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REGIONAL FORECASTING

Houston and Recession:
Likely or Not? Domestic or Global?
And Why Should We Care?

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We Saw a Strong Economic Picture in October 2018

- The U.S. economy was growing rapidly last year, with help from a late-cycle stimulus package passed by Congress in December 2017. The Federal Reserve was on high alert, concerned about a tightening labor market and possible inflation ahead. The Fed was actively raising interest rates
- OPEC and its allies were supporting oil prices with self-imposed quotas. In September oil prices averaged $70 per barrel, and Houston was hiring oil workers
- The Houston economy was growing moderately last year, although the numbers briefly disguised it. The original payroll job growth number for 2018 was estimated to be a boomtime 108,000, since revised to 79,000 -- with more downward revisions likely to come

The Situation Is Different Now As Many Fundamentals Slowly Weaken

- The U.S. economy has slowed in response to waning stimulus, tariff concerns, and a spread of global economic weakness. The Federal Reserve has joined other central banks around the world by cutting interest rates
- Oil Weakens Again
  - OPEC then launched a new strategy in 2019 hoping to slow U.S. production by holding oil prices at a level near $55 per barrel. The U.S. rig count has fallen steadily since December, falling 230 rigs or 21 percent
  - The fracking industry has failed to deliver on profits or equity gains and has lost the financial backing of Wall Street. A credit crunch has slowed oilfield activity in 2019
- The estimated payroll figures for Houston's job growth are again running too high in 2019, and moderate local growth still seems to be the right answer in 2019

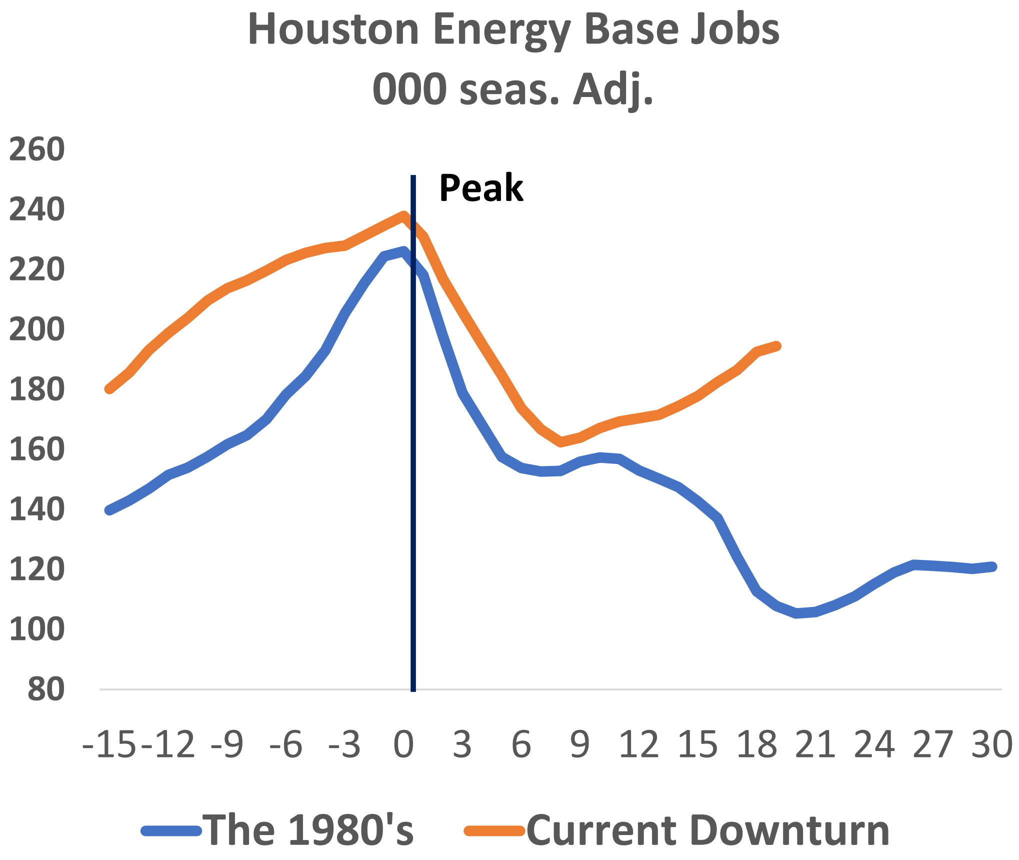
Putting the Oil Bust Behind Us

In 2015-16, Oil Hurt the Economy Badly, But Houston Found Help Elsewhere

	2014-2017
Oil	No
U.S. Economy	Yes
Ship Channel Expansion	Yes
Catch-Up from Boom Years	Yes
Hurricane Harvey	Yes

We Lost 77,200 Jobs to the Fracking Bust, and Only 31,100 Have Returned

(Net Change in Jobs in Boom and Bust)



	Change in Job Number (000)	
Sector	Dec'14 to Dec '16	Dec '16 - Now
Upstream	-77.2	31.1
Oil Producers	-16.2	0.1
Oil Services	-20.7	10.1
Machinery	-19.8	8.2
Fabricated Metal	-20.5	12.8
Downstream	1.6	3.6
Refining	-0.1	2.5
Chemicals	1.6	1.1
Energy Base	-74.1	35.8

*Texas Workforce Commission estimates. Oil-Related Jobs = Oil Producers and Services, Machinery and Fabricated Metal, Refining, Chemicals, Plastics, Pipelines, and some Wholesale Trade and Professional Services.

Ship Channel Construction Continues: Just At a Slower Rate

Chemical Expansion Was Essential to Helping Houston Offset Drilling Bust

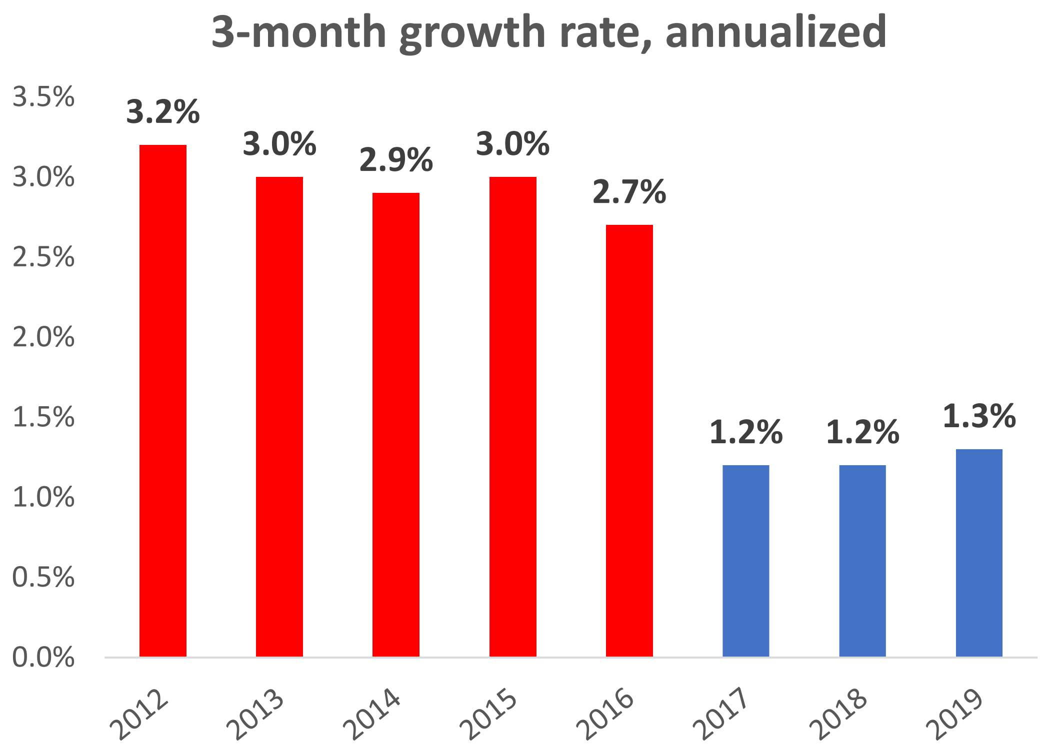
- New proposals and projects continue, but the first wave of construction has wound down, becoming a modest drag on the economy
- A second wave of construction is building again, but other Gulf Coast cities – Corpus, Lake Charles, Orange -- are increasingly attractive compared to Houston
- The Ship Channel has only a handful of undeveloped sites, land prices are very high, redevelopment is expensive
- Companies also seek geographic diversification against storms

Big New Projects Still Coming Online

- As the ethylene and polyethylene projects have come online, they have produced a glut of product that has slowed future expansion
- Easily $10 billion in on-going work, however, it is just not as much as before
- Among large projects that continue, here are recent announcements
  - Covestro MDI foam, $1.7 billion, at Baytown by late 2020
  - ExxonMobil, $1.9 billion for plastics processing at Baytown by 2021
  - Baystar/Total, $800 million, 625,000 mt/year of polyethylene at Pasadena by 2020
  - Combined $5 billion in midstream projects, most near Mont Belvieu

Nine Service Sectors Make Up Half of Houston's Jobs: They Carried the Economy in 2015-16

Job Growth in 9 Key Service Sectors Has Slowed from 3.0 to 1.5 Percent



Texas Workforce Commission and calculations of IRF

New Jobs Added in Recovery: December 2016 to Present

- 14,448 health care
- 13,536 bars and restaurants
- 10,048 finance
- 8,994 local gov't
- 4,894 private education
- 2,580 state gov't
- 2,532 accommodation
- 1,412 arts and entertainment
- -5,511 retail trade
- 52,961 all 9 sectors

What Worked for Houston Then and Now?
Now It Is Back to Basics

	2014-2017	2017-19
Oil	No	Yes
U.S. Economy	Yes	Yes
Ship Channel Expansion	Yes	No
Catch-Up from Boom Years	Yes	No
Hurricane Harvey	Yes	No

Houston's Economy and Oil: Boom, Bust and Moderate Recovery

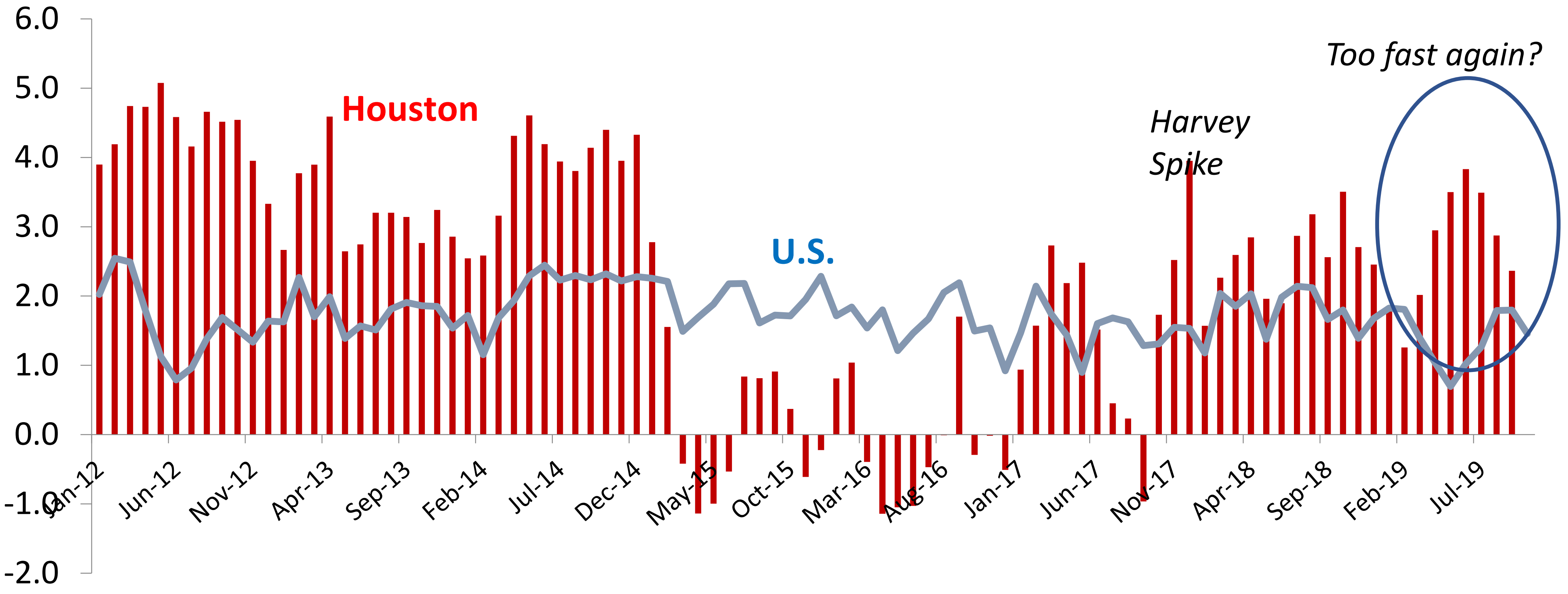
	Houston Job Growth	WTI Oil Price ($)	Houston Oil Job Growth	U.S. Job Growth (000/month)
2011	82,900	94.88	25,200	173
2012	117,500	97.05	16,300	187
2013	90,000	97.98	11,400	194
2014	116,700	93.17	12,400	252
2015	-2,500	48.66	-46,700	228
2016	-2,400	43.29	-28,100	184
2017	54,200	50.80	9,200	188
2018	73,300	65.2	12,400	222
2019*	60,900	56.82	18,300	177
averages:				
2011-14	101,775	95.77	16,325	202
2015-16	-2,450	45.98	-37,400	206
2017-19*	62,800	57.61	13,300	203

*To September and extrapolated or estimated by author. Sources are Bureau of Labor Statistics, FRED St. Louis Federal Reserve, and calculations of author

Houston’s Economy Now

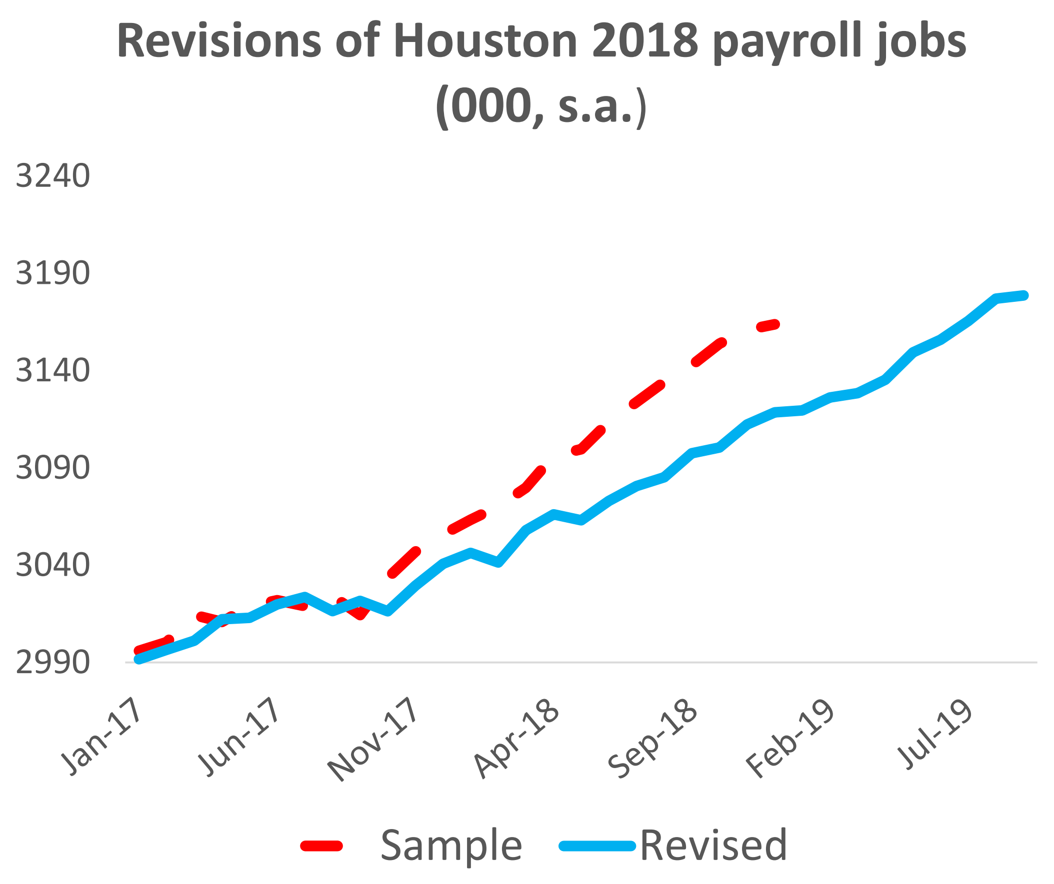
Recent Data Show Houston Accelerating As the U.S. Slows Down and Oil Prices Moderate?

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



Texas Workforce Commission adjusted by the Dallas Fed, IRF calculations

Careful with Jobs Numbers in 2019: Last Year Brought Big Revisions for 2018

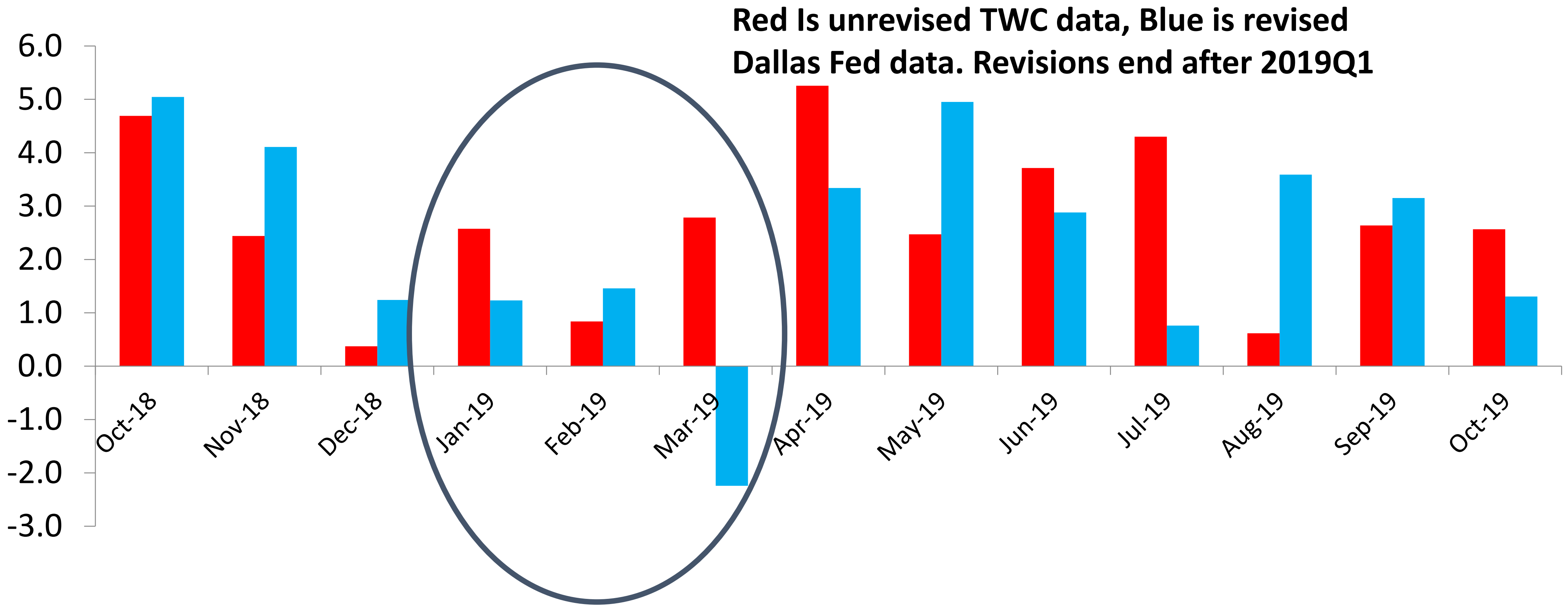


BLS, Texas Workforce Commission and calculations of IRF

- Payroll workers are those eligible for unemployment insurance
- Initial releases from the Texas Workforce Commission are based on a sample of Houston employers
- Initial annual revisions are released each March based on a count of administrative records of workers eligible for unemployment benefits
- Current estimates for December 2018 are 44,000 below preliminary estimates. Annual job growth was not 108,100 but 78,400
- This matters to the present because TWC data for the nine months of 2019 show Houston adding jobs at a rate of 85,300 if that growth continued through the rest of this year. This is far above average growth and very strong relative to current oil prices and the U.S.

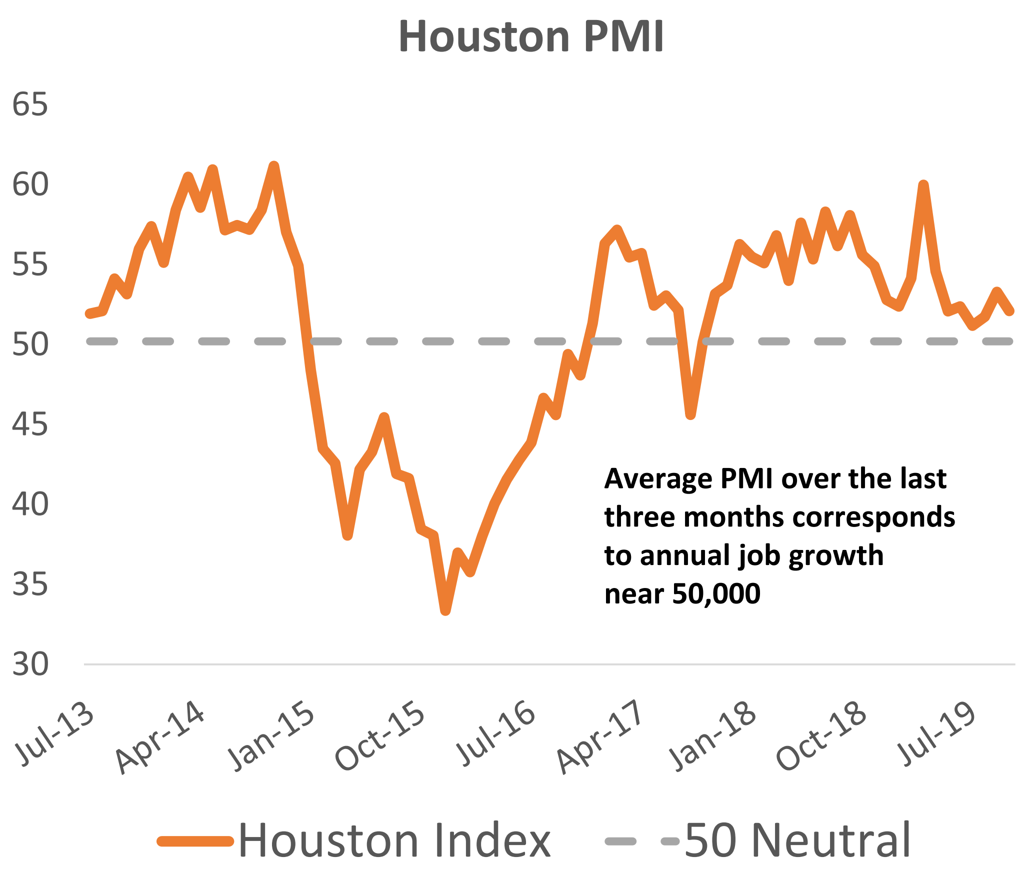
Based On Early Revisions Houston Is Growing At Annual Pace of 63,100 Jobs in 2019 - Not 85,300

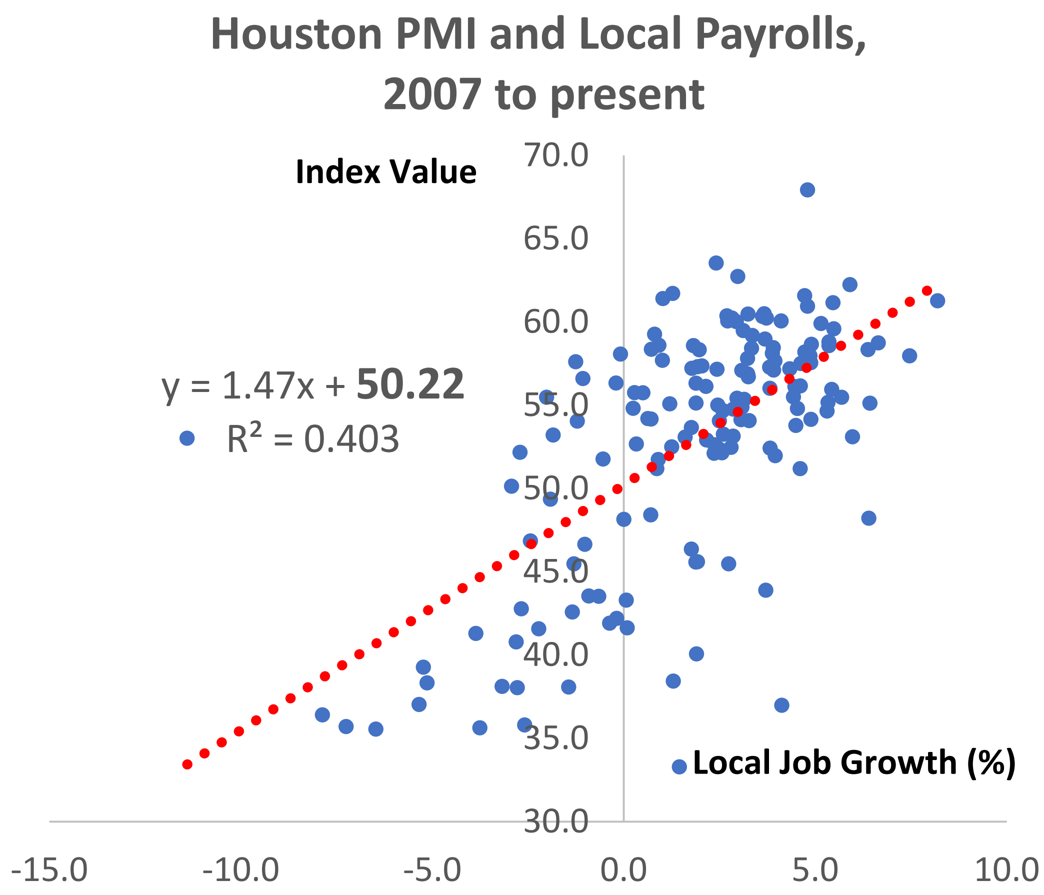
(3-month percent change at annual rates, s.a.)



Texas Workforce Commission and adjustments by the Dallas Fed, IRF calculations

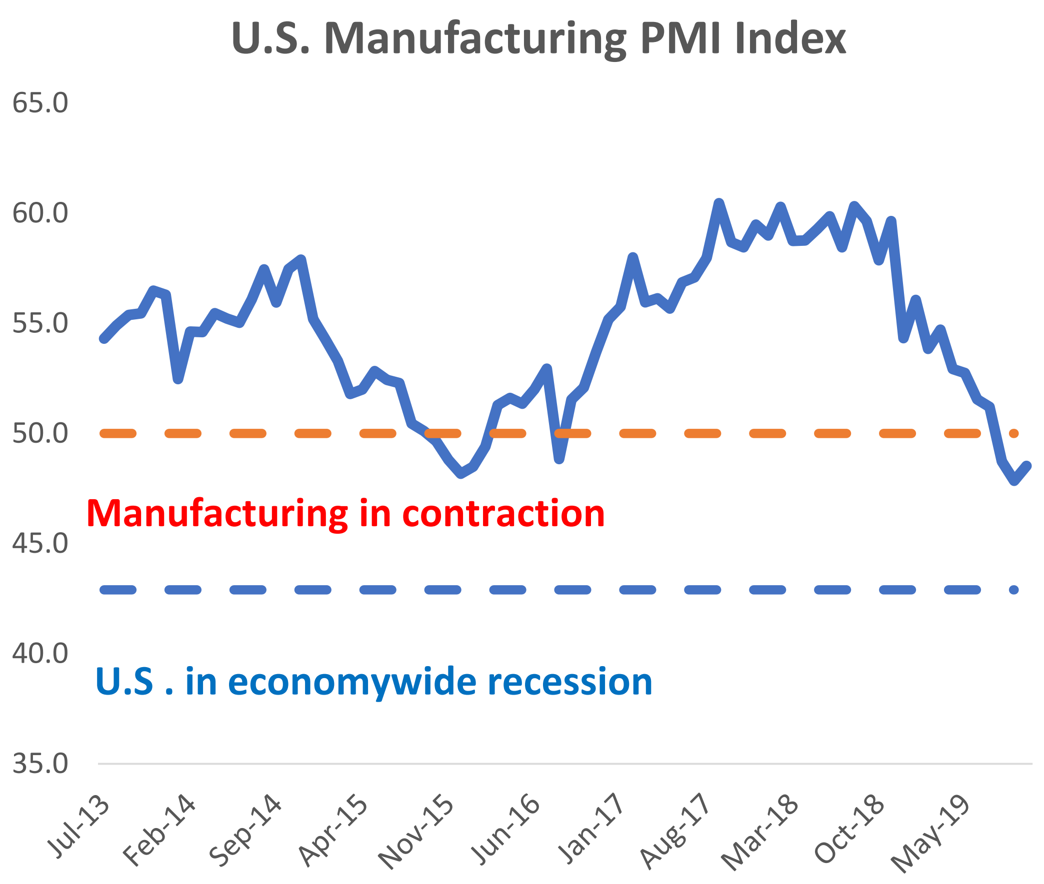
Houston PMI Also Tracks the Local Economy: Job Growth Is Positive and Healthy





U.S. PMI Has Slowed Sharply and National Manufacturing Is in Contraction -- But Not the Economy

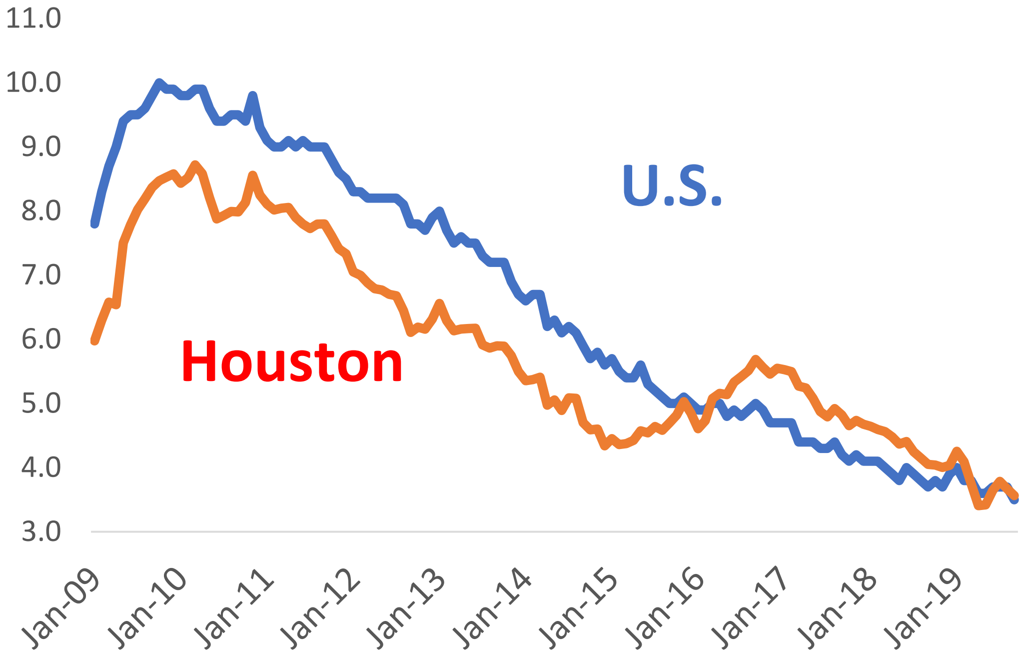
- Have often compared Houston PMI to U.S. manufacturing in the past
- Separate the indexes today because once they turn negative, they say different things
- Below 50, U.S. manufacturing is in contraction. It has been in contraction for three months with an October value of 48.5
- **But this index must be below 42.9 to indicate U.S. economy is contracting**



Houston Unemployment Rate Fell Steadily in 2018, Now Matches the U.S.

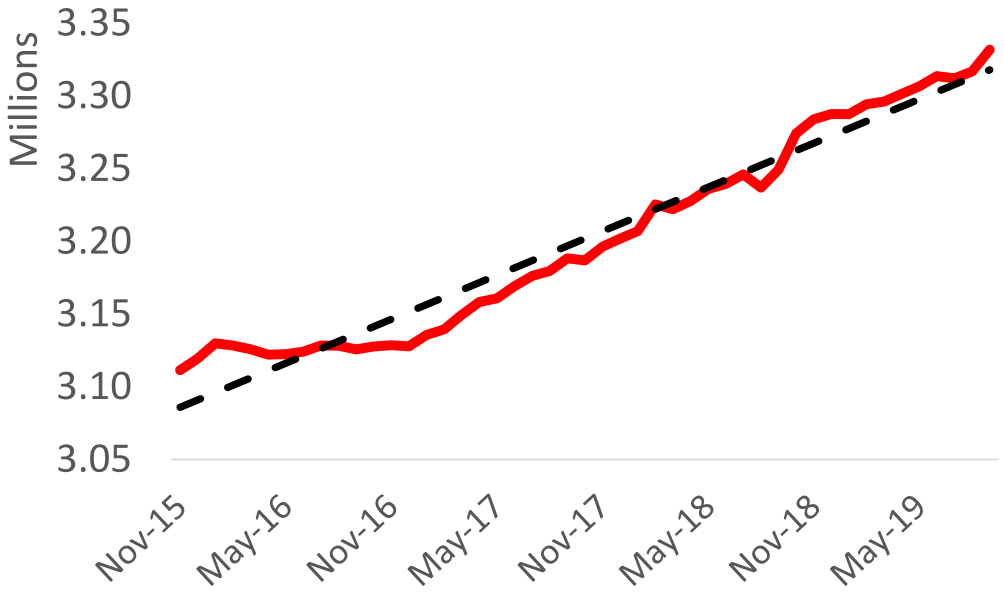
Houston unemployment rate near U.S. rate at 3.5% in September

Percent unemployed, Houston vs. U.S.



