Data InSight

GUIDING BUSINESS ANALYTICS IN COMMERCIAL REAL ESTATE

NAI Partners

HOUSTON | SAN ANTONIO | AUSTIN

J. Nathaniel Holland, Ph.D.
Chief Research & Data Scientist

AUGUST 2015 | VOL. 1, ISSUE 6

Houston's Office Leasing Activity: Less Dependent on Oil and Quarters of the Year than Typically Inferred

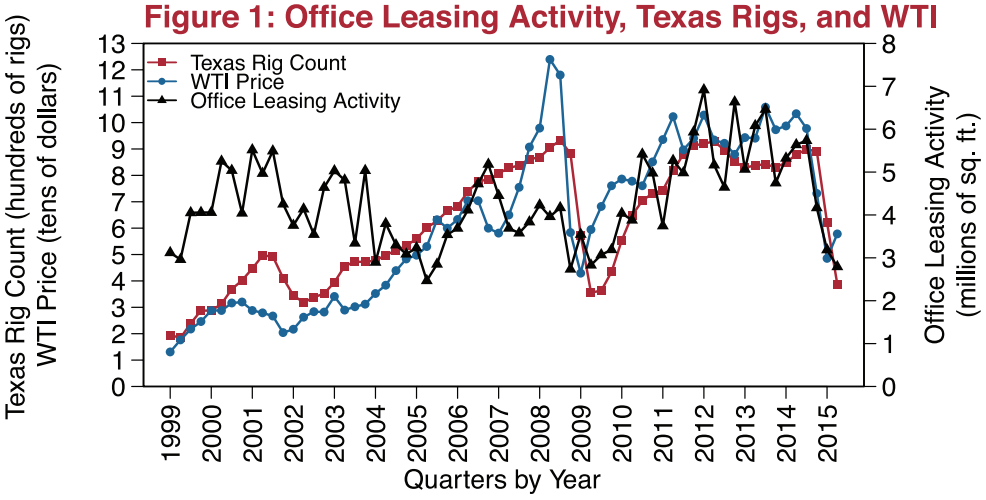
Executive Summary

Demand for office space is usually measured by net absorption, that is the change in occupied space over a quarterly 3-month time period. However, net absorption may lag one or more quarters behind actual leasing deals, leaving a hindsight view of office market conditions. A more timely snapshot of demand is leasing activity, that is the total leased space represented by direct, sublet, renewal, expansion and pre-leasing. Given changes in the price of oil and declines in leasing activity in recent quarters (Figure 1), we examine the extent to which Houston's office leasing activity is shaped by the oil industry. We further examine the commonly held perception that certain quarters of leasing activity tend to under and out perform others.

At the current pace of 6.0 million sq. ft. as of Q2, leasing activity in 2015 is likely to fall well below its historic annual average of 17.4 million sq. ft. However, leasing activity may vary substantially among quarters, whether slowdowns of the summer doldrums or heightened year-end activity, which may strengthen or weaken year-end numbers. Contrary to the common perception, historic leasing activity has not differed among quarters of years for either Class A or Class B buildings. Moreover, Class A and Class B buildings did not differ in their leasing activity, with historic quarterly averages of 2.3 and 2.0 million sq. ft., respectively. Yet, leasing activity of Class B space does tend to be much less variable than Class A space, which tends to be much more episodic, fluctuating more with market conditions.

Class A and Class B buildings differed in the extent to which the oil industry contributed to leasing activity. Texas rig counts did show an influence on office leasing activity for Class A but not Class B space. Specifically, leasing activity of Class A products decreases with declines in active rig counts in Texas, but Class B products show no such relationship. Texas rig count explained a full 38% of variation in leasing activity of Class A buildings. In sum, Houston's oil industry does dictate a substantial portion of Class A office activity, but it has little overall influence on Class B products.

