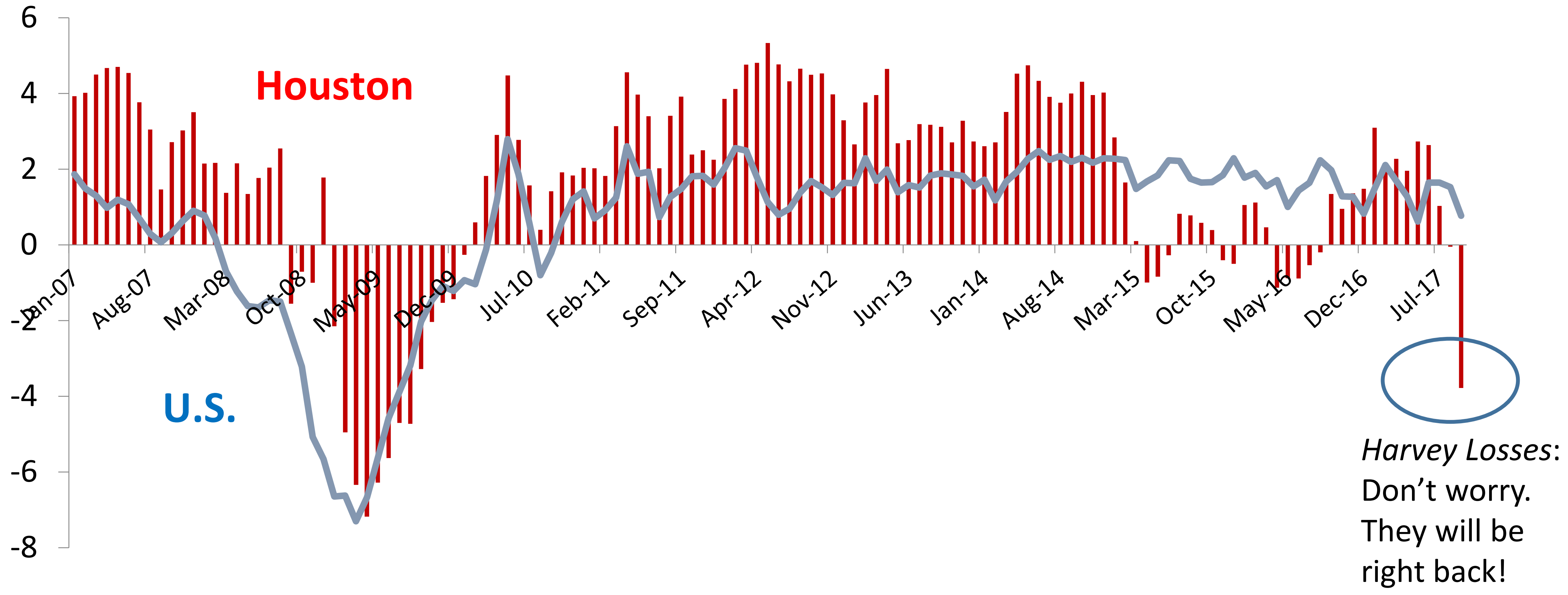




Texas Workforce Commission, seasonally adjusted to September 2017

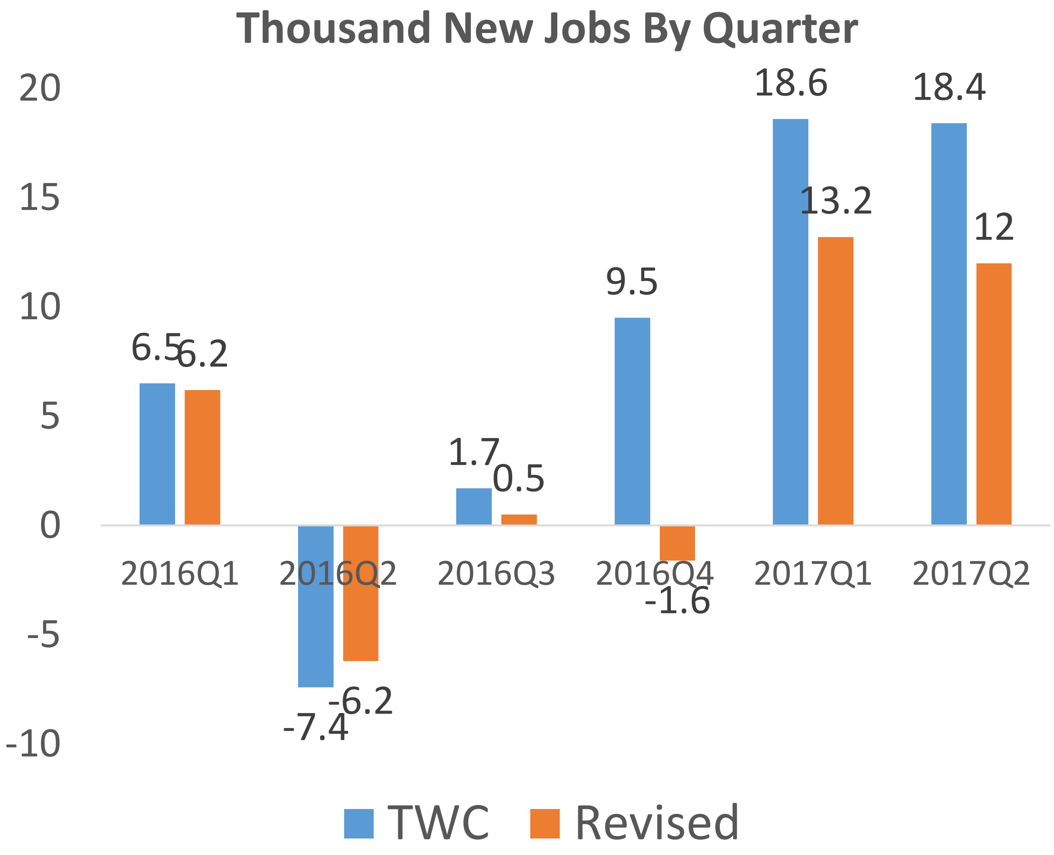
Solid Job Growth Is Back in Early 2017
Is it Real? Can It Continue?

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



Texas Workforce Commission and Bureau of Labor Statistics

Possible Revisions Cut the 4-Quarter Increase in Local Jobs from 48,000 to 24,000

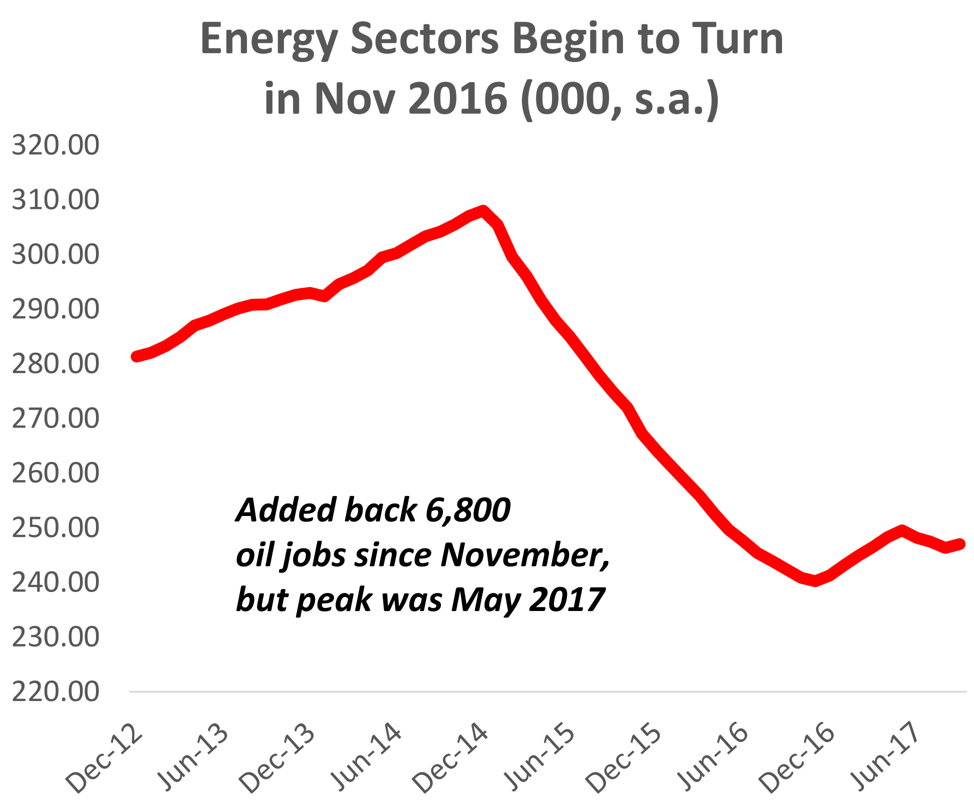


- Data to 2016Q3 is based on TWC's 2016 benchmark revisions
- Data for 2016Q4 and 2017Q1 are TWC estimates and Dallas Fed preliminary rebenchmark
- Data for 2017Q2 is a TWC estimate and an IRF model estimate
- The bottom line is a revised 4-quarter change in employment of 24,200 jobs, not TWC's 48,100

Oil-Related Job Losses Mostly Over, But Totaled 77,200 After Revisions

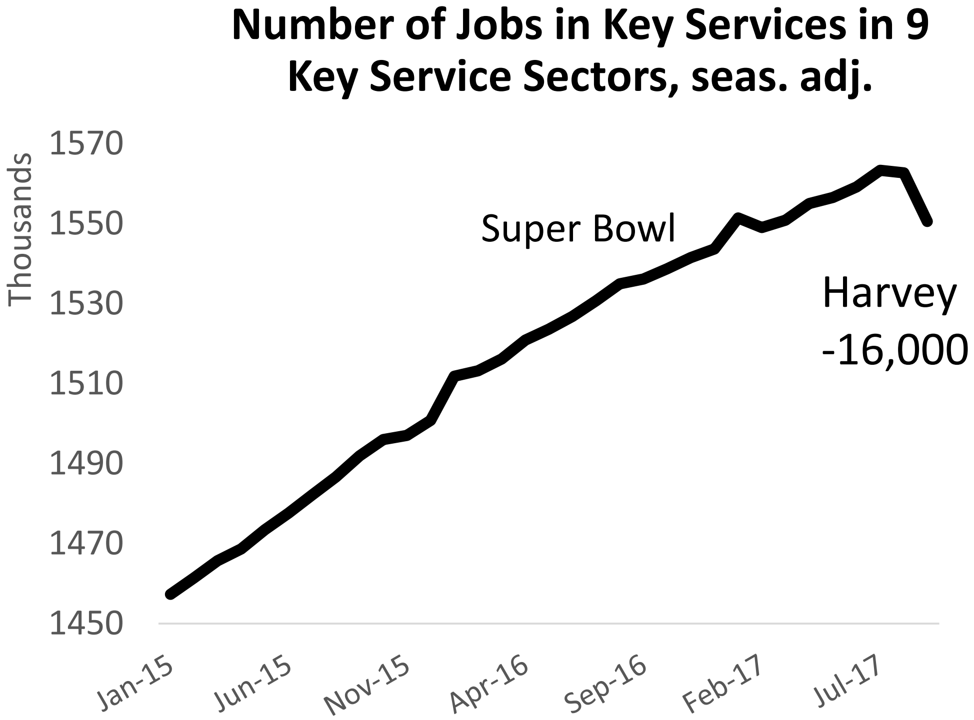
(Net Change in Jobs, Dec. to Dec.)

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%



*Texas Workforce Commission estimates. Oil-Related Jobs = Oil Producers and Services, Machinery and Fabricated Metal, Wholesale Trade, Pipelines, and Professional and Business Services. This I broader than the definition used above to compare to the 1980s.

Growth Of Selected Services Now Slowing Down?



Texas Workforce Commission

New Jobs Added:

Dec 2014 to Sept 2017

- 28,200 health care
- 20,400 local government
- 14,160 bars and restaurants
- 11,900 retail trade
- 9,100 finance
- 5,800 private education
- 2,900 arts/entertainment
- 4,200 state government
- 800 accommodation
- 97,264 all 9 sectors

Note: Includes effects of Harvey. Over 80 percent of 2017 growth in these sectors continues to come out of the top three categories above: health care, local government, and bars and restaurants.

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 36 months into this slowdown. The chemical boom is over; momentum has waned; net migration is evaporating. Only the U.S. economy left to help out … and renewed drilling activity. How strong will the economy be?

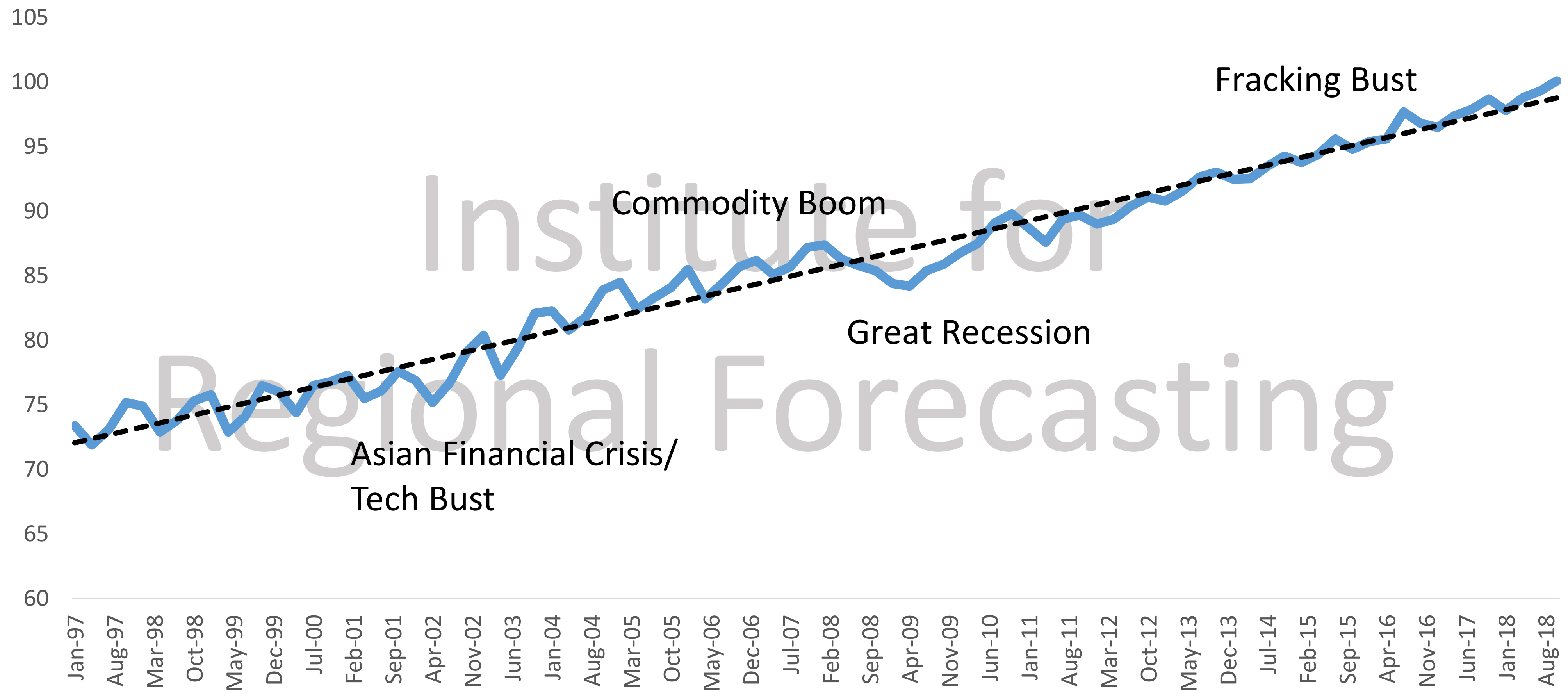
Lost Momentum?: Growth of Eight Secondary Industries in Houston

Industries are Arts and Entertainment, Food and Beverages, Private Education, Public Education, Retail, Accommodation, and Finance .
Calculation of 1.5% growth for 2017 excludes Harvey.

Houston's Growth:
It Is Still About Oil Markets

Global Oil Demand Has Grown Steadily After 2014: Low Oil Prices Are Supply Problem

(million bbl./d)



Source: International Energy Agency, *Oil Market Report*, various issues

Global Growth Slowly Accelerates: Provides Oil Price Optimism

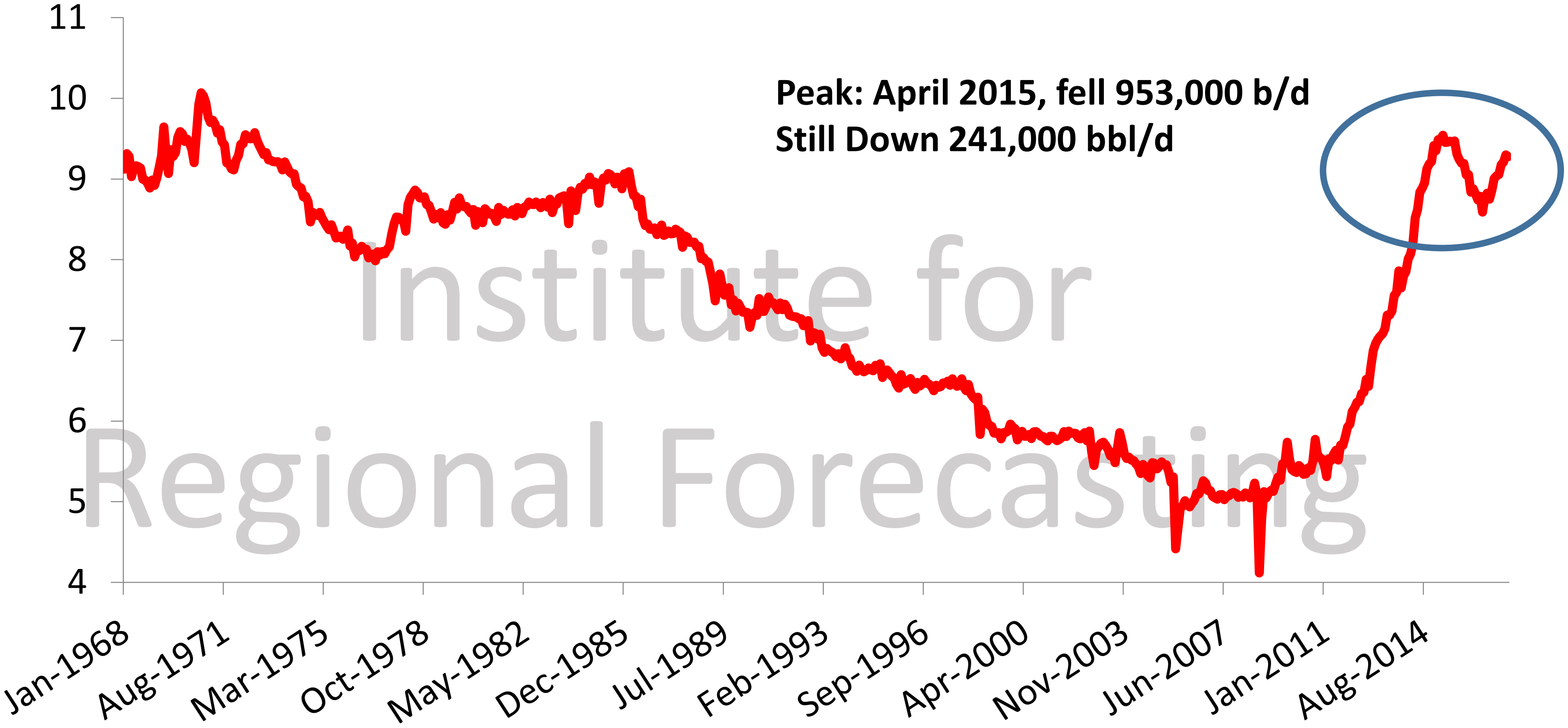
(% GDP Growth)

	2015	2016	2017	2018
World	3.4	3.2	3.6	3.7
U.S.	2.6	1.5	2.2	2.3
Euro Area	2.0	1.8	2.1	1.9
Japan	1.1	1.0	1.5	0.7
	---	---		
China	6.9	6.7	6.8	6.5
India	8.0	7.1	6.7	7.4
Brazil	-3.8	-3.6	0.7	1.5

Source: IMF *World Economic Outlook*: Oct 2017 Update

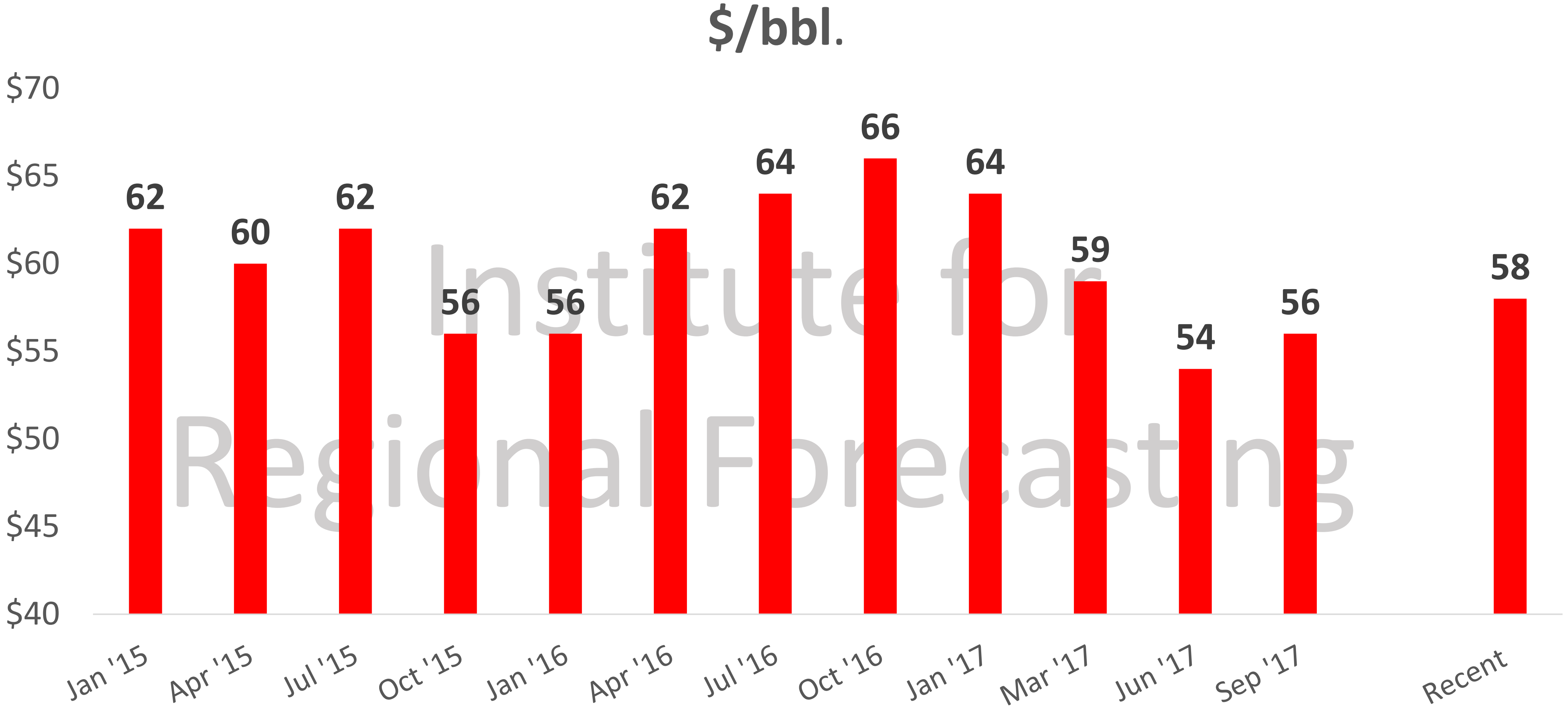
On Supply Side? U.S. Shale Reversed 40 Years Of Declining Oil Production

(million barrels/day, s.a.)



