Follow me on Twitter @pnjankowski
<table>
<thead>
<tr>
<th>Sector</th>
<th>Jobs Lost Dec ’14 – Dec ’16</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exploration &amp; Production</td>
<td>-5,400</td>
<td>-9.9%</td>
</tr>
<tr>
<td>Oil Field Services</td>
<td>-19,600</td>
<td>-35.1%</td>
</tr>
<tr>
<td>Fabricated Metal Products</td>
<td>-12,100</td>
<td>-18.3%</td>
</tr>
<tr>
<td>Equipment Manufacturing</td>
<td>-18,600</td>
<td>-30.7%</td>
</tr>
<tr>
<td>Engineering</td>
<td>-11,700</td>
<td>-15.4%</td>
</tr>
<tr>
<td>Total Losses</td>
<td>-67,400</td>
<td>-21.5%</td>
</tr>
</tbody>
</table>

Source: Texas Workforce Commission
<table>
<thead>
<tr>
<th>Sector</th>
<th>Jobs Lost</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wholesale Trade</td>
<td>-3,800</td>
<td>-3.1%</td>
</tr>
<tr>
<td>Transportation Services</td>
<td>-2,400</td>
<td>-1.7</td>
</tr>
<tr>
<td>Employment Services</td>
<td>-6,800</td>
<td>-8.1</td>
</tr>
<tr>
<td><strong>Total Losses</strong></td>
<td><strong>-13,000</strong></td>
<td><strong>-3.2%</strong></td>
</tr>
</tbody>
</table>

Source: Texas Workforce Commission
<table>
<thead>
<tr>
<th>Sector</th>
<th>Jobs Gained Dec ’14 – Dec ’16</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hotels, Restaurants, Bars</td>
<td>+30,600</td>
<td>+11.8%</td>
</tr>
<tr>
<td>Health Care</td>
<td>26,500</td>
<td>8.7</td>
</tr>
<tr>
<td>Public Education</td>
<td>13,500</td>
<td>5.7</td>
</tr>
<tr>
<td>Retail Trade</td>
<td>19,700</td>
<td>6.4</td>
</tr>
<tr>
<td>Services to Buildings</td>
<td>5,900</td>
<td>12.3</td>
</tr>
<tr>
<td><strong>Total Gains</strong></td>
<td><strong>+96,200</strong></td>
<td><strong>+8.3%</strong></td>
</tr>
</tbody>
</table>

Source: Texas Workforce Commission
“Hurricane Oil” is now in the rearview mirror.
NYMEX WTI Spot Price

Wednesday Close = $52.42/barrel

Source: U.S. Energy Information Administration
Source: Baker Hughes
Above 50 = Expansion, Below 50 = Contraction

Source: Institute for Supply Management - Houston
Regional Employment, Net Change

12-Month Running Totals

Source: Texas Workforce Commission
Regional Employment, Net Change

12-Month Running Totals

Jobs, 000s

Source: Texas Workforce Commission
How much damage was done?
Gross Domestic Product – Metro Area

$ Billions

<table>
<thead>
<tr>
<th>Year</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>'06</td>
<td>352.0</td>
</tr>
<tr>
<td>'07</td>
<td>391.9</td>
</tr>
<tr>
<td>'08</td>
<td>415.1</td>
</tr>
<tr>
<td>'09</td>
<td>374.1</td>
</tr>
<tr>
<td>'10</td>
<td>401.1</td>
</tr>
<tr>
<td>'11</td>
<td>441.2</td>
</tr>
<tr>
<td>'12</td>
<td>469.9</td>
</tr>
<tr>
<td>'13</td>
<td>504.7</td>
</tr>
<tr>
<td>'14</td>
<td>522.0</td>
</tr>
<tr>
<td>'15</td>
<td>503.3</td>
</tr>
</tbody>
</table>

Source: U.S. Bureau for Economic Analysis
<table>
<thead>
<tr>
<th>Rank</th>
<th>Metro Area</th>
<th>$ Billions</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>New York</td>
<td>1,602.7</td>
</tr>
<tr>
<td>2</td>
<td>Los Angeles</td>
<td>930.8</td>
</tr>
<tr>
<td>3</td>
<td>Chicago</td>
<td>640.7</td>
</tr>
<tr>
<td>4</td>
<td>Houston</td>
<td>503.3</td>
</tr>
<tr>
<td>5</td>
<td>Washington, D.C.</td>
<td>491.0</td>
</tr>
<tr>
<td>6</td>
<td>Dallas-Fort Worth</td>
<td>485.7</td>
</tr>
<tr>
<td>7</td>
<td>San Francisco</td>
<td>431.7</td>
</tr>
<tr>
<td>8</td>
<td>Philadelphia</td>
<td>411.2</td>
</tr>
<tr>
<td>9</td>
<td>Boston</td>
<td>396.5</td>
</tr>
<tr>
<td>10</td>
<td>Atlanta</td>
<td>339.2</td>
</tr>
</tbody>
</table>

Source: U.S. Bureau of Economic Analysis
Total Wages Paid, Second Quarter

$ Billions

Q2/10 $36.3  Q2/11 $37.8  Q2/12 $39.9  Q2/13 $41.7  Q2/14 $43.8  Q2/15 $44.9  Q2/16 $43.9

Source: Texas Workforce Commission

* ’16 Constant Dollars
Metro Retail Sales w/o Gasoline

4-Quarter Moving Total

Source: Texas Comptroller of Public Accounts
The recovery has begun.
What Will the Recovery Look Like?
What Will the Recovery Look Like?

