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Houston's Economic Outlook: Caught Between Improving Oil Markets and Growing Risks to U.S. Growth

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May 2018

Hurricane Harvey:
For the Economy Just One More Tropical Storm

- These storms do enormous property damage. Harvey shrank collective balance sheets across Texas by $80 billion. After Harvey, about 39,000 Houston homes left with major damage, and 300,000 vehicles totaled
- *That said, tropical storms and floods 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
- After the storm, we see gains in employment, construction activity, and retail spending. This offsets losses in the shelter period, and impact of the storm is usually a small plus or minus
- We are left poorer because of property losses, but after six months the effect on employment and income usually returns to near neutral. Continuing economic effects are too small to register in an economy of 3 million workers

Houston and Eight Billion-Dollar Storms

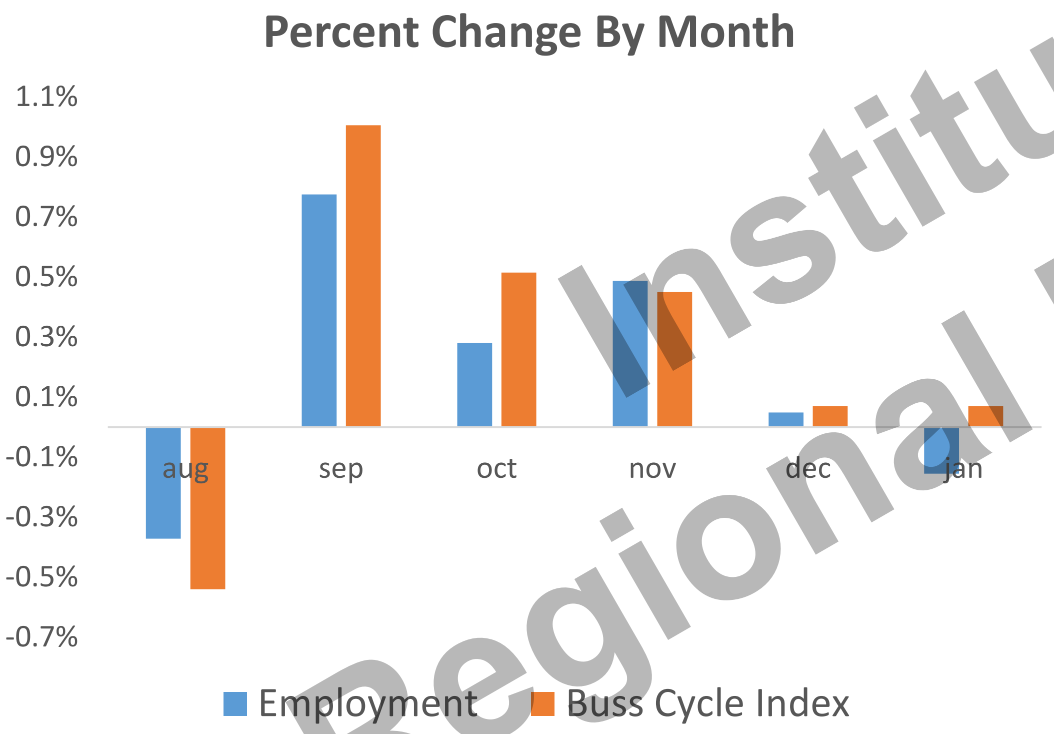
(Cumulative Percentage Impact Six Months After Storm)

	Date	Employment	BCI*	Spending	Construction
Alicia	8/83	--	1.50%	**27.4%**	--
SE Texas Floods	10/94	--	--	--	--
Allison	6/01	--	**-1.20%**	**23.5%**	**--**
Rita	9/05	--	--	**--**	**2.96%**
Ike	9/08	--	--	**21.9%**	--
Mem Day Floods	5/15	0.51	--	--	2.74%
Tax Day Floods	4/16	0.68	--	--	--
Harvey	8/17	**1.00%**	**1.57%**	13.2%	**3.66%**

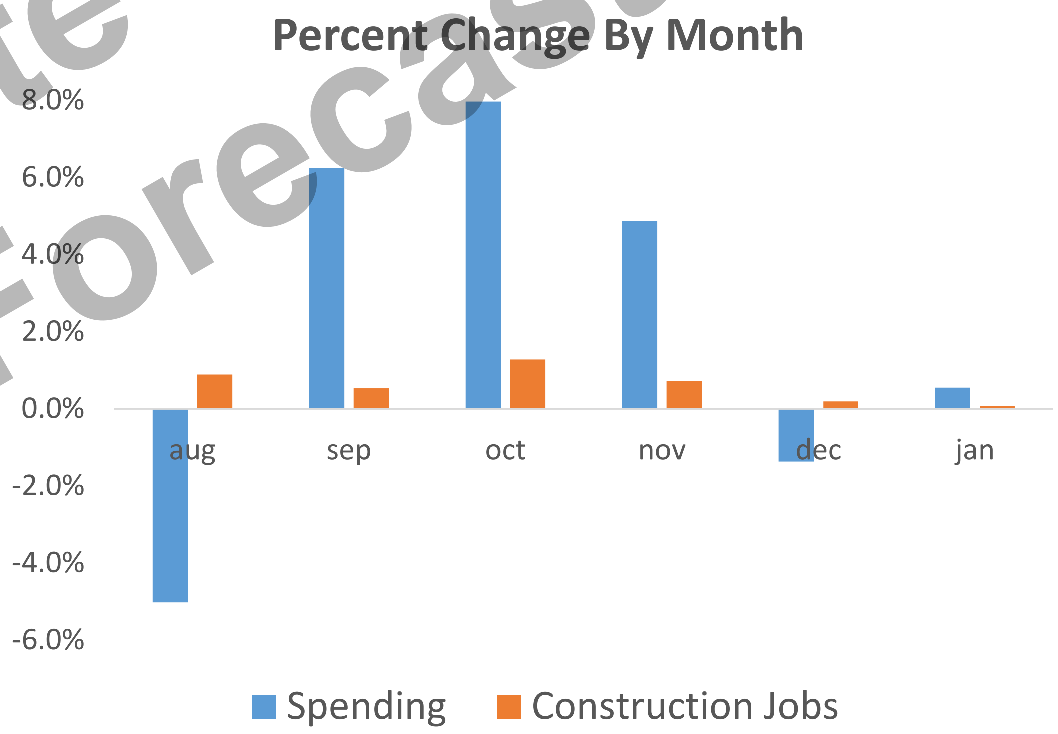
Note:*FRB Dallas Business Cycle Index. Percent change is shown only if there is a 75% or higher probability that it is greater than zero; changes with 90% or higher probability are in bold.

Harvey's Impact On the Broad Economy Was Over By Late 2017

Impact on the Broad Economy Ended By Late Last Year



This Was Also True for the Harvey Surge in Spending and Construction



Harvey Was a Warning About Our Flood Infrastructure It was Not About the Economy

- *Harvey was primarily a severe blow to single-family housing.* The big push in construction and spending is over, but lots of work left to do
- 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
- The City and County have both responded with new restrictions on building in the floodplain. Congress has allocated money, and studies are underway
- It is essential that we have adequate storm infrastructure, and not ignore warnings from Ike and Harvey? New Orleans, Puerto Rico, Galveston, and Indianola all ignored warnings that that their flood-control and other infrastructure was inadequate

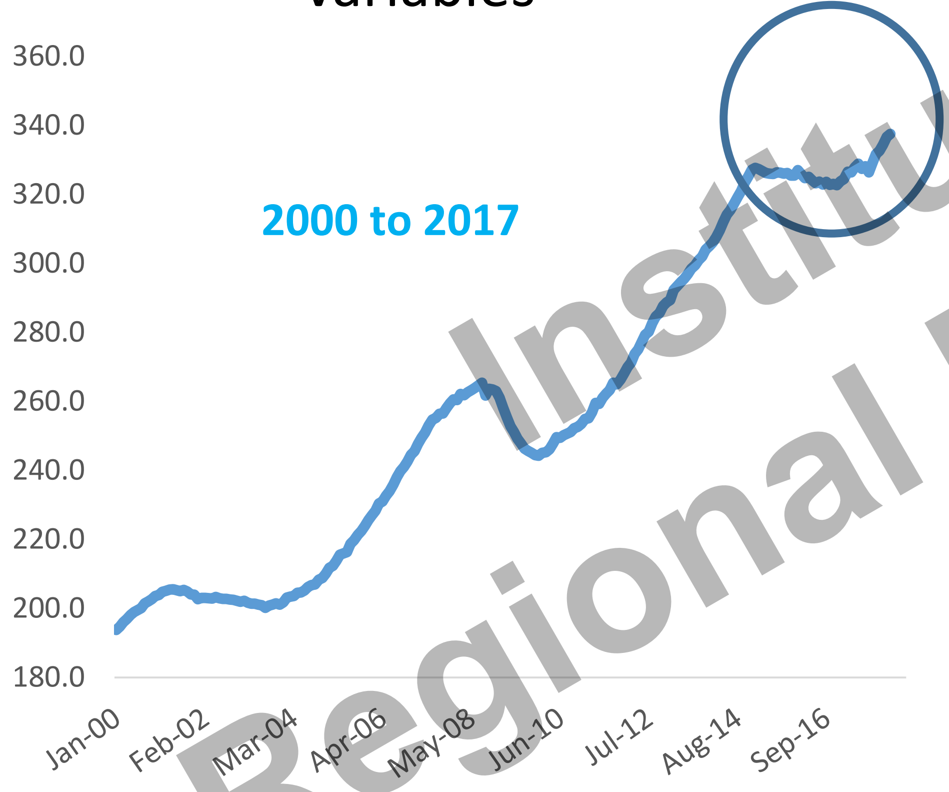
Re-Setting the Clock on Houston's Job Growth After the Fracking Bust

We Have Moved Into Another New Growth Cycle in Houston

- The loss of oil jobs came to an end in 2017. After losing nearly 75,000 oil-related jobs, about 9,000 have come now back
- After two years of no growth, payroll employment growth returned last year. It is still slow after Harvey is removed, but positive again
- There was no recession in Houston in the last two years. Unlike the 1980's, a growing U.S. economy, help from downstream industries, and momentum from the boom years kept up out a significant downturn
- Give Houston's economy credit for resilience in the face of an oil downturn that was probably worse than the 1980s

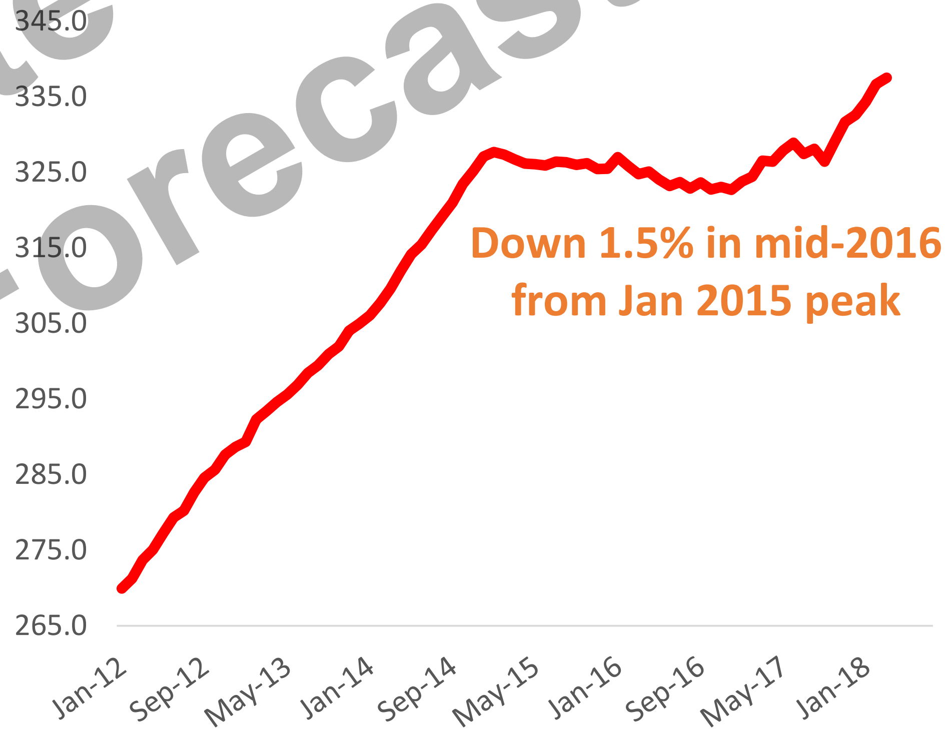
No Economic Reversal in Houston?
Oil Did Not Crush Houston in 2015-17

Tracks local business cycle with four variables



Dallas Fed, through March, includes Harvey effects

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



Houston Is Growing Again:
But Be Careful With All That Good News

- On the surface, all the economic news on Houston looks like a huge turnaround
  - Revised estimates of 2017 job growth jump to 62,900, a number that would reflect a return to normal growth in Houston
  - WTI is back at $65 per barrel, indicating a rebalancing of oil markets for first time since late 2014
  - Houston population growth in 2017 was just reported at 94,417
- Not far under the surface, some caution is still warranted
  - Maybe 36,000 of the 2017 jobs were due to Hurricane Harvey. Jobs due to fundamental improvement in Houston are more like 26,000
  - High oil prices depend on producer discipline, i.e., no big jump in drilling in 2018. No discipline? Oil prices fall, drilling programs shrink again.
  - The population increase was the weakest since 2010, and the third weakest since 1997. International net migration was positive, but domestic net migration turned negative. Birth and death was the population driver

Four Factors Have Driven the Local Business Cycle Since 2014 -- Now Add Harvey in 2017

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

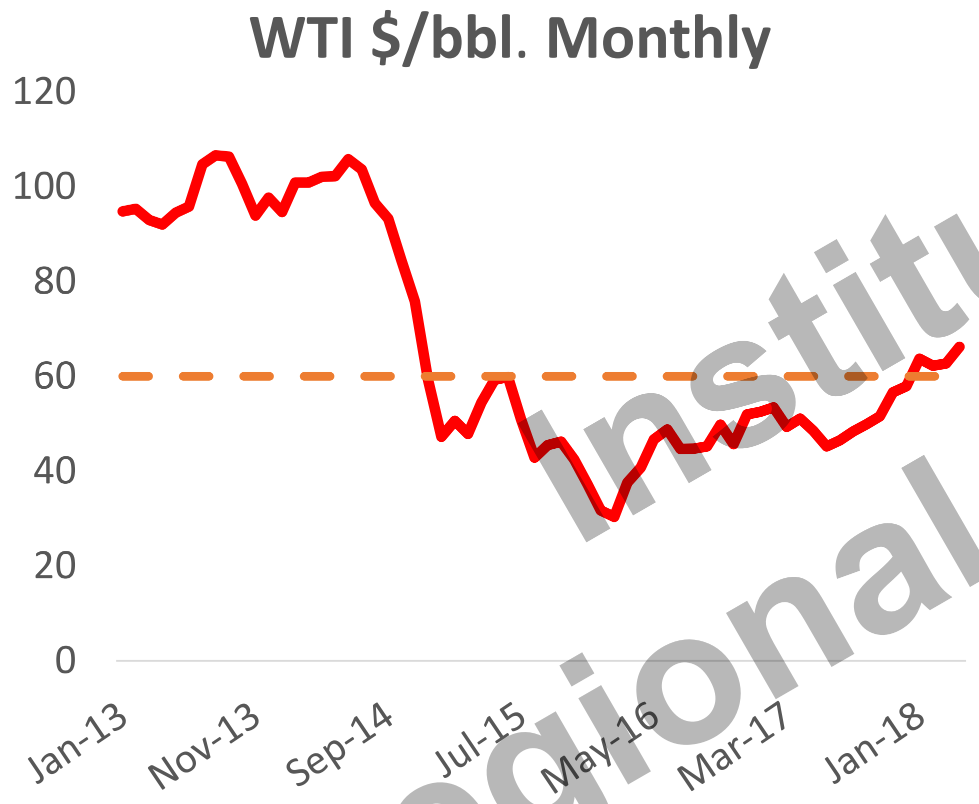
We will work our way through three key questions today:

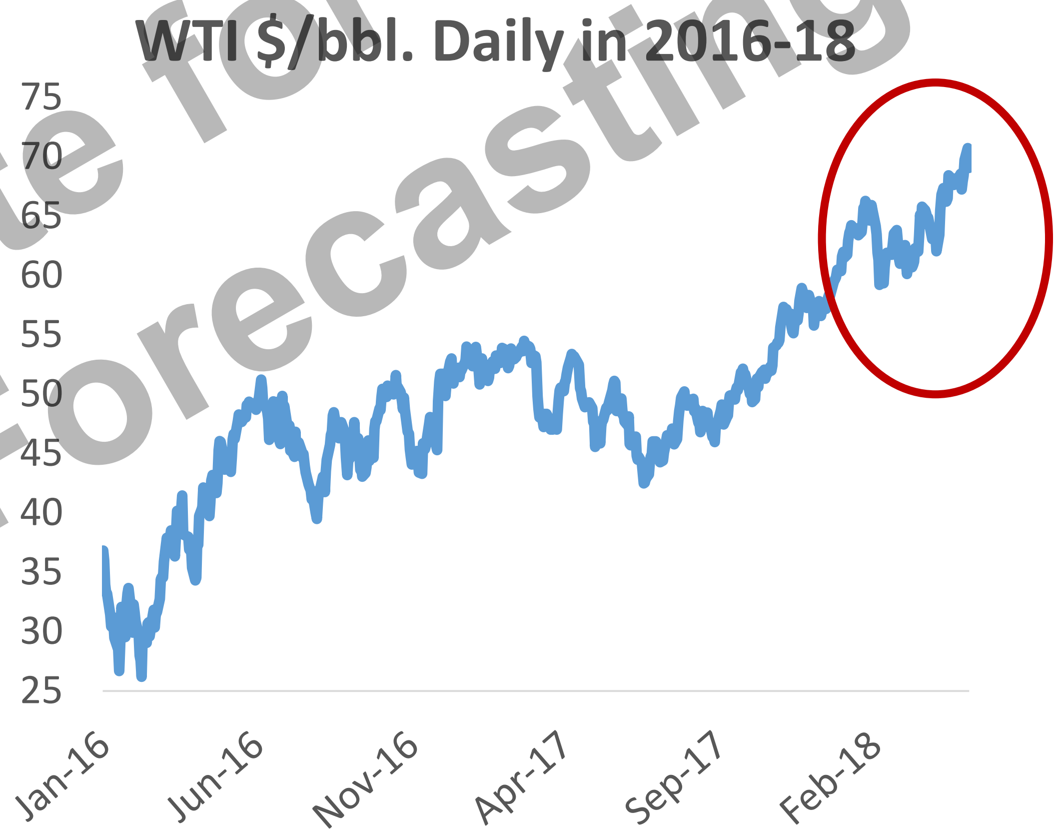
-- 62,900 jobs in 2017! How did that happen?

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

-- Are we really worried about the U.S. economy?

OPEC and Oil Market Still Have Their Fingerprints All Over Houston's Economic Outlook

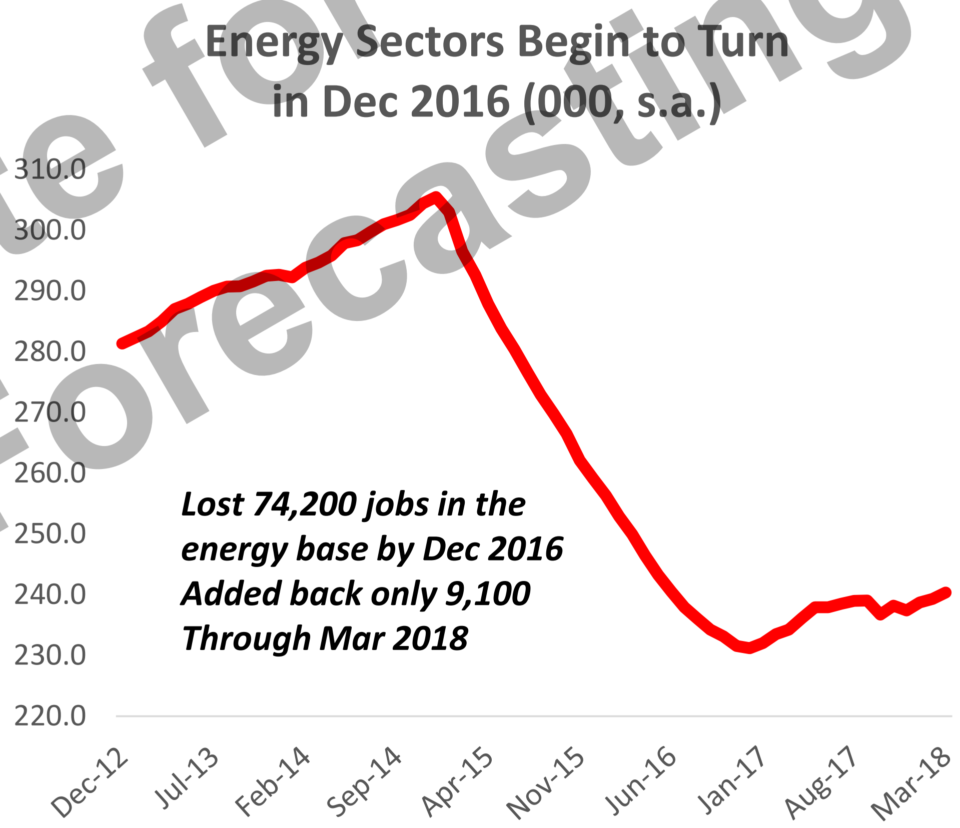




FRED, St. Louis Fed, Bloomberg Through 5/9/2018

Oil Jobs Are the Key to Faster Local Growth:
They Have Returned Slowly So Far
(Net Change in Jobs, Dec. to Dec.)

Sector	Dec '14 – Dec '17	
	New Jobs	Percent
Total Payroll ex Harvey	22,700	0.7%
Mining	-35,100	-31.1%
Construction	9,600	4.5%
Manufacturing	-41,400	-15.8%
Machinery	-18,300	-30.3%
Fab Metal	-18,000	-27.2%
Wholesale Trade	-2,100	-1.2%
Prof/Buss Services	12,400	2.6%

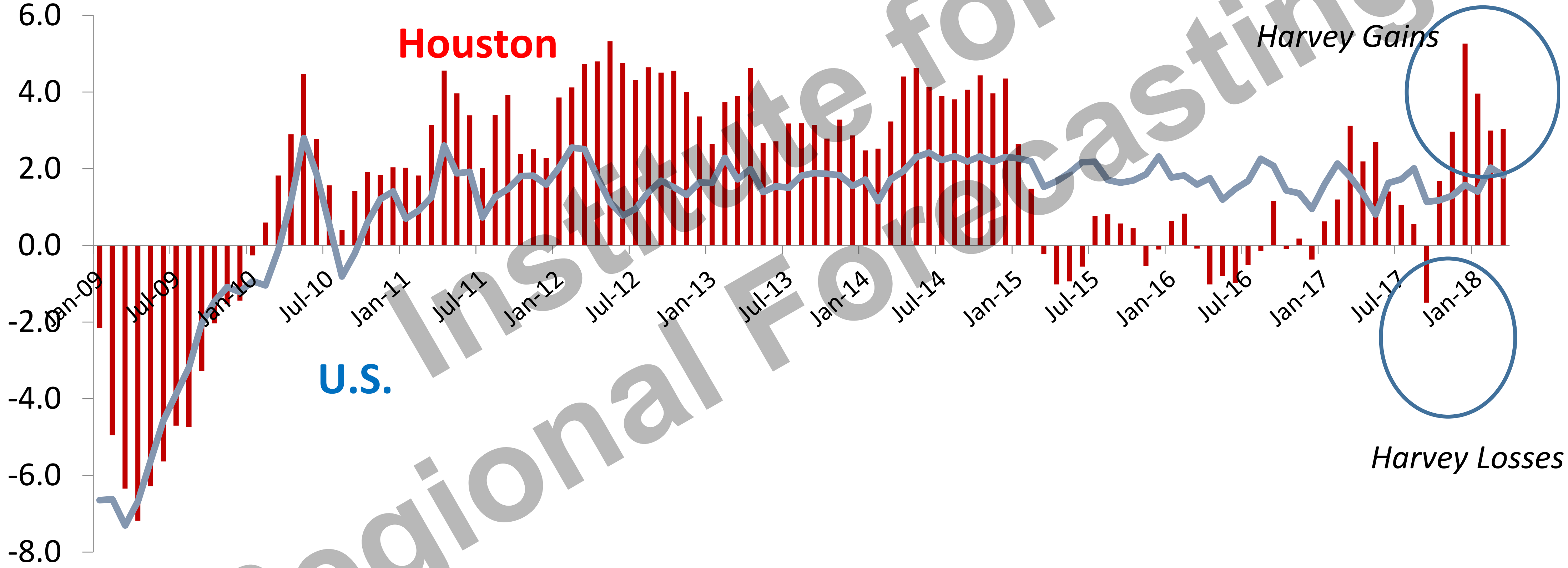


*Texas Workforce Commission estimates. Oil-Related Jobs = Oil Producers and Services, Machinery and Fabricated Metal, Refining, Chemicals, Plastics, and pipelines.

Houston Fundamentals Now

Slow Job Growth Returned to Houston in 2017 After Accounting for Year-End Gains Due to Harvey

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



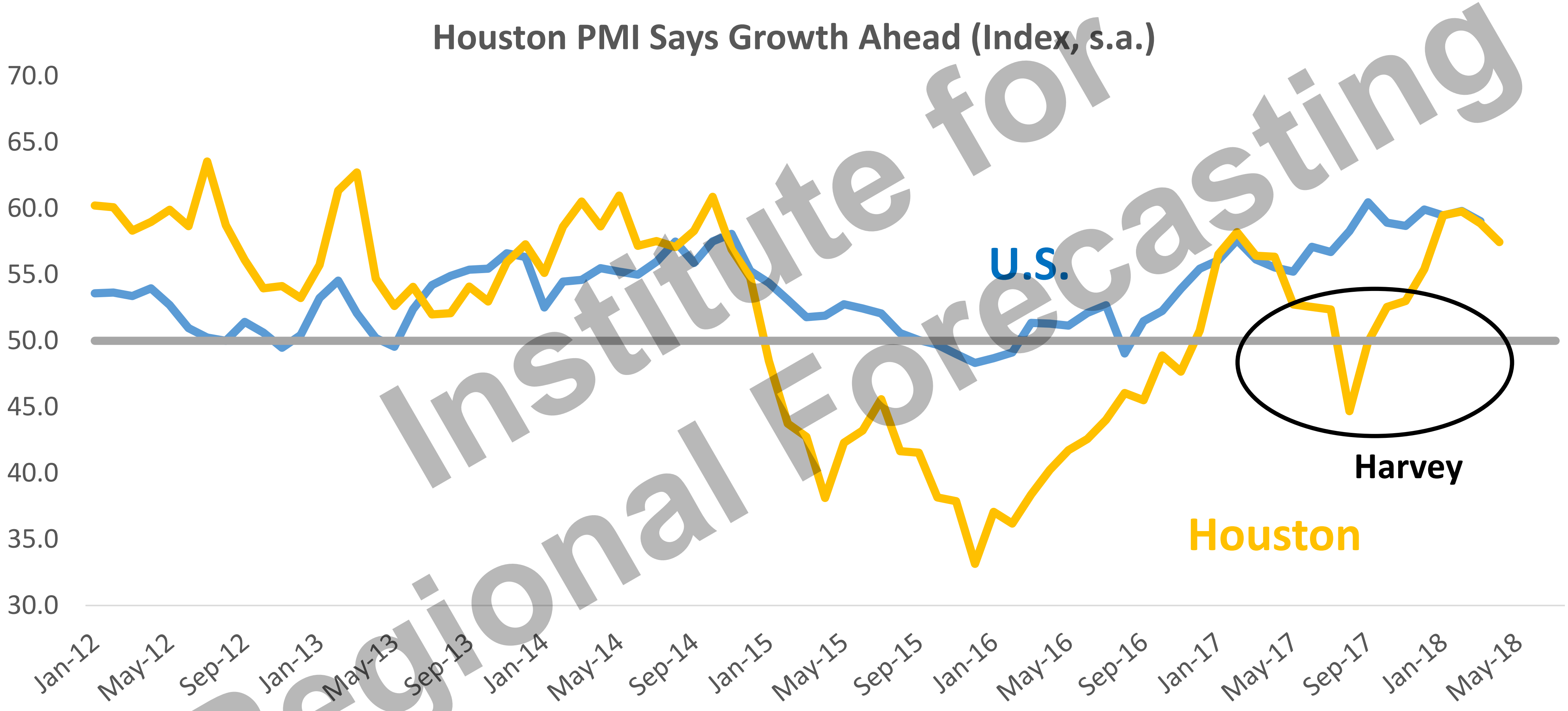
Texas Workforce Commission and Bureau of Labor Statistics

Houston Job Growth Turned a Corner in 2017: Recent Data with Market Revisions

	(000 Jobs)	
	Q4/Q4	**Dec/Dec**
Annual Job Growth:		
2014	113.1	116.7
2015	8.6	-2.5
2016	-3.0	-2.2
2017	53.7	62.9
2017 ex. Harvey	29.0	26.1
2017 Forecast:		
May-17	35.2	---
Nov-17	41.8	---

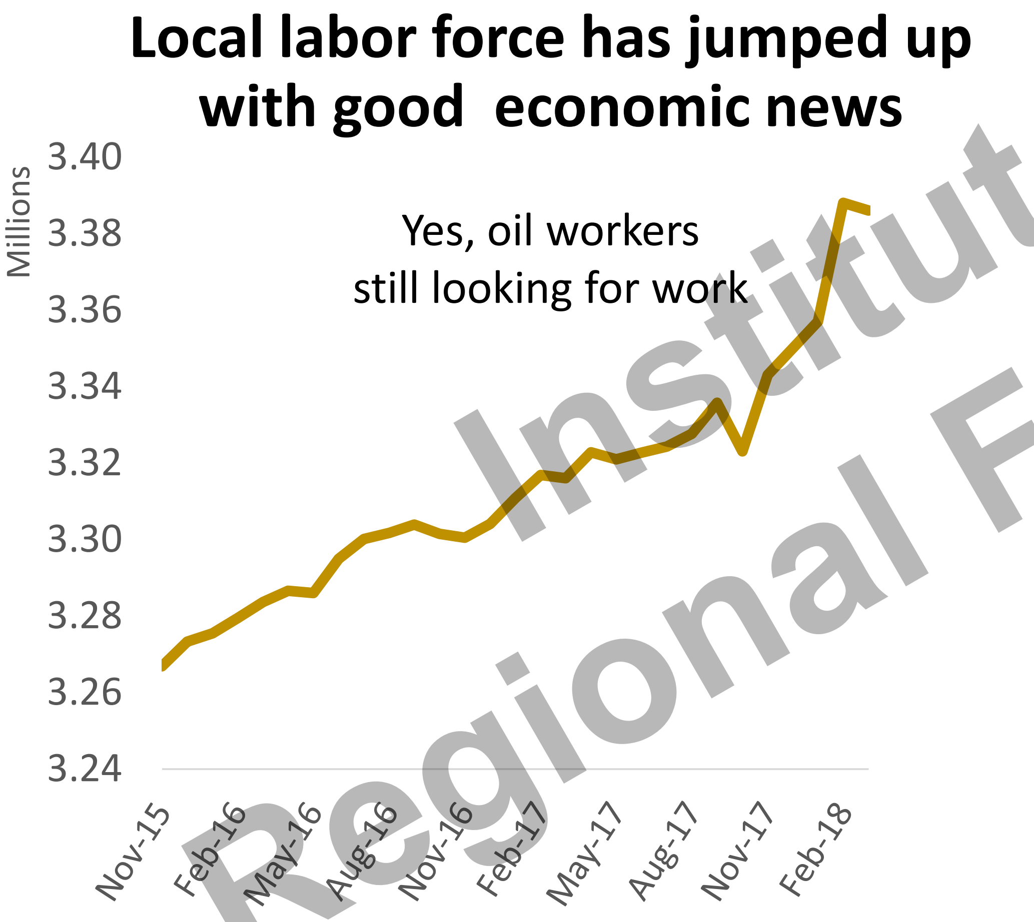
Payroll employment with March benchmark revisions; Harvey drove large year-end job gains of about 36,800 that are one-time, non-recurring jobs measured December to December. Without Harvey only 26,100 only were driven by the economy in 2017.

