Data InSight

GUIDING BUSINESS ANALYTICS IN COMMERCIAL REAL ESTATE

NAI Partners

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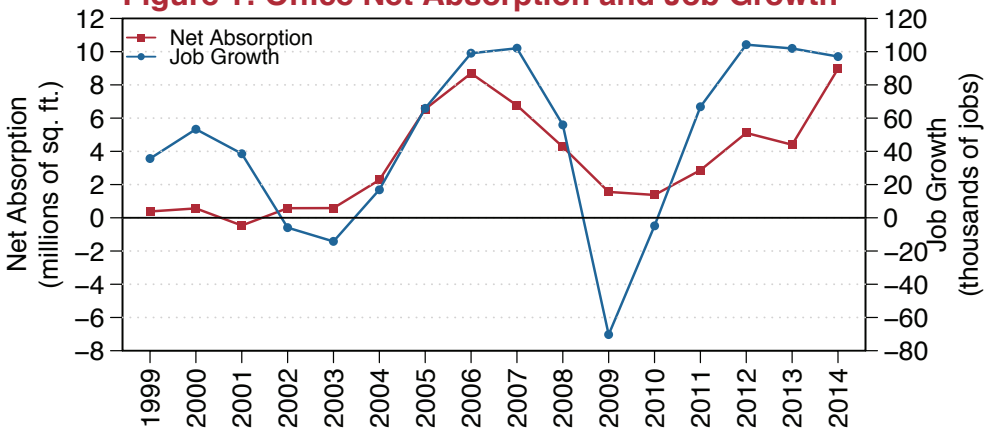
Job Growth Predicts Absorption in 2015 for Office but not Industrial Space

Executive Summary

How will commercial real estate perform in Houston in 2015 given recent shocks in oil prices? While low energy costs will stimulate the economies of most cities and states in 2015, those with prominent oil sectors, like Houston and Texas, are likely to experience economic slowdowns. Nevertheless, net employment and economic growth in Houston and Texas are still forecasted to be positive. Here, we ask whether job growth can predict demand for commercial real estate, given that the decline in oil is occurring in a backdrop of positive economic growth.

Our analyses reveal a positive relationship between job growth and net absorption for office, but not industrial space. Increases in Houston's job numbers are accompanied by increases in the absorption of office space. Specifically, annual job growth explained a sizeable 51% of variation in annual net absorption of office space from 1999 - 2014, which ranged from -500,000 to +9,000,000 sq. ft. (Figure 1). Though less than the 100,000 jobs created in recent years, forecasts for Houston's job growth in 2015 still remain positive, ranging from 46,000 to 63,000. For the most likely forecast of 52,600 new jobs in 2015, we predict office absorption to be about 3,617,000 sq. ft. The 80% prediction interval for this absorption is 591,000 to 6,643,000 sq. ft. That is, 8 out of 10 times (0.80 probability) absorption will be in this range for this level of job growth. Thus, while job growth and office absorption will likely decrease in 2015 compared to 2014, it is unlikely that they will turn negative.

Figure 1: Office Net Absorption and Job Growth



Data InSight is a monthly business-to-community (B2C) whitepaper series that uses data analytics to look at current and historical trends in commercial real estate (CRE). Indeed, like many other industries, CRE is undergoing a revolution in the volume, velocity, and variety of data being generated. At NAI Partners, we are embracing this data revolution through data science --- the process of using the scientific method and statistics to extract knowledge from data. Complementing its full CRE platform and more than 500 years of combined broker and professional experience, NAI Partners offers a data analytics consulting service to guide its clients in their business intelligence and decision making in CRE.