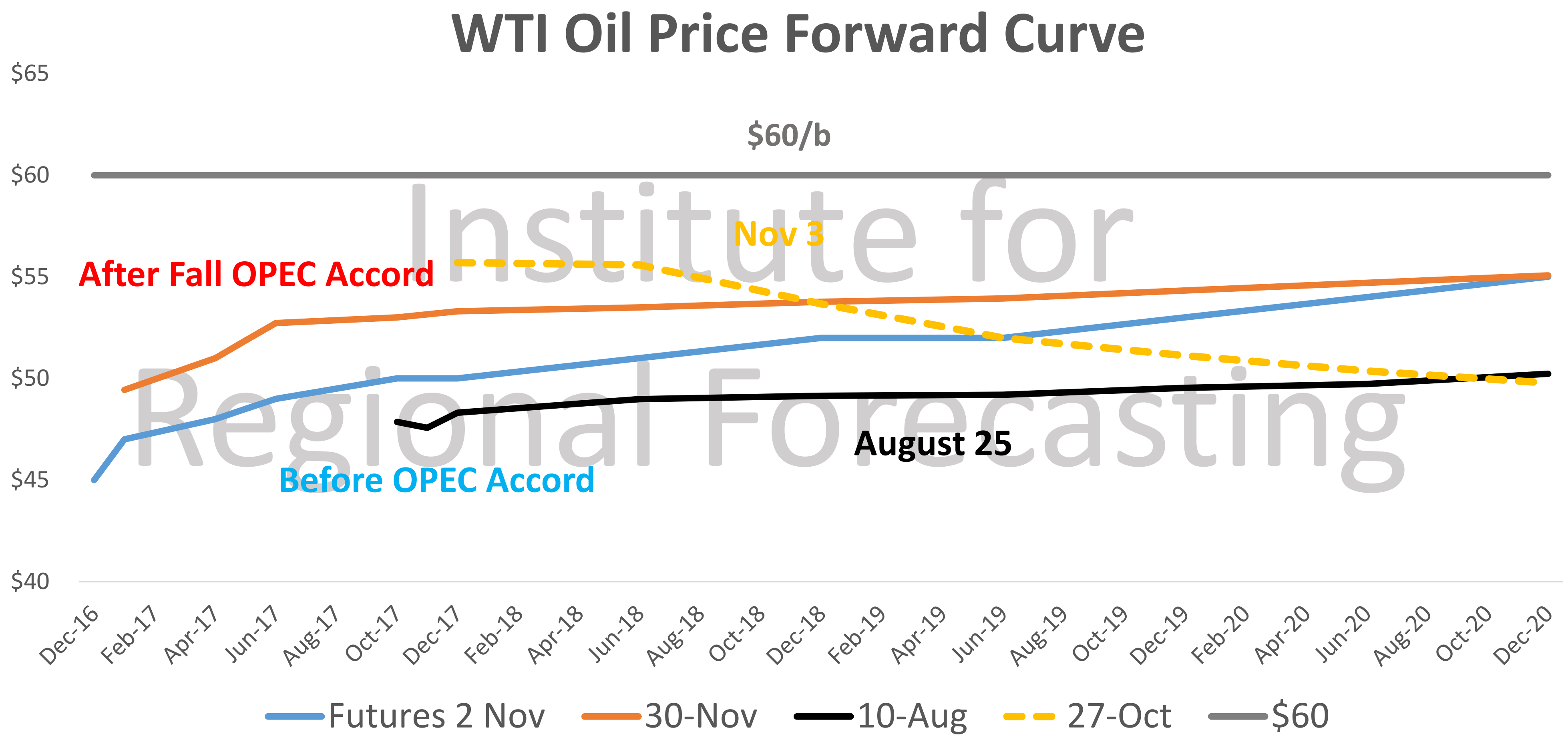
DOE/EIA, Seasonally adjusted by IRF

Long-Run Oil Price: WTI as Implied by Valuation Of Stock Values of 40 Oil Producers



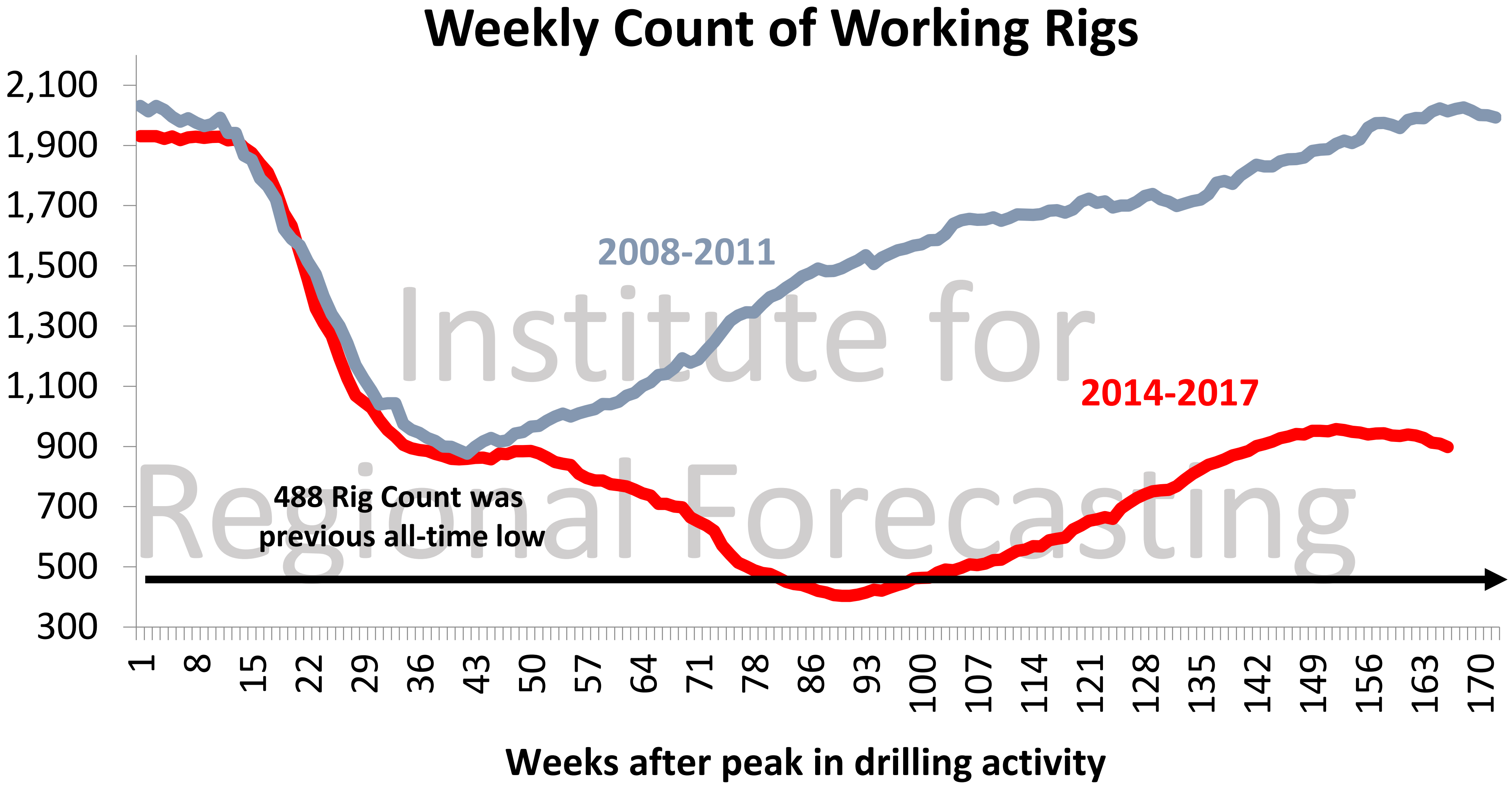
Goldman Sachs Research, at first week of each quarter

OPEC Optimism Reappears?
Another Go at "Whatever It Takes …"



CME Group

Drilling Turned Up Strongly in June 2016, But Now Is Peaking Again



Baker Hughes, IRF calculations

Mutual Destruction
By Increasing Production

Fracking Has Fundamentally Changed American Oil Production

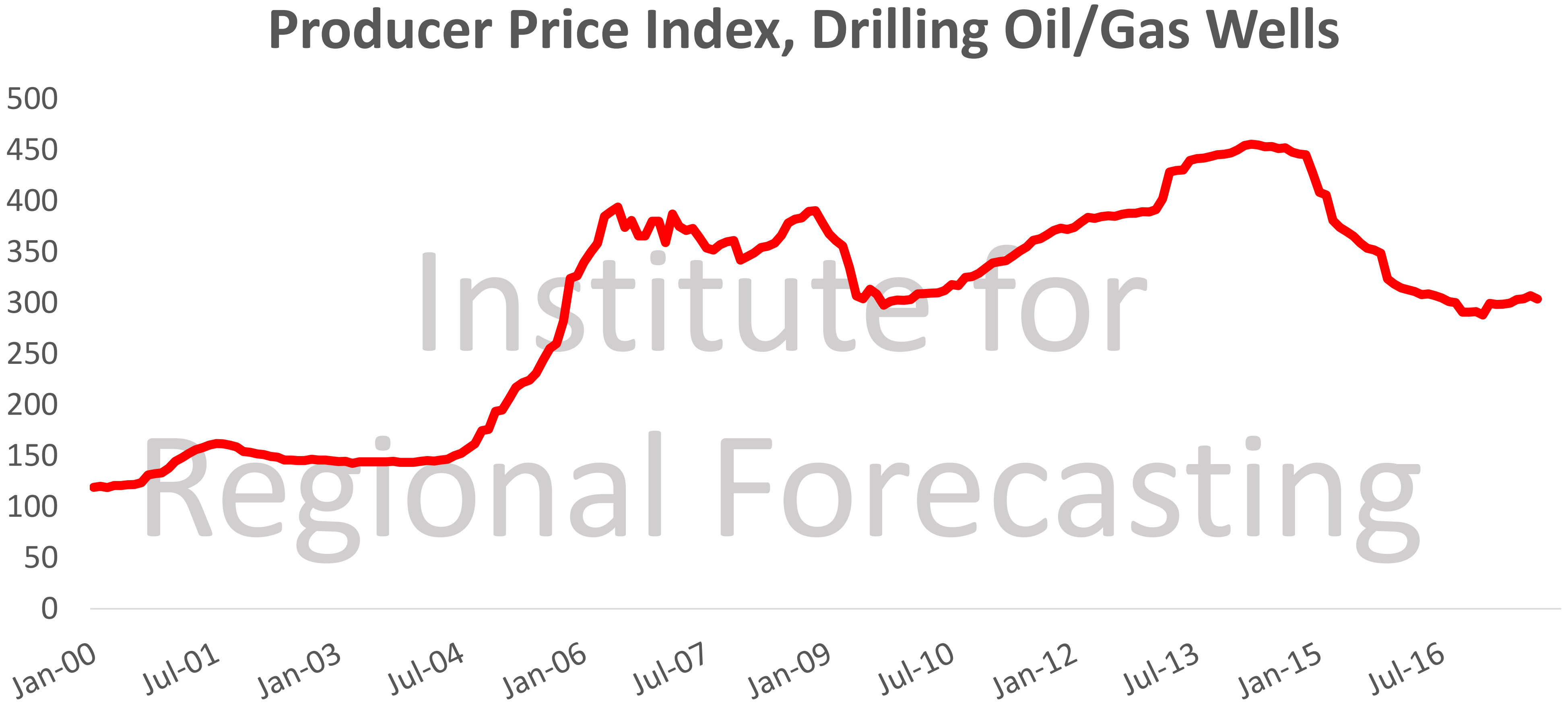
High Cost Oil at Low risk

- Looks more like a competitive industry
- Traditional exploration risk is gone, the oil is there
- Low barriers to entry for new producers, i.e., capital, some geology, leases, and a hire a service company
- Get a quick and certain rise or fall in oil production in response to changing oil price incentives

What Has Gone Wrong?

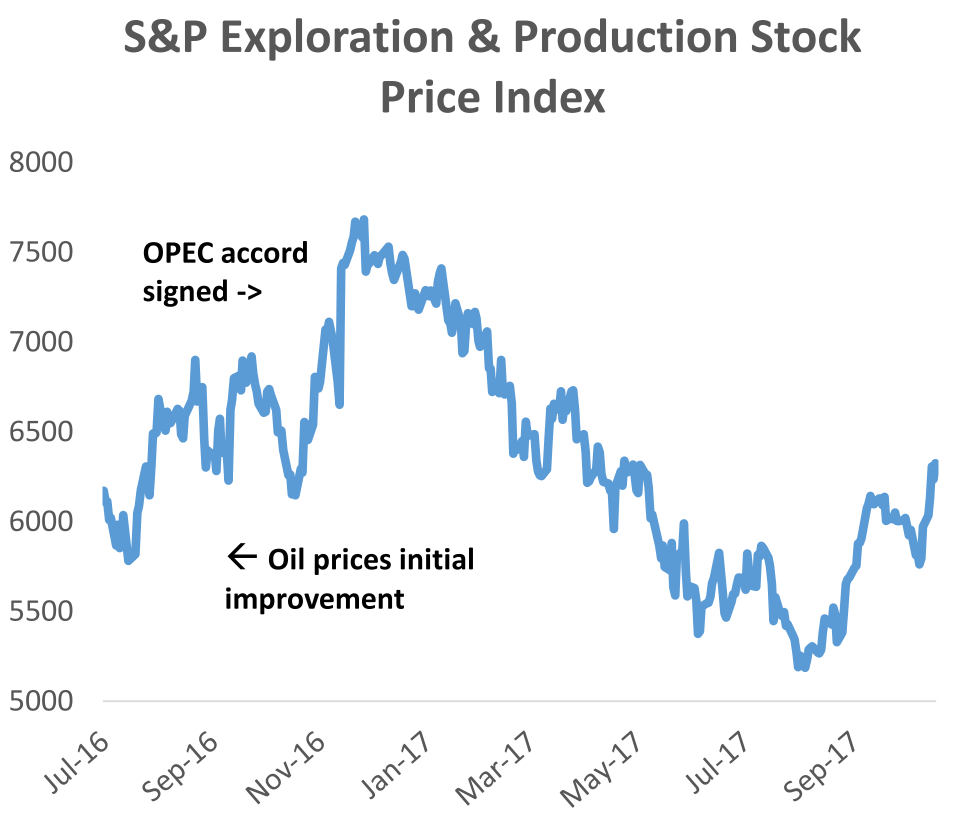
- How does highly competitive industry over-produce? Where is $60 oil?
- Ignoring profits over the oil-price cycle, seeking short-term gains in equity
- Facilitated by private equity and high-yield markets, providing “unbridled abundance of capital.”

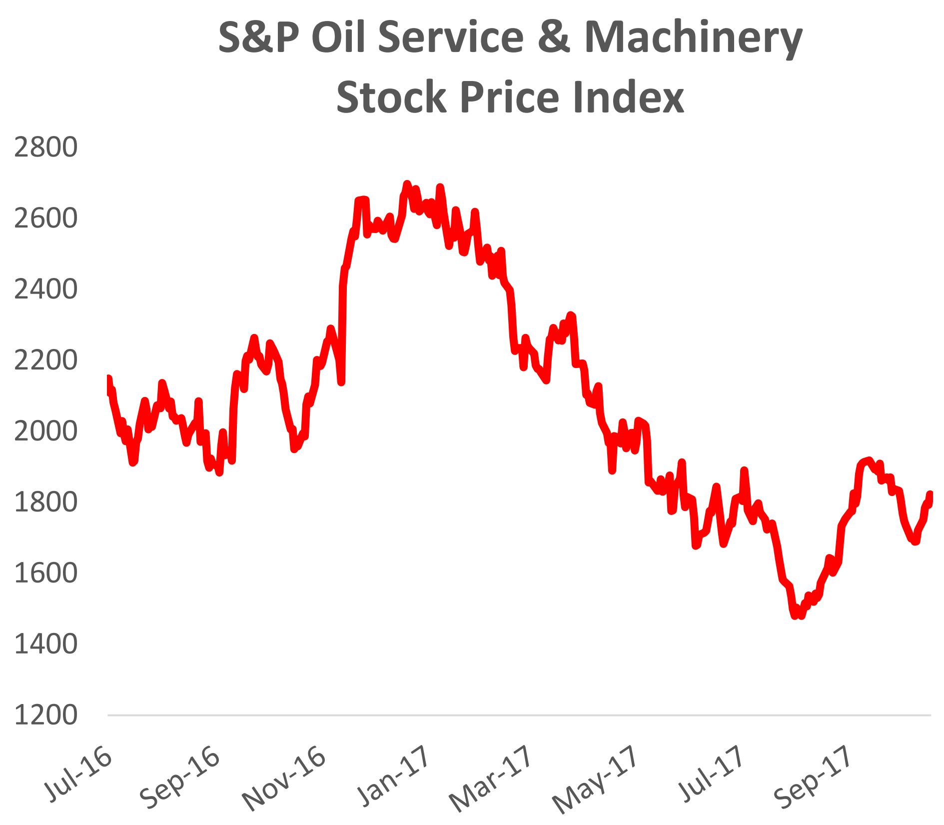
Cost of Drilling and Oil Services Remains Depressed Despite the Rise in the Rig Count



Bureau of Labor Statistics

If Oil Producers Were Chasing Equity Gains …
It Didn't Work for Them or their Suppliers





S&P Dow Jones Indices, to Nov 3

What Happens Now in the Oil Patch?

- **Current cycle broken?**
  - Drilling slows in the near-term, production falls, oil prices rise to near $60 per barrel
  - Producers show discipline, ignore cheap money, and low service costs with focus on the long run
  - Can we really expect them to ignore these powerful incentives to drill?
- **Or current cycle of Mutual Destruction by Production continues?**
  - After the current pause in drilling, producers respond to rising oil prices by out-spending cash flow to drill and build reserves
  - Conditions in the oil patch briefly improve with higher drilling levels, machinery orders, new oil-related jobs
  - But then oil production rises too fast, oil price falls, drilling cycles down, and the down-phase of a new cycle begins

Building Scenarios For Recovery In Oil

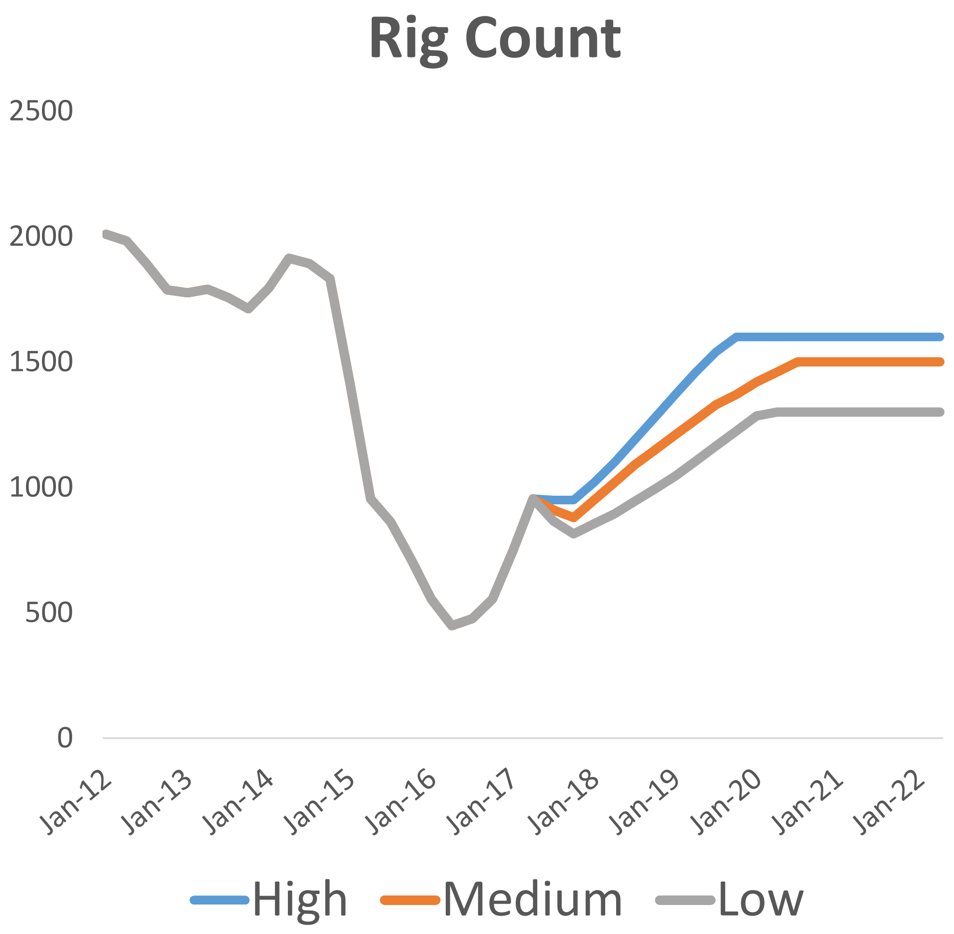
- When will oil prices hit bottom? ***2016Q1***
- When will the rig count turn up? ***2016Q3***
- When do oil jobs begin to return? ***2017Q1***
- *What path does the rig follow from current peak?*
- *How high will the rig count go in this recovery?*
- *How long before the rig count reaches these highs?*

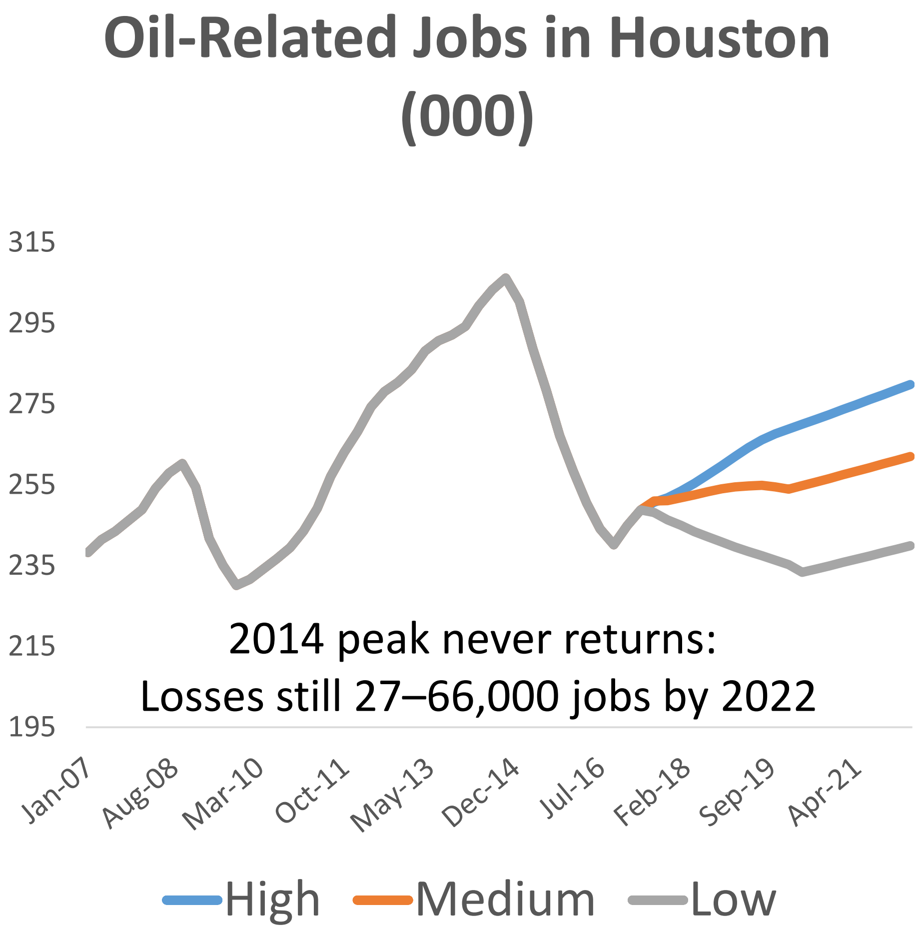
Three Scenarios for a Drilling Recovery

- **Rig Count?**
  - *High Scenario*: The rig count stalls in mid-2017 but no reversal
  - *Medium Scenario*: Rig count sees moderate reversal in 20172H, then moves back on track
  - *Low Scenario:* falls back in 2017 Q3, remains low and slow through 2018
- **Rig Count Max After Recovery?**
  - High Scenario: 1600
  - Medium Scenario: 1500
  - Low Scenario: 1300
- **Return of Drilling Jobs in Houston?**
  - Turn up came in 2017Q1
  - Hiring slow to 2018Q3 in high/medium
  - Low Scenario: Limited hiring continues to 2020

High scenario requires a rebound in oil prices to $55, and sustained 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 2017-18.

Rig Count Scenarios: No Return Of Local Oil Employment to Peak

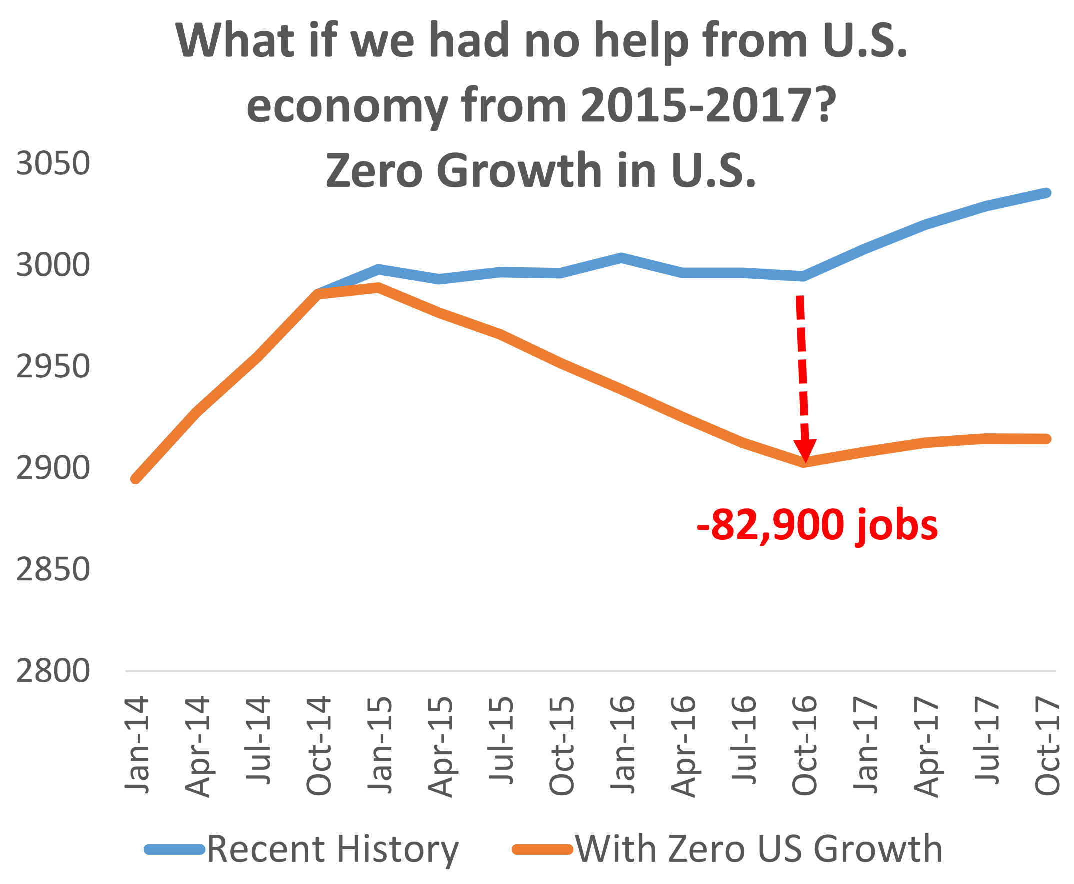


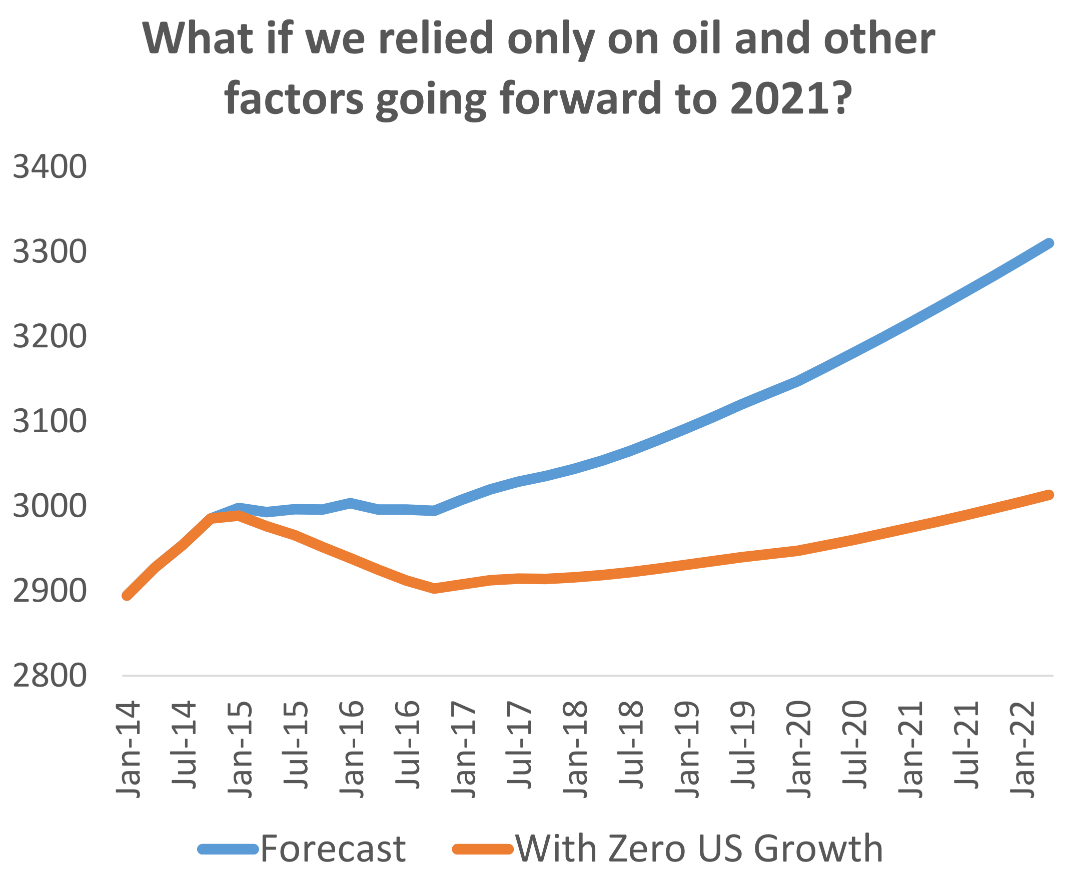


This is a broader definition of oil jobs than used in the initial slides that are comparisons to the 1980s events

The U.S. Economy Continues to Work Well for Houston

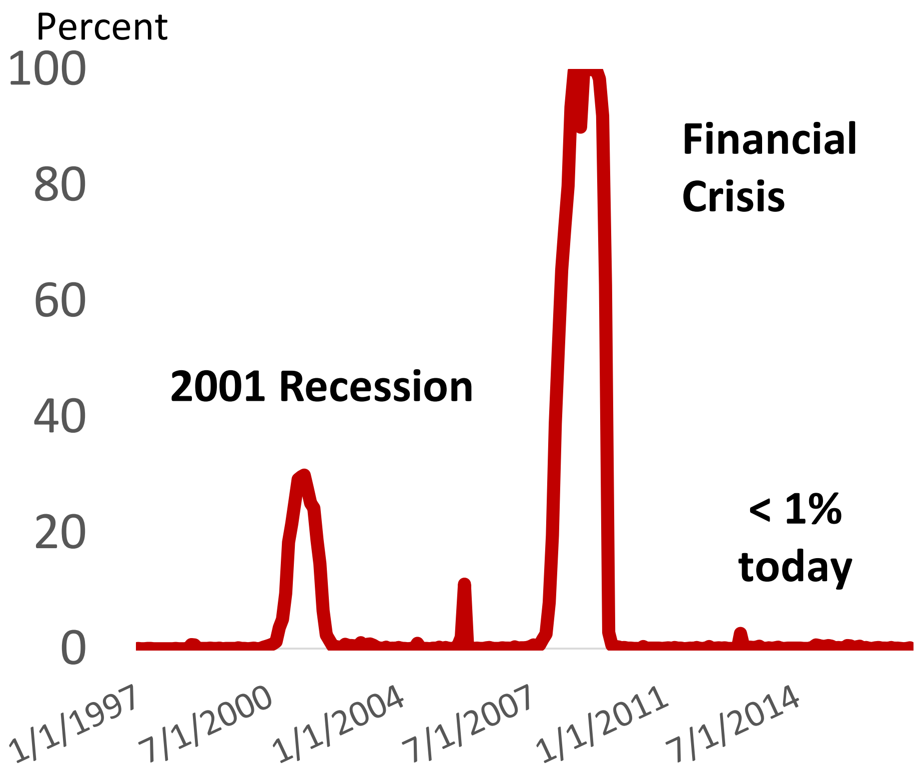
Does the U.S. Matter Much to Houston?
We Would Be In a Difficult Place Without It





Moderate U.S. Recovery Continues

Chance of Recession About One Percent Today



Consensus Forecast Is Not Too Hot, Not Too Cool

	Real GDP (%)	Unempl Rate (%)	Payroll Jobs ('000/mo)
Quarterly Data:			
2017Q3	2.6	4.3	186.4
2017Q4	2.3	4.2	161.0
2018q1	2.2	4.2	155.6
2018Q2	2.4	4.1	162.5
2018q3	2.4	4.1	165.4
Annual Average:			
2017	2.1	4.4	180.4
2018	2.4	4.2	165.8
2019	2.2	4.3	NA
2020	2.0	4.3	NA

Source: Chauvet and Piger smoothed recession probabilities, FRED, St. Louis Fed; Philadelphia Fed, *Survey of Professional Forecasters*, August 11 2017.