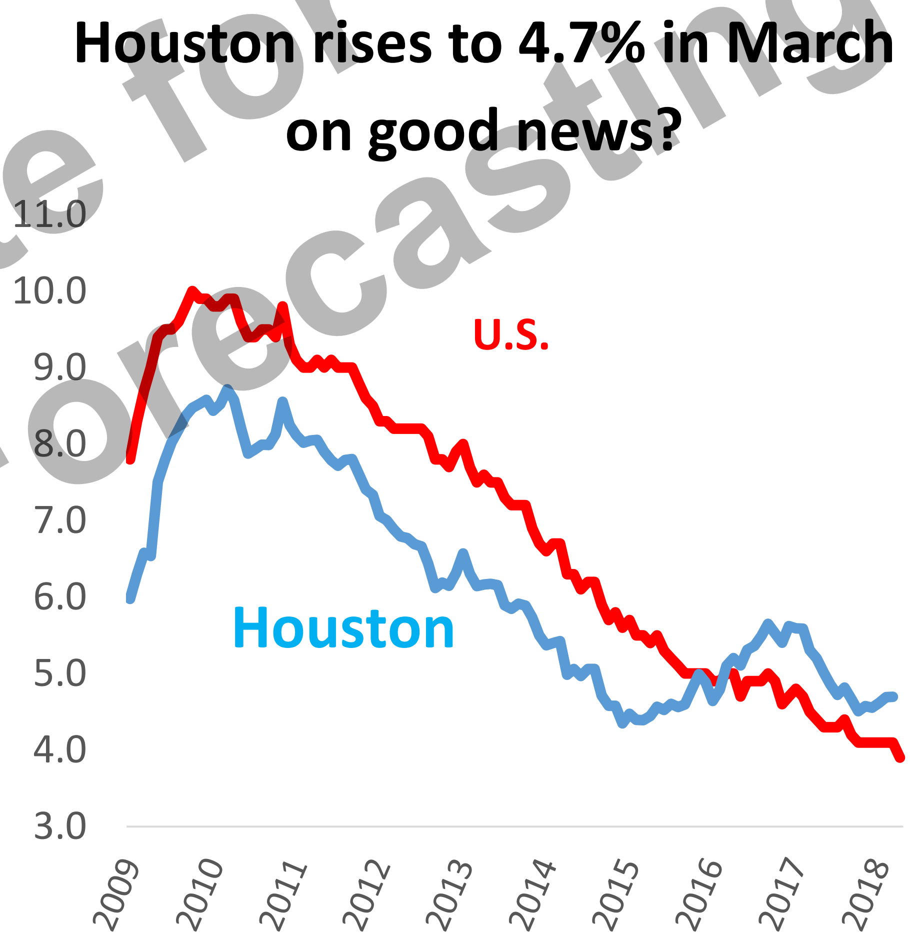
Houston Purchasing Managers' Index Picks Up Again Early in 2018



ISM Houston and IRF calculations

Houston's Unemployment Rate Has Behaved In Contrary Ways

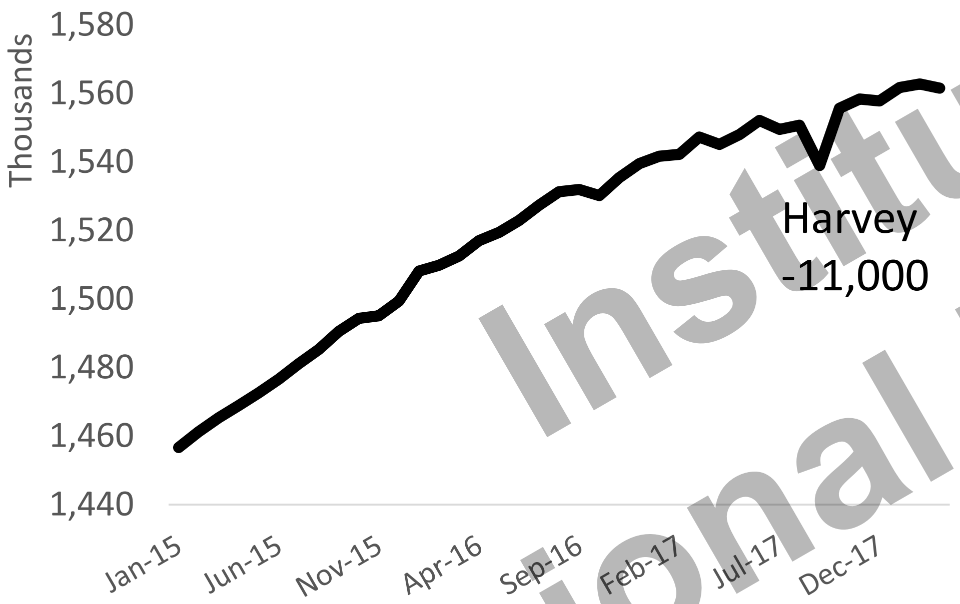




Texas Workforce Commission, seasonally adjusted to January 2018

Growth Of Selected Services Now Slowing Down on Lost Momentum

1.58 Million Jobs in 9 Key Service Sectors, seas. adj.



Texas Workforce Commission

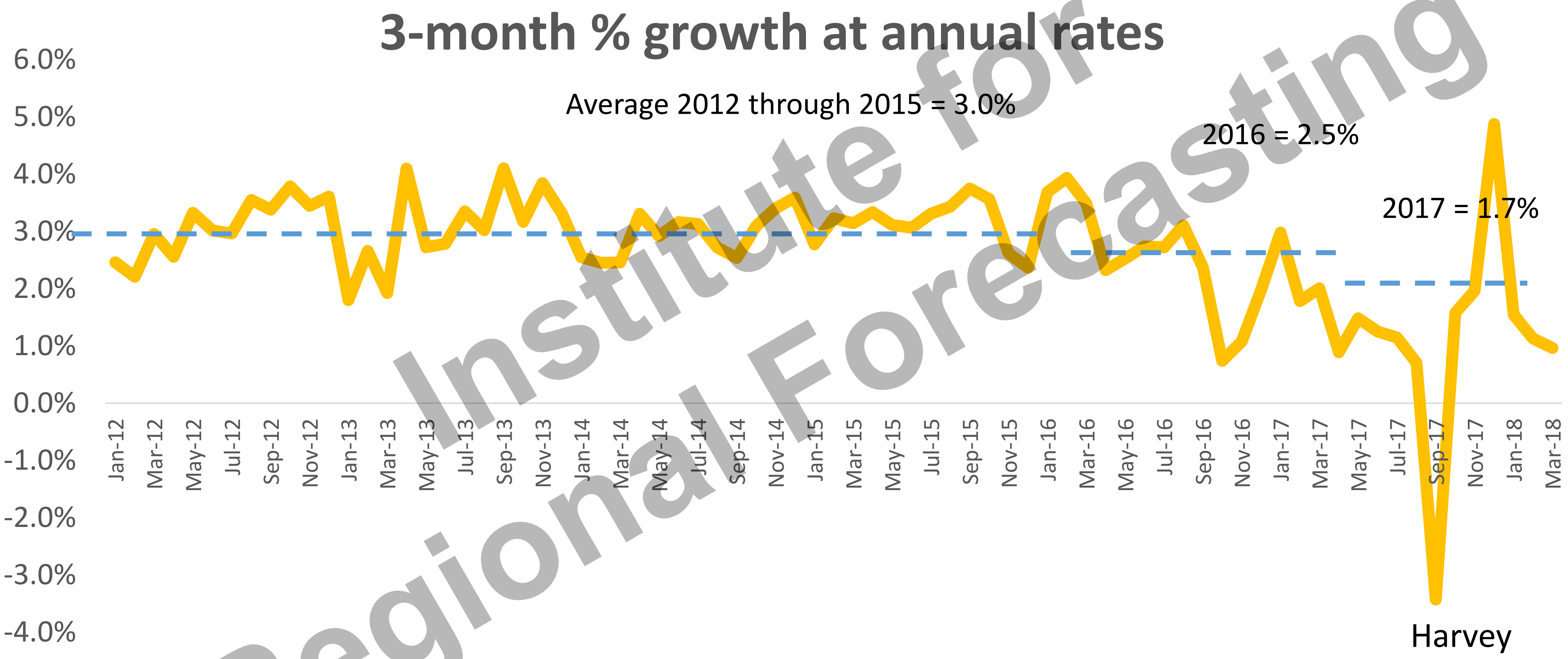
New Jobs Added:

Dec 2014 to Mar 2018

- 22,457 health care
- 21,249 retail trade
- 19,822 bars and restaurants
- 16,086 local government
- 11,896 finance
- 5,024 private education
- 4,807 state gov't
- 3,395 arts/entertainment
- 2,104 accommodation
- 107,619 all 9 sectors

Note: Includes effects of Harvey. Over 70 percent of 2017 growth in these sectors continues to come out of the top four categories above: health care, retail, bars and restaurants, and local government.

Lost Momentum: Growth of Nine 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 is the same whether the Hurricane Harvey setback and recovery is included or not.

Oil Markets Are Improved .. But We Need to Take a Deep Breath About Current Oil Prices

Global Growth Accelerates: Solid Base for Oil Demand Optimism

(% GDP Growth)

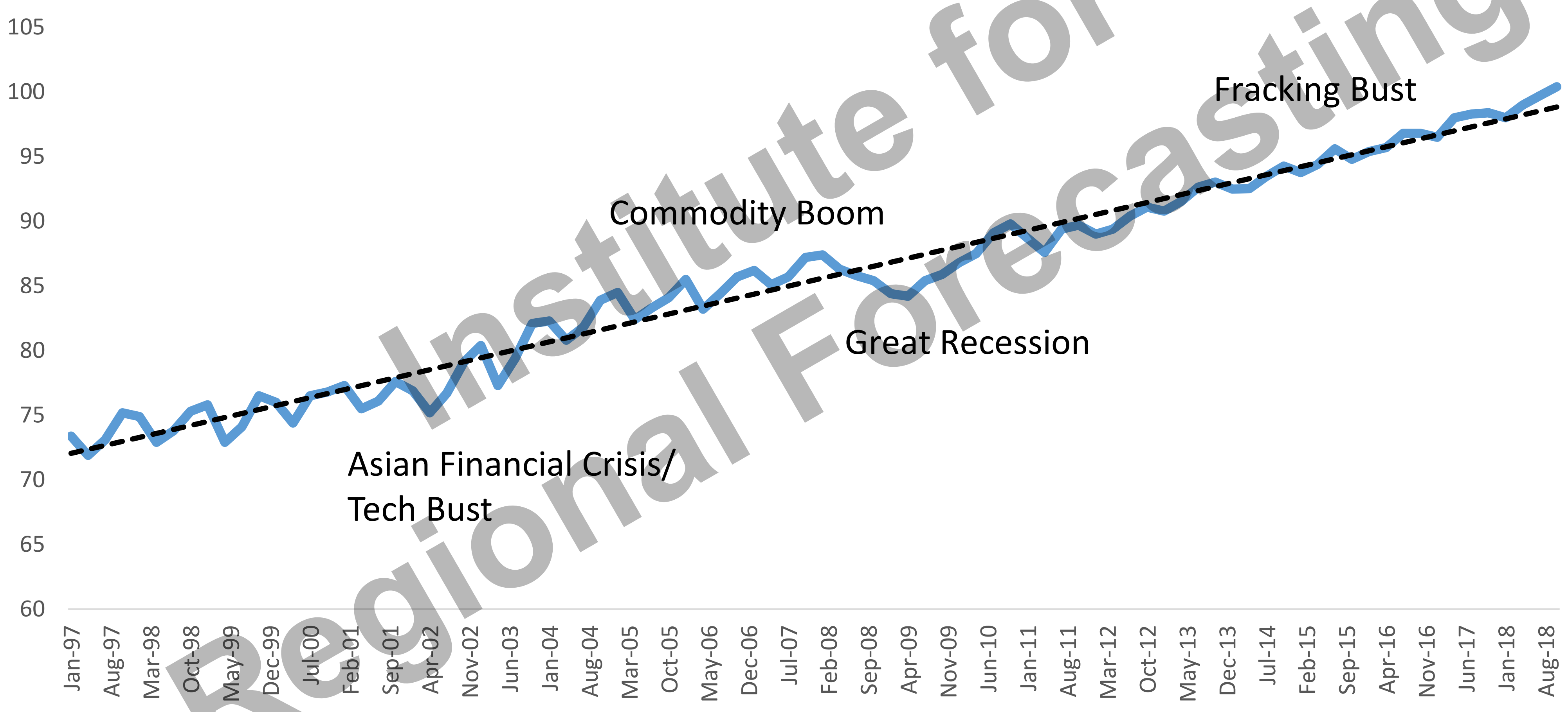
	2016	2017	2018	2019
World	3.2	3.9	3.9	3.9
U.S.	1.5	2.3	2.5	2.2
Euro Area	1.8	2.3	2.4	2.0
Japan	0.9	1.7	1.2	0.9
	---	---		
China	6.7	6.9	6.8	6.4
India	7.1	6.7	7.4	7.8
Brazil	-3.5	1.0	2.3	2.5

Source: IMF *World Economic Outlook*: April 17,2018 Update

- Stronger global growth in 2017 was led by an investment recovery in advanced economies, continued strong growth in emerging Asia, and an upswing in emerging Europe
- In 2018-19 global growth ticks up with strong economic momentum, favorable market sentiment, and expansionary U.S. fiscal policy
- Beyond 2019 growth slows to 3.7% as U.S. fiscal stimulus passes and advanced economies are generally more subdued

Fundamentals of Oil Demand Solid Since 2014: Low Oil Prices Are A Supply Problem

(million bbl./d)



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

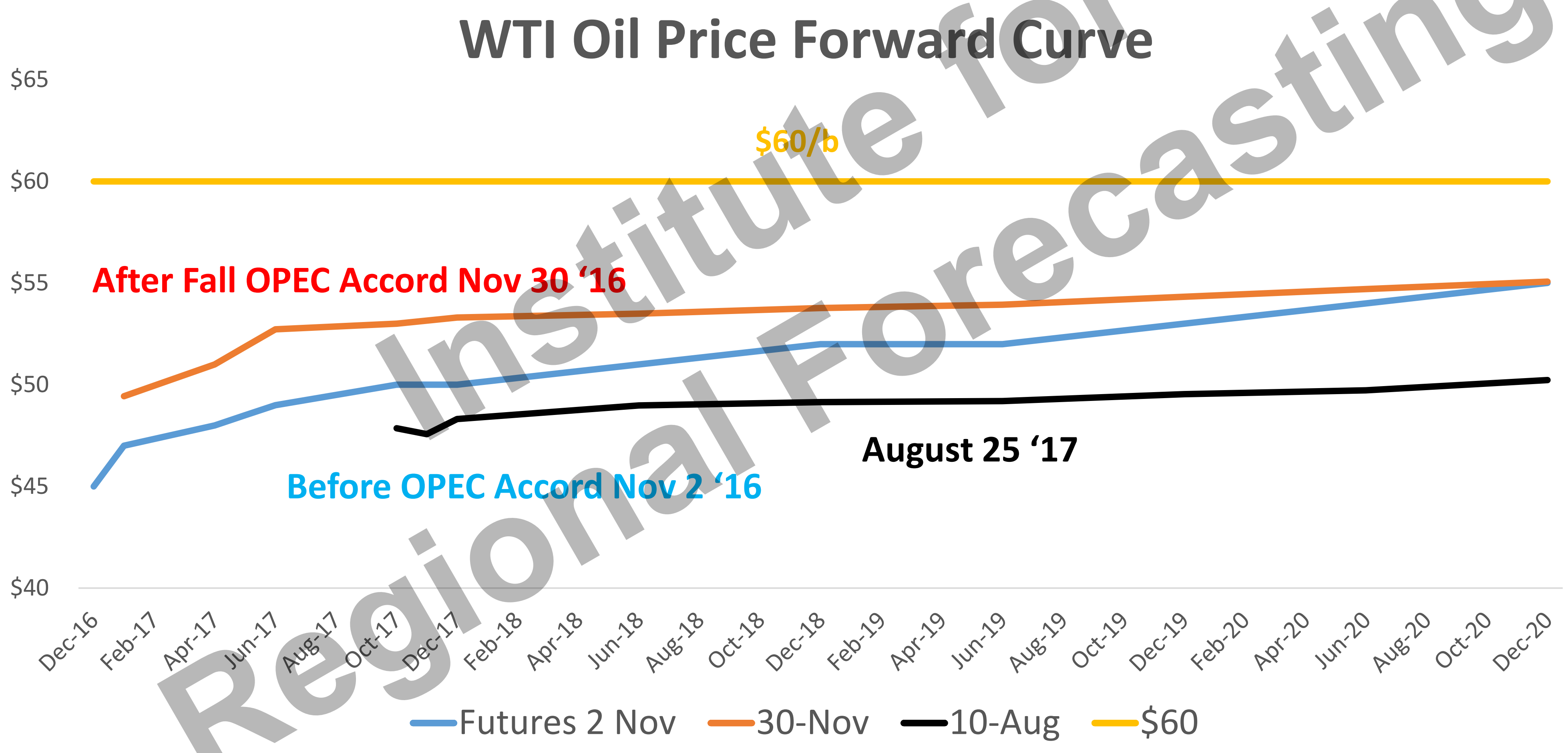
Political Risk Is Back in 2018 Giving Oil Price Upside Risk Again

- OPEC and stronger global growth have helped oil prices, but so have supply disruptions and growing political risk
- Supply disruptions like pipeline repairs in the North Sea, an on-going collapse of the Venezuelan economy, and guerillas in Nigeria have played a role in pushing prices up
- The risk that Middle East is back in play. Most recently it is sanctions on Iran. but there are the Kurds and Turks in Iraq, the U.S. and Russians tied up in Syria, the Saudis in Yemen, etc.
- For the first time in several years there is a perceived upside to oil prices from the supply side. Currently the risk premium is about $10/barrel

Trump and New Iranian Sanctions: Unlikely to Significantly Affect Oil Supply

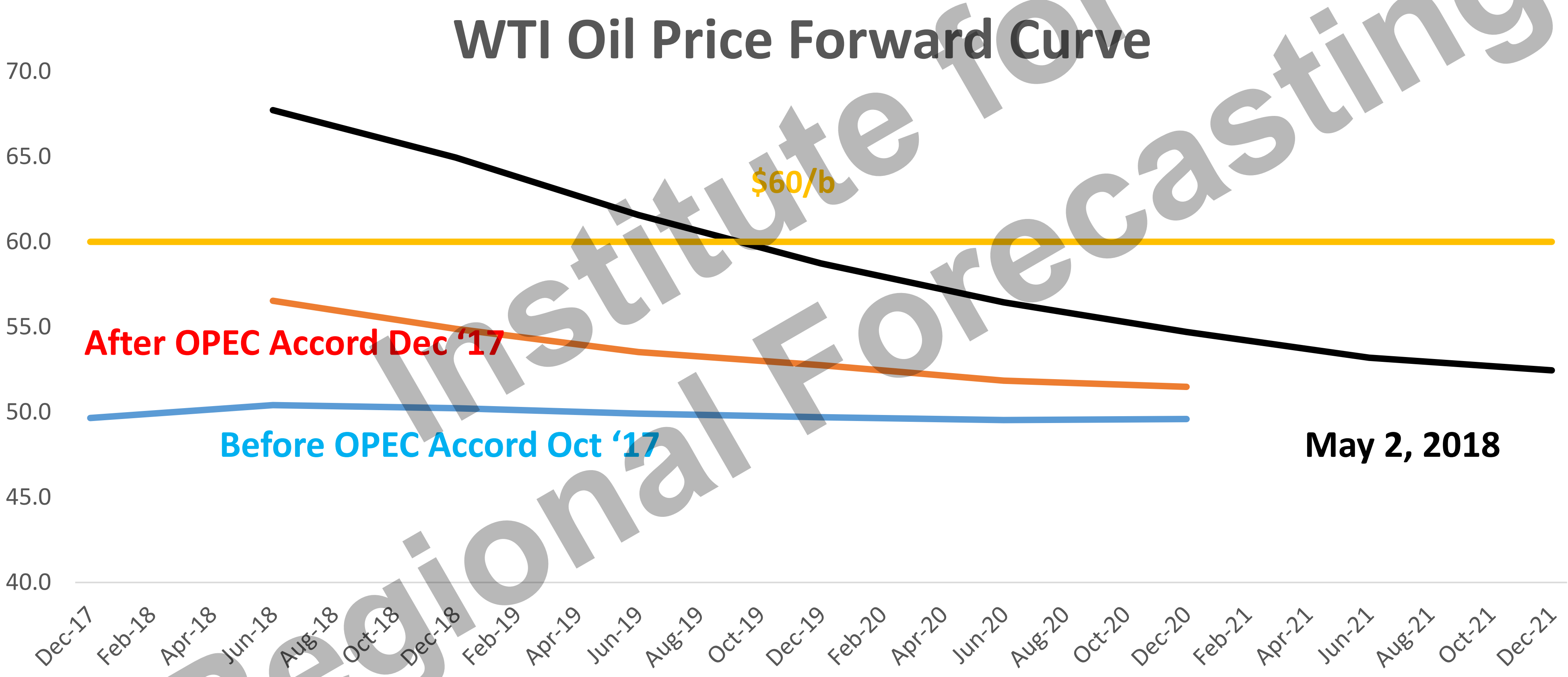
- On May 9, Donald Trump restored all prior economic sanctions on Iran. Over the next 6 months, this could potentially disrupt 2.7 million barrels per day of Iranian oil exports. The current treaty has a 6-month grace period before any reduction in oil sales by Iran is required by global buyers
- U.S. financial sanctions may force some allies and producers to go along with oil cuts, but France, the UK, Germany, China, and the U.N. vigorously oppose any new sanctions. Russia, Turkey, and India were not going along anyway. CME Group, for example, sees no coming cuts in Iranian oil production
- In the event some Iranian oil production is lost, a long line of producers are already lining up to take Iran's place as suppliers – Saudi Arabia, Russia, Iraq, Kuwait, and the UAE, among others
- There is a continuing $10 premium on political risk in oil markets right now, but it is based primarily on Saudi/Iranian tensions, *not* U.S. sanctions on Iran

OPEC Optimism Came and Went in 2017 After OPEC Says: "Whatever It Takes …"



CME Group

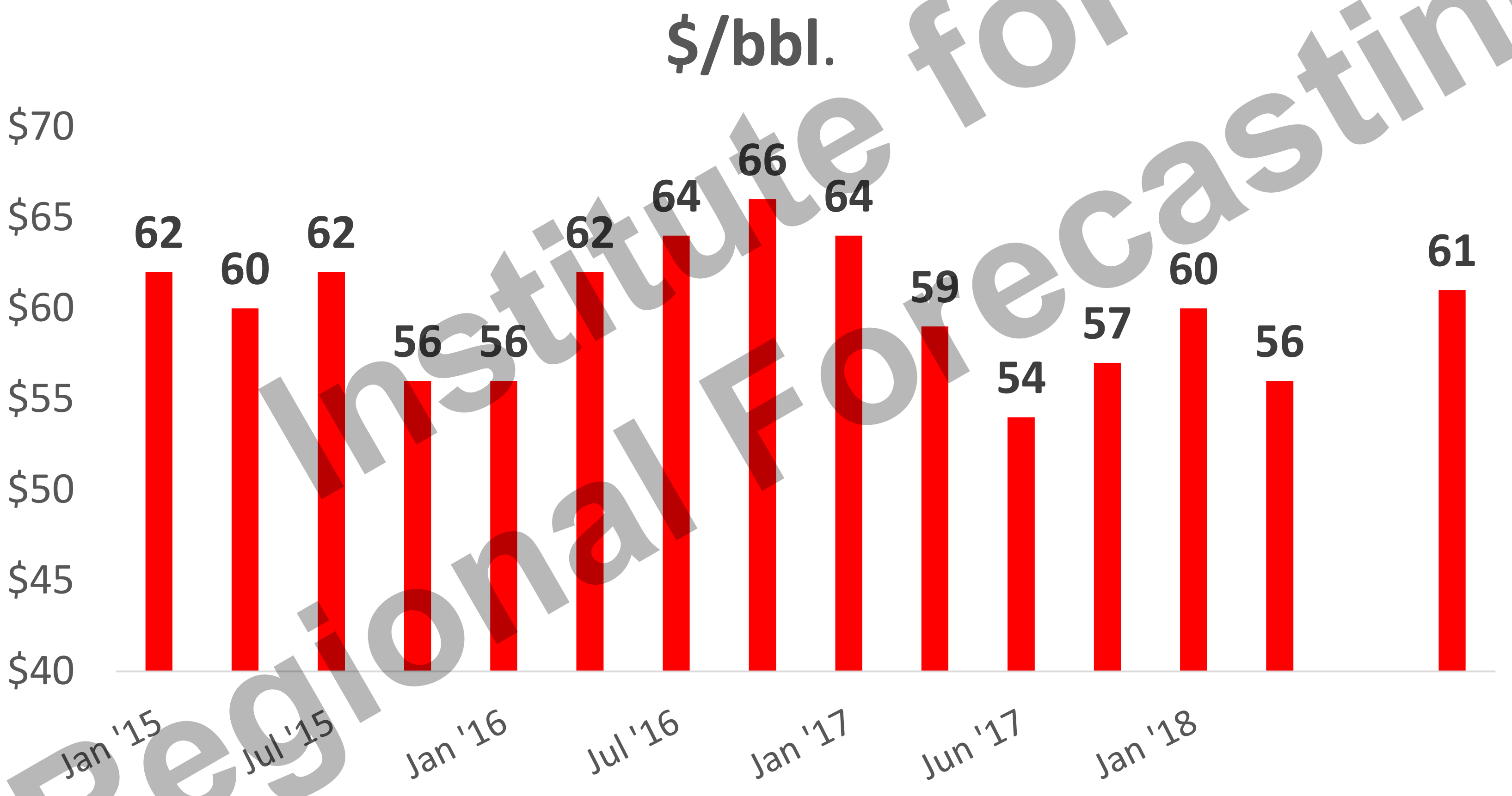
Current Oil-Market Built on OPEC and Political Disruption?



