Hotel Room-inventory Management

An Overbooking Model

The gentle art of overbooking can be augmented with a carefully constructed computer model—but human expertise will always be necessary.

BY REX S. TOH AND FREDERICK DEKAY

With their insistence that guests guarantee room reservations with a credit card, hotel operators have taken great strides to address the problems caused by no-shows, both for individual travelers and group-related guests. Moreover, some hotels are attempting to address the other end of the no-show problem, by imposing early departure penalties. Nevertheless, no-shows and early departures still cost hotels money. The credit-card guarantee compensates hotels for one night's stay in the case of a no-show, but the hotel still needs to make up for a revenue loss if that no-show guest had a multiple-night reservation.

Because of the prospect of no-shows and early departures, the hotel manager almost inevitably must engage in some level of overbooking to help ensure that those potentially unsold rooms are filled. As we all know, however, hoteliers who overbook will have to walk guests after the hotel is full. As we outline below, many researchers have investigated ways to untangle this Gordian knot of no-show guests, overbooked rooms, and walked guests. In this article we propose a model that we have developed to assist rooms managers in establishing an optimal level of overbooking. We show the model's derivation for readers who would like to see the mathematics, and provide a simple-to-use final formula for those who just want to plug in the numbers.

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Survey Questionnaires and Results

We began by conducting a wide-ranging literature review. From that information we constructed a 44-question survey, which we sent to the rooms managers at six hotels that agreed to participate (some hotels that we contacted declined to participate because of confidentiality concerns). Two to four weeks after the managers received the questionnaire, we interviewed each one at their hotel for approximately 90 minutes, and followed our interview with telephone inquiries to clarify issues. We subsequently interviewed managers at another six hotels by telephone, to minimize sampling errors on 20 crucial statistics, such as no-show and early departure rates, and the number of unexpected stayovers. Because of the sensitive nature of the answers (for example, the overbooking rate and walking protocol) all respondents requested strict confidentiality.

Our model is based on the pertinent statistics summarized in Exhibit 1. In addition to those factors, the model includes the following factors. Most critically, the model will accept walk-ins only when there are unsold rooms. Additionally, luxury and handicap-accessible rooms are usually protected from overbooking, but vacant rooms in those classes can be used as upgrades in the case of an oversale. Furthermore, state laws give room priority to stayovers and holdovers (those who refuse to leave on schedule) over new arrivals.3

One other factor that affects room-reservation calculations is the growth of the MICE (meetings, incentives, conventions, and exhibitions) market. While group reservations can constitute more than 50 percent of rooms sold in some large convention hotels, accepting a group’s reservation involves another set of no-show and early departure issues, because conventioners may arrive late, leave early, or skip a meeting altogether (even if they planned to attend). Hoteliers have begun to shift groups’ no-show risks to the groups themselves, with attrition provisions in the contracts. Groups can usually reduce a negotiated portion of their room blocks until 30 days before the arrival date, but for the final 30 days before arrival the number of room-nights in the contract is typically set in stone.

Our survey revealed that the booking profiles for individuals and groups are radically different. For individuals the total number of rooms booked increases as the day of arrival approaches, with the reservation rate peaking at seven to 14 days out, while bookings for groups decrease up to 30 days out, as we just explained in connection with attrition contracts. This convergence is illustrated in Exhibit 2.

* In most states holdovers have squatter’s rights, but in Hawaii they are considered trespassers and can be evicted.

3 Americans spend about $40 billion on more than one million meetings a year involving 79 million people (see: Meetings and Conventions, August 2002). By comparison, in 2002 hotels had total revenues of about $107 billion (data from the Hotel Operating Statistics database).
Literature Review

In a celebrated article, Weatherford and Bodily came up with a comprehensive taxonomy of 14 elements (such as capacity) and their accompanying descriptors (for example, fixed or variable) related to what's called perishable-asset revenue management, or PARM. They calculated that there are an astounding 124,416 possible combinations of elements and descriptors. It has been claimed that over 100 technical PARM-related papers have been published, none of which purport to address all aspects of perishable asset revenue management. We present the major aspects of the salient articles in Exhibit 3 (overleaf).