Motivation

How will Houston's commercial real estate (CRE) industry perform in 2015 given the recent shock in oil prices? Currently, West Texas Intermediate (WTI) is hovering around a soft bottom of $50 per barrel, down from nearly $100 in June 2014. As of the end of March, U.S. rig reductions have slowed to 1,048, down from 1809 a year ago. This is the fifth major decline in the oil industry since 1980, the four other periods including (1) the oil bust of 1981-1986, (2) the Asian financial crisis of 1998-1999, (3) the dot-com and technology recession of 2001-2002, and (4) the Great Recession and financial crisis of 2008-2009. Each of these four prior shocks in oil prices were simultaneously accompanied by economic downturns. This is in contrast with the current decline in oil prices, which is associated with overall positive economic growth in Houston, Texas, and the U.S.

Indeed, low oil prices will stimulate the economies of most states in 2015[1], with an anticipated 67 basis point bump in U.S. gross domestic product (GDP)[2]. Yet, those few states with prominent energy sectors will experience economic slowdowns and job losses due to oil pullbacks, including Wyoming, Oklahoma, North Dakota, Alaska, Louisiana, Texas, West Virginia, and New Mexico[1]. For Texas, the drop in oil from $106 to $80 per barrel was good for state and local economies, while the sustained drop from $80 - $50 per barrel will hurt their economies, as most breakeven points for shale oil are $50 - $60 per barrel[2,3]. Nevertheless, net employment and economic growth in Houston and Texas are still forecasted to remain positive. For Texas, job growth is forecasted to be 1-2% in 2015[3]. For Houston, job growth is forecasted to be 1.6 - 2.1% in 2015[4].

To what extent will the downturn in oil influence commercial real estate in Houston, given that it is occurring in a backdrop of slowing but still positive economic growth. Initial gloom and doom sentiment has shifted to cautious optimism with a close eye on the months to come. How can we convert these sentiments to quantitative expectations for the performance of CRE. One way is to ask whether job growth is at all indicative of demand for CRE. Can job growth predict absorption of office and/or industrial space? If so, what do forecasts for Houston's job growth suggest for absorption in 2015?

Absorption and the Demand for Commercial Real Estate

In last month's issue of Data InSight, we examined the supply side of CRE, in terms of sublease availability. This month we look at demand for CRE, as measured by net absorption. Net absorption is the net change in occupied space (increases minus decreases) from one period of time to another. Absorption is reported in terms of square feet (sq. ft.) of rentable building area (RBA). Positive net absorption occurs when there is a net increase in occupied space, whereas negative net absorption arises when there is a net decrease in occupied space. Total net absorption equals direct plus sublease net absorption. Here, we analyze total net absorption for Class A and B office buildings combined. While we do include some analyses of industrial space, we focus on office space as those statistical results were more revealing.

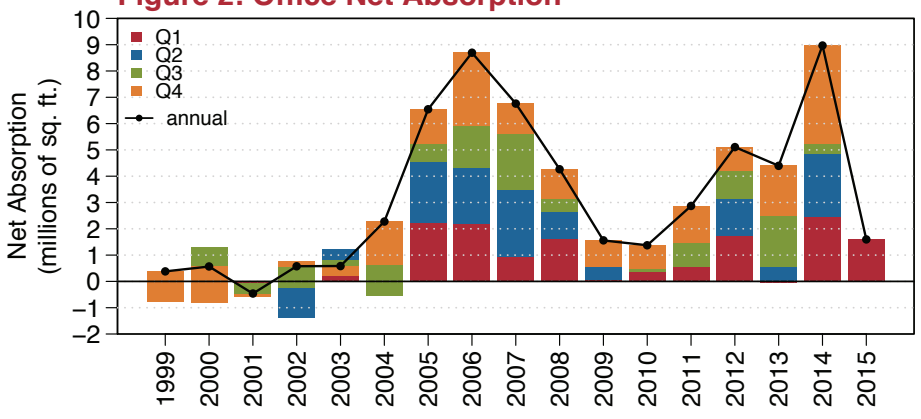
Overall, demand for office space has remained strong and positive in Houston, despite some large fluctuations from quarter to quarter and year to year (Figure 2). For Q1 2015, there was about 1,600,000 sq. ft. of positive net absorption, statistically more than the historical first-quarter average. Total net absorption has varied widely from quarter-to-quarter, ranging from -2,000,000 sq. ft to +3,000,000 sq. ft. since 1999 (Figure 2). Likewise, total net absorption of office space has varied substantially, ranging from -500,000 to +9,000,000 sq. ft. since 1999 (Figure 2). On an annual basis, demand for office space has shifted as much as an 86% increase in net absorption (2013 to 2014) to a 64% decrease (2008 to 2009). While positive net absorption can be highly variable, negative net absorption is not common for Houston office space. In the 64 quarters since 1999, only 26% of quarters have recorded negative net absorption, and only one of 16 years (2001) ended with negative net absorption.