CME Group

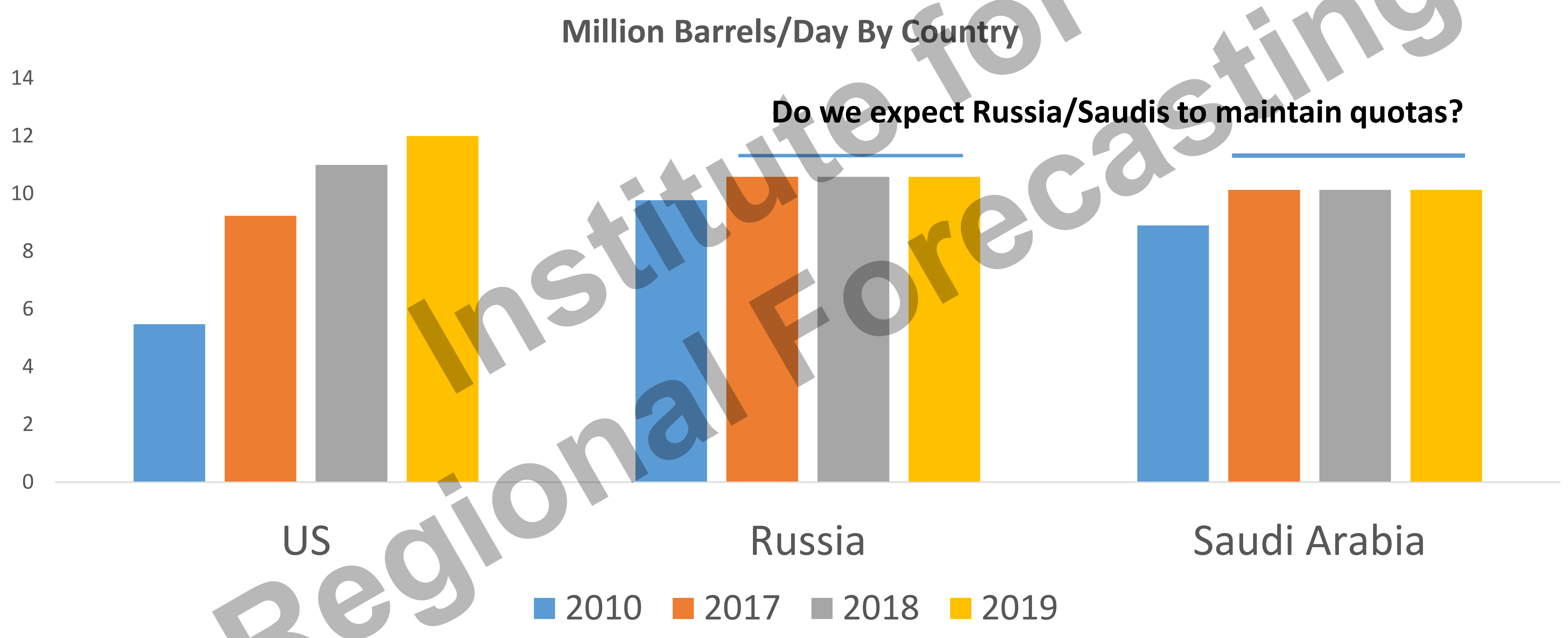
Let’s Put Aside Political Turmoil For Now: What About the Basics of U.S. Production?

What Is the Right Price of WTI?
Oil Price Implied by the Stock of 40 Oil Producers



Goldman Sachs Research, at first week of each quarter

At $60, U.S. Fracking Can Easily Move Oil Production to 12 million Barrels per Day by 2019



Fracking Has Fundamentally Changed American Oil Production

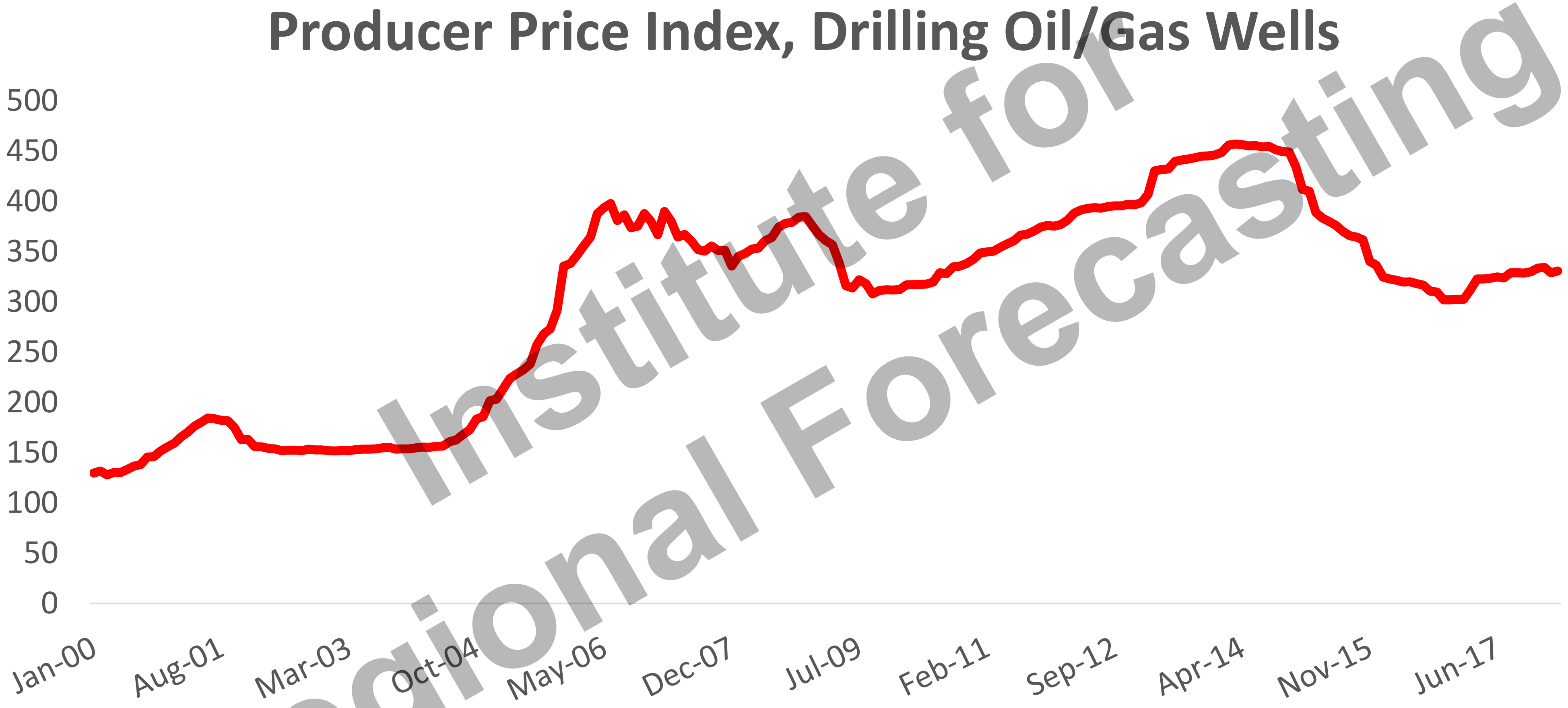
High Cost Oil at Low risk

- 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 Went Wrong in 2017?

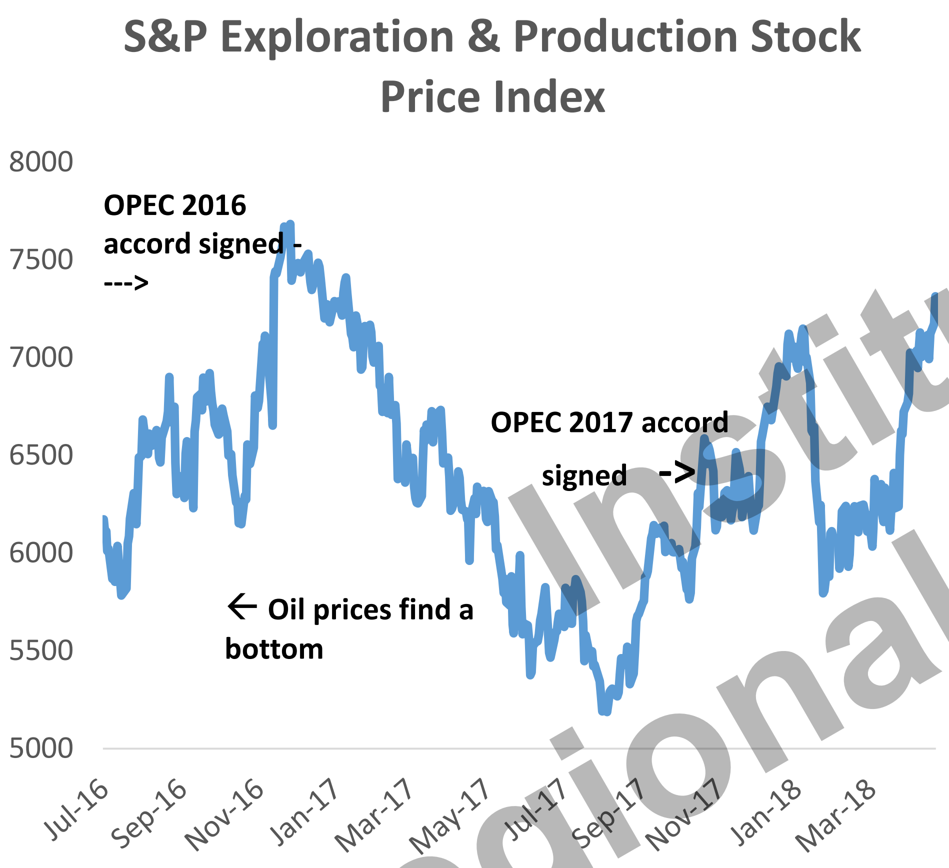
- How does highly competitive industry over-produce? Where is $60 oil?
- Big capital and operating cost incentives were in place
- In 2017, Ignored profits over the oil-price cycle, seeking short-term gains in equity
- Facilitated by private equity and high-yield markets, providing “unbridled abundance of capital.”

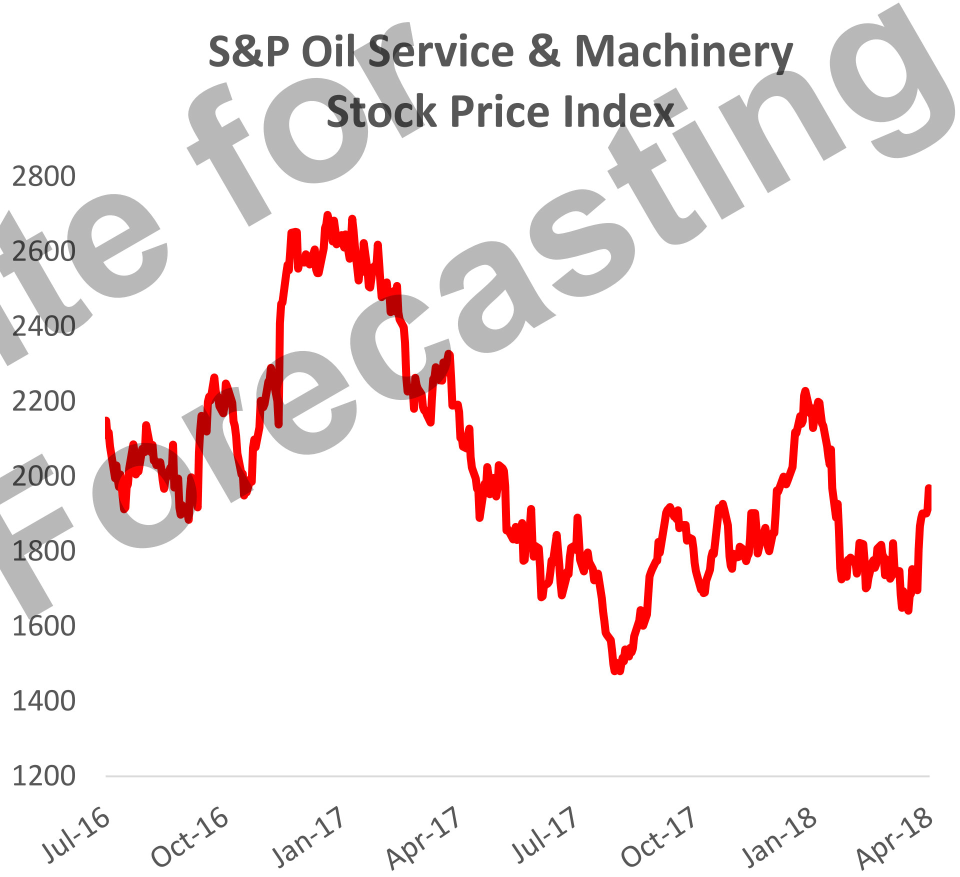
Cost of Drilling and Oil Services Remains Depressed Despite the Rise in the Rig Count



Bureau of Labor Statistics

Equity Gains for Oil Producers and Their Suppliers Evaporated in 2017: A Re-Run in 2018?



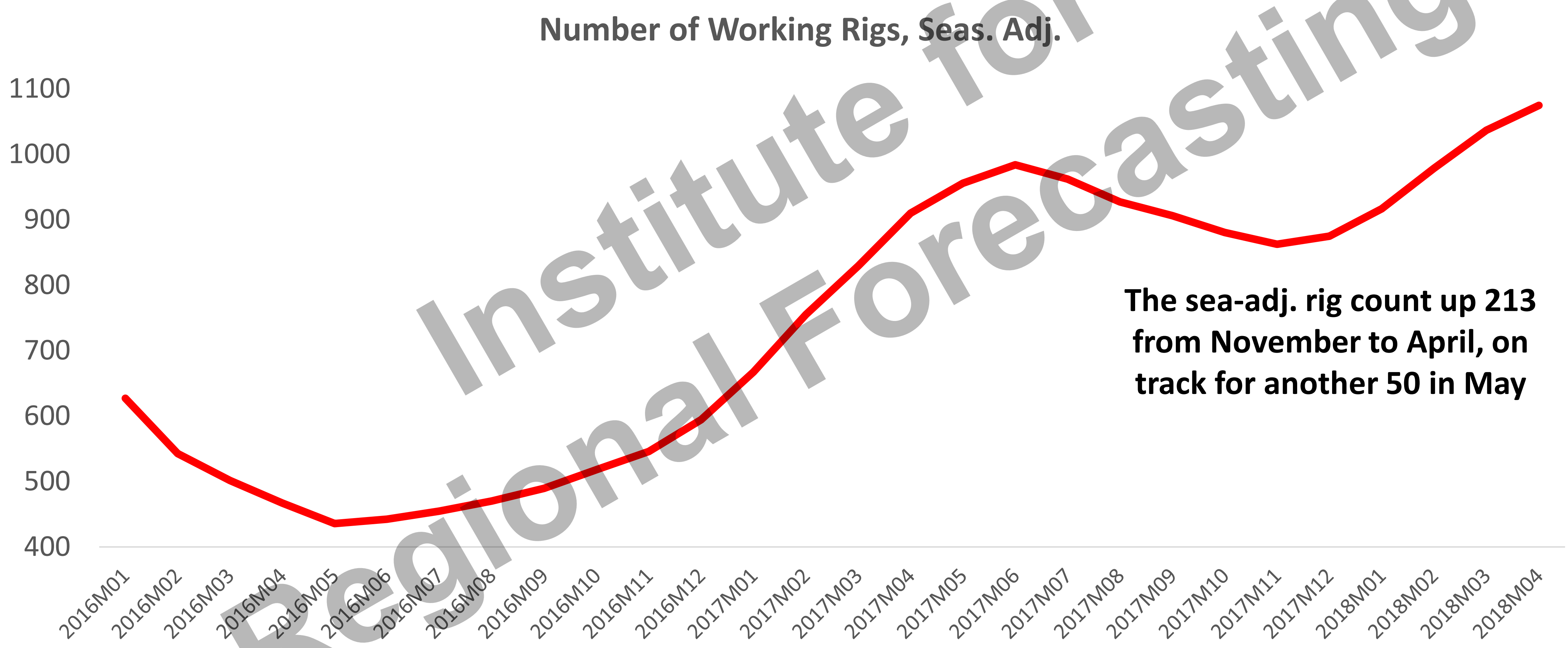


S&P Dow Jones Indices, to May 8, 2018

Drilling Likely Has A Limited Near-Term Upside … One Way or the Other

- **The 2017 cycle broken?**
  - Investors were distressed at last year's results and are demanding discipline from producers with a focus on their company's long-run future
  - Big public companies are showing this discipline, and have promised their investors that 2018 will not see them out-spending cash flow or chasing short-term equity gains. They will hold back on their drilling programs
  - Perhaps good news for oil prices, *but it caps the outlook for drilling and a return of oil jobs in Houston*
- **Or does the current cycle of overproduction continue?**
  - The big public companies that are followed by the analysts aren't alone, and it is easy for private companies to jump in with their own drilling
  - *Private companies might take advantage of public company discipline, and launch their own drilling programs, and rack up big profits*
  - Drilling rises sharply, but briefly. Oil production again rises too fast, oil price falls, drilling falls, and the down-phase of a new cycle begins

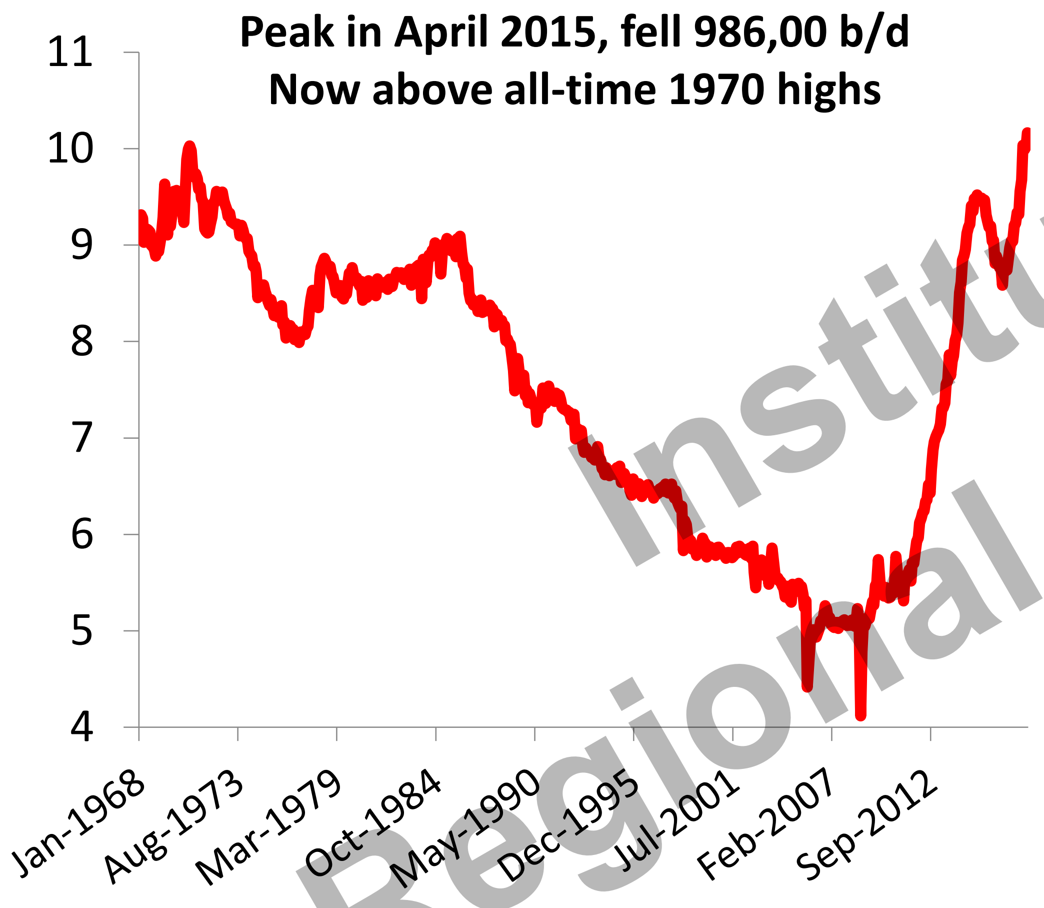
Drilling Up Already and High Prices from Latest OPEC Cuts Still to Be Felt



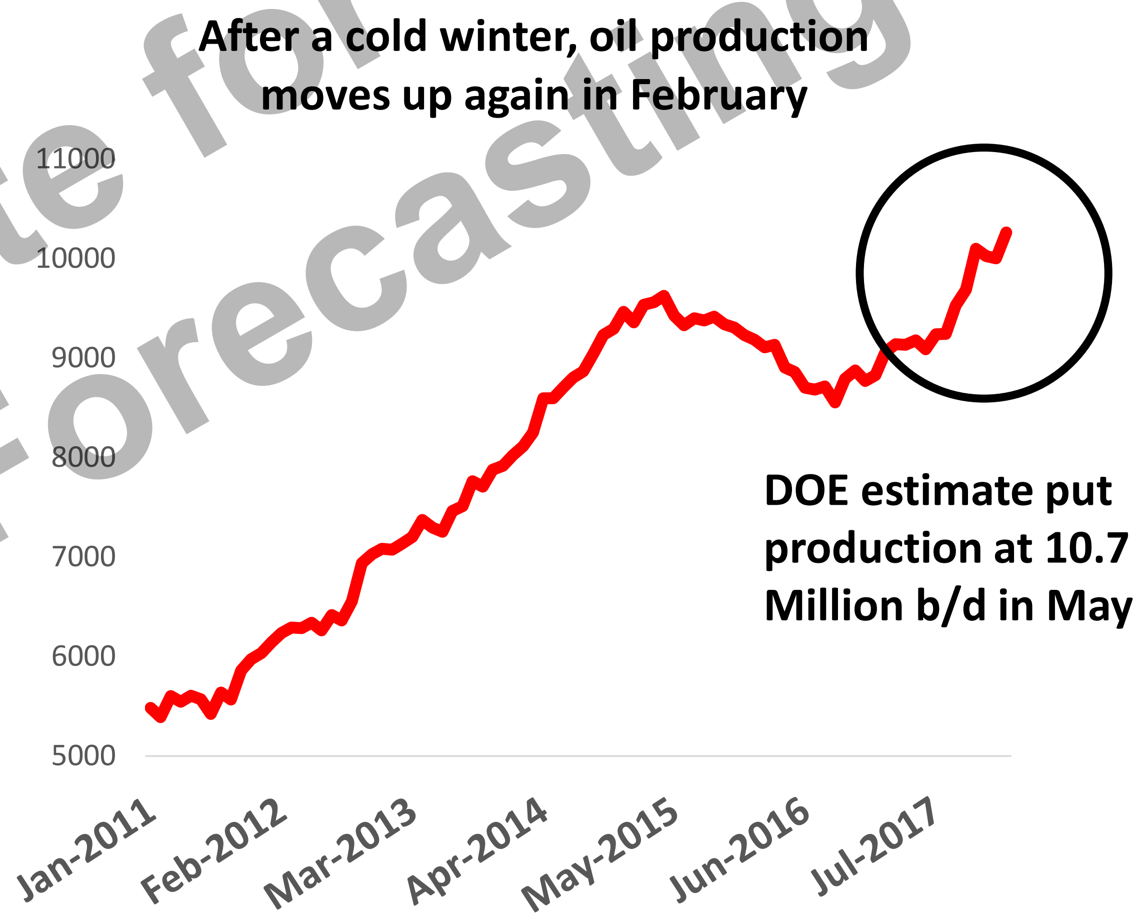
Baker Hughes, seasonal adjustment by IRF

U.S. Shale Oil Production Continues to Climb

(million barrels/day, s.a.)



DOE/EIA, Seasonally adjusted by IRF

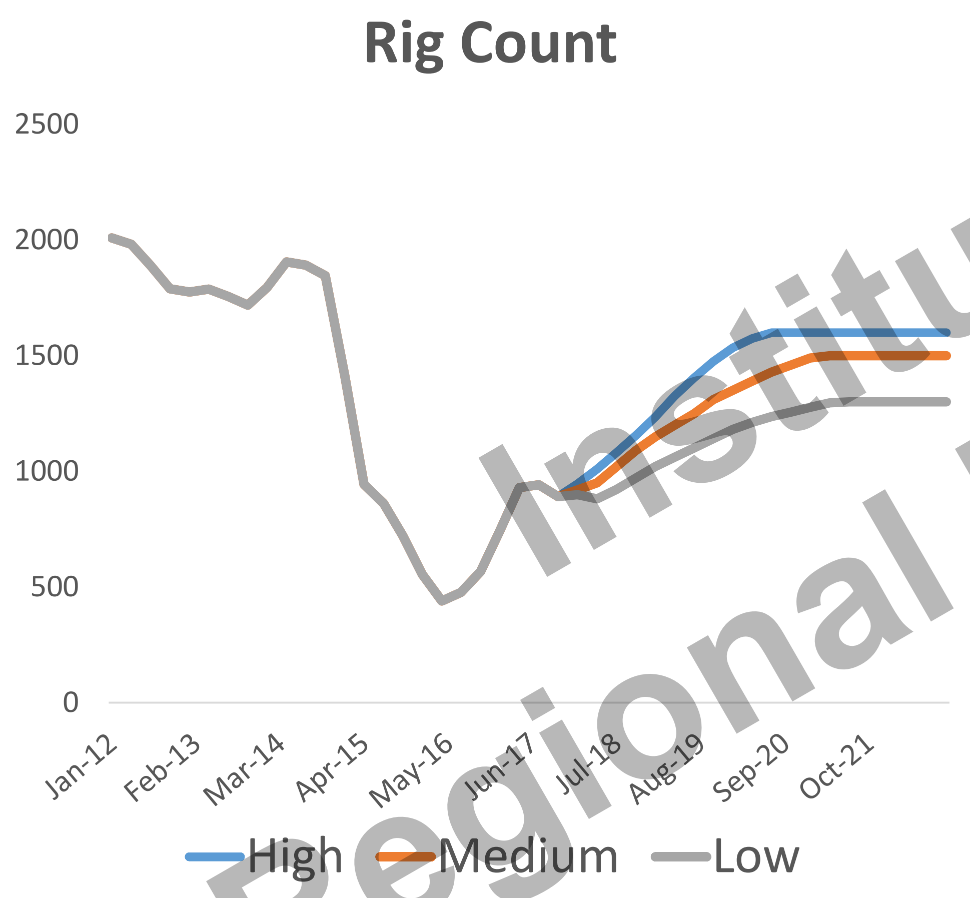


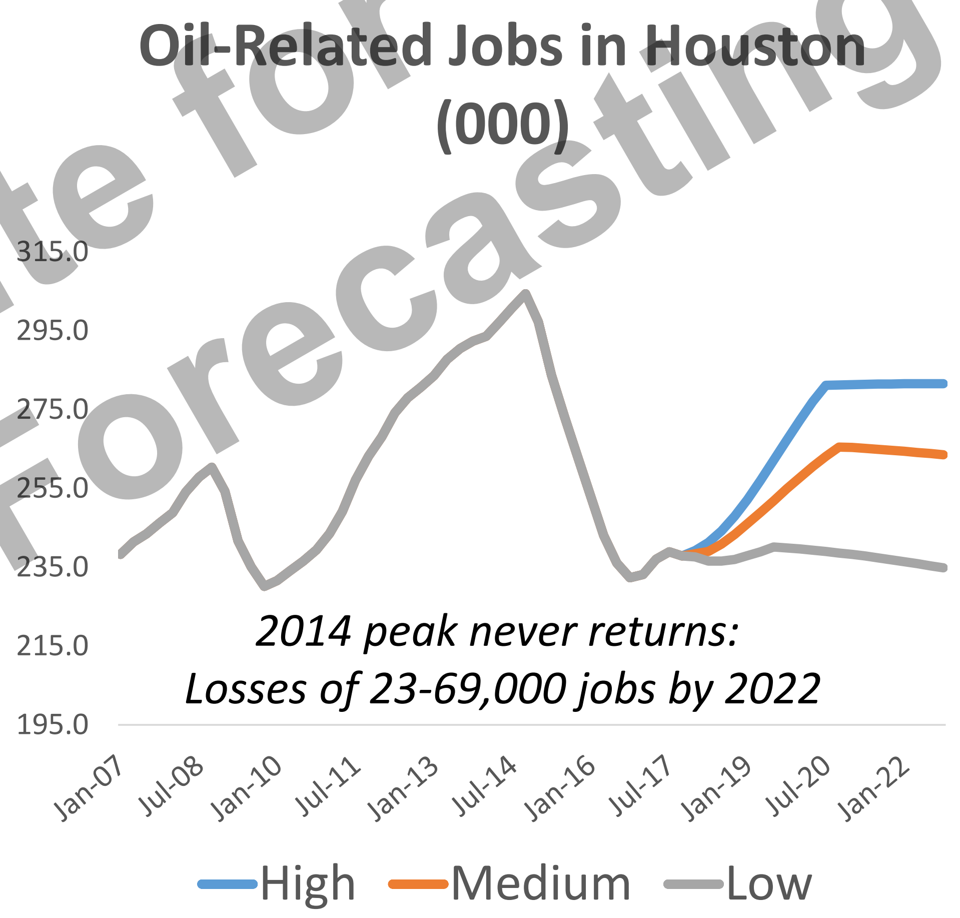
Three Scenarios for a Drilling Recovery

- **Rig Count?**
  - *High Scenario*: It takes a major supply disruption to move oil price over $70 for months
  - *Medium Scenario*: Rig count is capped with moderate gains. Producer disciple, slow gains all year. No discipline sees big gains early, drilling reversal late in 2018
  - *Low Scenario: Fracking wrecks global market again? OPEC withdraws as swing producer again*
- **Rig Count Max After Recovery?**
  - High Scenario: 1600
  - Medium Scenario: 1500
  - Low Scenario: 1300
- **Return of Drilling Jobs in Houston?**
  - High brings 10,000 oil jobs back in 2018
  - Medium is similar to 2017, with 5,500 oil jobs
  - Low Scenario: -800 in 2018, 2,900 in 2019.