In the context of the Weatherford and Bodily taxonomy, for our own model we confined ourselves to examining the problems of random individual demand, uncertain cancellations, no-shows leading to overbooking, and oversale of multiple grades of a discrete perishable asset of fixed capacity, with the possibility of upgrades as well as non-auction displacement procedures, and with continuous-time dynamic decision rules. We allow for group reservations, multiple-type rooms, and multiple-night reservations, as well as deal with the concomitant problems of early departures and holdovers. We also do away with the unrealistic assumption that all guests arrive at the same time, and we do not allow for hotels to unilaterally cancel reservations, which is simply not done. Furthermore, like Williams, we acknowledge that holdovers have priority, followed by guests with reservations, and walk-ins are to be accommodated only on a space-available basis. Note that our model attempts to realistically reflect the existing institutional framework in the hospitality industry, and deals primarily with the goal of full occupancy, once optimal room rates have been set, accepting reasonable displacement risks.

Overbooking Model

Despite reservation guarantees and groups' attrition agreements, overbooking still has good reason to exist. Indeed, it has been demonstrated that even if the hotel is assured of payment and there are penalties for oversales, the property has an incentive to overbook for the following reasons. First, Lambert, Lambert, and Cullen demonstrated that same-day reservations and walk-ins cannot overcome the loss of reservations from

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late cancellations and no-shows. Second, credit cards guarantee only the first night of a multiple-night reservation. Similarly, early departure penalties do not always cover all unsold room-nights. Third, even if group contracts are subject to attrition provisions, the odium of collecting on the penalties often induces hotels to sell into group those factors for the purpose of establishing a target customer-service level, which is the percentage of times the hotel can accommodate all its guaranteed reservations during peak times (given that the hotel will be overbooking). By determining the distribution of no-shows and early departures, the hotel manager can then establish optimal overbooking levels (basically determining how often guests are likely to be walked).

Our model assumes that the overarching objectives of yield management have determined the optimal rates to charge at the right times, and once those rates are set, our objective is to sell as many rooms as possible to fill up capacity, within the constraints of the predetermined optimal customer-service level. Thus, we propose an optimal overbooking model, within the broader framework of an optimal yield-management strategy.

As is the case with many other room-inventory-management models, ours is based on airline overbooking models—in this case, one that one of the authors (Rex Toh) developed for Singapore Airlines, which was a simple overbooking model for IATA-regulated full-fare economy-class seats on the Singapore-Jakarta route. That model was subsequently expanded to accommodate joint reservation control for full- and discounted economy-class seats on U.S. airlines, using inventory-depletion dynamic-decision rules to adjust for reservations and cancellations of the two types of fares. In this article we adjust the expanded airline model to

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bookings rather than invoke penalties. Fourth, overbooking allows hotels to double dip by collecting the no-show penalty and then reselling the room (unless prohibited by a group's contract). Finally, ancillary hotel revenues depend on the level of occupancy (e.g., restaurant and bar, convention services, concessionaires, and parking). In short, hotels overbook to ensure that the property is operating at full occupancy during peak periods.

Our principal hypothesis is that it is possible for hotel managers to assign explicit values and costs to empty rooms, loss of customer goodwill due to walks, and other relevant variables. Managers can then determine the trade-offs among

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## Summary of literature review

<table>
<thead>
<tr>
<th>Journal article</th>
<th>Main contributions</th>
<th>Comments</th>
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<tr>
<td>S. Ladany, &quot;Dynamic Operating Rules for Motel Reservations,&quot; Decision Science, Vol. 7 (1976), pp. 829–840.</td>
<td>Recognized both single and double rooms, and established limits on the number of each type of reservation.</td>
<td>Considered more than one room type.</td>
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<tr>
<td>Y. Feng and B. Xiao, &quot;Revenue Management with Two Market Segments and Reserved Capacity for Priority Customers,&quot; Advanced Applied Probability, Vol. 32 (2002), pp. 800–823.</td>
<td>Recognized that revenues are maximized through yield management (i.e., calling at the right price to the right customer at the right time).</td>
<td>Yield management model is applicable to both airlines and hotels.</td>
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handle hotel overbooking and to manage new arrivals and stayovers. Upgrades are still possible (from standard to luxury rooms), and multiple-night stays are treated the same way as multi-sector flight bookings, but we deal with the complicating fact that unlike flying on an airline where a passenger cannot step out of a plane in midair or refuse to disembark when the flight is over, a hotel guest can leave early or extend his or her stay.