Figure 1: Office Leasing Activity, Texas Rigs, and WTI



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

As a result of shifts in the oil industry over the past year (Figure 1), we are seeing key fluctuations in Houston's Office Market, including increased supply through subleasing (7.5 million sq. ft.) coupled with new deliveries (~20 million sq. ft. from 2015 - 2017). Net absorption, that is the change in occupied space over a quarterly 3-month time period, is the typical metric employed to estimate demand for office space. Yet, net absorption may lag one to three quarters behind the actual leasing deals (or lack thereof) that lead to changes in net absorption, leaving a hindsight view of office market conditions. In a commercial real estate (CRE) environment that is fluctuating outside the typical bounds of a normal business cycle, it is essential to be able to estimate shifts in demand on as current a time scale as possible.

Leasing activity is a metric that gives a more timely view of demand for office products. Leasing activity represents the total amount of space that is committed to and signed as a lease obligation (independent of occupancy), including direct leases, subleases, renewal leases, lease expansions, and pre-leasing. Net absorption, on the other hand, does depend upon occupancy, which with build-outs and other factors can lead to substantial lags well behind current market conditions reflected in actual leasing activity.

Despite advantages of leasing activity in evaluating demand, it may well be subject to the commonly held perception that the performance of the office market varies among quarters of the year. Such quarterly variation in performance could include slowdowns of the summer doldrums or increased year-end activity of fourth quarters. Here, we evaluate the extent to which leasing activity — a less retrospective measure of demand — is impacted by the oil industry. Specifically, we examine whether leasing activity in Houston varies with Texas rig counts, and the extent to which leasing activity is influenced by quarterly trends such as summer slowdowns or heightened year-end performance.

Office Leasing Activity

Figure 2 depicts Houston's leasing activity from 1999 through Q2 of 2015 for Class A and B buildings combined. Each of the four quarters of a year are plotted. The cumulative height of the four stacked quarters is the total annual leasing activity.

In Q1 2015 leasing activity was 3.2 million sq. ft. The historic Q1 average (± 95% confidence interval) for leasing activity for Class A and B buildings combined is 4,284,272 sq. ft. (± 562,882). We are 95% certain that Q1 leasing activity typically falls between 3,721,389 to 4,847,155 sq. ft.. Leasing activity in Q1 2015 was statistically lower than historic Q1 measures since 1999. Similarly, leasing activity of 2.8 million sq. ft. occurred in Q2 2015. The historic Q2 average (± 95% confidence interval) for Class A and B buildings combined is 4,313,032 sq. ft. (± 559,830). We are 95% certain that Q2 leasing activity typically falls between 3,753,202 to 4,872,862 sq. ft. This indicates that Q2 2015 leasing activity is statistically lower than historic Q2 measures since 1999.

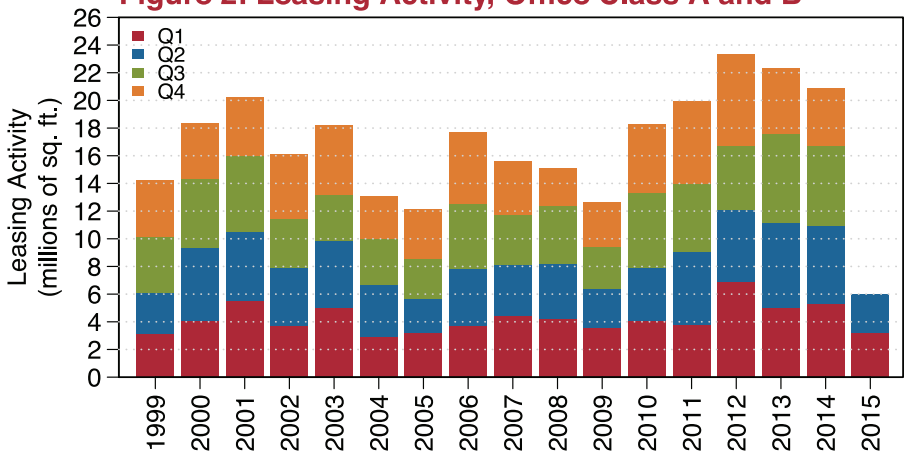
Thus, both Q1 and Q2 in 2015 had lower leasing activity than their historic quarterly averages. Year-to-date, there has been about 6.0 million sq. ft. of leasing activity (Figure 2). With this pace of leasing activity extended to the second half of the year, 2015 is likely to fall significantly below its historic annual average (± 95% confidence interval) of 17.4 million sq. ft. (± 1.8 millions sq. ft.).