High scenario requires a major market disruption, and sustained move above $60-$65 range; moderate requires holding $55 or better; low scenario triggered by continued oil price near $45, and staying at that level through 2018-19.

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





This is all oil-related jobs: oil producers, oil services, machinery, fabricated metal, refining, petrochemicals, plastics, pipelines, and selected jobs in wholesale trade and professional services.

Houston's Petrochemical Boom Is Not Over, But Winding Down for Now

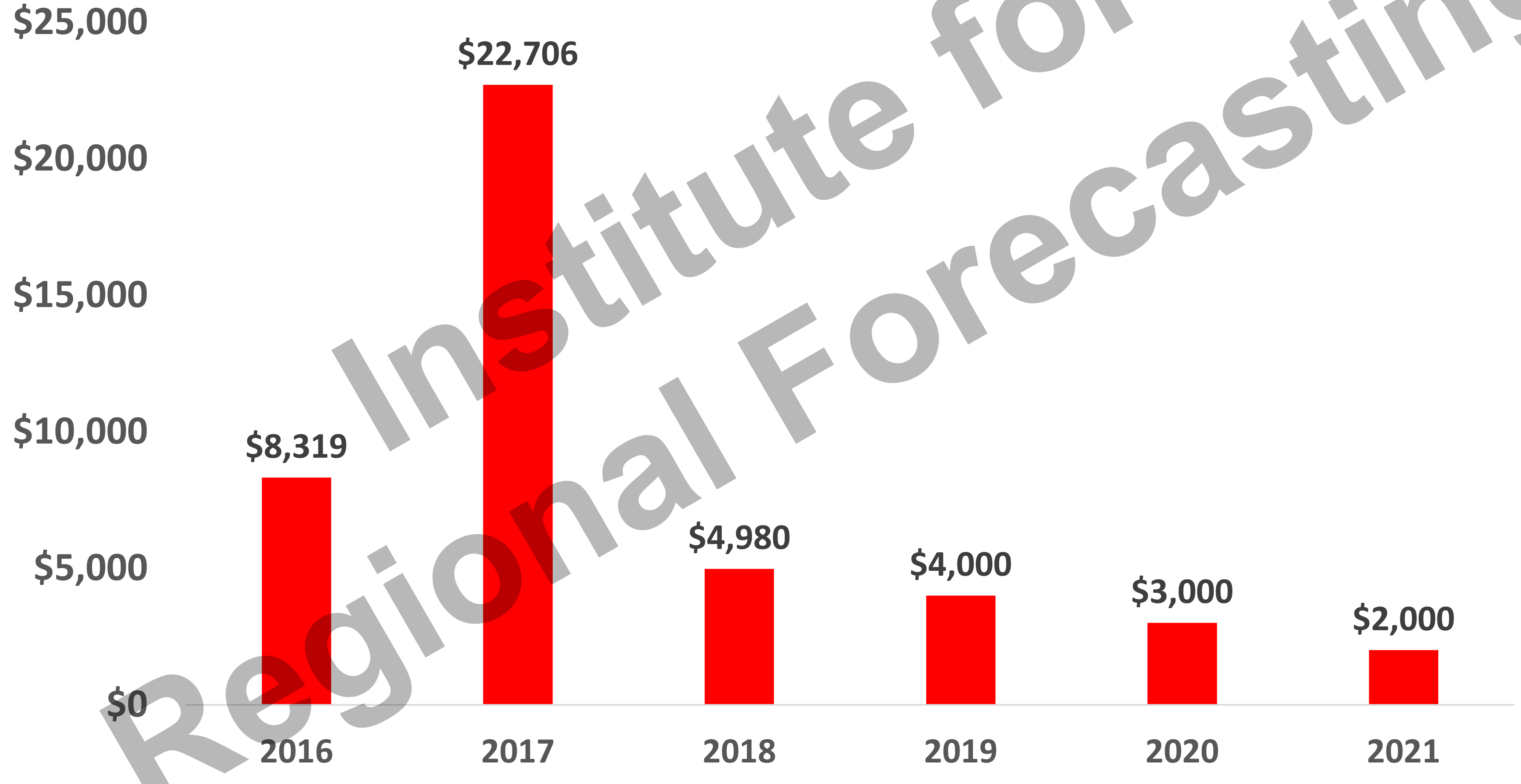
$185 Billion U.S. Construction Boom Is Based On Cheap Energy

- 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 $185 billion figure is based on all U.S. shale-related expansion, estimated by the American Chemistry Council in 2017

Projects Began To Wind Down Rapidly In 2017

(Value of Projects Completed, $ million)



The Big Plants That Defined This Boom Are Mostly Complete

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

Tariffs, Trade, and Stimulus:
The U.S. Economy Is Still Doing Fine

The Tariff Fight: Trade Is Good … Mostly

- The enormous reduction in tariffs and other trade barriers over the last 60 years has been enormously beneficial for the global economy, *although some industries and workers have been hurt …*
- The trade deficit is not inherently good or bad, as long as it is determined by relative comparative advantage
- Structural trade deficits can be bad – that part not determined by comparative advantage
  - U.S. imports of petroleum after the 1970s
  - Chronic U.S. budget deficits and low savings rates that lead us to “export” treasury bills
  - *Currency manipulation or intellectual property theft by trading nations*

Trade Creates Winners and Losers
Trade Is Good If Winners Can Compensate the Losers

- Trade often creates losers in specific industries, geographies or groups. Widely dispersed consumers are often the winners. If winners can compensate the losers, trade makes us richer
- The U.S. comparative advantage is in knowledge and skills, and unskilled manufacturing is often disproportionately hurt by trade agreements
- There is general agreement that compensation through trade assistance has been inadequate – retraining, relocation assistance, extended unemployment compensation has not worked well
- We can debate the effectiveness of compensation, but study by Case and Deaton blame the startling rise in death rates among U.S. middle-aged whites on "deaths of despair," triggered by a lack of job opportunities for those without a college degree

Comparative Advantage Does Not Include Cheating or Theft

- Peg your currency too low against the dollar, it encourages your exports and limits imports of U.S. goods. The Chinese have long pegged the Yuan to a basket of currencies, but one mostly full of dollars.
- China agreed to protect intellectual property (IP) when it joined WTO in 2001, but it has been very slow to enforce these rules
  - The most important source of U.S. comparative advantage is IP: patents, copyrights, trade secrets, software, and technical know-how
  - To operate in Chinese markets you must have a Chinese partner, and share your technology with the partner. You soon to find yourself competing with your own technology. Chinese government procurement discriminates against foreign IP
  - This is not a new issue. The Chinese response has been many promises, and little Chinese action on the issue
  - As a result, the U.S. Trade Representative released a list of 1,300 items subject to tariffs with a value of $50 billion, or the estimated value of lost corporate profits to IP theft

Tariffs Mean Houston Will Be In the Middle of Big Supply Chain Disruptions

- We have the nation's second largest port, and are the second largest U.S. metropolitan exporter
- We are a major manufacturing city for oil production and oil services, machinery and metals, as well as the Ship Channel industries
- Global supply chains could be seriously disrupted

Percent Value of Industry Inputs Subject to Chinese Tariffs

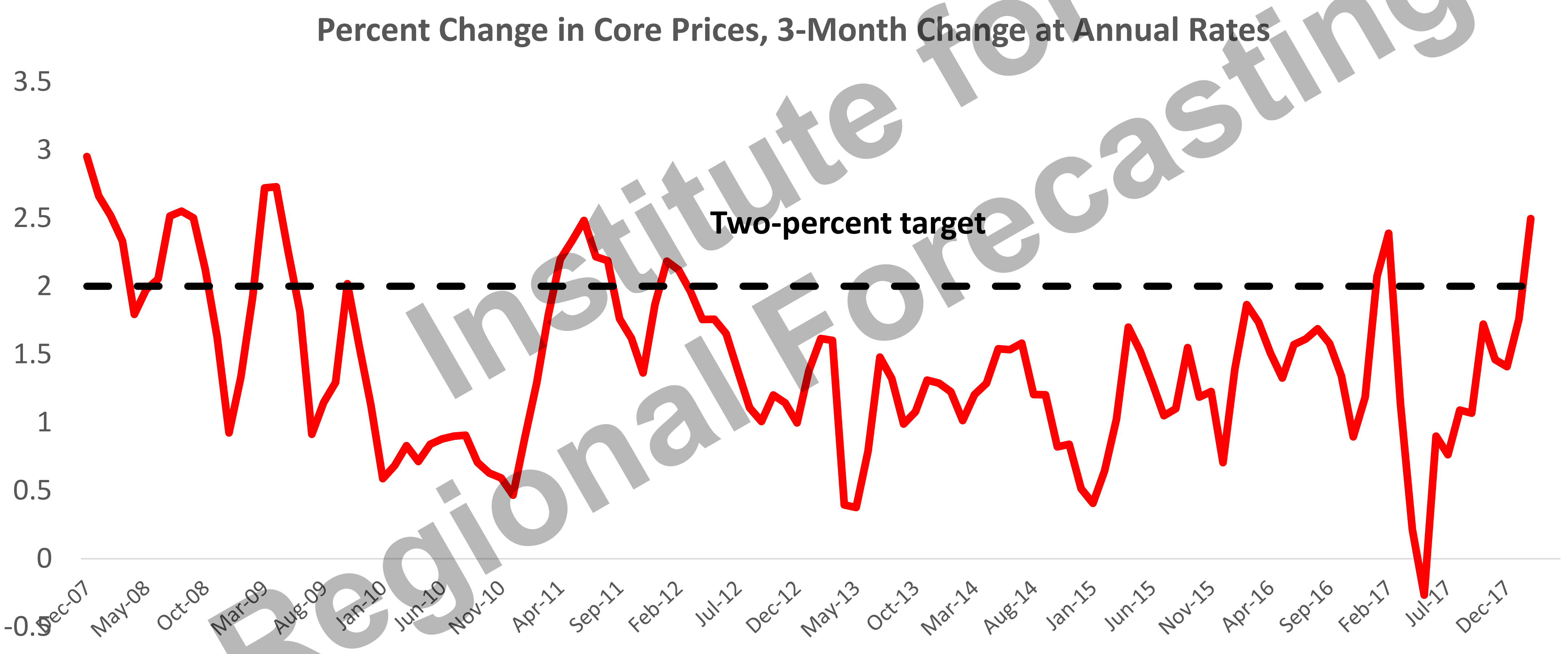
	Inputs Affected
Fabricated Metals	62%
Plastics	59%
Machinery	58%
Chemicals	48%
Primary Metals	47%
Oil Services	29%
Pipelines	27%
Oil Producers	19%

Wells Fargo Securities

The U.S. Economy Is Performing Well

- The U.S. economy remains strong. We know this from virtually every economic measure, and from surveys of professional forecasters, consumers, purchasing managers, and small business
- The probability of recession remains near zero, and the economy has strengthened significantly in recent months
- Any problems ahead for the national economy are tied to emerging strength, not to potential weakness
- Our forecast assumes that the U.S. economy remains as an important source of strength for Houston in 2018 and beyond

Personal Consumption Core Deflator Has Moved Up to Two Percent Target



Core market-based PCE is all items less food and energy

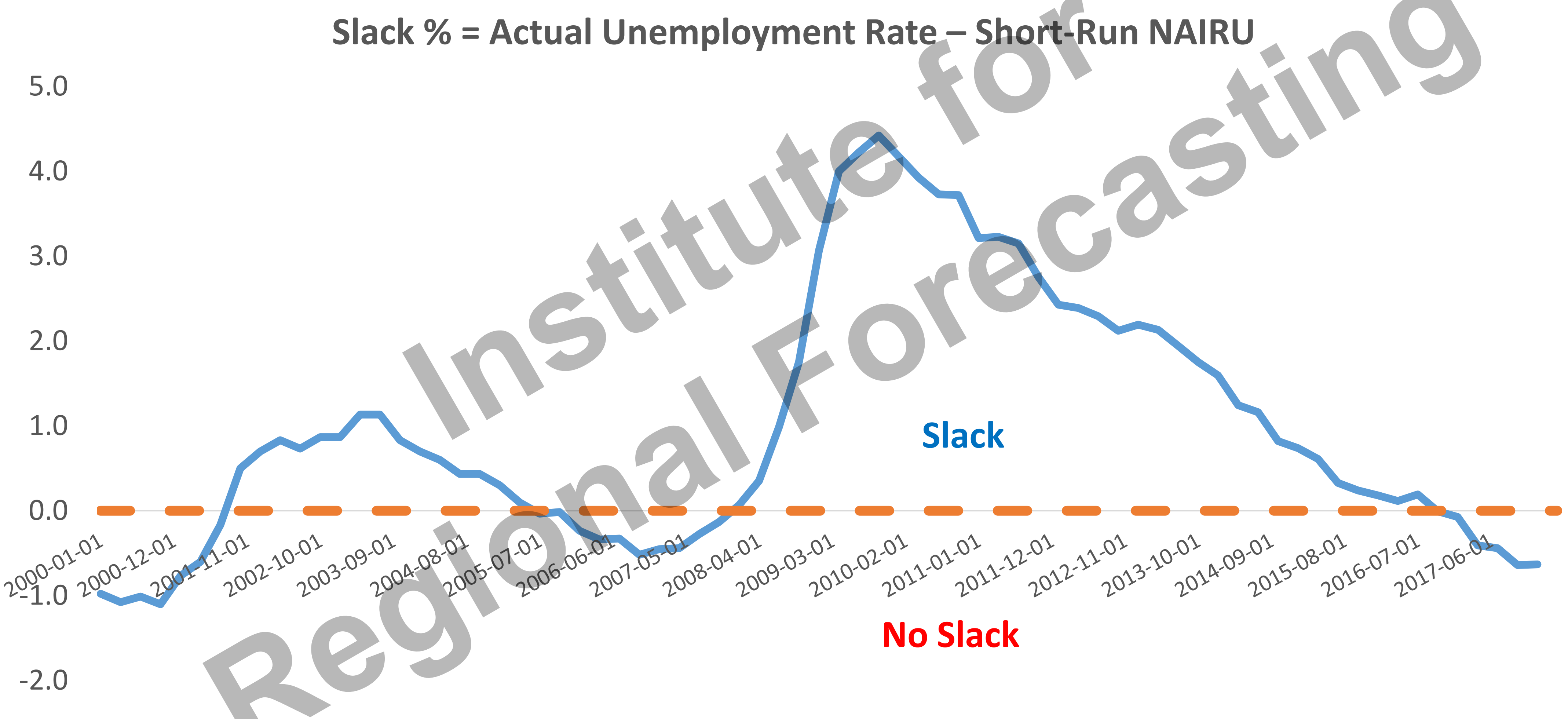
Fed Policy Still at Center Stage

- The current U.S. expansion began in 2009, and began very slowly. About 2012 it moved to moderate and steady growth, with few speculative excesses. In July it should become the second longest U.S. expansion
- The Fed undertook unprecedented policy measures in the financial crisis, including zero interest rates and doubling its balance sheet. In the last 18 months, the Fed has moved to normalize these measures
- Through much of the recovery, the Fed repeatedly ask Congress to help speed the recovery with fiscal policy, e.g., tax cuts or infrastructure spending, but to no avail
- We have recently seen inflation measures pick up, and move back to the Fed's two percent target. We have seen this before in the recovery, only to see prices fall back. Will this be different with full employment and high levels of capacity utilization?

Tax Cuts and Jobs Act of 2017

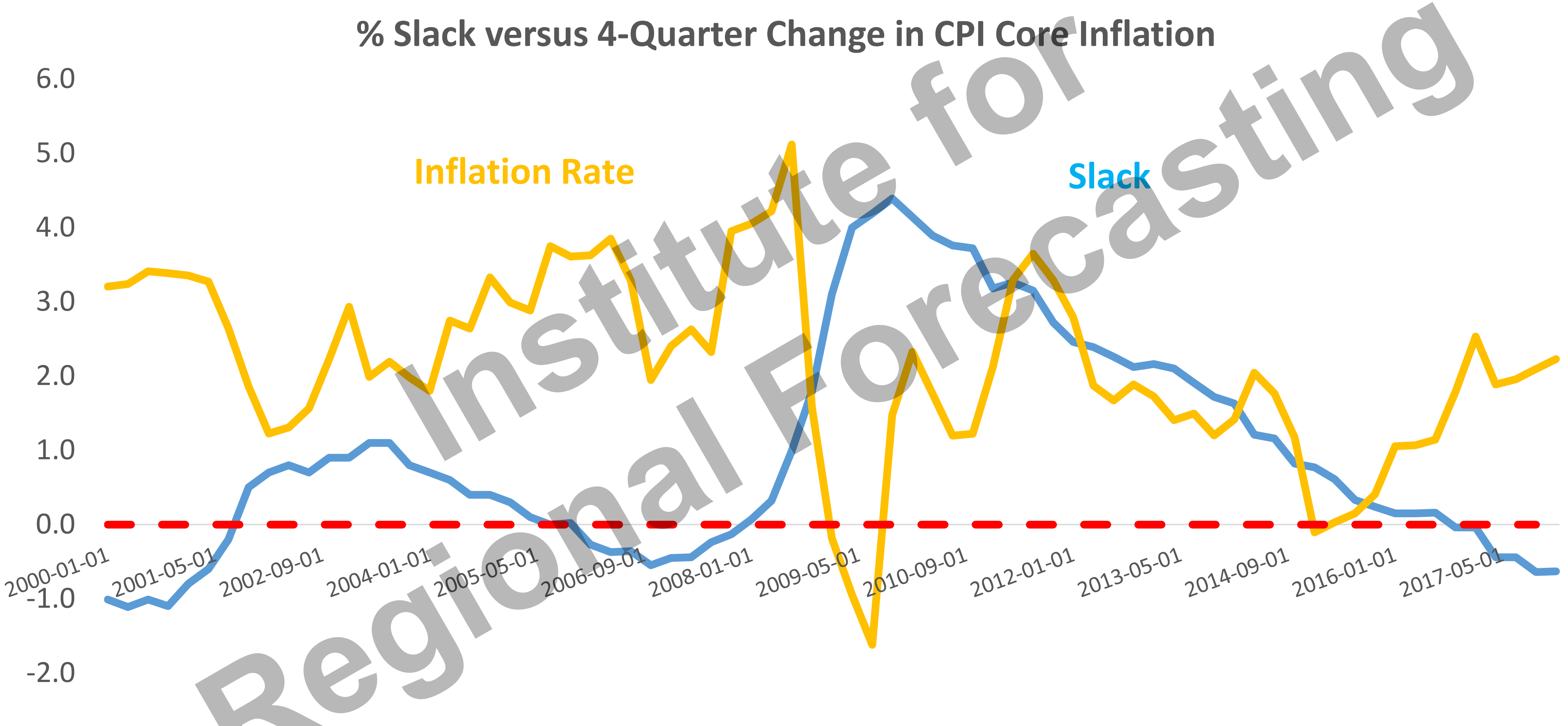
- In December, Congress passed the Tax Cuts and Jobs Act that enacted much needed tax reform and lowered taxes for corporations and individuals. It did not raise taxes elsewhere or cut spending leaving a $1.5 trillion dollar deficit over 10 years
- The administration argues the tax reforms unleash growth and will pay for themselves; the nonpartisan Urban Institute says additional growth will pay 13 percent of the deficit. This is what the Fed wanted … five years ago
- Economists are revising growth figures for GDP upward, but in the near-term and not nearly as much as the administration
- Faster growth is likely capped by three specific factors:
    - We are already close to full employment and industrial capacity
    - Faster growth puts fiscal and monetary policy at cross purposes. If the labor market continues to tighten, the Fed accelerates its rate increases
    - If large fiscal deficits materialize, other legislation is in place to require spending cuts, including cuts to entitlements

A Measure of Slack in the Economy Based on the Unemployment Rate



Congressional Budget Office

When Slack Disappears, Inflation Picks Up



Congressional Budget Office

Fed's Slow Track on Rates Continues: Futures Market *Still* Says Three Hikes in 2018

Fed Funds futures sees three 2018 increases

Meeting Date	Range b.p.	Prob. of Increase	Change
31-Jan	125-150	--	**None**
21-Mar	150-175	--	**+0.25**
2-May	150-175	--	**None**
13-Jun	175-200	100.0%	**+0.25**
1-Aug	175-200	6.0%	**None**
26 Sept	200-225	76.0%	**+0.25**
8 Nov	200-225	12.0%	**None**
19 Dec	200-225	46.2%	**None**

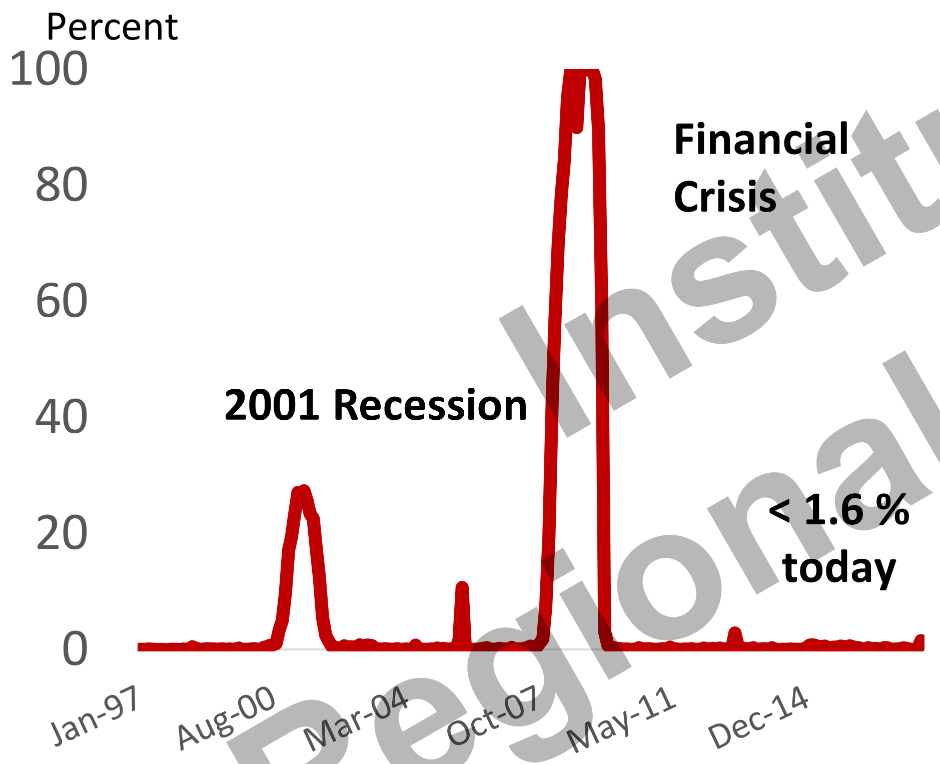
Source: CME Group, 5/9/2018. Table assumes as soon as probability of a rate increase passes 50% a 25 basis point increase is triggered.

Futures market as predictor of policy

- New Chair Powell? TCJA? Fed funds futures have barely moved since Janet Yellen
- Primary tool for tightening is rate increases, and Fed still on the same slow track of three rate hikes in 2018 even with Tax Cuts and Jobs Act in place
- But TCJA does present a new and very big risk to Fed policy going forward, significant fiscal stimulus near full employment
- Fed begins to shrink the balance sheet in 2018. Risk of another taper tantrum?
- Rising rates will strengthen an already strong dollar?
- Will rising rates expose asset bubbles? In commodities like oil? Or in the stock market?

Moderate U.S. Recovery Continues

Chance of Recession About One Percent Today



Consensus Forecast Is Still Strong: But Not Too Hot, Not Too Cool

	Real GDP (%)	Unempl Rate (%)	Payroll Jobs ('000/mo)
Quarterly Data:			
2017Q4	2.5	4.0	183.0
2018q1	3.0	4.0	183.3
2018Q2	2.9	3.9	171.7
2018q3	2.8	3.8	151.8
2018q4	2.4	3.8	172.9
Annual Average:			
2017	2.8	4.0	178.0
2018	2.5	4.0	175.1
2019	2.0	3.9	150.3
2020	1.7	3.9	NA

Source: Chauvet and Piger smoothed recession probabilities, FRED, St. Louis Fed; Philadelphia Fed, *Survey of Professional Forecasters*, First Quarter 2018.

Pull It All Together?

- Three oil scenarios: high, medium, or low. High is based on major political disruption to oil markets; medium sees 2018 drilling capped by producer discipline or over-production; low is OPEC again pulling out as swing producer
- Continued U.S. expansion at moderate or better rates
- Continued drag from the end of the East Side petrochemical construction
- Momentum from the fracking boom years is gone
- Harvey jobs slowly disappear

Forecast Job Growth Is Moderate As Drilling Discipline Takes Hold

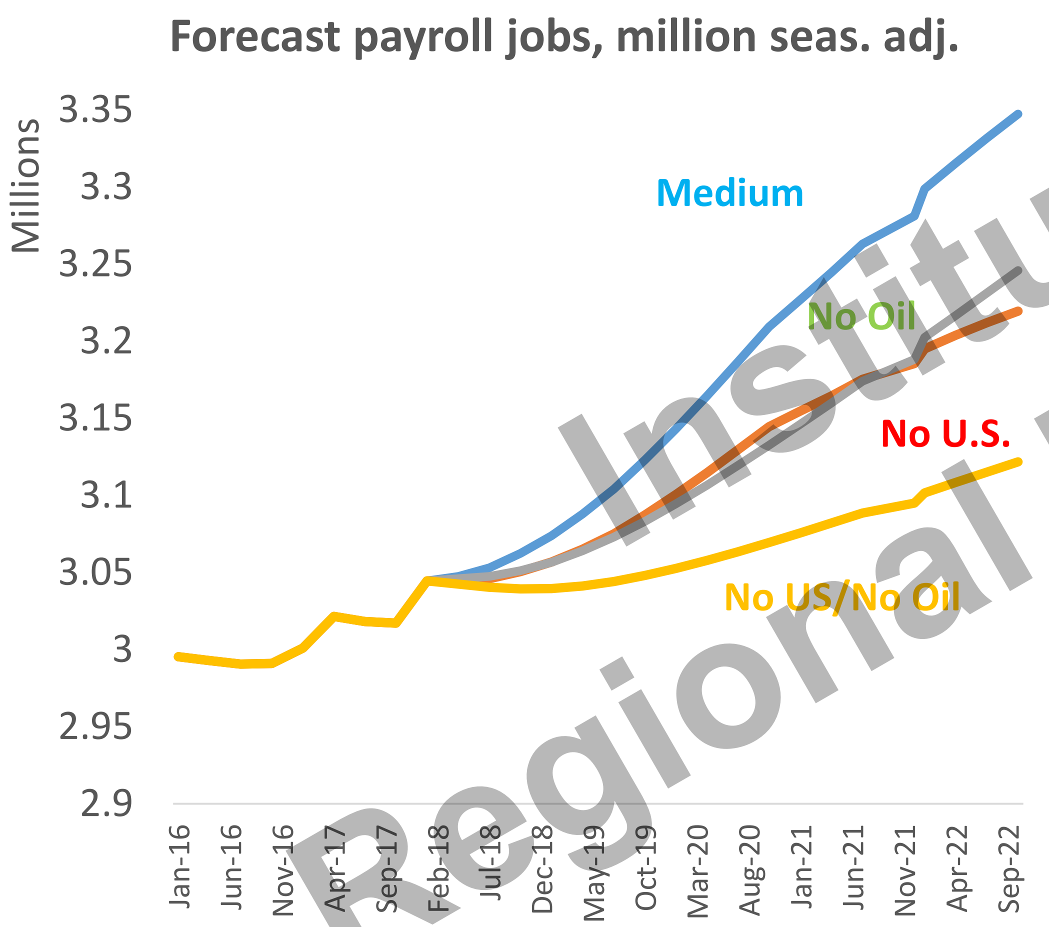
(000 New Jobs, Q4/Q4)

By Scenario

Year	High	Medium	Low	15/70/15
2014	112.3	112.3	112.3	112.3
2015	8.9	8.9	8.9	8.9
2016	-2.6	-2.6	-2.6	-2.6
2017	29.0*	29.0*	29.0*	29.0*
2018	54.8	45.1	28.7	44.1
2019	81.9	60.7	34.0	59.9
2020	102.1	86.2	47.0	82.7
2021	85.0	71.9	51.6	70.8

*Excludes 24,700 temporary jobs in 2017Q4 driven by hurricane Harvey.
Calculations of IRF, based on drilling scenarios above. Figures are Q4/Q4. The 2016 calculations include benchmark revisions of March 2018.

What Happens to the Medium Forecast With No Help from U.S.? None From Oil?



New Payroll Jobs ('000) in Medium Forecast Without Oil or the U.S.

	Medium	US/No Oil	Oil/No US	No Oil/No US
2017	29.0*	29.0*	29.0*	29.0*
2018	45.1	33.2	33.9	22.1
2019	60.7	36.9	32.0	8.6
2020	86.2	57.1	49.4	21.4
2021	71.9	40.9	55.5	25.6
2022	66.2	34.1	57.7	26.8

***Adjusted for Harvey-related jobs in 2017Q4**

Note: In the medium forecast, about 40% of near-term growth is from oil, 30% from U.S. expansion, and 30% from long-term growth factors. Oil's contribution is higher and U.S. lower than long-term contributions since 1990.