We model a hypothetical convention hotel with 950 rooms, of which 150 are in the overbooking-protected categories of luxury (or deluxe) or handicap-accessible rooms, while the remaining 800 are standard rooms that can be overbooked. The booking profile over time (shown in Exhibit 4) is typical of large center-city convention hotels. As the graph in Exhibit 2 shows, group bookings tend to be almost rect-
angular in nature with discrete drops as the day of arrival approaches (as permitted by most group-sales contracts), while individual bookings tend to assume a reverse-S shape with the rate of bookings rising to a peak at seven to 14 days out. Typically, about 80 percent of individual reservations are made within 30 days of arrival.13 The previous year's reservation profile of 40 fully booked days (excluding extraordinary days such as Memorial Day, Labor Day, Thanksgiving, and Christmas) is shown in Exhibit 4. We made a conscientious attempt to ensure that the numbers and percentages shown in our hypothetical hotel are typical and reflect our survey results.

Using historical and accounting records, plus one's own judgment, one can assign explicit values to the following relevant variables: opportunity cost of empty rooms, prevalence of walk-ins as a last-minute substitute for no-shows and early departures, value of customer goodwill, the availability of nearby hotels of comparable standard, the cost of walking displaced guests, and legal penalties of walking a conventioneer protected by a no-walk agreement. Suppose that the overall cost of an empty room less variable cost is high and that walk-in traffic is insignificant. Also suppose that there are excellent prospects for room upgrades because the luxury and handicap-accessible rooms are seldom sold out, and there are many comparable hotels in the vicinity. Additionally, there are reciprocal-walk arrangements with comparable hotels offering discounts (usually around 33 percent). While the presence of such arrangements suggests that the hotels maintain a high overbooking rate and a low customer-service level, most of the hotel's guests are repeat business travelers and many of its group-sales agreements include no-walk provisions with heavy penalties for oversales. Moreover, suppose that employee morale has been undermined by having to deal with unhappy displaced guests. Those factors argue for a low overbooking rate and a high customer-service target. Given all available data and judgments, suppose that the hotel considers a 90-percent customer-service level to be best. Thus, guests are walked 10 percent of the time during peak periods when the hotel overbooks.

Hotels can define their customer-service level in this fashion because they have advance warning of being overbooked. Unlike airlines, which cannot know that they are oversold until a short time before the plane takes off, hotels are aware of their oversale situations by checkout time (normally 11:00 AM). Thus, hotels can make advance arrangements for alternative accommodation, determine which guests to protect, and alert the front desk to the likelihood of walking guests—all before the guests present themselves. Our rooms managers informed us that walking guests is one of the most stressful parts of their duties exactly because they cannot conduct an impromptu auction and ask for volunteers to be walked. Thus, the issue is not the number of walks so much as it is the fact that the front desk must gear up for managing any walks at all.

For our purposes, the customer-service level is defined as the percentage of peak days during which the hotel walks at least one guest due to overbooking. Determining the appropriate customer-service level is an extremely challenging task. To set customer-service levels, one has to balance the cost of empty rooms—which is relatively easy to calculate—with the consequences of an oversale—which is difficult to quantify, given the loss of customer goodwill and adverse effect on employee morale.

Airlines routinely set customer-service levels. For instance, on the Singapore-to-Jakarta route, Singapore Airlines and Garuda Airlines could reduce their usual customer-service levels because they operated 32 round trips per day between them and could make a revenue-pooling arrangement work. Moreover, since their flights were closely scheduled, bumping an oversold passenger would have meant a 30-minute travel delay.

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for that individual—usually not a hardship.\footnote{For a full discussion as to how an airline determines the appropriate customer-service level, see Rex S. Toh (1975), \textit{op. cit.}} In analogous fashion, many large downtown hotels are located near one another. Thus, a displaced guest would for the most part not be terribly inconvenienced, and a reduced customer-service level could be acceptable.