Quick Rebound

Slow, Gradual Rebound

Wide Bottom, Then Quick Rebound
What Will the Recovery Look Like?

- **Quick Rebound**
- **Slow, Gradual Rebound**
- **Wide Bottom, Then Quick Rebound**
Energy still losing money
<table>
<thead>
<tr>
<th>Exploration</th>
<th>EPS</th>
<th>Services</th>
<th>EPS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anadarko</td>
<td>-$1.61</td>
<td>Baker Hughes</td>
<td>-1.00</td>
</tr>
<tr>
<td>Apache</td>
<td>-1.51</td>
<td>FMC</td>
<td>0.59</td>
</tr>
<tr>
<td>Chevron</td>
<td>0.68</td>
<td>Halliburton</td>
<td>0.01</td>
</tr>
<tr>
<td>ConocoPhillips</td>
<td>-0.84</td>
<td>NOV</td>
<td>-3.62</td>
</tr>
<tr>
<td>EOG</td>
<td>-0.35</td>
<td>Oceaneering</td>
<td>-0.12</td>
</tr>
<tr>
<td>ExxonMobil</td>
<td>0.63</td>
<td>Oil States</td>
<td>-0.22</td>
</tr>
<tr>
<td>Hess</td>
<td>-1.12</td>
<td>Schlumberger</td>
<td>0.13</td>
</tr>
<tr>
<td>Marathon</td>
<td>-0.23</td>
<td>Tesco</td>
<td>-0.47</td>
</tr>
<tr>
<td>Occidental</td>
<td>-0.31</td>
<td>Weatherford</td>
<td>-0.05</td>
</tr>
<tr>
<td>Shell</td>
<td>0.17</td>
<td>Wood Group</td>
<td>-1.98</td>
</tr>
</tbody>
</table>

Source: Securities and Exchange Commission
Still Losing Money

Earning a Profit

- Anadarko
- Baker Hughes
- Wood Group
- Apache
- Hess
- Halliburton
- eog resources
- Marathon
- Oxy
- ConocoPhillips
- Oceaneering
- NOV
- States
- Weatherford
- Tesco
- ExxonMobil
- Chevron
- Schlumberger
- FMC
- Shell
Energy still losing money

30,000+ manufacturing workers unemployed
Houston Manufacturing Employment

Source: Texas Workforce Commission
Energy still losing money
30,000+ manufacturing workers unemployed
Rig count 1/3 its previous peak
Rig Count Remains Low

Rig Count

Peak: 1,931
Current: 729
Difference: 1,202

Source: Baker Hughes
Energy still losing money
30,000+ manufacturing workers unemployed
Rig count 1/3 its previous peak
Office vacancy rate exceeds 20 percent
Office Vacancy Rates

Vacancy Rates:
- Q4/13: 11.3%
- Q1/14: 11.7%
- Q2/14: 12.1%
- Q3/14: 12.5%
- Q4/14: 12.9%
- Q1/15: 13.3%
- Q2/15: 13.7%
- Q3/15: 14.1%
- Q4/15: 14.5%
- Q1/16: 14.9%
- Q2/16: 15.3%
- Q3/16: 15.7%

With Sublease Rates:
- Q4/13: 15.7%
- Q1/14: 16.1%
- Q2/14: 16.5%
- Q3/14: 16.9%
- Q4/14: 17.3%
- Q1/15: 17.7%
- Q2/15: 18.1%
- Q3/15: 18.5%
- Q4/15: 18.9%
- Q1/16: 19.3%
- Q2/16: 19.7%
- Q3/16: 20.9%

Source: CBRE
Energy still losing money
30,000+ manufacturing workers unemployed
Rig count 1/3 its previous peak
Office vacancy rate exceeds 20 percent
Construction winding down
Construction Starts, Metro Area

12-Month Moving Total

$ Billions

Source: Dodge Data and Analytics
Three sectors to cut jobs in ’17.
Still Losing Money

Earning a Profit

- Anadarko
- Baker Hughes
- Wood Group
- Halliburton
- eog resources
- Hess
- Marathon
- Oxy
- ConocoPhillips
- Oceaneering
- States
- Weatherford
- Tesco
- ExxonMobil
- Chevron
- Schlumberger
- FMC
- Shell
Energy