Forecast Compared to May Outlook

(000 New Jobs, Q4/Q4)

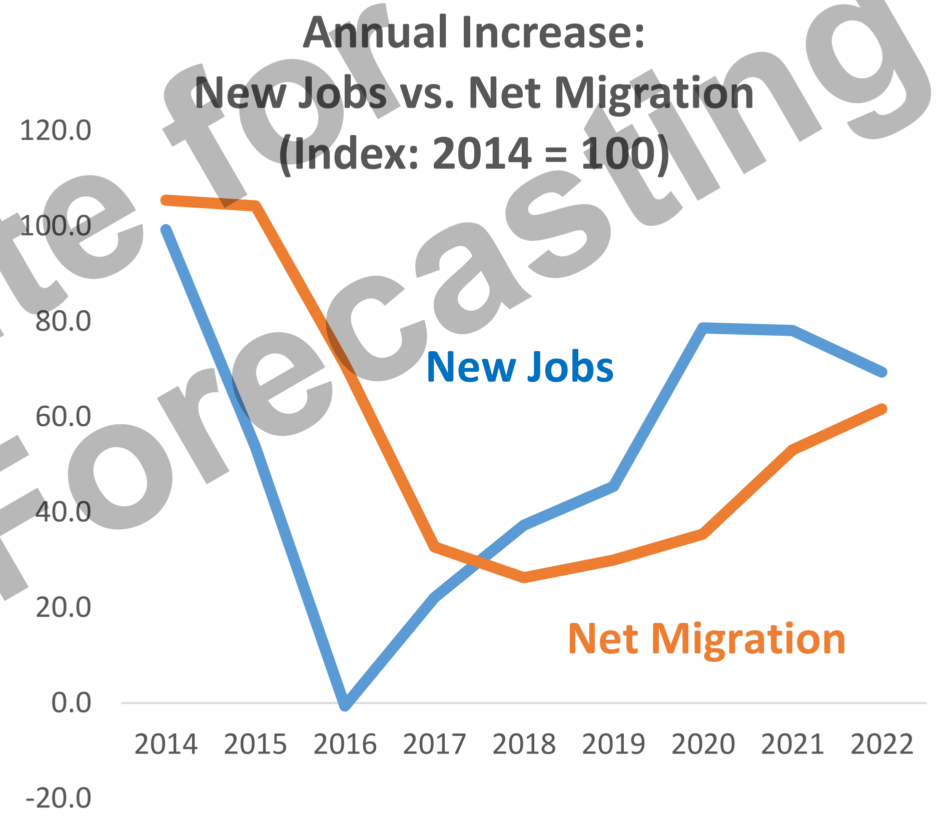
By Scenario

Year	This forecast Medium	May Symposium Medium	Nov Symposium Medium
2014	112.3	112.7	112.7
2015	8.9	11.0	11.0
2016	-2.6	10.8	-1.5
2017	29.0*	35.2	41.1
2018	45.1	52.6	42.1
2019	60.7	68.0	56.0
2020	86.2	74.1	64.5
2021	71.9	78.8	73.2
2018-2021	263.9	273.5	235.8

Calculations of IRF, based on drilling scenarios above. Figures are Q4/Q4. This forecast (*) in 2017Q4 excludes 24,700 one-time jobs from Hurricane Harvey. May forecast does not foresee Harvey, November forecast underestimates Harvey impacts.

Net Migration Follows Job Growth: Bottoms Out in 2018 in Houston

- 2017 local population increase of 94,417 was smallest since 2010, third smallest since 1997
- Weak net migration of 33,000 was the chief reason, with domestic migration turning negative at -10,000
- Net migration is strongly related to job growth, lagging a year
- Data at right matches medium employment forecast, sees a 2018/19 trough with 25-30,000 net in-migrants



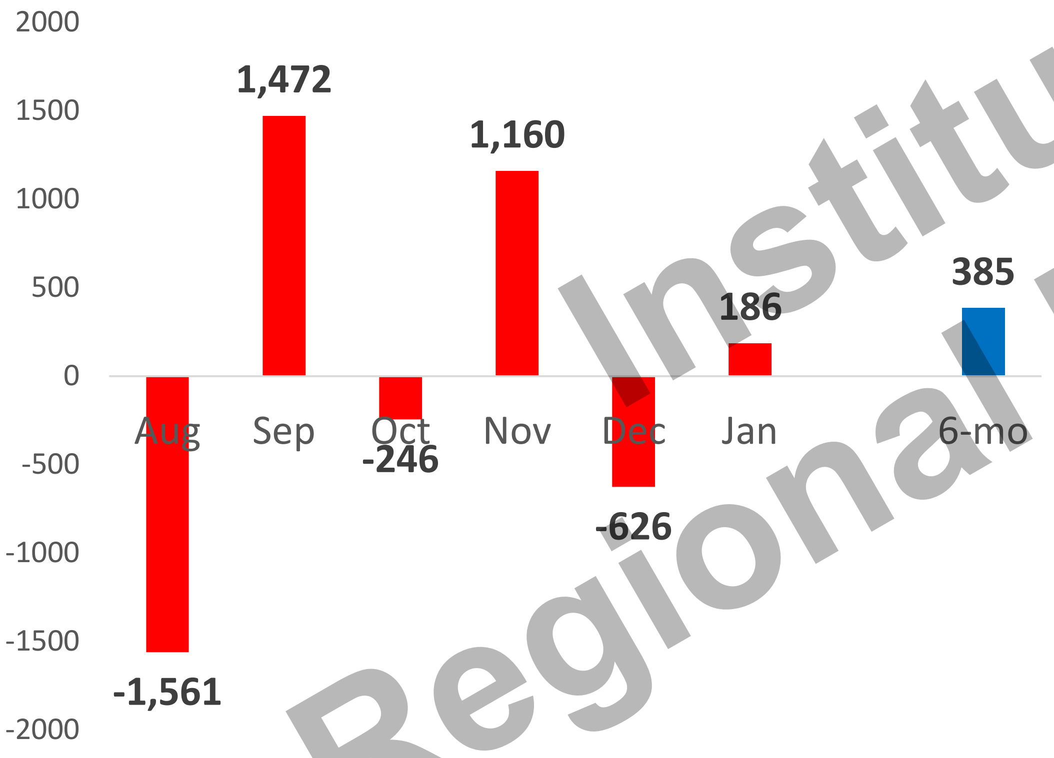
Houston Housing Market Returning to Its Moderate-Price Roots

Harvey Was Not a Threat to the Economy, But About Our Homes and Neighborhoods

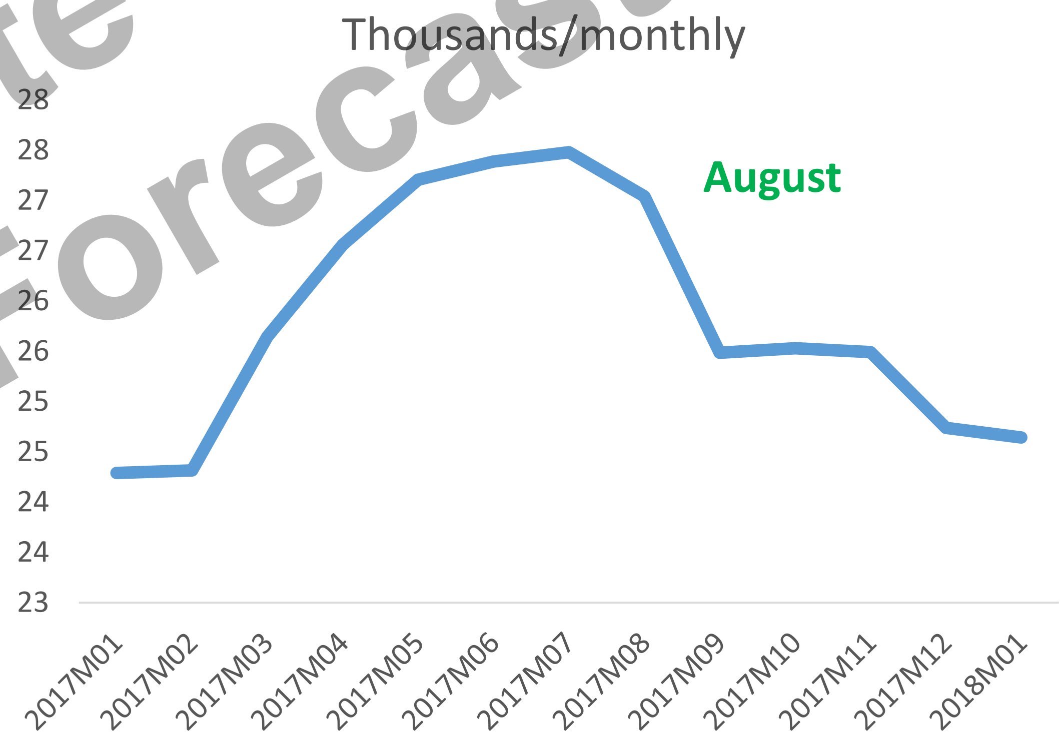
- The economy improved after Harvey based on spending and income, but at the cost of billions in property damage to homes and neighborhoods
- Out of 101,500 Houston-area homes damaged, there were 60,100 quickly habitable, and 3,600 destroyed. The remaining 38,000 have undergone a long process of repair. Construction and sales data say repair is winding down
- Harvey was mostly an urban, pre-Allison problem. Suburban/MUD-sponsored properties with post-Allison floodplain regulations in place made up only 3 percent of flooded homes. Damage to new home construction was minimal
- Existing home sales due to Harvey were small: they fell 20 percent in August, rose 22% in September, and over six months resulted in net additional sales of 6-7 percent or 400-500 homes. A big fall in listings reduced inventory, partly due to fear of the price consequences of recent flood damage

Harvey's Effect on Home Sales Was Small, Its Impact on Listings Big

Home Sales By Month Due to Harvey
Net Increase Was Small

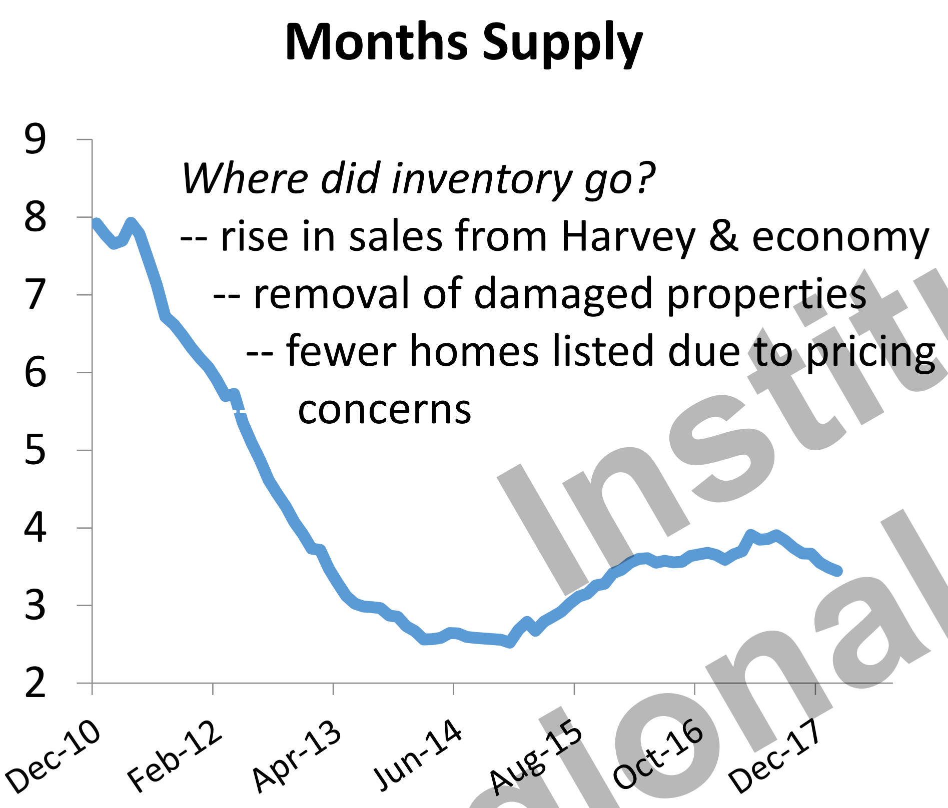


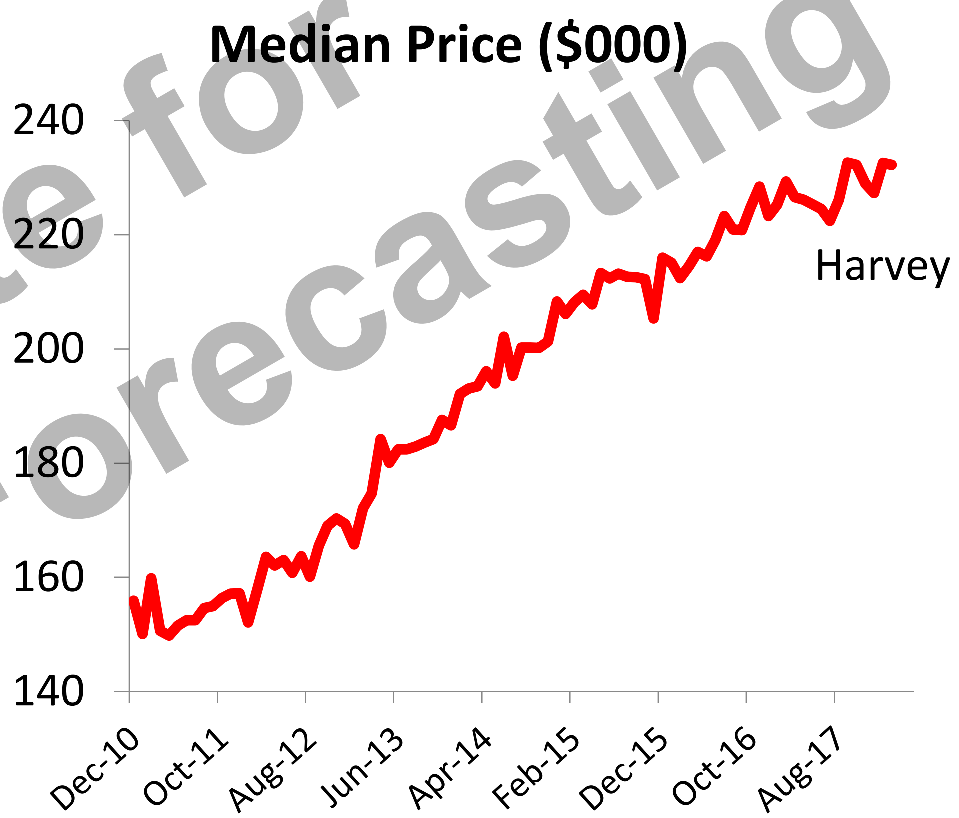
Harvey's Significant Impact Was to Reduce Listings By 3,000 or 8.8%



This is the change in sales after the effects of economic growth are excluded

Post-Harvey the Existing Home Market Should Begin to Loosen Up Again

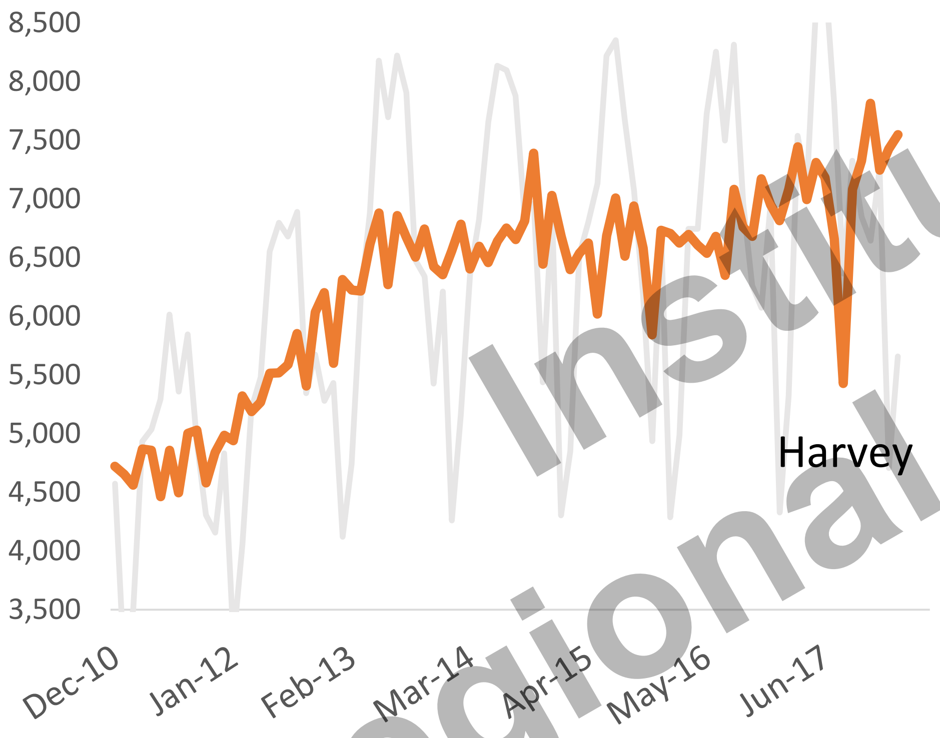




Source: Texas A&M Real Estate Center, seasonal adjustment by IRF

Existing Home Sales Rise In Recent Months Along With Harvey and Oil Prices

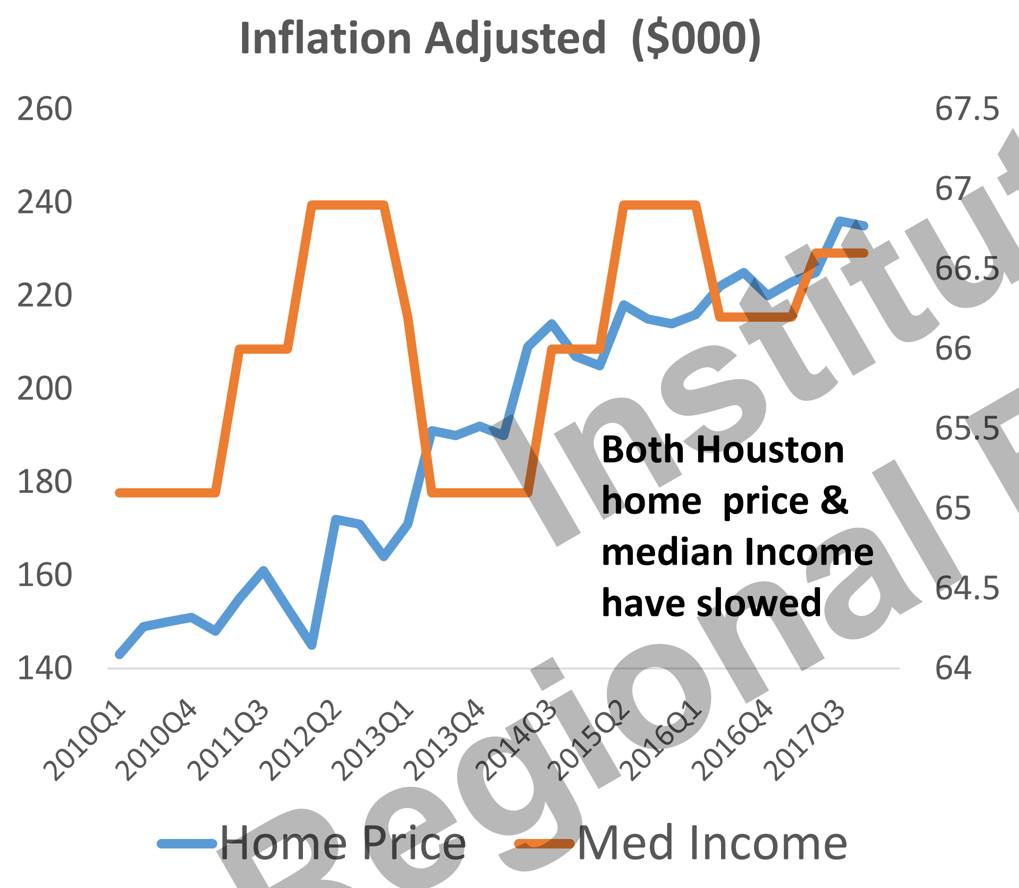
(sales, s.a.)

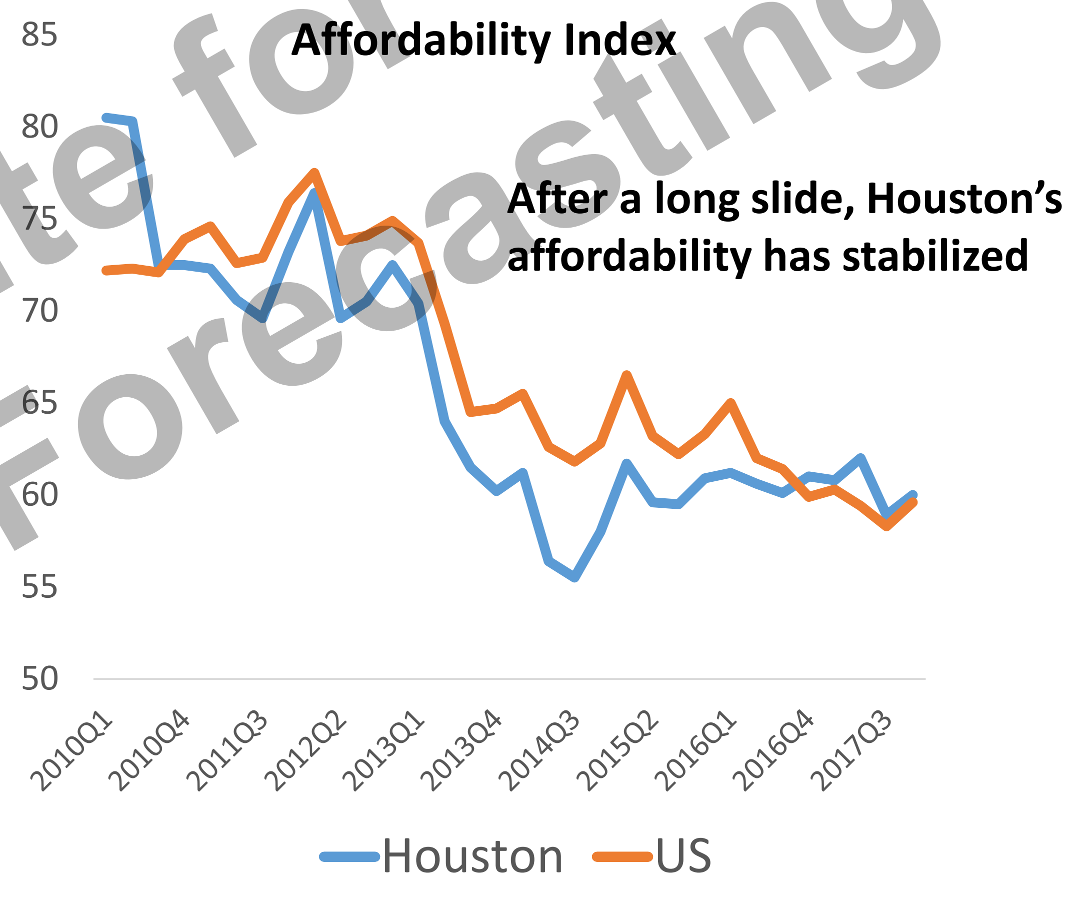


Source: Texas A&M Real Estate Center

- The immediate task left after Harvey is the restoration of inventory levels – both for existing homes and new homes
- As Harvey moves behind us, we need to return to fundamentals – Houston has now turned the corner on economic growth
- Sales have been relatively flat since 2012, thanks mostly a lack of existing and new home supply. There was nothing left to sell until 2015, then demand softened
- New home inventories remain as the safety valve for the housing market, and must remain strong.

Houston's Home Price Affordability Was Hurt For a Decade By Supply Constraints



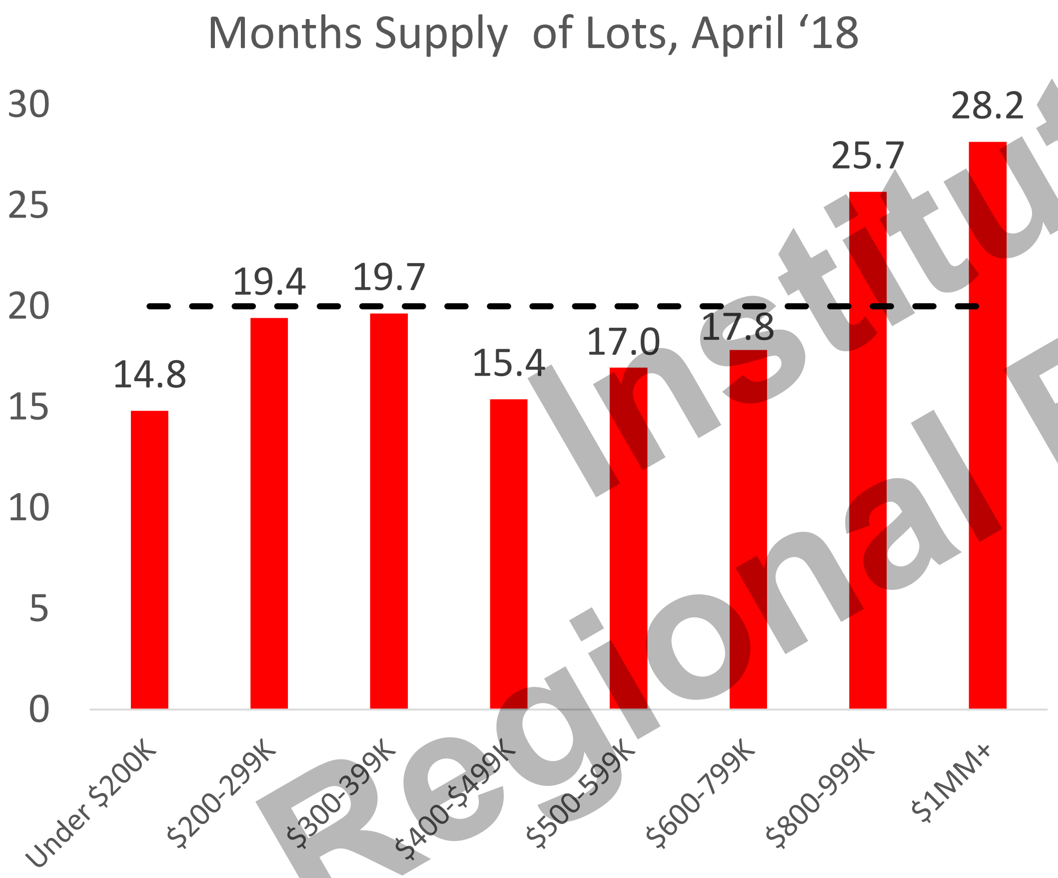


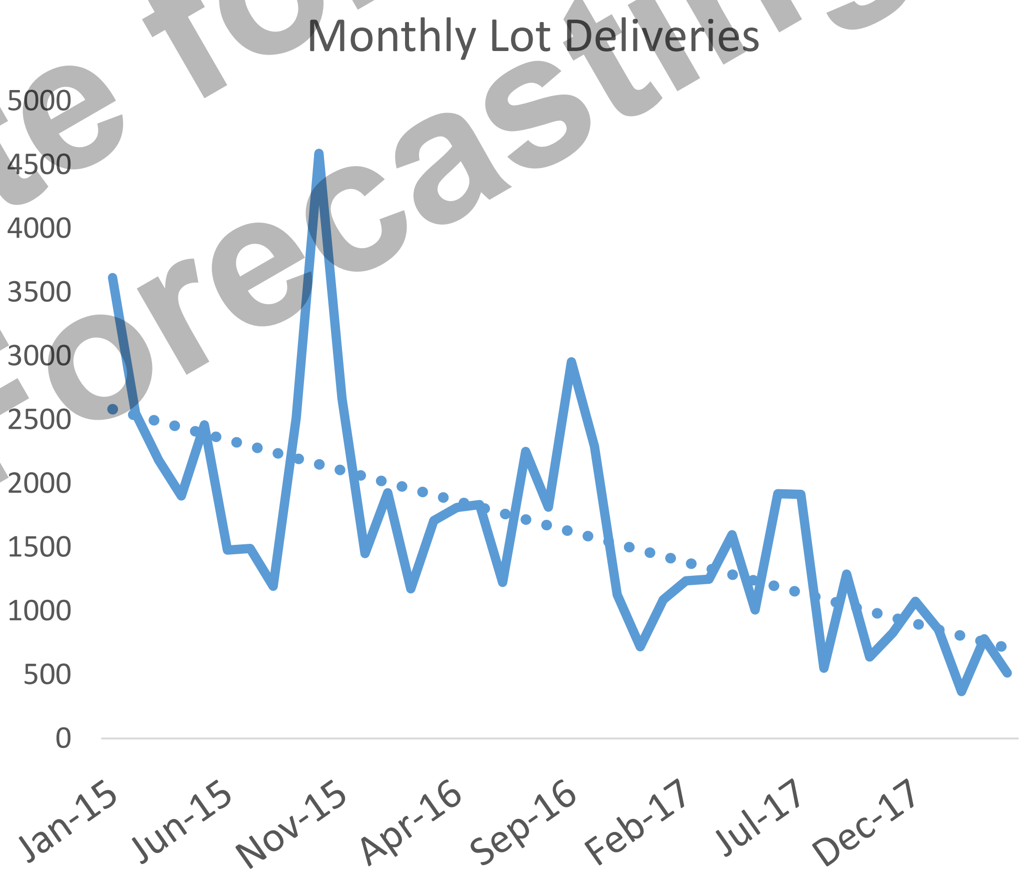
Wells Fargo Housing Opportunity Index

Basics Rule Again in Lot Development

- A long history of mis-steps on lot development
  - 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 three years have paid off in lot development for low- to moderately-priced homes with 45-60 foot frontages. The traditional, middle-class home is finally back in business