Having explained the factors underlying a determination of the customer-service level, we calibrate the model, using our customer-service level of 90 percent on peak days. As shown in Exhibit 4, of the 40 days when the hotel had overbooked during peak periods, there were 20 days when at least one guest had to be walked. In other words, the hotel had an implicit 50-percent customer-service level during peak periods, far less than the optimal level of 90 percent. The model can help us determine the authorized booking level that will permit the desired level of service.

To begin building the model, each reservation can be treated as a Bernoulli problem: the guest either shows up or is a no-show, and will either stay over as expected or depart early.\footnote{A Bernoulli problem involves a situation that has only two possible mutually exclusive, complementary outcomes, such as the guest shows up or does not do so.} This problem is addressed by calculating the standard error of proportions, as follows:

$$\sigma = \sqrt{\frac{pq}{n}}$$

where:

- $\sigma$ = standard error of proportion of no-shows or early departure
- $p$ = probability of a no-show or early departure
- $q$ = probability of a show up or stayover
- $n$ = number of expected arrivals or stayovers

Next, the Central Limit Theorem will guarantee that the sampling distribution of the proportion of no-shows or early departures is approximately normal (i.e., a bell-shaped curve) if the sample size (the average number of guests with reservations) is sufficiently large.\footnote{The Central Limit Theorem holds that, provided the sample is of sufficient size, the distribution of the means of every conceivable sample combination will be approximately normal. The distribution of the proportion of no-shows is strictly binomial, but when the sample size is sufficiently large so that both $np$ and $nq$ are equal to or greater than 5, then the normal distribution is a good approximation. For an explanation of all the statistical techniques used, see: Rex S. Toh and Michael Y. Hu, \textit{Basic Business Statistics: An Intuitive Approach} (St. Paul: West Publishing Co., 1991), chapters 5, 9, and 10.}

Given the mean proportion, standard error, and the assumed normality of the distribution of no-shows or early departures, a one-sided confidence interval reflecting the desired customer-service level can be constructed to give us the lower limit of the normal distribution, since we need to protect only against the lower proportion of no-shows or early departures to prevent oversales.

Mathematically, this is expressed as:

$$\left\{1 - \left[ p - z \sqrt{\frac{pq}{n}} \right] \right\} X = C$$

where:

- $X$ = authorized booking level
- $C$ = working inventory of rooms, which is the number of rooms less the average number of unexpected stayovers
- $z$ = standard normal deviate corresponding to the desired customer-service level

Note that we have one equation with only one unknown, where $p$, $q$, $z$, and $C$ are all known constants and $X$ (the authorized booking level) is the only unknown variable. Our goal is to create a single factor to express $X$ (allowing us to plug in known values to derive a value for the authorized booking level, $X$). By a process of legitimate mathematical transformations, we can obtain the following cubic equation, which has three values for $X$:

$$(1 - p)^2 X^3 - \left[2C (1 - p) + z^2 pq\right] X^2 + Cz X = 0$$

Factoring out $X$, it is clear that one of the three roots of the cubic equation is $X = 0$, allowing us to work with the following equation:

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AN OVERBOOKING MODEL

\[ X[(1 - p)^2 X^3 - 2C(1 - p) + z^2pq)] X + C^2 = 0 \]

Dividing throughout by \( X \), we reduce the cubic equation to the following quadratic form, which will have two possible values for \( X \):

\[ (1 - p)^2 X^3 - 2C(1 - p) + .+q\) X + C\) = 0 \]

Restating the above equation in terms of \( X \), the solution to the general quadratic equation is:

\[ X = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \]

where:

\[ a = (1 - p)^2 \]
\[ b = -[2C(1 - p) + z^2pq] \]
\[ c = C^2 \]

Since the discriminant \( b^2 - 4ac \) must always be positive (as is clear from inspection), the quadratic equation will have two real and distinct roots, \( r_1 \) and \( r_2 \). However, only one of the roots will satisfy the original equation. The solution will therefore be unique, and there will be only one authorized booking level. (We will clarify this calculation by calibrating the model with data from Exhibit 4.) Note that the following equality must always hold:

\[ \text{stayovers + unexpected stayovers - early departures + expected arrivals - no-shows + walk-ins - upgrades = rooms occupied + walks.} \]

Also note that when overbooking leads to oversales, no walk-ins are accepted, and upgrades may be made.