Houston Job Forecast for 2015

No single measure arises as a best indicator of the economy for any given city or state. Yet, it is recognized that job growth and GDP, which are highly correlated themselves, are two strong indicators of economic performance. Figure 3 shows Houston's job growth from 1991 to 2014 (red squares and lines), along with four forecasts (blue triangles) for job growth in 2015. On average Houston has added about 48,000 jobs per year. Net job losses have been rare in Houston, occurring only during the dot-com (and Enron) bust and the Great Recession.

All four forecasts for job growth in 2015 are near or modestly above Houston's long-term average of 48,000 new jobs (Figure 3, blue triangles). Patrick Jankowski, of the Greater Houston Partnership, forecasts 2015 job growth to be 62,900 new jobs. Drs. Robert Gilmer and Adam Perdue, of the University of Houston's Institute for Regional Forecasting, have made three separate forecasts for 2015 job growth[4]. Their forecasts depend (1) baseline job growth arising from the growing national economy, (2) job losses arising from the pullback in oil stemming from the west side of Houston, and (3) job growth arising from the boom in construction of the petrochemical industry on the east side of Houston[4]. Their analyses of job losses and gains for 2015 indicate three different potential scenarios of 1.8%, 2.1%, and 1.6% job growth, with the first two scenarios being more likely than the latter. Combining these percentages with the 2014 baseline number of jobs (2,924,490) in Houston reported by

Figure 2: Office Net Absorption



the Federal Reserve Bank of Dallas, forecasts for 2015 job growth in Houston are 61,400, 52,600, and 46,800. Though less than the 100,000 new jobs created in each of 2012, 2013, and 2014, forecasts for Houston's job growth in 2015 still remain positive, ranging from 46,000 to 63,000.

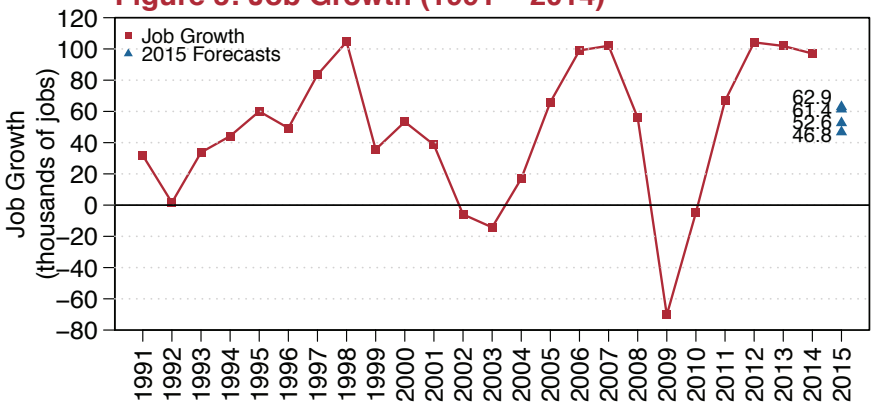
Can Job Growth Explain Net Absorption?