Variation among Quarters in Leasing Activity

The often-held perception in CRE is that leasing activity (and CRE performance in general) varies among quarters within the year. In short, some quarters perform better than others. For example, it is thought that summers experience reduced CRE activity, while winter periods experience heightened activity before year end. Here, we examine whether leasing activity tends to have lower and higher performing quarters, and if such quarterly performances differ between Class A and Class B buildings. Such seasonal variation could greatly impact forecasts for the performance of office markets.

Figure 3a and 3b plot leasing activity (*y*-axis) per quarter (*x*-axis) from 1999 through 2014 for Class A and Class B buildings, respectively. The four red horizontal lines of each panel are the average leasing activities of each respective quarter (Q1, Q2, Q3, Q4). There are 16 vertical lines extending up and down from each horizontal line, each of which represents the quarterly leasing activity for years 1999 to 2014. The average (mean) and coefficient of variation (CV) for each quarter are included above each horizontal line. The CV, expressed as a percentage, measures the dispersion of the individual data points about the mean. That is, the larger the CV, the greater the scatter, spread, or variability among the data. In this way, the CV helps to assess which quarters are more and less variable.

Figure 2: Leasing Activity, Office Class A and B



Consider quarterly leasing activity of Office Class A buildings (Figure 3a). There was little difference in the average leasing activities among the four quarters, ranging from 2.2 million sq. ft. in Q1 to 2.4 million sq. ft. in Q4. There are no statistical differences in the leasing activity of Class A buildings among the four quarters, despite the otherwise commonly-held perception. Leasing activities of Class B buildings ranged from 2.0 to 2.1 million sq. ft. (Figure 3b). Statistical differences did not occur in the leasing activity of Class B buildings among the four quarters, again despite the otherwise commonly-held perception. In sum, historic leasing activity has not differed among quarters for either Class A or Class B buildings.

In addition to the lack of differences in leasing activities among quarters within a year, no differences in leasing activity occurred between Class A and Class B buildings. Overall, the average quarterly leasing activity (± 95% confidence interval) of Class A buildings was 2,291,615 sq. ft. (± 205,242), and Class B buildings was 2,012,731 sq. ft. (± 104,215). Note, this level of leasing activity was generated by just under 3,300 Class B buildings with an RBA of 131,630,215 sq. ft., while only 425 Class A buildings with a similar RBA of 127,055,964 produced roughly the same leasing activity. In sum, historic leasing activity has not differed between Class A and Class B buildings.

However, one key quantitative difference did emerge from these data analytics, namely that leasing activity is substantially less variable for Class B buildings than for Class A buildings. Specifically, the coefficient of variation (CV) for Class A buildings ranged from 42% in Q1 to 33% in Q4 (Figure 3a). On the other hand, the CV for Class B buildings ranged from just 17 - 22% (Figure 3b). Overall, the CV in leasing activity for Class A buildings was 36.4%, nearly double the 21.0% of Class B buildings.

The smaller CV for Class B buildings indicates a smaller scatter, spread, and variability among leasing activities. In contrast, the larger CV for Class A buildings indicates a larger scatter and variability among their leasing rates. In market upheavals, whether they be up or down cycles, the highs and lows are much more extreme for Class A than Class B buildings.