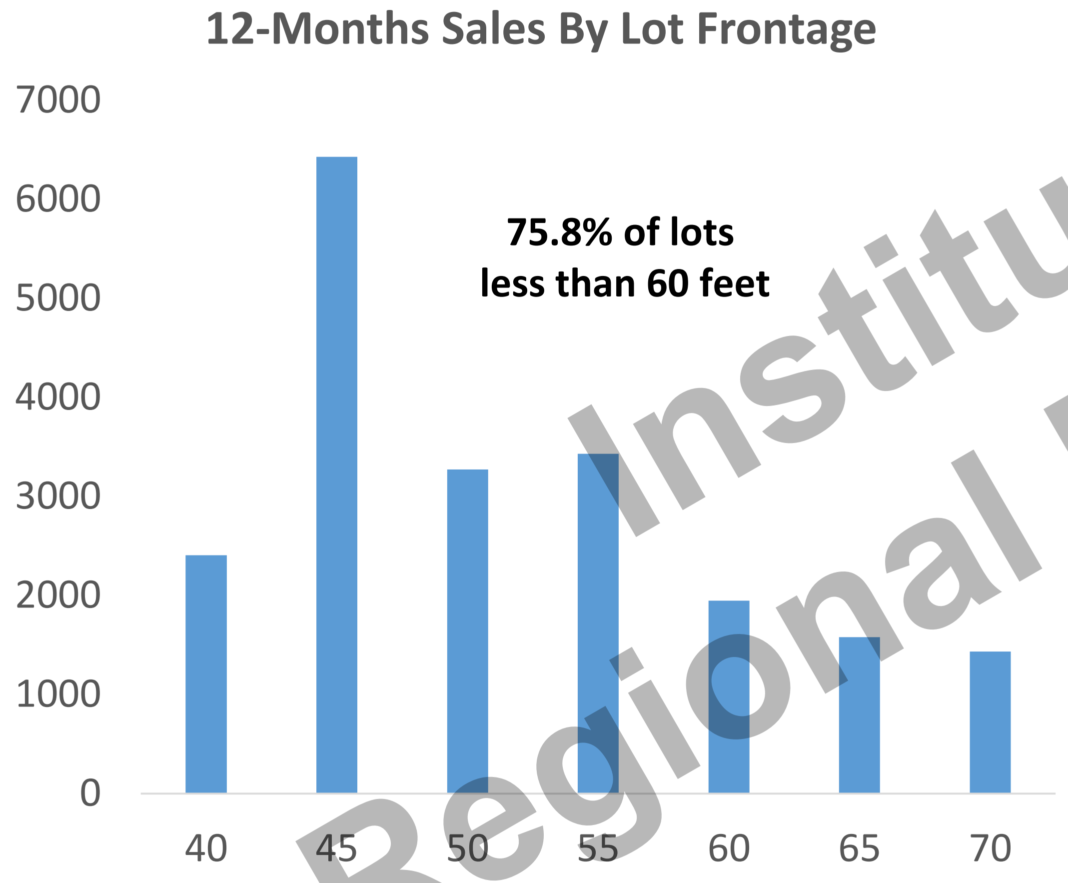
New Home Lots Supply Currently in Good Shape, But Recent Deliveries Are Slowing



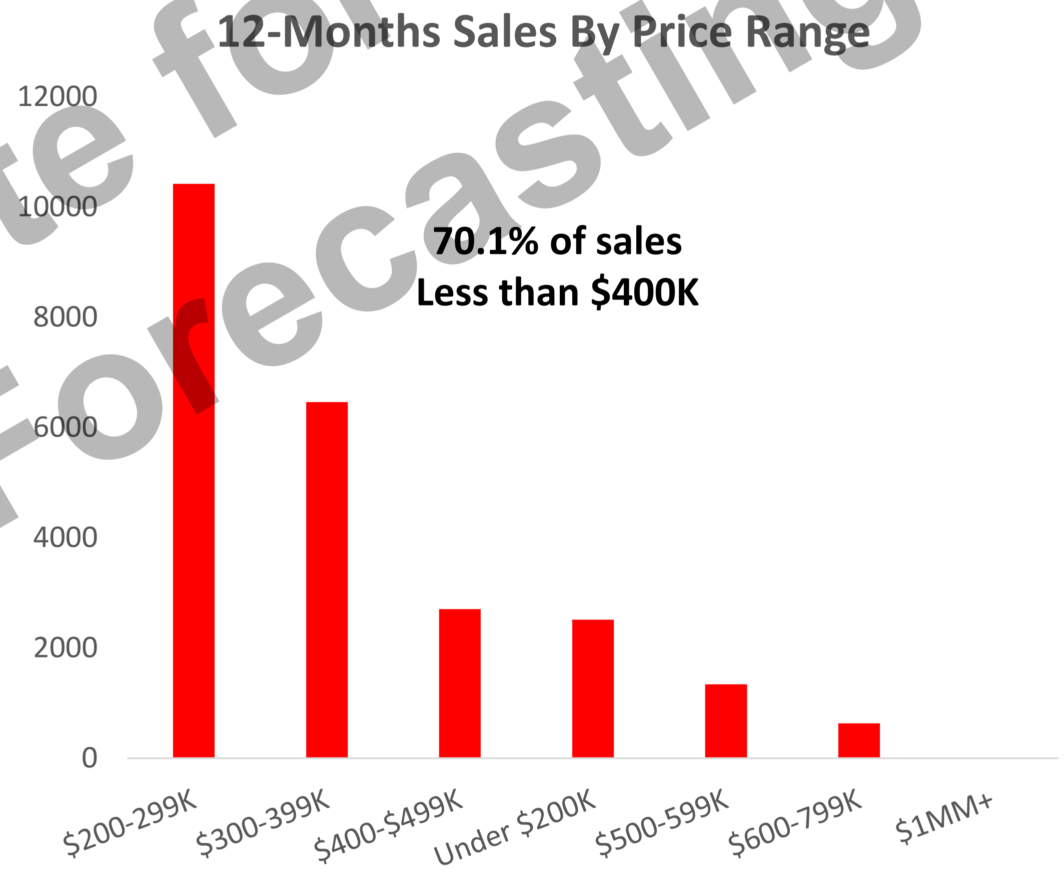


Zonda by Meyers Research

Lot Development and New Home Sales Still Squarely Focused on the Middle Class



Zonda by Meyers Research



On Pace for 36,000 Single-Family Permits in 2018

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

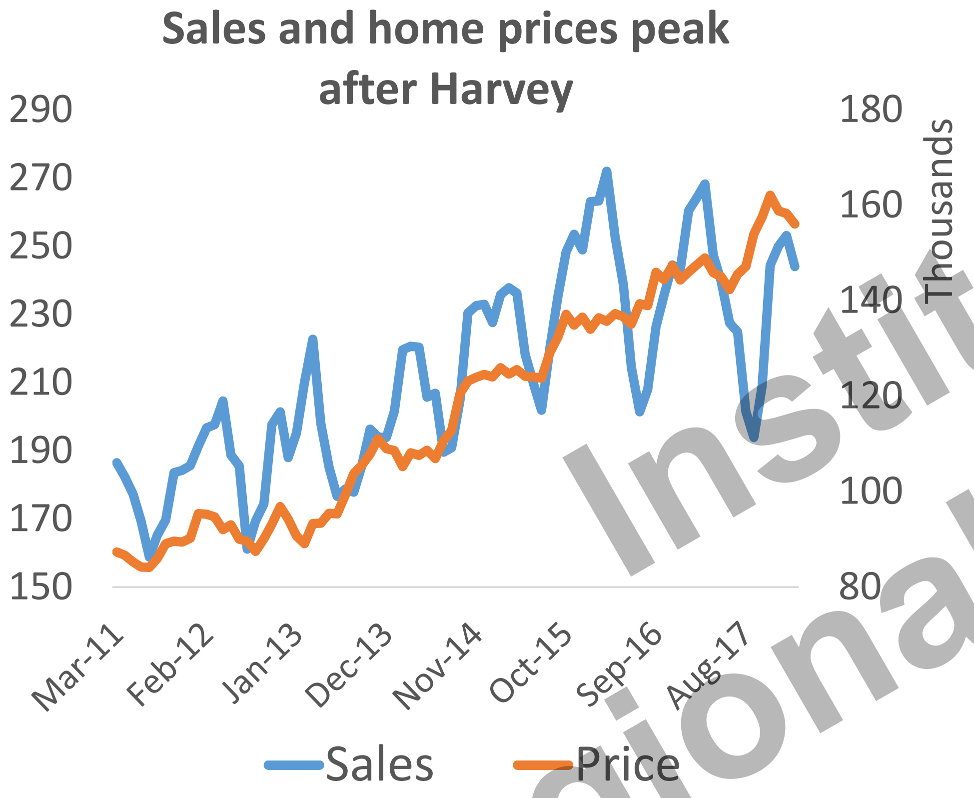
Texas A&M Real Estate Center

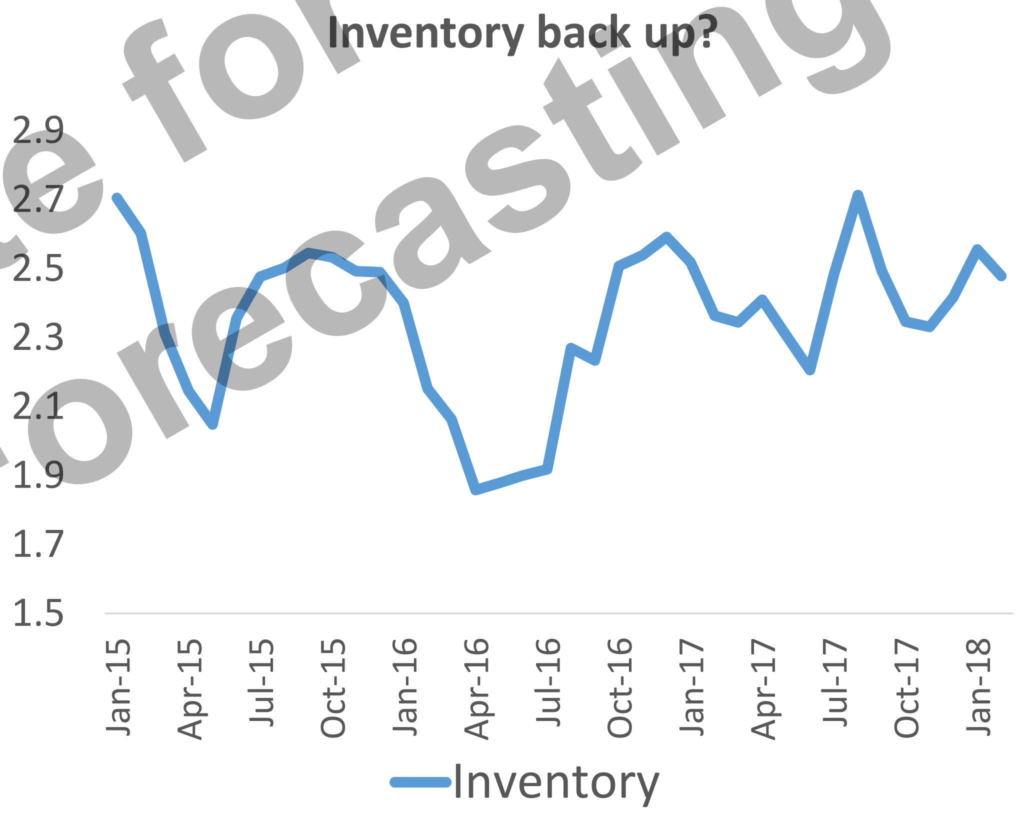
Cost Pressures and Lot Restrictions Could Bring Sharp Cost Increases and Lot Shortages

- Builders face cost pressures from potential steel, lumber, and China tariffs, and from growing labor shortages partly attributable to sanctuary city and immigration restrictions
- Harris County and the City of Houston both have passed floodplain restrictions that will move home construction from the 100- to 500- year level. When released, new FEMA maps will raise these levels yet again.
- New applications for municipal utility districts in Houston's ETJ have been held up since June 2017. This is partly the City clarifying/rethinking its role in the ETJ, and partly driven by Harvey-related concerns. About 30 MUDS are now restricted from conveying lots at a time new development is sorely needed.

Ship Channel Cities

Baytown, Channelview, Pasadena

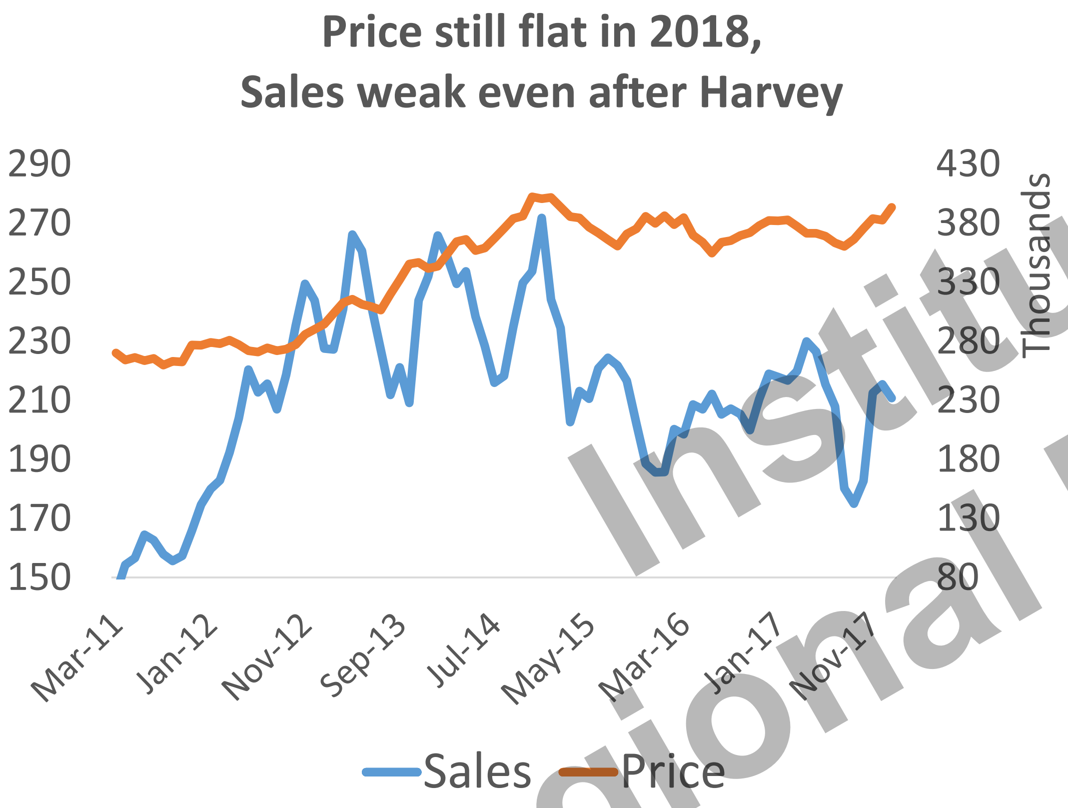


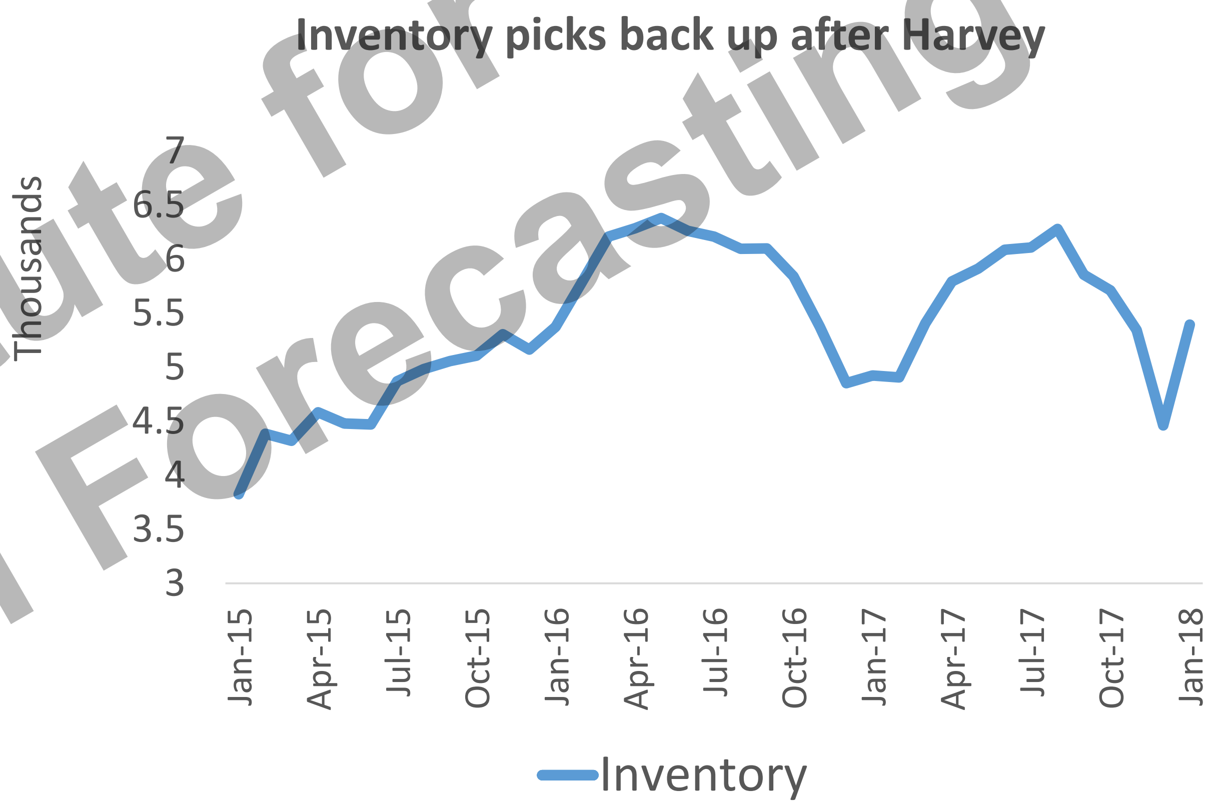


Source: Texas A&M Real Estate Center, calculations of IRF

Close-In and Upscale

Rice Military, Heights, Galleria



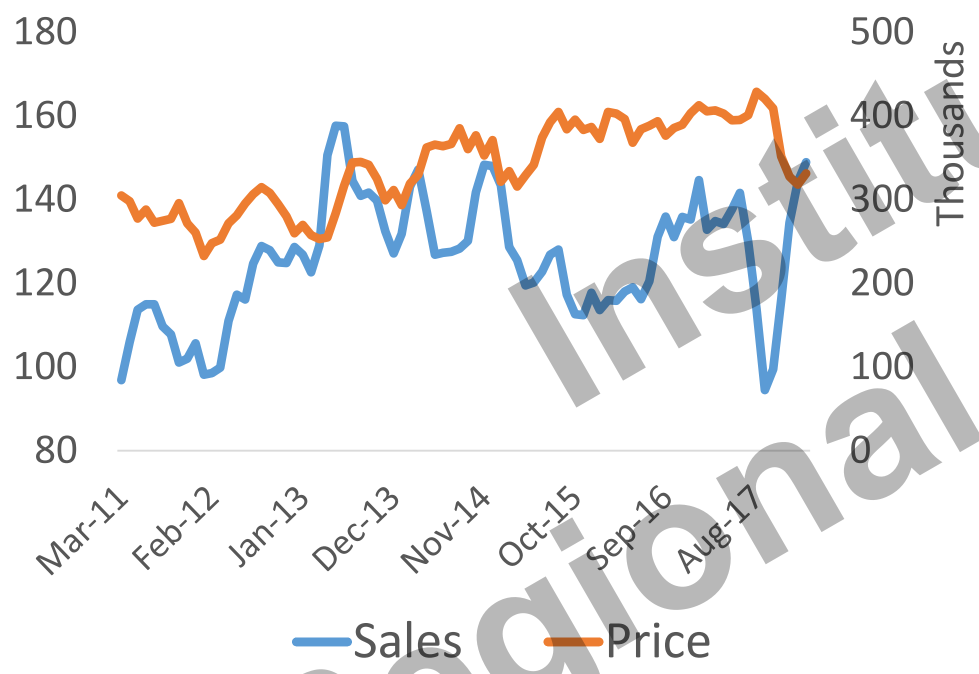


Source: Texas A&M Real Estate Center, calculations of IRF

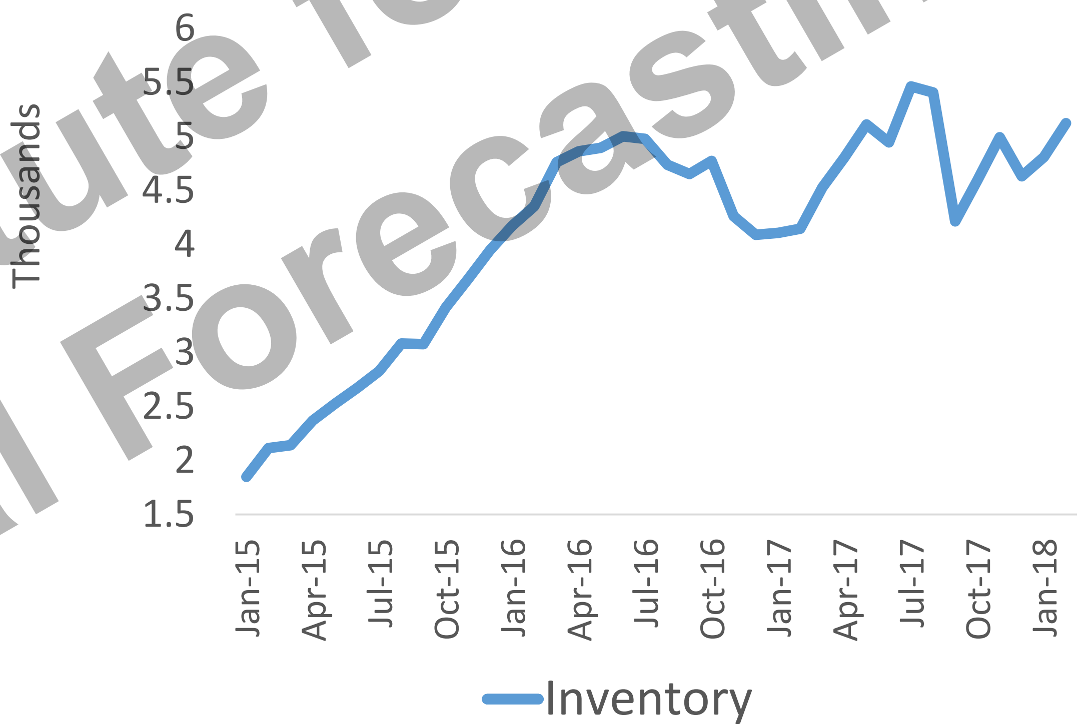
South Of I-10 West

Memorial and Energy Corridor

Prices weaker, as sales rebound after Harvey



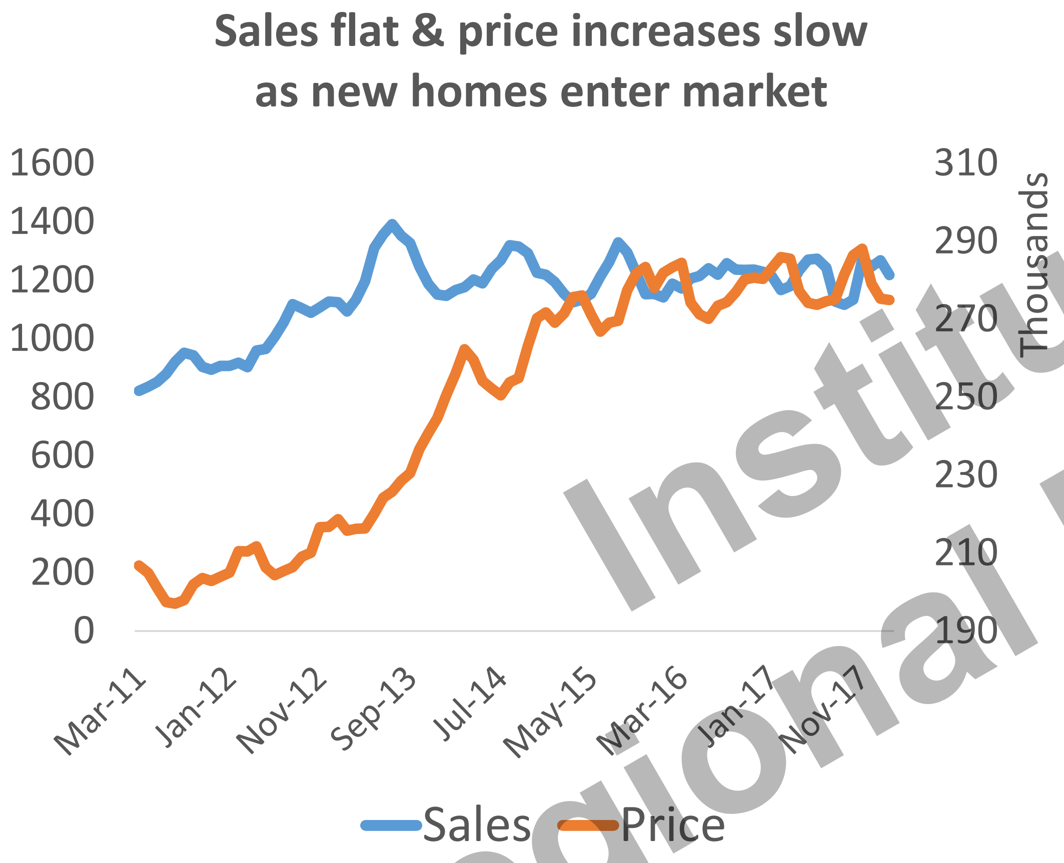
Inventory rises after Harvey

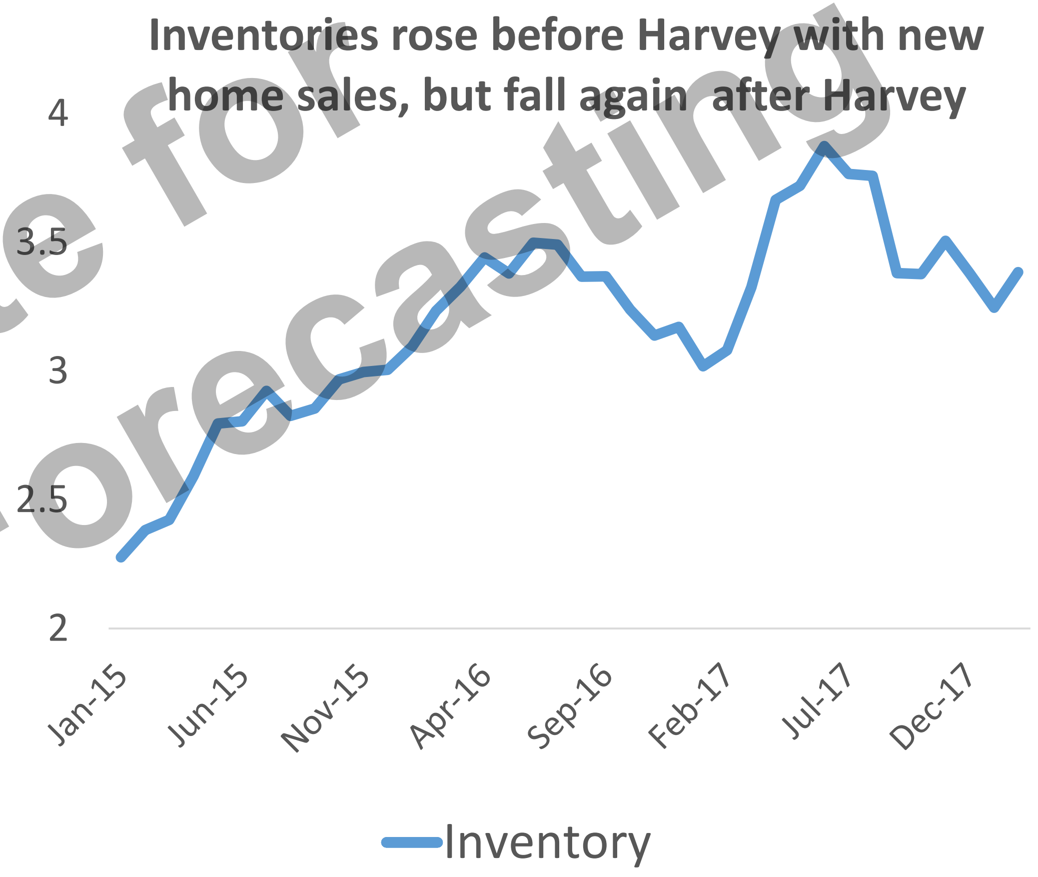


Source: Texas A&M Real Estate Center, calculations of IRF

Distant Suburbs

Pearland, Sugar Land, Kingwood, Katy





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

Harvey's Roller Coaster Ride For Apartments Is Coming to an End

Harvey-Driven Apartment Stats Are Still Riding High in March

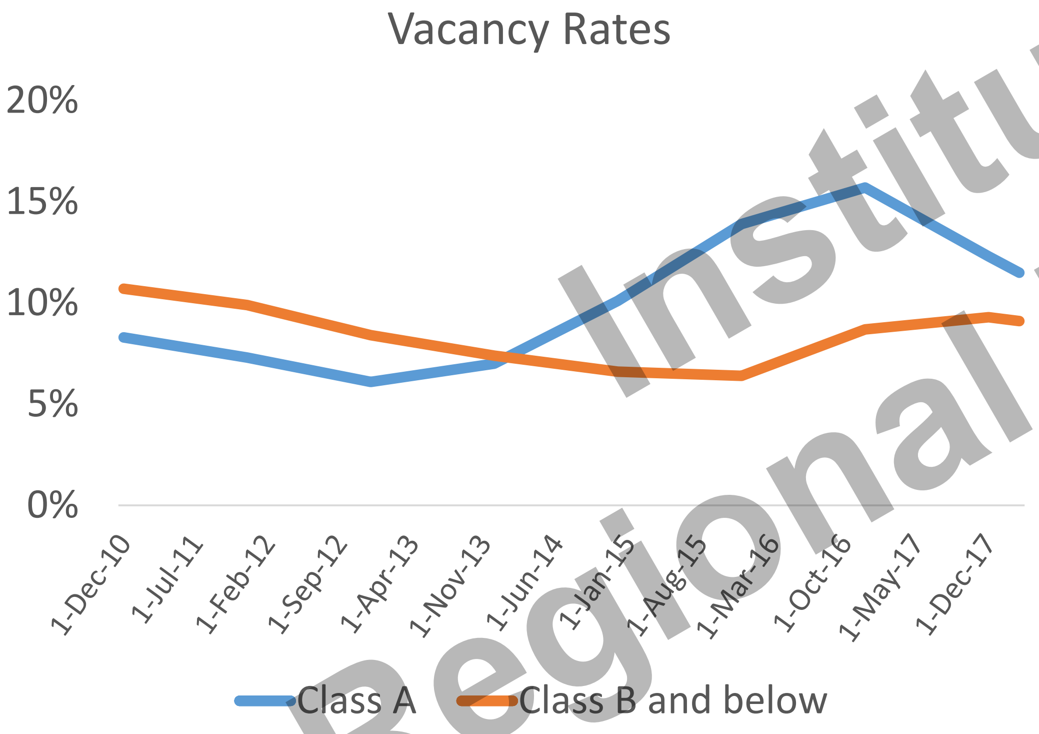
Class A Rents and Occupancy After Harvey			
	Stable	In Lease Up	All Class A
No. of Units	134,410	14,829	149,239
Monthly Rent	$1,496	$1,602	$1,507
Occupancy	90.0%	47.7%	88.4%