Fed's Slow Track on Rates Continues: But Still Risk From Monetary Policy

Fed Funds futures see only two increases

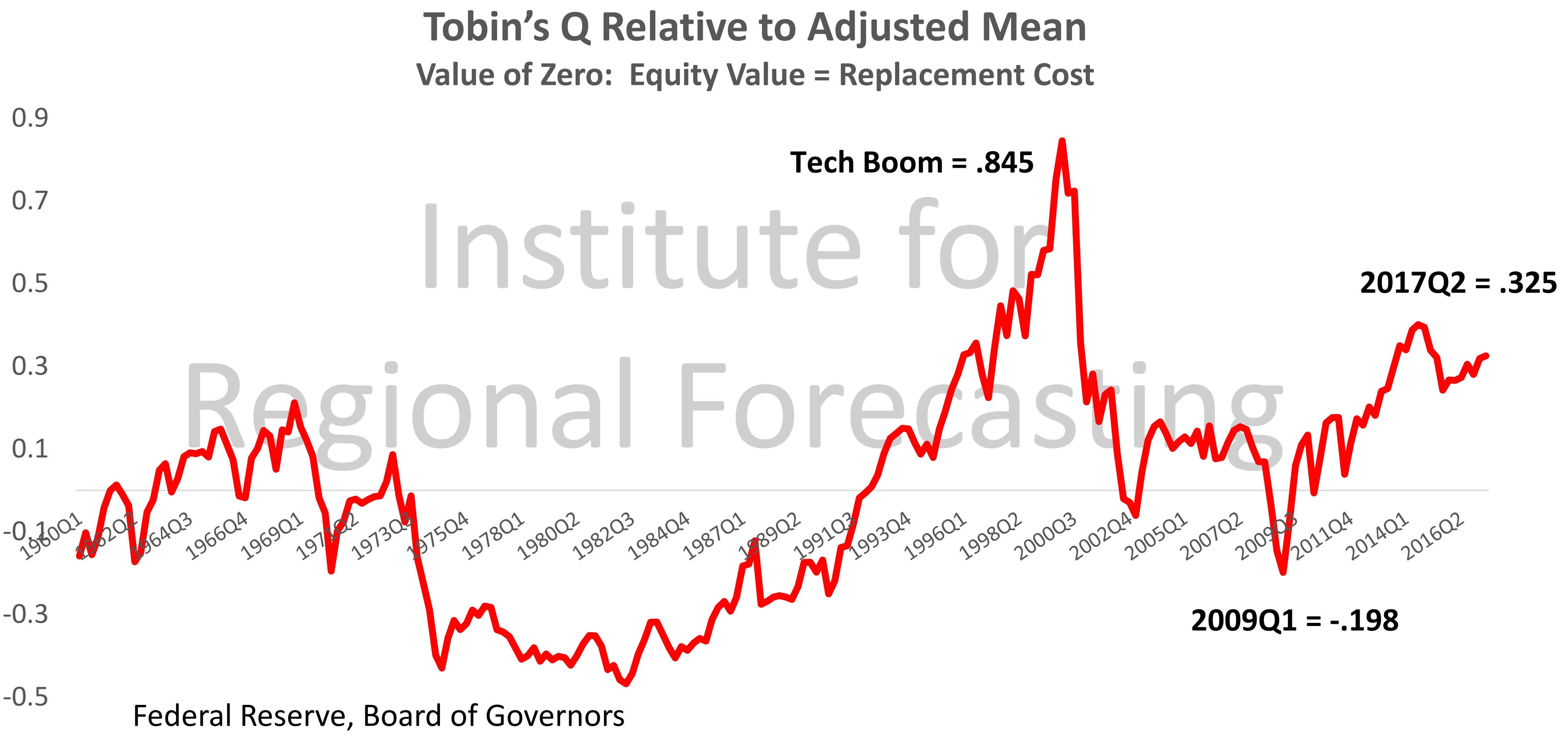
Meeting Date	Range b.p.	Prob. of Increase	Change
1-Nov	100-125	1.5%	**None**
13-Dec	125-150	96.7%	**+**
31-Jan	125-150	15.4%	**None**
21-Mar	125-150	42.6%	**None**
2-May	125-150	45.6%	**None**
13-Jun	150-175	66.1%	**+**
1-Aug	150-175	22.0%	**none**
26 Sept	150-175	34.0%	**None**

But there are still new risks

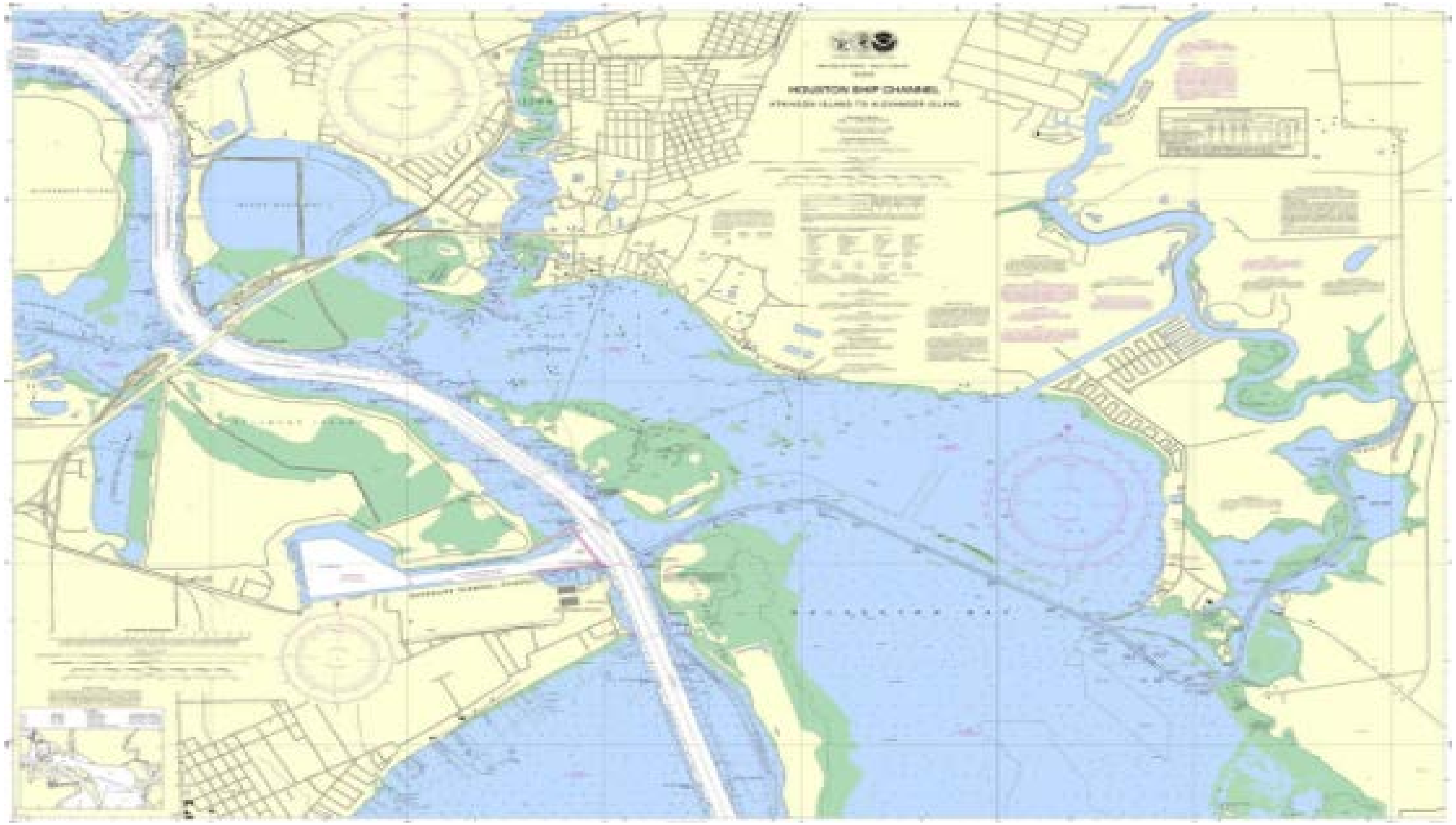
- Yellen reappointed? Or new Chair? More or less aggressive on rates?
- Fed begins to shrink the balance sheet in 2018. Another taper tantrum?
- Rising rates will strengthen an already strong dollar?
- Does tightening risk inflation as large quantities of M2 begin to matter again?
- Will rising rates expose asset bubbles? In commodities like oil? Or in the stock market?

Source: CME Group, 11/3/2017. Table assumes as soon as probability of a rate increase passes 50% an increase is triggered of 25 basis points.

Stock Market:
Tobin's Q Says Over-Valuation Is 32.5%



Houston's Downstream Petrochemical Boom Is Over for Now



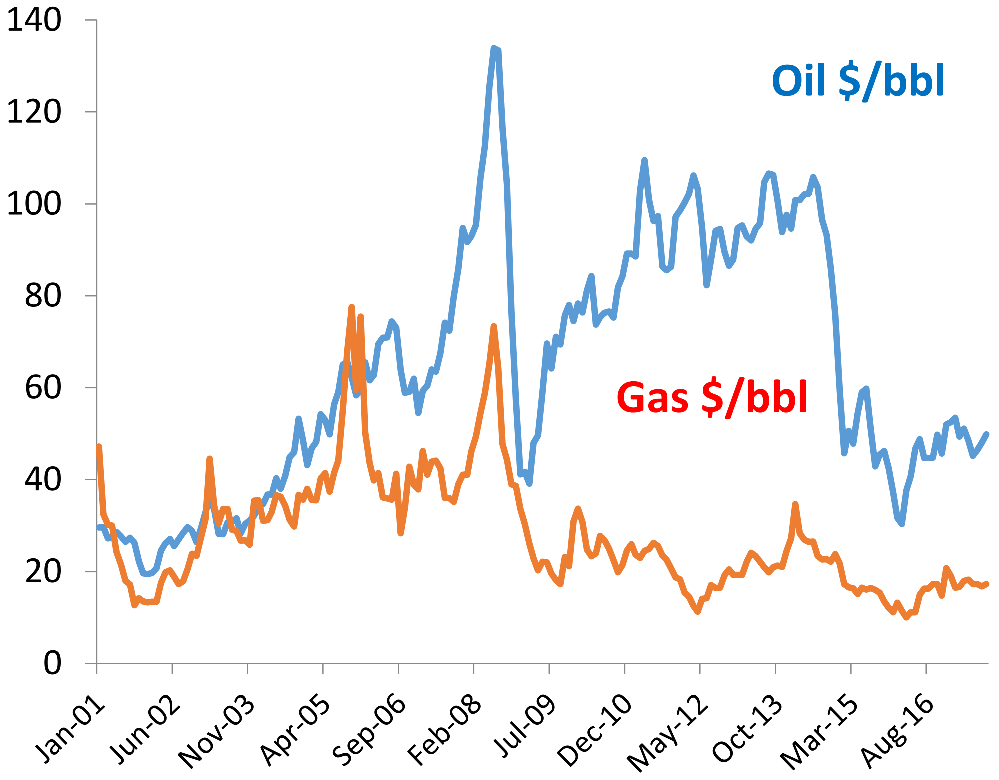
$185 Billion U.S. Construction Boom Is Based On Cheap Energy

- This $185 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 June 2017

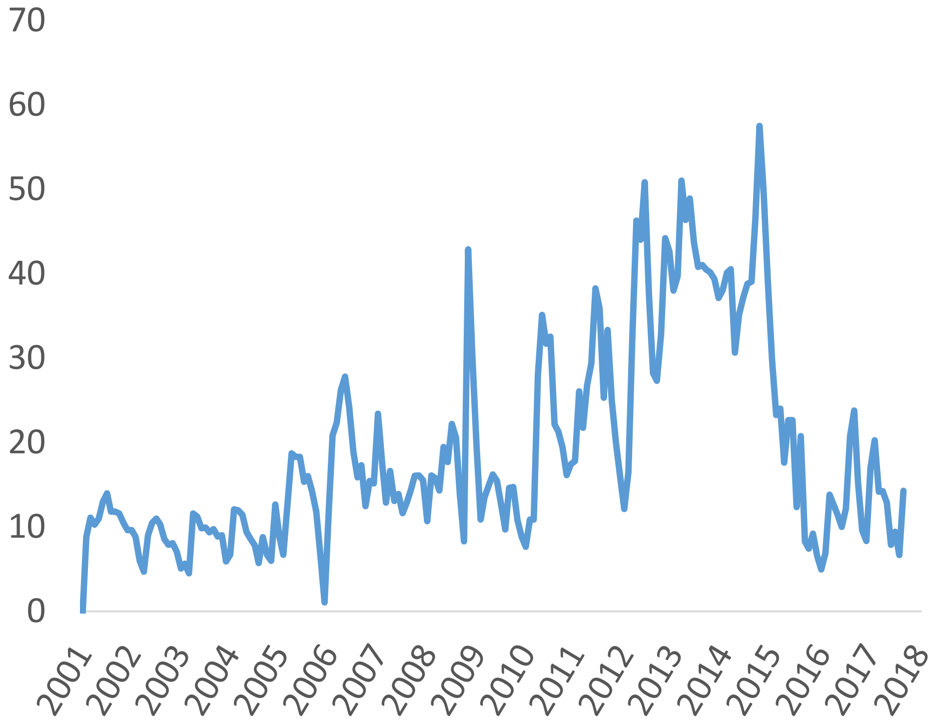
Natural Gas Energy Content Now Equivalent $16 per Barrel For Oil

Huge Feedstock Advantages for Oil Over Natural Gas



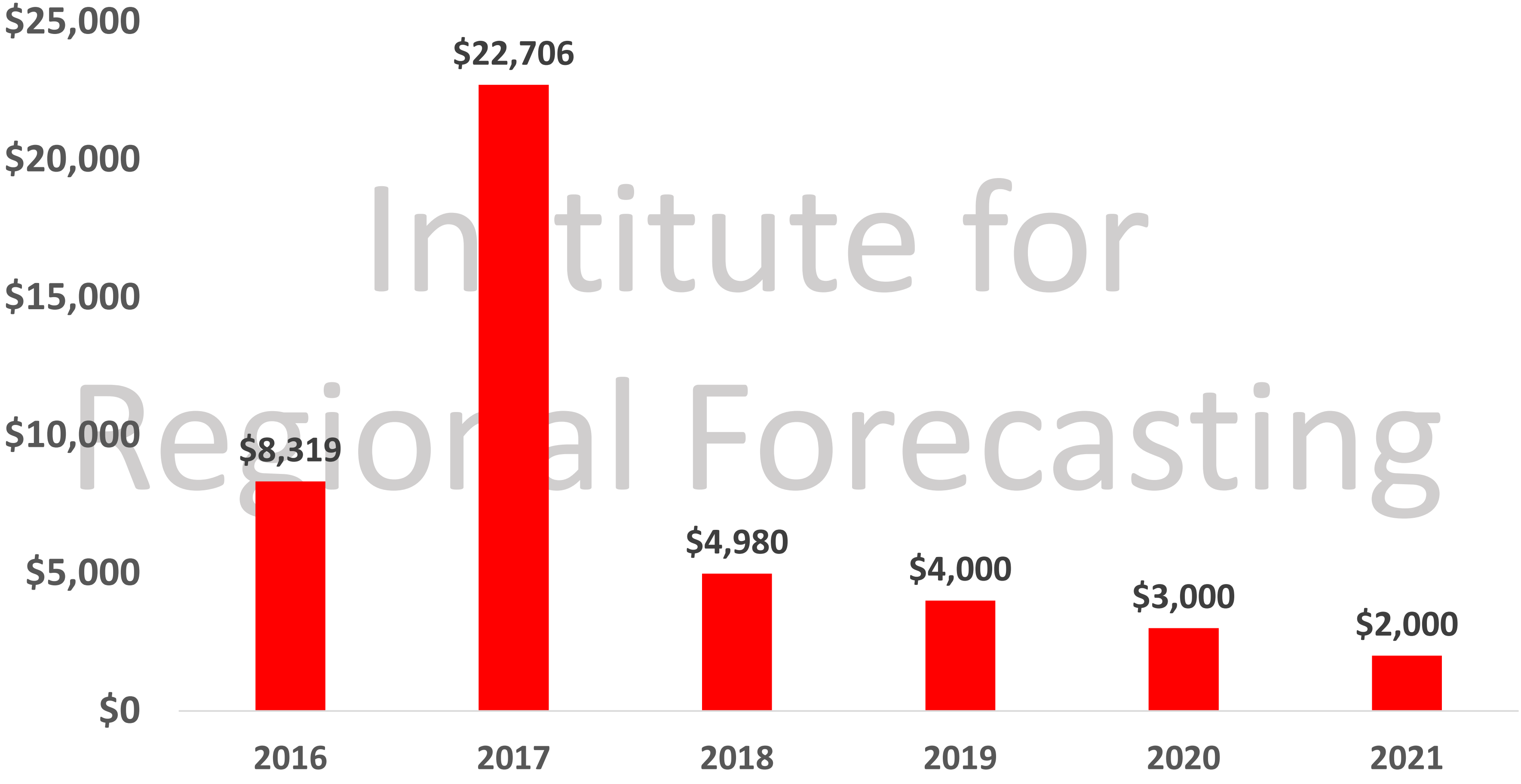
DOE/EIA and calculations of the author

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



Projects Begin To Wind Down Rapidly In 2017

(Value of Projects Completed, $ million)



The Big Push in Ethylene & Polyethylene is Over

Ethylene Finishes Up

Company	Where	Status
Houston area		
ChevronPhillips	Baytown	Complete
Dow	Freeport	Complete
ExxonMobil	Baytown	Complete
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	Complete
Dow	Freeport	Complete
ExxonMobil	Mont Belvieu	Complete
Ineos/Sasol	LaPorte	Complete
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 now sees drilling recovery stall but no reversal in drilling; medium sees reversal until early 2018; low reversal and slow improvement only after late 2018
- Continued U.S. expansion at moderate rates
- Continued drag from the end of the East Side petrochemical construction
- Momentum from the fracking boom is gone
- Data revisions that point to possible mild local recession in in early 2016.

Forecast Job Growth Is Slow As Drilling Momentum Stalls & Reverses

(000 New Jobs, Q4/Q4)

By Scenario

Year	High	Medium	Low	10/65/25
2014	112.7	112.7	112.7	112.7
2015	11.0	11.0	11.0	11.0
2016	-1.5	-1.5	-1.5	-1.5
2017	65.8	41.1	30.3	40.9
2018	69.9	42.1	20.5	39.5
2019	87.2	56.0	35.7	54.0
2020	87.5	64.5	46.1	62.2
2021	90.1	73.2	62.9	72.3

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

Forecast Compared to May Outlook

(000 New Jobs, Q4/Q4)

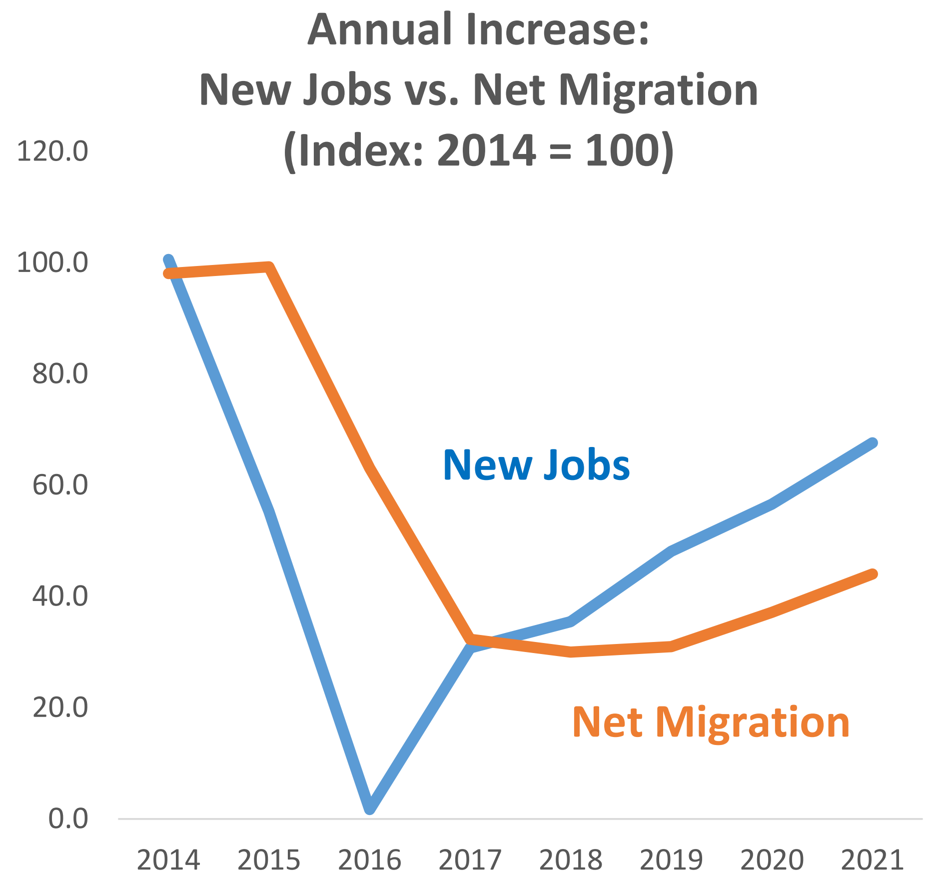
By Scenario

Year	This forecast Medium	May Symposium Medium
2014	112.7	112.7
2015	11.0	11.0
2016	-1.5	10.8
2017	41.1	35.2
2018	42.1	52.6
2019	56.0	68.0
2020	64.5	74.1
2021	73.2	78.8

Calculations of IRF, based on drilling scenarios above. Figures are Q4/Q4. The calculations include Dallas Fed preliminary benchmark revisions through 2017Q1.

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 10/65/25 weighted employment forecast, sees a 2018/19 trough with about 30,000 net migrants



Houston Housing Market Returning to Its Moderate-Price Roots

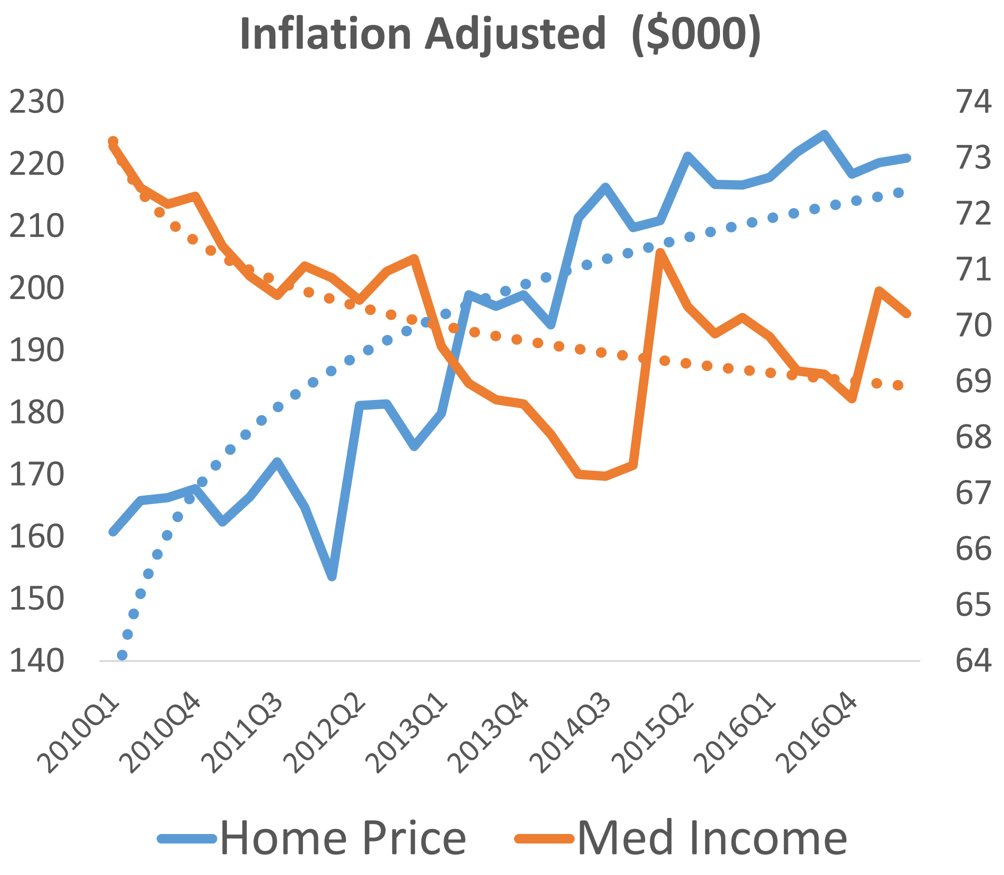
Harvey Mostly Brought Single-Family Housing Problems in Existing Neighborhoods

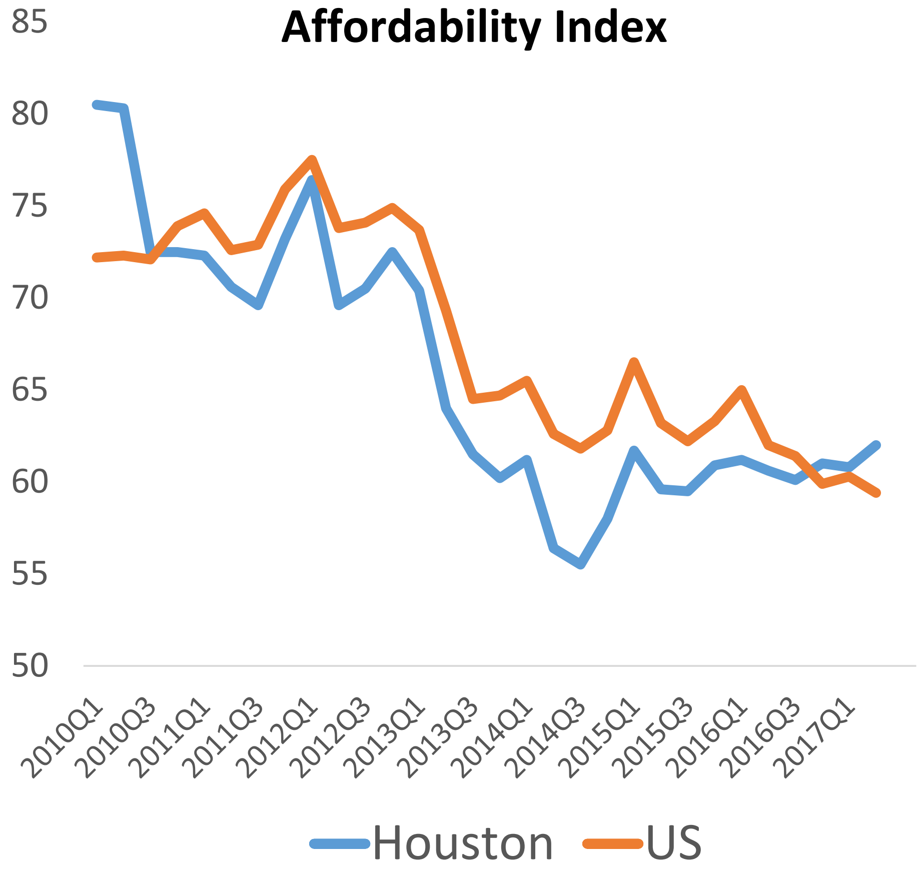
- *Existing homes*
  - Saw the fall in August closing as Harvey approached. Sales bounced back strongly in September, rentals soared to all-time records
  - About 97,000 homes were affected: 58,675 affected but quickly habitable with repair (2.4% of housing stock); 35,678 homes had major damage (1.5%), but habitable within 30-days; 2,598 homes were destroyed (0.1%)
  - 83% of Houstonians had no flood insurance. Even if you had it, big deductibles and limited total coverage. About half the flooded area was outside the 500-year floodplain. Financial problems for homeowners and mortgage holders ahead?
  - What happens to the value of homes in affected neighborhoods? Single-family REITS and other investors are actively acquiring damaged, single-family units
- *New Home Construction*
  - Limited damage to homes or infrastructure in active developments. Concerns about labor and materials cost are major short-term effect
  - Looking ahead will we see additional flood control or drainage requirements for large single-family tracts?

