Natural Occupancy Rates and Development Gaps

A Look at the U.S. Lodging Industry

by Jan A. deRoos

One method for determining whether a given lodging market could absorb additional rooms is to compare the market's long-run "natural occupancy rate" to existing occupancy—to quantify excess demand.

The recent surge in lodging development has many observers asking whether the volume of rooms in the new construction pipeline is proper, given short- and long-run demand projections.[1] According to recent projections, the U.S. lodging industry will add approximately 125,000 rooms to the supply in both 1998 and 1999,

[1] For example, see: Randell A. Smith and John D. Lesure, "The U.S. Lodging Industry Today," *Cornell Hotel and Restaurant Administration Quarterly*, Vol. 40, No. 1 (February 1999), pp. 18–25.

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equating to a 3.5-percent supply growth. Many observers argue that this growth is excessive, given expected long-run demand growth of no more than about 1.5 percent. The counter argument is that the recent surge in supply simply makes up for a lack of development early in the decade.

This article provides estimates of long-run stabilized occupancy rates, called "natural occupancy rates" (NOR), for the United States and its 24 largest lodging markets. Using these natural occupancy rates, I developed estimates of both long-run and short-run excess demand (i.e., opportunities to construct more supply). By comparing actual occupancy rates to the natural rates, a development gap is estimated both in relative terms, as an "occupancy gap," and in absolute terms, as a number of rooms.

Based on the Smith Travel Research data from 1987 through 1998, the natural occupancy rate for the United States is 62.9 percent, and its long-run occupancy gap is 0.8 percent. This means that actual long-run occupancy over the period of 1987 to 1998 was 0.8 percent above the natural rate. Expressed differently, the United States has a long-run "room gap" of approximately 51,000 rooms. By this analysis, that number of rooms could be added to the supply to meet growing demand. The short-run occupancy gap for the U.S. is 1.7 percent, based on 1997 occupancy rates—meaning that the industry would need approximately 96,000 additional rooms if long-run occupancy continued at 1997 levels. In this article I will explain how those calculations came to be.

Finding Equilibrium

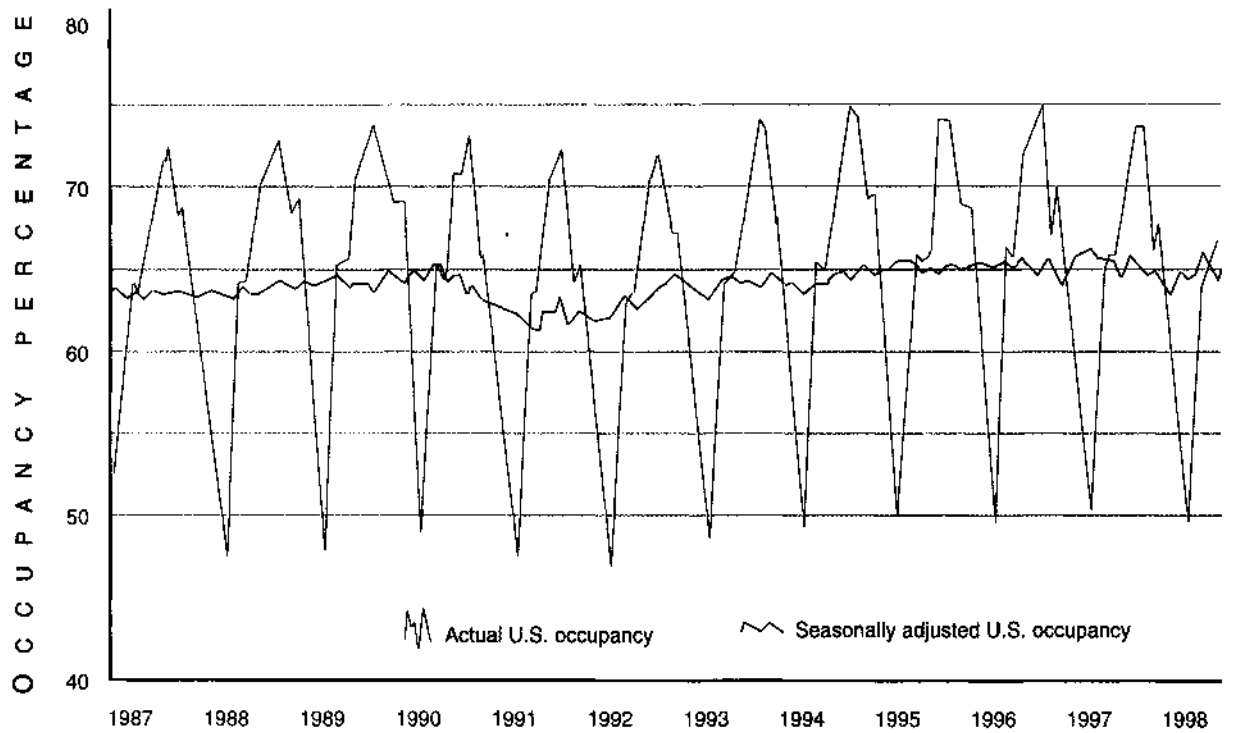
For many decades the U.S. lodging industry has struggled to define long-run equilibrium occupancy rates for the United States as a whole and for individual markets. Calculating an equilibrium occupancy provides a useful benchmark to gauge the relative performance of a market and to estimate development potential.[2] Lodging practitioners have typically depended on long-run average occupancies to estimate a stabilized occupancy level. The available data, however, present some difficulties. Yearly data are inadequate due to the infrequency of reporting and the long lags between reporting dates, while monthly occupancy is remarkably volatile, requiring seasonal adjustments to treat the variability of demand. For example, U.S. lodging occupancy fluctuates from about 50 percent in December and January to 75 percent in July and August. As shown in Exhibit 1 (on the next page), it is difficult to discern long-run changes given the raw monthly data. The seasonally adjusted data on the other hand, clearly show the low occupancies associated with the Gulf War early in this decade as well as recent record-high occupancy rates.