Figure 3a: Quarterly Leasing Activity, Office Class A

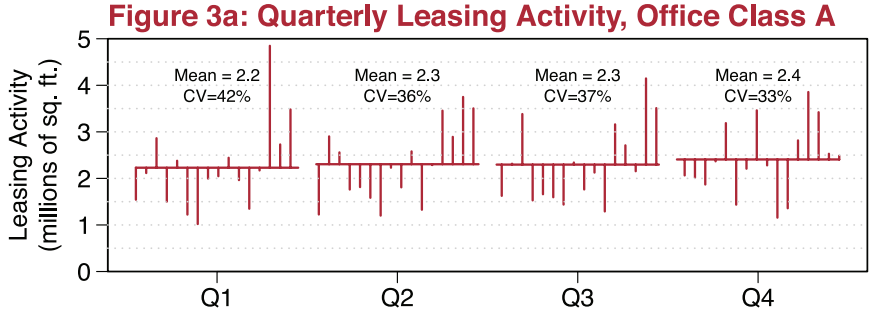
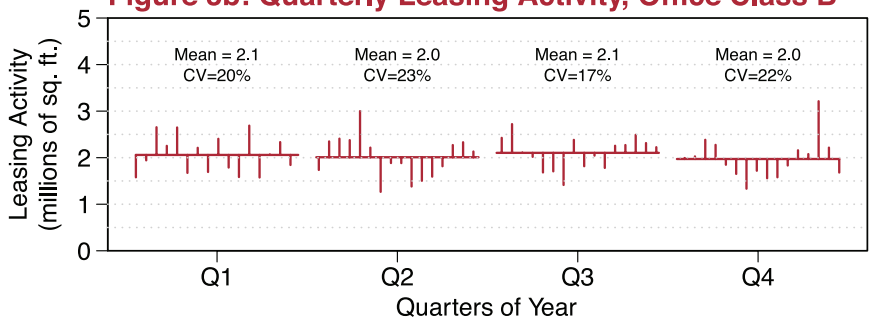


Figure 3b: Quarterly Leasing Activity, Office Class B



Texas Rig Counts and Leasing Activity

To what extent are the current lower levels of leasing activity attributable to Houston's oil industry. Consistent with the greater variability in leasing activity for Class A than Class B buildings, our analyses show that Class A leasing activity is more susceptible to changes in the oil industry than Class B (Figure 4). Specifically, leasing activity of Class A buildings did vary significantly and positively with Texas rig counts, that is leasing activity increases as rig counts grow (Figure 4a). However, no such relationship occurred between leasing

Figure 4a: Class A –– Significant Relationship

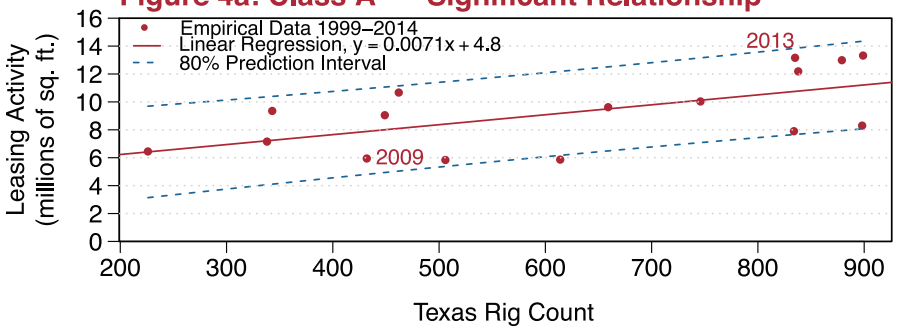
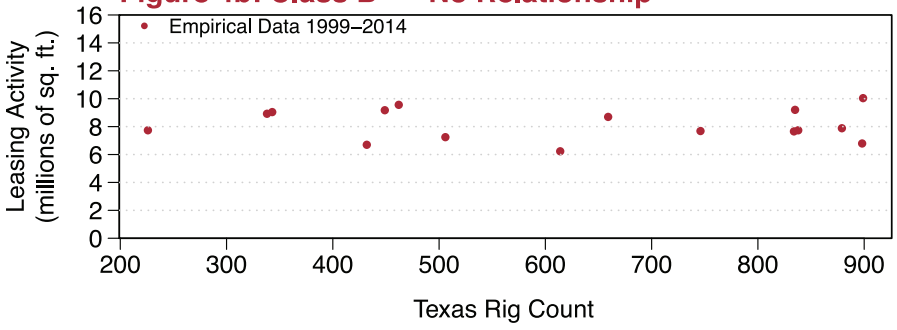


Figure 4b: Class B –– No Relationship



activity of Class B buildings and Texas rig counts (Figure 4b). This suggests that Class B leasing activity is more robust to shifts in Houston's oil activity, consistent with its lower variability over time.

