Forecasts for Absorption in 2016, 2017 and 2018 for Houston’s Industrial Market with Reduced Job Growth Arising from the Oil Downturn

Executive Summary

The sustained pullback in the oil industry due to oversupply is now projected to have more substantial impact on Houston’s economy than initially anticipated. Unlike the 1980s, however, Houston is not simultaneously experiencing a banking crisis, overbuilt commercial real estate, and negative job growth. With a strong national economy, Houston will continue to push forward but at a slower pace than experienced in recent years.

Demand for industrial space in Houston will likely remain steady in certain sectors (e.g., Warehouse, Distribution), but weaker in other areas (e.g., manufacturing) due to the forecast for Houston’s reduced job growth in coming years. To what extent will Houston’s industrial market slow down given the sustained pullback in the oil industry? Here, we use recent job forecasts by the Greater Houston Partnership and Institute for Regional Forecasting of the University of Houston to make quantitative predictions of how net absorption of industrial space will change from 2016 to 2018 due to the oil downturn.

Four different scenarios occur for job growth from 2016 - 2018, depending on whether the recovery from the oil downturn is a V-shaped recovery, a U-shaped recovery, a backwards checkmark recovery, or a damaged oil industry not recovering. For the most likely scenario aligned with a U-shaped recovery, we forecast industrial absorption to be 6.3, 8.2, and 8.0 million sq. ft. in 2016, 2017, and 2018 respectively (Figure 1). These values are in line with Houston’s long term average net absorption of 7.04 million sq. ft. per year. Thus, even though Houston’s economy will slow some with the oil industry, demand for industrial products will remain consistent with historic averages, but again dominated by warehouse and distribution facilities over the manufacturing space prominently supporting the oil industry.

Forecasts for Houston’s job growth from 2016 to 2018 remain positive, ranging from 20,000 to 97,000. Our analyses show that increases in job growth are accompanied by increases in net absorption of industrial space overall, but primarily for warehouse and distribution facilities over manufacturing. However, job growth only explained 27% of variation in annual net absorption of industrial space, indicating other important factors at play in shaping demand for industrial real estate.

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![Figure 1: Job Growth and Net Absorption](image)

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Motivation

The current downturn in oil is as series as that of the 2008-2009 downturn of the Great Recession, but it differs in that the overall U.S. economy remains strong. Rather than a V-shaped recovery beginning in early 2016, the oil downturn will likely have a U-shaped recovery not beginning until mid to late 2016 when the oversupply of oil is expected to begin to diminish. The prolonged trough of a U-shaped recovery increases the time period for the oil industry’s pullback to spread through Houston’s economy. Yet, the current oil downturn remains fundamentally different from that of the 1980s. Houston is not simultaneously experiencing a banking crisis, commercial real estate remains sound, and the outlook for job growth remains positive (but hampered).

As the oil downturn begins to ripple through the Houston economy, how will demand for industrial space change? Might demand vary among the contrasting products of flex, manufacturing, and warehouse/distribution facilities? In commercial real estate, demand is measured by net absorption, the change in occupied space in units of square feet (sq. ft.) of rentable building area (RBA) from one time period to another. Positive net absorption occurs with an increase in occupied space, while negative net absorption occurs with a decrease in occupied space. We assess whether changes in job growth in Houston arising from the oil downturn is a reasonable economic indicator that can forecast demand for industrial space. Specifically, we use recent job forecasts by the Greater Houston Partnership and Institute for Regional Forecasting of the University of Houston to predict how net absorption of industrial space will change in coming years with shifts in job growth.

Forecasts of Job Growth under Four Scenarios of Recovery from the Oil Downturn

Houston’s two most prominent economists that forecast job growth are Patrick Jankowski of the Greater Houston Partnership and Dr. Robert Gilmer, Director of the Institute of Regional Forecasting at the University of Houston. Jankowski indicates that, while Houston will continue to lose jobs in sectors of energy, manufacturing, and wholesale trade, job growth will occur in health care, construction, government, hotels/bars/restaurants, retail, and professional and technical. He forecasts a net gain of 21,900 new jobs in 2016, with 2015 finishing with 30,000 new jobs. Gilmer forecasts job growth in 2015 to finish at 14,500 new jobs, but forecasts job growth in 2016 and beyond to vary with four different scenarios of Houston’s recovery from the oil industry’s downturn. Forecasts of both Jankowski and Gilmer assume a stable, strong national economy.