If present trends continue, the U.S. lodging market could absorb another 51,000 rooms.

It is incorrect, however, to use the long-run seasonally adjusted occupancy rate as an estimate of the stabilized occupancy rate. As this article demonstrates, superior estimates are obtained using a methodology derived from research in multi-family, office, and retail real-estate markets. The methodology, known as the natural-vacancy-rate hypothesis, can be used to gain insight into equilibrium vacancy rates and to characterize the dynamics of

[2] The concept of an equilibrium occupancy rate is not well defined for hotels. The intuitive definition is: that occupancy which results from long-run interaction between supply and demand. For purposes of this paper, I adopt a more precise definition, to wit: a market's equilibrium occupancy is that occupancy at which there is no pressure either to increase or to decrease long-run room rates.

Exhibit 1
U.S. lodging occupancy, 1987-1998



the rental-rate-adjustment process. In this article we use the analogous concept of natural occupancy rates to provide estimates of equilibrium lodging-occupancy levels and gain insight into the long-run development potential of the U.S. lodging industry.

Natural Occupancy Rates

The U.S. lodging market does not function as one large market, of course, but rather comprises many submarkets. Each of the submarkets is subject to its own specific market dynamics, depending on its demand profile. Given that the supply of rooms is essentially fixed in the short run, demand determines month-to-month market dynamics. Some markets, such as Virginia Beach and Phoenix, exhibit a regular pattern of large annual swings in occupancy that relate to their orientation to vacationers or refugees from winter. Other markets, such as Dallas and Houston, exhibit relatively stable demand, except for the December slump that afflicts virtually all markets.

A statistical examination of the relationship between seasonally adjusted occupancy and average daily rates (ADR) provides insight into market dynamics. Specifically, a regression of the monthly change in ADR on seasonally adjusted occupancy can be used to estimate "natural" occupancy rates. I give the calculations of this estimate in the accompanying sidebar, on the next page. In essence, the natural occupancy rate is the annual occupancy rate that produces no change in ADR—that is, the annual occupancy rate at which there is no pressure on hotel owners and managers to increase or decrease ADR.[3]

In a recent article, Wheaton and Rossoff used quarterly data to estimate that the natural occupancy rate for the United States as a whole is 61.9 percent.[4] This paper uses monthly data (from January 1987 through April 1998) to estimate the

[3] The classic literature on natural vacancy rates includes: Rosen and Smith, "The Price-Adjustment Process for Rental Housing and the Natural Vacancy Rate," *American Economic Review*, Vol. 73, No. 4 (1983), pp. 779–785; Shilling, Sirmans, and Corgel, "Price Adjustment Process for Rental Office Space," *Journal of Urban Economics*, Vol. 22, No. 1 (1987), pp. 90–100; Gabriel and Nothaft, "Rental Housing Markets and the Natural Vacancy Rate," *Real Estate Economics*, Vol. 16, No. 4 (1988), pp. 419–429; and Jud and Frew, "Atypicality and the Natural Vacancy Rate Hypothesis," *Real Estate Economics*, Vol. 18, No. 3 (1990), pp. 294–301.