The estimated no-show probability for the expected arrivals and the early departure probability for stayovers can be computed by totaling the relevant columns in Exhibit 4 for division:

For expected arrivals, \( p = \frac{583}{13,759} = .042 \)

For stayovers, \( p = \frac{698}{119,025} = .037 \)

The computed estimates of the probabilities are based on large total samples and can therefore be deemed to be nearly equal to the true proportions. Initially confining our analysis to expected arrivals, we note that the probability of no-shows (\( p \)) equals .042, and that the standard normal deviate for a 90-percent customer-service level is 1.28. Even though the number of standard rooms is 800, the average number of unexpected stayovers is 14.35 (see Exhibit 4), giving us a working inventory of only 786 standard rooms. We now have all the values that can be substituted into the previously derived optimizing equation:

\[ (1 - .042)^2 X^2 - [2 (786) (1 - .042) + 1.28^2 (.042) (.958)] X + 786^2 = 0 \]

Using the formula to solve the general quadratic equation, the authorized booking level \( (X) \) is 813.

Similarly, since the probability of early departures \( (p) \) equals .037, we have the following equation for the authorized booking level \( (X) \):

\[ (1 - .037)^2 X^2 - [2 (786) (1 - .037) + 1.28^2 (.037) (.963)] X + 786^2 = 0 \]

Similarly solving, \( X = 809 \)

This means that the hotel can have 813 expected arrivals or 809 stayovers booked on any particular day, each with different statistically independent probabilities of materializing. Clearly, both of those eventualities cannot occur at once. That is, the hotel cannot accommodate all guests if it has 813 expected arrivals and has 809 stayovers booked. Since the individual authorized booking levels were computed on a working capacity of 786 standard rooms, each would be counted as follows in terms of realizable demand:

\[ \text{expected arrivals: 786 + 813 = 1,967} \]
\[ \text{stayovers: 786 + 809 = 1,972} \]

This means that whenever a new arrival is accepted, the hotel must remove .967 rooms from its working inventory of 786 standard rooms, and when it has one stayover booked, it must remove .972 rooms from that working inventory. Conversely, a cancellation or no-show will release .967 rooms for the day of arrival and .972 rooms for all subsequent days on a multiple night booking. We stop taking reservations when the working rooms inventory reaches zero.

Thus, for any particular day, taking a combination of reservations, a 90-percent customer-

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Thus, for any particular day, taking a combination of reservations, a 90-percent customer-
service level is achieved by way of the following inventory-depletion formula:

\[(0.967) X_1 + (0.972) X_2 = 786\]

where,

\[X_1 = \text{booking level for expected arrivals}\]
\[X_2 = \text{booking level for stayovers}\]

Thus, the following combinations can be authorized: \((0.967) 420 + (0.972) 391 = 786\) and \((0.967) 330 + (0.972) 480 = 786\).

In the end, we do not have fixed cut-off points for reservations, but a dynamic series of combinations of expected arrivals and stayovers. It has been demonstrated that as long as the distributions of no-shows and early departures are statistically independent, reservations can be cut off when the sum of the optimally weighted reservations approaches 786. Computer technicians can easily program these dynamic real-time decision rules into the hotel’s reservation system.

Returning to the 150 luxury and handicap-accessible rooms, as we said, hotels normally do not overbook them. Stayovers can be a factor for those rooms, however. If the average unexpected stayover is six, then the hotel has a working inventory of only \(150 - 6 = 144\) special rooms. Given a 100-percent customer-service level for those rooms, the working inventory of \(144\) serves as the maximum combination of new arrivals and stayovers booked. However, if the 90-percent customer-service level were applied, then the following will hold:

Assume that the weighted average of the no-show and early departure rate is 4 percent, then,

\[p = 0.04\]
\[q = 0.96\]

\[\sigma = \sqrt{\frac{p \cdot q}{n}} = \sqrt{\frac{(0.04) (0.96)}{144}} = 0.016\]
\[z = 1.28\]

The lower limit of the proportion of no-shows and early departures is therefore \(0.04 - (1.28) (0.016) = 0.02\). This means that the upper limit of those showing up or staying is 98. Thus we can be 90-percent confident that no more than \(0.98 \times 146 = 143\) protected rooms will be filled during peak demand periods. This, in turn, means that we can add \(146 - 143 = 3\) rooms to our working inventory of 786 standard rooms while maintaining the 90-percent customer-service level. This increases the maximum cut-off points for expected arrivals and stayovers, and affects the inventory-depletion ratios, all of which can be recomputed as we showed above.