Figure 2 shows Dr. Gilmer’s job forecasts under the four scenarios of recovery, namely a V-shaped recovery, a U-shaped recovery, a backwards checkmark recovery, and a damaged oil industry not recovering. Under a V-shaped recovery, the oil market begins to turn around in early 2016, with active rig counts returning to 2014 peak levels of 2000 rigs in 2019 and energy jobs growing 2.5% per year, ultimately gaining 7.6% more jobs than prior to layoffs. The V-shaped recovery has job growth from 2016 - 2018 at 41,100, 129,700 and 100,200 new jobs per year (Figure 2). Dr. Gilmer indicates that a V-shaped recovery is likely to occur.

Under a U-shaped recovery, the downturn in the oil industry has a longer trough than the V-shaped recovery, not beginning to turn around until mid to late 2016. For the U-shaped recovery, rig count returns to 1800 in 2019 with a 1.8% annual growth in energy jobs. The U-shaped recovery has job growth from 2016 - 2018 at 28,400, 97,400, and 90,100 new jobs per year (Figure 2). Dr. Gilmer places a 40% chance that the oil industry sees a U-shaped recovery.

Under a backwards checkmark recovery, rig counts remain flat throughout 2016 and the oil industry recovers very slowly through 2019 but eventually nearing 1800 active rigs. However, energy jobs never fully return and are in fact 5.3% below 2014 peaks in 2019. The backward checkmark shaped recovery has job growth from 2016 - 2018 at 22,700, 88,400, and 80,800 new jobs per year (Figure 2). Dr. Gilmer places a 40% chance on this backwards checkmark recovery.

The last scenario is a damaged U.S. oil industry in which Saudi Arabia won, nearly putting the U.S. fracking oil industry out of business. Rig count slowly returns to just 1250 rigs in 2019 and energy employment in Houston remains at levels of the trough, about 13% lower than the energy job peak in 2014. Job growth from 2016 - 2018 is 20,400, 53,000, and 66,000 (Figure 2). Dr. Gilmer puts a 20% chance on a permanently damaged U.S. oil industry.

Job Growth Predicts Net Absorption in the Industrial Market

Job growth is a modest economic predictor of net absorption of all industrial real estate (Figure 2). Demand for industrial space as measured by net absorption does increase with job growth (Figure 2). The explanatory variable of job growth (December to December, year over year change) on the x-axis is scaled in thousands of jobs per year. The response variable of total net absorption on the y-axis is scaled in millions of square feet of all...
industrial space combined. The solid red circles are the empirical data points for 1999 - 2014, for which the one extreme point of 2009 corresponds with the Great Recession.

The solid red line in Figure 1 is the linear regression model of the statistical relationship between job growth and net absorption, of the form $y = mx + b$. Specifically, $y = 0.029x + 5.51$, where $y$ is net absorption, $x$ is job growth, $m$ is the slope of the line, and $b$ is the $y$-intercept. While we have plotted the relationships in terms of their original raw data, due to lack of normality, absorption was log transformed for the statistical test yielding a coefficient of determination ($r^2$) of how well the data fit this log-linear statistical model of $r^2 = 0.27$ (0.17 for untransformed analysis). That is 27% of variation in net absorption is explained by job growth. This is a modest percentage given the many factors simultaneously occurring in economics and industrial real estate which could obscure any such relationship. At the same time, this leaves 73% of variation in net absorption explained by other factors. In particular, this analysis was performed for all industrial real estate combined. When the different products of flex, manufacturing and warehouse/distribution space are analyzed separately, it is only net absorption of warehouse/distribution space that shows a positive relationship with job growth, indicating that demand for flex and manufacturing space are not very well predicted by job growth.

The slope of the line, $m = 0.029$, describes how $y$ changes as $x$ increases, that is an increase by 1 unit of the $x$ variable increases the $y$ variable by how much. Accounting for the $y$-axis scaled in millions and the $x$-axis in thousands, the slope of 0.029 means that on average 29 sq. ft. of net absorption occur for every one new job. The dashed blue lines are the 80% prediction intervals (upper and lower bounds) for net absorption. That is, there is an 80% probability that net absorption will be between 394,000 to 11,479,000 sq. ft. for 14,500 new jobs. As of early January 2016, Houston industrial has posted 9,029,000 sq. ft. of net absorption. This value of net absorption falls within the 80% prediction interval, and is reasonably close to the predicted value of 5,937,000 rather than outside the 80% prediction interval. This gives us additional confidence in this statistical model to forecast net absorption of industrial space, despite the model only explaining 27% of variation in net absorption.