[4] Wheaton and Rossoff, "The Cyclic Behavior of the U.S. Lodging Industry," *Real Estate Economics*, Vol. 26, No. 1 (1998), pp. 430–436.

U.S. natural occupancy rate at 62.9 percent.[5] Estimates for the 24 largest lodging markets reveal natural occupancy rates that range from a low of 56.4 percent for Norfolk–Virginia Beach to a high of 75.9 percent for Oahu. A comparison study using the same model but with a slightly narrower time period (January 1987–March 1997) estimated the U.S. natural occupancy rate at 62.7 percent.

The wide range of individual markets' natural occupancy rates raises the question of what might explain the differences. First and foremost, the volatility of demand plays a large role in determining NORs. Markets with large annual swings in occupancy (say, a range of 30 percent to 90 percent, as occurs in Virginia Beach) will record a lower NOR than a market like Oahu, which experienced a monthly occupancy pattern that varied between 70 percent and 95 percent.[6]

The second reason for differences among NORs relates to pricing dynamics within markets. A market with a relatively low ADR needs to obtain a higher occupancy rate to break even than the same market would if it had a relatively high ADR. This interaction between occupancy and rate is a classic economic trade-off, and should result in higher NORs in markets with relatively low rates. Related to the trade-off between occupancy and ADR is price elasticity. Hoteliers in some markets have the ability to raise rates during periods of high demand, while others do not. Markets with high price elasticity (i.e., the ability to raise rates as demand increases) would have a lower NOR than markets with low price elasticity, holding other things equal.

Estimating Natural Occupancy Rates

The procedure for estimating natural occupancy rates is a three-step process: (1) acquire raw data, (2) transform data transformation, and (3) conduct regression analysis, as explained in detail below.

(1) The raw data necessary to run the analysis are:

(a) Eight or more years of market-occupancy data (eight or more years of monthly data are necessary to ensure that the analysis is truly long-run, covering a full lodging cycle);

(b) Eight or more years of market average daily rate (occupancy and rate data are available from several sources, including Smith Travel Research, PKF, and Source Strategies); and

(c) Consumer price index (CPI) data (CPI data should be the seasonally adjusted series and match as closely as possible the market under analysis. The Bureau of Labor Statistics produces monthly CPI data for 20 U.S. MSAs, as well as monthly data keyed to city size).

(2) Transform the data as follows:

(a) Compute real ADR by dividing the actual ADR by the CPI;

(b) Adjust the occupancy and real ADR data to remove seasonal effects (for this article I used the SAS X11 procedure, based on the X11 seasonal adjustments protocol of the U.S. Census Bureau); and

(c) Compute the monthly change in seasonally adjusted real ADR and CPI (Value at time t - Value at time t - 1) ÷ (Value at time t - 1).

(3) The regression model is:

$$\Delta ADR^* = b_0 + b_1 \Delta CPI^* + b_2 OCC^* + \text{error}$$

where:

ΔADR^* is the monthly change in seasonally adjusted real ADR,
ΔCPI^* is the monthly change in seasonally adjusted CPI,
OCC^* is the monthly seasonally adjusted occupancy rate, and
Error is a randomly distributed error term.

The expected value of b_1 is 0, if real ADRs are invariant to changes in inflation. The expected sign of b_2 is positive. If room rates are expected to increase 1 percent for each 1-percent increase in occupancy, b_2 is expected to be 1/12 percent per month, or 0.833. Real ADRs should increase when occupancy increases. The natural occupancy rate is calculated as:

$$NOR = -(b_0 \div b_2)$$

Mathematically, the natural occupancy rate is that occupancy that produces a ΔADR^* of zero.