This Measure Says Houston On Pace to Add 58,900 Jobs in 2019

Total Employment, millions



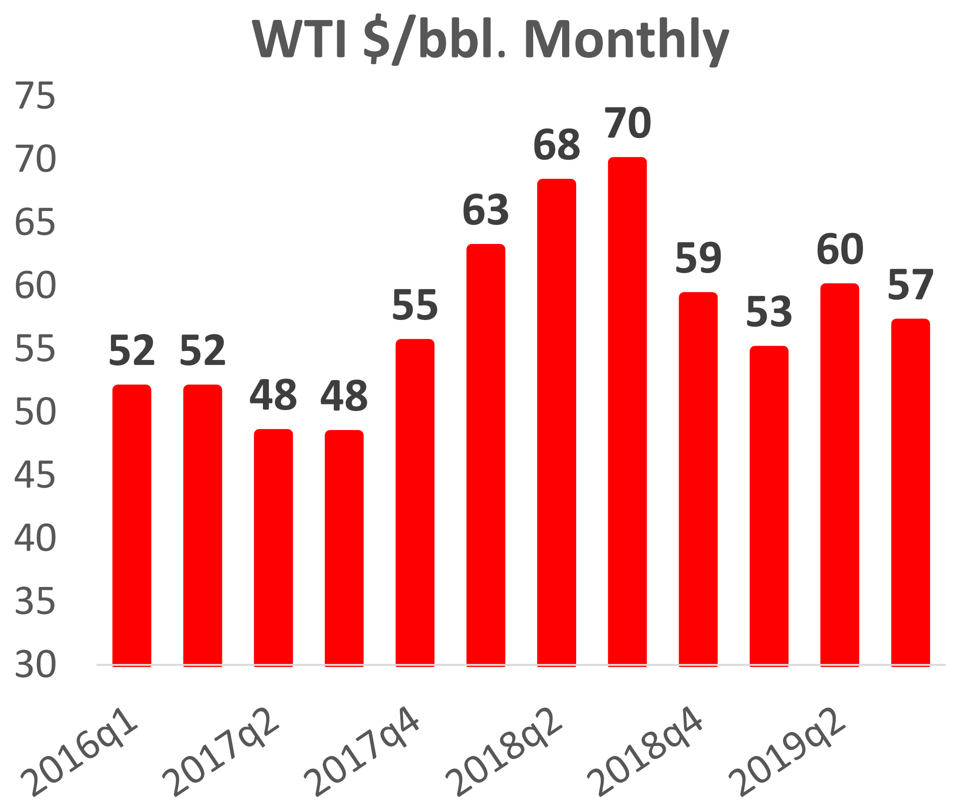
BLS and TWC

Which Number Do You Like?: Three Estimates of 2019 Job Growth in Houston

- **86,300:** TWC/BLS figures are unrevised since 2018Q3. The sample values since then point to 86,300 jobs in 2019 if things continue at the current rate
- **63,100:** Preliminary revisions made by the Dallas Fed through 2019Q1 suggest the TWC/BLS sample is too high. We should end this year with 63,100 jobs if things continue at the current pace
- **58,900:** The broader household survey is a different telephone survey that uses a different (broader) definition of employment. This unrevised sample says 58,900 jobs in 2019

Oil Still Struggles

Despite Much Talk and Many Promises OPEC Struggles to Support Oil Prices



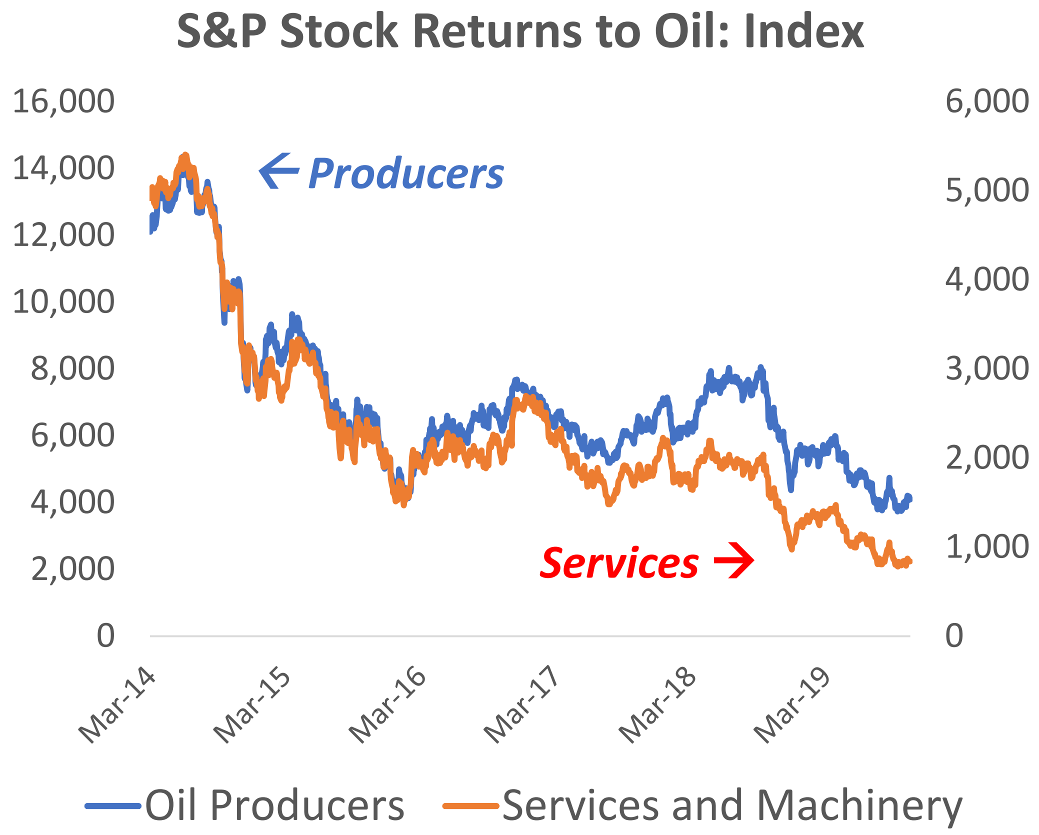
- *Nov 2014* -- OPEC withdraws as swing producer
- *Feb 2016* -- Oil falls to $30/b, rig count collapses
- *Nov 2016* -- OPEC declares victory, returns as swing producer
- *Jun 2017* -- Oil falls back to $45 per barrel
- *Nov 2017* -- OPEC comes back, prices stick with help from Russians and others
- *Oct 2018* -- Oil prices averaged $71/b
- *Dec 2018* – Oil averages $49 per barrel as Iran sells oil and OPEC compliance lags
- April 2019 – OPEC seeks a third path?

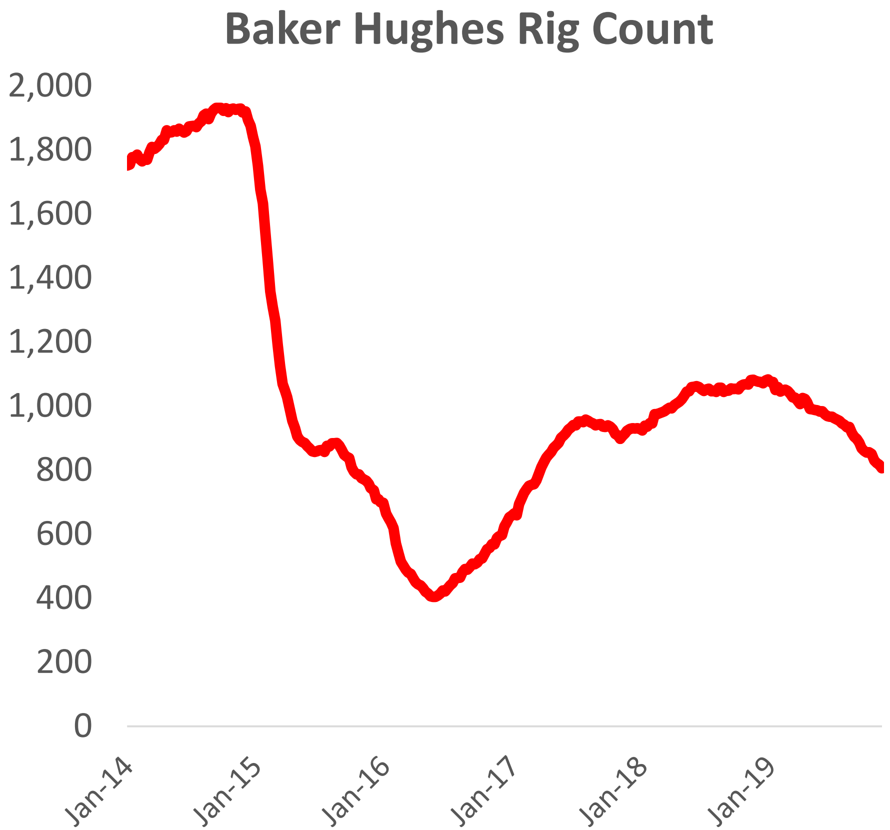
FRED, St. Louis Fed, IRF

Why $50-$60 Oil?

- If OPEC wants to slow U.S. fracking production, technical considerations say $50-$60 per barrel for WTI will work
- It is what producers were acting on in their 2019 plans for capital spending -- until the credit crunch arrived in force
- Apart from near-term political risk to oil markets, it is what the futures market for WTI is telling us
- Oil security issues keep near-term oil prices volatile – Iran waivers off and on, attacks on oilfields and tankers, Venezuelan collapse, and Libyan rebels

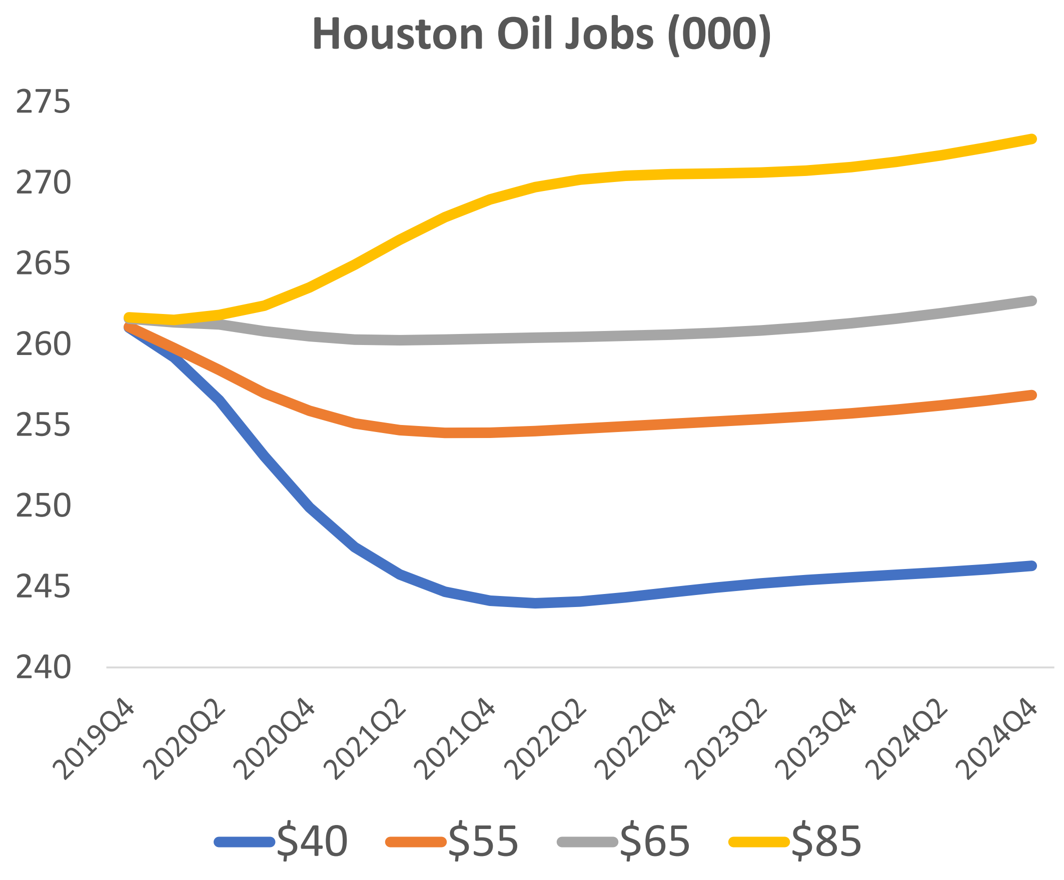
Lower Oil Prices and Efficiencies Pressure Profits, Lead to Lower Stock Prices, and Less Capital Spending

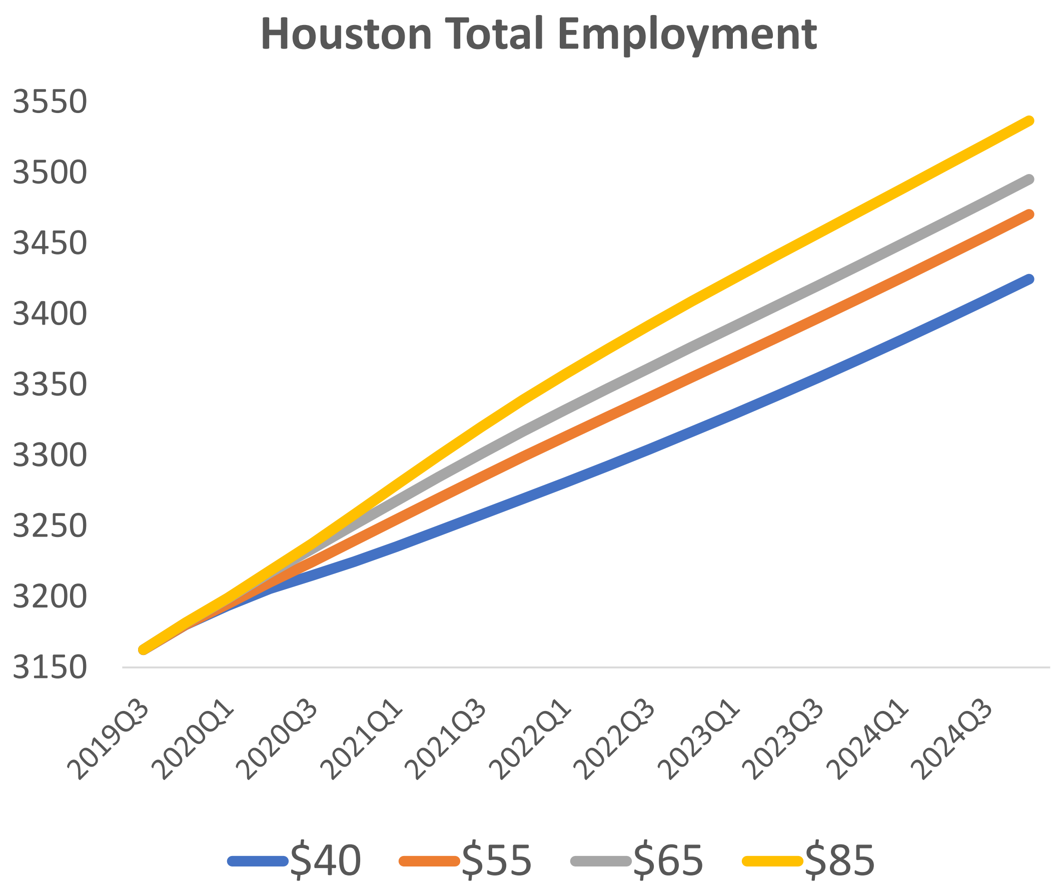




Baker Hughes, S&P Dow Jones to Nov 11, 2019

By the End of 2022 Expected Losses of Oil Jobs and Payrolls Are Limited In Overall Impact on Economy





Institute for Regional Forecasting, University of Houston

A Credit Squeeze Grips Fracking

New Paradigm?: High Cost Oil at Low risk

- Fracking looks more like a competitive industry than oil did in the past. Many small operators, price-takers, and assembly-line production
- Low barriers to entry for new producers, i.e., capital, some geology, leases, and a hire a service company. Today a hedge fund, tomorrow a producer
- Traditional exploration risk is gone, production costs understood, and the oil is there
- Get a quick and certain rise or fall in oil production in response to changing oil price incentives

Industry Born in an Era of Cheap Money

- Producers have struggled to deliver steady income and growth to impress the stock market with real equity gains
- The top 40 now have combined enterprise value of $356 billion and face maturing debt of $71 billion in the next seven years according to Rystad Energy
- Bankruptcies are not an epidemic, but will affect companies around the fringe with closure or more M&A activity
- There is, however, a serious industrywide capital squeeze, and capital rationing will be the watchword for many large producers and their service companies

Oil Bankruptcies Tick Up in 2019: But Not an Epidemic

	Oil Producers		Oil Services	
	Number	**Debt ($ bil)**	**Number**	**Debt ($ bil)**
2015	44	17.38	39	5.31
2016	70	56.80	72	13.49
2017	24	8.54	52	34.74
2018	28	13.15	12	3.89
2019*	33	12.99	15	7.82

* Through September

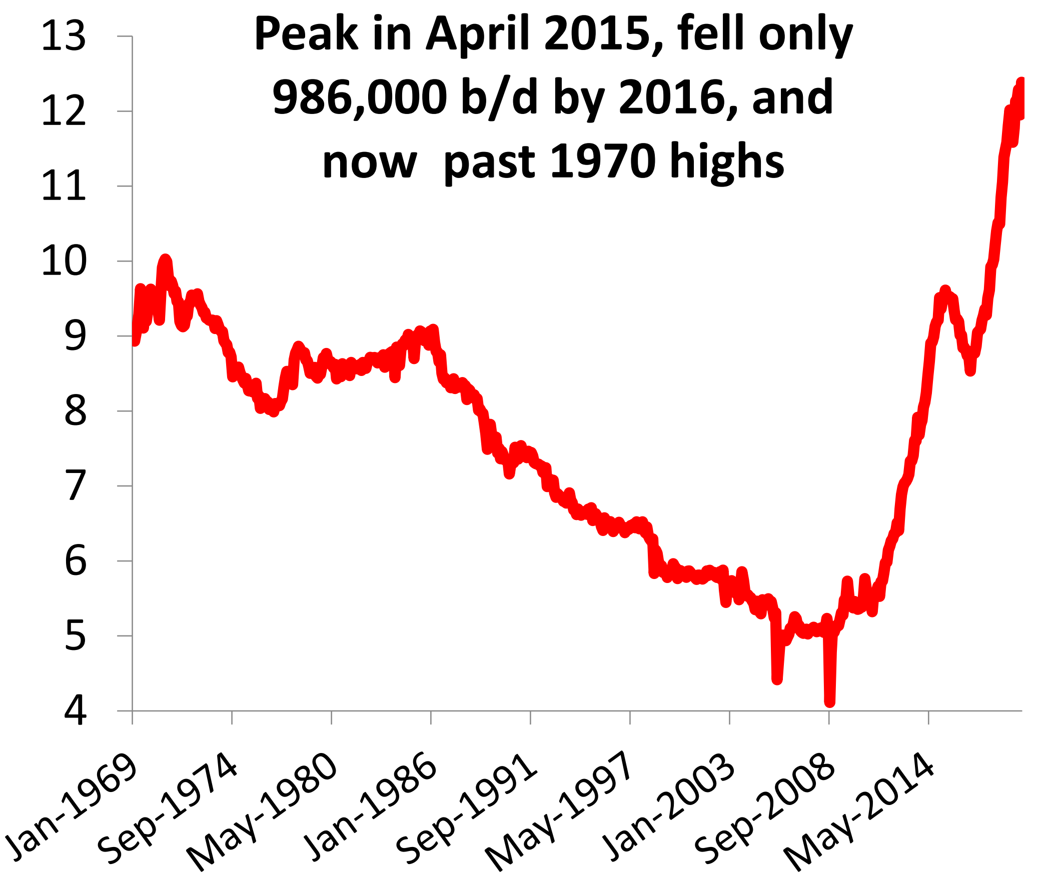
Billion $ Bankruptcies 2019

Producers:	**Debt ($ bil)**
Legacy Reserve	2.62
Sanchez Energy	2.28
Halcon Resources	1.66
Sheridan Holdings	1.11
Jones Energy	1.06
Services:	
Weatherford	7.43

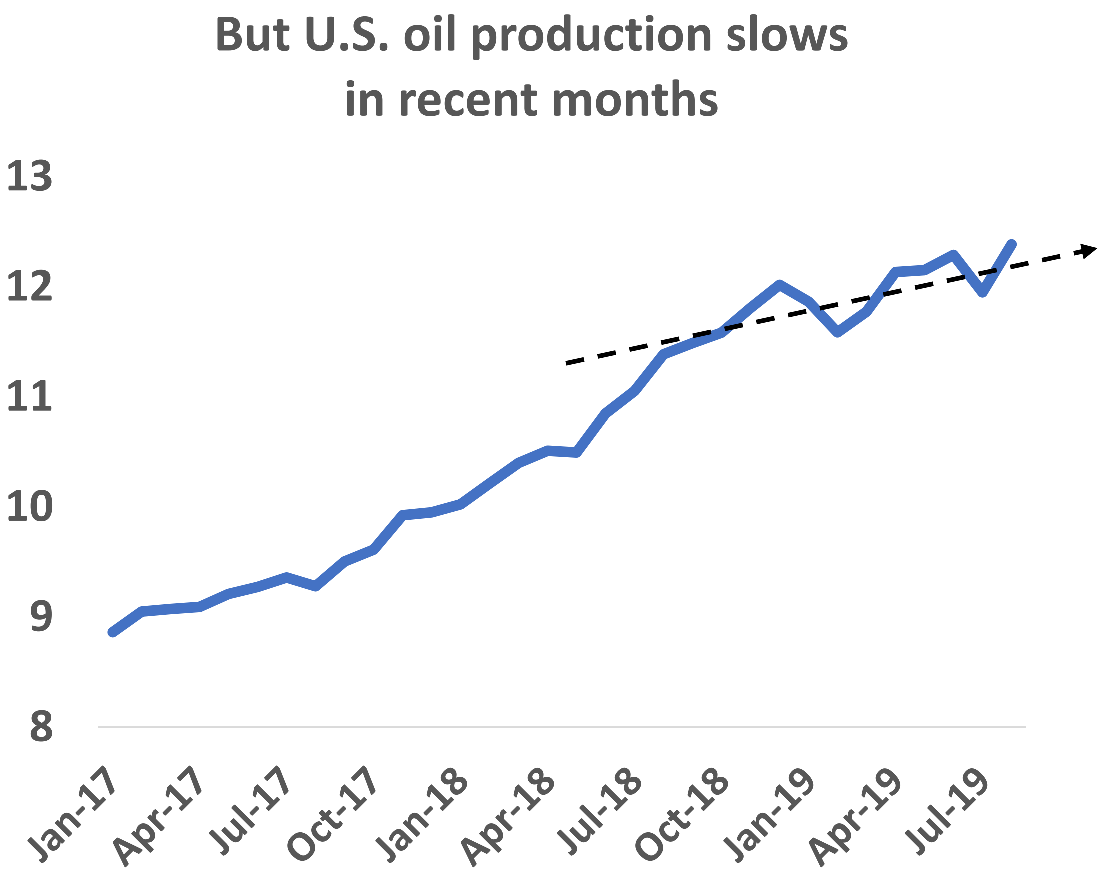
Haynes and Boone, *Oil Patch Bankruptcy Monitor, September 30 update*

Lower Oil Prices and Credit Squeeze Are Taking a Toll On U.S. Oil Production

(million barrels/day, s.a.)



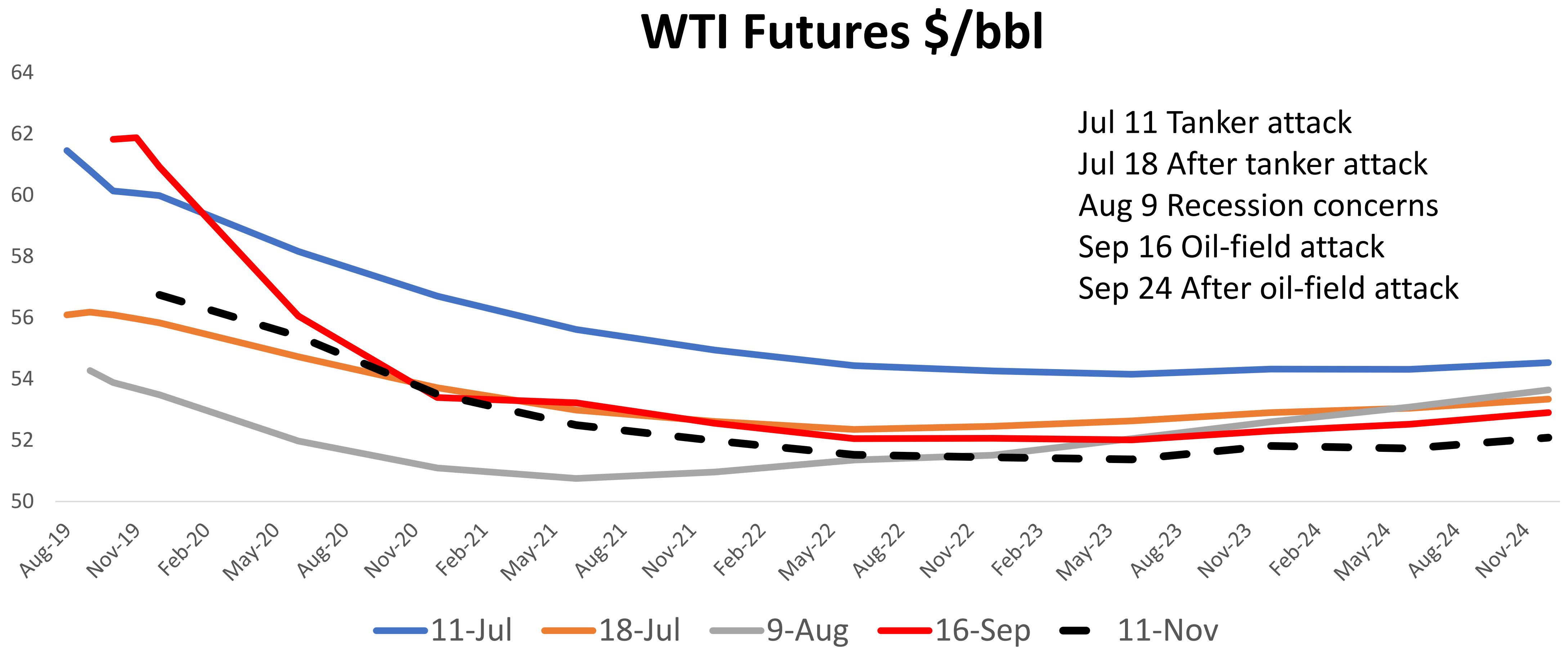
DOE/EIA, Seasonally adjusted by IRF



Short-term Political Events and Supply Disruptions Always Play a Role in Oil Markets

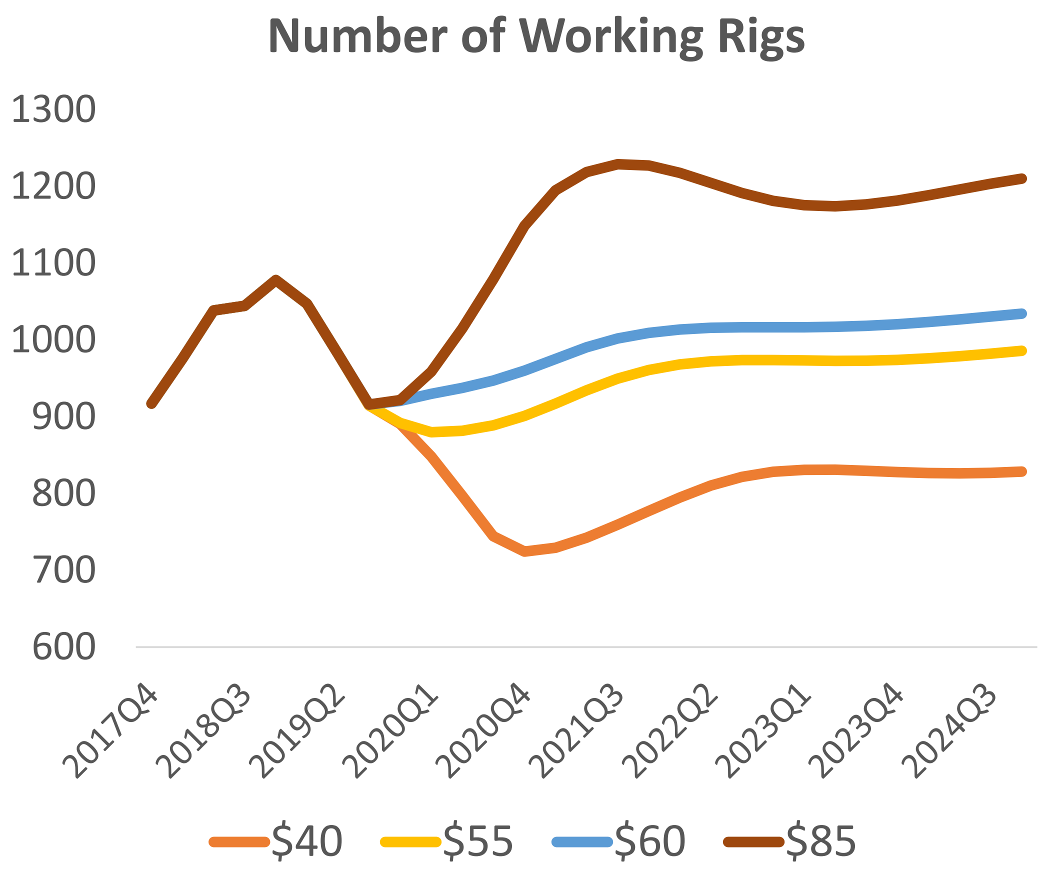
- *Global oil politics could create a perfect storm that could outstrip OPEC spare capacity of 2.8 million barrels per day*
  - Iran sanctions and waivers revoked for five countries to "drive Iranian exports to zero." This would remove 1.2 million barrels of production. Now Iran threatens shipping through the Strait of Hormuz, tanker attacks, and drone attacks
  - A Venezuelan economic collapse could remove 1.2 million barrels per day
  - A rebel takeover of Libya could remove 1.0 to 1.2 million from Africa's largest producer.
- *There is downside risk as well*
  - A U.S./Global economic slowdown or recession would cut consumption and price
  - Can Russia and the Saudis restrain American oil production?
    - Russia and the Saudis now joined by the U.S. in an unstable coalition of as the world's three largest oil producers
    - How long do these two lose market share to support American production?

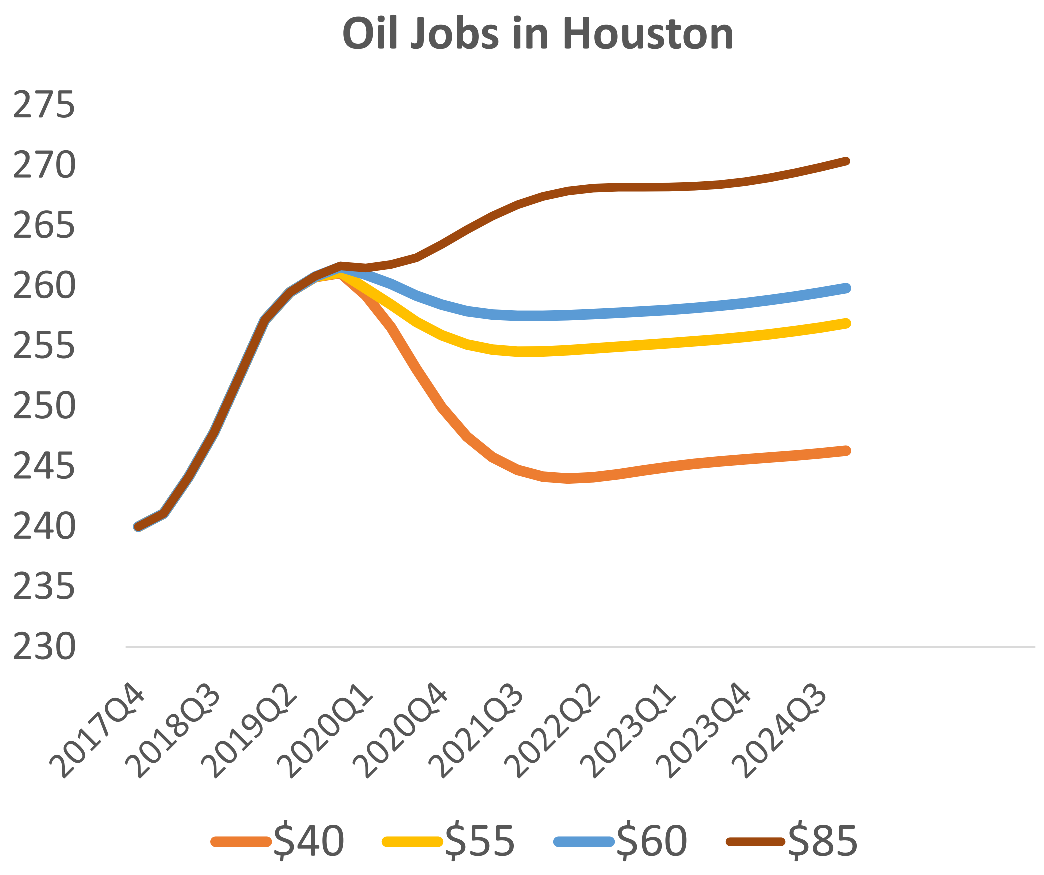
Political Economic Risk Keeps Near-Term Oil Price Futures Volatile, Then Longer-Term Near $55-$60



COMEX oil futures prices, broken line as of Nov 11

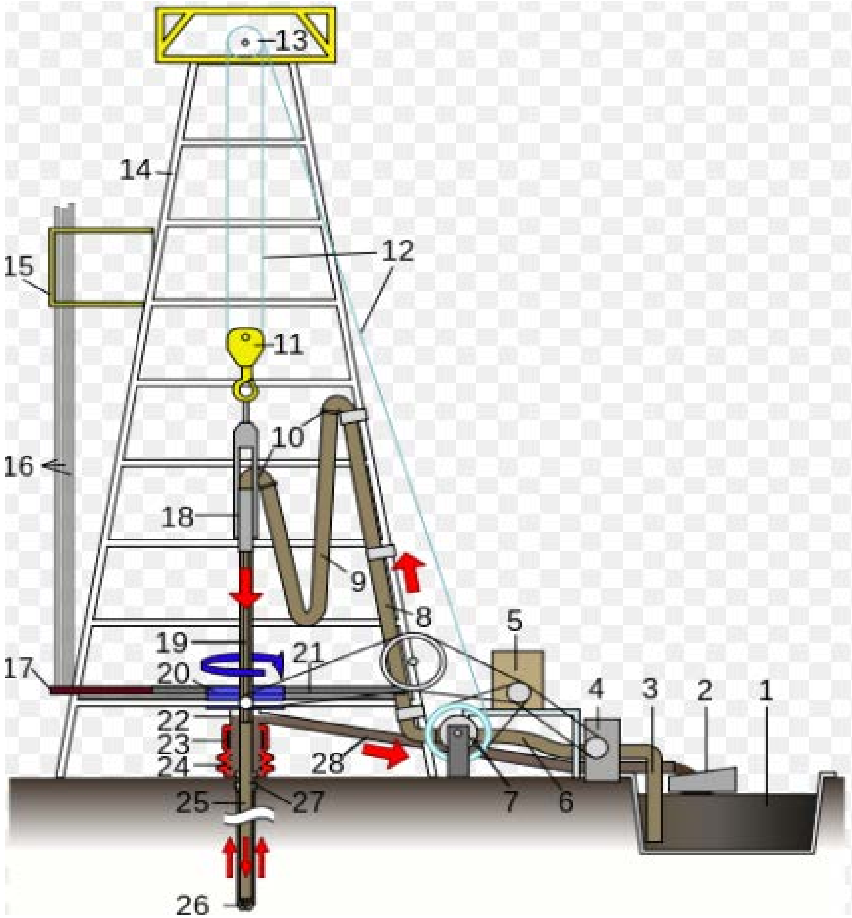
Three Rig Count and Oil Jobs Scenarios: Medium Based On Oil at $55-$60, High at $85, and Low at $40





Three Scenarios for Drilling's Future

- **Oil price and rig count:**
  - *High Scenario*: It takes a supply disruption to move oil price over $85 and keep it there for several months
  - *Medium Scenario*: Oil price stays near $55-$60 in the rest of 2020 and going forward
  - *Low Scenario: OPEC withdraws as swing producer again – with oil price near $40, or perhaps a major recession*
- **New estimates of rig count by 2023:**
  - *High Scenario*: 1218
  - *Medium Scenario*: 997
  - *Low Scenario*: 828
- **Return of Drilling Jobs in Houston by 2023**
  - *High* brings 11,500 oil jobs back by 2023
  - *Medium* forecast for 2023 brings back only 2,300 oil-related jobs from current levels
  - *Low* in 2023 would mean the loss of 14,000 jobs as oil prices fall again.