### Industrial Absorption for Different Scenarios of Recovery from the Oil Downturn

Based on recently released job forecasts for Houston, we make quantitative predictions of how net absorption in the industrial market will change with job growth in Houston. We forecast net absorption in 2016, 2017 and 2018 based on job growth under a U-shaped recovery, backwards checkmark recovery, and a damaged oil industry. We do not consider Gilmer’s V-shaped recovery given his assessment of its very unlikely occurrence. Figure 4 shows historic net absorption of industrial space from 1999 - 2015 (with a mean of 7.04 million sq. ft.) and forecasted net absorption from 2016 - 2018. The different scenarios of oil recovery suggest similar levels of net absorption in 2016, between 6.0 to 6.5 million sq. ft.
The most likely scenario for oil recovery is the U-shaped recovery, beginning to rebound in mid to late 2016. Under a U-shaped recovery (blue line, Figure 4), net absorption is predicted to be 6.3 million sq. ft. in 2016 (80% prediction interval 0.8 to 11.8 million sq. ft.), followed by 8.4 million sq. ft. in 2017 (80% prediction interval 2.8 to 13.9 million sq. ft.), and 8.1 million sq. ft. in 2018 (80% prediction interval 2.6 to 13.7 million sq. ft.). This is the most optimistic scenario for demand for industrial space in coming years given the different likelihoods of oil recovery in Houston.

The second most likely scenario to manifest in oil recovery is the backward checkmark recovery. This scenario is quite similar to the U-shaped recovery in terms of the influence of job growth on net absorption, with net absorption just slightly lower than the U-shaped scenario (green line, Figure 4). Specifically, net absorption is predicted to be 6.1 million sq. ft. in 2016 (80% prediction interval 0.6 to 11.7 million sq. ft.), followed by 8.1 million sq. ft. in 2017 (80% prediction interval 2.5 to 13.7 million sq. ft.), and 7.9 million sq. ft. in 2018 (80% prediction interval 2.3 to 13.4 million sq. ft.).

Under a damaged oil industry (orange line, Figure 4), net absorption differs most from the other scenarios in the year 2017 with a substantially lower net absorption. Net absorption is predicted to be 6.1 million sq. ft. in 2016 (80% prediction interval 0.5 to 11.6 million sq. ft.), followed by 7.1 million sq. ft. in 2017 (80% prediction interval 1.5 to 12.6 million sq. ft.), and 7.5 million sq. ft. in 2018 (80% prediction interval 2.0 to 13.0 million sq. ft.).

Caveats and Uncertainty in Absorption Forecasts

We have assumed 80% prediction intervals. This is a probability of 0.80, which means that, while we are 80% certain, 2 out of 10 cases may fall outside this prediction interval given the noise associated with the data. If this were NBA free throws, we would likely bet on the shooter at 80% to win the game, but in two instances we would lose our bet. In predictive analytics, it is important to note whether the new values of the predictor variable (job growth) is within the range of the original data on which the projections are based. Extrapolation far outside the original data range can lead to unreliable predictions. In our case, job growth of original data ranges from -110,000 to +115,000. Most forecasted job numbers are well within this data range, which increases the likelihood of a reliable prediction.

Methodology

Commercial real estate data on industrial space were obtained from CoStar in January 2016. Data for all industrial buildings were combined for industrial space, and then separated by flex, manufacturing, and warehouse/distribution. Job and employment data were obtained from the Federal Reserve Bank of Dallas, based on Dec-Dec year over year changes in job growth. The statistical analyses and data visualization were performed using the R software and programming language:


We used linear regression to examine the predictive effects of annual changes in employment (Dec to Dec year over year change) on annual total net absorption (direct plus sublease) from 1999 - 2014, along with log transformed absorption to improve normality. Assumptions of linear regression that could render a biased statistical model were tested. None of the assumptions were violated, including statistical outliers in absorption, overly influential points in job growth, statistical outliers in employment, unequal variance, heteroscedascity, and serially correlated residuals (nonwhite noise error).