Practitioners should be aware that the adjusted R^2 for these models rarely exceeds 15 percent, with a value of 10 percent considered to be a good fit. If the model has an insignificant overall F-test, the results should not be used to calculate a NOR.—*J.A.D.*

Natural Occupancy Rates and the Development Gap

Calculating natural occupancy rates can assist market analysts in assessing the relationship between supply and demand in a market, to determine whether that market could absorb more supply (both in the short term and the long term). Exhibit 2 presents summary data and natural occupancy rates for the United States overall and for its 24 largest lodging markets. For the most part, natural occupancy rates range between 60 and 70 percent. Interestingly, both the highest and the lowest NORs occur in destination-oriented markets, with Oahu, Orlando, and Las Vegas defining the top of the range, while seasonal Phoenix and Norfolk–Virginia Beach define the bottom. As I just indicated, I believe that the reason for the two groupings is seasonality of demand, with the high NOR markets being much less seasonal than the low NOR markets.

[5] J. deRoos, "Room Rate Adjustments and Natural Occupancy Rates in the Lodging Industry," Cornell University Center for Hospitality Research working paper, 1998.

[6] The correlation between NOR and the standard deviation of monthly occupancy for the 24 MSAs is -0.26, but is not statistically significant. Thus, while there is evidence that high NORs are associated with low volatility, the results are not conclusive.

Exhibit 2
Summary data for the U.S. lodging industry and 24 MSAs

Market[1]	Natural occupancy rate[2]	Volatility of occupancy (std. dev.)	Average daily rate (1997)	Number of properties[3]	Number of rooms[3]	Sample percentage[4]
USA	62.9%	7.54%	$75.30	34,594	3,623,439	60.5%
Oahu	75.9%	6.18%	$113.19	113	35,838	81.6%
New York	73.0%	8.25%	$164.00	244	66,204	69.1%
Orlando	72.5%	9.18%	$80.18	328	92,212	66.4%
Las Vegas	72.1%	6.80%	$75.61	257	107,710	27.3%
San Francisco	70.9%	10.53%	$117.40	304	42,990	76.5%
New Orleans	68.8%	8.99%	$104.10	146	27,100	81.2%
Seattle	67.1%	12.49%	$88.64	236	27,007	77.1%
Washington, DC	67.1%	11.36%	$99.93	367	68,739	84.7%
Chicago	66.3%	10.06%	$100.11	406	69,986	81.7%
Boston	66.0%	13.25%	$114.98	220	35,081	85.7%
Minneapolis–St. Paul	64.9%	10.40%	$75.70	206	27,100	82.0%
Los Angeles–Long Beach	64.1%	6.77%	$82.20	644	80,045	68.1%
San Diego	64.1%	8.74%	$86.11	394	47,185	68.0%
Miami–Hialeah	63.8%	8.17%	$92.98	254	40,702	60.2%
Nashville	63.8%	10.41%	$71.91	228	28,446	78.1%
Philadelphia	62.3%	8.83%	$89.57	206	29,570	79.0%
Anaheim–Santa Ana	62.1%	8.51%	$75.54	358	44,888	64.4%
Atlanta	61.2%	7.40%	$76.48	513	72,887	78.7%
Dallas	61.2%	7.55%	$78.49	321	49,124	82.4%
Tampa–St. Petersburg	60.7%	10.71%	$72.23	299	35,428	69.4%
Phoenix	59.6%	12.15%	$96.09	269	41,091	78.3%
Houston	59.1%	6.34%	$69.90	277	42,822	83.1%
Detroit	58.8%	8.20%	$70.10	255	31,926	77.3%
Norfolk–Virginia Beach	56.4%	15.53%	$61.88	309	33,222	66.8%

[1] Market figures are for MSAs, not legal city boundaries.
[2] Natural occupancy rates are estimated using data from January 1987 through April 1998.
[3] The figures are for year end 1997. All data are based on the Smith Travel Research U.S. Lodging Census.
[4] The relative size of the sample used to estimate the natural occupancy rate as a percentage of all rooms in the market.

As stated previously, the natural occupancy rate is that long-run occupancy level at which hoteliers feel no pressure to increase or decrease room rates. A long-run occupancy that remains above the NOR creates pressure to increase room rates. Increased rates coupled with increased occupancy drive significant increases in profitability. That profitability, in turn, attracts new supply, as developers see opportunities to capture a portion of the profits by building at new locations. Completing the cycle, the new supply lowers occupancy levels, creating pressure to stabilize rates, thus lowering profitability and dampening new development opportunities—and market occupancy returns to its natural level.