### Setting Booking Levels

In setting optimum booking levels, hotels need to determine only two factors: \(z\) (the customer-service level) and \(p\) (the probability of an empty room arising from a no-show or early departure). The \(z\) figure is much more difficult to determine, because it is derived by trading off the opportunity cost of empty rooms with the adverse consequences of oversales. The second can easily be computed from historical records. We assume a normal (bell-shaped) distribution of the proportion of no-shows and early departures, based on the properties of the Central Limit Theorem, while the magnitude of the standard deviation of proportion of no shows and early departures can be approximated by binomial theory. Both are implicit in the optimizing formula that we explained above:

\[\left\{ \frac{1 - \left[ p - z \sqrt{\frac{p \cdot q}{n}} \right]}{1 - p} \right\} X = C\]

which, through legitimate transformations, can be operationalized to the quadratic form:

\[(1 - p)^2 X^2 - [2(z(1 - p) + z^2pq)] X + C^2 = 0\]

We present the above overbooking model in its irreducible simplest form, so that rooms managers without any sophisticated knowledge of statistics or operations research can use it to augment their personal judgment regarding rooms-inventory management. It is by no means a comprehensive model, because (as noted earlier) it’s impossible to take into account every conceivable factor or variable that affects room occupancy. For instance, block reservations may have a distinctly different no-show rate than individual reservations do, and some groups are more reliable in showing up than are others.

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19 See: Toh (1979), op. cit.
Moreover, each of the hotel managers we interviewed knew which days of the week have the highest no-show rate, and they also mentioned that they could always expect a considerable number of early departures on a conference’s penultimate day. Scheduled and unscheduled maintenance and repairs can also affect room capacity. Suffice it to say that operating with an overbooking model necessitates management intervention for extraordinary circumstances, such as when an entire city or district is sold out, making walks impossible.

The other purpose of advancing our simplified overbooking model is to allow rooms managers of large hotels currently using sophisticated computer programs to have some understanding of the sort of factors that allow the computer to make continuous real-time adjustments to inventory. We have already discussed many of those factors, including the number of expected arrivals and stayovers, historical rates of no-shows and early departures, the room capacity of the hotel and the average unexpected stayover rate, the effects of group reservations and provisions for reducing the size of a block over time as per sales agreement, the possibility of upgrades, management’s input on the opportunity cost of empty rooms and loss of goodwill attendant to oversales, and complicated decision rules on displacement analysis associated with accepting multiple-night reservations at the expense of possibly walking an individual guest. Furthermore, our inventory rules suggest that all hotel overbooking models have algorithms that allow for continuous real-time adjustments to inventory as new reservations are accepted, cancellations are received, and early departures occur.

Note further that the customer-service level specified in our model applies only to peak periods. When total reservations (expected arrivals plus booked stayovers) do not deplete the revised working inventory of 789 standard rooms, oversales will not occur. Thus, on an annual basis, the customer-service level will be much higher. For our example, if the hotel overbooks to the maximum level permitted, it will have to walk guests 4 out of 40 times during peak periods. This means that it will walk guests only four days in a year. How many guests may get walked is explained next.

A 90-percent customer-service level does not mean that every guest will encounter a 10-percent chance of being walked. It merely means that during peak-demand periods, oversales will occur an average of one day out of ten. The actual number of walks involved would be relatively small. Exhibit 4 indicates that of the 13,759 guests expected to arrive, 69 were walked, representing a ratio of only 0.5 percent, or five out of 1,000, though walks occurred 50 percent of the time during peak periods. The aggressive overbooking led to an average occupancy of 799 out of 800 standard rooms sold during peak periods, and washes (empty rooms) occurred on only nine out of 40 peak nights. A wash is not particularly bad as long as there are not too many empty rooms. Indeed, one hotel manager whom we interviewed considered nights with a few empty rooms to be sold out for all practical purposes.