In contrast with Figure 4b for Class B leasing activity, Figure 4a shows a significant relationship between leasing activity of Class A buildings and Texas rig counts. The explanatory variable of Texas rig count is on the *x*-axis. The response variable of leasing activity on the *y*-axis is scaled in millions of square feet per year. The solid red circles are the empirical data points for 1999 - 2014, two points of which are labeled by their years, namely 2009 and 2013. The solid red line in Figure 4a is the linear regression model of the statistical relationship between leasing activity and Texas rig count. It is of the form $y=mx+b$. Specifically, $y=0.0431x+1.44$, where y is net absorption, x is job growth, m is the slope of the line, and b is the y-intercept. Because the slope, m, is positive, there is a positive relationship between leasing activity and Texas rig counts, namely leasing activity increases with increases in rig count.

The coefficient of determination (r^2) indicates how well the data fit this statistical model. In this case, $r^2 = 0.379$, that is 37.9% of variation in leasing activity of Class A buildings can be explained by Texas rig counts. This is a fairly large percentage given the many different businesses that could potentially be leasing Class A office space. On the other hand, this leaves 62.1% of leasing activity explained by other potential variables than rig counts and Houston's oil industry. Nevertheless, these results do indicate that a substantial portion of Class A leasing activity is explained by active rig counts.

The slope of the line, $m = 0.0071$, 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, the slope of 0.0071 means that on average a change of 7,100 sq. ft. of leasing activity occurs for a change in one rig count. That is, an increase in 100 rig counts can lead to an increase of 710,000 sq. ft. of leasing activity. The 95% confidence interval for this slope is 1,800 to 12,400 sq. ft. of leasing activity per rig. The dashed blue lines are the 80% prediction intervals (upper and lower bounds) for leasing activity. That is, there is an 80% probability that leasing activity will be in this range for a given number of active Texas rigs.

Methodology

Commercial real estate data on office space were obtained from CoStar following at the end of July in 2015. Data for Class A and B buildings were combined and kept separate for various analyses. Class C buildings were omitted entirely. 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/.

We used coefficients of variation and 95% confidence intervals to assess differences in leasing activity among quarters for Class A and for Class B office space, and to assess differences in leasing activity between Class A and Class B space. We used linear regression to examine the predictive effects of Texas rig counts on total annual leasing activity from 1999 - 2014, separately for Class A and Class B office space. Assumptions of linear regression that could render a biased statistical model were tested. None of the assumptions were violated, including statistical outliers, overly influential data points, normality, unequal variance, heteroscadascity, mean value of zero for residuals, residuals normally distributed, and no serially correlated residuals. There was a statistically significant, positive relationship between Texas rig count and annual leasing activity for Class A office space ($F_{1,14}=8.5$, $p=0.011$, $r^2=0.38$), but not Class B office space ($F_{1,14}=0.05$, $p=0.821$, $r^2=0.004$).

J. Nathaniel Holland, Ph.D.
Chief Research and Data Scientist

Dr. J. Nathaniel Holland is a research scientist with 20 years of experience in using the scientific method to extract information from complex multi-dimensional data. He joined NAI Partners in 2014 as Chief Research and Data Scientist. At NAI Partners, Nat leverages his sharp intellectual curiosity with his skills in statistical modeling to guide data-driven business decisions in commercial real estate. Like many data scientists in the private sector, Nat joined NAI Partners following a career in academia. Prior to taking up data analytics at NAI Partners, he held professorial and research positions at Rice University, University of Houston, and the University of Arizona between the years of 2001 and 2014. Nat is the author of more than 50 scientific publications, and he has been an invited expert speaker for more than 60 presentations. Trained as a quantitative ecologist, he holds a Ph.D. from the University of Miami, a M.S. from the University of Georgia, and a B.S. from Ferrum College.

NAIPartners
HOUSTON | AUSTIN | SAN ANTONIO

NAI Partners
1900 West Loop South, Suite 500
Houston, TX 77027
tel 713 629 0500