Estimates of Development Gaps

Comparing long-run and short-run NORs can give one a sense of the potential for development, especially since the short-run signal may be different from the long-run signal. Exhibit 3 presents NORs and two sets of development gaps, a long-run gap and a short-run gap. The long-run gaps are based on monthly occupancy over the 11-year period from January 1987 through April 1998. I submit that this extended time period encompasses a full development cycle from peak in 1987 through the trough in 1991–92 to another peak in 1997–98. Gaps are measured in two ways. The first, the occupancy gap, is the difference between the NOR and average occupancy over the 11-year cycle. Positive occupancy gaps indicate excess demand. A second way to express the gap is to calculate a room gap, defined as the annual supply growth necessary to produce an occupancy rate equal to the natural occupancy rate. Positive room gaps mean that an increase in supply is necessary to achieve the natural occupancy rate.

Exhibit 3 shows an estimated long-run occupancy gap of 0.89 percent for the United States as a whole, meaning that long-run demand growth is 1.4 percent above equilibrium demand as represented by the NOR.[7] Another way of in-

[7] The 1.4 percent is calculated thus: 0.89% divided by the U.S. NOR of 62.9%.

Exhibit 3
Natural occupancy rates and development gaps

Market[1]	Natural occupancy rate[2]	Average occupancy rate (1987–97)[3]	Long-run occupancy gap[4]	Long-run room gap[5]	Average occupancy rate (1997)	Short-run occupancy gap	Short-run room gap
USA	62.9%	63.8%	0.89%	51,170	64.6%	1.67%	95,890
Oahu	75.9%	82.5%	6.65%	3,139	77.7%	1.85%	875
New York	73.0%	74.7%	1.71%	1,551	80.9%	7.93%	7,192
Orlando	72.5%	75.8%	3.25%	4,137	79.8%	7.23%	9,195
Las Vegas	72.1%	74.6%	2.47%	3,690	77.6%	5.51%	8,233
San Francisco	70.9%	72.3%	1.42%	864	80.0%	9.09%	5,474
New Orleans	68.8%	68.7%	-0.10%	-39	69.5%	0.73%	287
Seattle	67.1%	70.5%	3.39%	1,365	72.3%	5.14%	2,067
Washington, DC	67.1%	67.4%	0.30%	308	70.7%	3.63%	3,720
Chicago	66.3%	67.0%	0.66%	698	71.5%	5.12%	5,396
Boston	66.0%	68.1%	2.07%	1,100	74.1%	8.08%	4,292
Minneapolis–St. Paul	64.9%	66.3%	1.41%	589	68.5%	3.66%	1,528
Los Angeles–Long Beach	64.1%	65.8%	1.70%	2,116	68.7%	4.54%	5,672
San Diego	64.1%	66.1%	1.93%	1,419	71.4%	7.25%	5,331
Miami–Hialeah	63.8%	70.3%	6.50%	4,149	72.1%	8.36%	5,339
Nashville	63.8%	64.8%	1.04%	465	66.5%	2.71%	1,209
Philadelphia	62.3%	65.6%	3.28%	1,555	70.6%	8.28%	3,928
Anaheim–Santa Ana	62.1%	64.8%	2.63%	1,901	68.2%	6.09%	4,402
Atlanta	61.2%	64.2%	3.00%	3,576	63.9%	2.72%	3,247
Dallas	61.2%	63.2%	2.08%	1,668	66.8%	5.59%	4,492
Tampa–St. Petersburg	60.7%	61.5%	0.79%	461	65.5%	4.79%	2,793
Phoenix	59.6%	66.1%	6.55%	4,519	69.6%	10.09%	6,960
Houston	59.1%	60.6%	1.46%	1,056	64.0%	4.81%	3,485
Detroit	58.8%	61.4%	2.63%	1,429	66.3%	7.51%	4,082
Norfolk–Virginia Beach	56.4%	58.2%	1.83%	1,078	57.5%	1.04%	615
	Average for MSAs		2.44%			5.49%	
	Sum for MSAs			42,794			99,814

[1] Market figures are for MSAs, not legal city boundaries.

[2] Natural occupancy rates are estimated using data from January 1987 through April 1998.

[3] Average of lodging industry monthly occupancy from January 1987 through April 1998.

[4] Difference between the long-run average occupancy and the natural occupancy rate.