The Global Picture Turns Ugly

Impact of Tariff War on U.S. and China GDP

- The direct impact of *currently implemented tariffs* on GDP is limited. Federal Reserve says long-term annual percent fall in GDP is -0.19% in the U.S. and -0.25% in China. The IMF says -0.29% and -.39%.
- Why are these figures small? A small part of the economy is affected: Imports are only 12% of U.S. GDP and 19% of Chinese. Even if all pending tariffs implemented, 16% of U.S. imports will be affected and 20% of Chinese.
- However, pending increase tariffs by the U.S. would increase the *direct impact* substantially. The Fed estimates become -0.31% for the U.S. and -0.39% in China, and IMF figures are -0.47% and -0.55%
- Concerns about *indirect tariff impacts* through temporary disruptions run the impacts up quickly: investments reduced by trade uncertainty, supply chain disruptions, slowed innovation, and increased financial risk. Combine all this with direct tariff impacts and IMF estimates U.S. GDP annual losses rise to -0.66% and Chinese to -1.97%
- If U.S. long-run growth should be 2.0% and China 6.0%, *direct and indirect effects* mean both countries lose one-third of long-run growth to the trade war

Ferraro and Leeput, Federal Reserve Board, https://www.federalreserve.gov/econres/notes/feds-notes/;
IMF, *World Economic Outlook*, October 2019

Phase One U.S./China Tariff Agreement: A Truce, Not a Treaty

- U.S. suspends a pending October 15 increase on existing tariffs on Chinese goods from 25 to 30 percent based on early progress
- Still unclear if the U.S. will suspend or cancel $160 billion in new tariffs scheduled for December 15. These tariffs will apply to consumer goods produced in China
- China will buy $40-$50 billion in U.S. crops and aircraft
- Some progress has been made on Chinese financial regulation, removing restrictions on the scope of business and ownership of banks, security companies, funds, etc.
- Intellectual property transfer cannot be forced by "administrative tools." Described as a low-level beginning by White House – a 2 on a scale of one to ten
- No/limited progress indicated in key areas:
  - Scaling back prior tariffs Limited at best in this agreement
  - Unclear or undetermined enforcement mechanisms
  - Treatment of listed Chinese companies like Huawei
- Still no written agreement, unclear where or when it will be signed

Press accounts

Export-Oriented Jobs Under Chinese Tariff Retaliation By Metro Area

Rank	Metro Area	Number of Jobs
1	Los Angeles, CA	7,734
2	Chicago, IL-IN-WI	6,542
3	Dallas, TX	4,983
4	Houston, TX	4,754
5	New York, NY-NJ-PA	4,475
6	Minneapolis, MN-WI	3,772
7	San Jose, CA	3,602
8	Portland, OR-WA	3,495
9	Detroit, MI	3,136
10	Boston, MA-NH	2,952
11	Atlanta, GA	2,744
12	Philadelphia, PA-NJ-DE	2,622
13	Seattle, WA	2,548
14	Fresno, CA	2,415
15	San Diego, CA	2,368

Rank	Metro Area	Share of Jobs
1	Fresno, CA	13.5%
2	Stockton, CA	12.2%
3	Virginia Beach, VA-NC	7.6%
4	Birmingham, AL	7.8%
5	Oxnard, CA	8.7%
6	Nashville, TN	6.6%
7	Toledo, OH	7.2%
8	Kansas City, MO-KS	6.1%
9	Boise City, ID	7.6%
10	Augusta, GA-SC	7.4%
	…	…
70	Hartford, CT	3.8%
71	Phoenix, AZ	3.4%
72	Houston, TX	3.9%
73	Salt Lake City, UT	3.5%

Brookings Institution, October 2018. Does not include May 2019 imposition of $180 billion in tariffs and the retaliation by China in response.

World Growth Stumbles in 2019 with Recovery in 2020?
IMF Says Recovery Requires No Major Policy Errors

Percent GDP Growth, Year-Over-Year

	2017	2018	2019	2020
World	3.8	3.6	3.0	3.4
Advanced Economies	2.4	2.3	1.7	1.7
U.S.	2.2	2.9	2.4	2.1
Euro Area	2.4	1.9	1.2	1.4
Germany	2.5	1.5	0.5	1.2
France	2.2	1.7	1.2	1.3
Italy	1.7	0.9	0.0	0.5
Japan	1.9	0.8	0.9	0.5
Emerging/Developing	4.8	4.5	3.9	4.6
Brazil	1.1	1.1	2.1	2.5
Russia	1.6	2.3	1.1	1.9
India	7.2	6.8	6.1	7.0
China	6.8	6.6	6.1	5.8

IMF, *World Economic Outlook*, October 2019

Global Economy at a Crossroads?

- *Immediate Problems*
  - Tariff and trade tensions between the U.S. and China
  - Europe faces serious economic and political problems
    - German auto slowdown spreads through EU, German GDP to fall in third quarter?
    - Italy tips into recession in 2018. Budget crisis/sovereign debt spreads widen
    - BREXIT postponed again. Elections, more uncertainty … And the British economy limps along with GDP record below one percent so far this year
- *Bigger Issues*
  - Over-leverage in the Chinese financial system. Rein it in? Or stimulate the economy to offset the economic bite from tariffs?
  - European banking system was never cleaned up after 2008 crisis. Italian debt puts Europe's financial system at risk?
  - A broad slowdown in Asian demand slowly spreads beyond tariffs

IMF Expresses Serious Concerns in Its October *World Economic Outlook*

- *IMF's Recent World Economic Outlook Expressed Its Concerns in Some Shrill Language*
  - The world economy is at a delicate juncture
  - Global growth in 2019 remains stable, but weak
  - The projected growth pickup in 2020 is precarious
  - Risks are mainly to the downside
  - Accommodative monetary policy is appropriate in advanced economies
- *Making It Through the Slowdown*
  - Progress needed on tariff and trade talks
  - Fed/EU/other central banks have signaled accommodation and continued rate cuts
- *Is the Federal Reserve concerned about the U.S. economy? Or more about Europe and Asia?*

The U.S. Is Slowing But Not Struggling

Growth Is Still Healthy, But A Slower U.S. Economy Brings Mixed Data

- ***Good News***
  - *Growth has slowed* but remains solid: GDP grew 3.1% in the first quarter, 2.0% in Q2, and 1.9% in Q3. It is forecast to grow 2.0% in Q4.
  - *The U.S. unemployment rate was at 3.6% in October*, with 2019 seeing the lowest rates since the 1960's. Wages, salaries and benefits are up 3.0% year-over-year and rising across all levels of income.
  - In 2018, the U.S. added 223,000 new payroll jobs per month. *The average monthly increase so far in 2019 has been 167,00 jobs*. A slower rate, but it comes in the face of a very tight labor market
  - *Retail sales have been strong in 2019, up at a 4.8% annual rate after adjusting for inflation*. University of Michigan consumer sentiment index is high and shows consumers focused on jobs and income. Spending has slowed in the second half of this year.
  - In 2018, single-family construction weakened along with rising interest rates in 2018, *but in 2019 lower rates have seen new home sales rise 7.2% with rapidly falling new home inventories*
- ***Not So Good News***
  - *Manufacturing* has persistently weakened over the last year according to several measures, with some *measures showing declines*
  - *Domestic investment remains weak*, with uncertainty revolving around tariffs, trade, and a slowing global economy

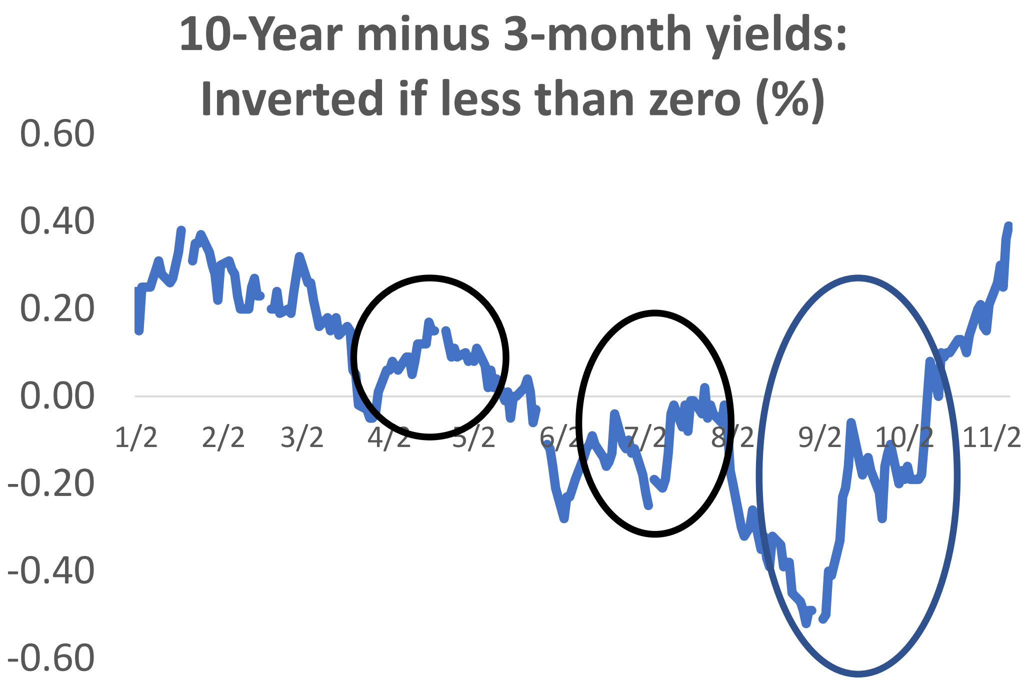
Survey of Professional Forecasters: Probability of a Year-Over-Year Fall in GDP

Probability of a Fall in GDP Is Still Low

GDP Growth Change		2019	2020	2021	2022
< 0	recession	1	6	12	10
0 to 1.9	weaker	19	55	53	51
2.0-2.9	moderate	77	31	26	29
>3.0	stronger	4	7	9	11

Philadelphia Federal Reserve Bank, *Survey of Professional Forecasters, Fourth* Quarter. There were 31 respondents.

Three Recent Inversions of the Yield Curve Signal Recession in 12-18 Months?



FRED, St Louis Fed

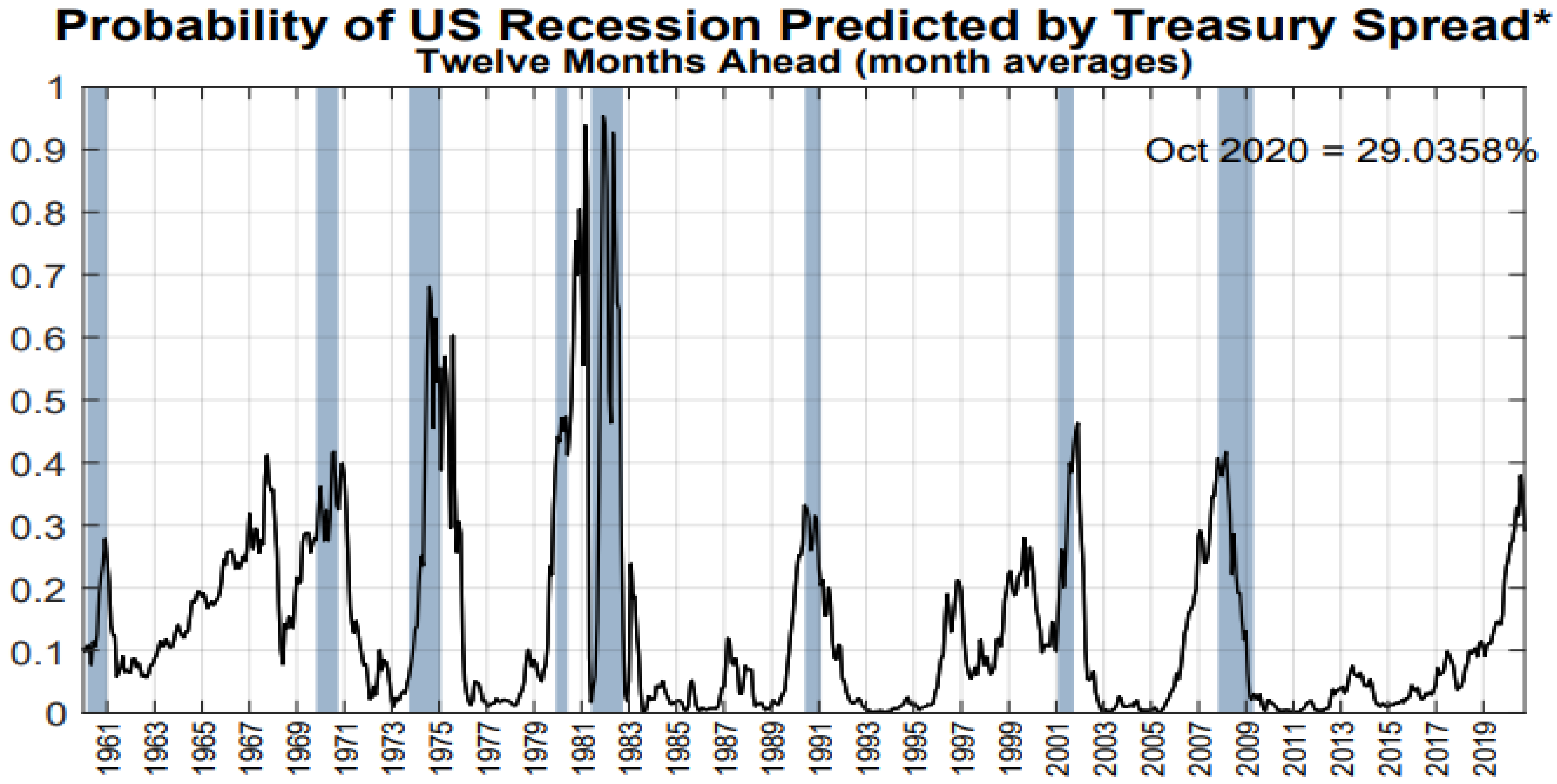
Why does the 3-month Treasury rise above the 10-year?

- The three-month rate is higher than the 10-year: The Fed raising rates is the chief factor here
- The 10-year falls: inflation expectations recently declined, economic growth cooled off, or a flight to safety due to tariff or global economic concerns
- Past inversions that signal recession have been large and lasted weeks or months

Does it matter?

- An artificial rate environment makes the whole exercise problematic right now. The Fed has spent the last decade making the yield curve as flat a possible
- Recent rate cuts by the Fed have righted put the curve back where it belongs

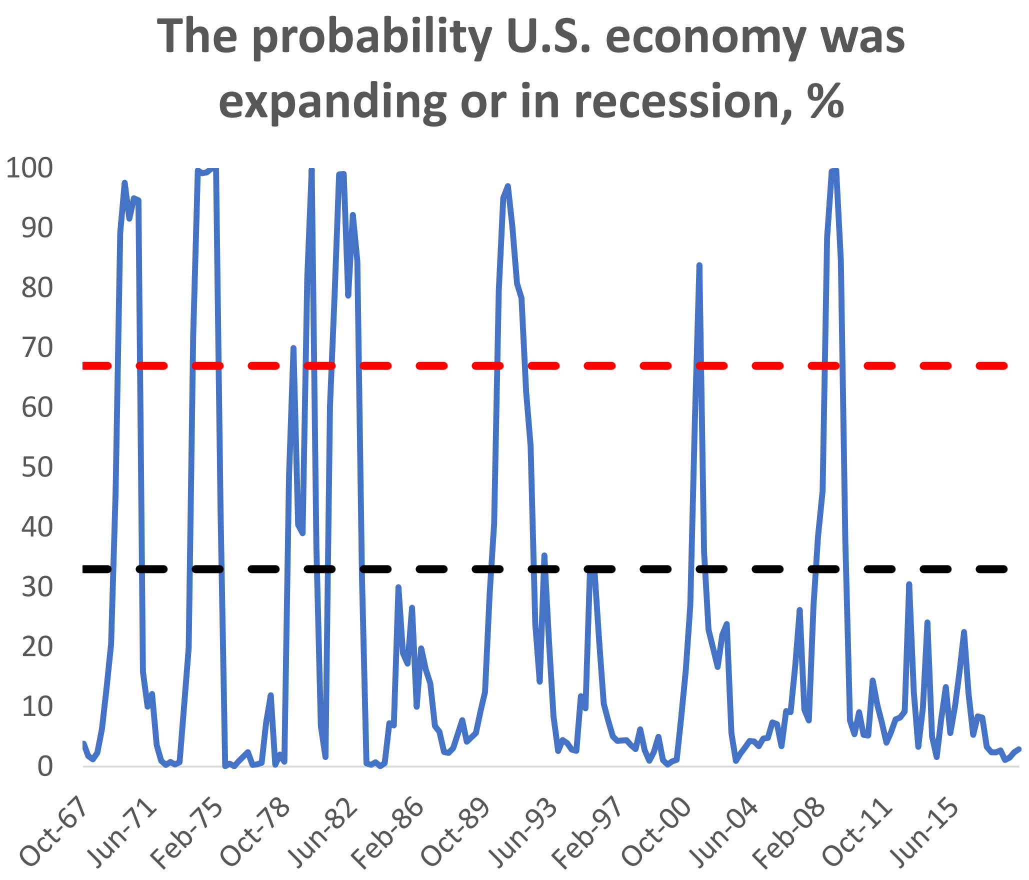
New York Fed: If the Yield Curve Matters, Then a 29% Chance of Recession Ahead



*Parameters estimated using data from January 1959 to December 2009, recession probabilities predicted using data through Oct 2019.
The parameter estimates are α=-0.5333, β=-0.6330.

Updated 04-Nov-2019

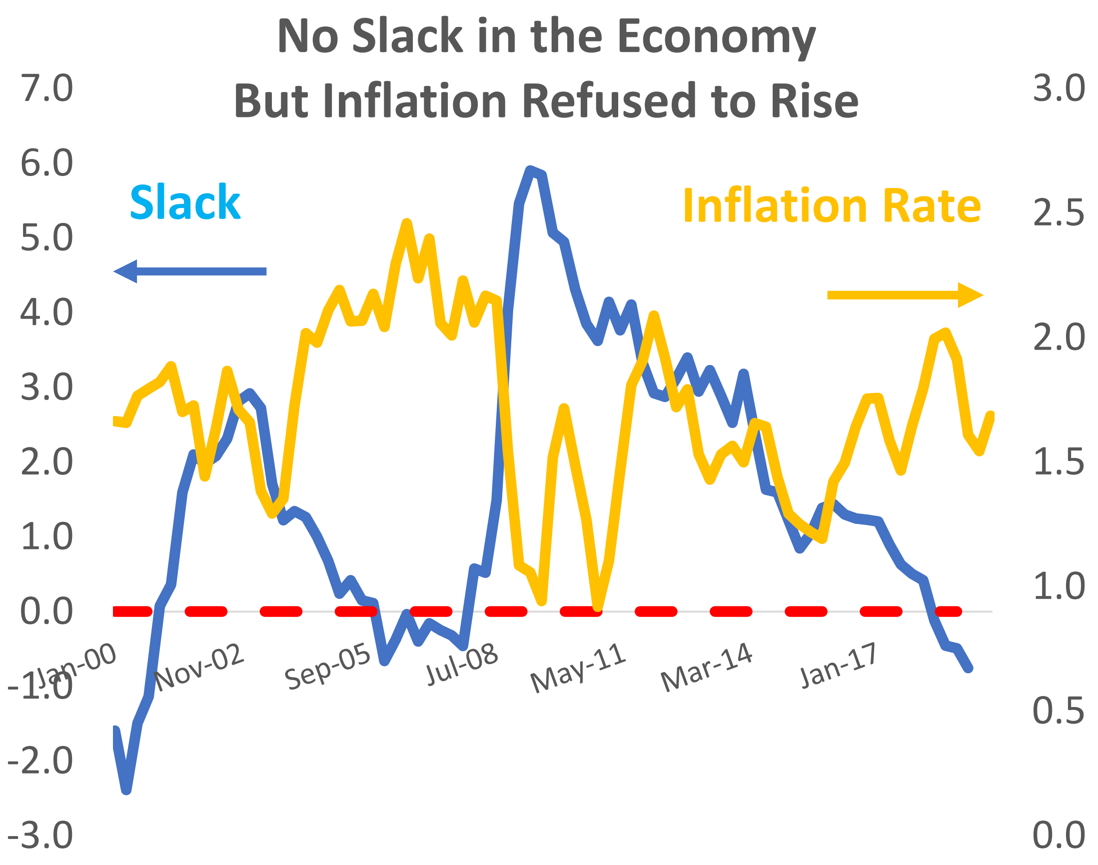
With The Right Trigger We Could Be In Recession In a Couple of Quarters … But What Trigger?

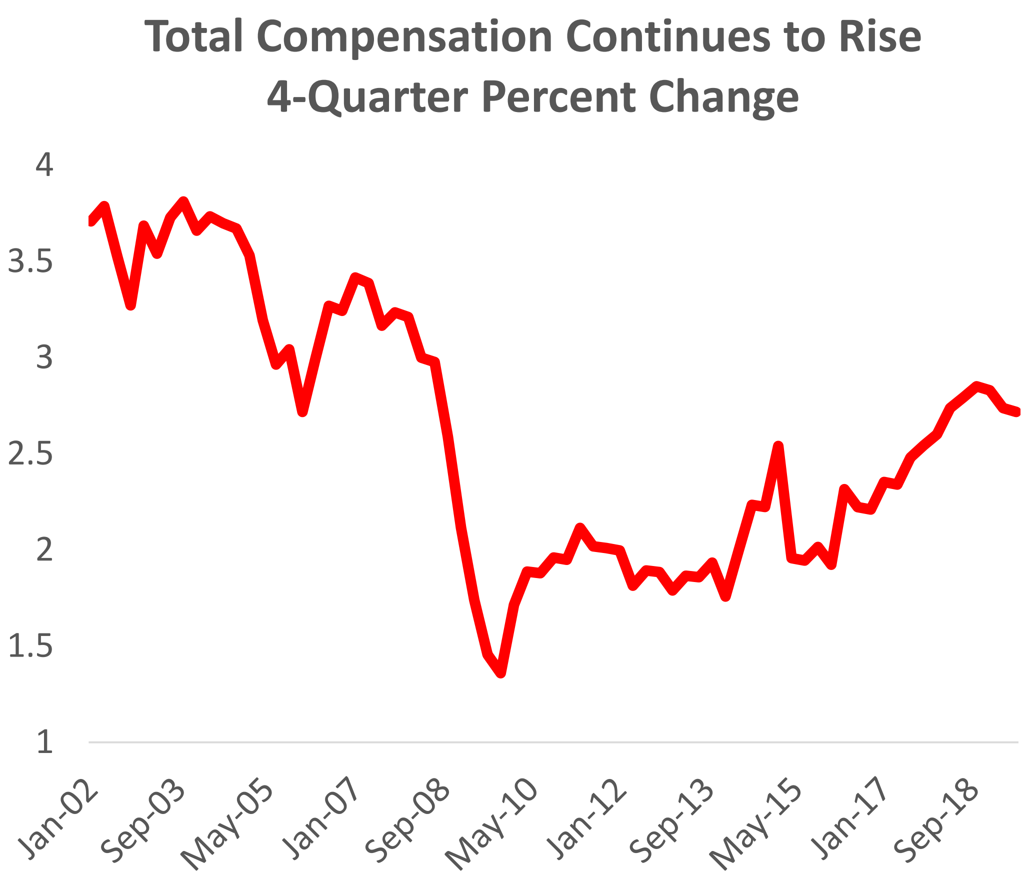


- An index value greater than 67% would indicate the U.S. economy is in recession
- Below 33% it is almost certainly expanding. Recent data says it was expanding with no trend toward recession in 2018
- The transition from expansion to recession has come quickly in past recessions. Usually it takes only two to four quarters to move from strong expansion to recession. But there needs to be a trigger to set things quickly in motion

James Hamilton, *GDP-Based Recession Indicator Index*, retrieved from FRED, St. Louis Fed

Inflation Remains Tame and Below Fed Target Despite Tight Labor Markets





Congressional Budget Office, Bureau of Economic Analysis

Fed Funds Futures Say
One More Rate Cut Probably Coming

Only rate cuts now on the horizon

Meeting Date	Range b.p.	Prob. of Decrease	Change
30 Oct	175-200	100.0%	(-)
11 Dec	150-175	3.0%	--
29 Jan	150-175	17.3%	--
18 Mar	150-175	23.2%	--
30 Apr	150-175	30.7%	--
10 Jun	150-175	50.5%	(-)
29 Jul	125-150	2.4%	--
18 Sep	125.5	28.0%	

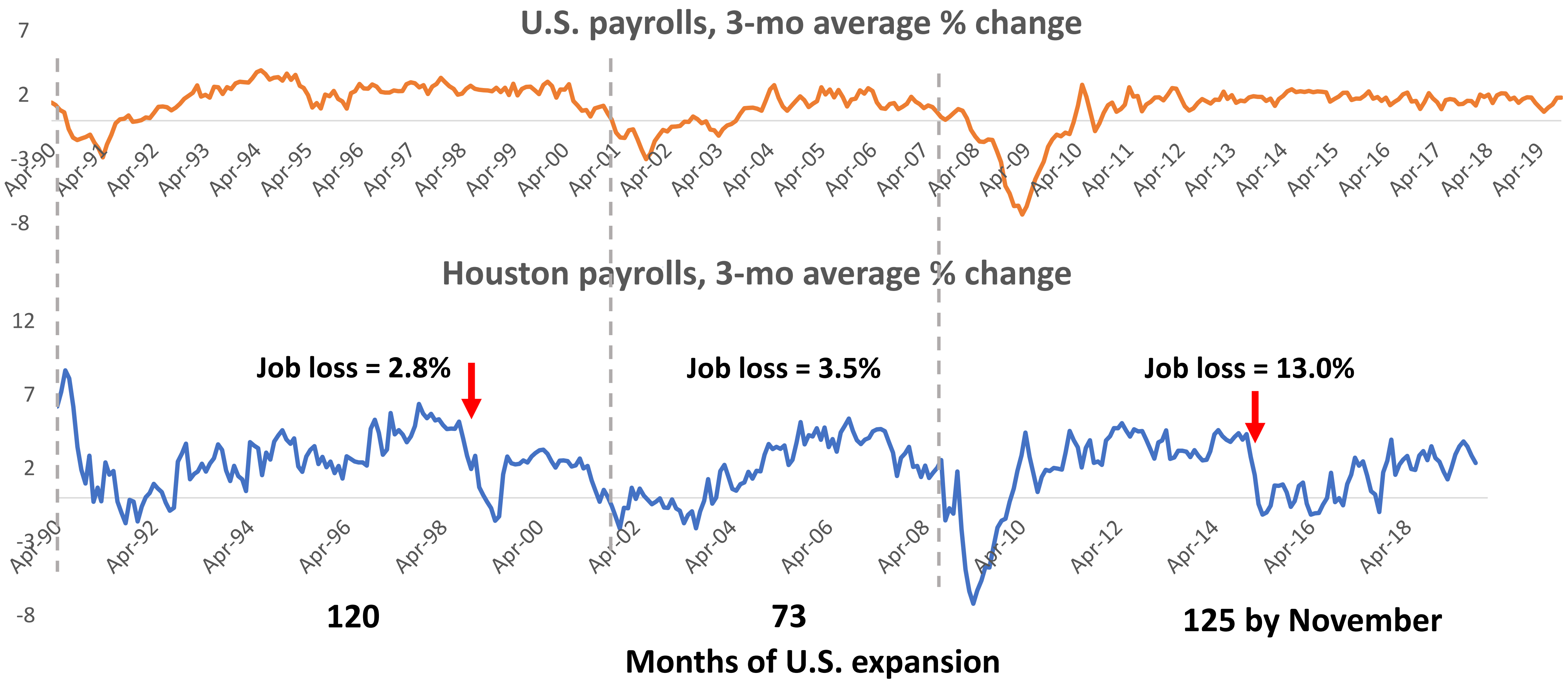
Fed policy on track to cut rates further?

- At its July, September, and October meetings, the Fed expressed concern about tariffs, the slowing U.S. economy, and problems in Europe and China. It cut the fed funds rate each time by 25 basis points as "insurance"
- If the probability of a rate cut must be greater than 50% to see a cut, then one more rate cut is projected for June 2020
- *Why the cuts? The U.S. economy is weaker but not faltering. Perhaps global economic concerns play the bigger role here?*

-

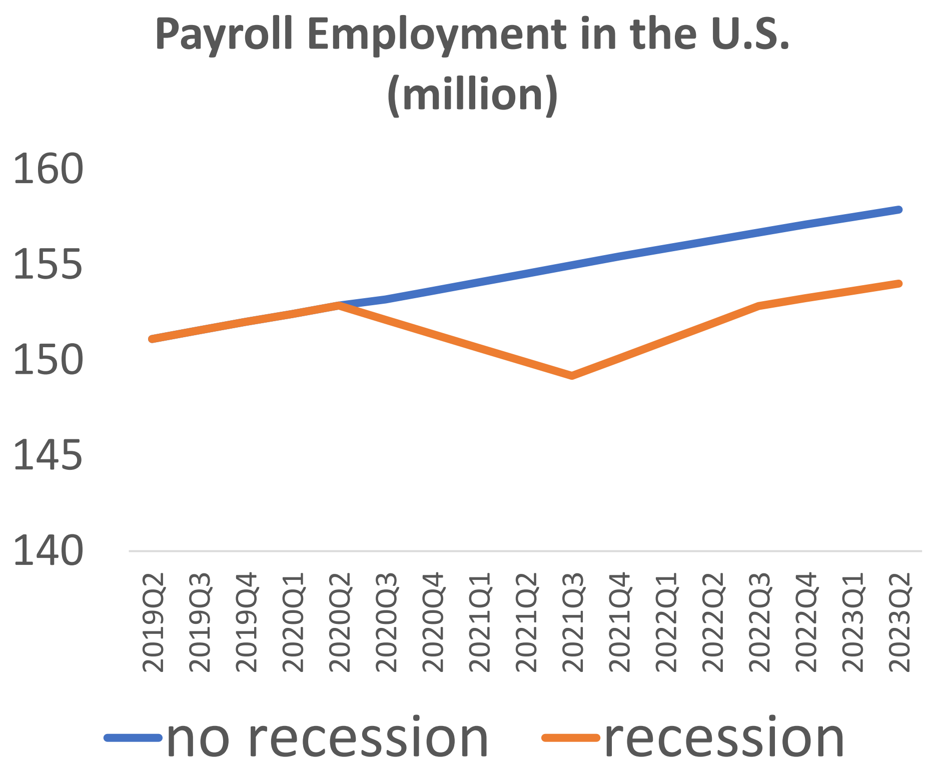
Source: Fed Funds futures, CME Group, 11/11/2019. Table assumes as soon as probability of a rate change passes 50% a 25-basis point increase or decrease is triggered.

U.S. and Houston Share Three Recessions Since 1990, Houston Has Flirted with Two Others



What Happens When the U.S. Has A Recession? A Hypothetical Example

	U.S. Payrolls
Peak	2020Q2
Quarters of Decline	5
Percent Decline	2.40%
Jobs Lost	3.7 million
Trough	2021Q3
Quarters to Recover	4
Return to Prior Peak	2022Q3



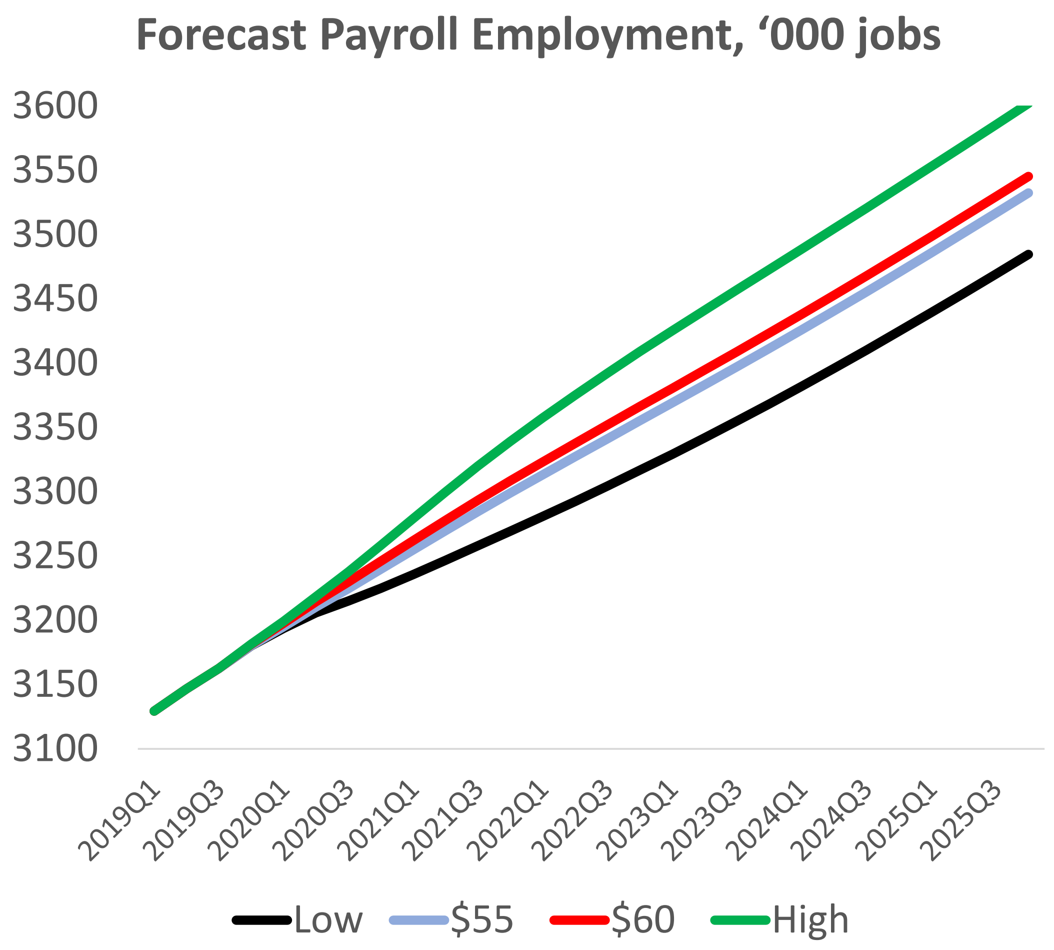
U.S. Growth Slows As Moderate Recovery Continues: Professional Forecasters 2019Q3 Update

	Real GDP (%)	Unemployment Rate (%)	Payroll Jobs ('000/mo)
Quarterly Data:			
2019Q2	1.9	3.7	190.5
2019Q3	2.1	3.6	164.7
2019Q4	2.2	3.6	154.9
2020Q1	2.0	3.6	133.3
2020Q2	1.7	3.6	154.2
Annual Average:			
2019	2.4	3.7	200.1
2020	2.0	3.6	142.3
2019	1.8	3.7	151.3*
2023	2.1	3.9	153.1*

Source: FRED, St. Louis Fed; Philadelphia Fed, *Survey of Professional Forecasters*, Third Quarter 2019. The (*) value is not provided by this survey, but inserted by the IRF, University of Houston.