Back to the Basics: For the Last Decade Houston Lot Development Has Been Out of Step

- 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 – just 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

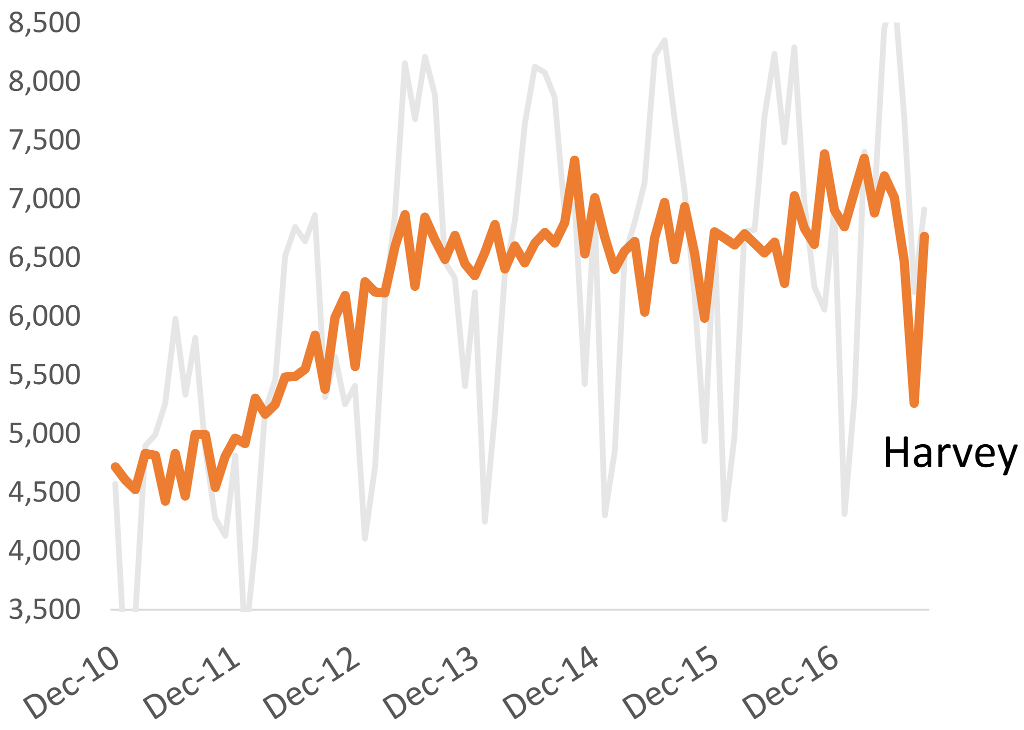
Houston's Home Affordability Hurt By No Income Growth and Rising Home Prices





Sales Rise as In Recent Months Along With Optimism About Oil Markets

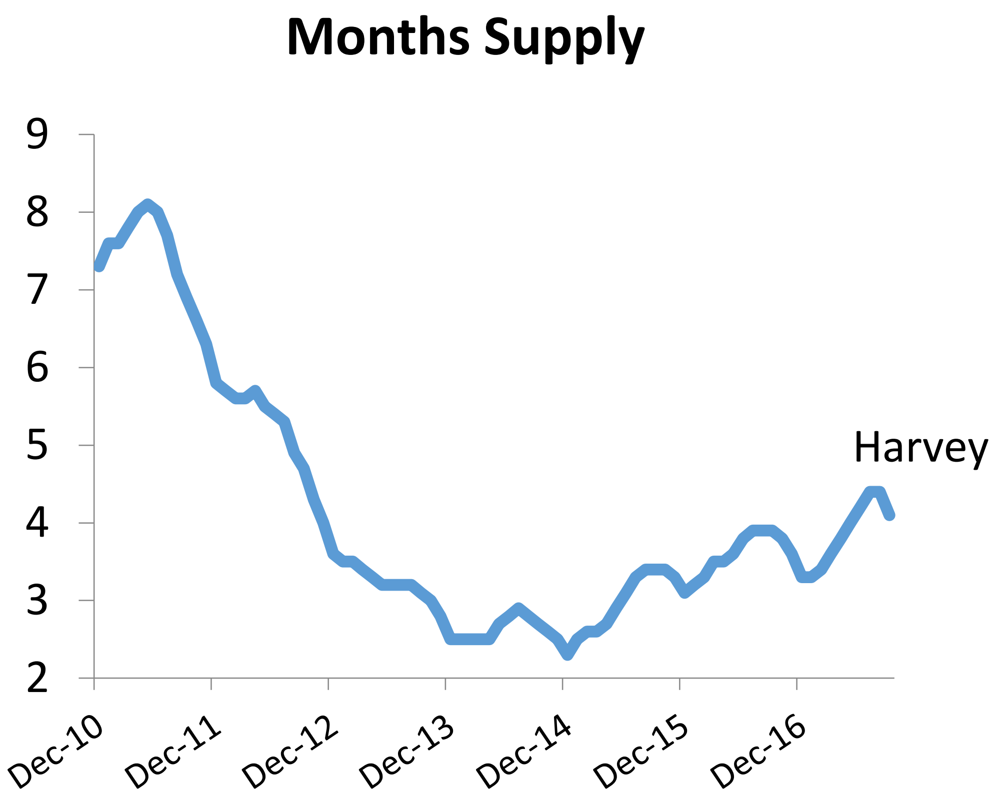
(sales, s.a.)

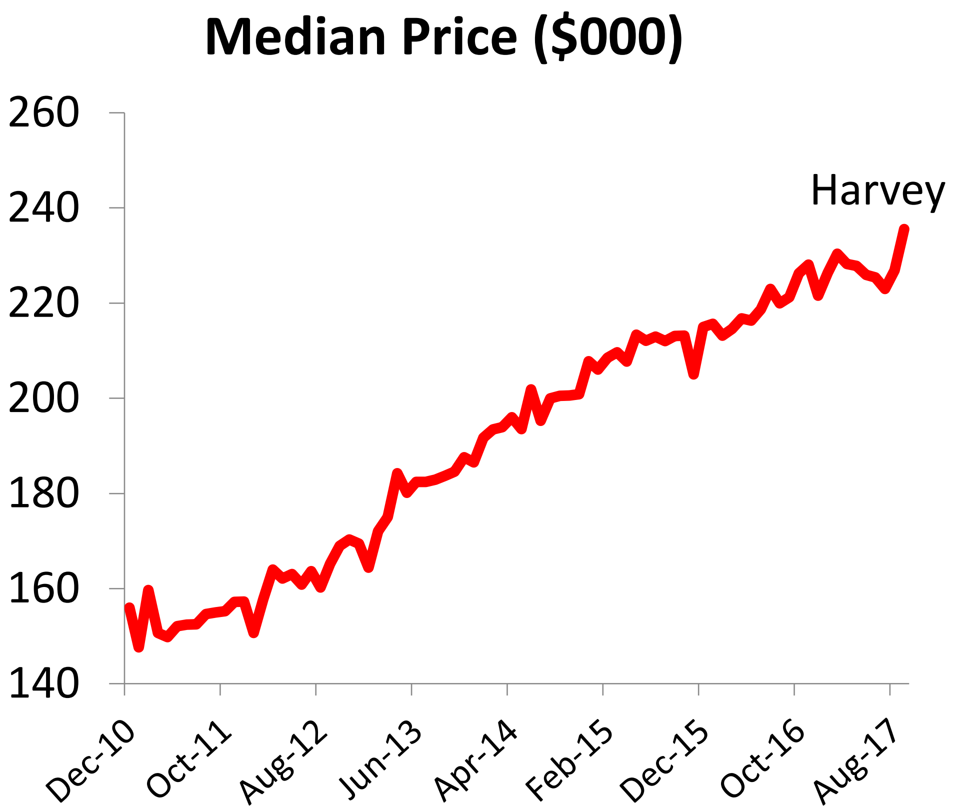


Source: Texas A&M Real Estate Center

- Flat since 2012? First, sales flat due to a lack of existing and new home supply. There was nothing left to sell. Then in 2015, demand softens
- But oil bust drives changes beneath the surface, as existing home market moved downscale in price and home size
- November OPEC accord pushes a lot of people off the fence about both listing and buying a house
- Before Harvey, market slowly loosening as inventories rise

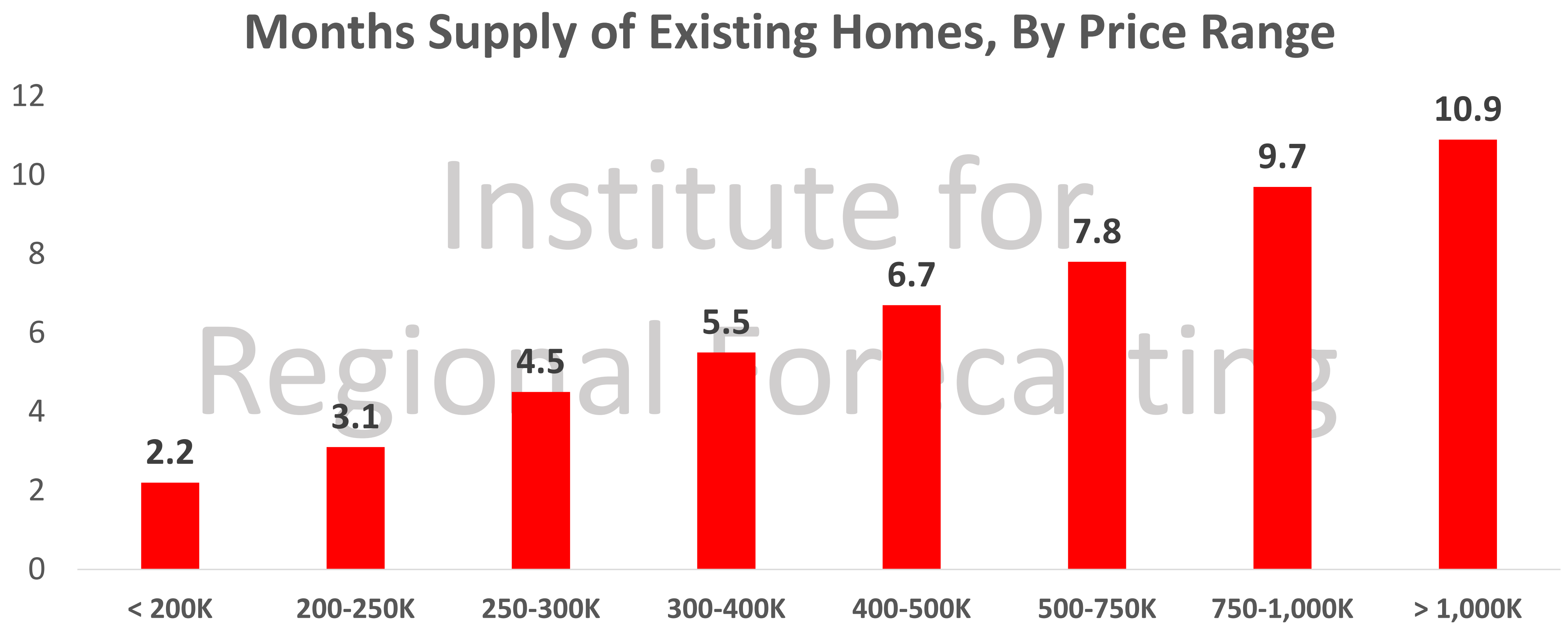
As Builders Deliver Moderately-Priced Product, Market Finally Loosening Up





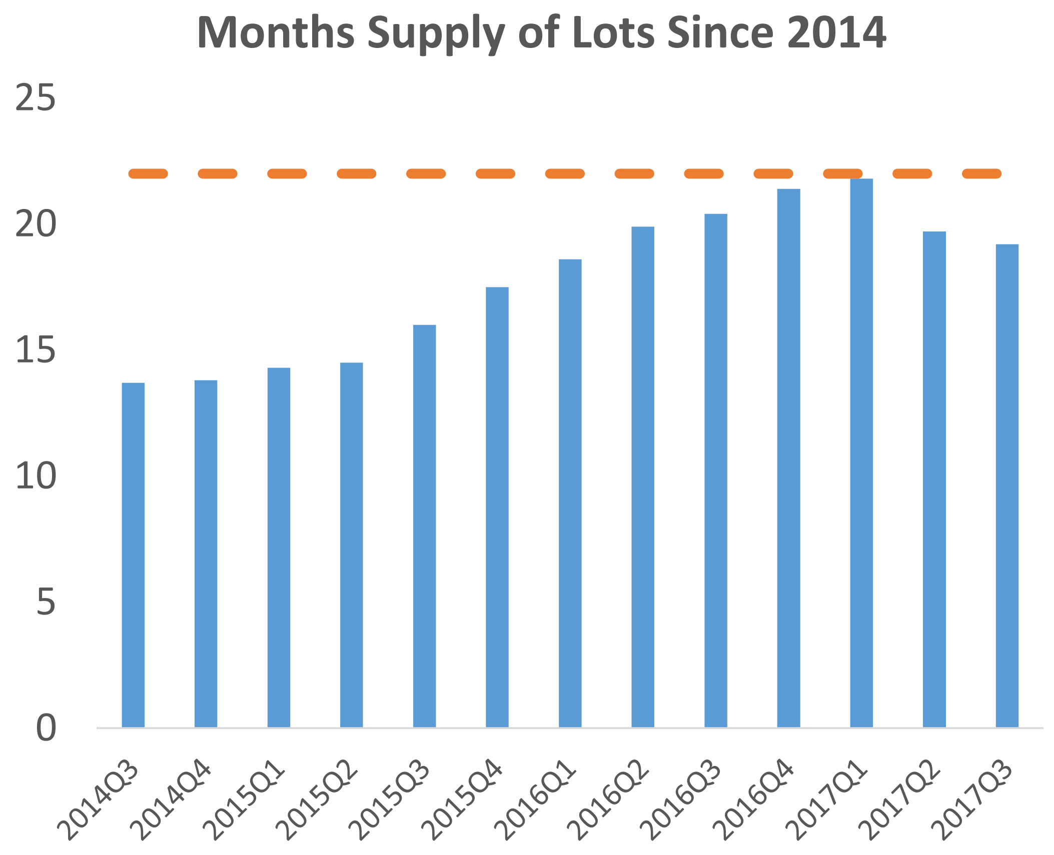
Source: Texas A&M Real Estate Center, seasonal adjustment by IRF

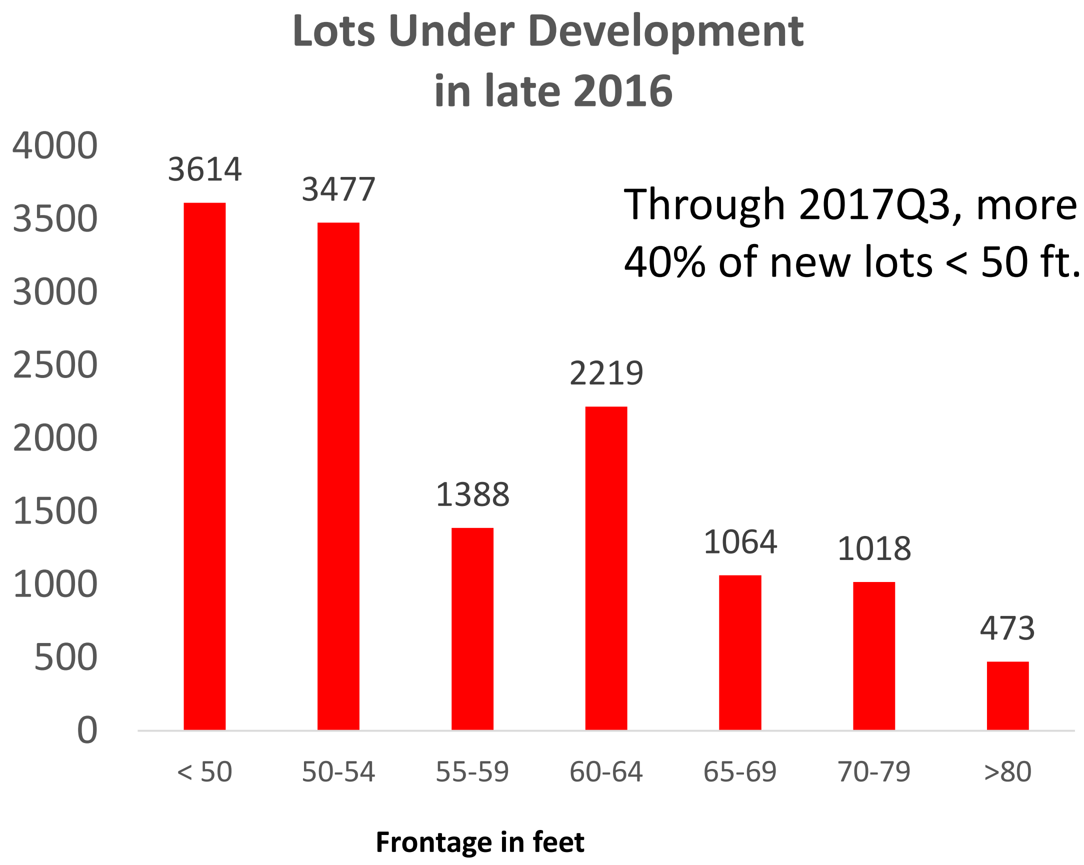
Existing Houses: Strong Demand Below $300,000 Price Leaves Limited Inventory



John Burns Real Estate

2016 Marked the Turn to an Equilibrium Number and Mix of Lots

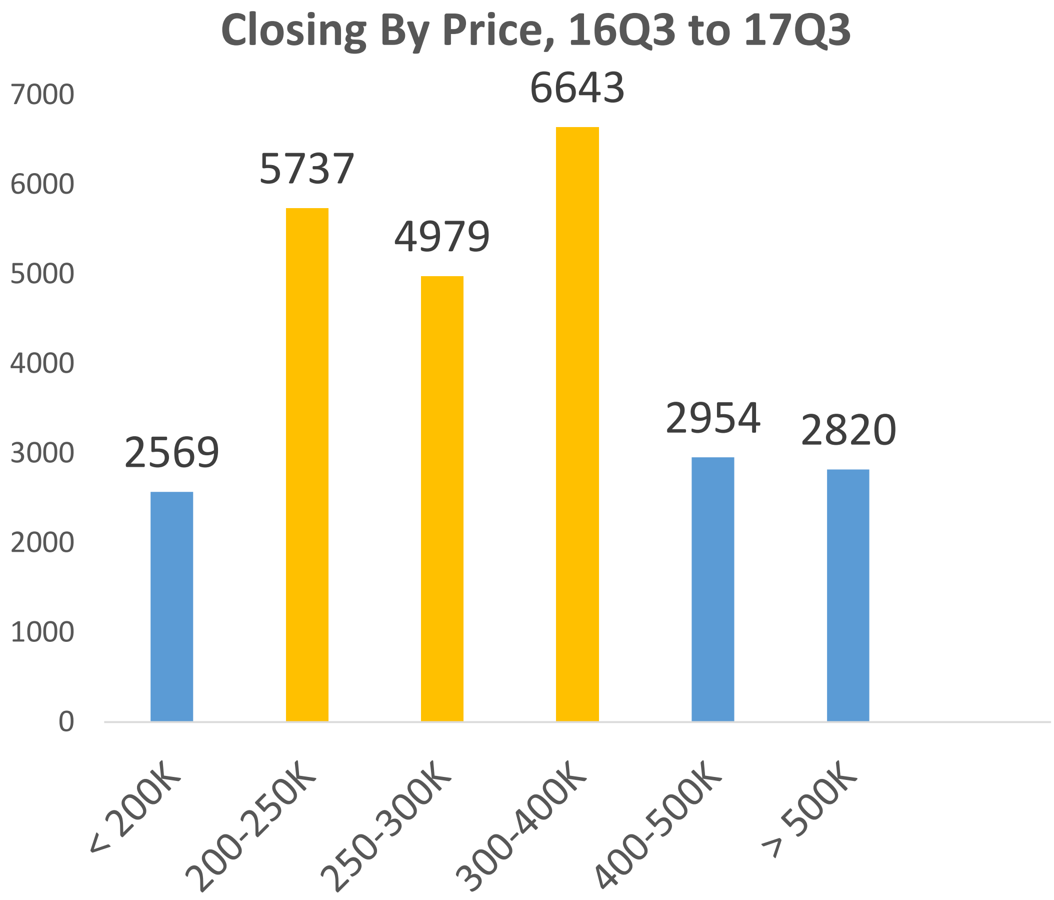


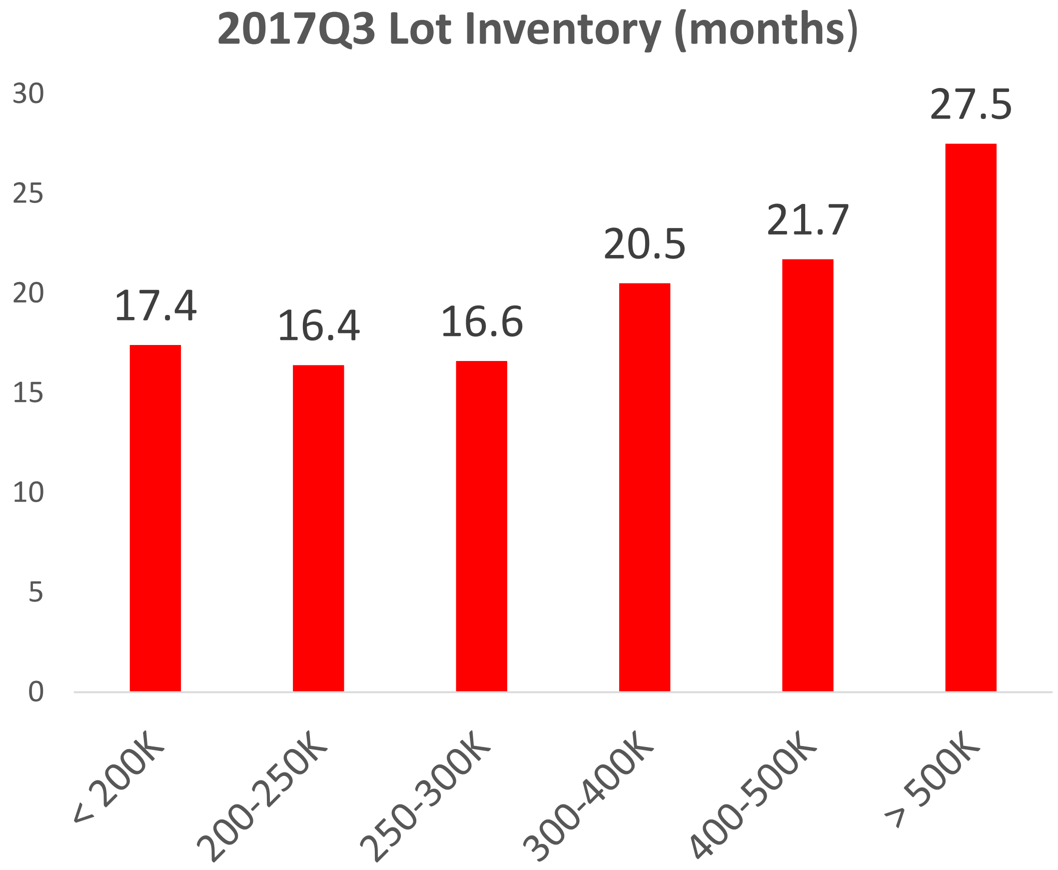


Through 2017Q3, more than 40% of new lots < 50 ft.