The data visualization in Figure 1 suggests that there is a positive relationship between Houston's job growth and its net absorption of office space. Indeed, upswings in job growth are accompanied by upswings in absorption. Likewise, downswings in one occur with downswings in the other. Without proper statistical analyses, however, caution is warranted; false impressions and erroneous conclusions can be drawn by over-interpreting data just through their graphical and tabular visualization. Here, we use simple linear regression to test whether job growth has any predictive power of net absorption in office and industrial space. Our statistical analyses show a strong, positive statistical relationship between job growth and absorption for office space, but there was no detectable relationship between job growth and absorption for industrial space (see Methodology below). The lack of a relationship for industrial space likely arises from the disconnect between employee numbers and the sizes of industrial spaces.

Figure 4 depicts analyses of job growth and net absorption for office space. The explanatory variable is job growth, which is plotted on the *x*-axis and is scaled in thousands of jobs per year. The response variable is net absorption of office space, which is plotted on the *y*-axis and is scaled in millions of square feet of RBA per year. The solid red circles are the empirical data points for 1999-2014. Two of those data points are labeled by their year, namely 2001 and 2009, which represent the dot-com/Enron bust and the Great Recession.

Statistical analyses reveal that job growth does help to explain net absorption (see Methodology below). The red line in Figure 4 is the linear regression model of the statistical relationship between job growth and absorption. It is of the form $y=mx+b$, specifically $y=0.042x+1.43$, where y is absorption, x is job growth, m is the slope of the line, and b is the y-intercept. The coefficient of determination (r^2) indicates how well the data fit the statistical model. In this case, $r^2 = 0.50$, that is 50% of variation in absorption is explained by job growth. This is a fairly large percentage given the many factors simultaneously occurring in economics and real estate which could obscure a relationship between job growth and absorption.

Figure 3: Job Growth (1991 – 2014)



The slope of the line, $m = 0.042$ (rise over run, if you recall from high school algebra), describes how we expect y to change as x increases, that is an increase by 1 unit of the x variable increases the y variable by how much. Because we have scaled the y-axis by millions and the x-axis by thousands, the slope of 0.042 means an increase of 10,000 new jobs increases office absorption by 420,000 sq. ft., on average, or 42 sq. ft. of absorption occur for every one new job.

2015 Prediction for Net Absorption

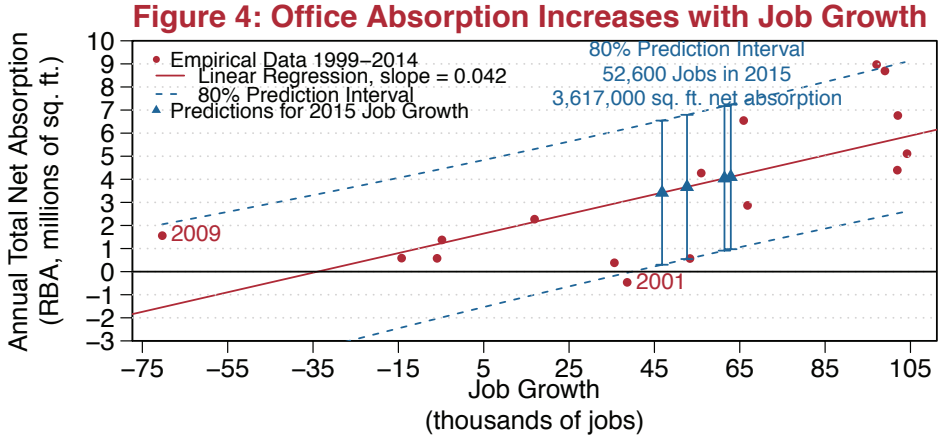
Because the statistics show that job growth can contribute to explaining net absorption, we can use the linear regression equation to predict net absorption from forecasts of job growth. In Figure 4, the dashed blue lines are 80% prediction intervals (upper and lower bounds) for net absorption. That is, 8 out of 10 times (0.80 probability) absorption is predicted to be in this range for the predicted job growth (red line).