Pull It All Together for Houston?

- Three oil scenarios: high, medium, or low. *High* is based on $85 oil and political disruption to oil markets; ***medium* sees $55-60 oil**; low has U.S. over-production, OPEC again pulling out as swing producer, and a $40 oil price
- Continued U.S. expansion is at moderate rate. Any recession handled separately from the forecast
- Petrochemical construction slows; momentum from the fracking boom years is gone; Harvey is over



Houston's Job Growth Forecast Is Moderate And Just Below Trend

(000 New Jobs, Q4/Q4)

		By Scenario	
Year	High	Medium	Low
2014	112.6	**112.6**	112.6
2015	9.3	**9.3**	9.3
2016	-3.1	**-3.1**	-3.1
2017	30.4*	**30.4***	30.4*
2018	79.6	**79.6**	79.6
2019	61.8	**60.9**	60.3
2020	76.7	**62.1**	44.8
2021	80.9	**61.0**	44.5
2022	68.8	**57.0**	47.3
2023	63.9	**56.7**	51.6
2024	63.8	**59.4**	56.4

*Excludes 18,800 temporary jobs in 2017Q4 driven by Hurricane Harvey.

Calculations of IRF, based on drilling scenarios above. Figures are Q4/Q4. Figures are Q4/Q4. The 2018 calculations are revised once but still subject to further downward revisions.

This Forecast Compared to Recent Outlooks

(000 New Jobs, Q4/Q4)

By Scenario

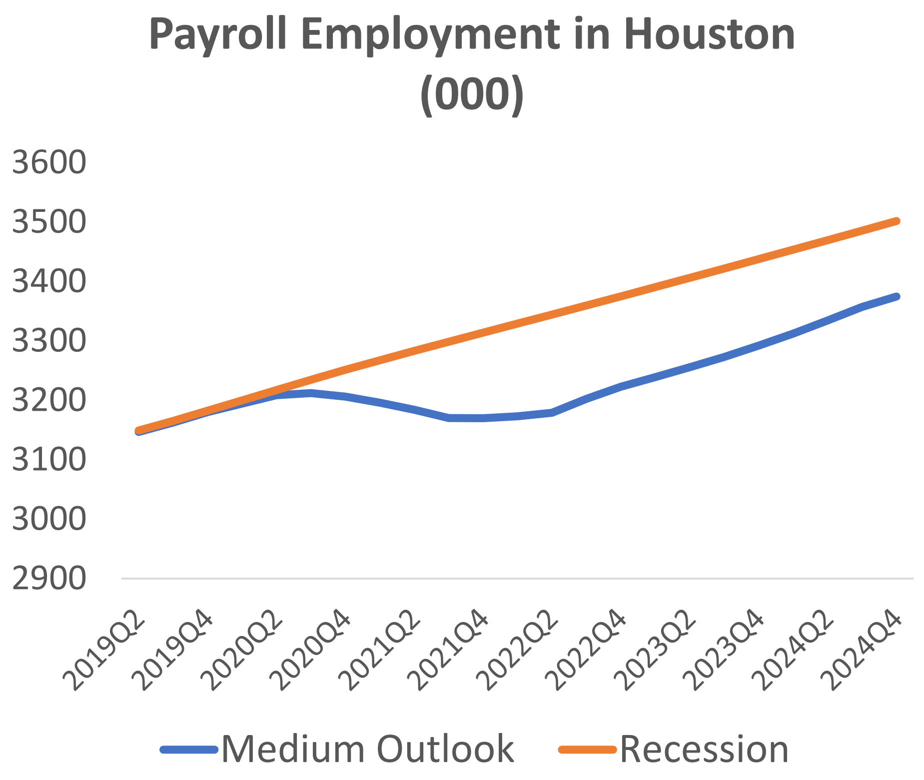
Year	This Forecast Medium	May 2019 Medium	Nov 2018 Medium	May 2018 Medium	Nov 2017 Medium
2014	**112.6**	112.6	112.3	112.3	112.7
2015	**9.3**	9.2	8.9	8.9	11.0
2016	**-3.1**	-2.3	-2.6	-2.6	-1.5
2017	**30.4***	30.5*	27.9*	29.0*	41.1
2018	**79.6**	75.5	62.4	45.1	42.1
2019	**60.9**	66.8	67.4	60.7	56.0
2020	**62.1**	58.2	54.8	86.2	64.5
2021	**61.0**	55.8	67.1	71.9	73.2
2022	**57.0**	62.8	66.1	NA	NA
2023	**56.7**	70.3	68.5	NA	NA

*Hurricane Harvey jobs removed from 2017

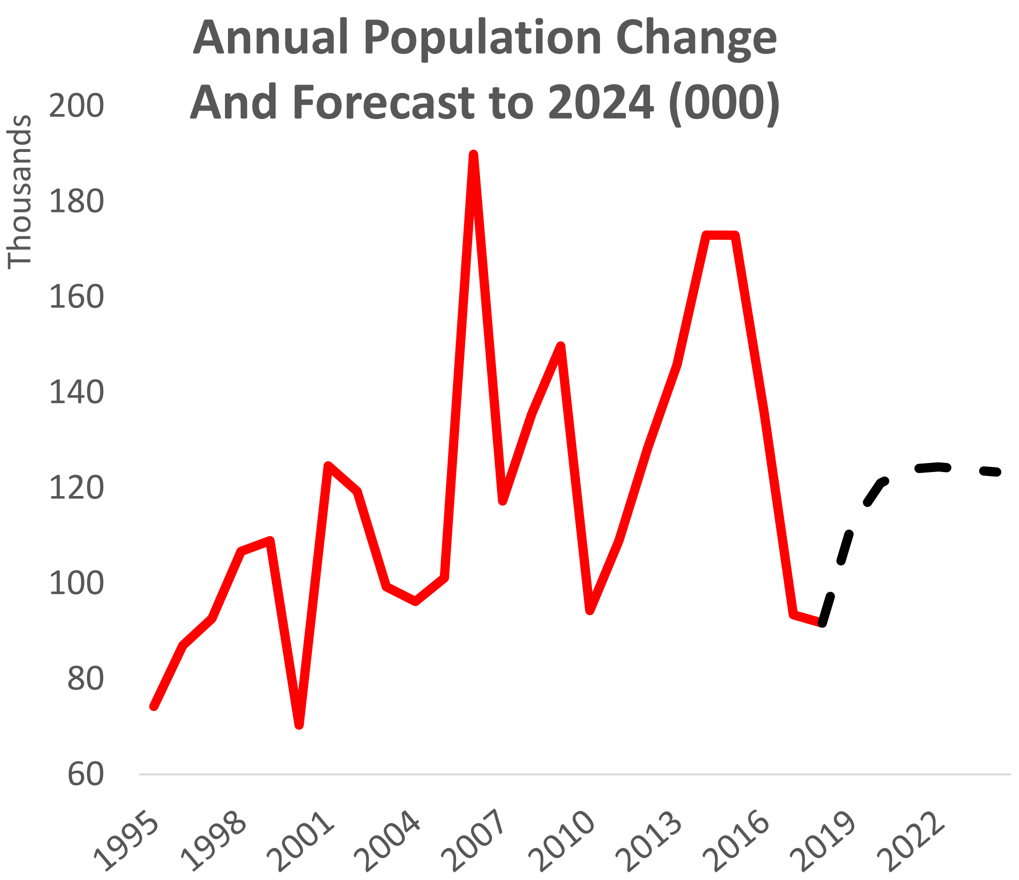
Note: Calculations of IRF, based on drilling scenarios above. Figures are Q4/Q4. This forecast (*) in 2017Q4 excludes one-time jobs from Hurricane Harvey.

What Happens When the U.S. Has A Recession? Both Oil Markets and Houston Will Follow

	U.S. Payrolls	Local Oil Jobs	Houston Payrolls
Peak	2020Q2	2020Q3	2020q3
Quarters of Decline	5	7	5
Percent Decline	2.40%	10.30%	1.30%
Jobs Lost	3.7 million	25,900	42,200
Trough	2021Q3	2022Q2	2021Q4
Quarters to Recover	4	9	4
Return to Prior Peak	2022Q3	2024Q3	2022Q4



Houston Metro Population Growth Has Been Slowing Since 2014

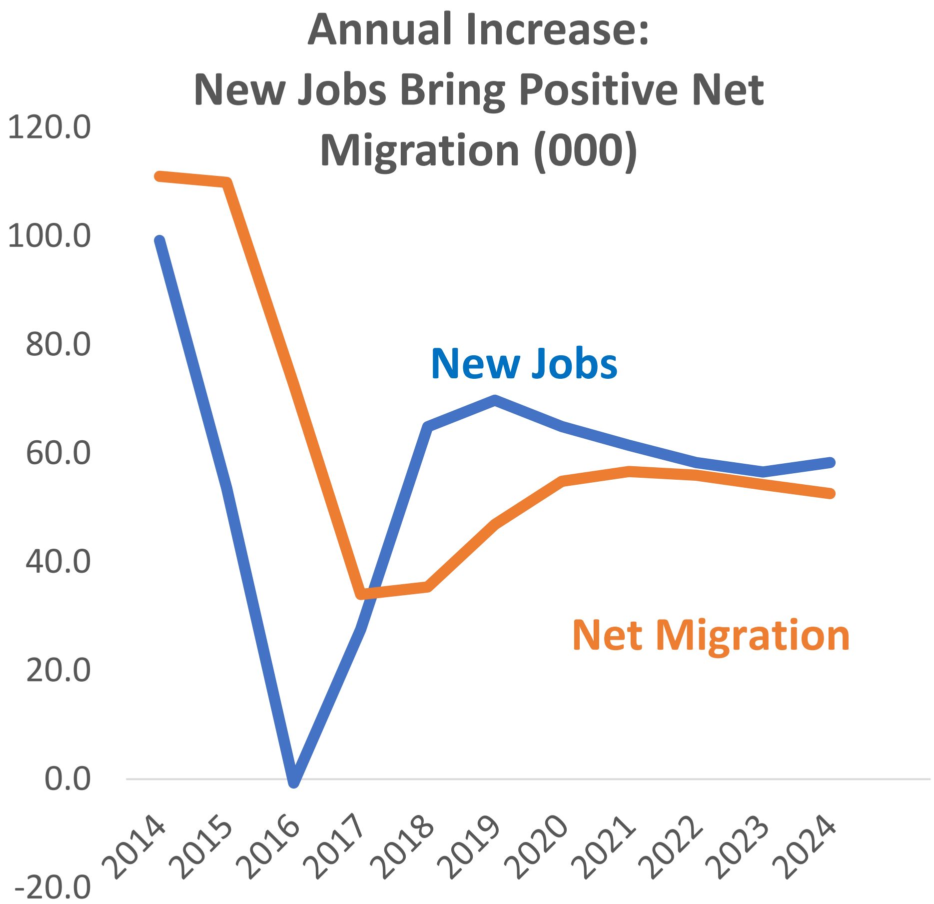


It Is Domestic Migration That Makes Local Population Growth Volatile

	Pop Change	Natural Increase	Net Migration	Int'l Migration	Domestic Migration
2011	108,957	59,236	49,917	26,921	22,996
2012	128,495	57,839	70,411	30,982	39,429
2013	145,796	57,303	87,874	32,796	55,078
2014	172,961	60,926	111,044	43,797	67,247
2015	172,947	62,711	109,862	47,902	61,960
2016	135,695	62,962	72,681	45,475	27,206
2017	93,435	59,171	34,074	43,948	-9,874
2018	91,689	56,119	35,397	44,535	-9,138

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

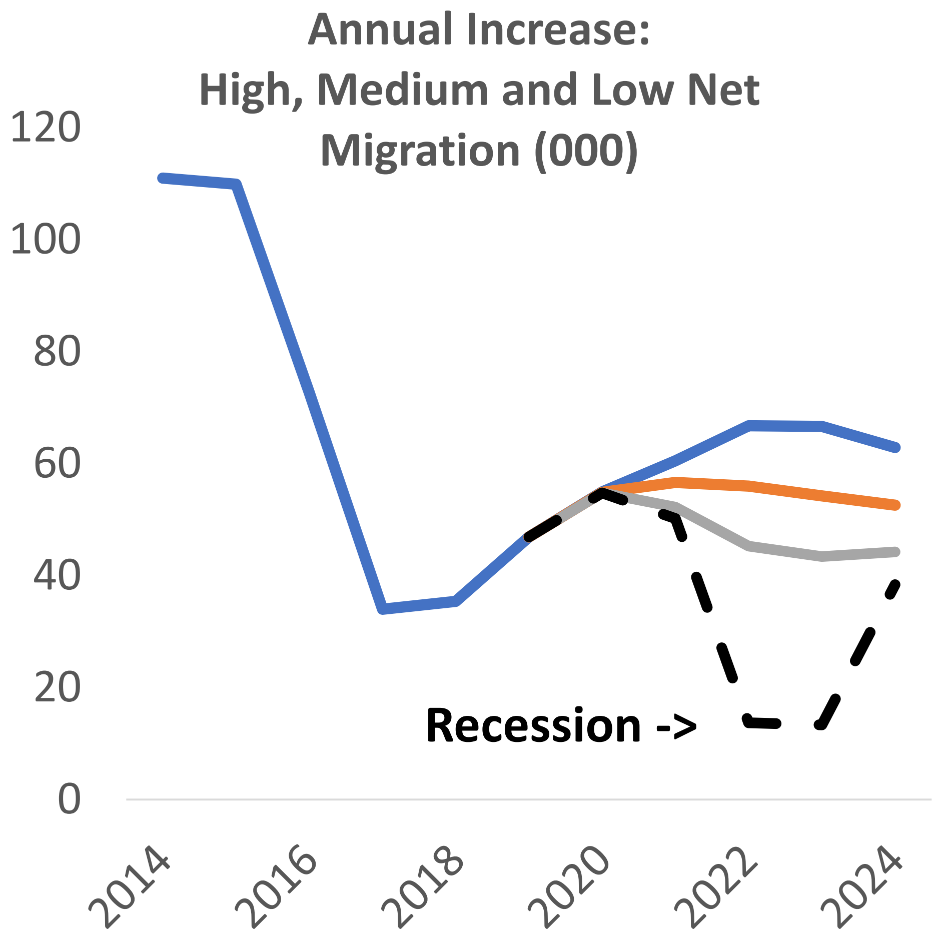
- 2018 local population increase of 91,689 was smallest since 2010, third smallest since 1997
- Net births over deaths add a steady 60,000 to 70,000 new residents per year. Secular not cyclical growth
- Weak net migration of 33,000 was the chief reason, with domestic migration turning negative at -10,000. Gains in international migration kept total migration positive
- Domestic net migration is strongly related to job growth, lagging a year.
- Data at right matches medium employment forecast, sees a 2017/18 trough with 35,000 net in-migrants. Improves to over plus-50,000 net migrants by 2020, then stays near that level through 2024



Calculations of IRF

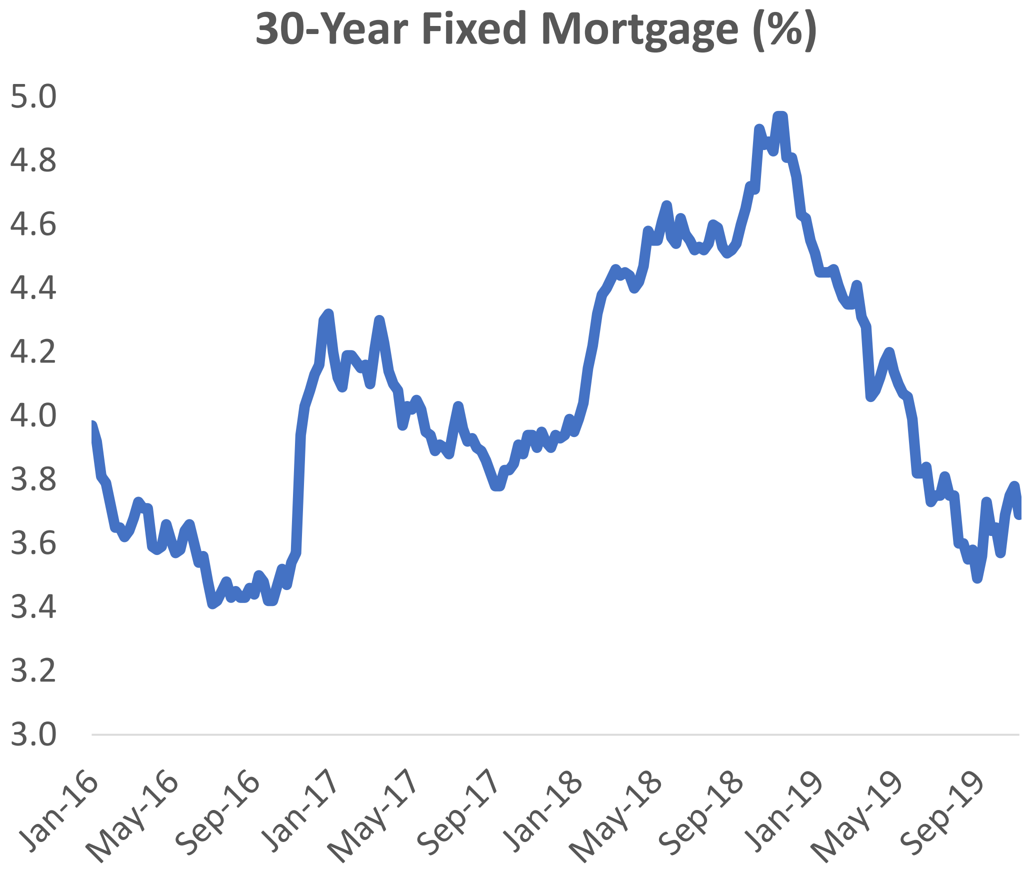
High, Medium and Low Net Migration Compared to Recession

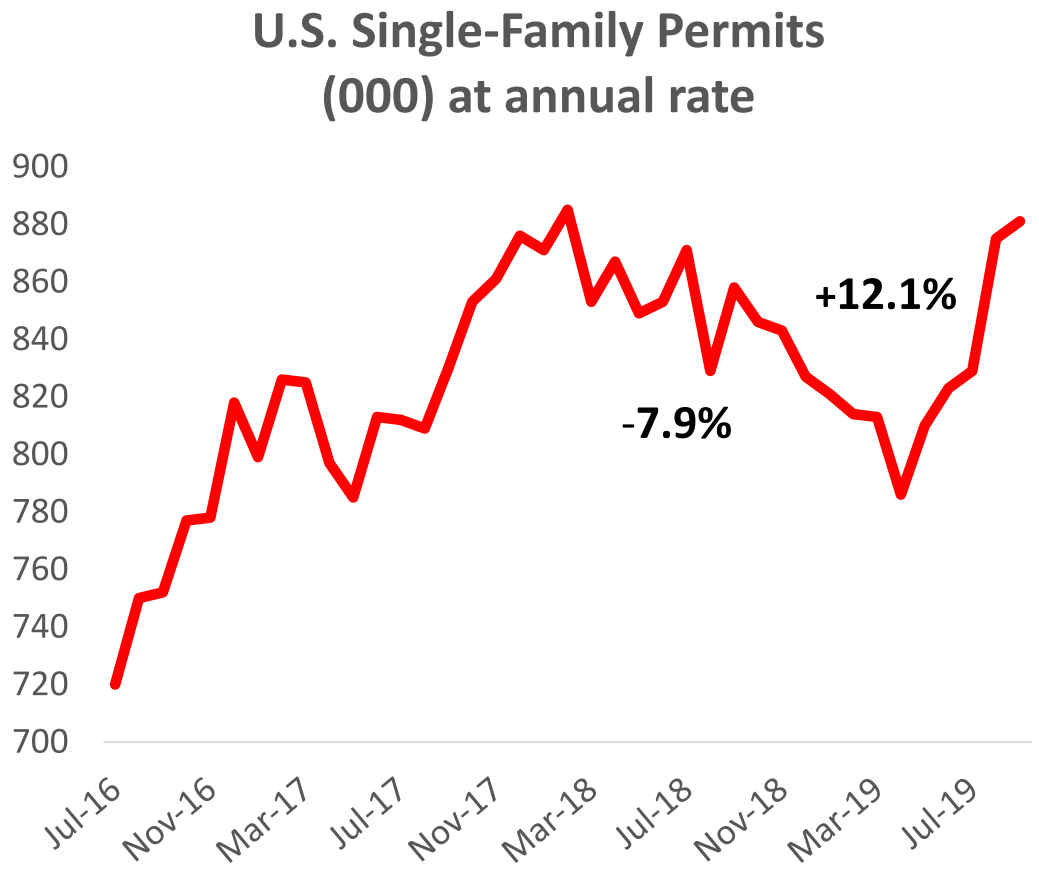
- High, medium and low migration correspond to our forecast job growth
- Medium scenario shows net migration settle at about 50,000 per year. High and low near 60,000 and 40,000
- Compare to abnormal 100,000 per year during fracking boom years, followed by abnormal lows at 35,000
- Recession provides a big and temporary setback followed by recovery only by 2024



Rate Cuts Revive the Housing Market in the U.S. and Houston

After a Long Slide in 2018, the U.S. Single-Family Market Turned Up in 2019 as Rates Fell Back





FRED St Louis Fed

Lower Mortgage Rates Turn National Single-Family Housing Around in 2019

Existing Home Sales Held Back By Low Inventories

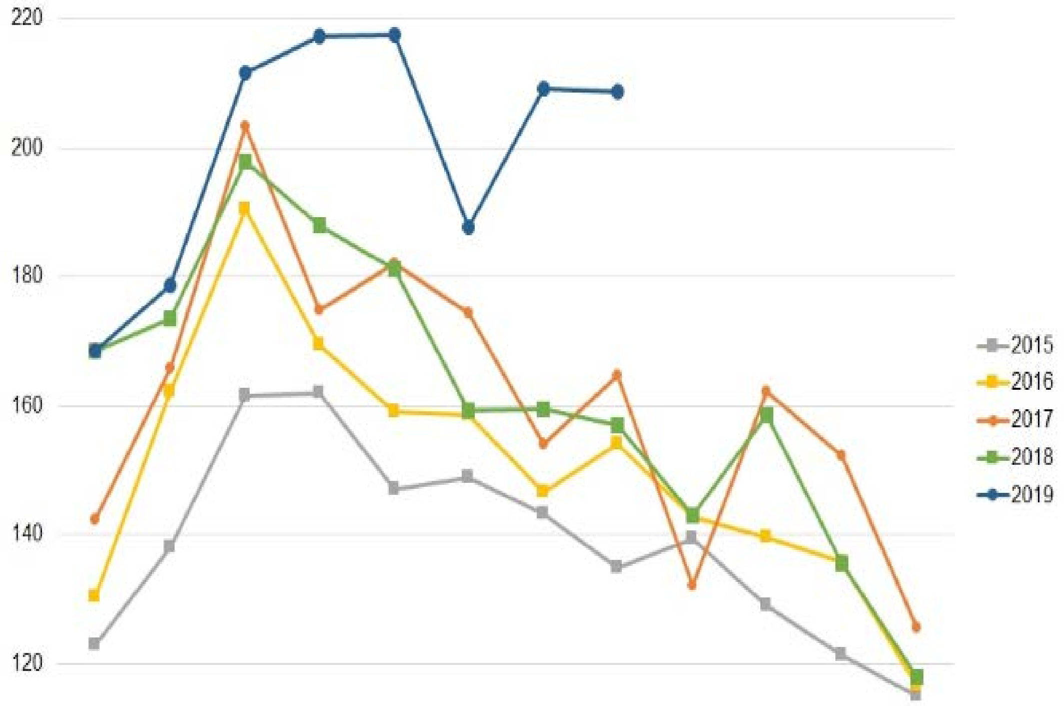
- Sales are soft but only because of lack of supply, still up 3.9 percent year-over-year
- Inventories stand at only 2.8 months of supply and tightening steadily
- Median existing home price is up 6.1% in the last 12 months to $275,000

New Home Sales Show Strength Across the Board

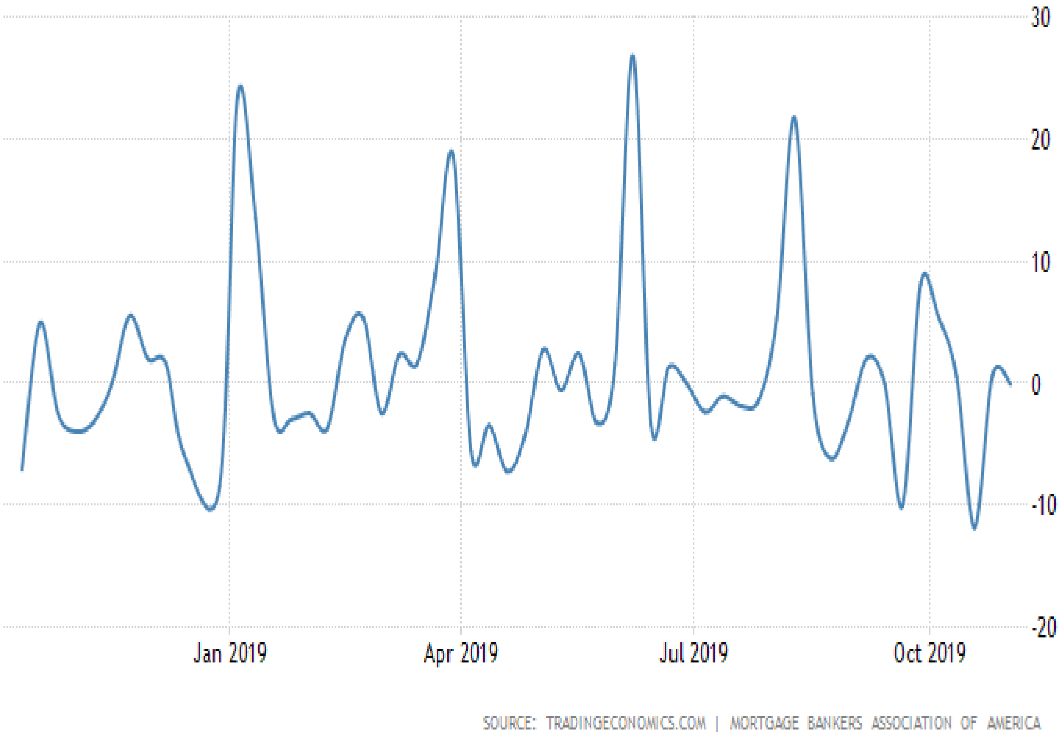
- The current trend is for considerable strength now that mortgage rates have turned around
- Year-to-date new home sales are up 7.2%, and inventories have fallen for each of the last eight months
- Median price has not joined the upward trend, down 8.8% year-over-year

Mortgage Rates Volatility in 2019 Repeatedly Opened the Door to Home Purchases and Refinancing

New Home Purchase Applications (000) Not Seas. Adj.



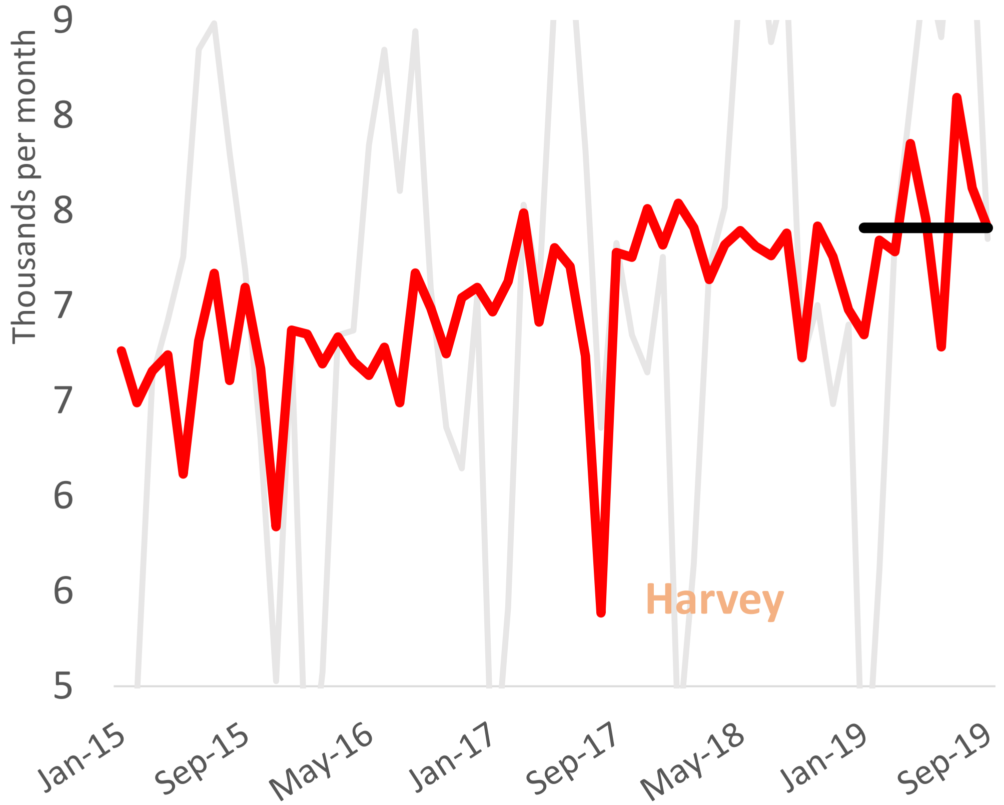
Mortgage Refinance Applications (000) Weekly % Change



Mortgage Bankers Association

Houston Existing Home Sales Share National Slide in 2018, Turn Up Early 2019

(Houston MLS sales, s.a.)