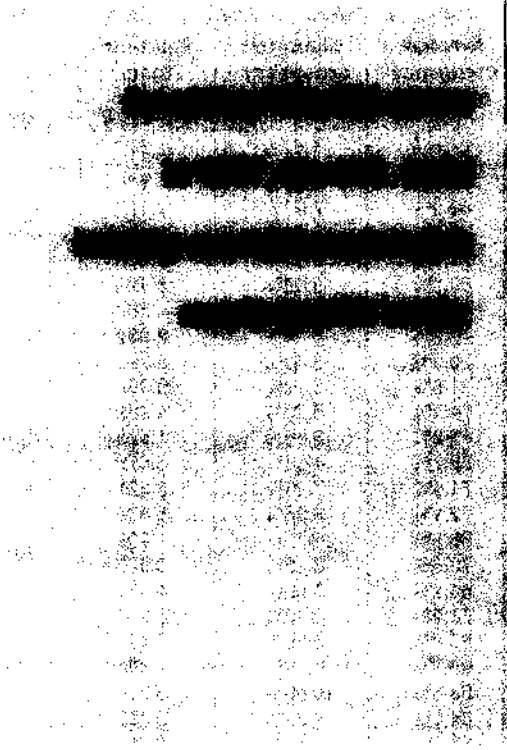
[5] Number of rooms necessary to make the actual occupancy equal to the natural occupancy rate. Positive numbers mean new supply is needed, while negative numbers mean the supply needs to be reduced.

terpreting this result is as follows: due to long-run growth in demand, long-run occupancy exceeds the NOR by 0.89 percent. The U.S. room gap is approximately 51,000 rooms, meaning that 51,000 additional rooms are needed to accommodate new demand while holding occupancy constant.

The short-run gaps are based on actual occupancy for calendar year 1997, which is generally recognized as a good year for the U.S. hotel industry. Those gaps show an occupancy gap of 1.67 percent, indicating 2.7-percent demand growth or a room gap of approximately 96,000 rooms. The short-run signal, based on 1997 results, clearly overstates long-run supply needs, because 96,000 rooms per year is an unsustainable level of supply growth. The actual nationwide supply growth in 1997 was 125,000 rooms. Thus, the U.S. hotel industry not only misread the long-run signal, but overshot the short-run signal as well.[8]

[8] The figure for supply addition is an estimate by F.W. Dodge, as reported by BT Alex. Brown in its *Hotel Construction Update* for the third quarter of 1998.

As shown in Exhibit 3, all but one of the 24 largest MSAs have a long-run need for additional supply (the exception is New Orleans). The largest occupancy gap occurs on Oahu, at 6.65 percent, while the largest room gap is in the Phoenix market, with 4,500 rooms needed. The MSA results also show the danger of using a good year, in this case 1997, to determine aggregate supply needs. In all but three cases, short-run gaps exceed long-run gaps—in some cases by large margins (exceptions are Oahu, Atlanta, and Norfolk–Virginia Beach).



MSA	Price point	Geographic submarket	Combination
Atlanta	Upscale	Airport	Upscale–Airport
Dallas	Midprice	North	Midprice–North
Orlando	Economy	Maingate	Economy–Maingate
San Francisco	Luxury	Knob Hill, Wharf	Luxury—Knob Hill, Wharf

San Francisco, for in- easily misread the om gap of 5,474 rooms siderable new supply. e long-run signal indi- n Francisco would be th the addition of only equivalent to one major property or a handful or limited-service

A results confirm that of lodging demand is ly solved in local mar- gh the average long-run ap for the individual 4 percent, that occu- nges from -0.10 per- cent to 6.05 percent—a fairly broad interval. It would certainly be inappropriate to apply the 0.89-percent nationwide occupancy gap to individual markets when superior estimates can be obtained at the MSA level.

Submarket Results

While nationwide or MSA-level results are useful, many developers wish to know the potential for development within a particular price segment or in a narrowly defined geographic market. Given the intuitively appropriate results for the United States and the 24 largest MSAs, it is important to examine how well the model and results hold up in submarkets of a given MSA. To answer this question, I examined submarkets in four MSAs by sampling a given price point for a given geographic submarket. The resulting combinations of price point and geographic submarket are illustrated in the box above.

As shown in Exhibit 4, subdividing the market can produce a small sample. I found just seven properties in Atlanta's upscale–airport segment, for instance, and 11 in the case of Dallas midprice–north. In addition, some of the time periods are truncated due to Smith Travel Research's sampling constraints—namely, all markets must record at least five hotels over the entire time period. Interestingly, all submarkets have a sample percentage that is higher than that of the MSA as a whole, meaning that the STR database includes proportionately more of the hotels in the submarkets than in the entire MSA. This indicates the data used to estimate submarket natural occupancy rates are truly representative of their market segments.