Apartment Data Services through March

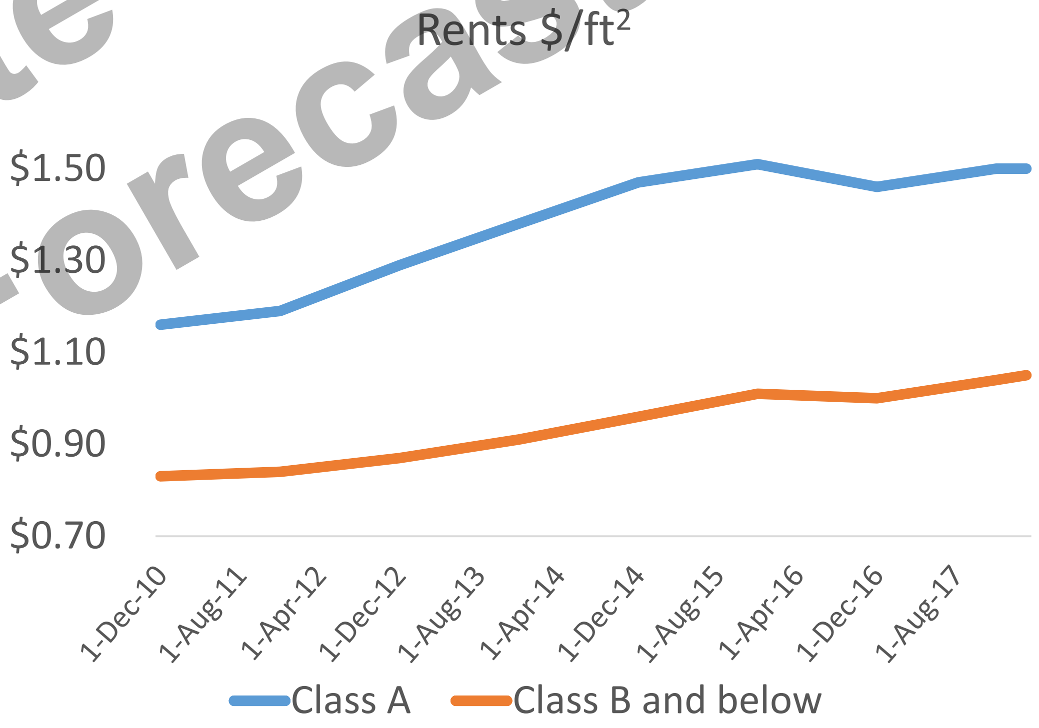
- Class A drove recent problems in Houston's apartment market. New product enters here
- Increased absorption due to job gains preceded Harvey, and then a Harvey-driven surge lasted through the winter and spring
- Harvey absorption has reversed, and 14,829 unit in lease-up. But the 2018 construction pipeline has mostly emptied out
- Key questions: Job growth, number of Harvey move-outs, and whether Class A continues to rob units from B&C

Harvey Was a Temporary Fix for Depressed Rents and Occupancy

Class A Vacancy Falls to 11.5% with Help from Harvey

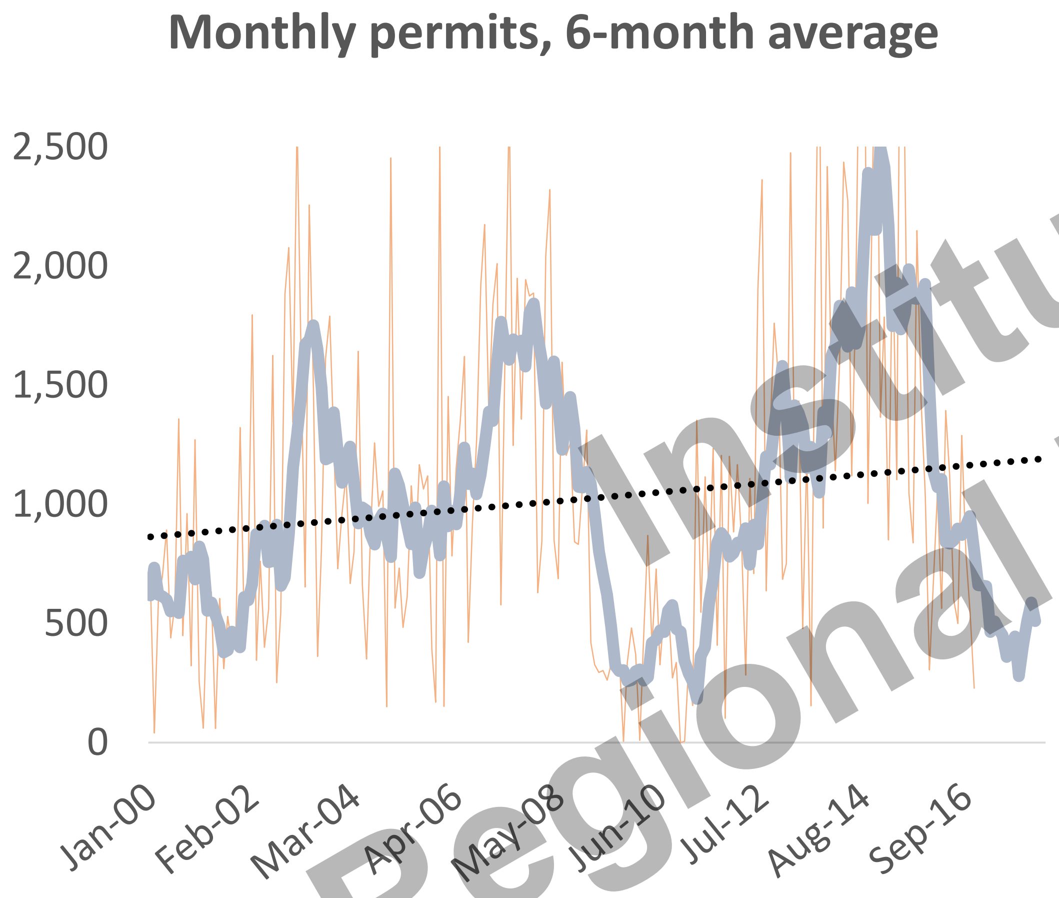


Class A Rents Still Weak Since 2014 Ex. Harvey Class A Pressures B



CoStar

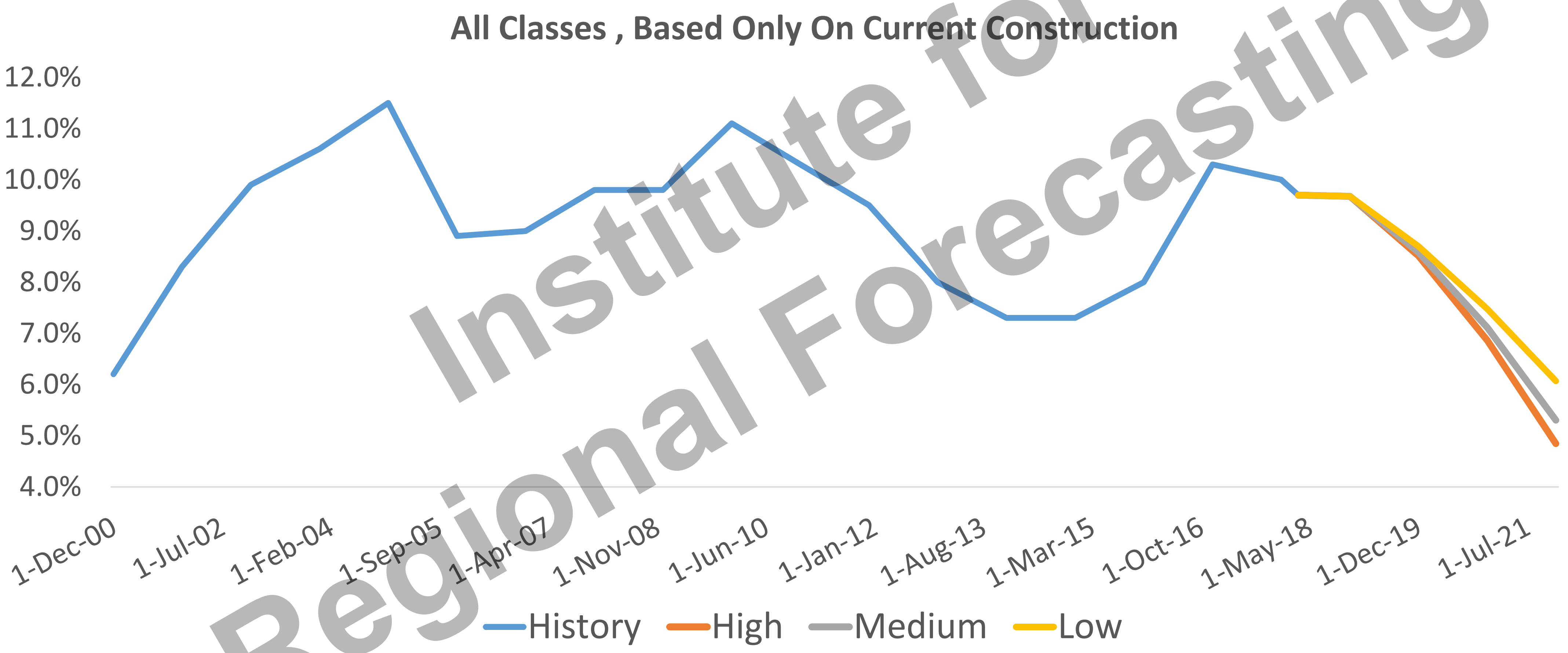
Construction Pipeline Empties: Multifamily Permits Fall Hard



TAMU Real Estate Center

- Multi-family permitting since Harvey averages 500 units/month for the metropolitan area
- CBRE says about 11,000 units are under construction. Apartment Data Services estimates 8,000 new units in 2018
- Harvey and/or a better economy stirring recent announcements of more projects to come

Harvey Exodus Means Stable Vacancy in 2018, Current Pipeline Cuts 2021 Vacancy to 7.1%



CoStar and calculations of IRF

Class A Multi-Family Markets with Early 2018 Vacancy Rates Greater than 20 Percent

Black Dot = Property located in 2-mile radius market area with 20%+ vacancy

CoStar and calculations of IRF

Outlook for the Office Market Still Bleak

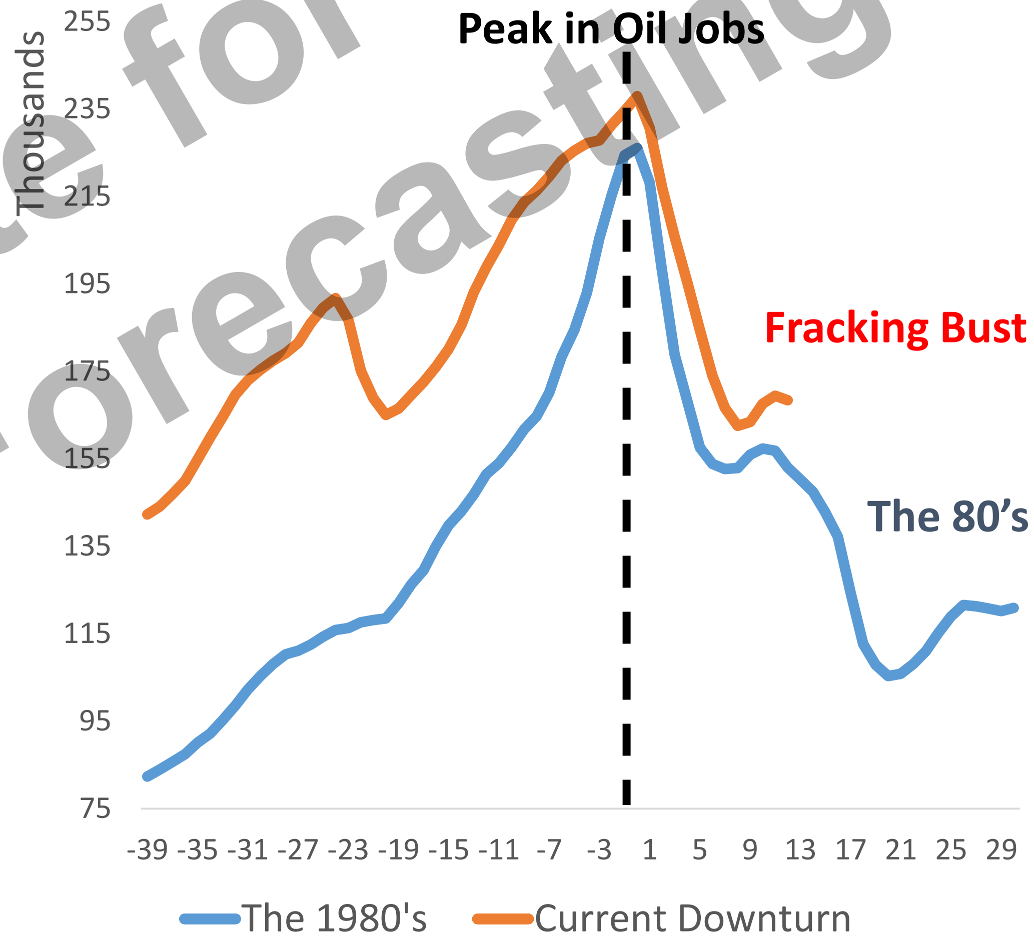
- 26.9 million square feet of space added to Houston's market 2014-17
- 57.8 million square feet available direct, plus current 8.7 million for sublet
- Metro area vacancy rate is 16.7%, Class A much higher at 21.2%
- Available sublet is 2.7 percent of the market; 10 largest spaces for sublet are all energy companies
- Net absorption has been negative seven of the last eight quarters
- Class A base rents remain under substantial pressure, falling steadily to $22.26/ft^2
- Harvey brought limited damage to the office market, and quick recovery
- The construction pipeline continues to wind down at 2.4 million ft^2 of mostly anchored tenants
- *We are still waiting for those oil jobs to return in large numbers*

A Brutal Downturn in Local Oil-Related Jobs Hurt the Office Market

Large Subleases On Houston Market Are All Energy

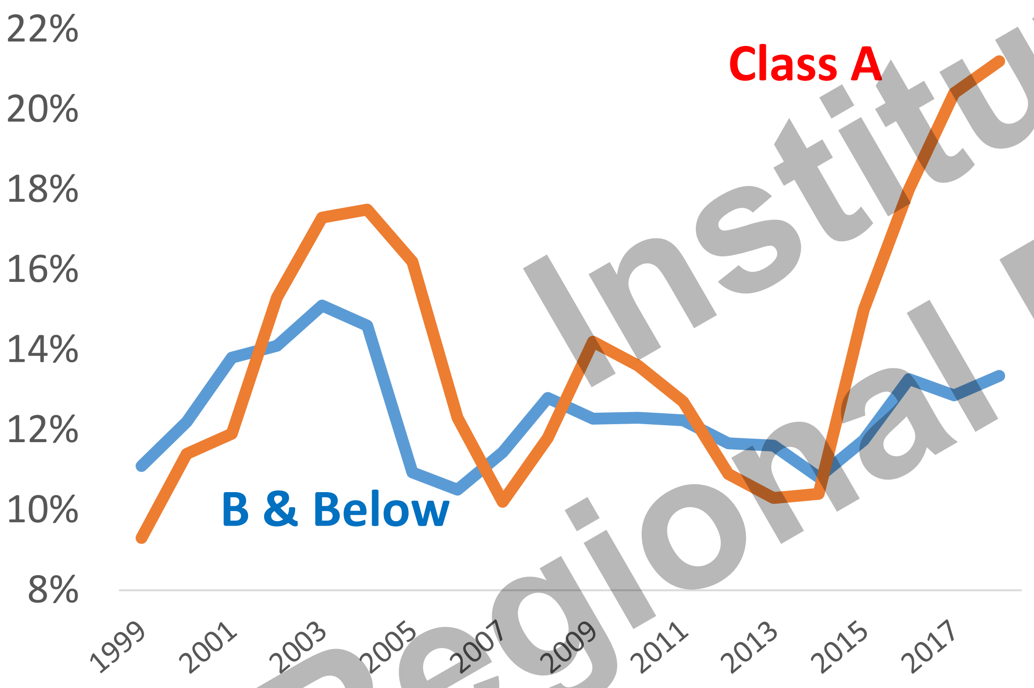
Company	(000 ft^2)
BP	504.3
Technip	375.9
NRG/Reliant	262.3
ExxonMobil	253.6
Phillips 66	221.7
Enbriige	202.7
ExxonMobil	198.3
AMEC Foster Wheeler	189.3
AMEC Foster Wheeler	183.0
BHP	180.3
IHI E&C	158.3
FMC Technologies	157.3
Shell	154.1
All Sublet < 500 K	**3,041.1**

CoStar and calculations of IRF



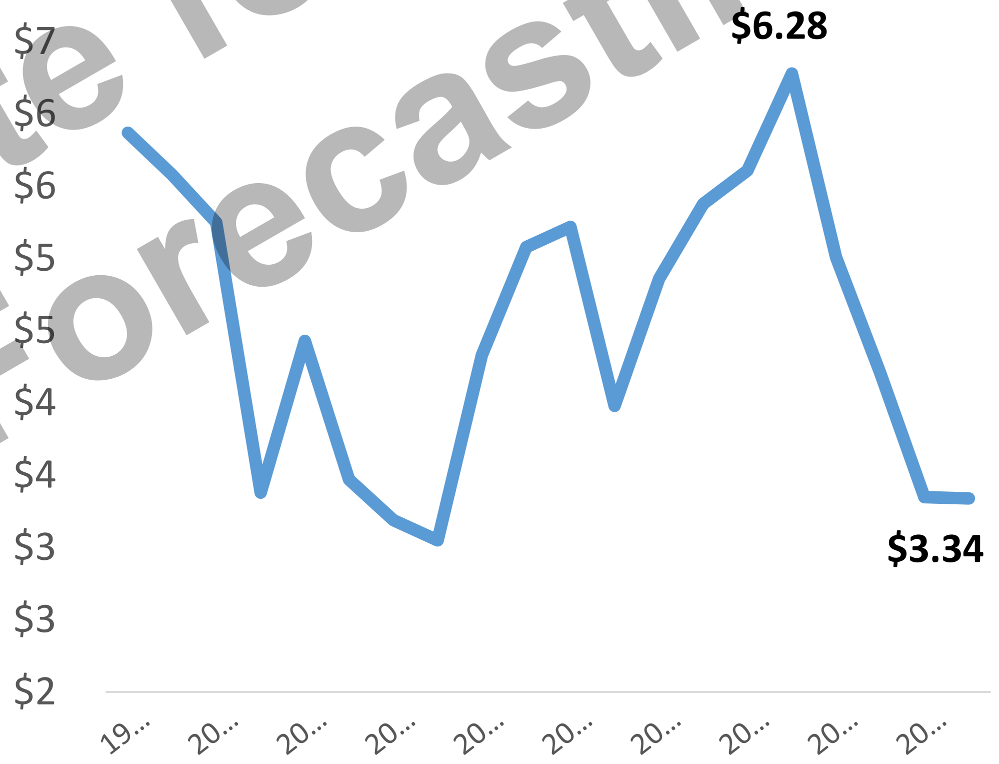
Problems All Start In Class A

Class A Vacancy Rates Nearly Double, Head to Modern Highs

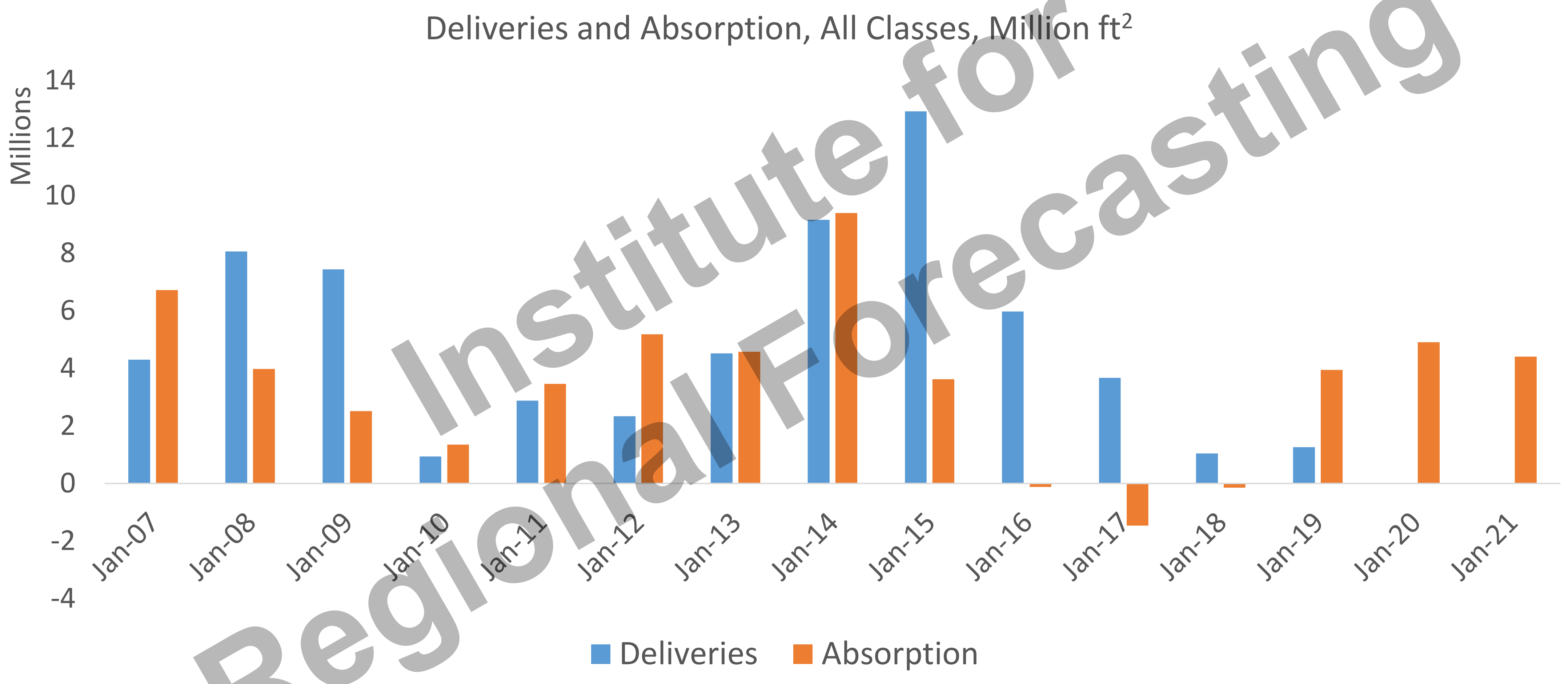


CoStar

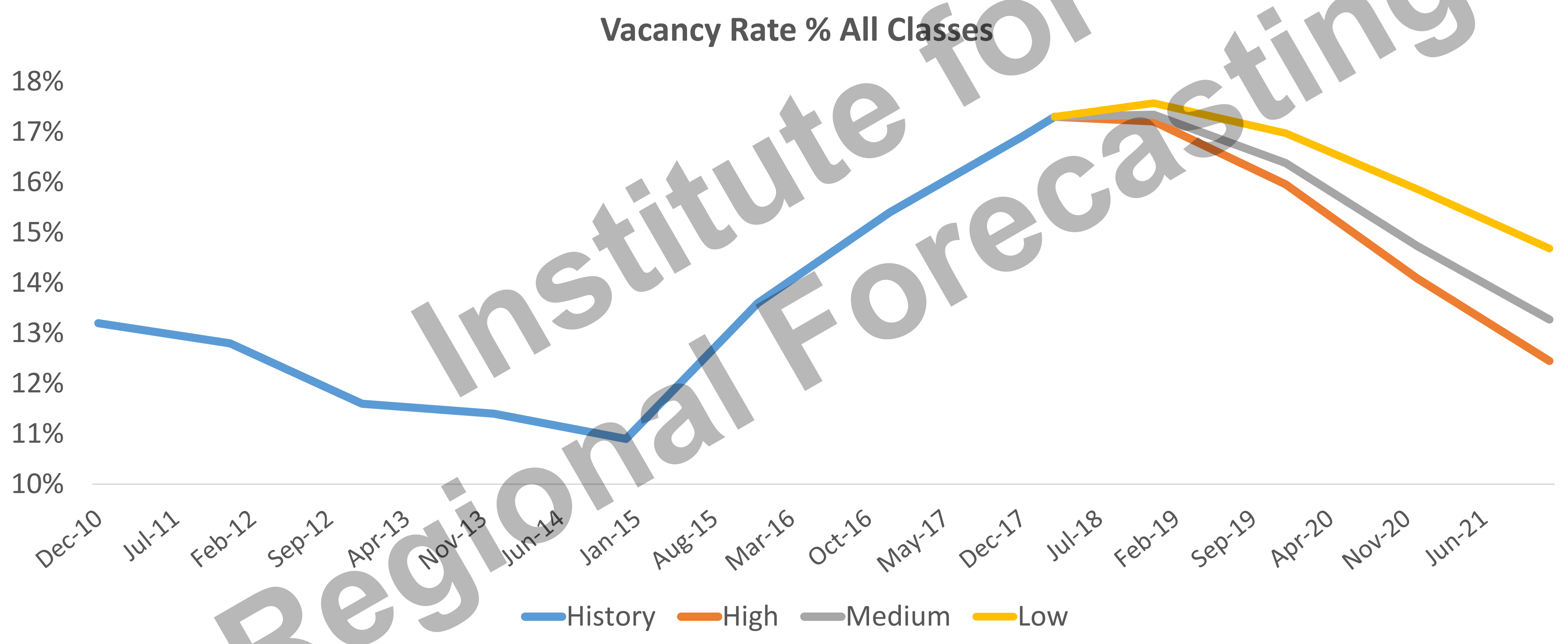
Class A Rent Premium Nearly Cut in Half By 2018