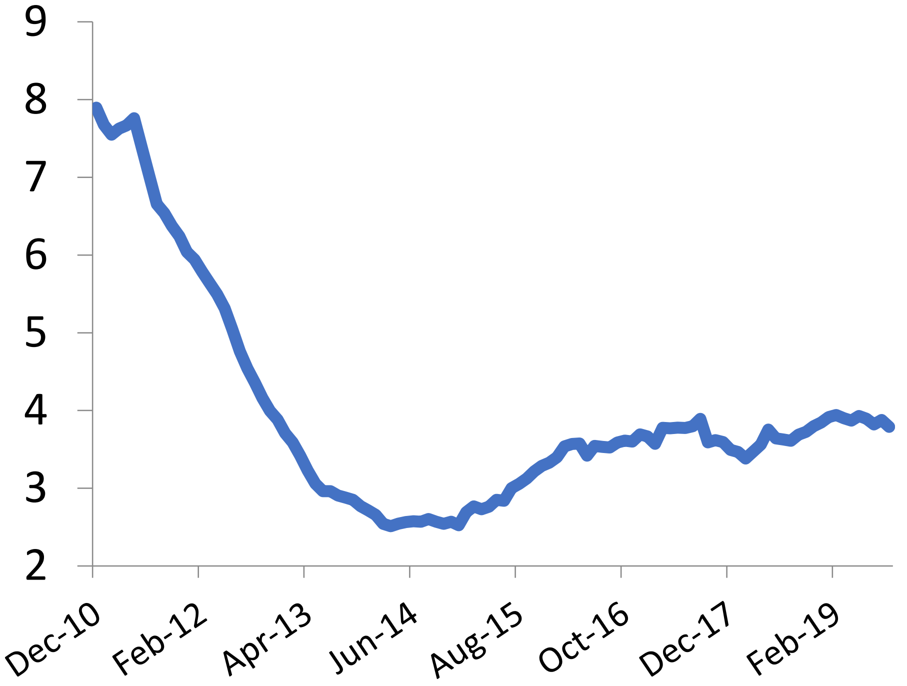


- Even with the wild 2019 gyrations from mortgage rates and refinancing, 2019 has brought only modest changes for Houston's home sales
- The black line is 2019 average sales.
- Sales in the first nine months of 2019 are 2.1 percent higher than the same period in 2018. Seasonally adjusted listings but are very flat since December
- Sales are slower than the national existing home data, inventories higher, and median price rising more slowly

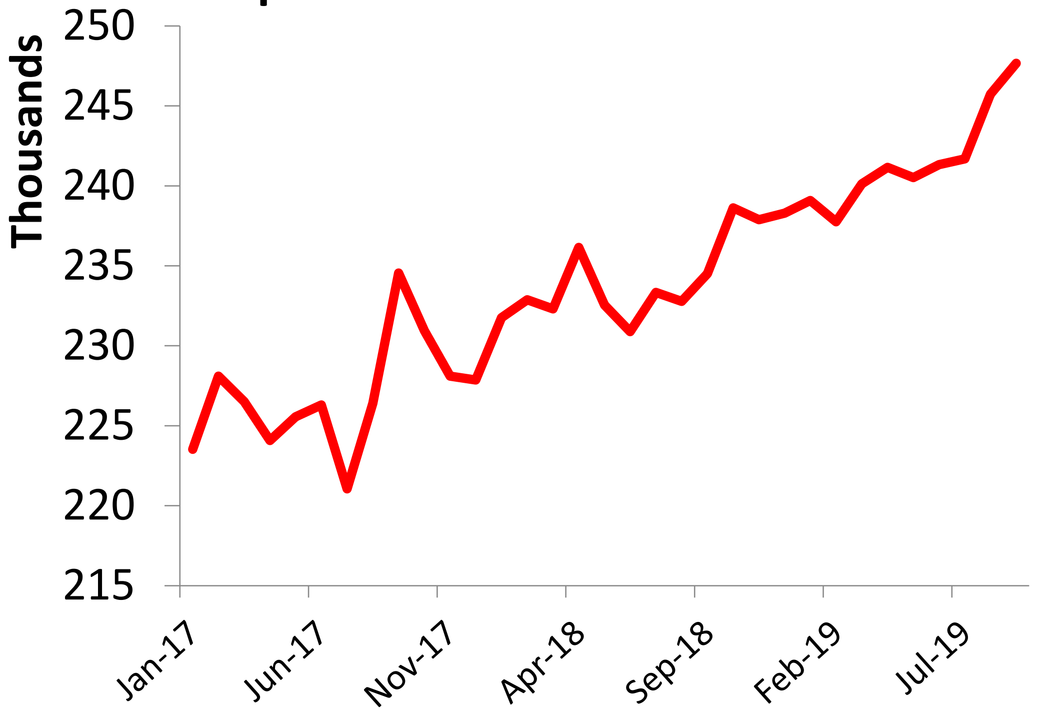
Source: Texas A&M Real Estate Center, seasonally adjusted by IRF

Houston In 2019:
Stable Inventory and Moderating Prices

Months Supply: 3.6 in 2018 And Steady Near 3.9 This Year

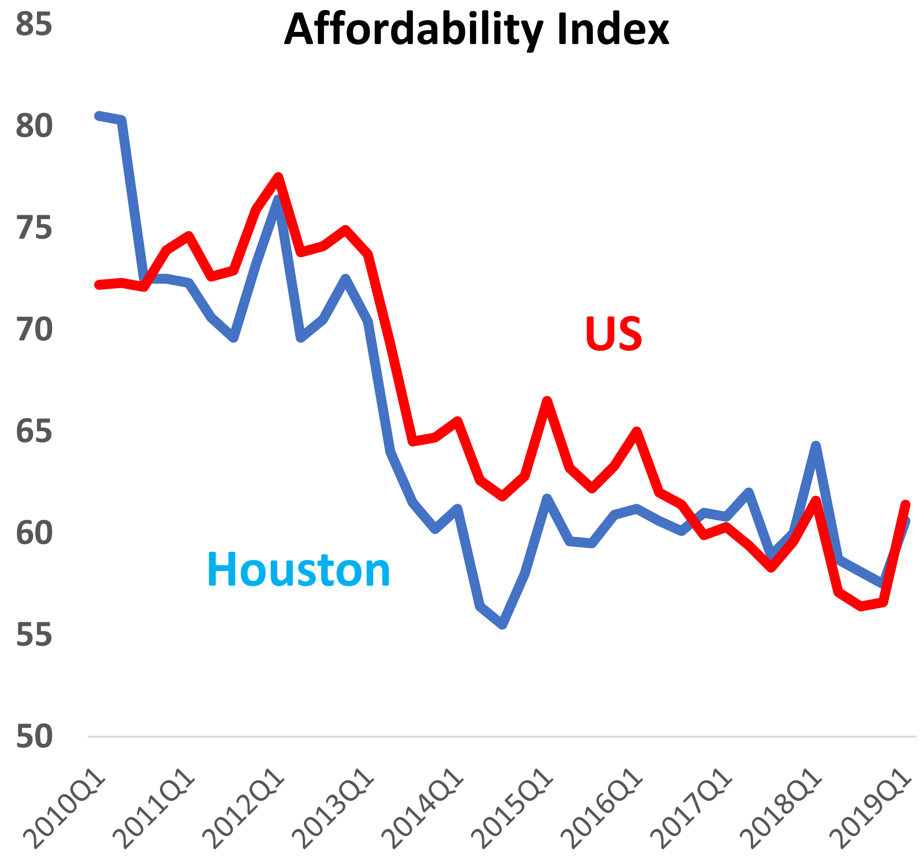


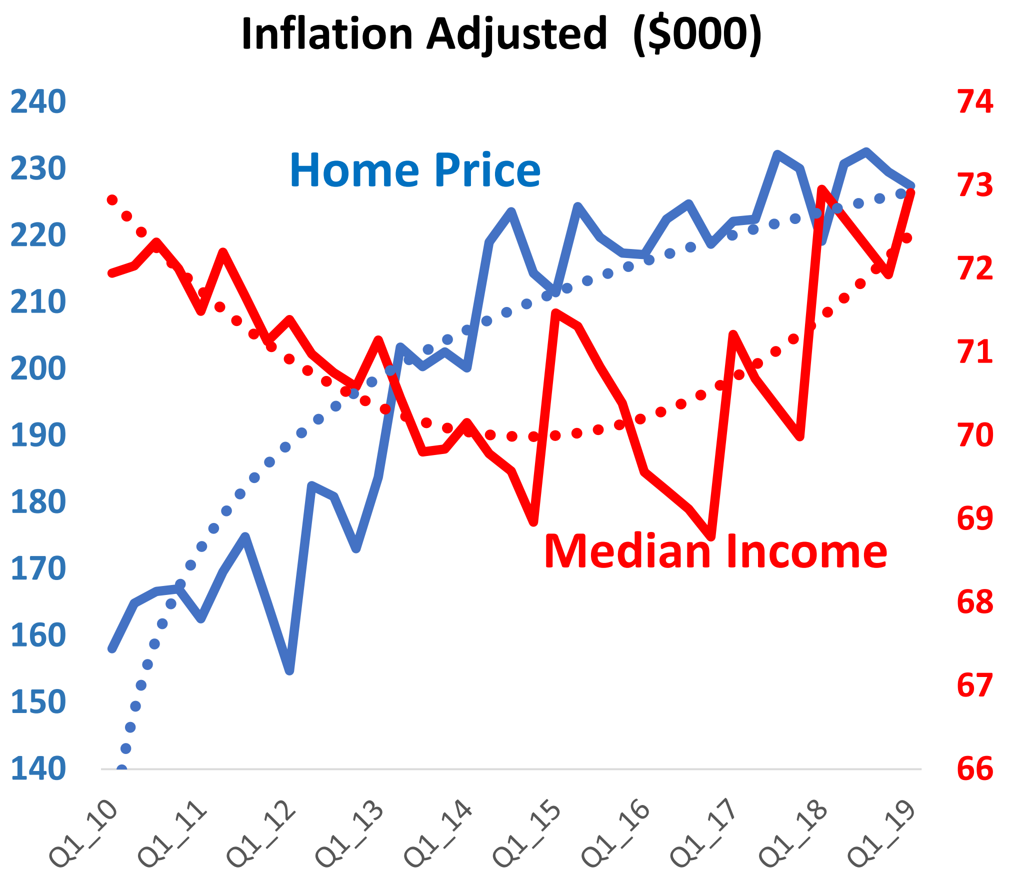
Home Prices Rise 4.6% in 2018
Up At 3.7% Annual Rate So Far in 2019



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

Houston's Home Affordability Now Comparable to U.S., With Local Median Income Gaining on Home Prices





Wells Fargo Housing Opportunity Index

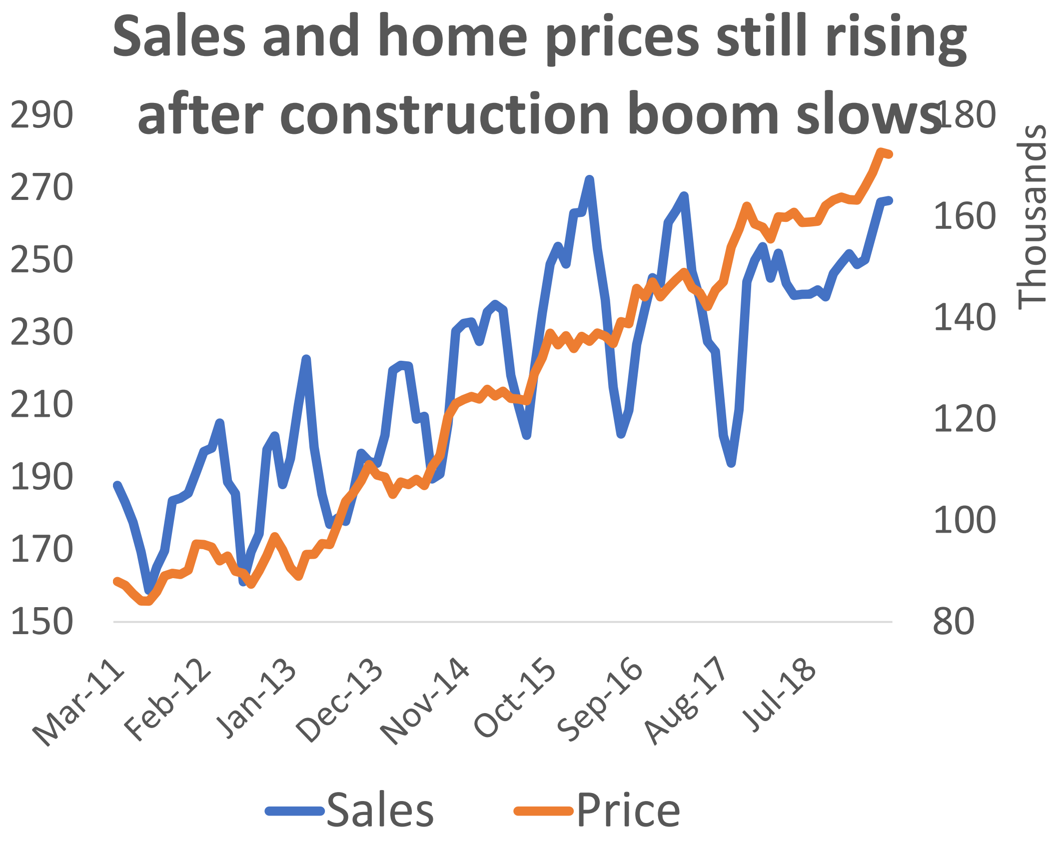
Among the Largest Dozen U.S. Metros, Houston Ranks Only #5 on Low Housing Cost and #9 on Median Income

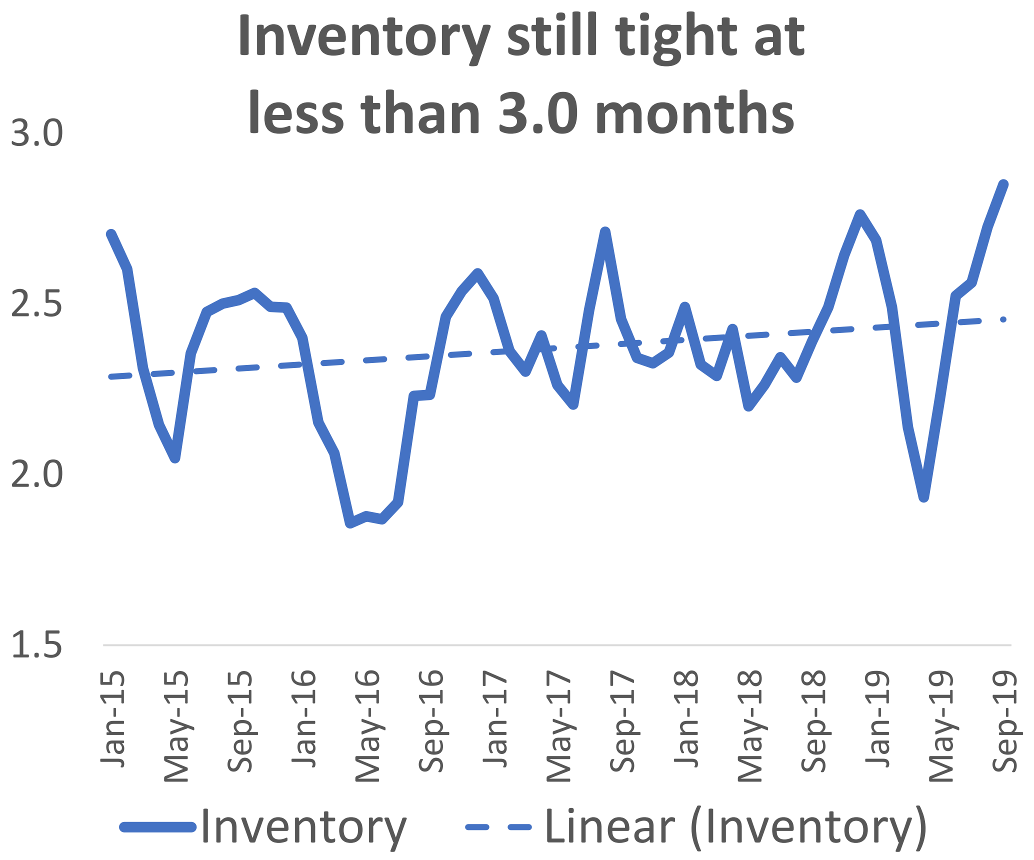
	Opportunity Index	Med Home Price	Home Price Rank	Median Income	Income Rank
Washington	73.9	360	8	120.7	2
Atlanta	70.9	231	2	79.7	8
Philadelphia	70.8	160	1	64.8	11
Chicago	68.1	235	3	86.5	4
Phoenix	63.9	235	4	86.5	5
Houston	60.6	238	5	76.3	9
Dallas -Fort Worth	55.7	274	6	80.3	7
Boston	47.2	450	10	104.3	3
New York	37.0	425	9	81.9	6
Miami	31.6	305	7	54.9	12
Los Angeles	10.6	600	11	72.8	10
San Francisco	6.9	1,270	12	122.2	1

Wells Fargo Housing Opportunity Indexes, Dallas-Fort Worth is a population weighted average of the metropolitan divisions

Ship Channel Cities Still Busy

Baytown, Channelview, Pasadena

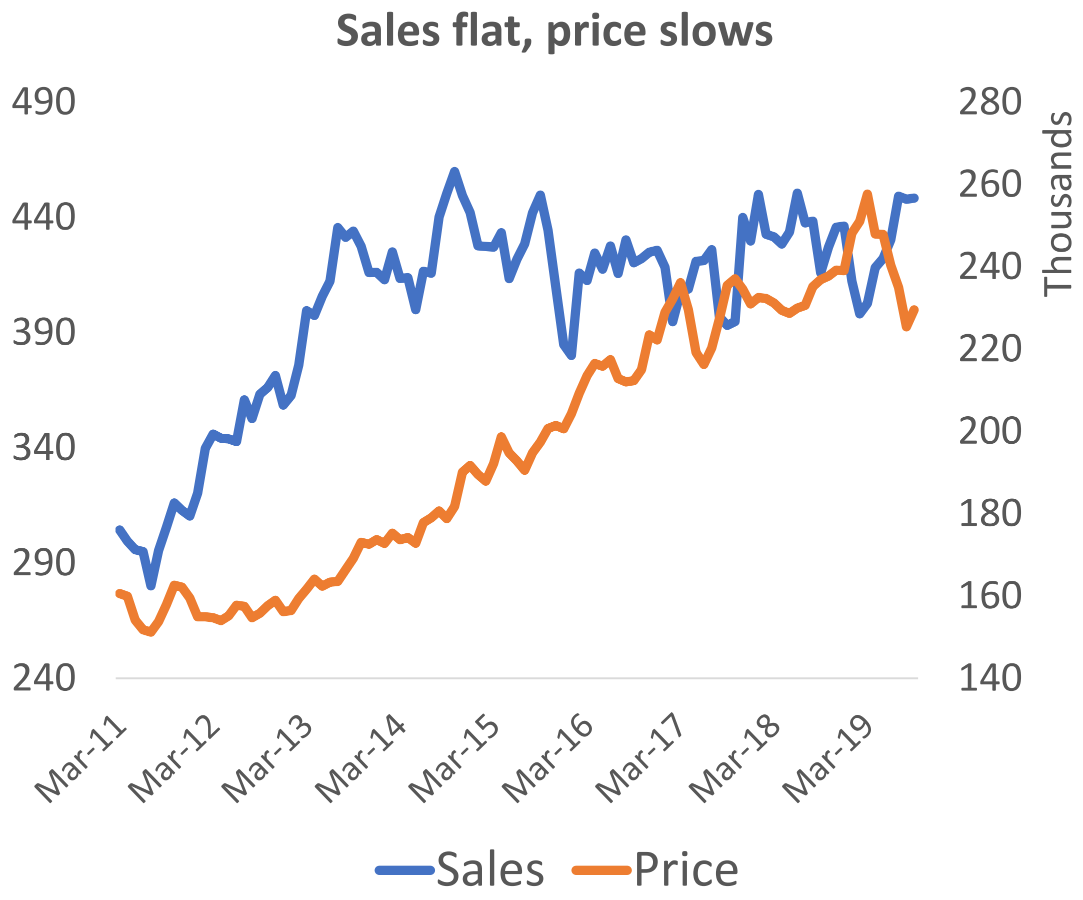


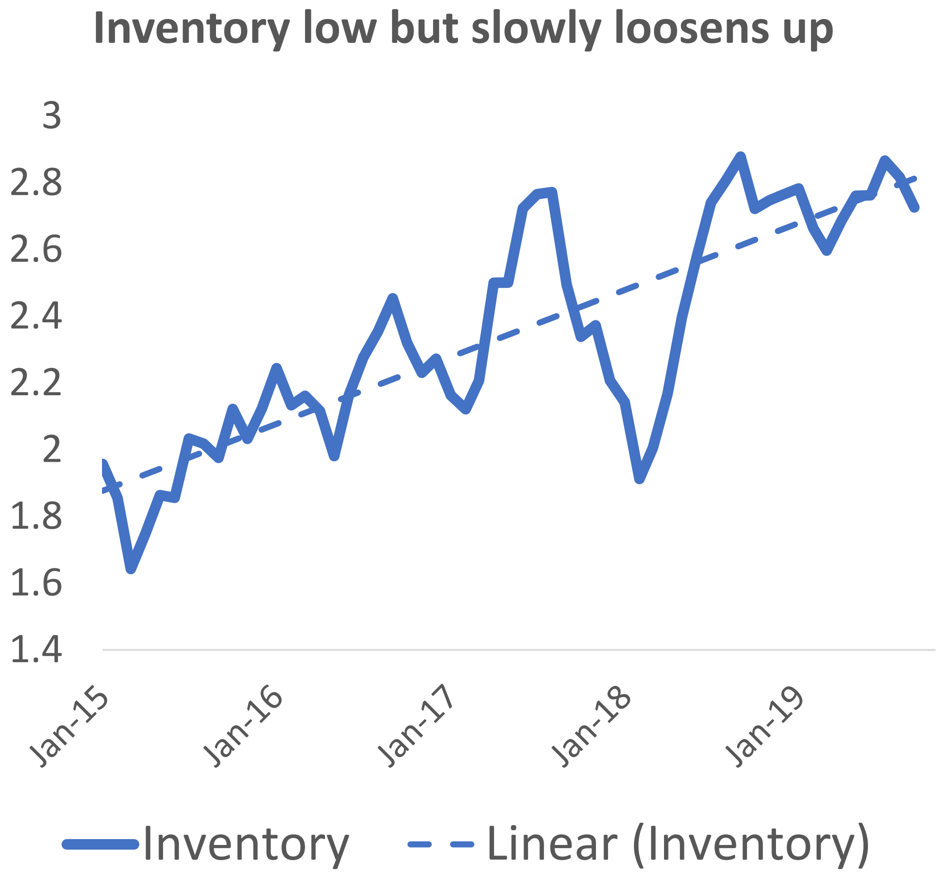


Source: Texas A&M Real Estate Center, calculations of IRF

South Houston

South Belt, Clear Lake, League City

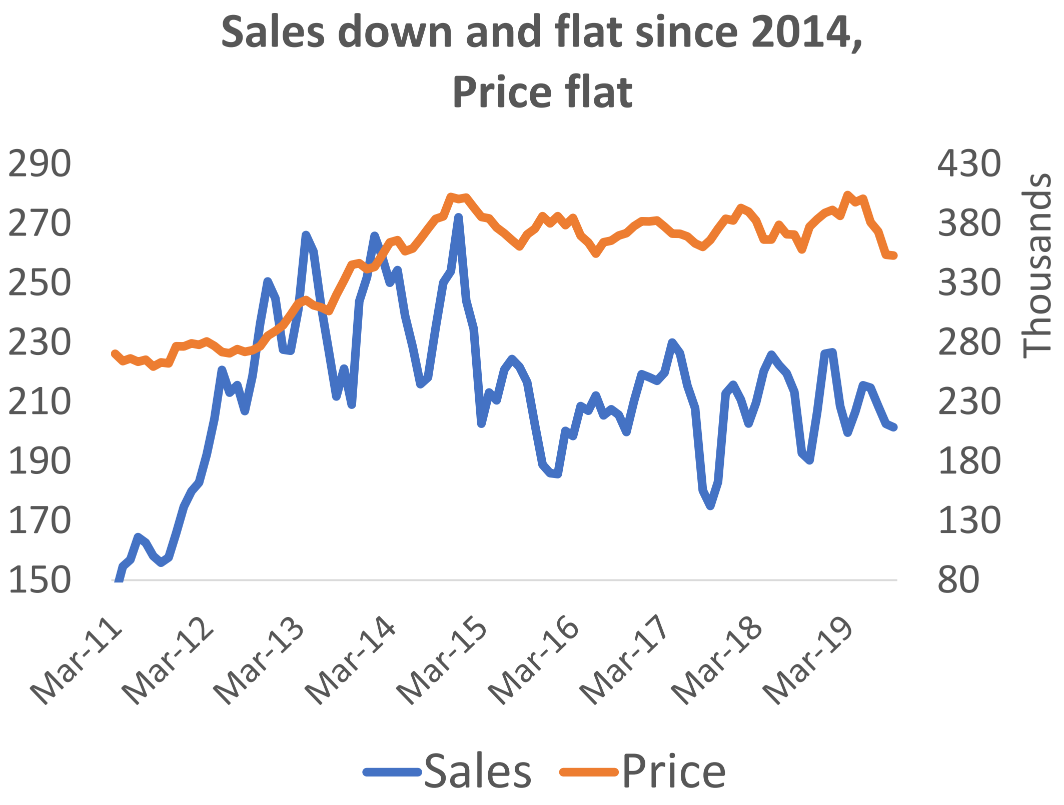


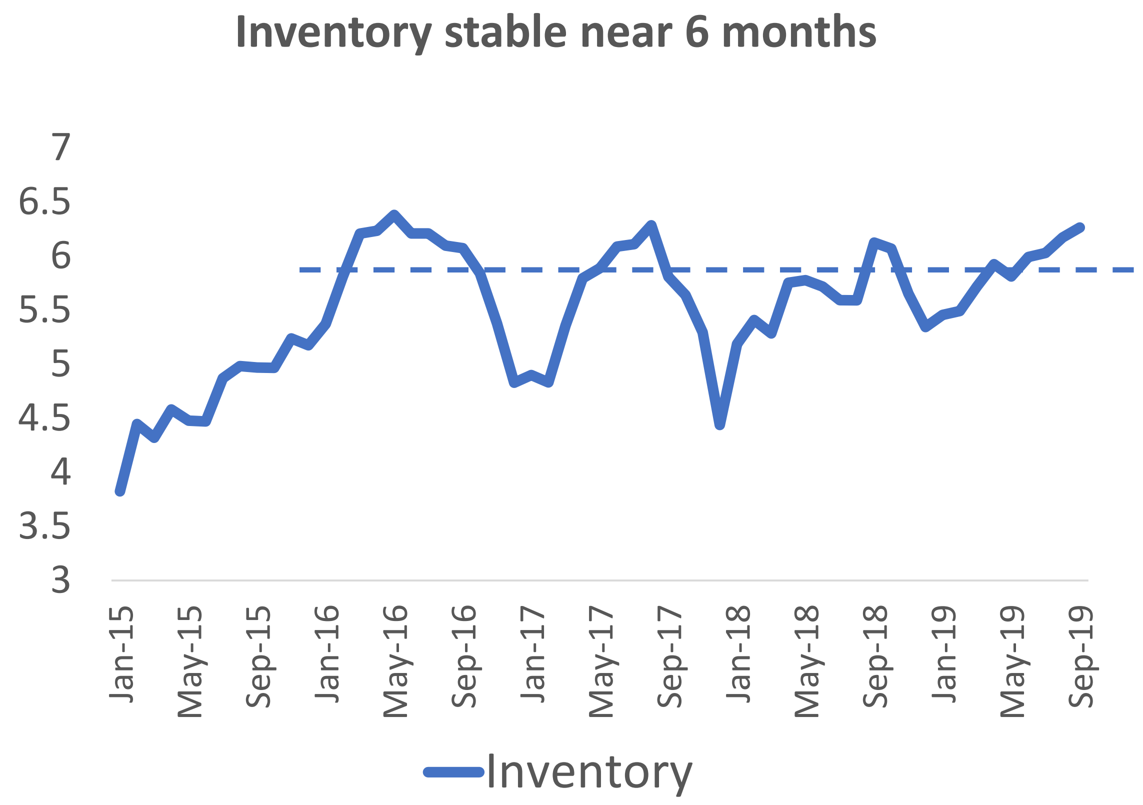


Source: Texas A&M Real Estate Center, calculations of IRF

Close-In and Upscale

Rice Military, Heights, Galleria

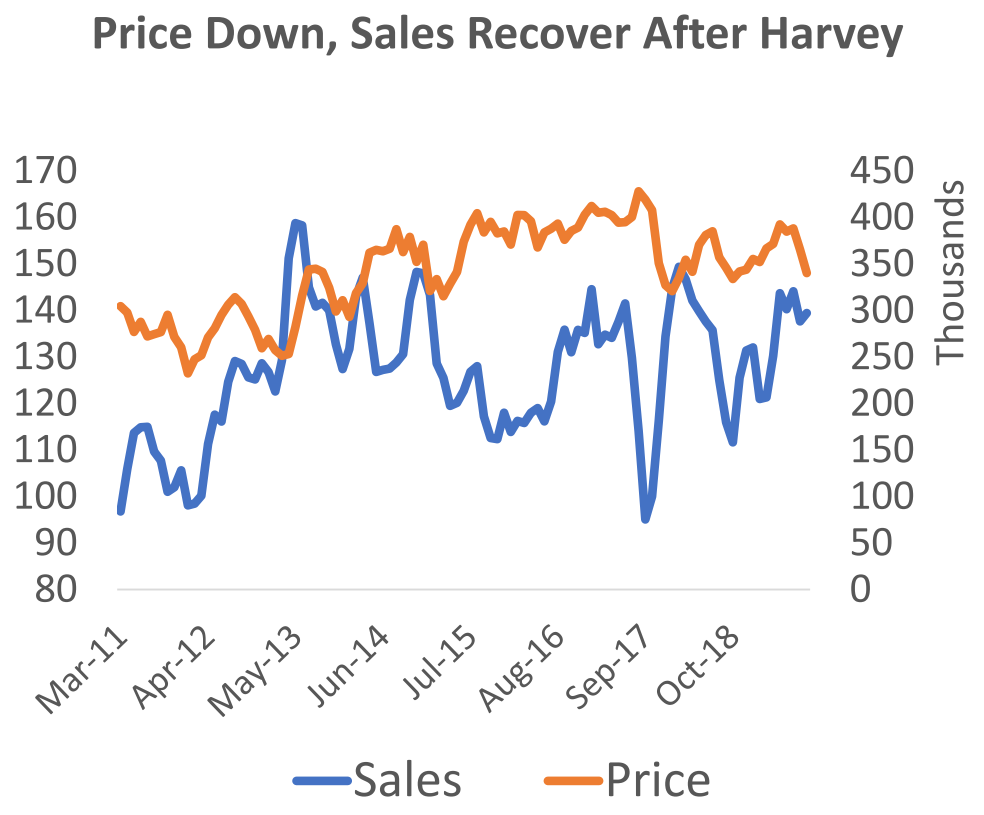




Source: Texas A&M Real Estate Center, calculations of IRF

South Of I-10 West

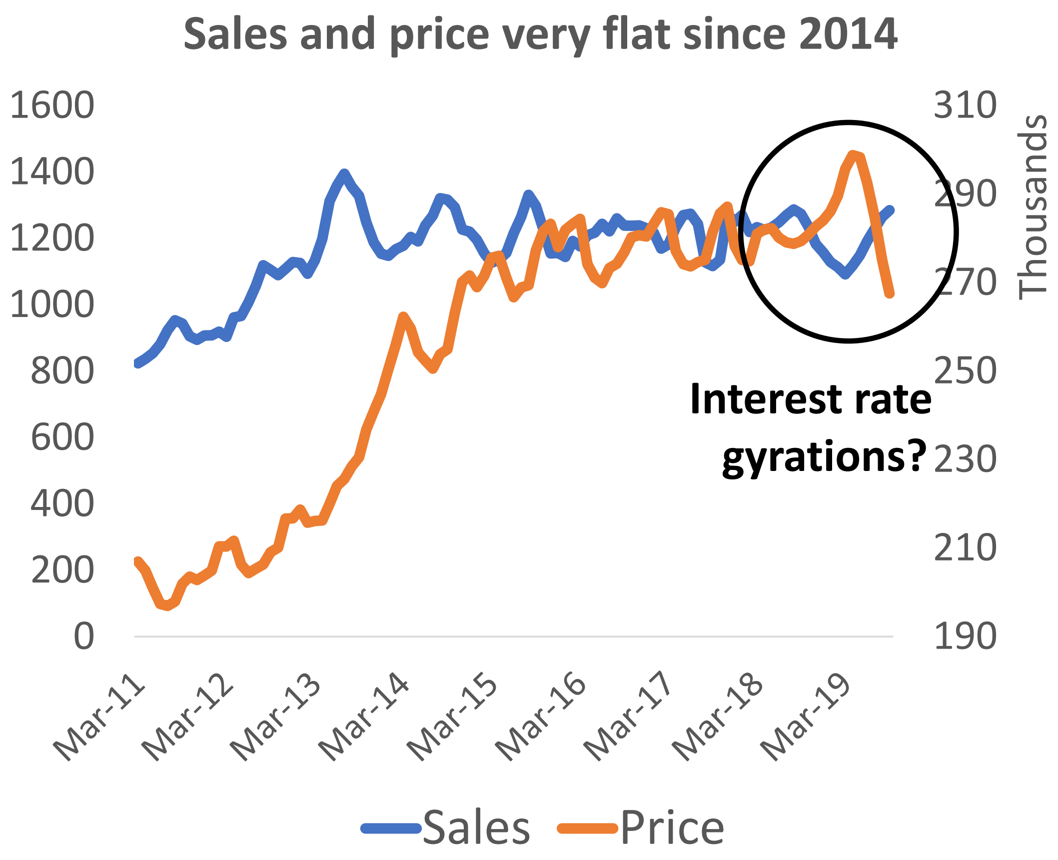
Memorial and Energy Corridor

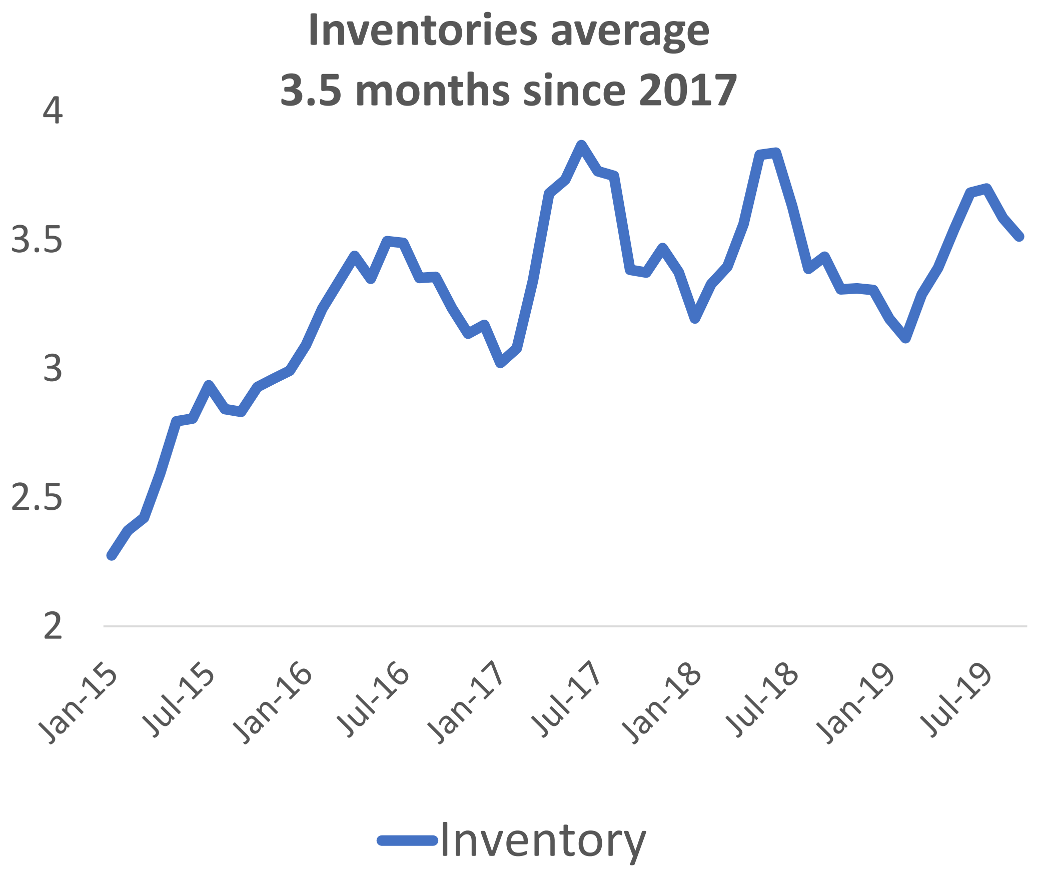


Source: Texas A&M Real Estate Center, calculations of IRF

Distant Suburbs

Pearland, Sugar Land, Kingwood, Katy, Cypress



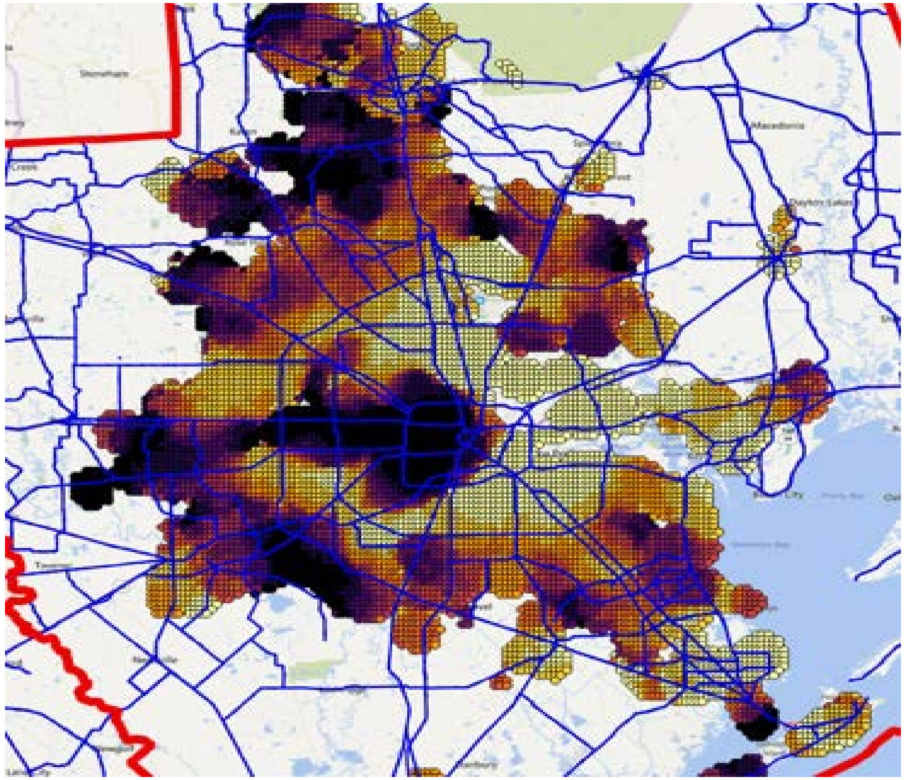


Source: Texas A&M Real Estate Center, calculations of IRF

Median Home Price By Small Market Area: Anglo Arrow Gentrifies and Spreads West

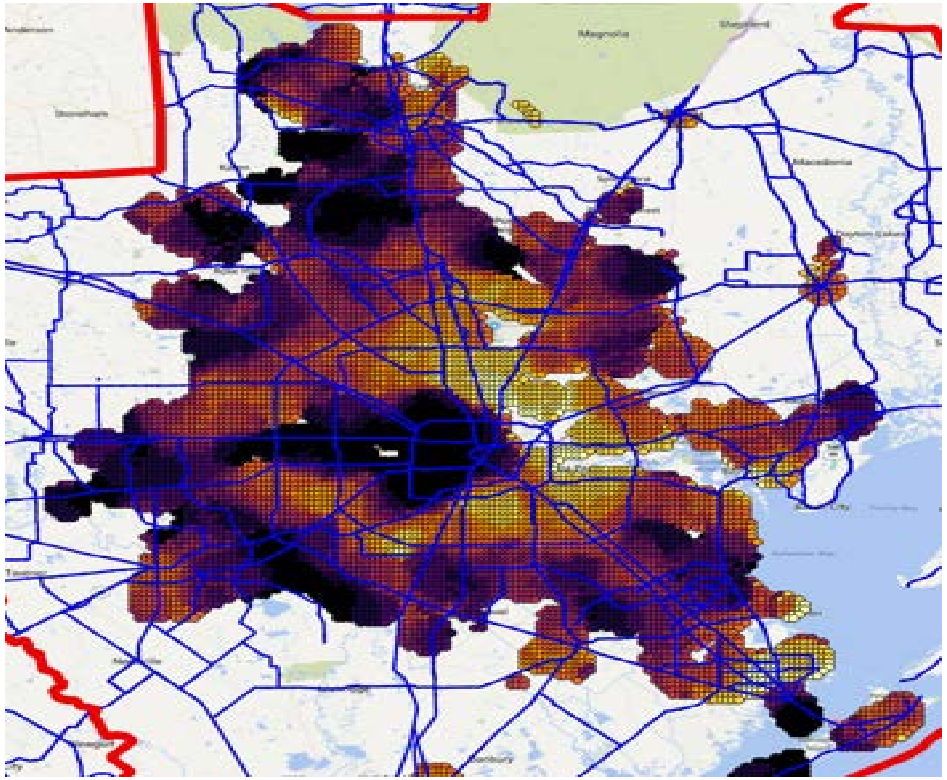
2014 Median Home Price:

The darker the area, the higher the price



2019 Median Home Price:

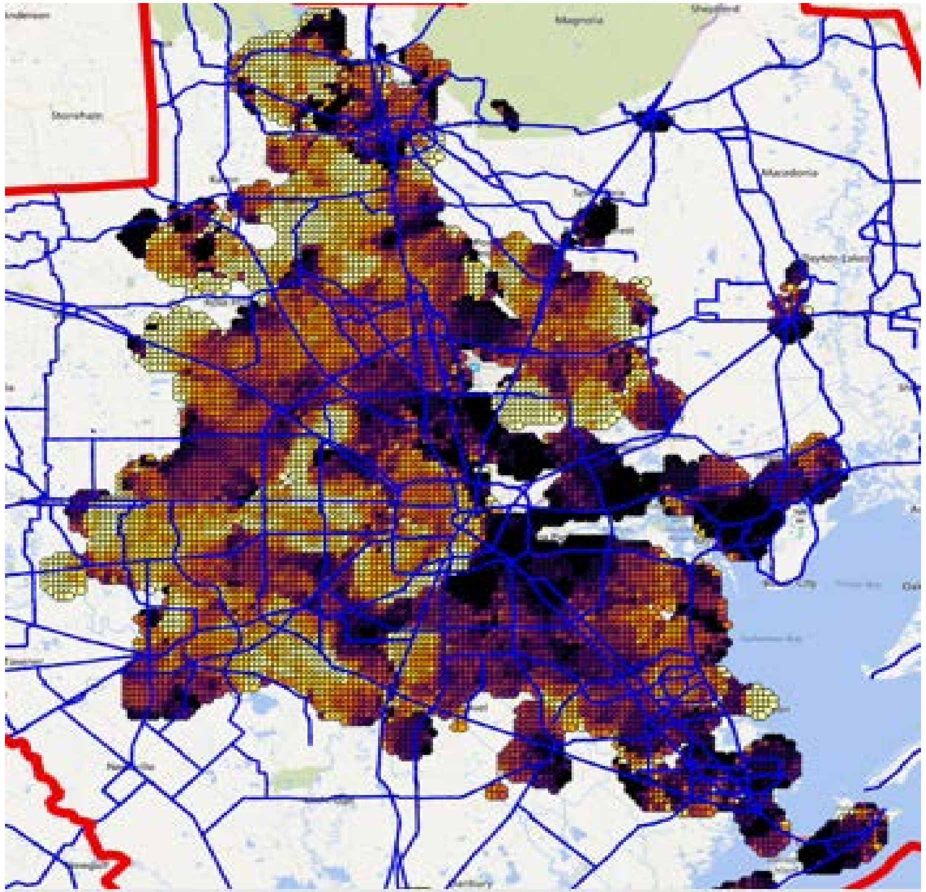
The darker the area, the higher the price



JOHN BURNS
REAL ESTATE CONSULTING

Median Home Price Change 2014 to 2019: The East Side Gains with Gentrification and Chemical Boom

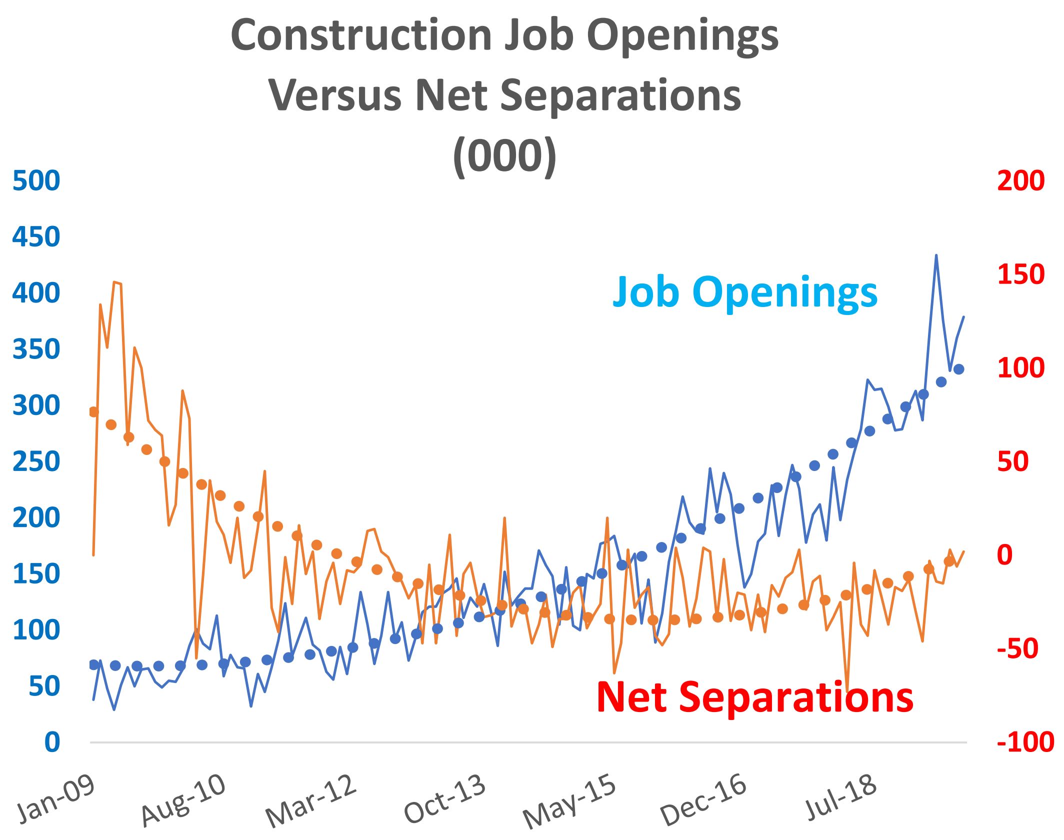
- The darker the area, the bigger the price increase.
- The north and east side around the Anglo Arrow is gentrification
- Many suburban areas in and around 99 make big gains
- The petrochemical boom helped the east side, raising prices in previously low-priced neighborhoods
- You see the continued post-Hurricane Ike redevelopment of Galveston



New Home Sales and Construction

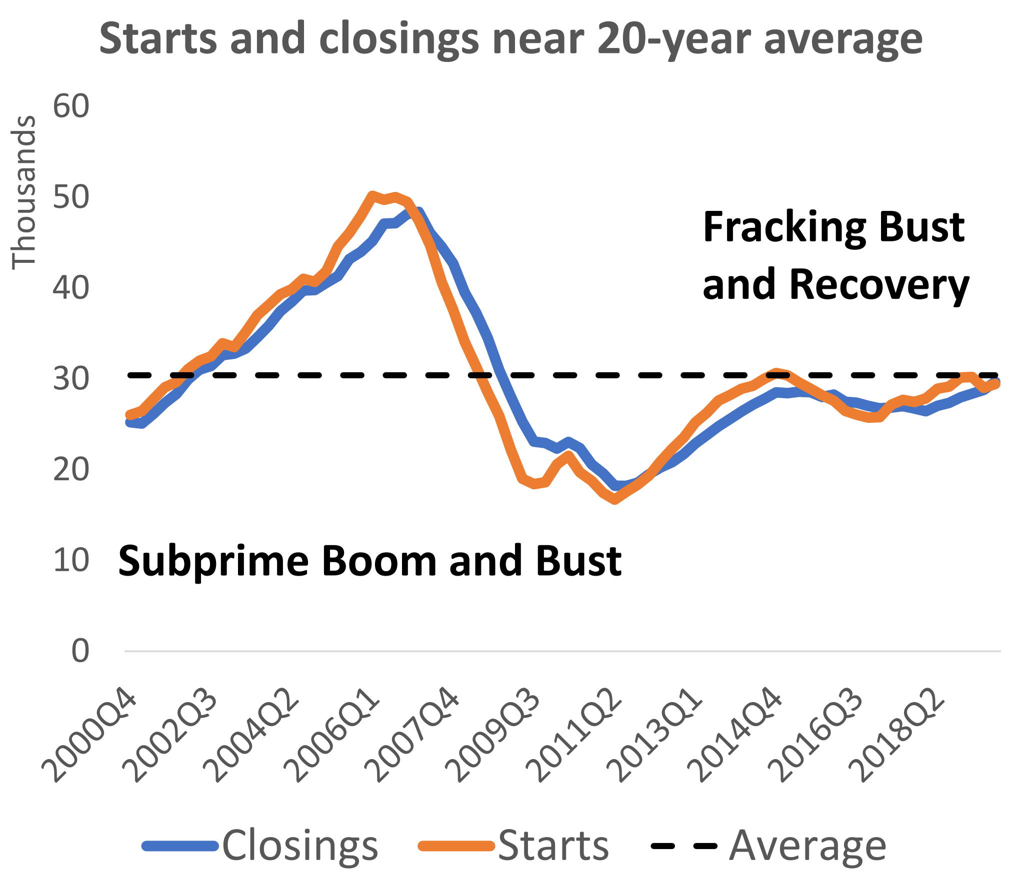
Mortgage Rates and Goods Inputs to Construction Fall, Labor Still Very Tight

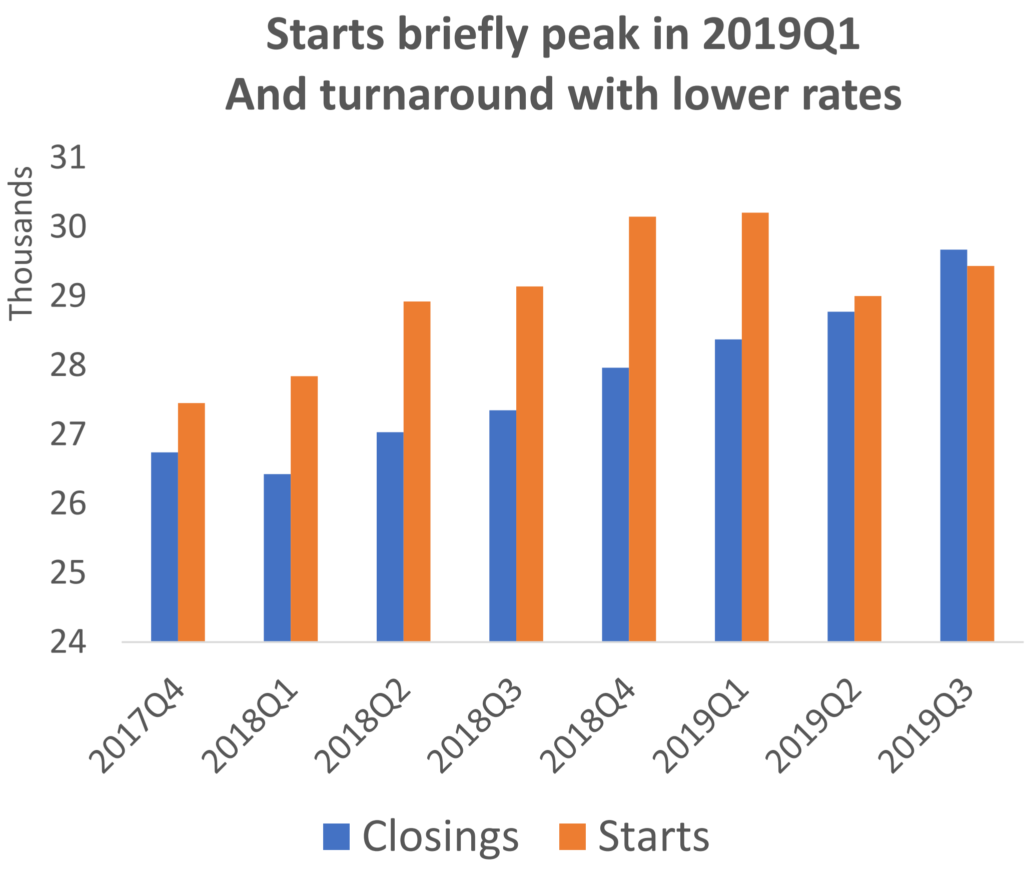
- After rising 4.8% in 2017 and 3.2% in 2018, the Producer Price Index says goods inputs to the construction industry fell slightly in 2019 through September
- Softer demand for construction early in 2019, and major declines in prices for lumber and gypsum products led the way to lower costs
- The gap between the rising demand for workers and the supply continues to grow, putting pressure on wages



BLS, JOLTS, net separations are total separations minus hires

Houston's New Home Market Only Briefly Pulled Back With Rising Mortgage Rates

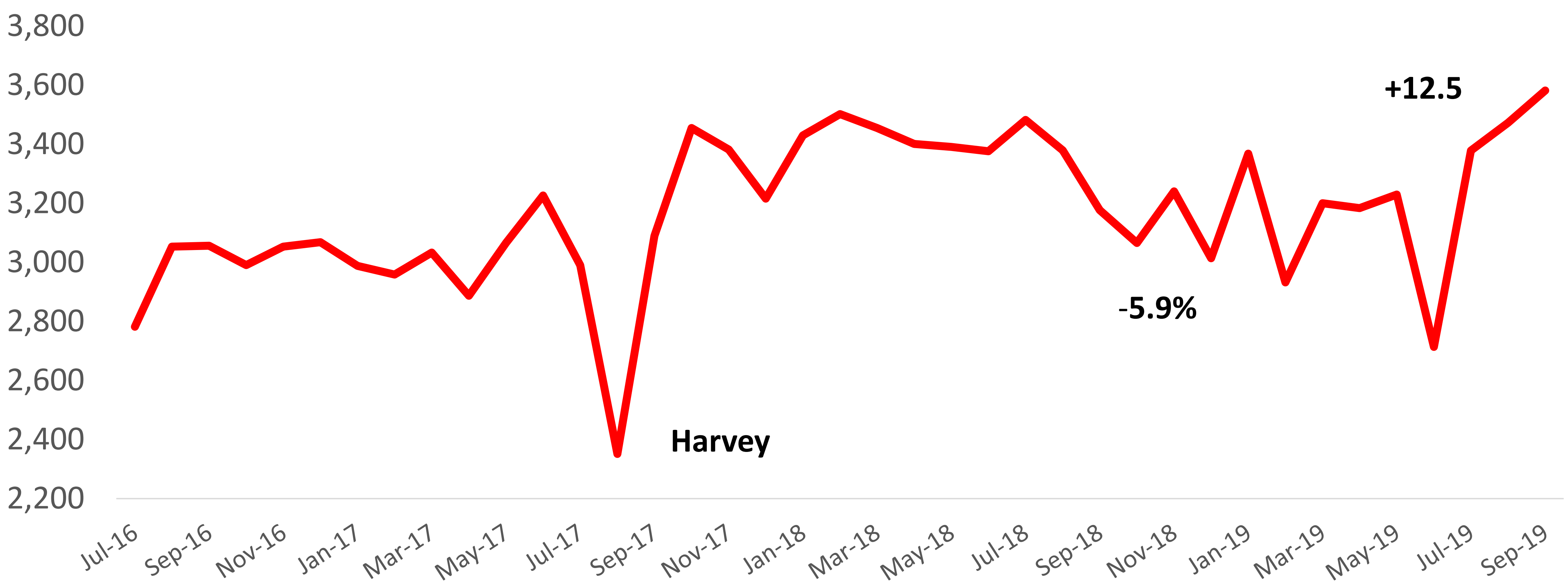




Metrostudy data, seasonally adjusted by IRF

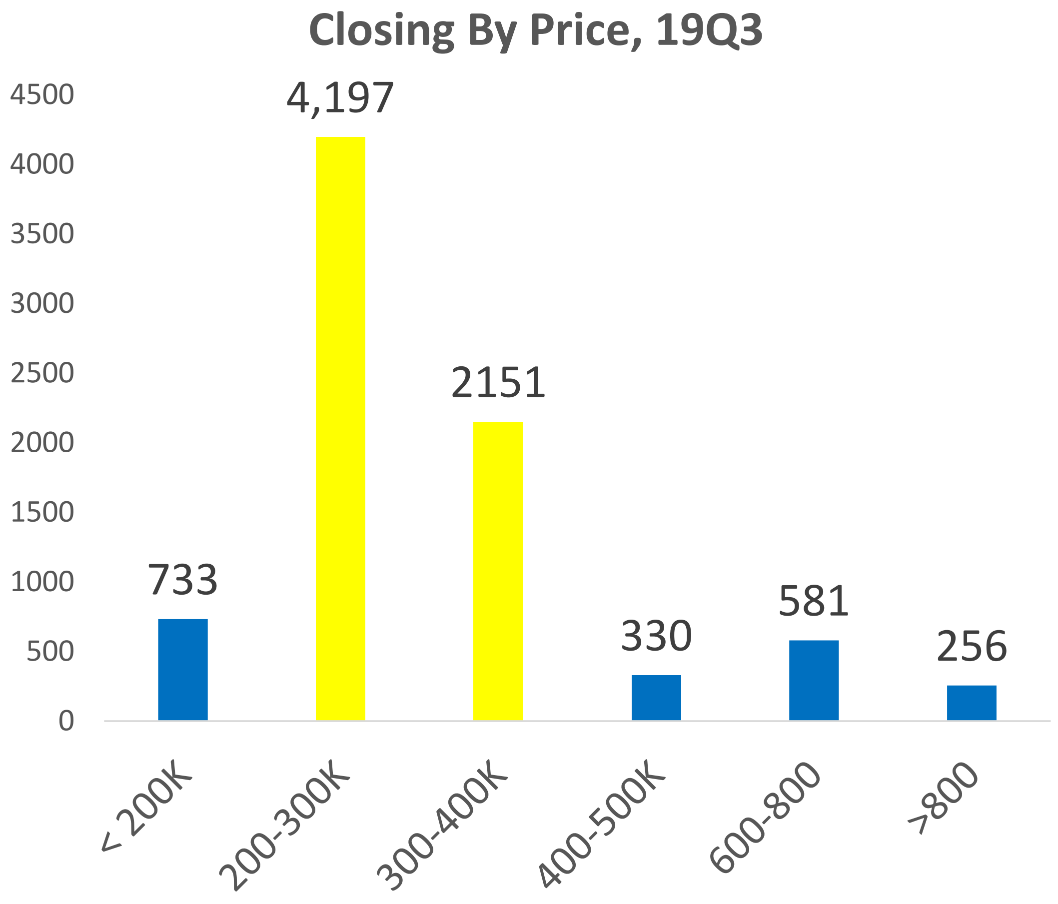
Local Single-Family Permits Held Up Better than the U.S in 2018 Then Turn Nicely Up Over the Summer

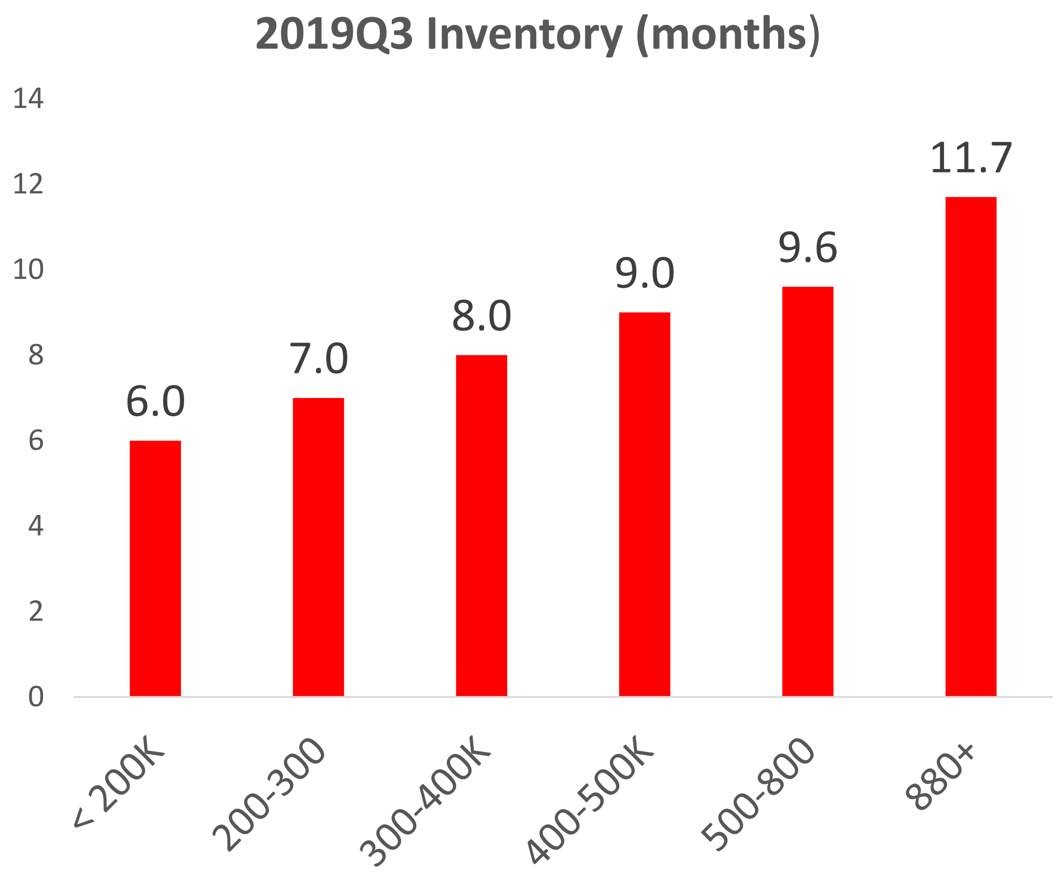
(monthly permits at annual rates, s.a.)



Houston metropolitan area permits, FRED St Louis Fed

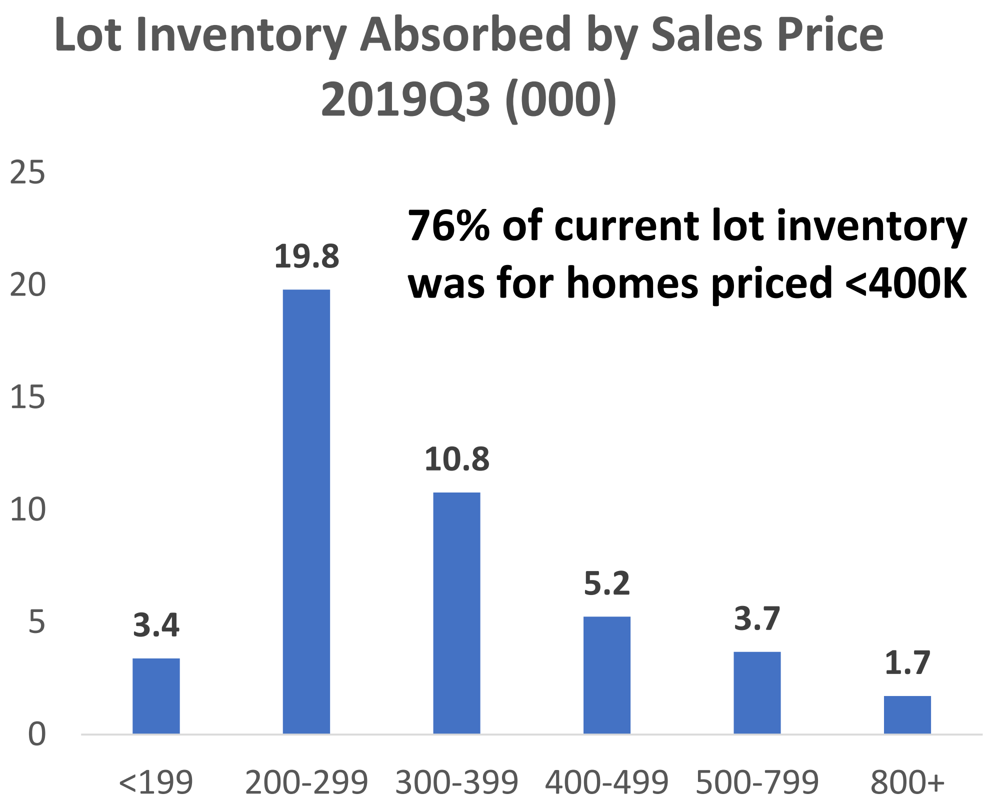
New Home Sales in Houston Are Still Strong at the Entry-Level and Prices Just Above

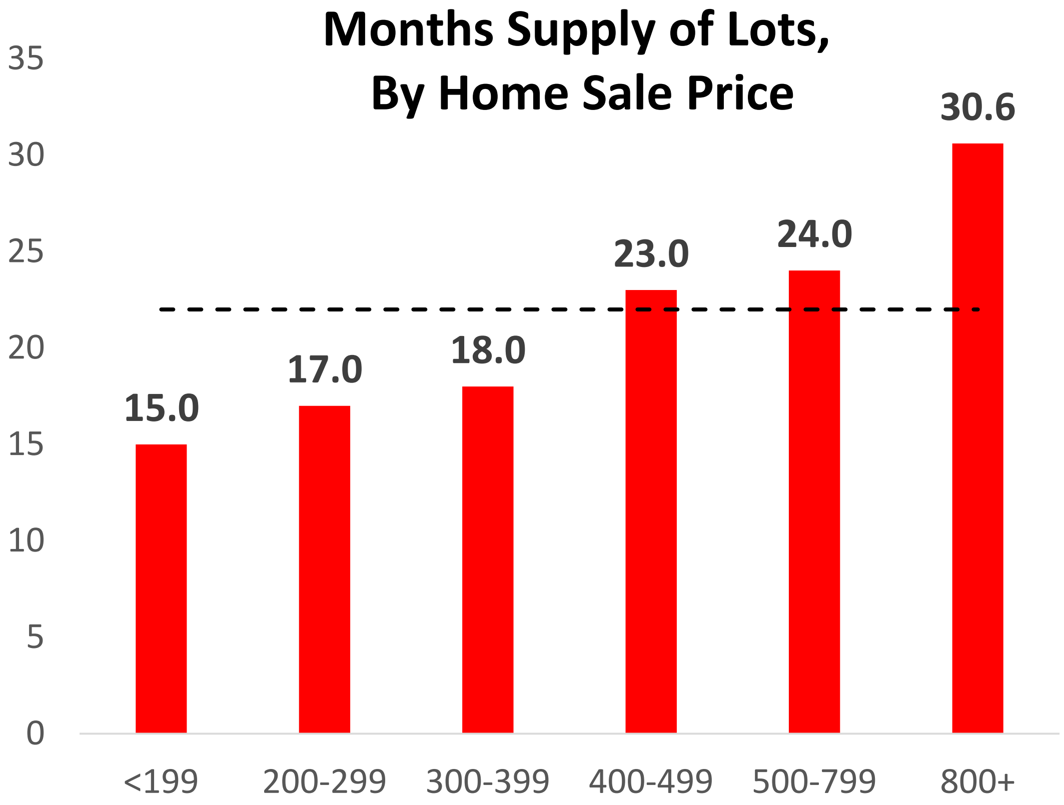




Metrostudy

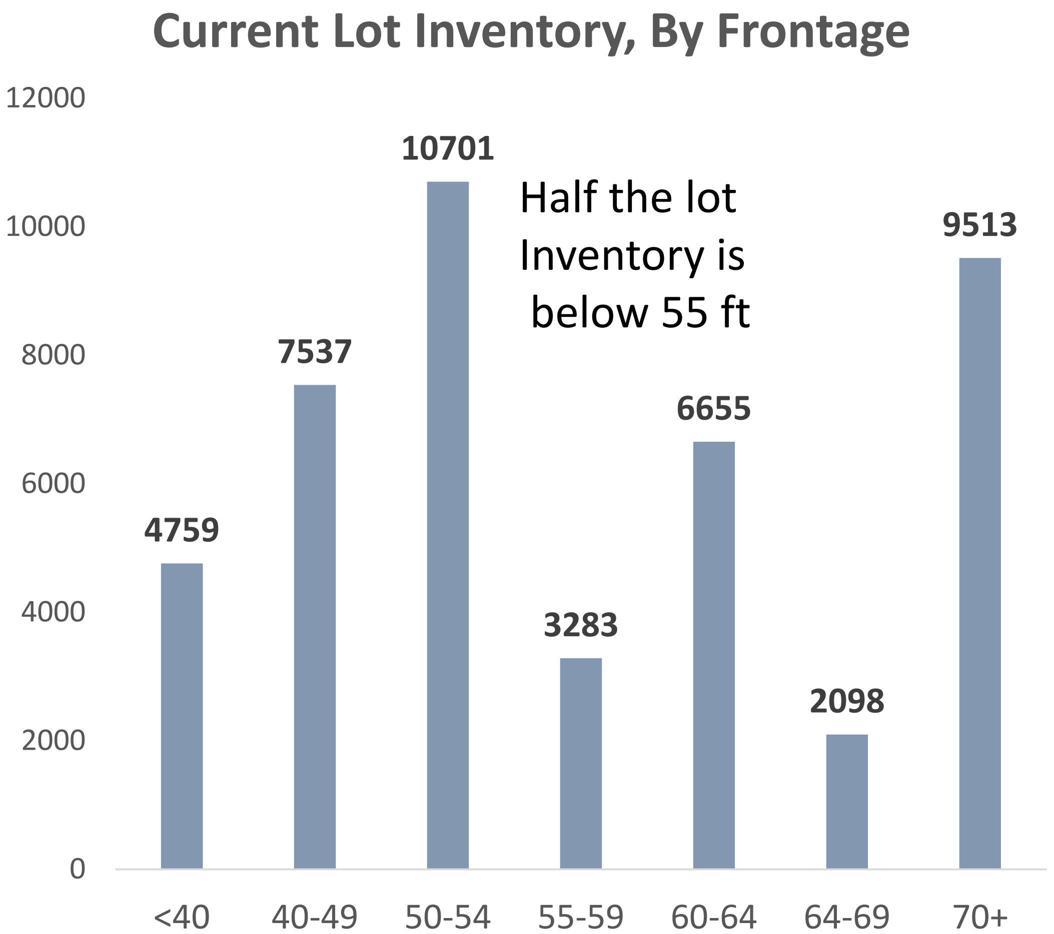
Entry-Level Homes and Those Priced Just Higher Make the Market for Lot Demand



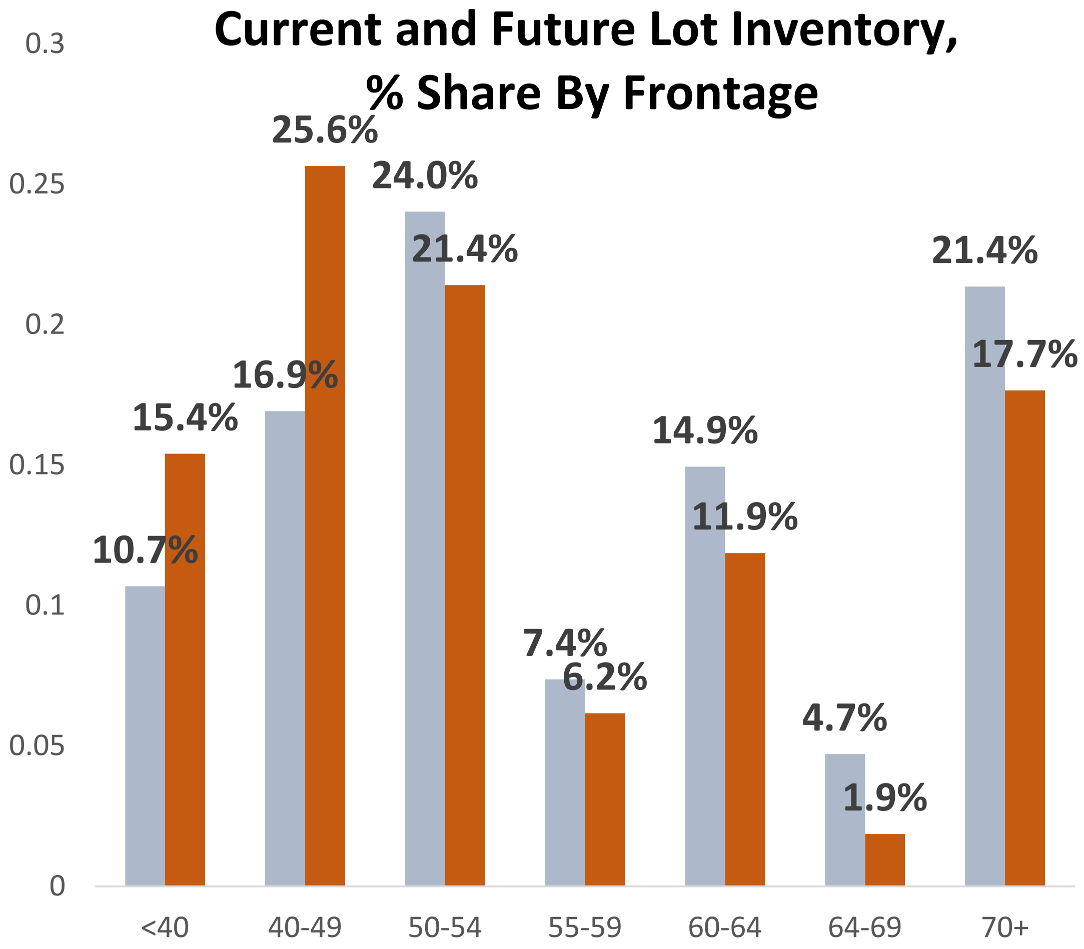


Metrostudy

Current Lot Inventory Focused on Smaller Lots, Future Inventory Even More So

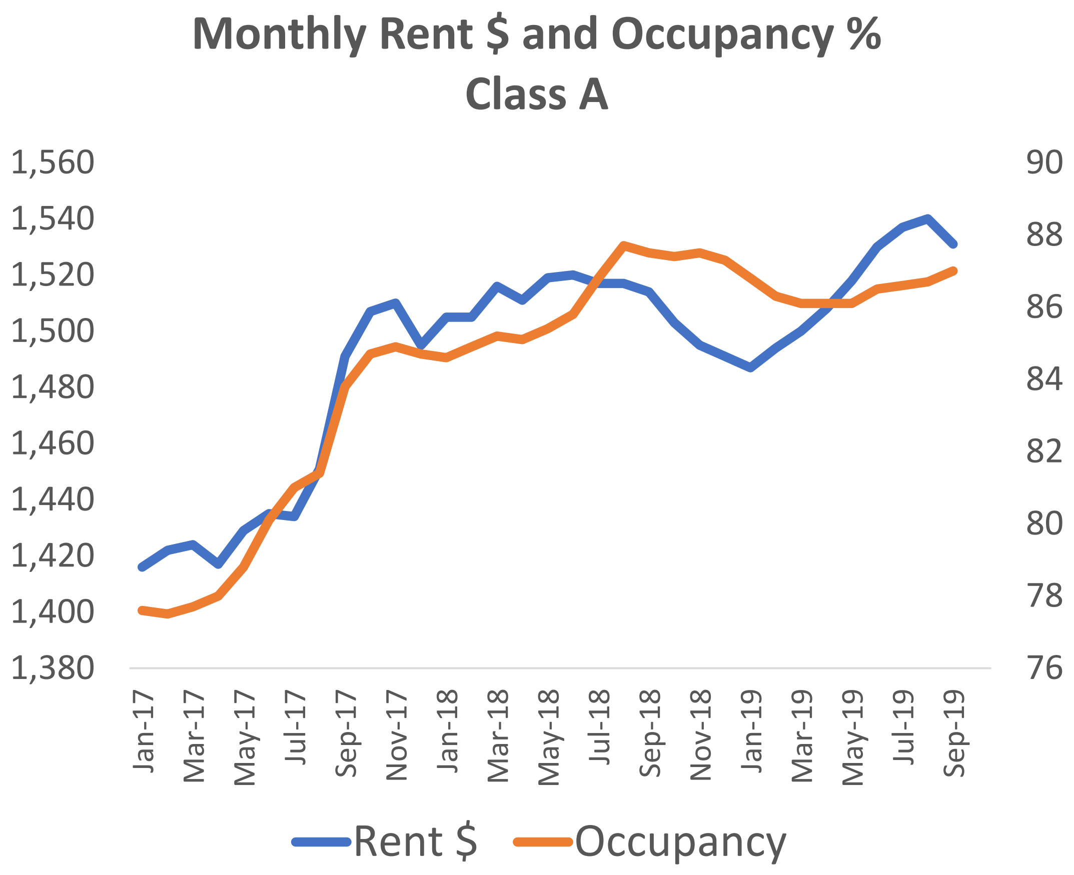


Metrostudy



Houston’s Apartment Market:
Has Construction Pulled Back in Time?