Another point is that the instruction against exceeding the combined authorized booking levels by way of the inventory-depletion model applies only to the day of arrival. Like the airlines, hotels recognize that early reservations tend to be tentative, and may therefore overbook aggressively in advance of the arrival date to compensate for anticipated late cancellations and group attrition. Rooms managers are usually experienced enough to ensure that the authorized booking levels are seldom exceeded on the day of arrival.

One final observation is that hotels have done a much better job of managing the no-show problem than airlines. In particular, requiring guests to guarantee their reservations by credit card has reduced the hotel no-show rate from between 10 percent and 15 percent to about 4 percent. All six rooms managers whom we interviewed volunteered the observation that since hotels started to accept only reservations guaranteed by credit cards, the no-show rate has plummeted. This complements the fact that penalties on early departures have had a similar effect on the rate of

21 See: Gould, Ramsey, and Sherry, op. cit.
22 All six of the rooms managers whom we interviewed had worked with several other hotels in the past, and all have wide experience within the industry. Anecdotally, we noticed a high turnover rate among those in the profession, as the best rooms managers are repeatedly lured away by bigger hotels.
unexpected departures. The airlines, on the other hand, have a no-show rate of 15 percent or more. Additionally, the hotel industry has done a better job than the airlines of sharing information on no-shows, early departures, and group cancellations.

Our Recommendations
Whenever we asked our rooms-manager respondents about overbooking, we noticed that all of them indicated that the level of overbooking depends on the number of expected arrivals. While that is an important factor, we draw rooms managers' attention to the equal importance of early departures and stayovers, because they have the same effect on empty rooms as new guests who do or do not show up. We also suggest that managers take into consideration the working inventory of rooms when setting overbooking levels, rather than use the physical inventory as the benchmark.

We make the following additional recommendations. First, a hotel that wants to invoke early departure penalties must give guests prior notice of that policy when it confirms a reservation and again upon check-in. One must remain flexible, though, because early departure penalties can become a service issue. That is, if a guest complains about an early departure penalty (given that it is not always levied), the matter is better dropped—even if the guest has initialed a document confirming a check-out date. Half of the hotels that we surveyed attempt to levy early departure penalties, but all drop the fee if the guest becomes irate. Ironically, meeting planners favor the use of early departure penalties, because those fees prevent conventioners from leaving early (thus invoking attrition penalties), and make it easier to plan for final banquets. Indeed, we have found that some meeting planners have started imposing their own no-show and early departure penalties on their meeting participants. Discussing early departure penalties at check-in also compels guests to announce their intention to shorten their stay (if that is the case), thus allowing other guests to gain access to rooms that would have been booked but left empty.

Second, planning for walking guests should start no later than the traditional 11:00 AM checkout time, when the number of unexpected stayovers and early departures is known. It goes without saying that the hotel should do everything in its power to placate guests who are thus inconvenienced. In all cases, it is best to ask for volunteers, just as the airlines are doing by way of auctions.

Third, guests should be told of cancellation deadlines and no-show penalties when they confirm their reservation. MasterCard suggests that hotels get the cardholder’s address as proof that a reservation was made, while Visa suggests that the hotel get the guest’s telephone number for the same purpose. The wisdom of such actions is shown by the 1998 estimate that the hotel industry incurred $13.5 million in charge-backs for no-show penalties, 80 percent of which were settled in favor of guests. It is not surprising that some hotels are now sending credit-card authorization forms to guests for their signature to confirm reservations.

In closing, all the rooms managers whom we interviewed are experienced and energetic people who work long hours and appear to enjoy their work. When we asked in various ways whether computers could replace them, they all indicated that it would not be possible, because there are too many eventualities that cannot be anticipated or programmed. We agree with their assessment. Even when guided by proprietary company-wide room-management applications, all the rooms managers were constantly obliged to override the computer, based on circumstances and guided by their personal expertise. Helpful as mathematical models may be, no overbooking model, however sophisticated, can supplant good judgment based on accumulated experience.

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