MetroStudy

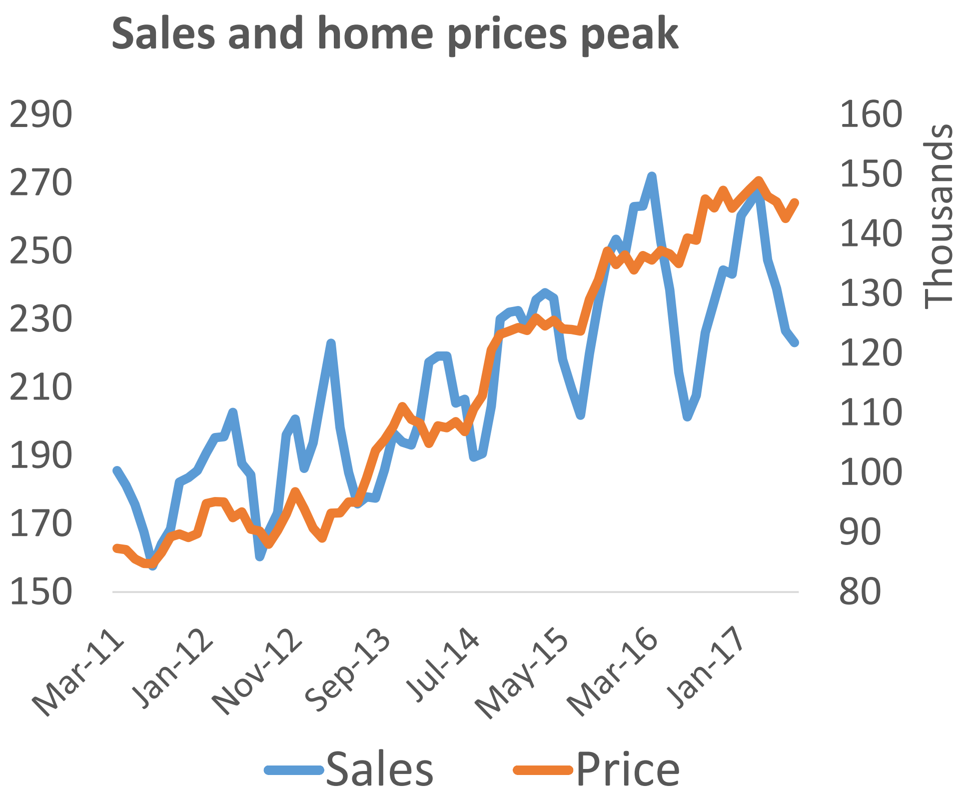
Builders Respond: Sweet Spot Moves Downscale, Lot Supply Normalizes

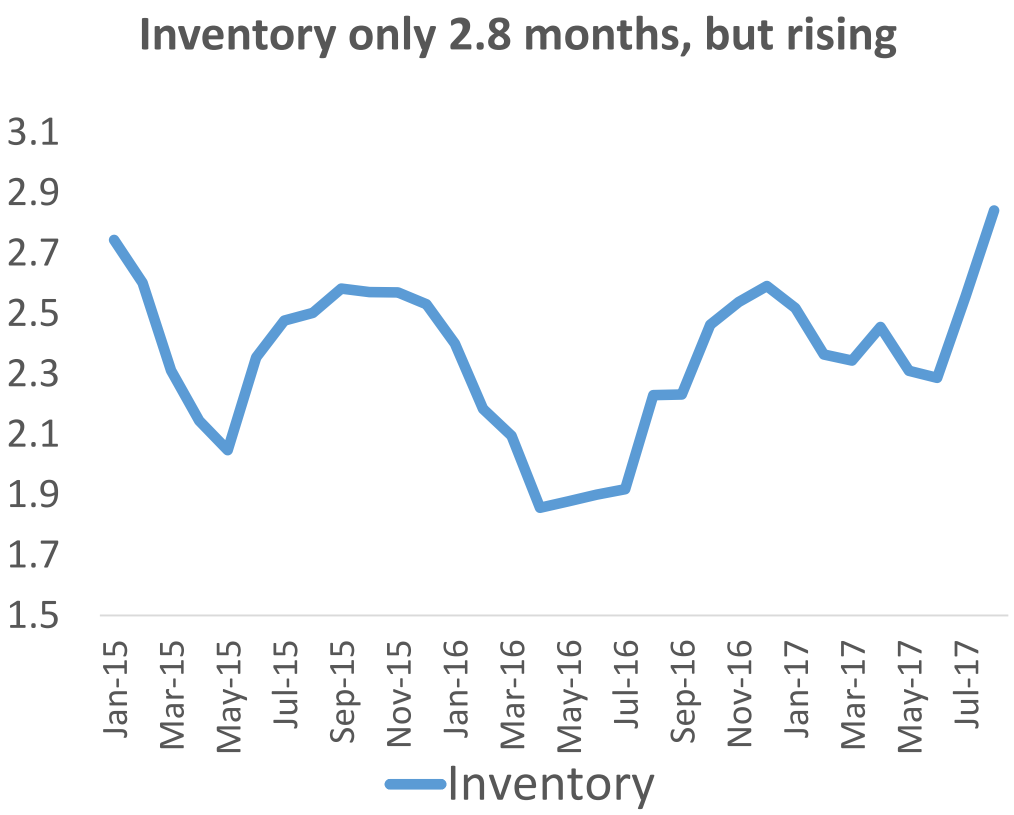




Ship Channel Cities

Baytown, Channelview, Pasadena



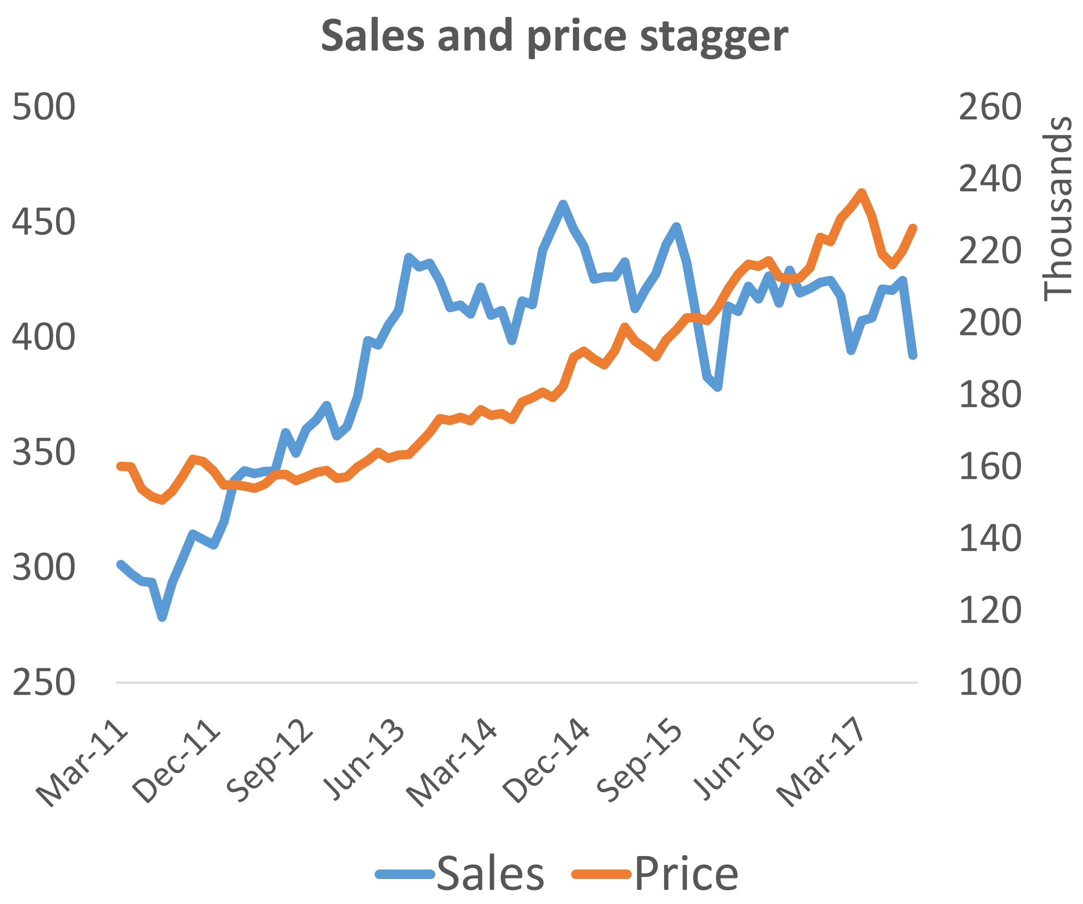


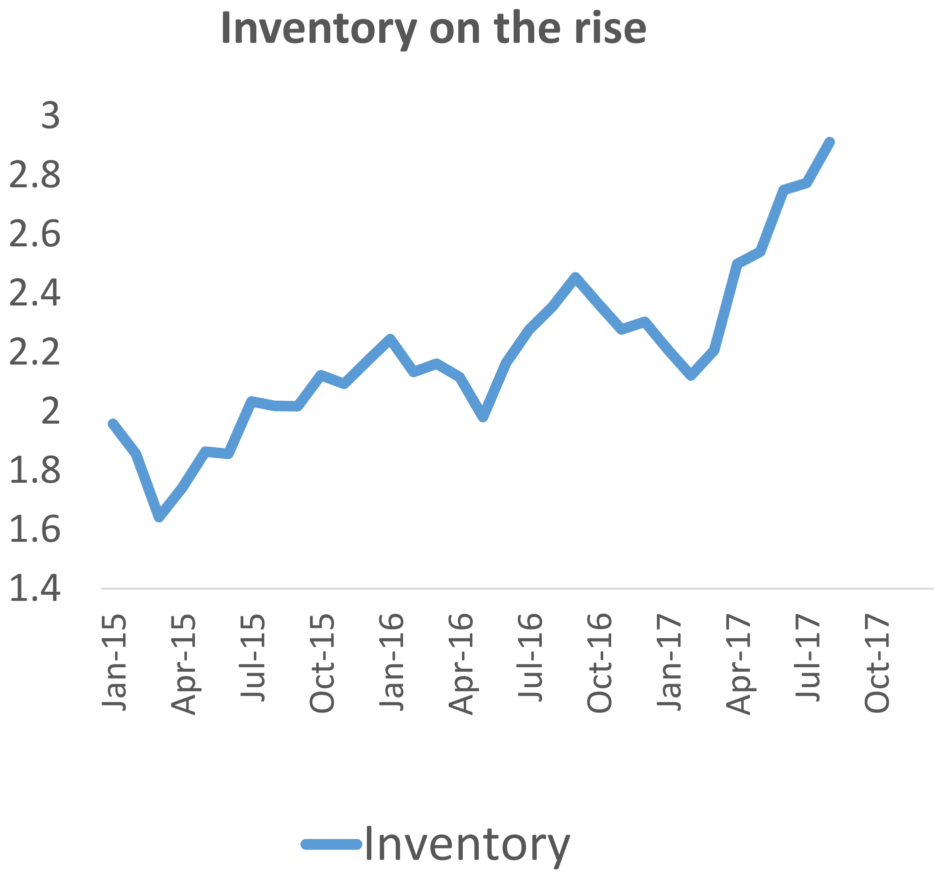
Note: Last observation is August, ***affected by Harvey***

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

South Houston

South Belt, Clear Lake, League City



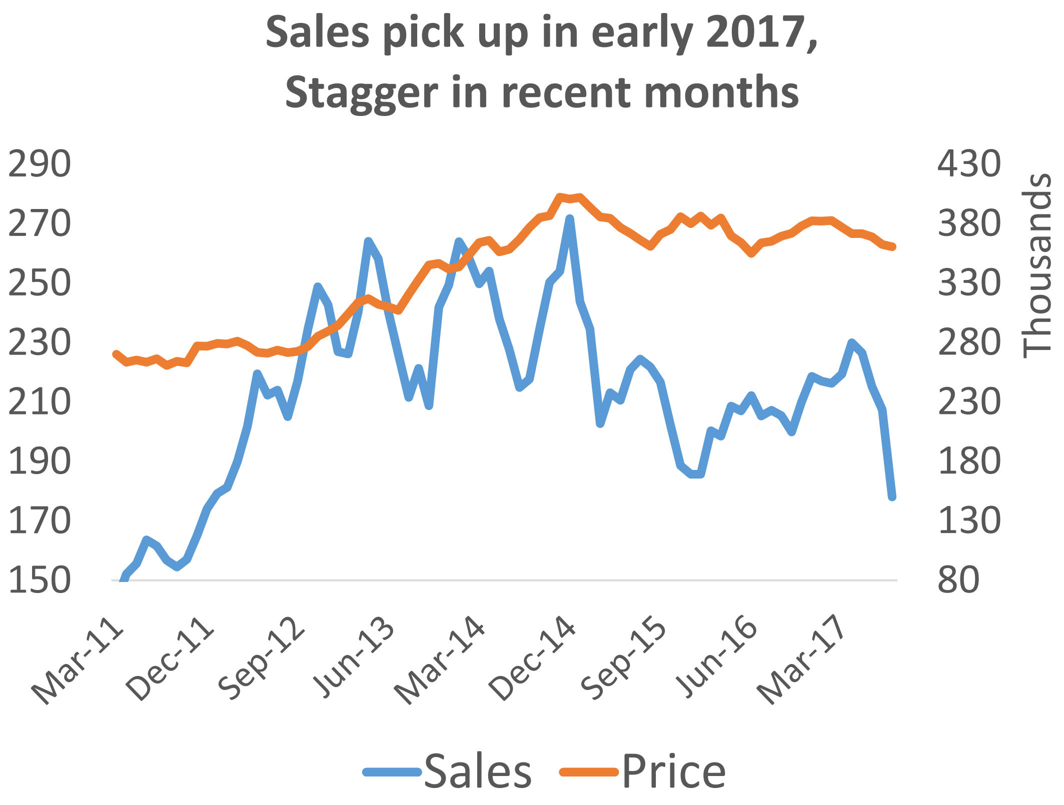


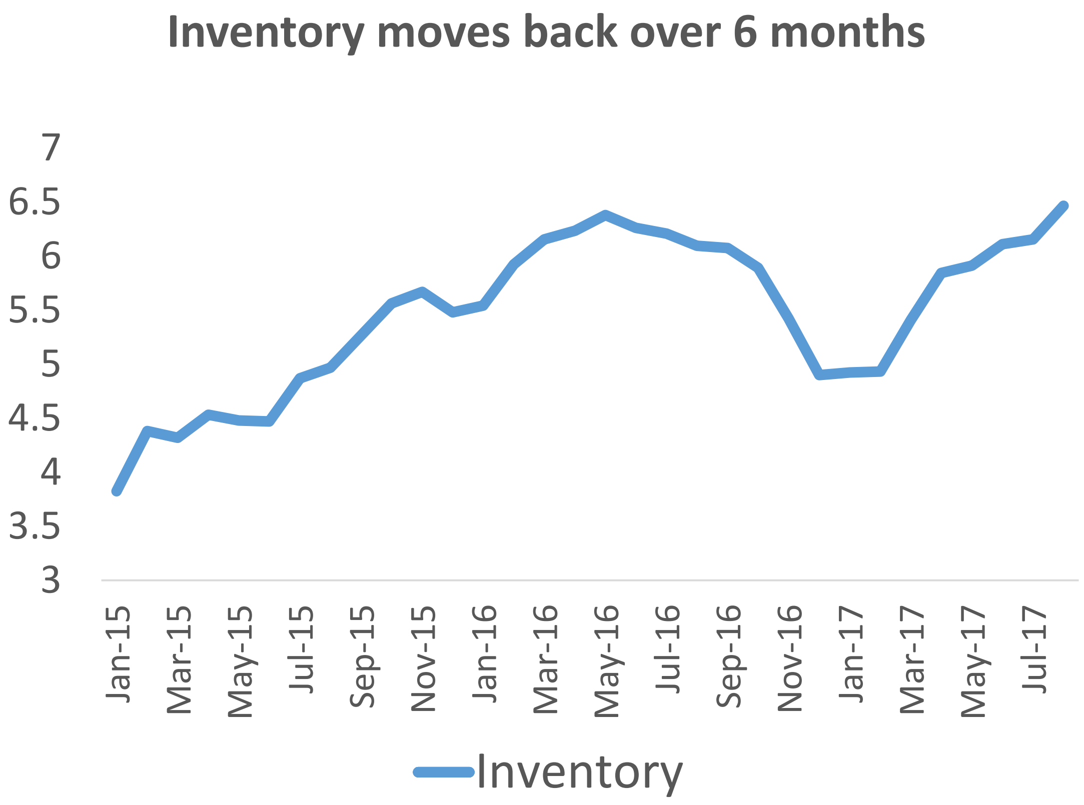
Note: Last observation is August, ***affected by Harvey***

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

Close-In and Upscale

Rice Military, Heights, Galleria

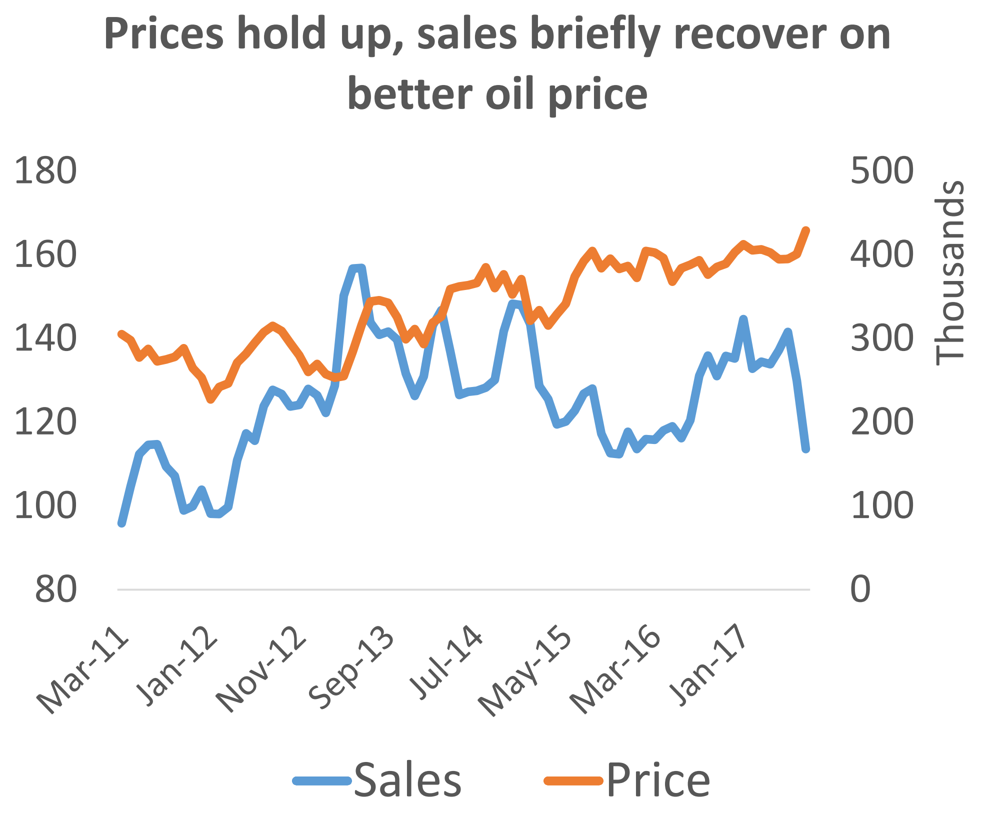


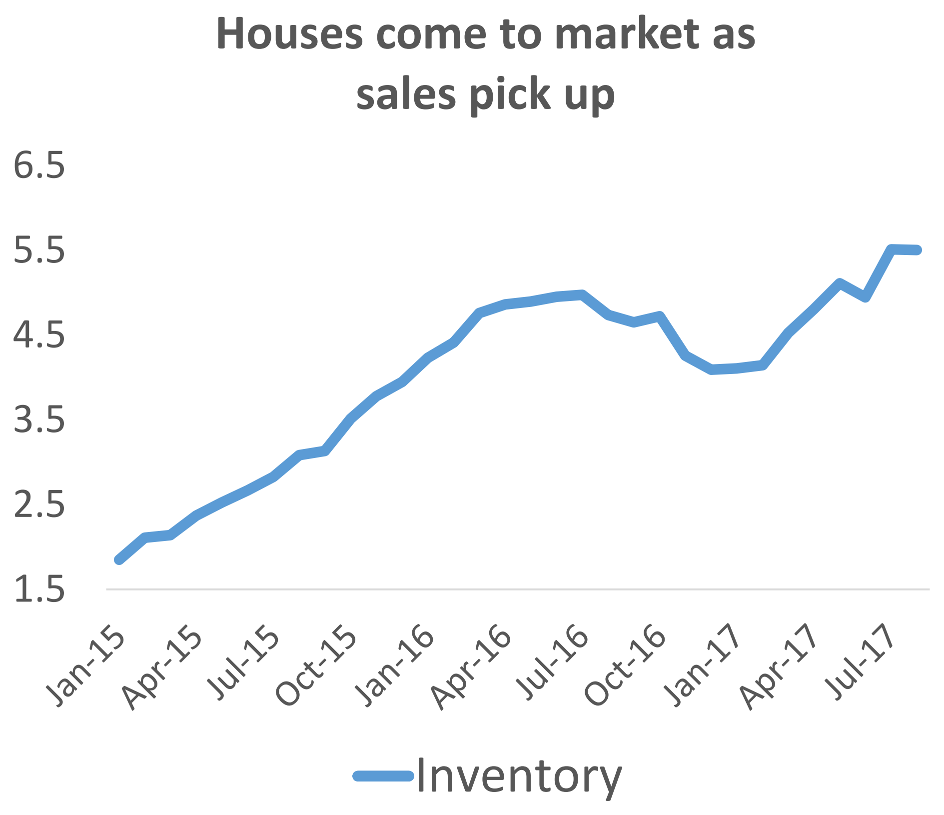


Note: Last observation is August***, affected by Harvey***
Source: Texas A&M Real Estate Center, calculations of IRF

South Of I-10 West

Memorial and Energy Corridor

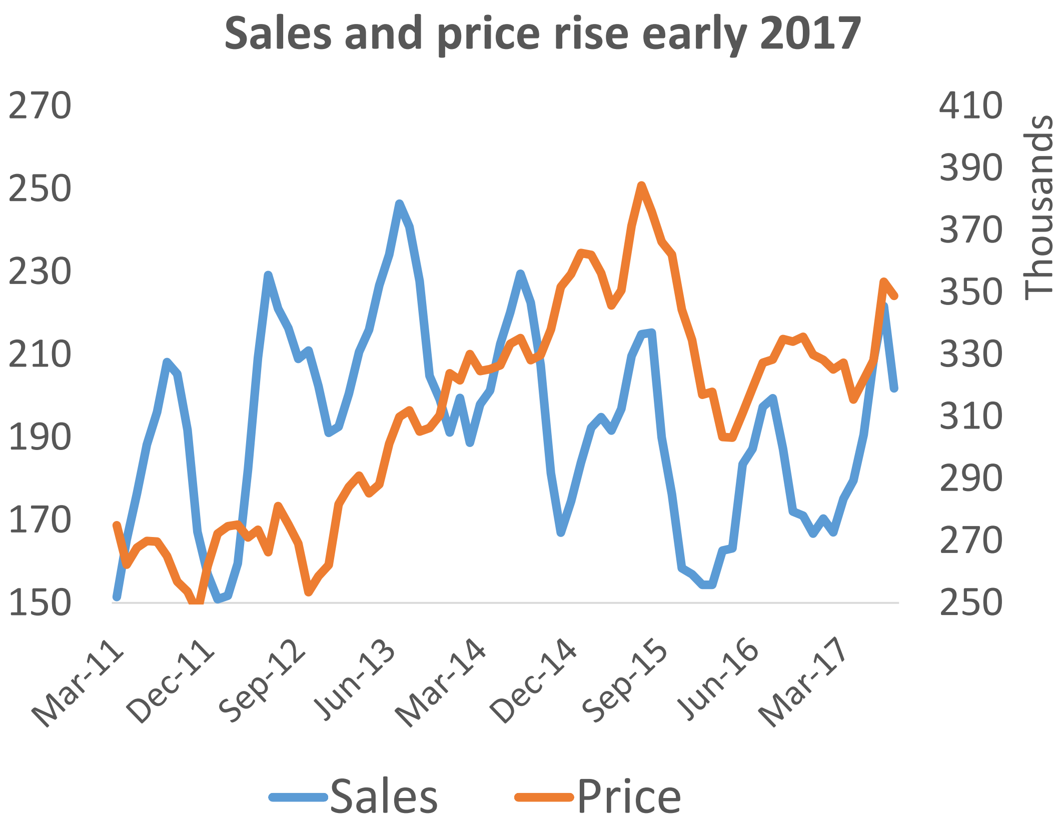


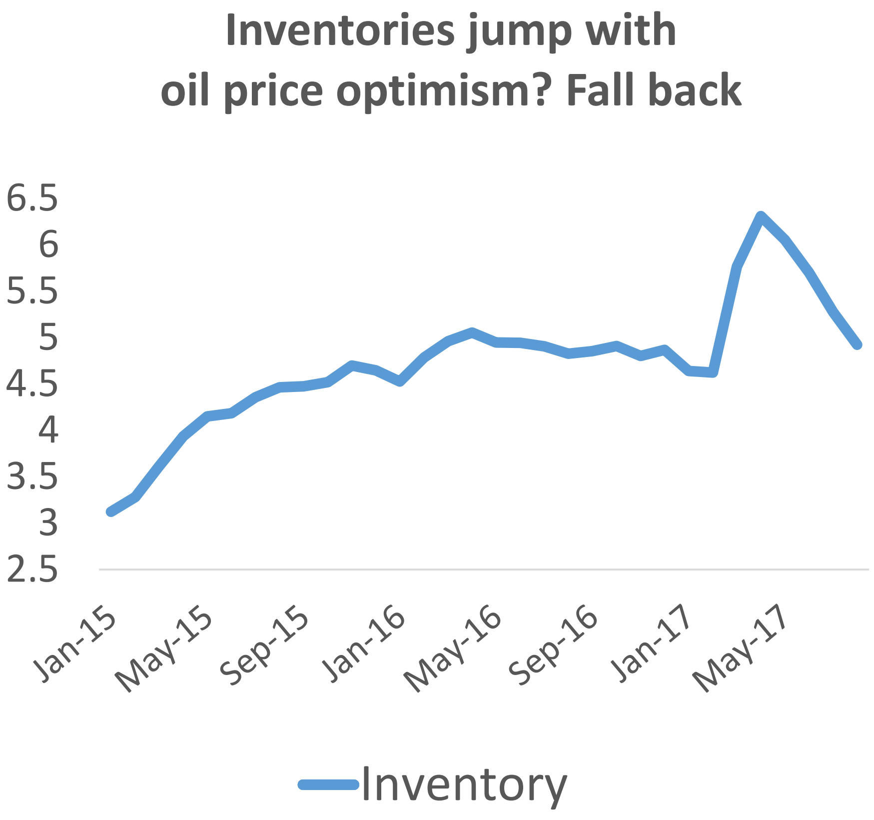


Note: Last observation is August***, affected by Harvey***

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

The Woodlands Still Struggles



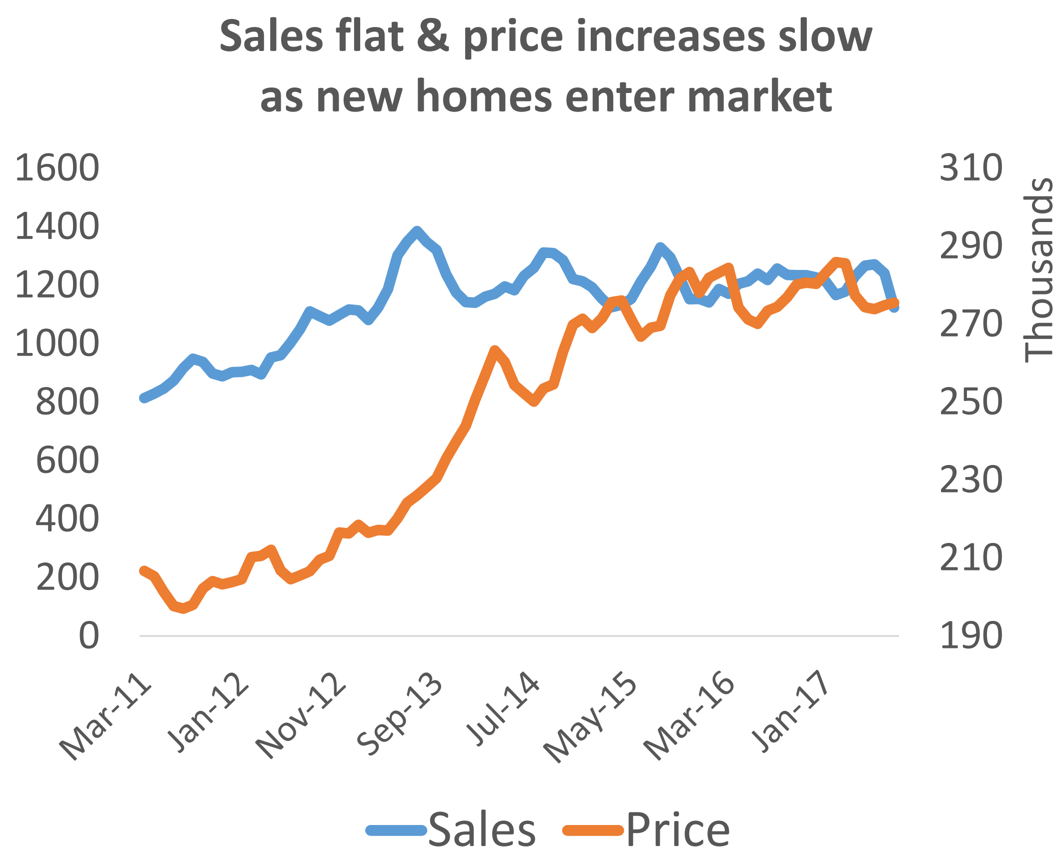


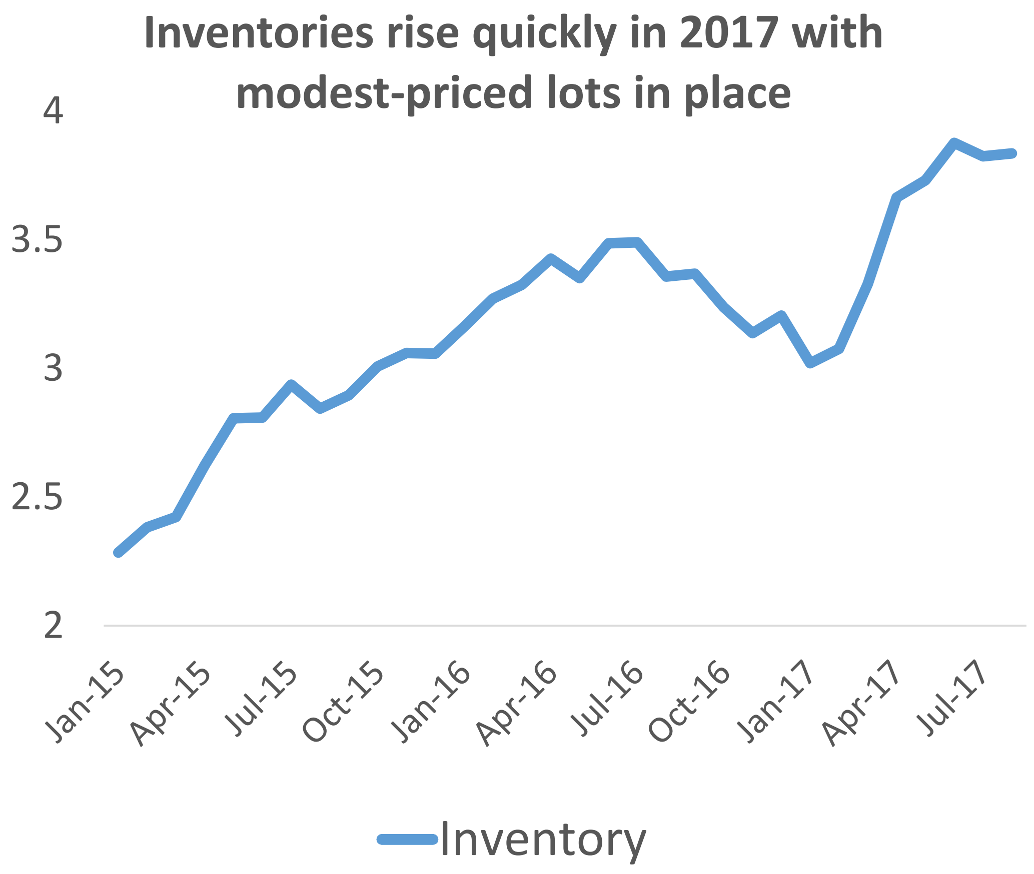
Note: Last observation is August, ***affected by Harvey***