Both Rent and Occupancy Briefly Staggered with Harvey Exodus in 2018, Then Recovered



- A combination of good job growth and Harvey-driven renters pushed up occupancy and rents in 2018
- The Harvey-tenant exodus in late 2018 saw both rents and occupancy sag
- We see nice recovery in 2019. But will high levels of construction led by Harvey's high but temporary occupancy and rents push these figures back down again?

Apartment Rents and Occupancy Look Healthy in Class A in Late 2019

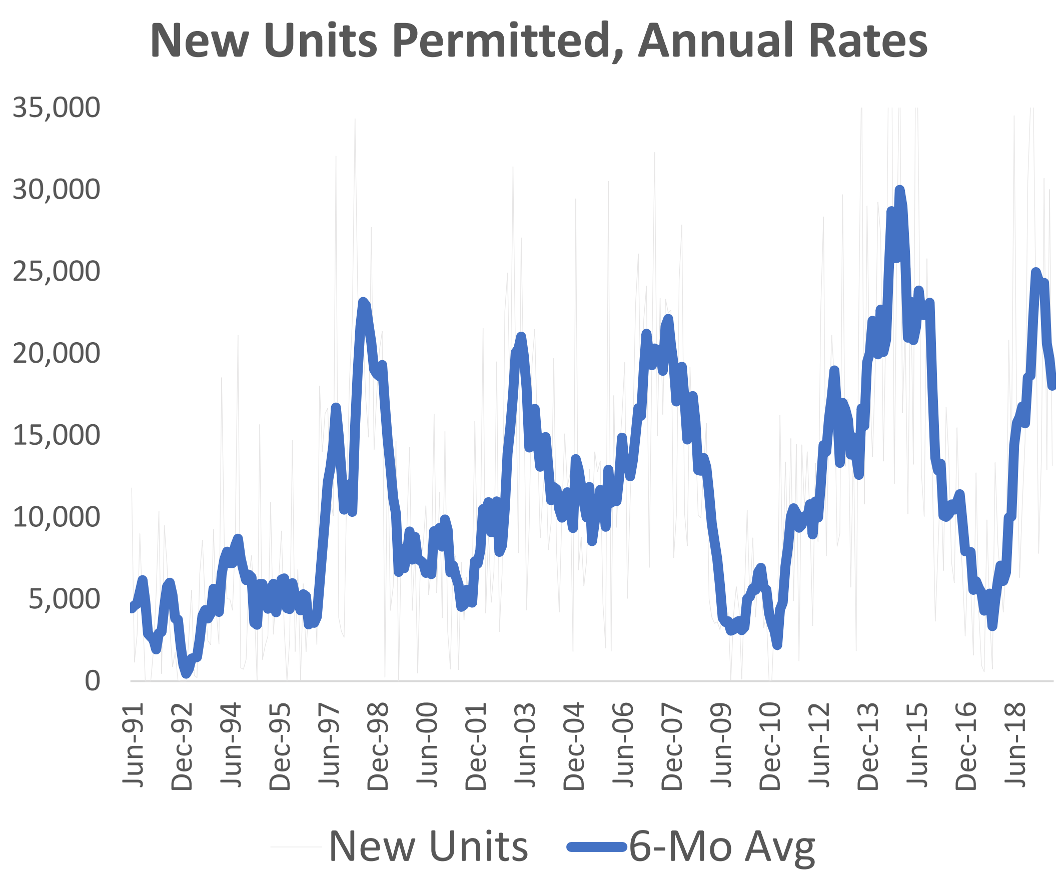
Class A Rents and Occupancy After Harvey		
	2018	**2019**
Absorption First nine months	8,300	7,562
Monthly Rent September	$1,514	$1,531
Occupancy September	87.5%	87.0%

Apartment Data Services through September 2019

- Even after the give-back from Harvey renters in late 2018, the apartment market occupancy and rents are holding up well at present
- Harvey move-outs came late in 2018, resulted in net absorption of only 848 units in the last quarter. This year should see absorption easily pass 2018
- Monthly rent remained basically unchanged over the last 12 months: $1,514 versus $1,531. Occupancy is 87.0%, down from only 87.5% last year
- Leasing incentives remain limited in 2019, often a marketing ploy

Have We Over-Built the Apartment Market? How May Jobs Will We Have?

- *How many units do we need? Absorb one unit for each five jobs*
  - 50,000 jobs = 10,000 units
  - 60,000 jobs = 12,000 units
  - 70,000 jobs = 14,000 units
  - 80,000 jobs = 16,000 units
- *What is being built?*
  - Recently opened = 12,817
  - Under construction = 22,319
  - Proposed = 28,779
- *Permit data indicates construction is now pulling back*, but still running above trend growth



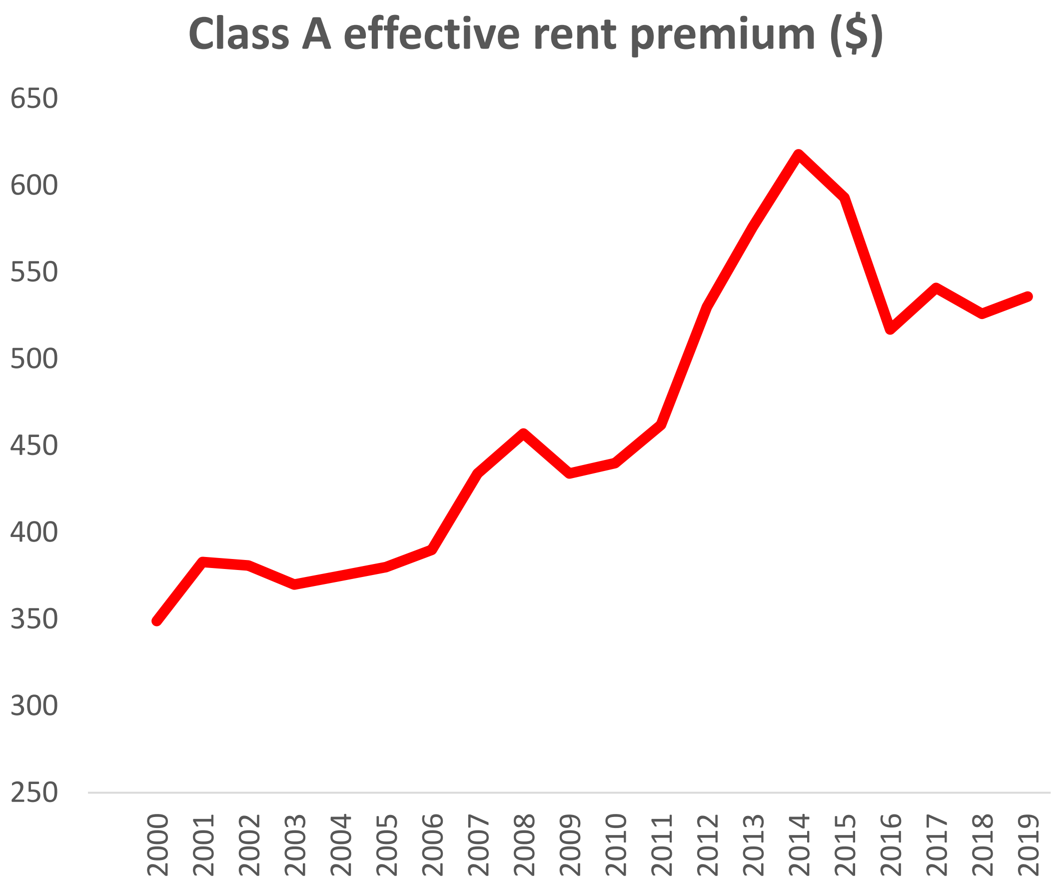
Given Current Apartment Construction Trends

Need 70,000 or More Jobs to Keep Occupancy and Rent Stable

	Absorption	Occupancy 2020 (%)		Change in Rent
New Jobs in 2020	New Units	Class A	Total	Class A
50,000	10,000	84.7	89.6	-$19
60,000	12,000	85.9	89.9	-$9
70,000	14,000	87	90.2	$0
80,000	16,000	88.1	90.5	$5
Recession	4,000	81.3	88.3	-$52
Current 2019	---	87	90.4	---

Apartment Data Services, Calculations of IRF, effects of a 2020-21 recession will mostly be felt in 2021. Only the second half of 2020 is affected.

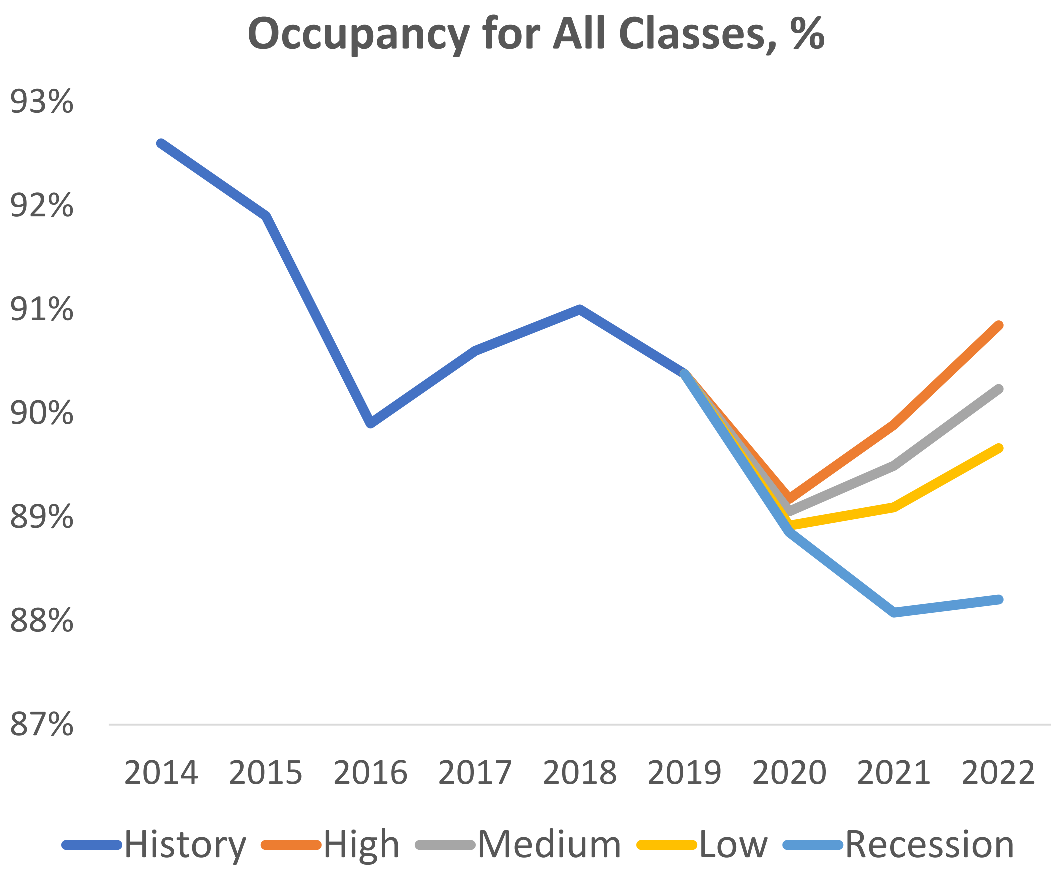
Since the End of the Fracking Boom, the Class A Rent Premium Is Stable



CoStar

- Past 2020, future occupancy and rents are hard to see. It depends on developer decisions on future building
- Over-building creeps through the market as occupancy falls. Class A units then cut rents to pull tenants out of Class B and C. Rents fall in B and C.
- Shortage of Class A units? Raise rents to push some tenants into B and C, and rents rise in B and C as well
- Lets just suppose that developers make the "right" decision by following our forecast of employment and population

Well-Behaved Construction and Moderate Growth Would Mean Good Health by 2022

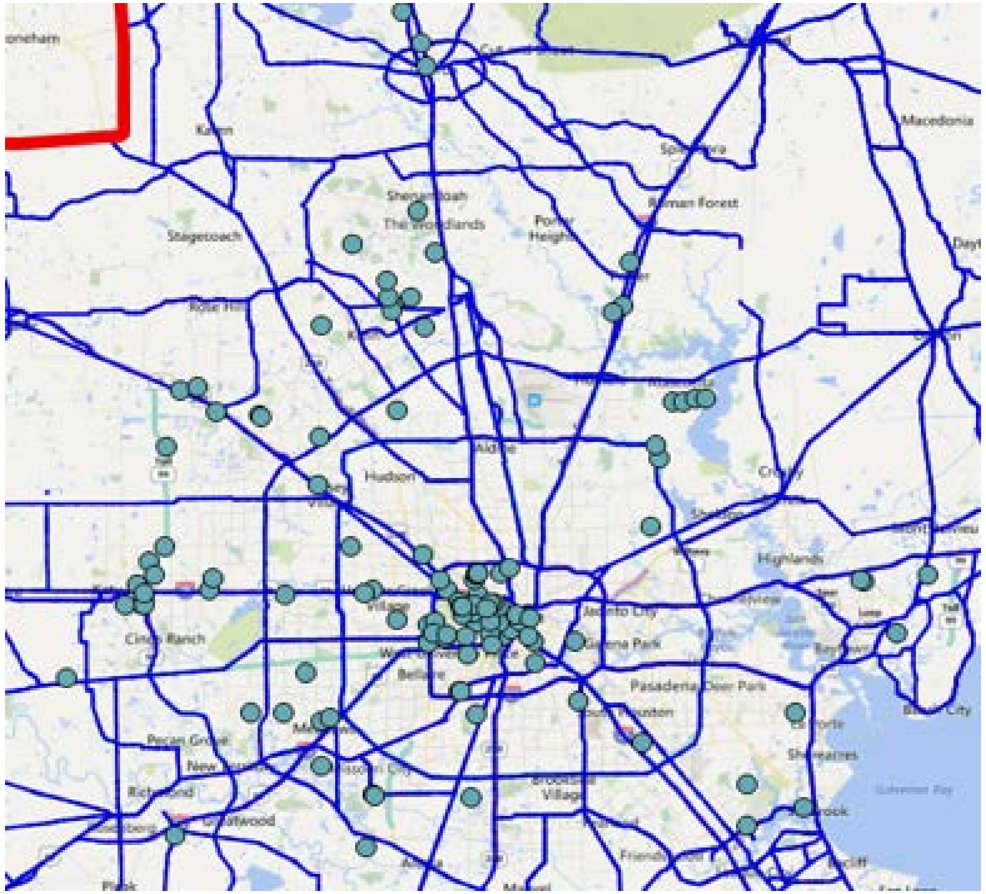


CoStar, calculations of IRF

- Assume we just finish out everything in the current construction pipeline – and nothing else. Then growth matches expectations for job and population growth
- The swings in occupancy would be much bigger in Class A where most new product enters the market
- Even so, the medium forecast works back to marketwide 90% occupancy only by 2022
- The recession has its main impact in 2021 with occupancy falling to 88.1% and followed by slow recovery

Apartment Construction Pushes Into the Suburbs

- Apartment construction is concentrated inside the west side of the 610 Loop as always, but then mostly skips past Belt 8 to the suburbs
- Still relatively little development out I-10 and the Energy Corridor
- There is limited development to the east, but a surge of suburban development on the far west side of Houston
- Much of the suburban construction is following the Grand Parkway, but it has also pushed into the southwest to the Missouri City area, for example



Office Still Treading Some Deep Water

Absorption and Deliveries in Lockstep Until 2015 When the Boom Ended

Absorption Stumbled in 2015 (Million ft^2)

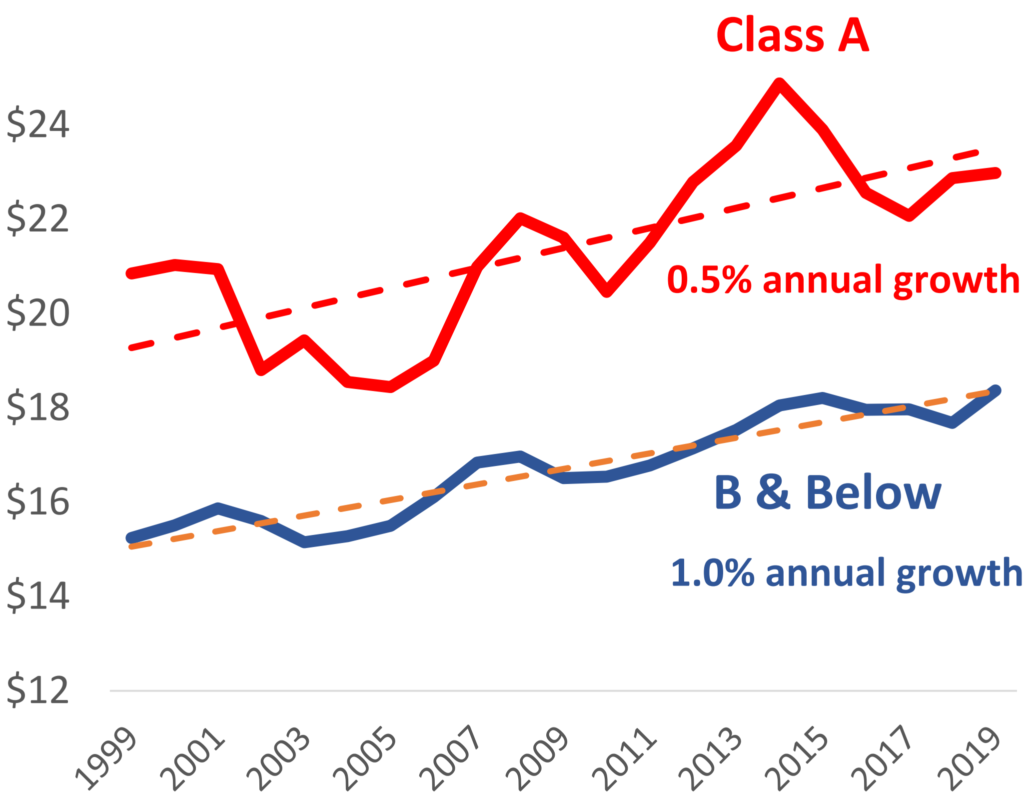
	Deliveries	Absorption
2012	2.0	5.0
2013	4.5	4.6
2014	8.1	8.5
2015	12.9	3.7
2016	5.7	-0.1
2017	4.1	-1.4
2018	1.6	1.3

Vacancy (%) Soars After 2015
Never a Meaningful Improvement

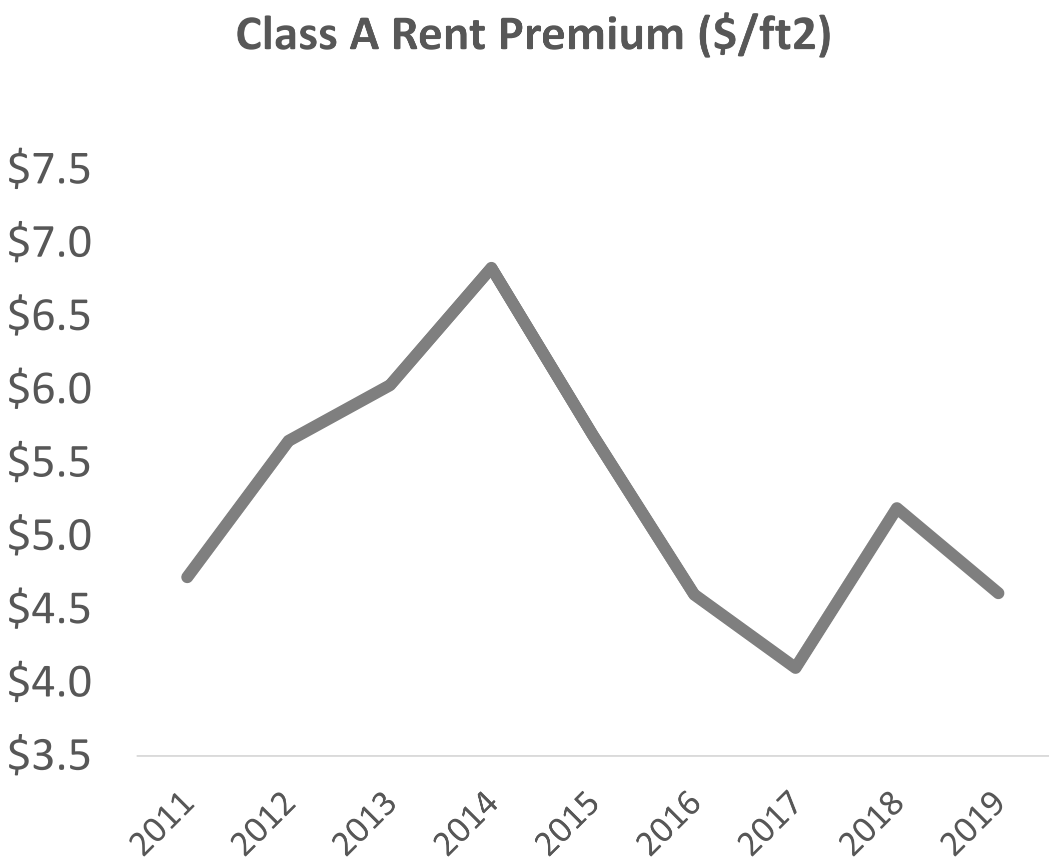
CoStar, calculations of IRF

Growth in Office Rents in Houston Badly Lags 2.2% Annual CPI Inflation

Class A Rents ($/ ft²) Show Boom to Bust
Rents Run Below Trends for Class A

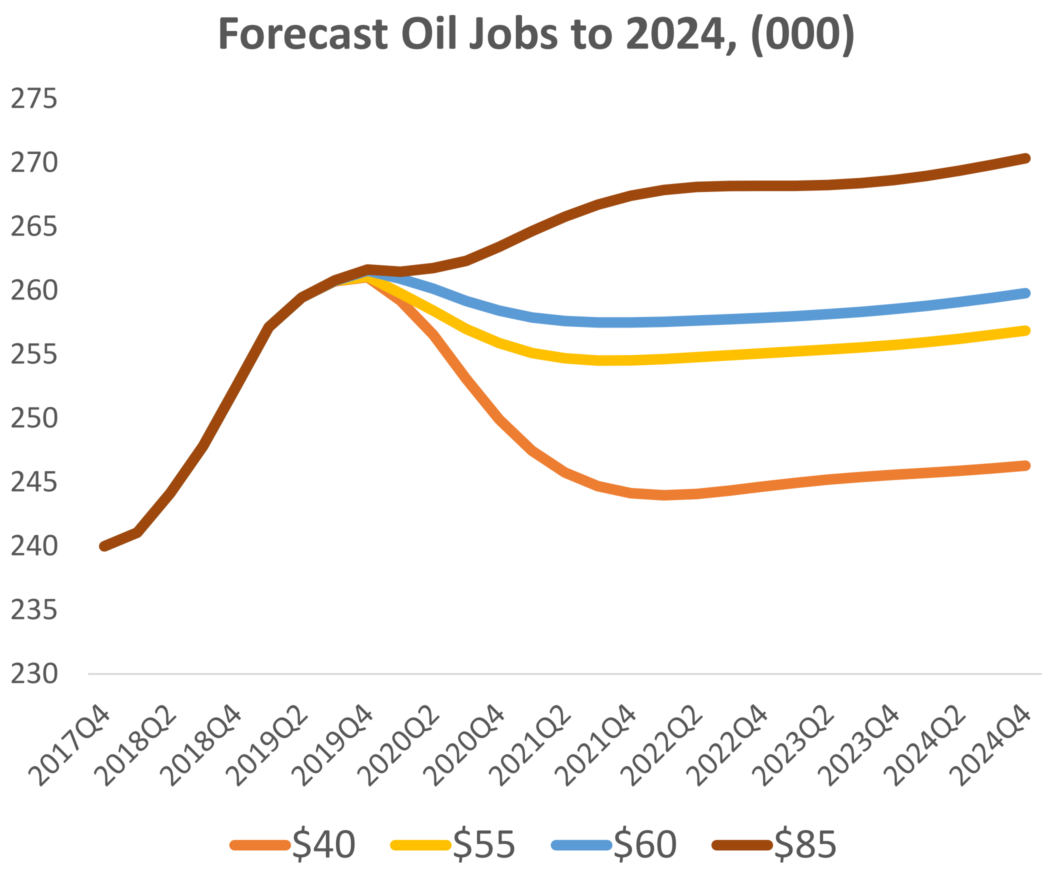


Squeeze on Class A Rents Continues



CoStar, calculations of IRF

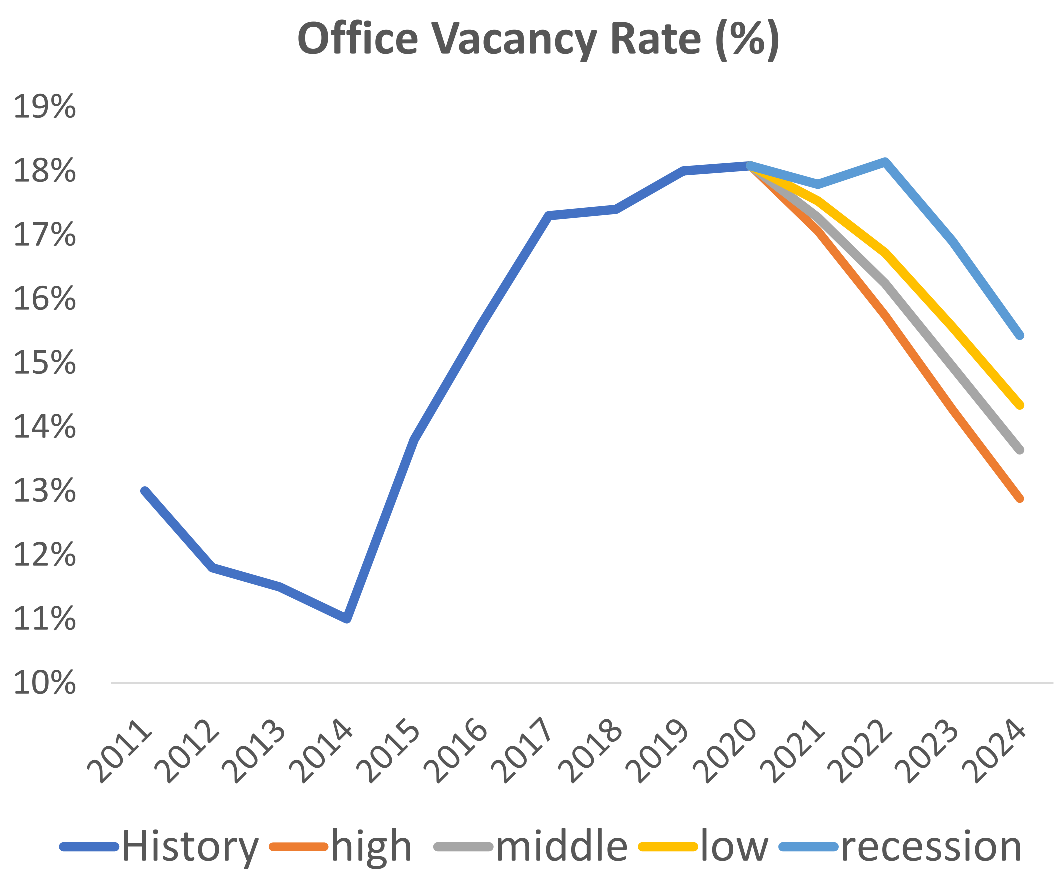
The Oil Boom Created the Office Glut, But Is an Unlikely Savior Right Now



- The oil-price bust of 2015-16 was the root cause of the office glut we are working our way through. Can oil turn things around?
- Probably not. Oil is not going back to $100 per barrel soon. The current credit crunch again drives high levels of de-listings, bankruptcies, and mergers
- Of the 13 local buildings with 100,000 square feet of space for sublet, all are energy companies
- Of the 8 buildings under construction, none are directly tied to oil and gas

Without Oil's Help and Only General Population Growth, Office Recovery Is Slow and Partial

- This forecast is not based on energy recovery, but general population growth in Houston
- It is the vacancy rate for all classes of offices, and currently stands near 18%
- It is a long, slow and partial recovery if 10% is where Houston begins to build again
- A recession simply slows everything down by another couple of years



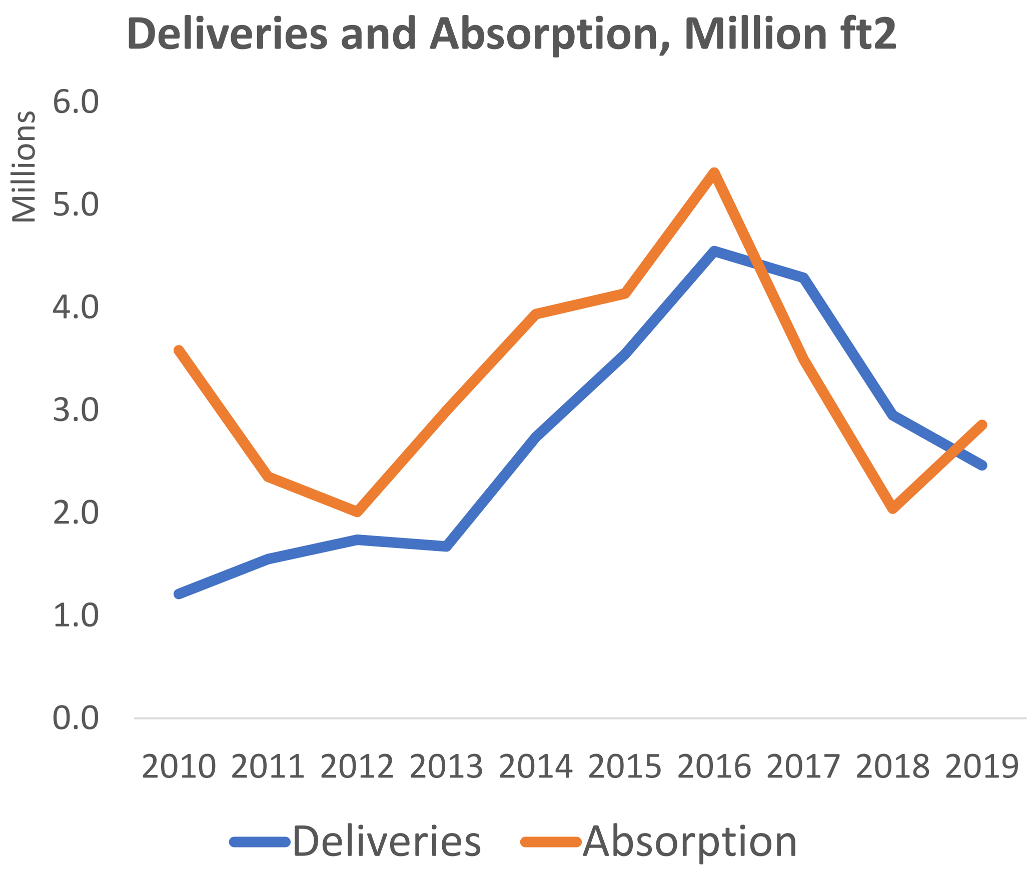
Hundreds of Millions Are Being Spent for New Office Buildings and Refurbishment