As Deliveries Fall Back, Absorption Slowly Turns Vacancy Rates Around After 2018



Office Vacancies Have Probably Peaked: But a Long Way to Go for a Healthy Market



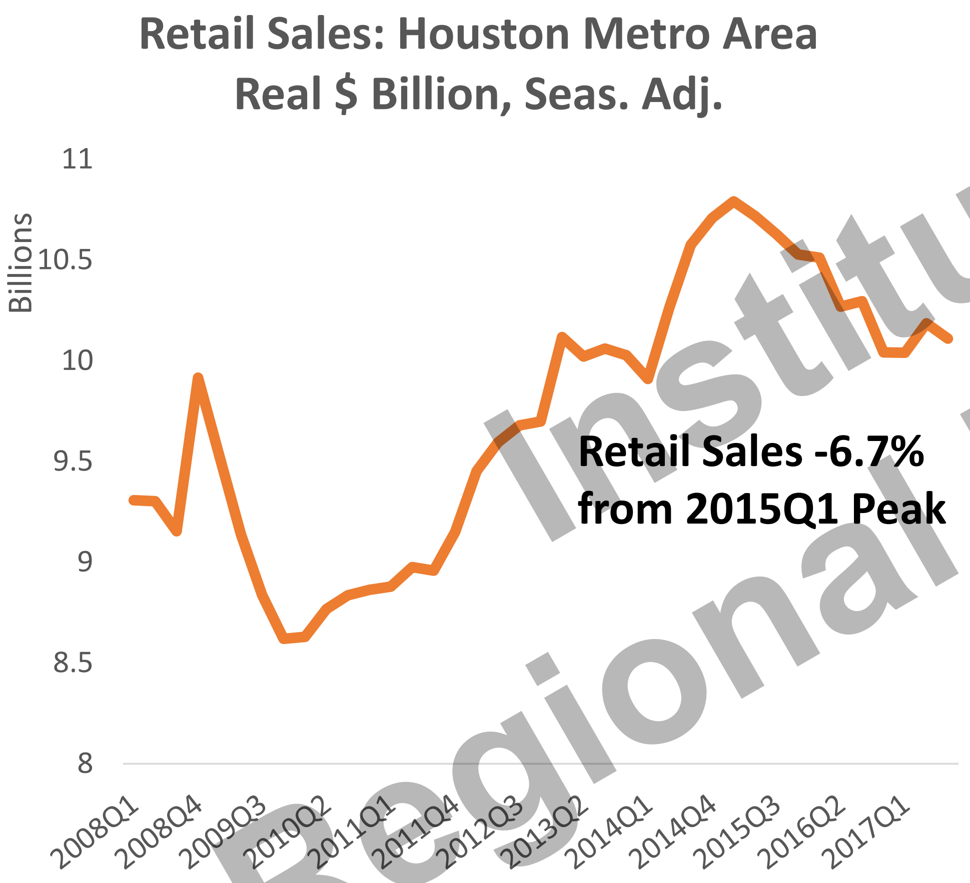
CoStar, Calculations of IRF

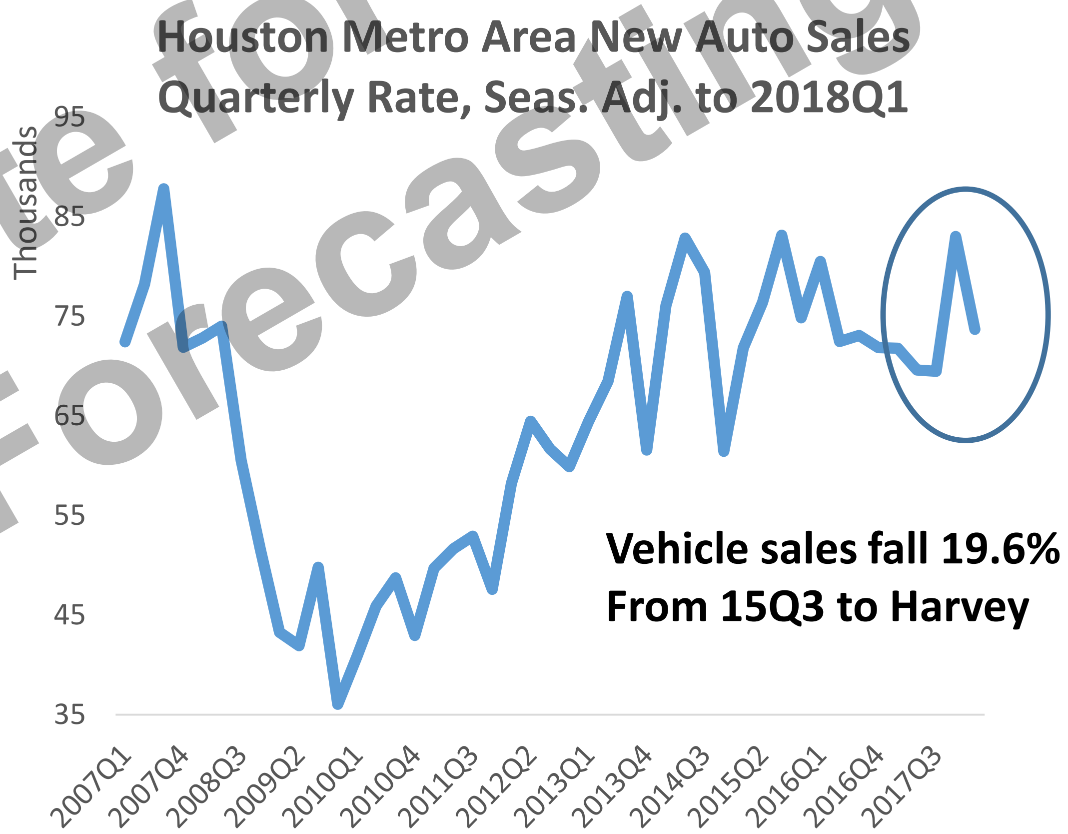
End-of-Year Office Markets with Vacancy Greater than 20 Percent

Black Dot = Building located in 2-mile radius market area with 20%+ vacancy

Industrial and Retail:
Each Find Their Own Logistics Connection

Retail and Auto Sales Have Taken a Big Hit Since 2014



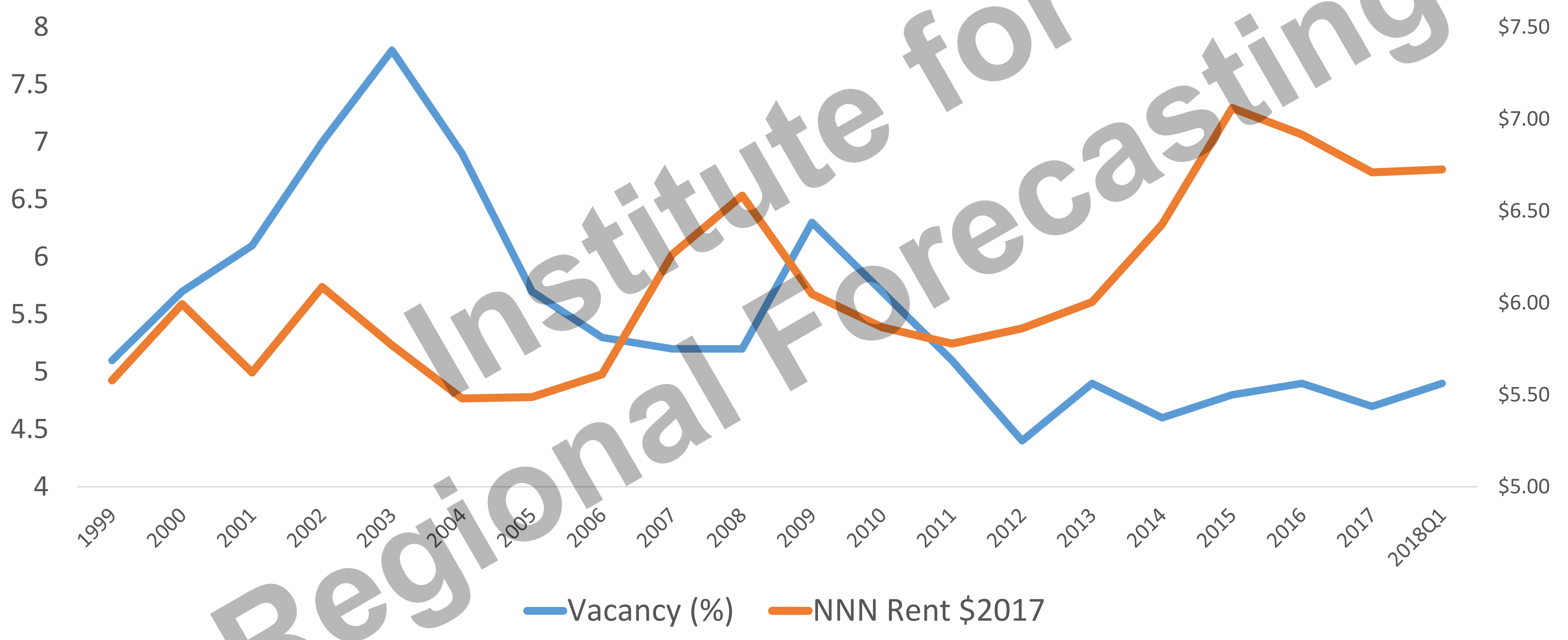


Texas Comptroller and InfoNation

Out-Of-State Merchants Now Take More Than 10% of Texas Taxable Retail Sales

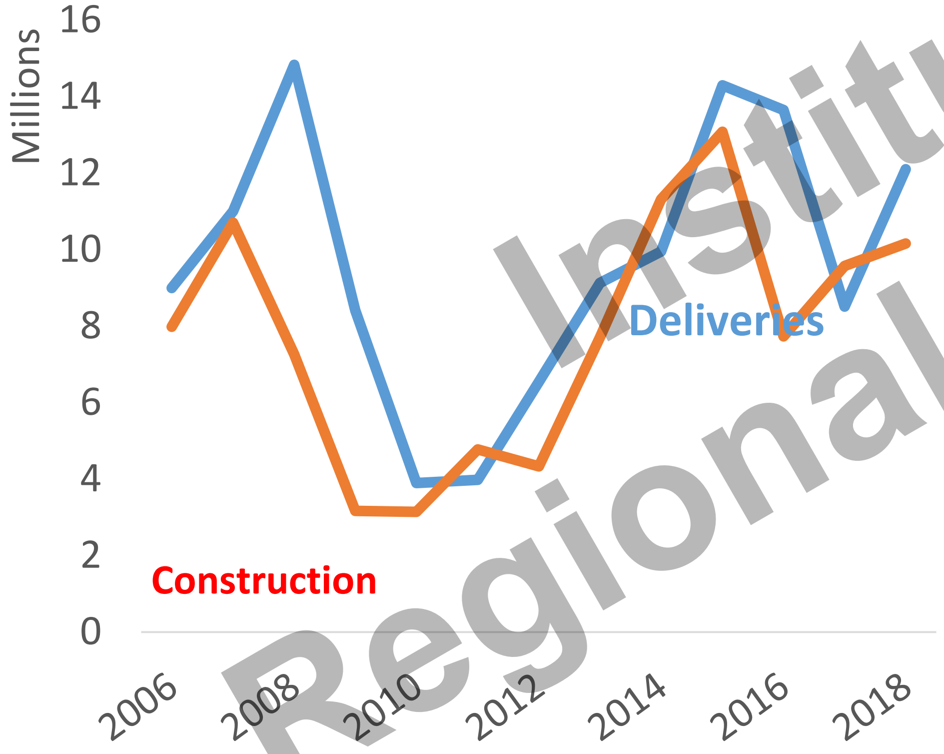
- If a retailer has any in-state presence, they collects from the buyer and pay the tax to the state
- Use tax shifts the out-of-state tax payment burden from retailer to the in-state purchaser
- The Amazon agreement extended the in-state presence from just store-fronts to warehousing and distribution
- Allows the state to pick up some e-commerce revenue, but certainly not all
- Localities in Texas do not collect most out-of-state tax revenue from Amazon or most e-commerce, e.g., City of Houston or METRO

After a Long Period of Over-Building the Retail Market Tightened in 2014

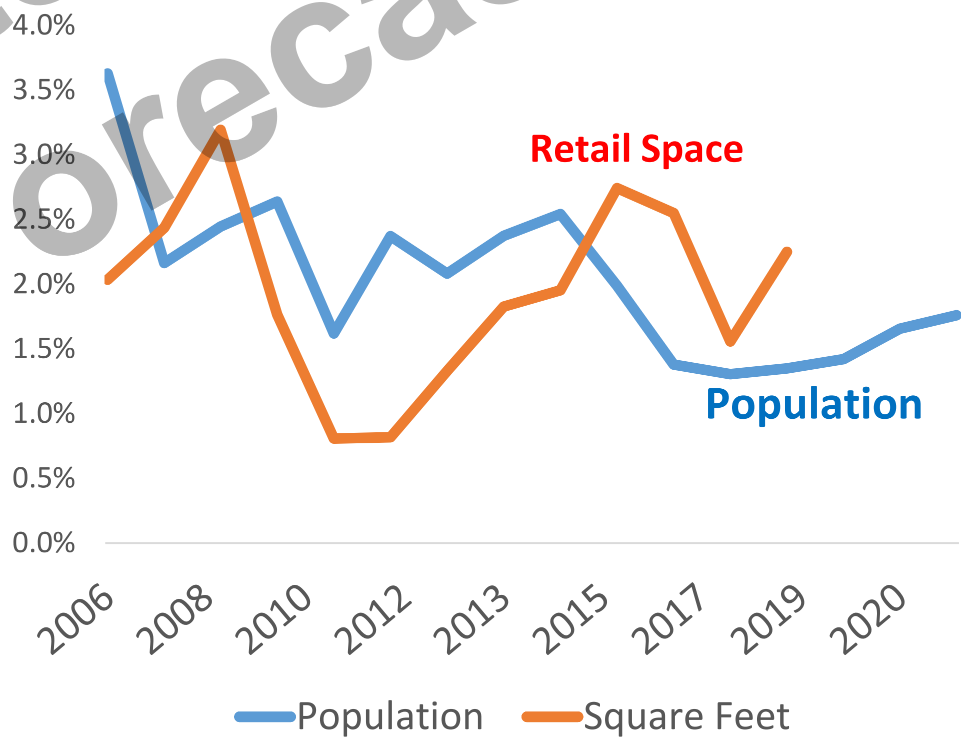


Retail Pipeline Shows Healthy Growth, In-Line with Population

Retail Delivered and Under Construction (000 Ft^2)

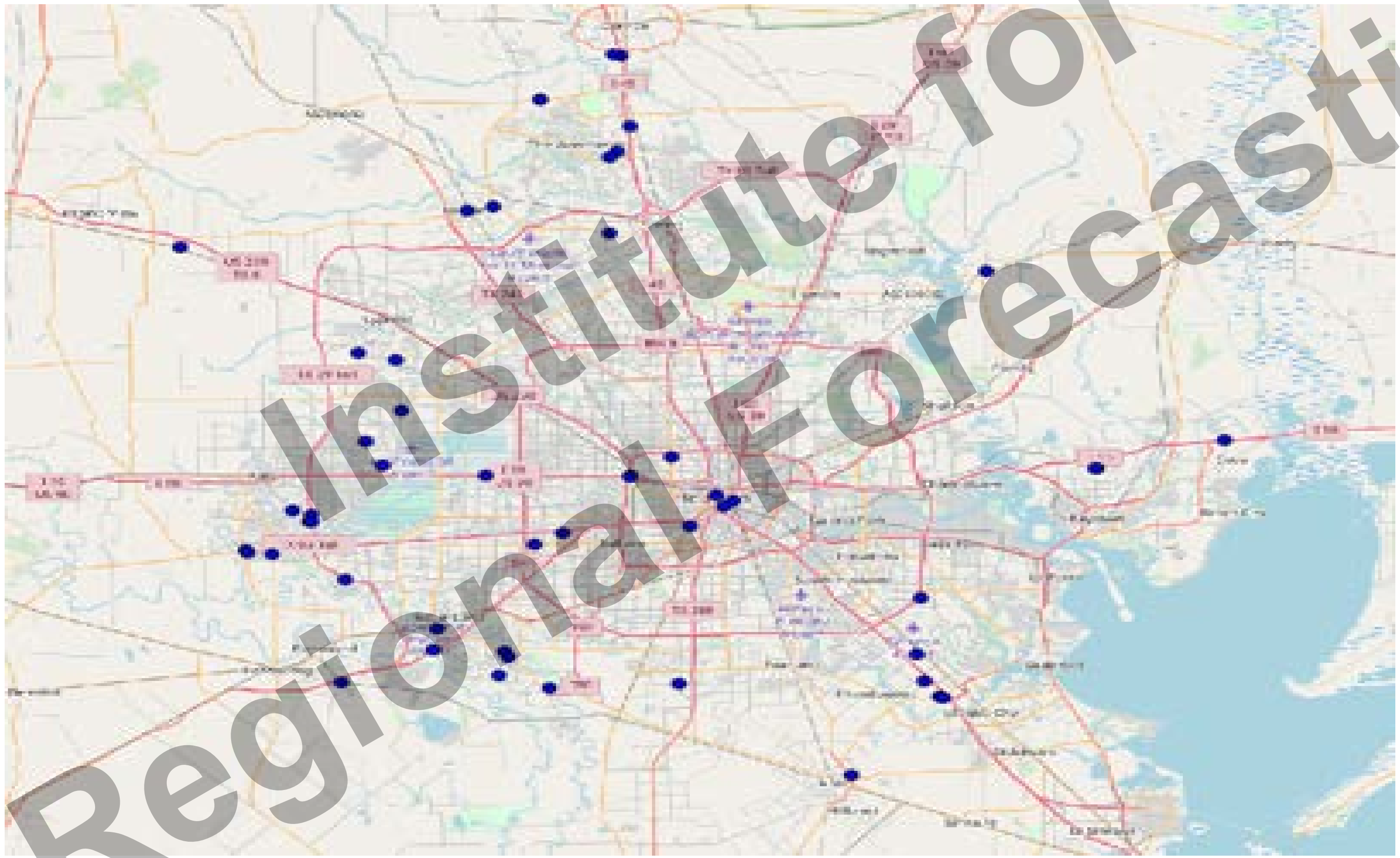


Growth Rate of Space Faces Softer Population Growth (%)



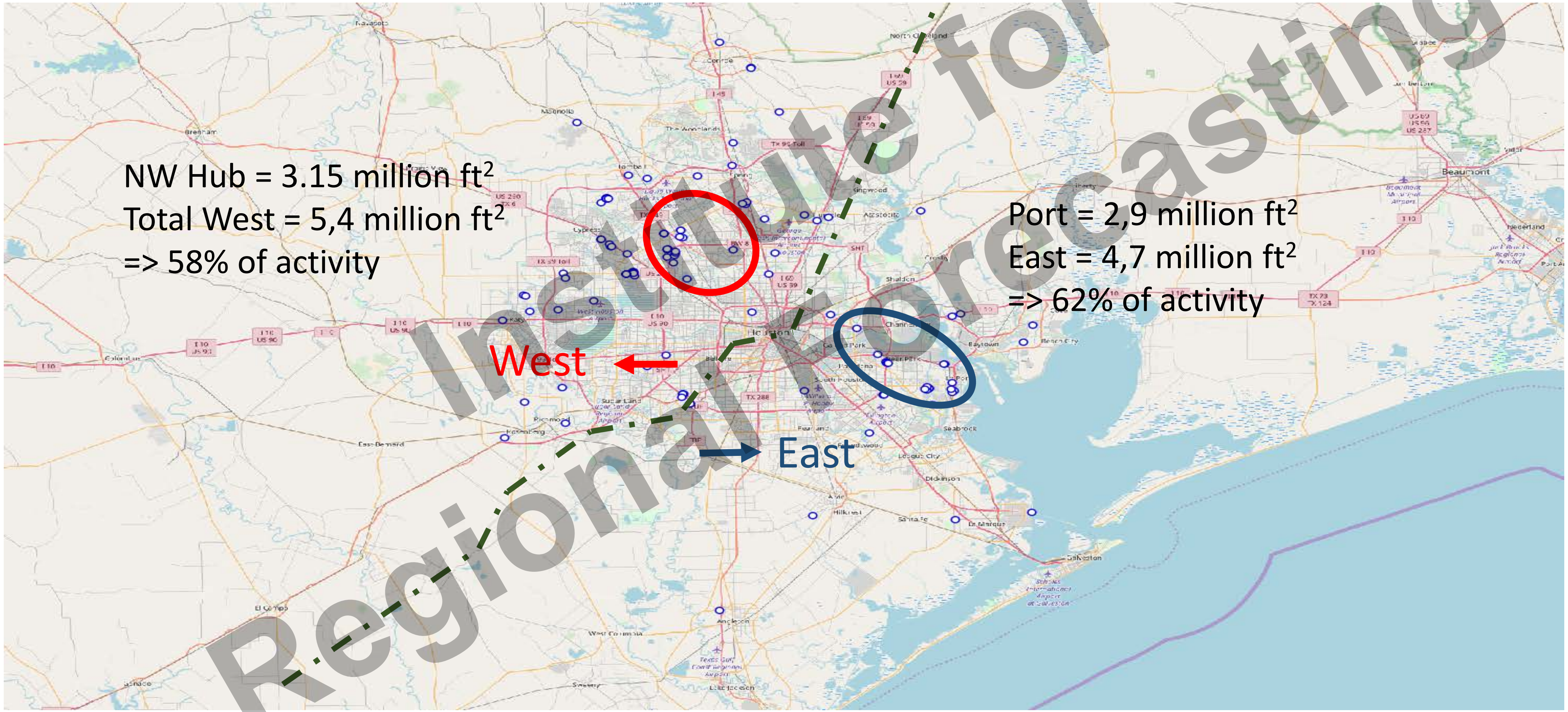
CoStar 2018Q1, deliveries and retail growth stated at annual rates

Large Retail Under Construction Vested in Hwy 99 and Other Far Suburbs

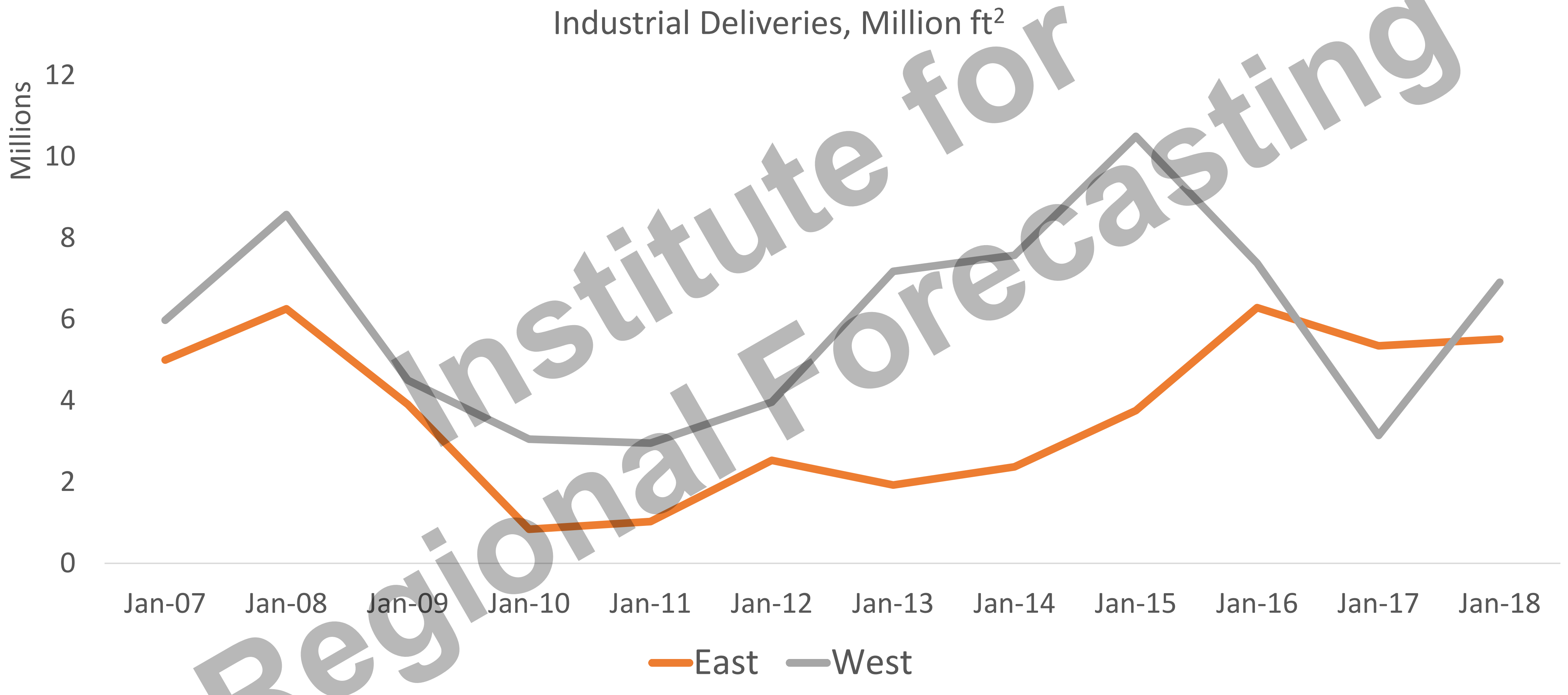


All Houston-area retail projects > 20,000 square feet

Ten Million Square Feet of Industrial Space
With Bulk in NW Distribution and Port of Houston

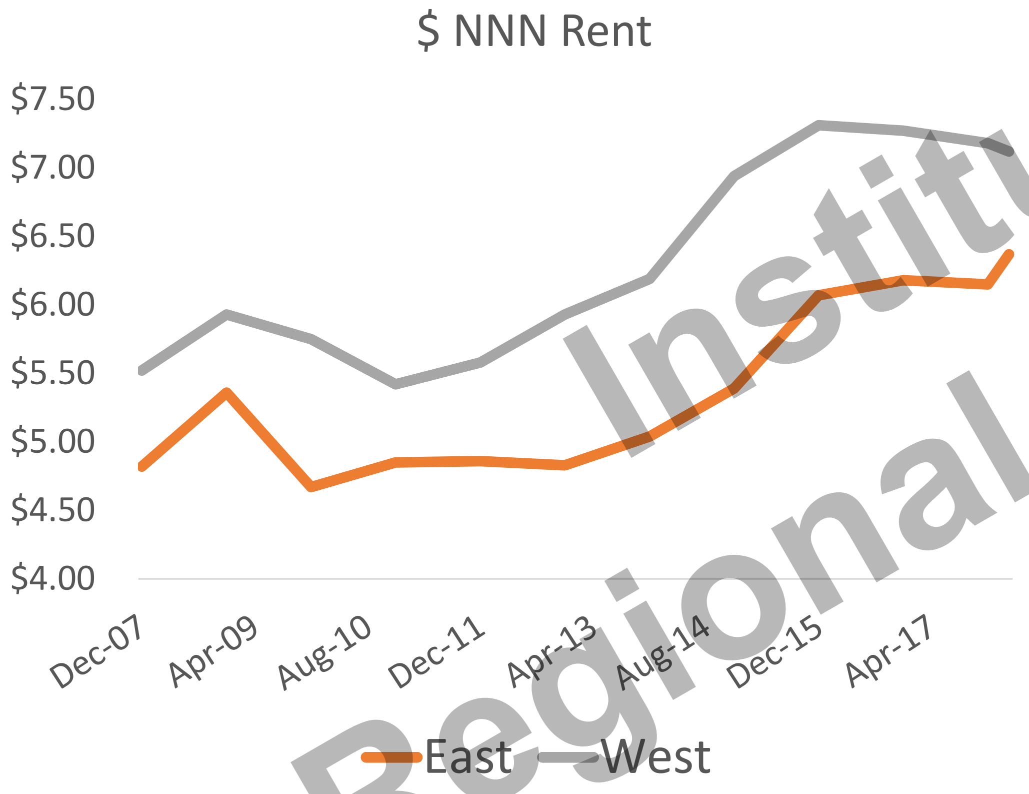


East Side Industrial Deliveries Peaking, As (Mostly) West Side Logistics Pick-Up

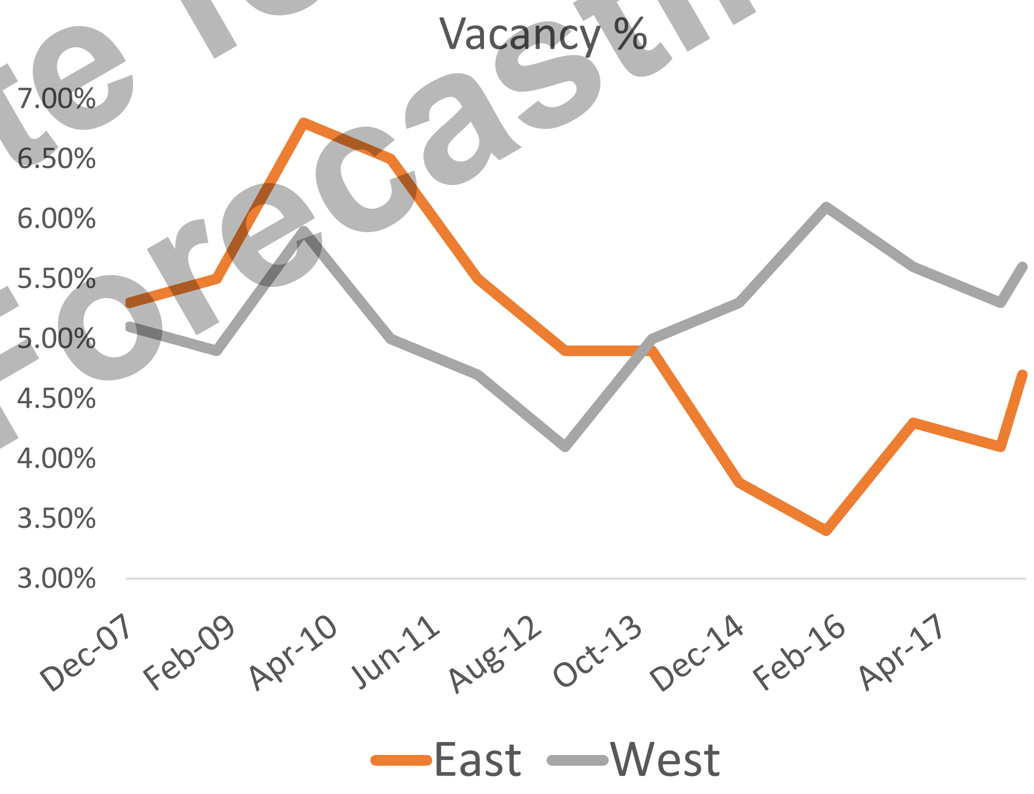


Overall Industrial Market Still Pulled Down By Oil-Related Manufacturing

East and West Rent Is Soft, Remain Stable Since 2015



East/West Switch Places in 2013, While East Vacancy Rising Again



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Thank you for attending

Please mark your calendars for our next event on Tuesday, November 6, 2018