The results are encouraging, in that one can estimate natural occupancy rates in all cases. Shown in Exhibit 5 are the natural occupancy rates, occupancy gaps, and room gaps for the four submarkets. Note that the submarket NORs are different from those of the overall MSA, as one might expect. For example, the Atlanta upscale market has a NOR of 66.7 percent, while the entire MSA has a NOR of 61.3 percent. Additionally, while the Atlanta airport market has a NOR of 61.9 percent, the upscale submarket of the Atlanta airport has a higher NOR, 65.9 percent, consistent with the higher overall upscale NOR for the entire Atlanta market.

That price-point effect occurs in some form in all four markets. Luxury properties in San Francisco

Exhibit 4
Natural occupancy rates for four lodging submarkets

	Natural occupancy rate[1]	Average daily rate (1997)	Number of properties[2]	Number of rooms[2]	Sample percentage[3]
Atlanta	61.3%	$76.48	513	72,887	78.7%
Atlanta Upscale	66.7%	$83.20	63	10,865	88.1%
Atlanta Airport	61.9%	$71.92	50	8,347	80.7%
Atlanta Upscale–Airport	65.9%	$84.57	7	1,471	89.5%
Dallas	61.9%	$78.49	321	49,124	82.4%
Dallas Midprice	60.4%	$67.58	73	10,407	95.6%
Dallas North	60.4%	$90.51	37	7,335	90.3%
Dallas Midprice–North	56.6%	$67.59	11	1,751	89.7%
Orlando	72.8%	$80.18	328	92,212	66.4%
Orlando Economy	69.4%	$42.67	75	12,128	75.7%
Orlando Maingate	75.4%	$52.05	123	22,959	68.1%
Orlando Economy–Maingate	74.7%	$41.63	41	6,980	77.3%
San Francisco	70.9%	$117.40	304	42,990	76.5%
San Francisco Luxury	72.0%	$172.65	25	12,208	96.3%
San Francisco Knob Hill, Wharf	70.8%	$127.05	191	29,965	77.9%
San Francisco Luxury—Knob Hill, Wharf	71.9%	$172.63	24	12,046	97.6%

[1] Natural occupancy rates are estimated using data from the following time periods: for Atlanta, July 1990–April 1998; for Dallas, February 1988–April 1998; and for Orlando and San Francisco, February 1987–April 1998. The MSA-level results differ from those in Exhibit 2 due to the different time periods.

[2] The figures are for year-end 1997.

[3] The size of the sample used to estimate the natural occupancy rate as a percentage of all rooms in the specified market segment.

Exhibit 5
Natural occupancy rates and development gaps in lodging submarkets

	Natural occupancy rate[1]	Average occupancy rate	Long-run occupancy gap[2]	Long-run room gap[3]	Average occupancy rate (1997)	Short-run occupancy gap	Short-run room gap
Atlanta	61.3%	65.1%	3.77%	4,486	63.9%	2.61%	3,104
Atlanta Upscale	66.7%	69.6%	2.86%	466	67.3%	0.53%	86
Atlanta Airport	61.9%	68.9%	7.08%	955	70.7%	8.80%	1,187
Atlanta Upscale–Airport	65.9%	72.8%	6.91%	154	73.3%	7.34%	164
Dallas	61.9%	64.3%	2.41%	1,911	66.8%	4.92%	3,904
Dallas Midprice	60.4%	62.8%	2.40%	413	67.7%	7.30%	1,258
Dallas North	60.4%	65.8%	5.40%	656	69.0%	8.63%	1,048
Dallas Midprice–North	56.6%	59.7%	3.04%	94	64.0%	7.40%	229
Orlando	72.8%	75.9%	3.07%	3,689	79.8%	6.98%	8,645
Orlando Economy	69.4%	72.3%	2.94%	513	73.7%	4.34%	758
Orlando Maingate	75.4%	76.3%	0.89%	272	78.2%	2.79%	850
Orlando Economy–Maingate	74.7%	75.3%	0.56%	53	76.4%	1.64%	154
San Francisco	70.9%	72.4%	1.42%	860	79.9%	8.98%	5,442
San Francisco Luxury	72.0%	72.5%	0.45%	77	79.6%	7.51%	1,273
San Francisco Knob Hill, Wharf	70.8%	72.2%	1.34%	568	79.3%	8.51%	3,600
San Francisco Luxury—Knob Hill, Wharf	71.9%	72.5%	0.60%	100	79.6%	7.67%	1,285

[1] Natural occupancy rates are estimated using data from the following time periods: for Atlanta, July 1990–April 1998; for Dallas, February 1988–April 1998; and for Orlando and San Francisco, February 1987–April 1998.