- Still restructuring
- No hiring when losing money

- 3,500 jobs
Energy

- Still restructuring
- No hiring when losing money

- 3,500 jobs

Industry needs $60 oil
Petrochem
Office
Industrial
Residential
Health care
Government
Construction Starts, Metro Area

12-Month Moving Total

Source: Dodge Data and Analytics
- 16,000 jobs

- Petrochem
- Office
- Industrial
- Residential
- Health care
- Government
Information

- Long-term decline continues

- 200 jobs
Where will job growth come from?
Annual Change, Houston MSA Population

Source: U.S. Census Bureau
Gross Domestic Product

- Expected to grow 2% or better in ’17

Employment

- Averaging 180,000 per month
Health Care
Houston Health Care Employment

Jobs, 000s

Source: Texas Workforce Commission
Health Care as % of Total Employment

<table>
<thead>
<tr>
<th>City</th>
<th>'90</th>
<th>'15</th>
</tr>
</thead>
<tbody>
<tr>
<td>Philadelphia</td>
<td>11.0</td>
<td>16.9</td>
</tr>
<tr>
<td>New York</td>
<td>9.7</td>
<td>15.1</td>
</tr>
<tr>
<td>Minneapolis</td>
<td>8.8</td>
<td>14.0</td>
</tr>
<tr>
<td>Los Angeles</td>
<td>7.3</td>
<td>13.7</td>
</tr>
<tr>
<td>Phoenix</td>
<td>8.1</td>
<td>12.2</td>
</tr>
<tr>
<td>Dallas</td>
<td>7.2</td>
<td>10.6</td>
</tr>
<tr>
<td>HOUSTON</td>
<td>7.6</td>
<td>10.4</td>
</tr>
<tr>
<td>Atlanta</td>
<td>6.1</td>
<td>10.4</td>
</tr>
<tr>
<td>Washington</td>
<td>6.2</td>
<td>9.4</td>
</tr>
</tbody>
</table>

Source: U.S. Bureau of Labor Statistics
Health Care

+ 9,800 Jobs
Hotels, Restaurants and Bars
Houston Area Bars and Restaurants

Q2/05  Q2/06  Q2/07  Q2/08  Q2/09  Q2/10  Q2/11  Q2/12  Q2/13  Q2/14  Q2/15  Q2/16

7,184  7,464  8,023  8,082  8,353  8,677  8,950  9,342  9,619  9,939  10,217  10,627

Source: Texas Workforce Commission
Hotels, Restaurants and Bars

+ 8,700 Jobs
Government
Metro Employment

Source: Texas Workforce Commission
Government

+ 6,200 jobs
Retail
Metro Retail Employment

Annual Change, 000s

Source: U.S. Bureau Labor Statistics
Retail

+ 4,500 Jobs
Manufacturing
Local Chemical Plant Completions

Value, Billions

Source: Institute for Regional Forecasting
Manufacturing

+ 3,000 Jobs
'17 Metro Employment Forecast

<table>
<thead>
<tr>
<th>Industry</th>
<th>Employment Forecast</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hotels, Restaurants, Bars</td>
<td>9,800</td>
</tr>
<tr>
<td>Government</td>
<td>8,700</td>
</tr>
<tr>
<td>Administrative Support</td>
<td>6,200</td>
</tr>
<tr>
<td>Retail</td>
<td>4,900</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>4,500</td>
</tr>
<tr>
<td>Educational Services</td>
<td>3,000</td>
</tr>
<tr>
<td>Professional Services</td>
<td>2,400</td>
</tr>
<tr>
<td>Financial Activities</td>
<td>2,400</td>
</tr>
<tr>
<td>Transportation</td>
<td>2,200</td>
</tr>
<tr>
<td>Other Services</td>
<td>2,100</td>
</tr>
<tr>
<td>Art, Entertainment, Rec</td>
<td>1,100</td>
</tr>
<tr>
<td>Wholesale</td>
<td>1,000</td>
</tr>
</tbody>
</table>

Construction: -16,000
Energy: -3,500
Information: -200
’17 Metro Employment Forecast

+ 29,700 Jobs
Decide to Decide, (000s)

Source: Texas Workforce Commission
Rules of Thumb, Guestimates and Theorems

Elasticity of supply

\[ E_s = \frac{\frac{Q_2 - Q_1}{Q_1} \cdot \frac{2}{P_2 - P_1}}{\frac{Q_1 + Q_2}{2}} = \frac{\% \Delta Q}{\% \Delta P} \]

- \( E_s > 1 \) Elastic
- \( E_s < 1 \) Inelastic
- \( E_s = 1 \) Unitary elastic
The Yahtzee Rule for Measuring Houston Growth
Houston wins when we roll sixes.
Houston wins when we roll sixes.
Houston wins when we roll sixes.

$60 oil

60,000 jobs
Houston wins when we roll sixes.

$60 oil

60,000 jobs

60,000 relocations
Houston wins when we roll sixes.

$60 oil

60,000 jobs

60,000 relocations

60 MPH
Thank you
'17 Houston Economic Outlook
Patrick Jankowski