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

Other Distant Suburbs

Pearland, Sugar Land, Kingwood, Katy



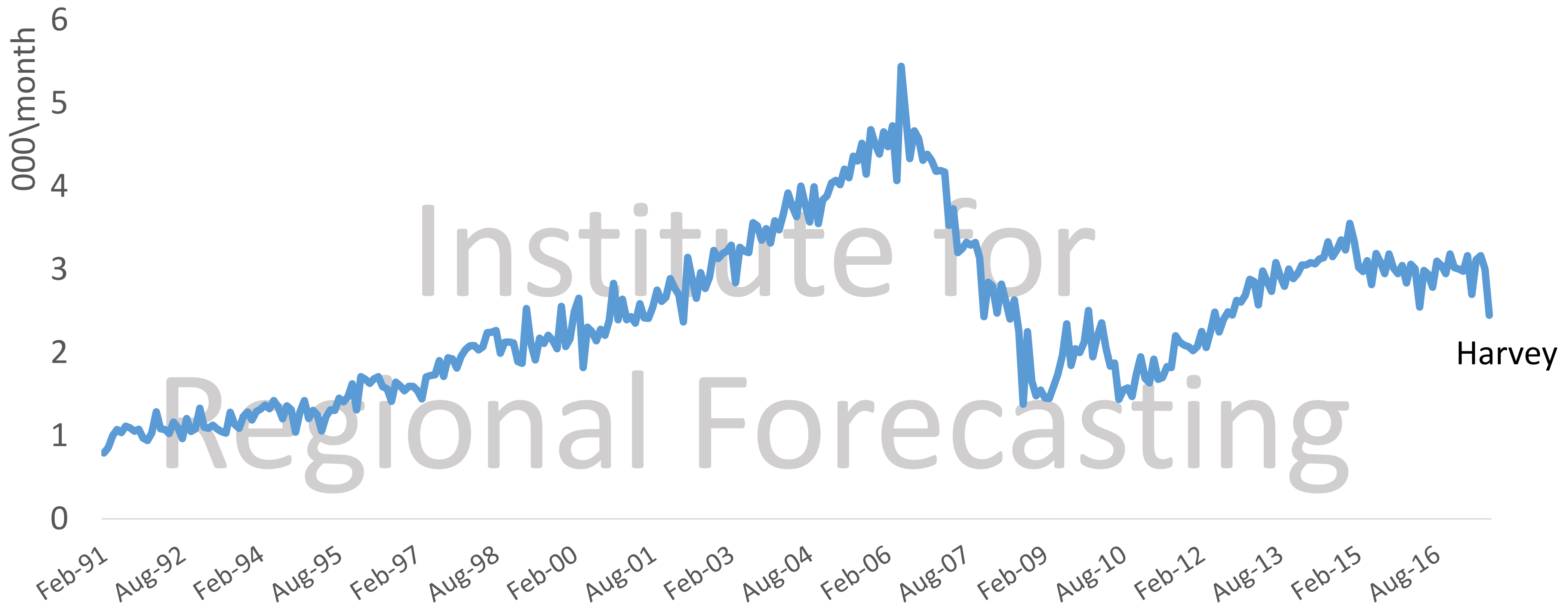


Note: Last observation is August, ***affected by Harvey***

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

On Pace for 36,000 New Single-Family Permits Before Harvey

(monthly permits, s.a.)



Texas A&M Real Estate Center

Multi-Family After Harvey: Less Damage than Expected

- Apartment Data Services survey of 98.4% of 638,000 units in Houston finds 215 properties damaged with 15,662 units, or 2.4 percent of the market. Only 2,000 units removed from inventory until repairs complete.
- For class A,B,C,D properties, the percent of units damaged is 20, 40, 40, 20. Class A is a beneficiary with fewer lost properties, and heavier damage in much larger Class B,C.
- This is half the damage compared to Ike? Why? (1) A different kind of storm, with water moving in narrow and more predictable channels compared to wind or storm surge; and (2) Lessons well learned from recent floods.
- Harvey created new demand from the displaced, and 8,000 units were absorbed in September. Metro-wide effective rent increases $16 per month to $1000.
- *This is not organic growth in the renter base*: Leases are typically 3 to 6 months, and these units will return to market after homes are reclaimed.
- Plenty of supply with 76,016 units available at time of floods. Taking damage out, now right at 90 percent occupancy. Main effect of Harvey will likely be to remove some incentives from the market.

Damage by Market Area Widely Distributed: Number of Units and Local Share

Market Area	No. Units	Market Area	Share
Energy Corridor/Briar Forest	2743	Northline	17.0%
Greenspoint/Aldine	1696	I-10 E/Woodforest	10.8%
Katy/Cinco Ranch	1379	Energy Corridor/Briar Forest	8.8%
Braeswood/Fondren	1110	Lake Houston/Kingwood	7.1%
I-10 E/Woodforest	974	Katy/Cinco Ranch	6.2%
Med Center/Braes Bayou	804	Braeswood/Fondren	5.1%
Lake Houston/Kingwood	732	Almeda/So Main	4.7%
Willowbrook/Champions	659	Heights/Wash Ave	4.2%
Clear Lake/Webster	563	Med Center/Braes Bayou	3.6%
Woodlands/Conroe	502	Bear Creek/Copperfield	3.2%
Pasadena Deer Park	496	Woodlands/Conroe	3.2%
Total	*11,658*	*Average*	*74.4%*

Apartment Data Services. Red indicates market area is on both lists, heavy damage that is also a significant share of the local market

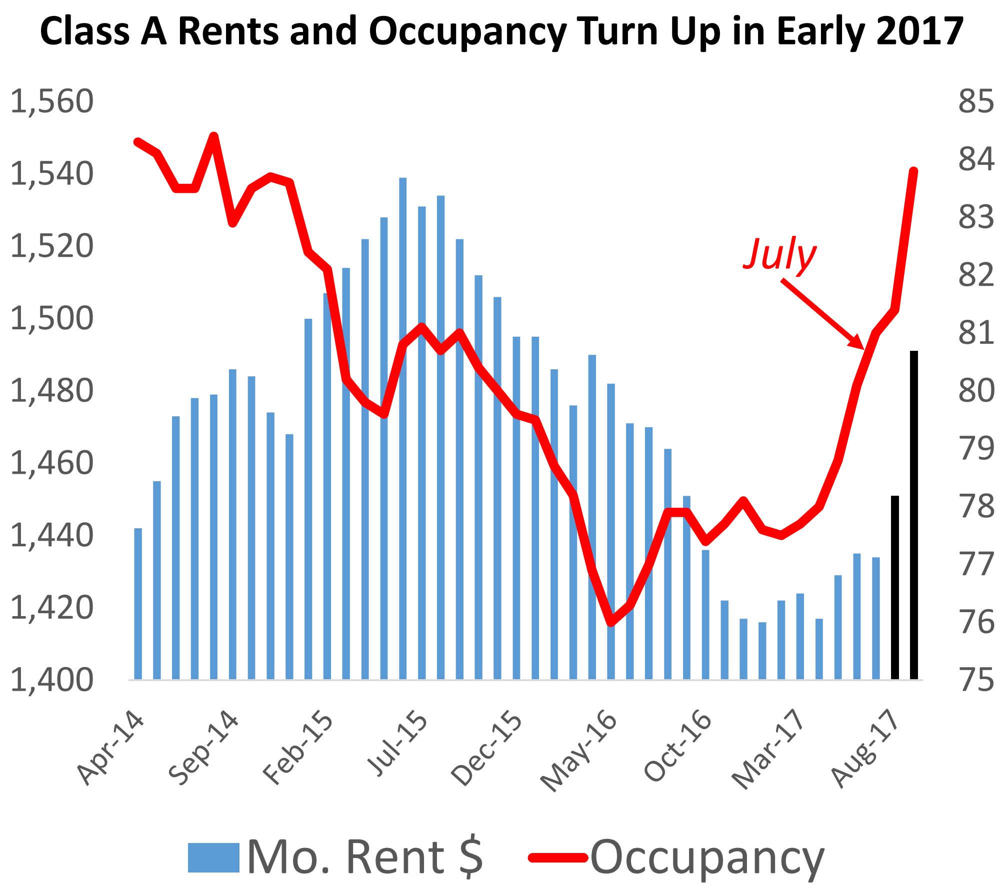
Class A Apartment Market Looks Better After Harvey

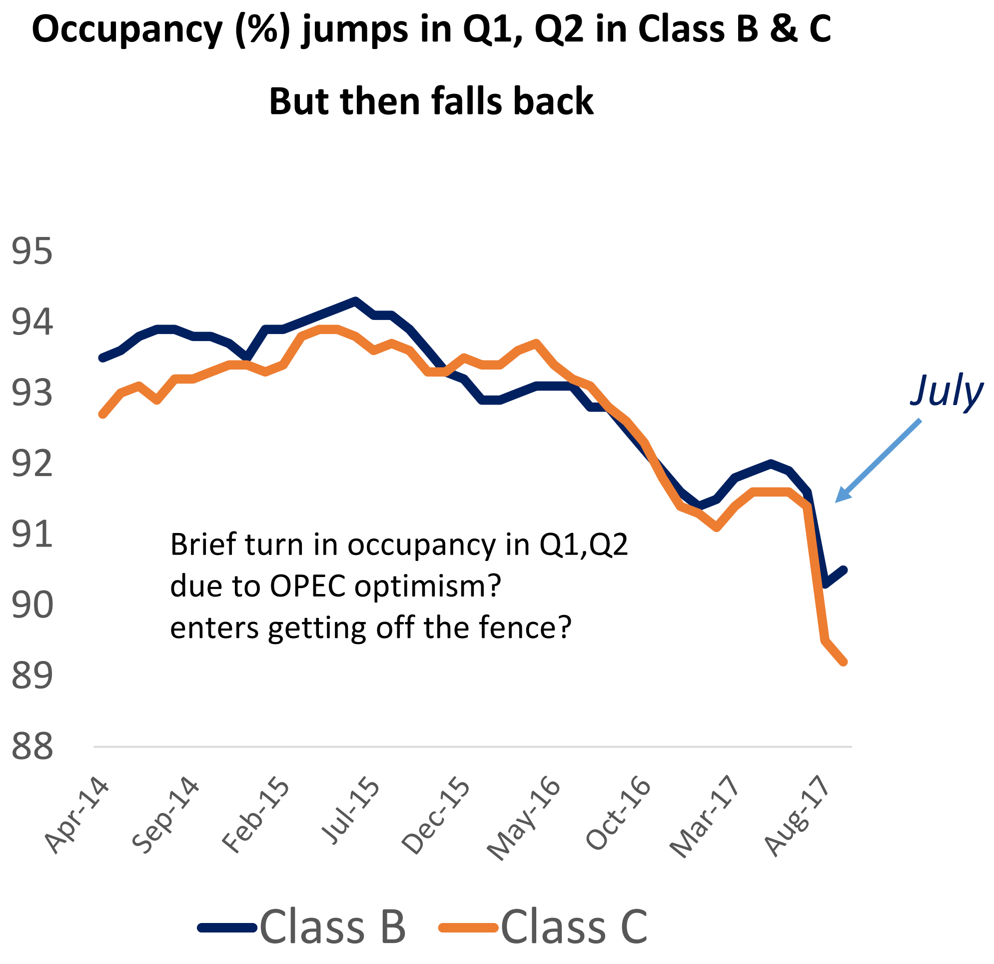
Class A Rents and Occupancy After Harvey			
	Stable	In Lease Up	All Class A
No. of Units	126,930	18,438	145,368
Monthly Rent	$1,466	$1,501	$1,663
Occupancy	90.9%	35.4%	83.9%

Apartment Data Services through September

- Class A is the source of recent problems in Houston's apartment market. New product enters here
- Solid gains in absorption through early 2017, and then a Harvey-driven surge in July and August
- 18,500 units are still in lease-up. Depending on who counts, as many as 18,000 units still in the 2017-18 pipeline
- Harvey is a mostly a sugar high from displaced homeowners, with 3- and 6-month leases. Further absorption gains may come from Class B,C tenants

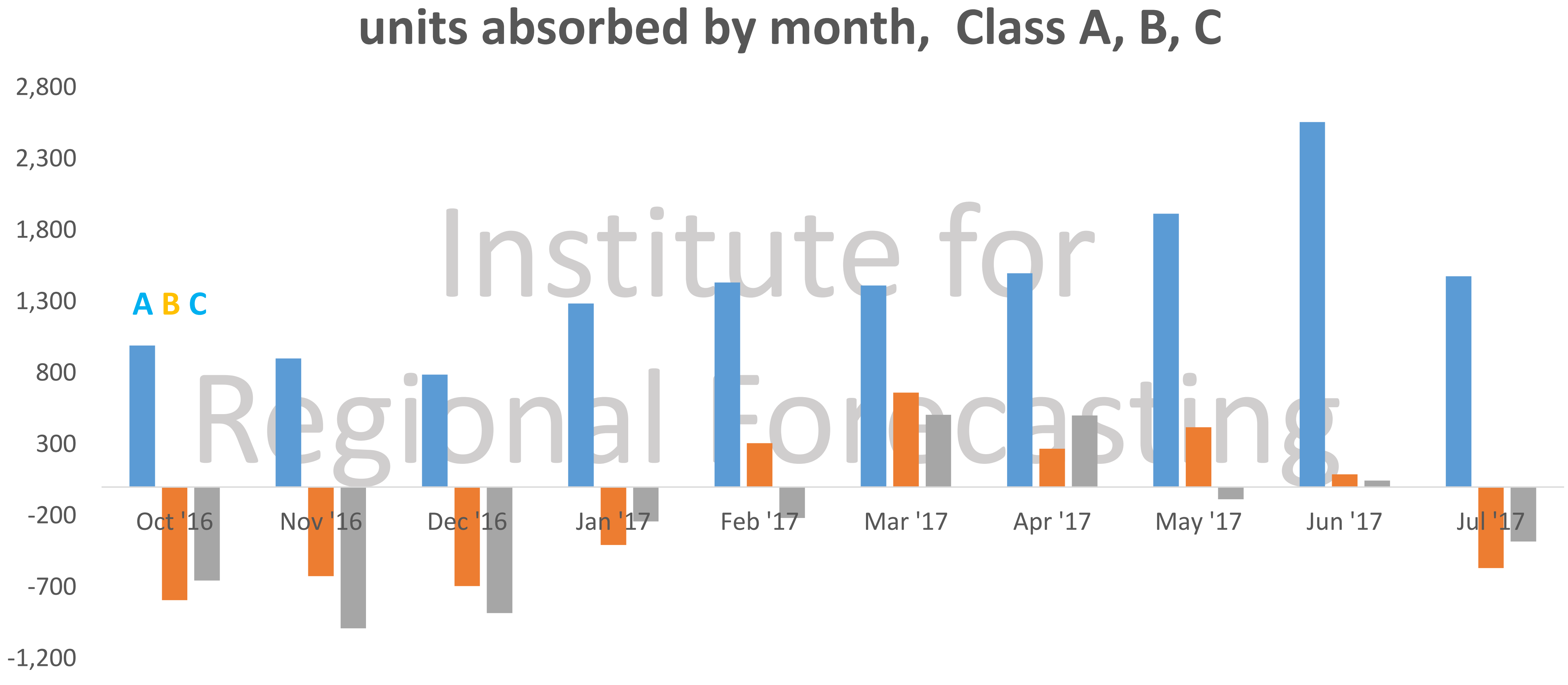
Class A Makes 2017 Gains in Occupancy and Rent: At Expense of B & C?





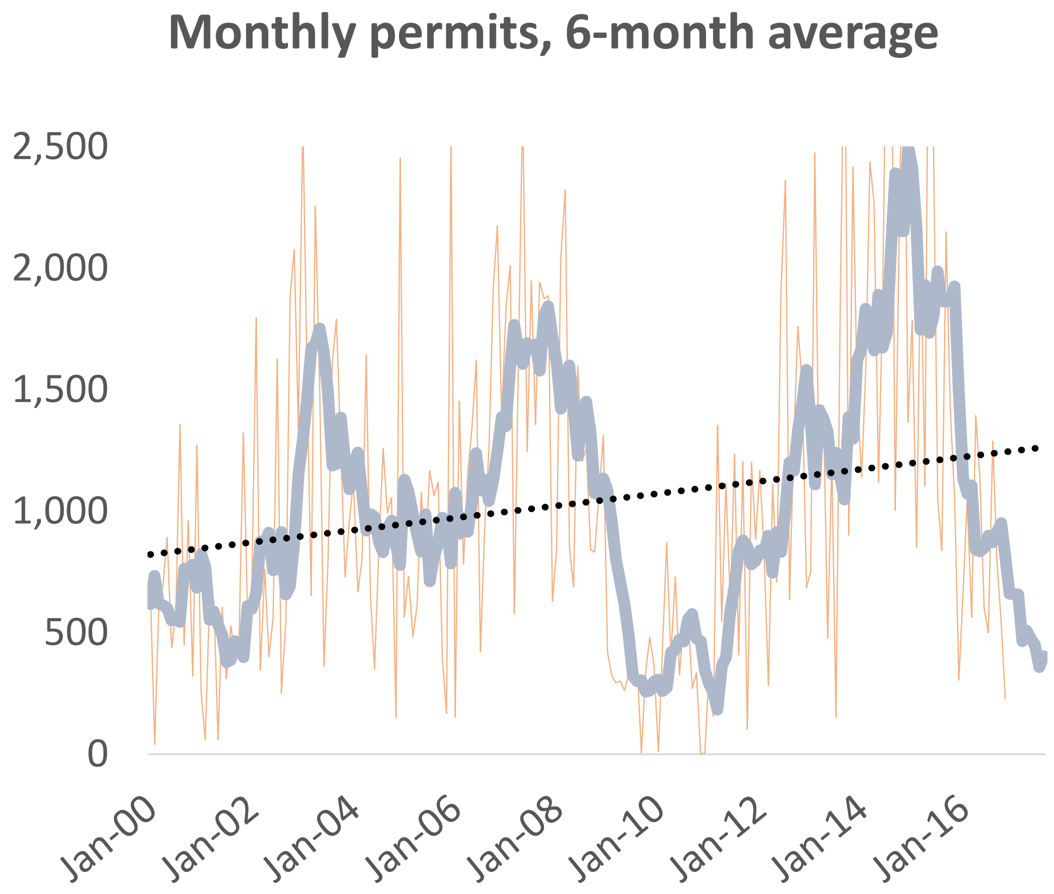
Apartment Data Services to September

2017 Class A Absorption Gains Before Harvey: A Mix of OPEC High and Rent Incentives to Leave B,C



Apartment Data Services

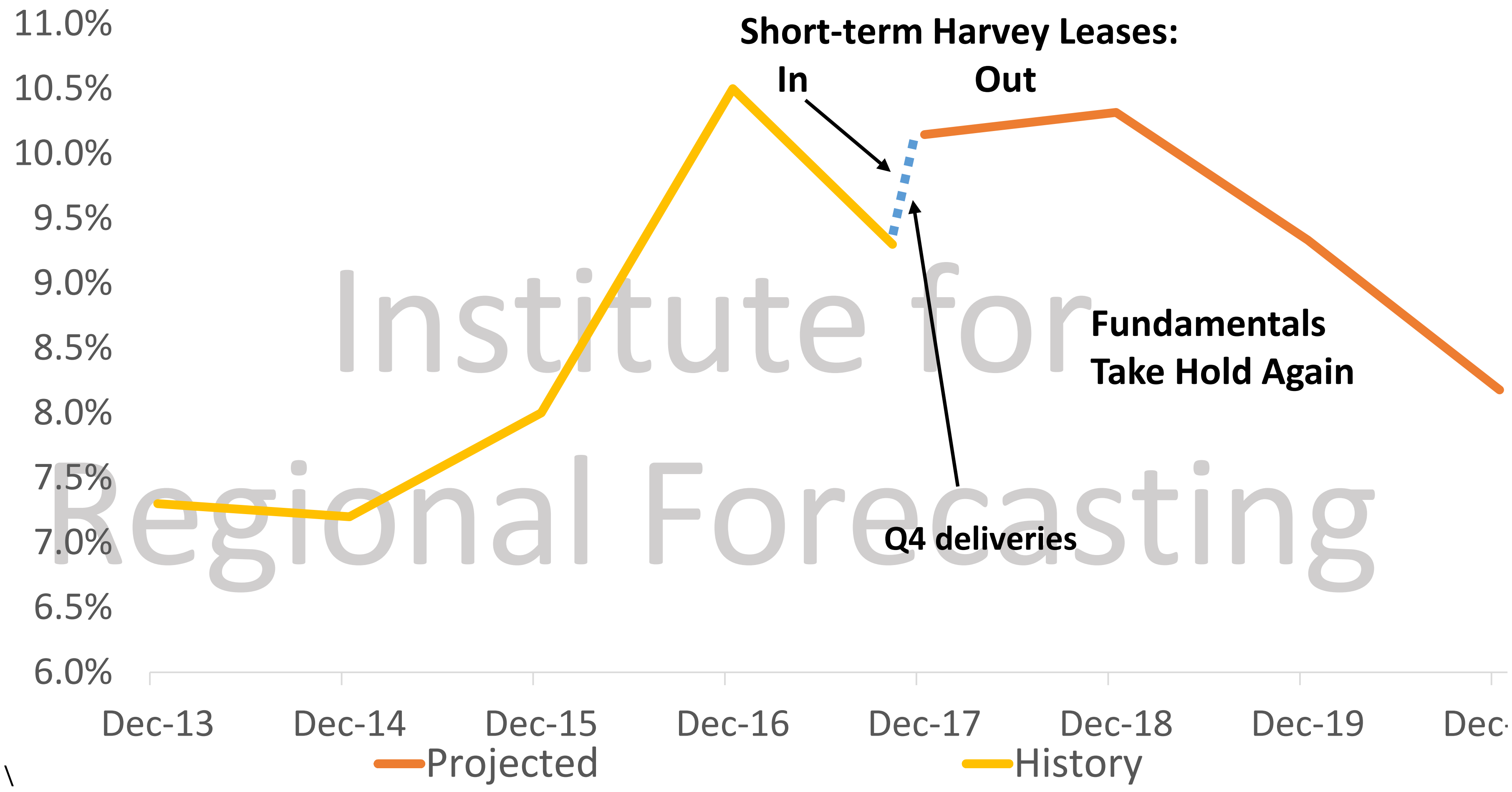
Construction Pipeline Empties: Multifamily Permits Fall Hard



TAMU Real Estate Center; CoStar

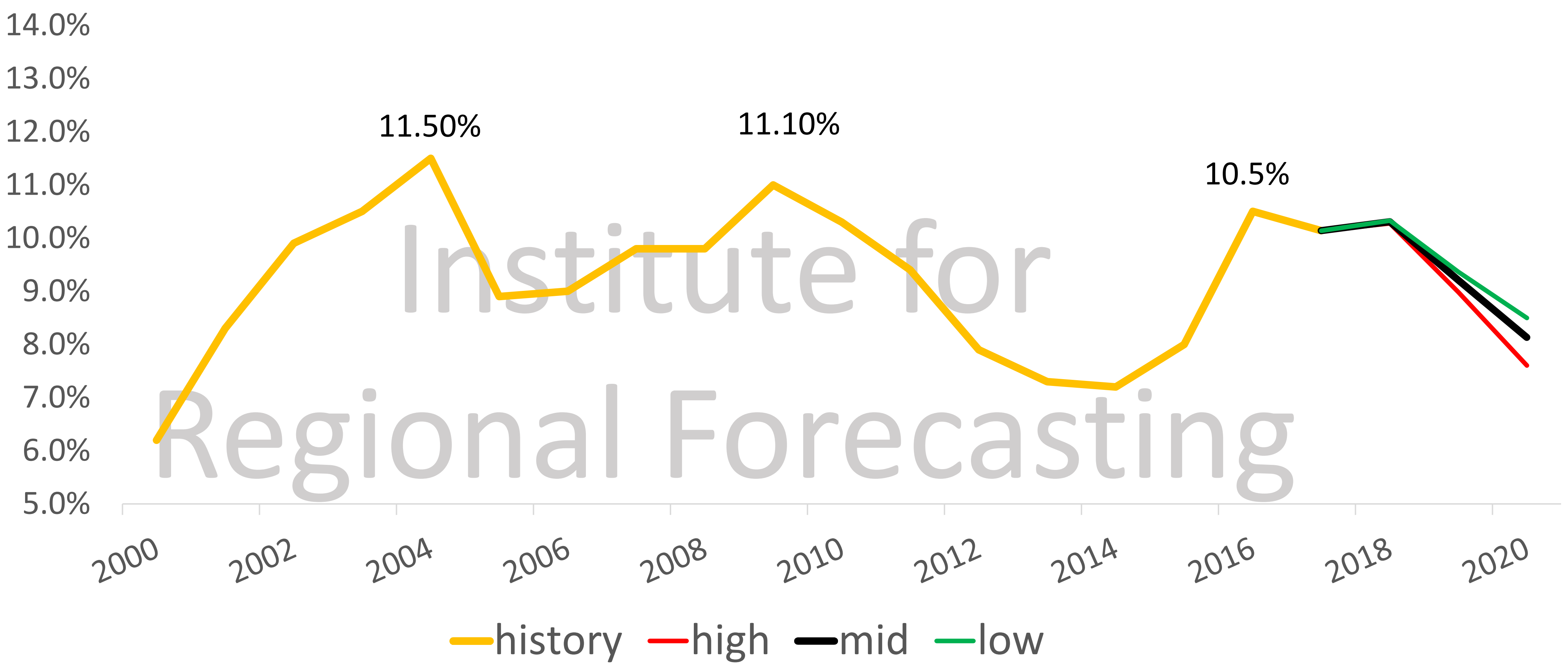
- Multi-family permitting before Harvey less than 400 units/month
- 2017Q4 deliveries will be about 7,000 according to CoStar
- 2018 deliveries from current active construction 5,600
- Harvey and/or a better economy has stirred recent announcements of more projects to come