Now, we can estimate net absorption in 2015 based on forecasts for job growth in 2015. The four estimates of job growth for 2015, that is the blue triangles of Figure 3, are plotted on the red prediction line in Figure 4. The capped blue lines of each blue triangle are the upper and lower levels of the 80% prediction intervals (which are the same as the dashed lines). The most likely scenario for job growth[4] in 2015 is 1.8%, that is approximately 52,600 new jobs (*x*-axis). These 52,600 jobs equate with office absorption of about 3,617,000 sq. ft. (*y*-axis). The 80% prediction interval for this net absorption is 591,000 to 6,643,000 sq. ft. While we predict 3.6 million sq. ft. of absorption, we are 80% certain that absorption will be within this range of the prediction interval. Thus, even though office absorption will likely decrease in 2015 compared to 2014, it is unlikely that it will turn negative.

Uncertainty in the Predictive Analytics of Net Absorption

We have conducted predictive analytics of net absorption of office space based on job growth. We project that if job growth is 1.8% (i.e., 52,600 new jobs), then net

Figure 4: Office Absorption Increases with Job Growth



absorption of office space in 2015 will be on the order 3.6 million sq. ft. Any such projection, however, includes error and noise, and is associated with a prediction interval within which realized values are likely to reside. In this case, we used an 80% prediction interval for 3.6 million sq. ft. of absorption, which spans 591,000 to 6,643,000 sq. ft. There are three key factors that may contribute to deviation within and outside this span.

First, this is a probability of 0.80. This means that, while we are 80% certain, 2 of 10 cases would fall outside this prediction interval given the error and noise associated with the statistical analysis. 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).

Second, in predictive analytics, it is important to note whether the level of prediction is within the range of data on which the projections are based. Extrapolation outside the range of data can lead to particularly unreliable predictions. In our case, job growth spans -70,000 to +105,000. Our prediction for absorption is based on job growth of 46,000 to 63,000, well within the range of the data. Hence, we are not extrapolating, reducing the likelihood of an unreliable prediction.

Third, and possibly most critical, the distribution of jobs among various industries within Houston is assumed not to deviate too drastically between the 2015 forecast and the prior 16 years on which the statistical analyses were based. Yet, Drs. Gilmer and Perdue's analyses[4] do show a bias in job growth toward downstream refining, petrochemical business, and construction. So, some jobs in office spaces may fall while others pick up, though this is to some extent built into analysis given the inclusion of oil downturns of 2001 - 2003 and 2008 - 2010. Still other office jobs based on Houston's economic growth alongside national growth will include the office sector.

Methodology

Job and employment data were obtained from the Texas Workforce Commission and the Federal Reserve Bank of Dallas. Commercial real estate data were obtained from CoStar on April 7. Data for Class A and B buildings were combined for office space and warehouse and flex were combined for industrial space. The statistical analyses and data visualization were performed using the R software and programming language:

> R Core Team (2014). R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. URL http://www.R-project.org/.

For both office and industrial space, we used linear regression to examine the predictive effects of annual changes in employment (i.e., job growth) on annual total net absorption (direct plus sublease) from 1999 - 2014. 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, normality in absorption, unequal variance, heteroscadascity, and serially correlated residuals (nonwhite noise error). There was a statistically significant, positive relationship between job growth and total net absorption for office space ($F_{1,14}$=*14.3*, p=0.002, r^2=0.510), but no significant relationship between job growth and absorption for industrial space ($F_{1,14}$=3.1, p=0.100, r^2=0.181).

Notes

1. Brown, P.A and M.K. Yucel. The Shale Gas and Tight Oil Boom: U.S. States' Economic Gains and Vulnerabilities. http://www.cfr.org/united-states/shale-gas-tight-oil-boom-us-states-economic-gains-vulnerabilities/p31568
2. Peter Linneman, Chief Economist, NAI Global; Webinar March 19, 2015.
3. Keith Phillips, Sr. Economist and Research Officer, Federal Reserve Bank of Dallas, San Antonio Branch; Seminar, The Houston Economic Club, March 24, 2015.
4. R.W. Gilmer and A.W. Perdue. "Houston and Low Oil Prices: An Update on the Economic Outlook", March 18, 2015, http://www.bauer.uh.edu/centers/irf/houston-updates.php

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