- Two Premium A/A+ buildings in the CBD are changing the downtown landscape
  - Capitol Tower/Bank of America: 778,000 square feet, 86% preleased, delivered 2019Q2
  - Texas Tower: CBD, 1.1 million square feet, 35% preleased, deliver 2021Q3
  - The higher quality, better amenities and superior floor plans of new buildings are bringing a flight to quality by existing tenants in older buildings
- In response, major renovations are underway in many 1980s era buildings as they try to compete by upgrading their product: Heritage Plaza, Houston Center, Allen Center, Total Plaza, 717 Texas, and others
- There are seven other buildings of 100,000 square feet or more under construction in metro Houston that will deliver about 1.5 million square feet. Most are in the suburbs: Kingwood, Katy, and the Woodlands

Various reports

Steady and Balanced Retail Growth

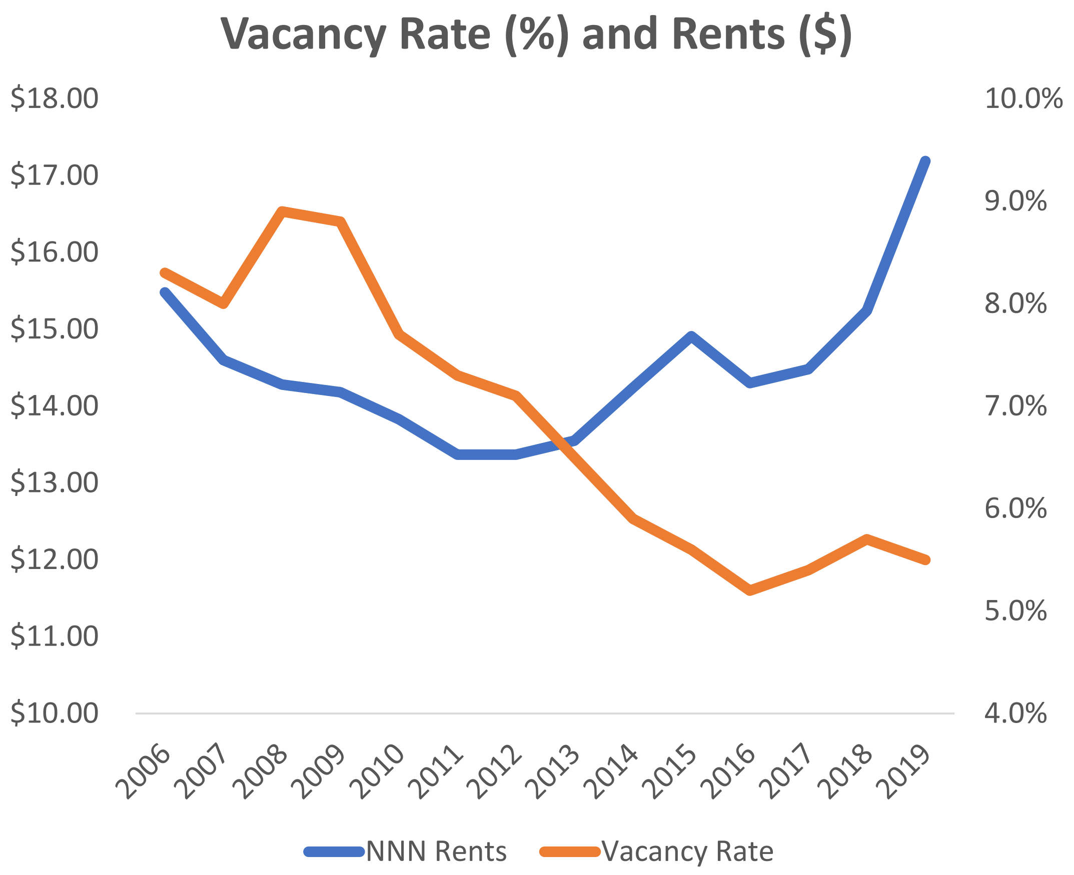
A Cautious Retail Market in 2019



CoStar

- For the last decade, Houston's retail deliveries and absorption have remained balanced, with absorption leading the way
- Much of the construction surge in 2014 and 2017 was tied to the build-out of the Grand Parkway
- Vacancies through 2019Q3 averaged 5.5%, and have hovered between 5.2% and 5.7% since 2016
- Despite a tight market, and rising rents, developers have been very cautious in building new space

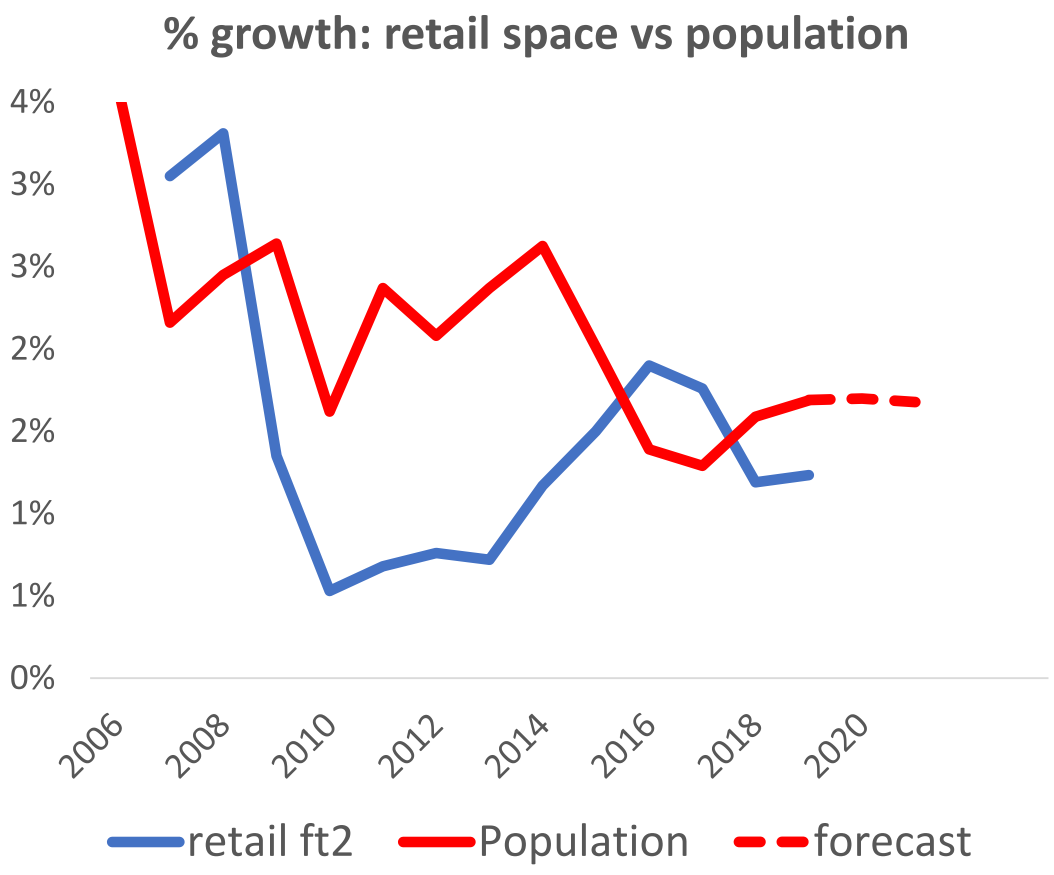
Sharp Increases in *Reported Asking Rents* in 2018 and 2019

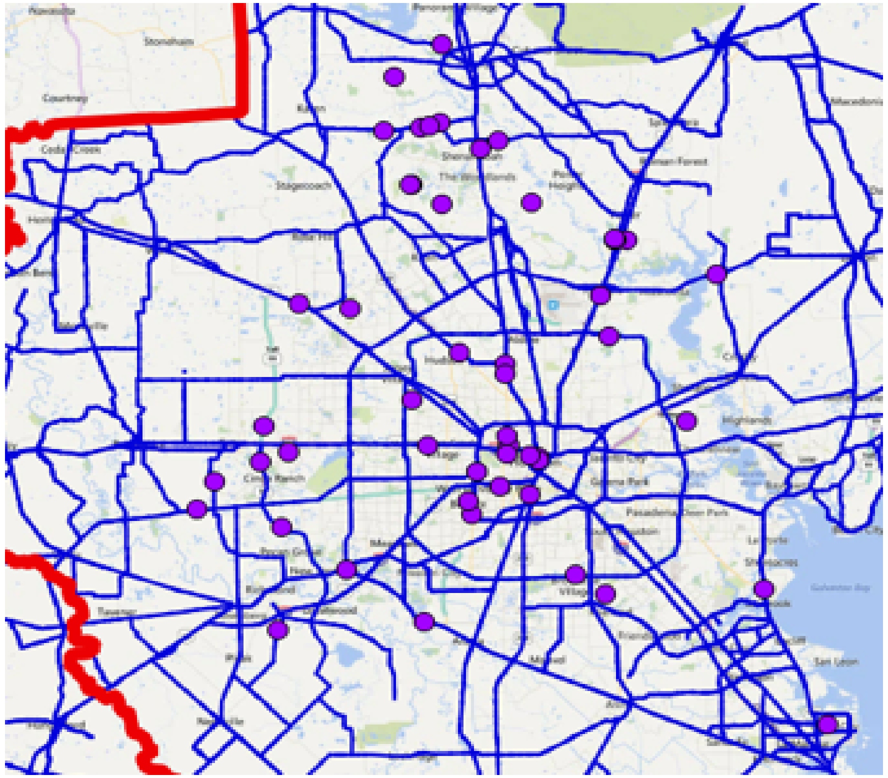


CoStar, NAI Partners, Calculations of IRF

- CoStar reports vacancy rates that have stabilized near 5.5%, while rents have risen sharply
- For the metro area, NNN asking rents were up 5.2% in 2018 and an even stronger 12.8% in 2019
- The biggest rent increase by far was in the Southwest (59/69), followed by the Southeast (225E), the Inner Loop, South (288), and the Northwest (290)
- The suburbs dominate many of these retail statistics. The Inner Loop is 65% of rentable footage, but only 7% of recent leasing activity and 11.2% of year-to-date deliveries

Growth of Retail Square Footage Moves In Line With Population and Suburban Growth

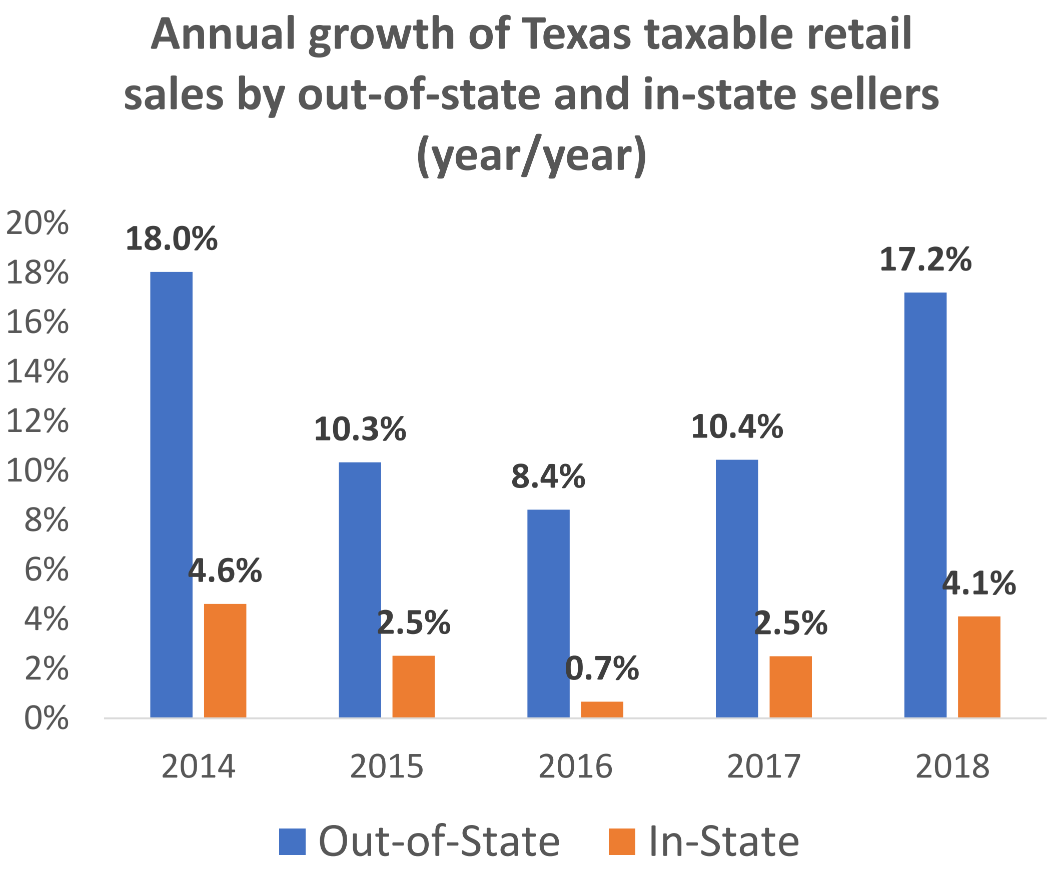




Dots indicated location of retail projects as of this fall

CoStar, calculations of IRF

The Pressure on Brick and Mortar Remains Intense in Texas and Across the U.S.

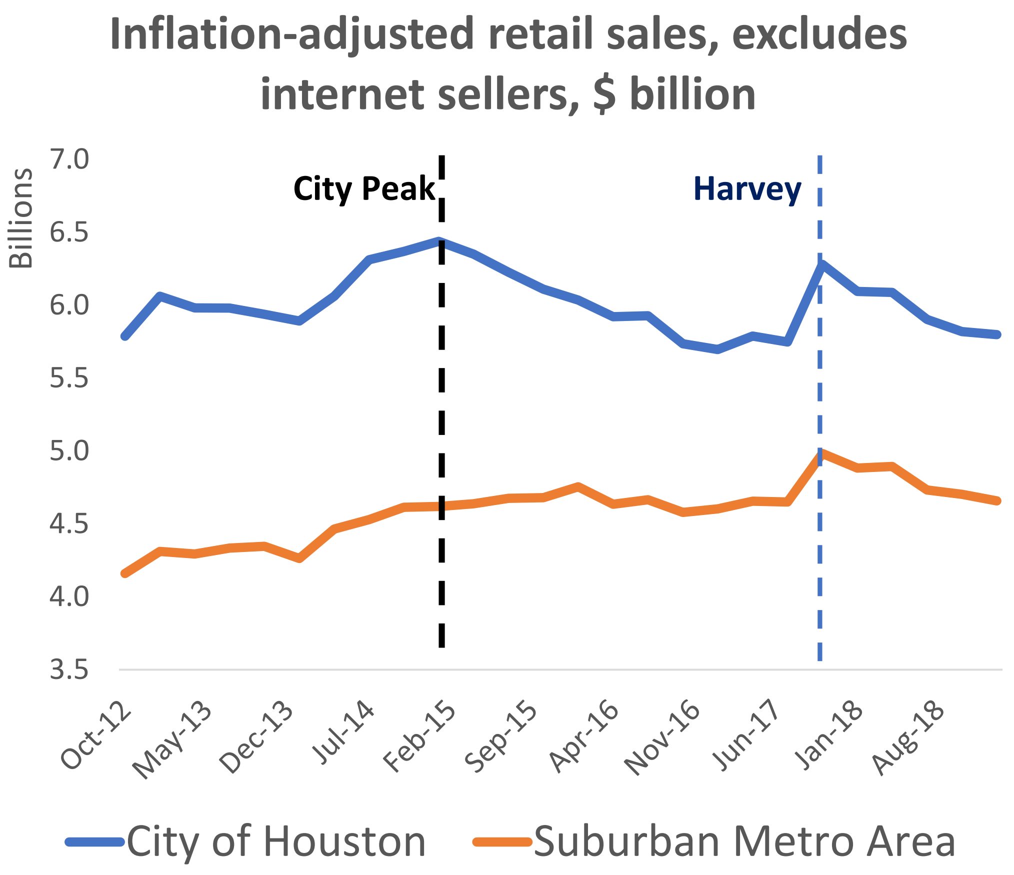


Texas Comptroller

- The growth rate of out-of-state retail sales far exceed in-state growth, and growth continues unabated in 2018. In 2018, remote by catalog, internet, etc. sales were 11.0% of all state retail
- We have seen 8,200 retail outlets close nationwide in 2019 including stores of Payless Shoes, Gap, Victoria's Secret, Abercrombie & Fitch, Family Dollar, Chico's, Gymboree, JC Penney, Sears, Kmart, Charming Charlie, and Charlotte Russe
- 102 million square feet of retail closed in the U.S. in 2017 and another 145 million in 2018. Much the same is expected this year.

Pressure On Brick and Mortar Retail Extends to Houston

- Since peaking in early 2015, inflation-adjusted retail sales in the City of Houston have now declined 9.9%
- Real retail sales in the suburbs peaked in early 2016, and are down 2.0% since then
- Retail growth in metro Houston for several years has been largely confined to strip malls and grocery-anchored shopping centers. They are mostly chasing the new rooftops around the Grand Parkway



Texas Comptroller, Sales and Use Taxes, calculations of IRF

Industrial Set for a Slowdown?

Still an East/West Split in Industrial

- In 2015-16, new industrial space in Houston was driven by two factors: e-commerce and petrochemical expansion. The chemical industry drove warehousing and bagging of plastic pellets, which has now eased back with the chemical buildout completed
- E-commerce boomed -- and continues to boom -- as consumers seek the best of all worlds: wide selection, good prices and free delivery in two days or less. The freeway intersections on the north and northwest side of Houston are important gateways
- Oil briefly bounced back in 2018, and with it the traditional oil-related warehousing and manufacturing activity. This is also mostly found in the Northwest. The falling rig count and oil-related credit crunch have slowed this sector again
- The Port of Houston adds to logistic activity with booming inbound container activity, with imports and exports exceeding 2 million units ANNUALLY since 2018. Key drivers are the wider Panama Canal, and large retailers like Walmart looking for a hedge against continuing labor strife at LA-Long Beach

Warehouse and Distribution Dominate Recent Industrial Deliveries and Construction

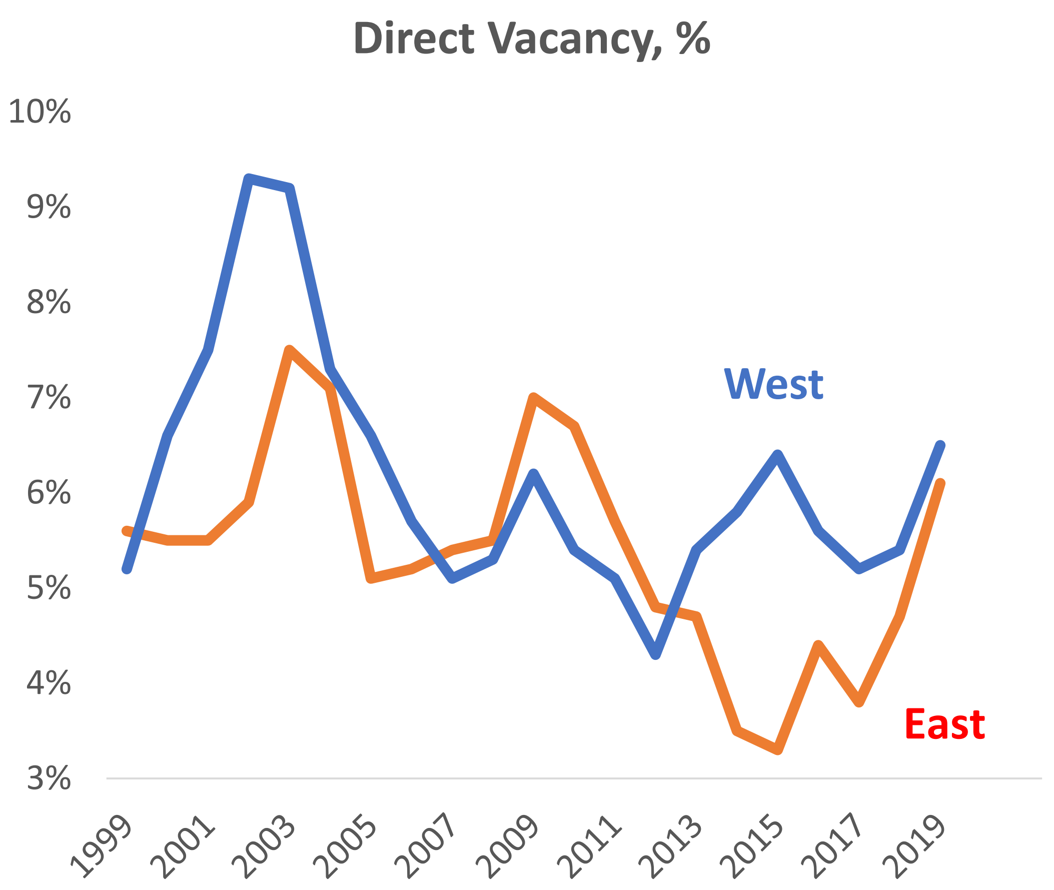
- Metrowide warehouse and distribution makes up 76.9% of industrial inventory, but over 92 percent of recent deliveries or current construction
- Some industrial activity in the north and northwest are the main exceptions that pull the numbers down from over 90 percent
- The warehouse square footage under construction is concentrated in the North and Northwest (a combined 50.1%) and in the Southeast (30.5%)
- It is still about logistics, whether chemicals or e-commerce

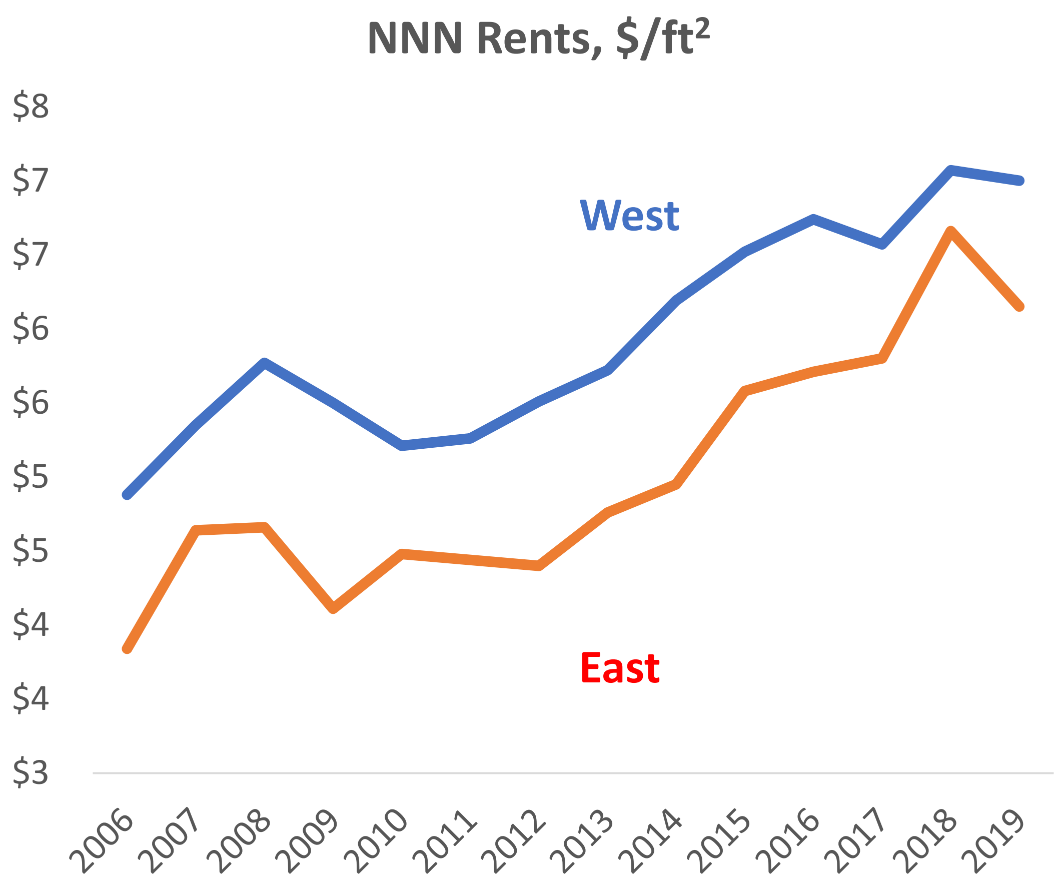
Percent Share of Warehouse/Dist'n Space

Area	Inventory Warehouse	2019 Deliveries	Under Construction
Metro	76.9%	93.5%	92.3%
North	77.4%	93.4%	82.1%
Northwest	60.8%	88.1%	97.3%
Southeast	80.6%	99.6%	99.6%
Southwest	73.1%	96.1%	97.9%
Other	77.5%	89.1%	100.0%

Warehouse/distribution data from NAI Partners

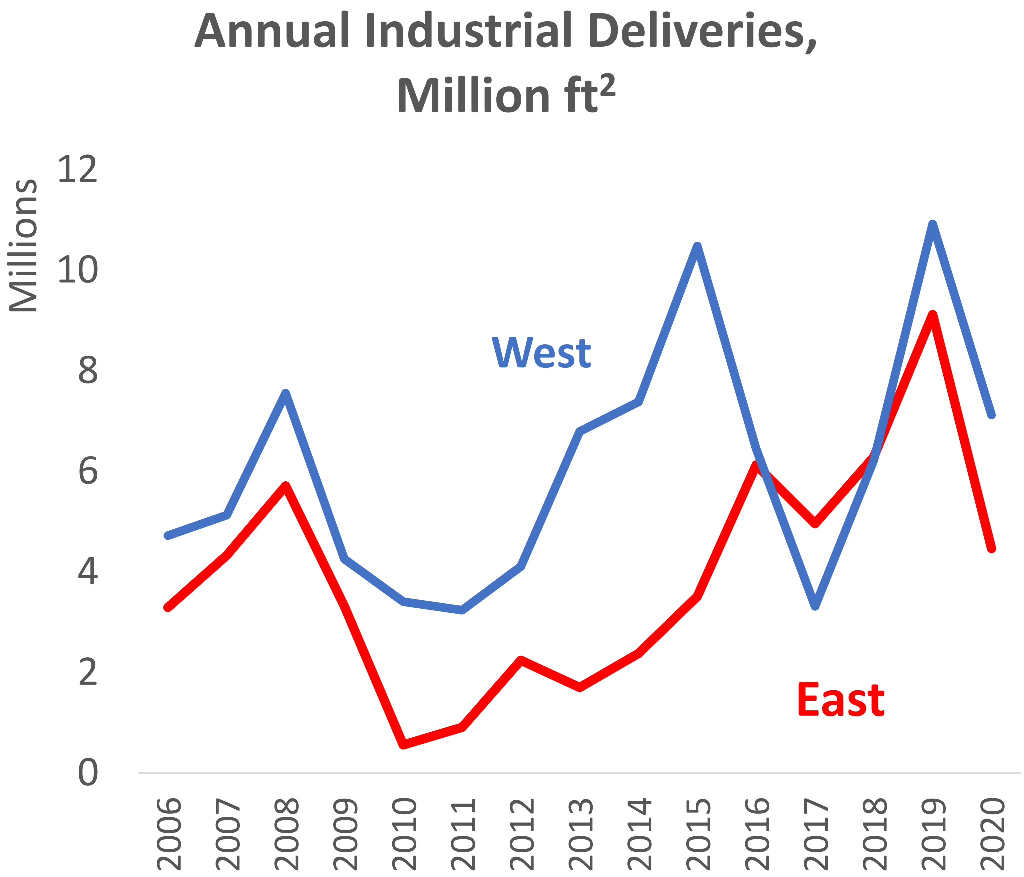
Industrial Vacancy Rates Rising and Rents Falling Throughout the Houston Metro

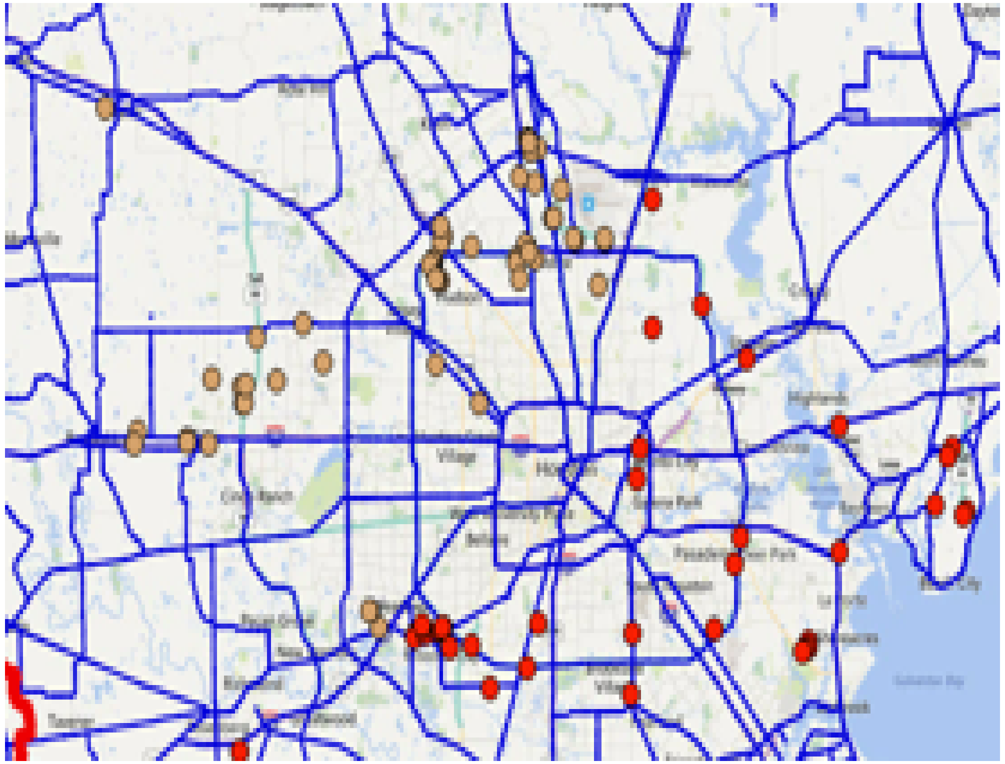




CoStar, calculations of IRF

Work in the Industrial Pipeline Down By Half on the East Side and One-Third in the West



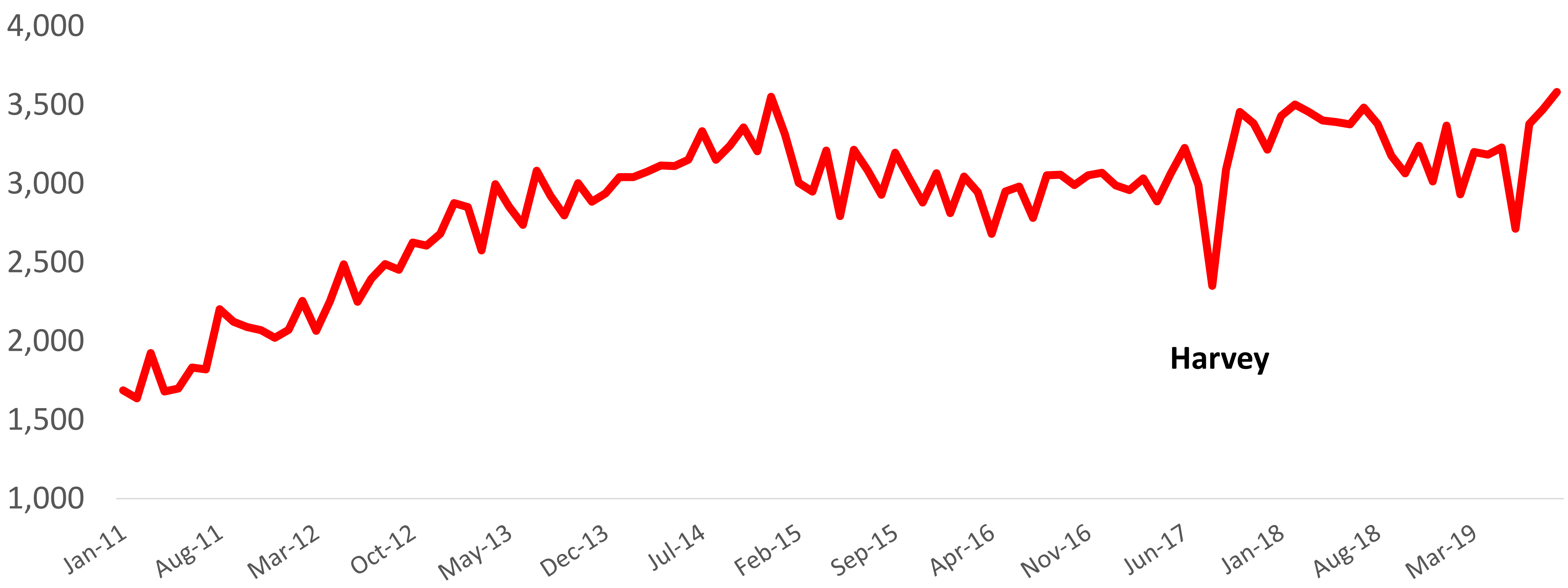


Each dot an on-going construction project

CoStar, calculations of IRF, 2020 deliveries are only the announced projects through 2019Q3.
Construction projects greater than 20,000 square feet

Local Single-Family Permits Held Up Better than the U.S in 2018 Then Turn Nicely Up Over the Summer

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



Houston metropolitan area permits, FRED St Louis Fed

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