Impact of Harvey Does Not Last: Marketwide Vacancy Rate



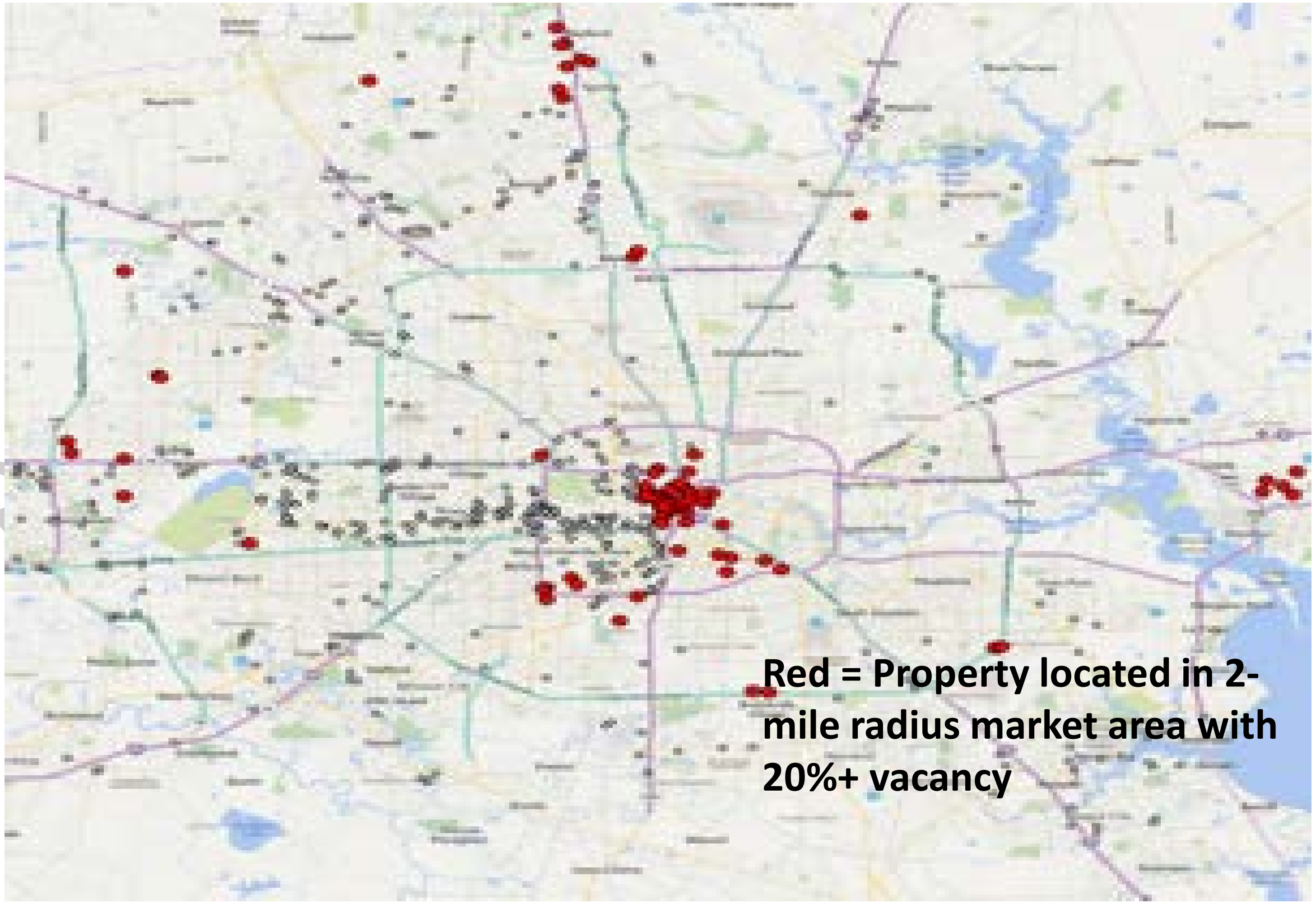
Source: Costar, Apartment Data Services, IRF Forecast

Fundamentals Drove Moderate Gains in 2017 that Should Carry Forward to Coming Years



Source: Costar, IRF Forecast, based on current construction pipeline and Harvey assumptions above

Location of Class A Multi-Family Markets with Year-End Vacancy Rates Greater than 20 Percent



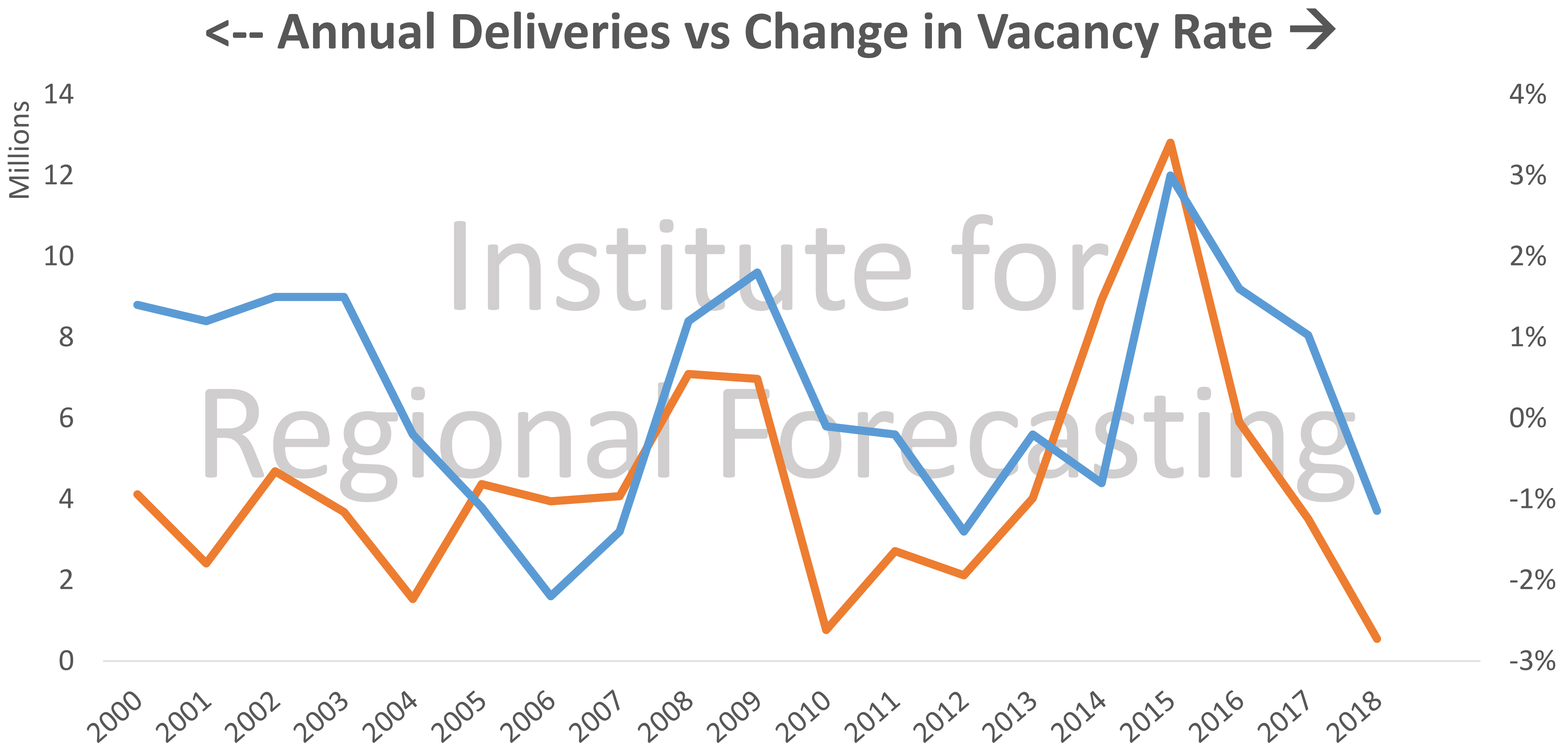
Commercial Real Estate Sees Less Damage than Expected: Basics Still Rule

- Office? CBRE Survey of 1,200 buildings, 250 million square feet of office space. These are not owner-occupied buildings.
  - 46 buildings affected, 11.6 million square feet, or 4.6 percent of the market. Half the affected buildings were operational soon after Harvey, now repaired; another quarter will be repaired and operational by year-end.
  - Plenty of office space for lease in Houston: Vacant space, including sublease, is 44 million square or a rate of near 20 percent. Harvey won't fix this problem.
- Retail? FEMA says 585 small businesses destroyed, many will be retail. Not many reliable specifics, but 95% occupancy can only get tighter
- Industrial? Only very active segment is e-commerce. Industrial plastics in the east and oil machinery in the west have been rapidly winding down construction.

Office Market Still Seriously Challenged As Little Has Changed in 2017

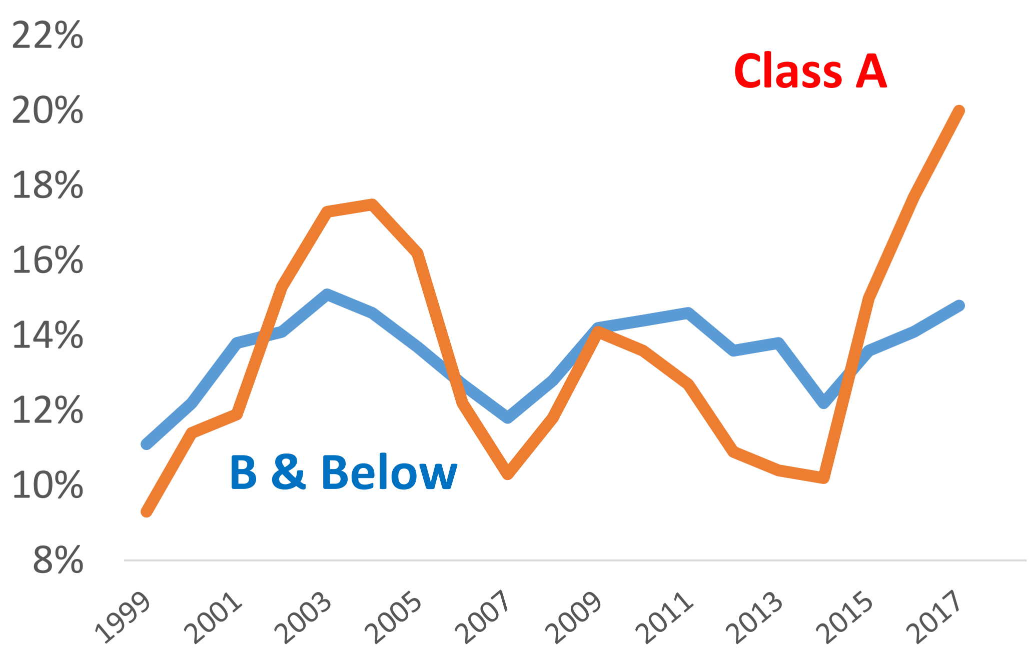
- 38 million square feet of space added to Houston's market 2014-16
- Direct vacancy 60 million square feet, 10 million for sublease.
- Class A vacancy rate near 20%, rest of market near 15%
- Sublease about 4 percent of the market; 10 largest spaces for sublet are all energy companies
- Absorption falling for last 5 quarters
- Rents under substantial pressure
- Problems are widely shared across virtually all Houston markets
- Only 2 million square feet in the construction pipeline now
- Waiting for those oil jobs to return

There Is an Oil Bust: But Vacancy Problem Starts with Deliveries

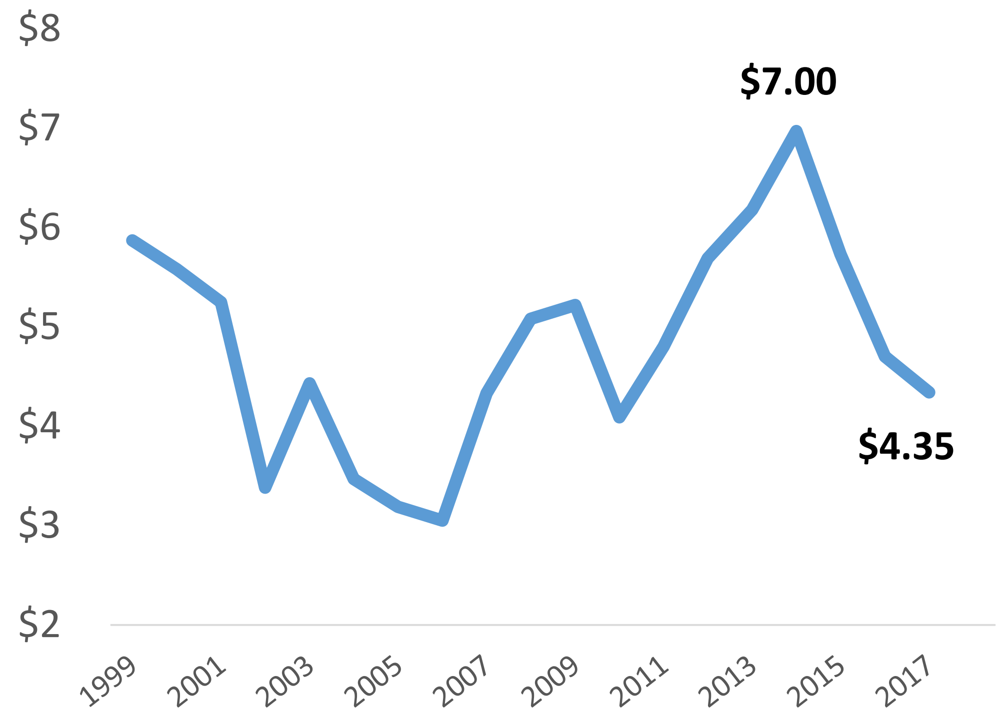


Class A Office Market:
Pain Continues on for Class A

Class A Vacancy Rates Nearly Double, Head for Modern Highs

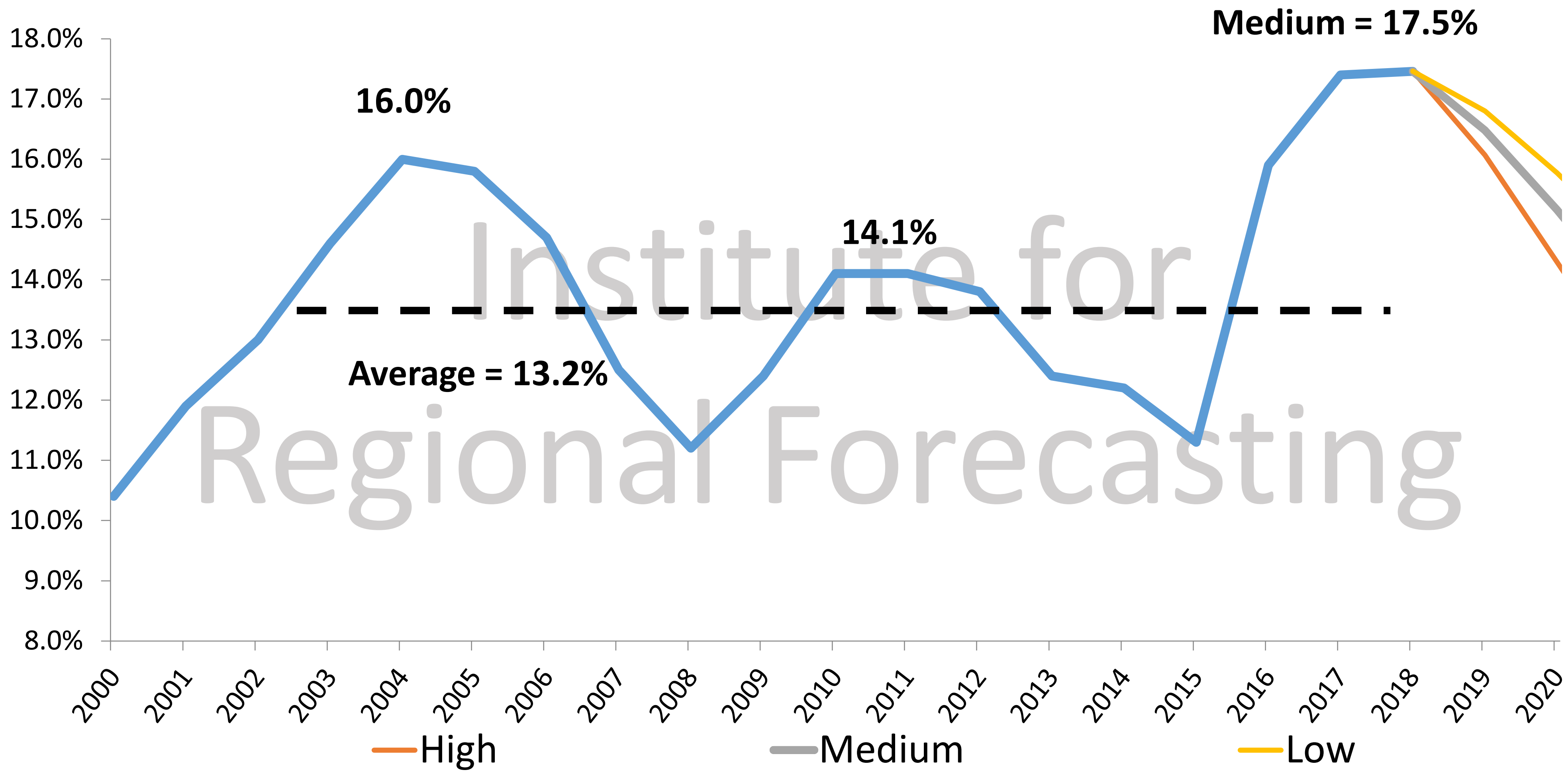


Class A Base Rent Premium Approaches 2010 Lows



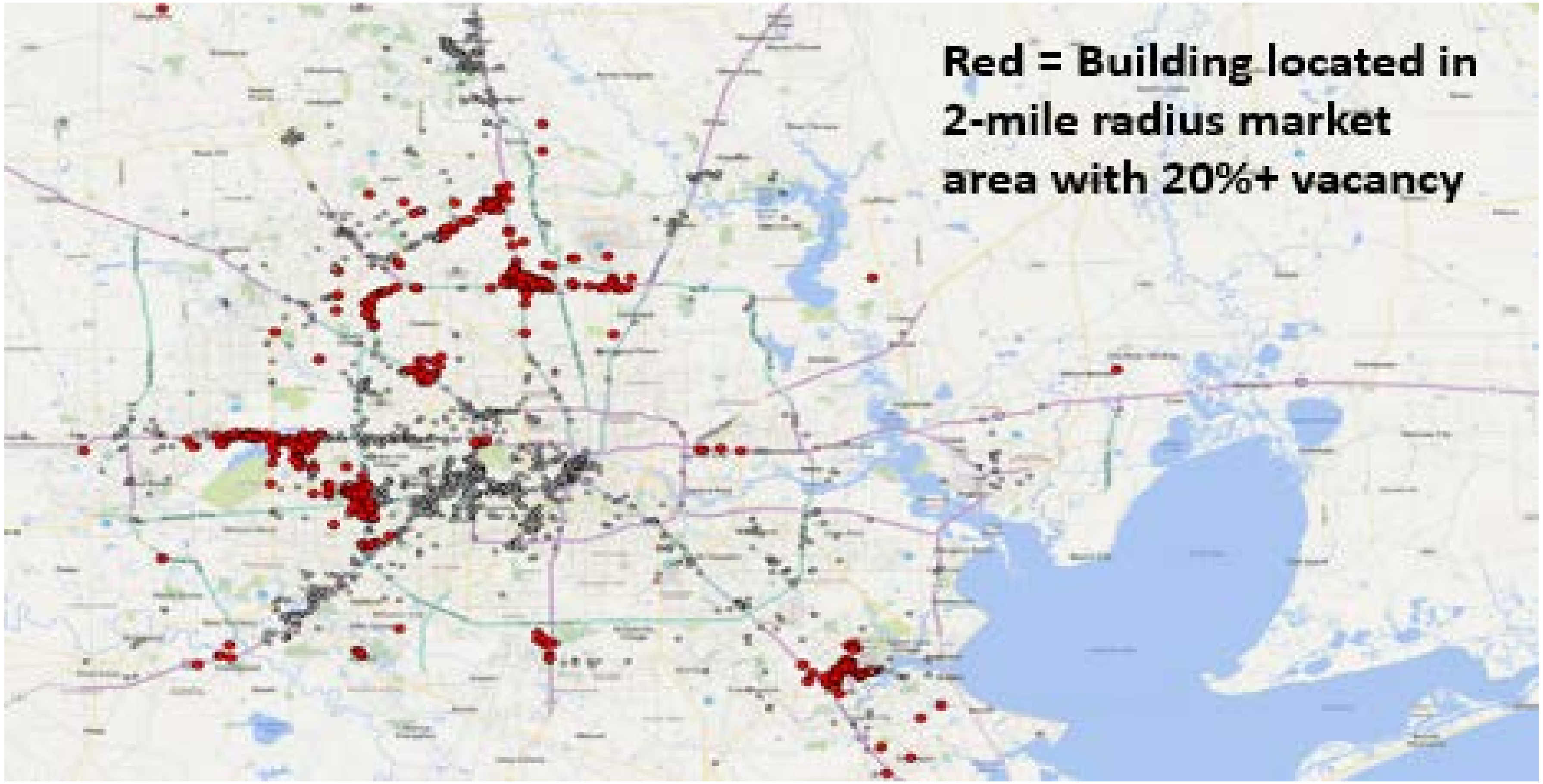
CoStar

Across All Classes of Buildings: Office Vacancy Rate Now Peaking



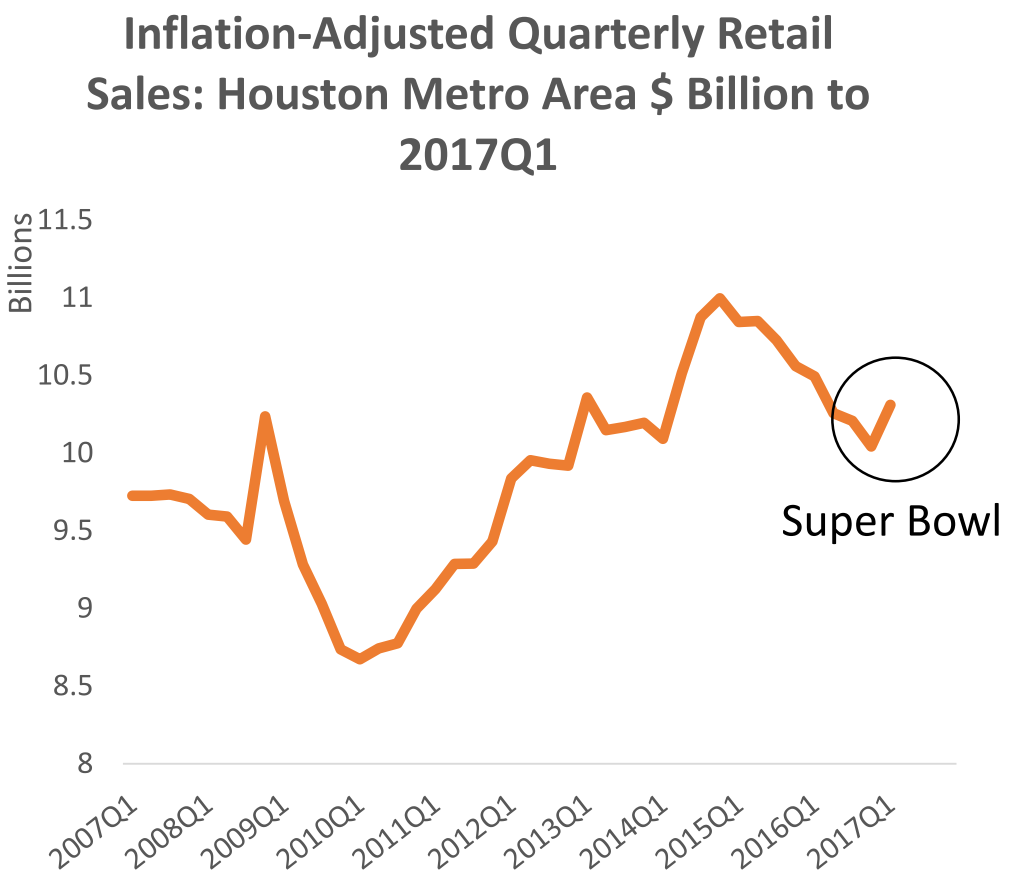
Source: CoStar, IRF Forecast

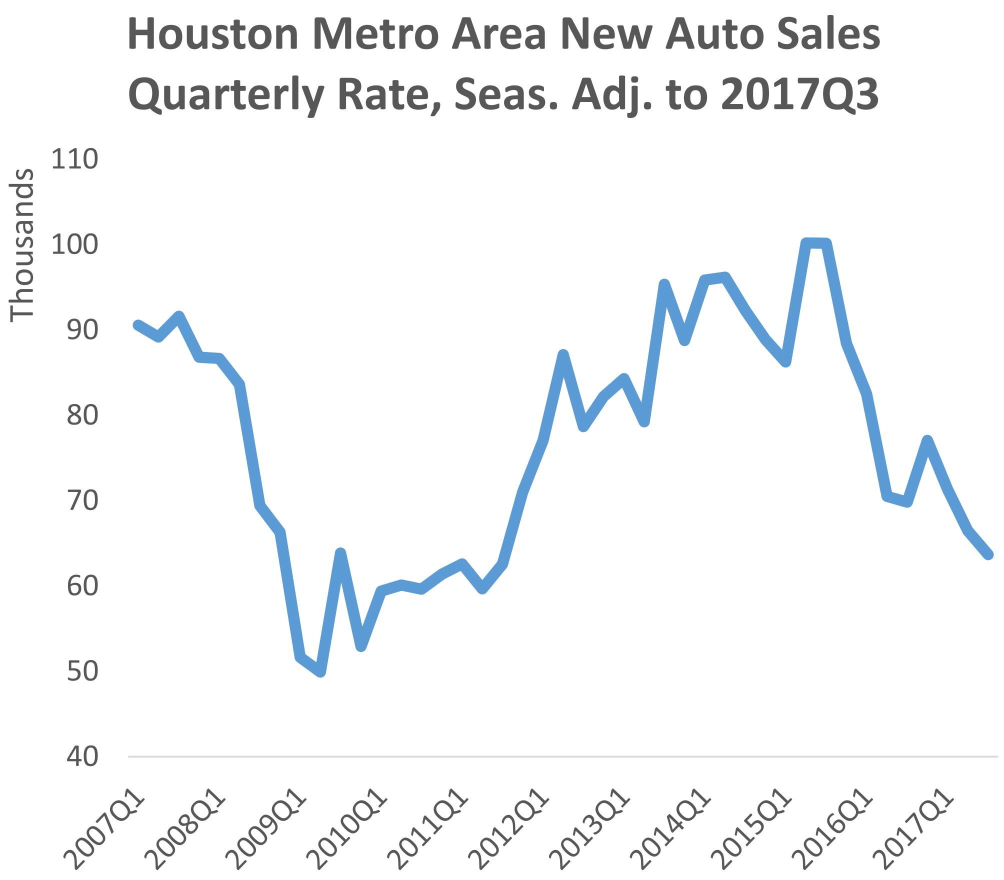
End-of-Year Office Markets with Vacancy Greater than 20 Percent