[2] Difference between the long-run average occupancy and the natural occupancy rate.

[3] Number of rooms necessary to make the long-run occupancy equal to the natural occupancy rate. Positive numbers mean new supply is needed, while negative numbers mean the supply needs to be reduced.

get an NOR premium relative to the market, both for the entire MSA and the Knob Hill, Wharf submarket. Analysis of Dallas and Orlando reveals a penalty for hotels at certain price points. Midprice hotels in Dallas have a lower NOR than the market (both market-wide and in the north submarket). The same effect holds for Orlando, but with economy properties. The results are consistent with STR's *Lodging Outlook*, which consistently shows that luxury and upscale hotels have long-run occupancies above those of midprice and economy hotels.[9]

The natural-occupancy-rate methodology provides a useful perspective on the supply needs of each market and its submarkets, and gives a clear indication of the difference between long-run and short-run results. For example, San Francisco has recently enjoyed strong occupancy rates that (if they continued) would lead one to believe that the city needs the addition of approximately 1,275 new luxury rooms. A long-run view of this market however, reveals that if occupancies follow their recent historical pattern the market will need just 77 rooms (see Exhibit 5, on the previous page). The different perspectives allow developers to gauge the attractiveness of development in light of long-run trends. Thus, the San Francisco market could absorb, say, another 125-room luxury hotel, but opening ten 125-room luxury hotels would clearly be excessive. While those ten hypothetical new hotels would enjoy short-run success during the current economic upturn (based on the short-run gap analysis), an economic downturn would cause suffering across the entire luxury market. Similar, albeit less-dramatic results hold for the other market segments.

[9] *Lodging Outlook* is a monthly publication of Smith Travel Research.

NOR Applications

A particular attraction of the NOR methodology is its ability to estimate the number of rooms needed, by price point, within geographic submarkets. This allows precise pinpointing of development gaps, and accurate forecasting of supply growth.

I hope that market participants will use the methodology to assist their growth and acquisition strategies. In addition to estimating development gaps, natural occupancy rates can be used in feasibility analysis, market analysis, and room-rate pricing.

Feasibility analysis. NORs provide a basis for estimating stabilized or long-run occupancy rates, as well determining the magnitude of current excess demand. The feasibility analyst needs yearly estimates of occupancy and rate to generate the typical five- to ten-year *pro forma*. Thus, both near-term and long-term projections of demand are necessary for a feasibility analysis.

If occupancy rates eventually revert to the mean (that is, if their long-run tendency is to rise or drop to an equilibrium), then NORs provide an estimate of this equilibrium condition. By adding lags to the regression model, the feasibility analyst can also estimate the annual occupancy adjustment as a market moves from (say) excess demand to equilibrium.

Market analysis. NORs and occupancy gaps provide a basis for quickly screening markets to determine which are hot and which are not. Presumably, a market with a large positive long-run occupancy gap would be more profitable than a market with a small gap, as the market with the large gap demonstrates substantial excess demand. The NOR information provides market intelligence that can be used to verify anecdotal evidence and to quantify hunches.

Room-rate pricing. NORs can be used to inform future pricing decisions, by providing solid evidence of market strength, again as evidenced by the occupancy gap. In fact, the occupancy gap $\times 12 \times b_2$ from the NOR regression equation (the occupancy coefficient; see the box on page 17) is the theoretical increase in rates that should occur from the gap. For example, assume a market with a long-run occupancy gap of 2.0 percent, a short-run occupancy gap of 5 percent, and a b_2 value of 0.10. This market faces long-run pressure to raise rates by 2.4 percent per year ($2.0\% \times 12 \times 0.1$) and short-run pressure to raise rates by 6.0 percent ($5.0\% \times 12 \times 0.1$). This potential use of NORs, which should be of interest to lodging owners and operators, will be the subject of future study.

Technical, but Valuable

Natural occupancy rates provide market participants with essential data for estimating long-run equilibrium occupancy rates. One use for these data is to estimate supply needs, both for the market as a whole and for any given submarket. This article provides a methodology for implementing the technology and demonstrates the usefulness of the technique. Natural occupancy rates have several potential uses in the industry and are worthy of further study. CQ