Industrial and Retail:
Waiting for Better Times

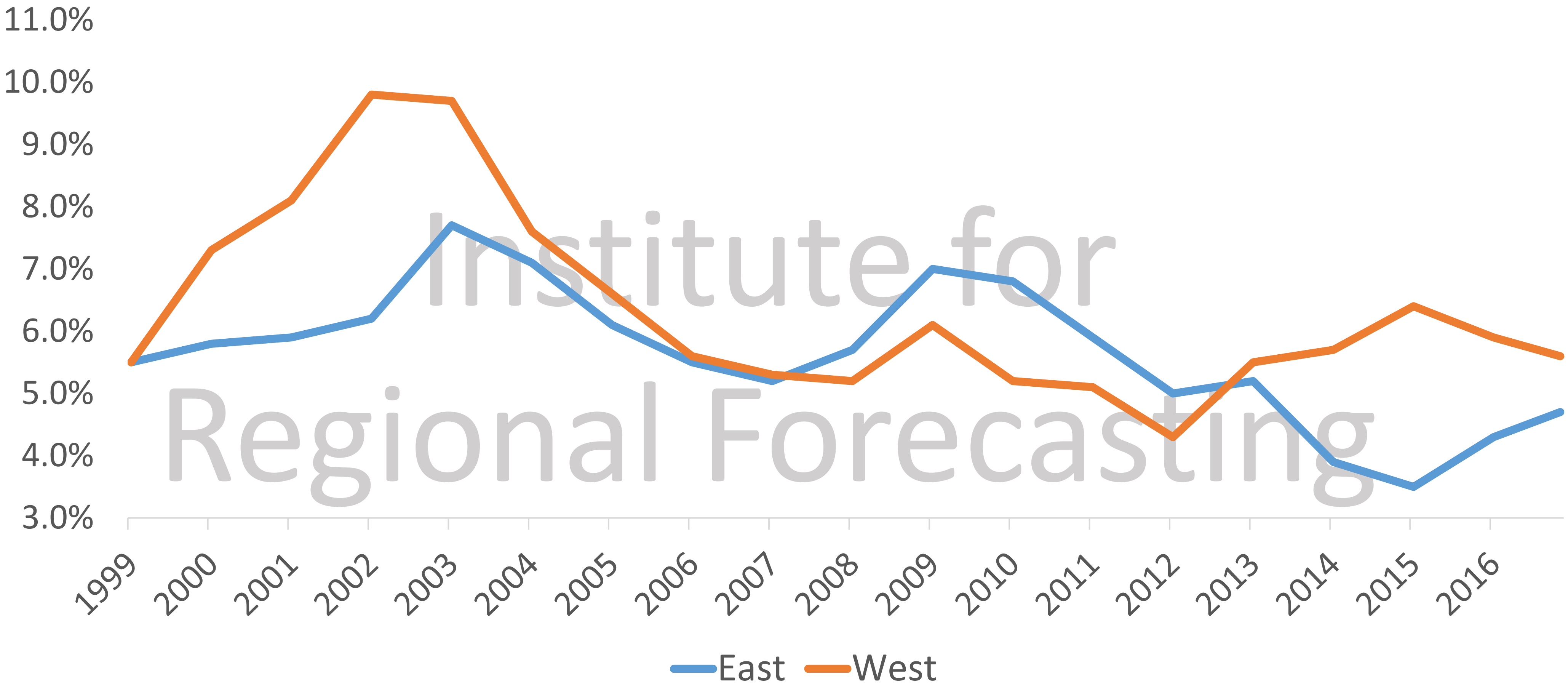
The Houston Consumer Hasn't Felt That Well Since 2014





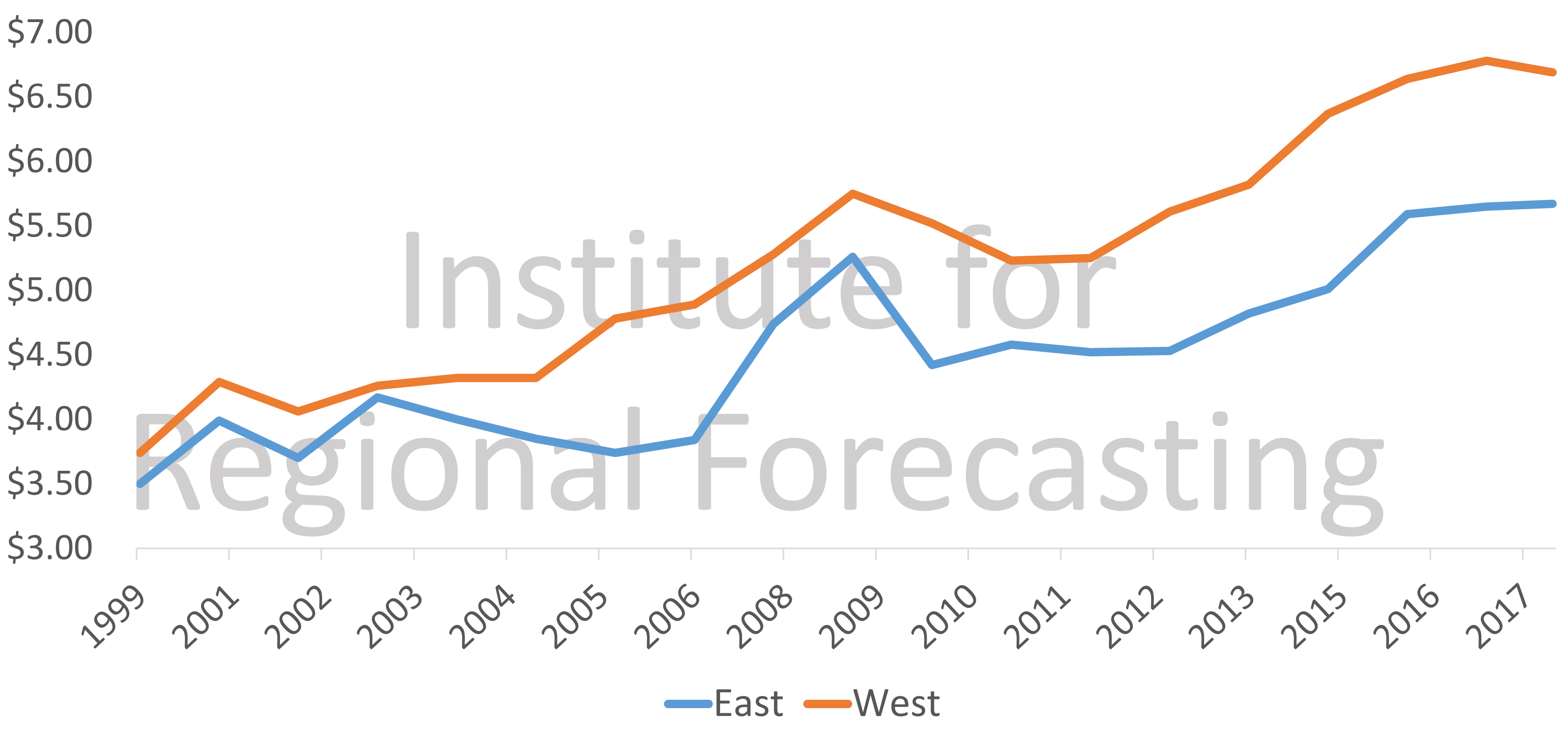
Texas Comptroller and InfoNation

Industrial Vacancy: East Side Ticks Up As Chemical Boom Winds Down



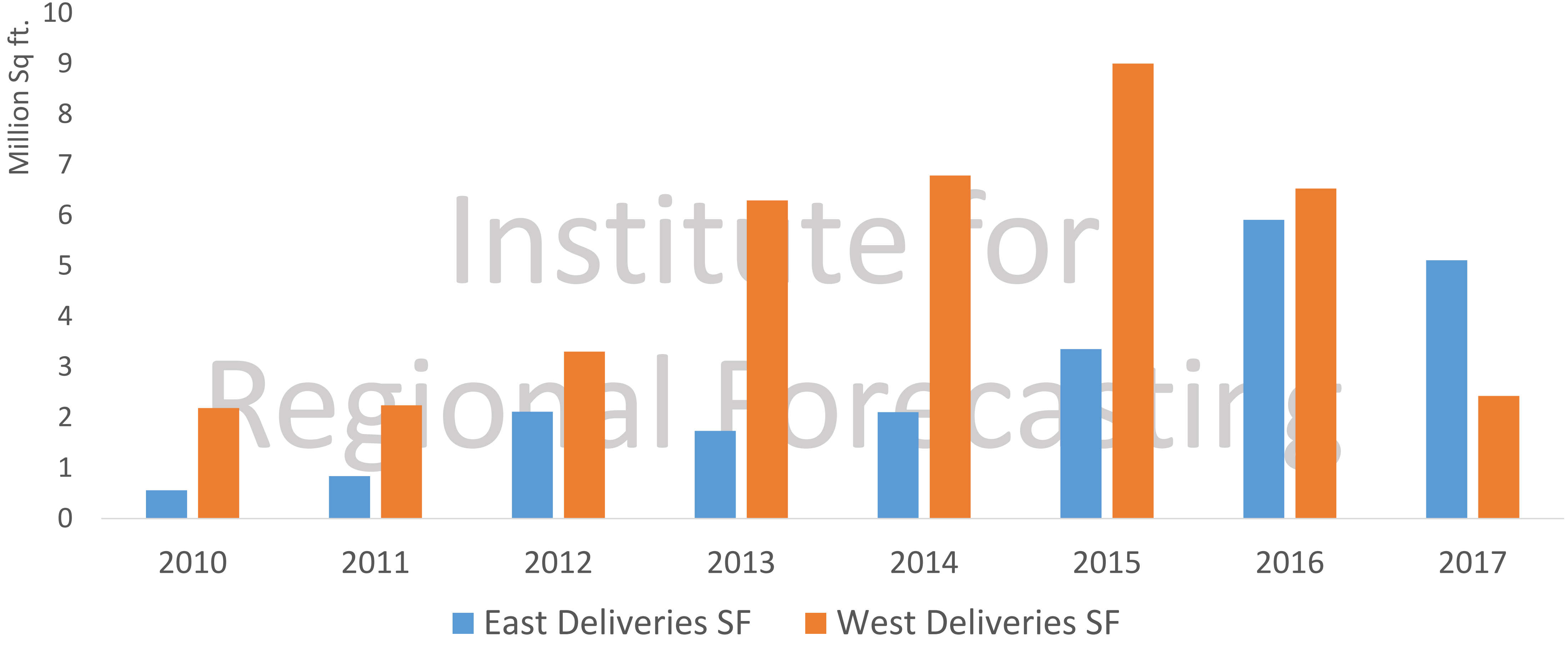
CoStar to September 2017, IRF

Industrial NNN Rents Turn Flat



CoStar to September 2017, IRF

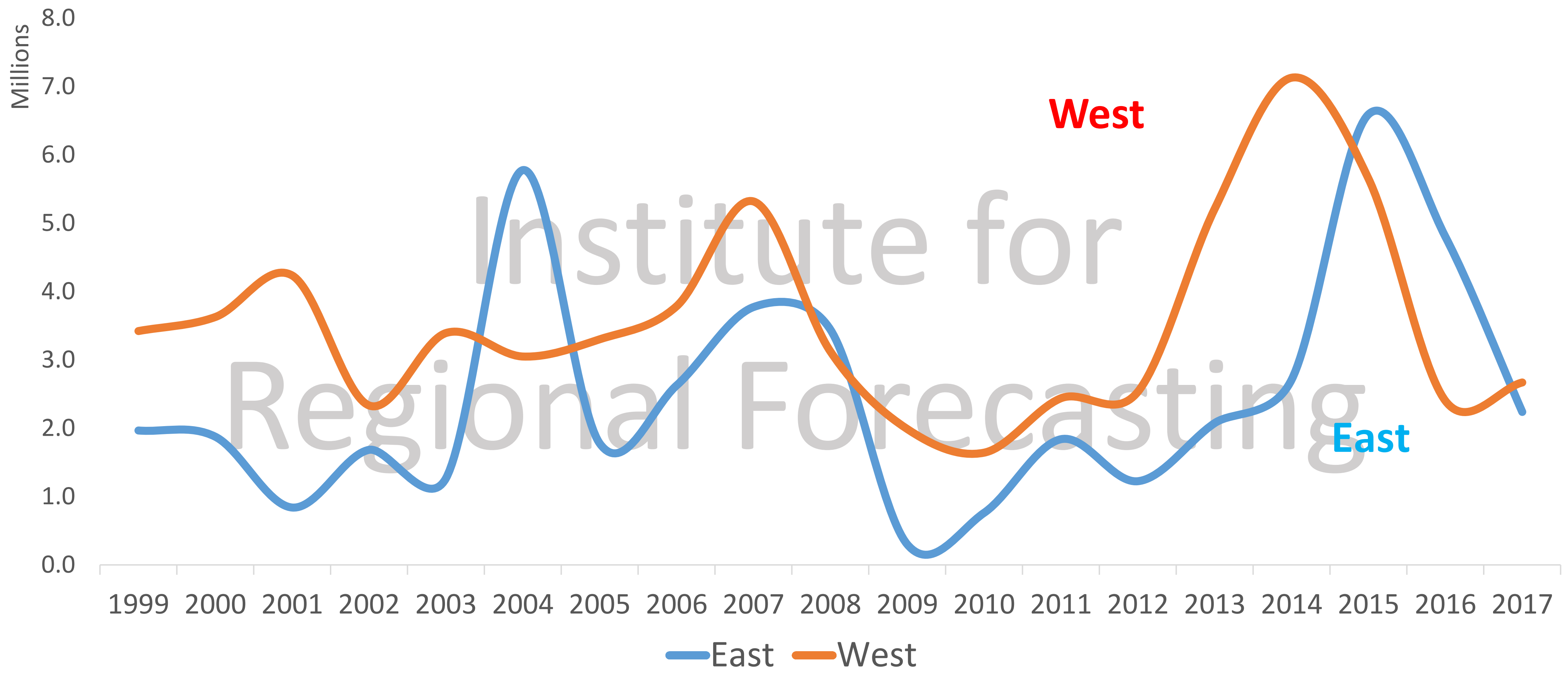
Industrial Deliveries Fade On Both Sides of Town



CoStar to September 2017

Industrial Construction Pipeline Empties Out

(million square feet)

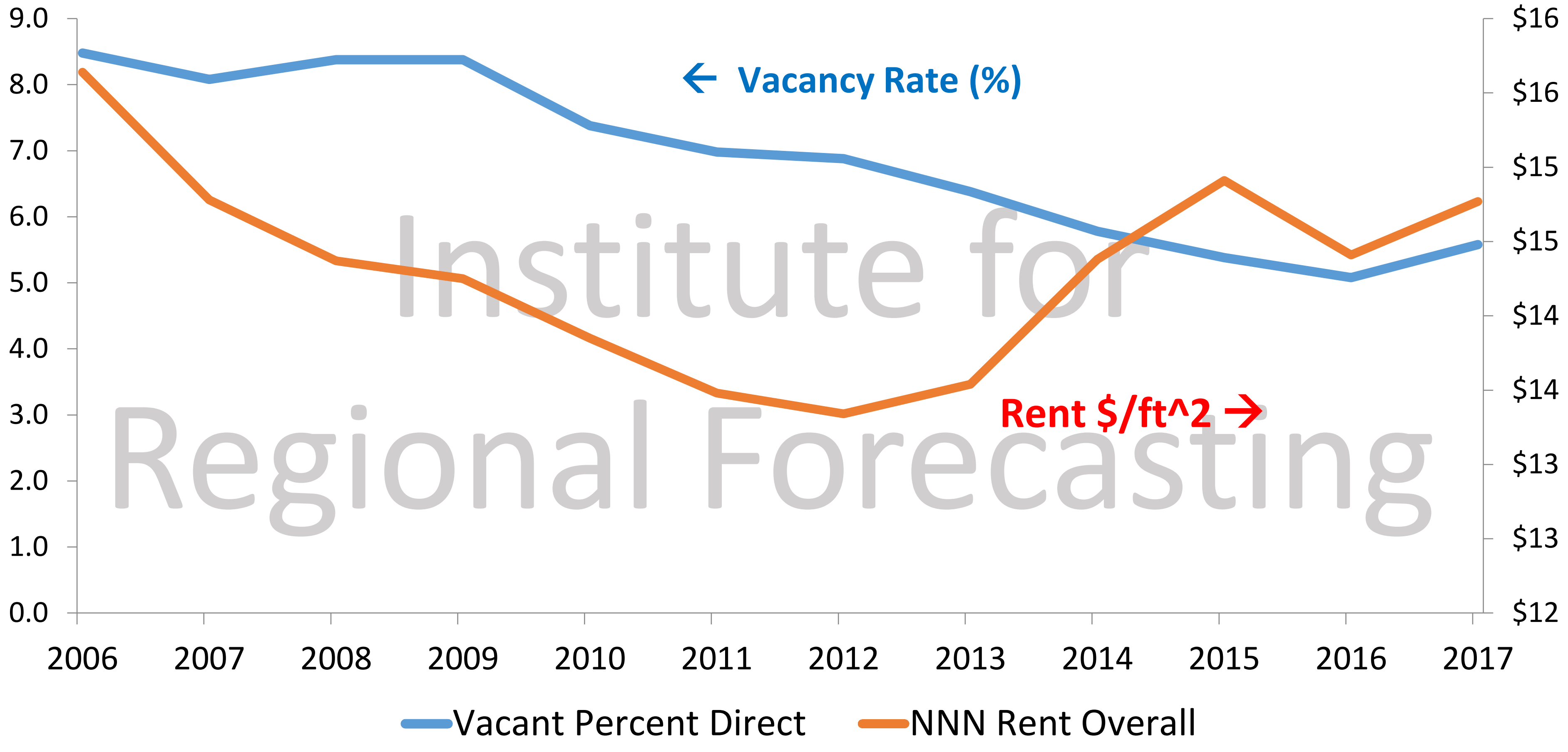


CoStar Construction to September 2017

Retail Caught Between E-Commerce and a Weak Economy

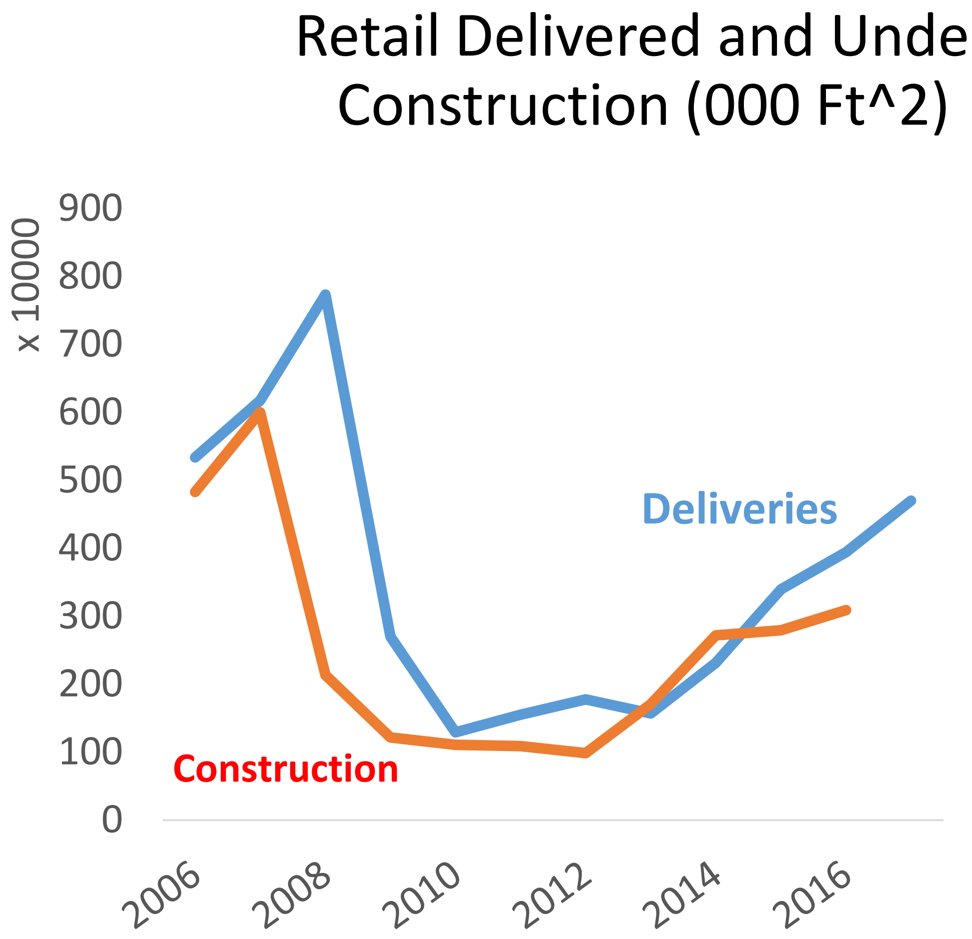
- Retail missed the boom of recent years after delivering 16 million square feet in 2006-07, leaving a glut of space that lasted to 2014
- Local growth caught up with retail space needs in 2013-14, and vacancy rates are tightness, and rents are healthy
- A weak economy and uncertainly about retail's future left this sector building grocery-anchored shopping centers, chasing new home construction around the Grand Parkway. Now even that is slowing
- The current construction pipeline is no threat to the market, but growth of space now exceeds population
- But be careful – consumer purchases of retail, food service, entertainment and other services have been falling since 2014

Retail Rent And Vacancy Began to Tighten In 2014

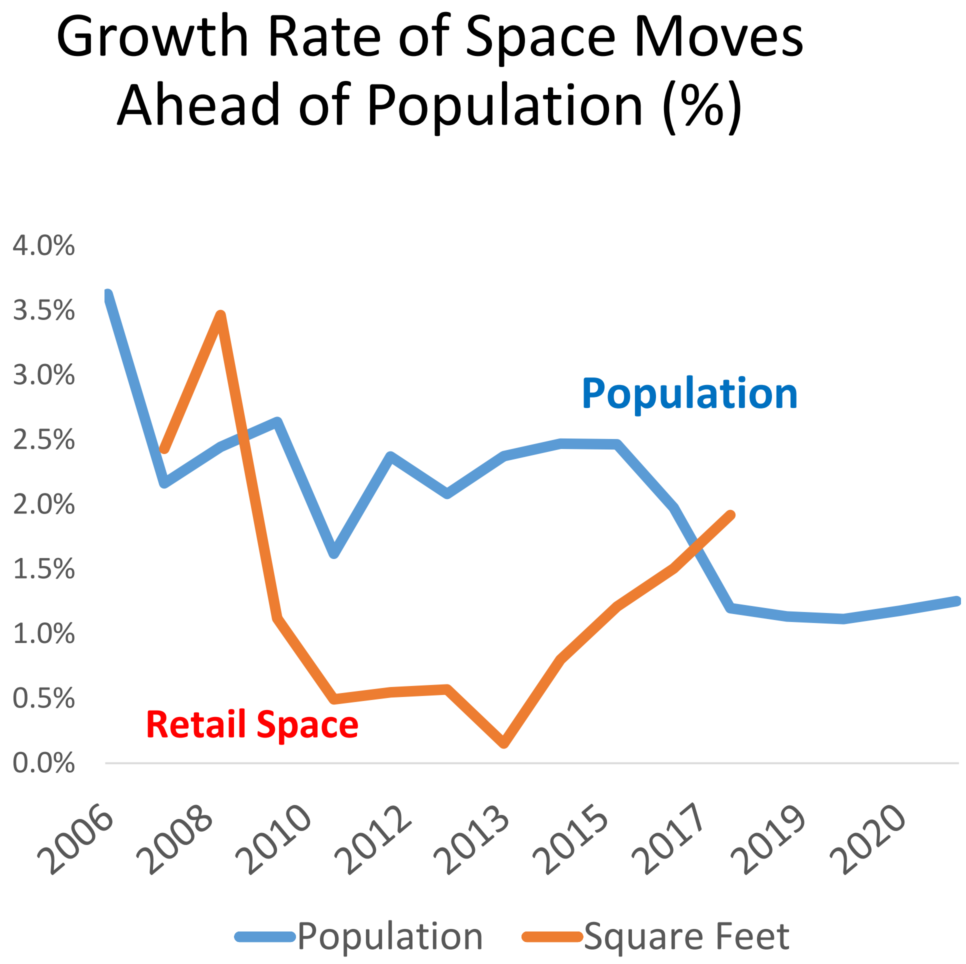


CoStar to September 2017

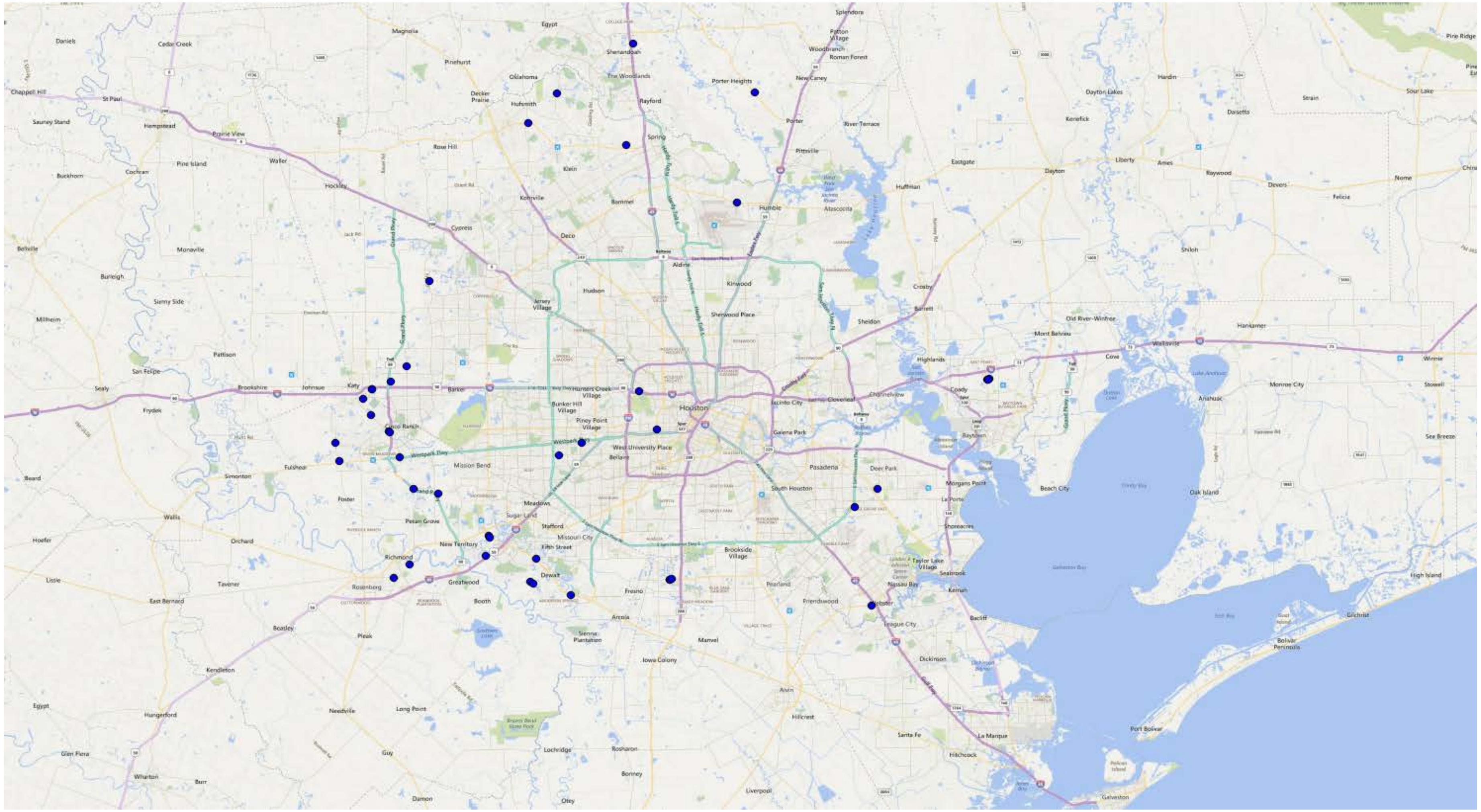
Retail Pipeline Is Okay – Despite a Declining Retail Market



CoStar to September 2017



Retail Under Construction Is Almost All In the Far Suburbs



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INSTITUTE FOR REGIONAL FORECASTING

Thank you for attending

Institute for Regional Forecasting

Please mark your calendars for

***Spring 2018 Symposium tentatively scheduled for Thursday, May 17**

***Fall 2018 Symposium tentatively scheduled for Thursday, November 15**