



Langham Hotel,
Boston
(formerly the
Federal Reserve
Bank of Boston,
1922-1977)

The Historical Origins of Business Statistics and a Current Application in Lodging Forecasting

Barry A.N. Bloom

Academic journals often contain statistical information, and this is certainly true in the hospitality discipline. So it may be interesting for some readers to examine the nature of business statistics in general, review the contributions of a pioneer in the development of business statistics, and explain how some of these methods can be applied to the prediction of future performance in the lodging industry.

Roger Babson

Roger W. Babson is remembered today primarily as the benefactor of Babson College in Wellesley, Massachusetts. Few may realize that he was a well-known investor in the early twentieth century and the founder of Babson's Statistical Organization, which served as a clearinghouse for information about investments and business conditions. After developing this firm and amassing a small fortune,

Babson turned his efforts to offering advice through many other channels. He served for more than a decade as a weekly columnist for the *Saturday Evening Post* and published nearly 50 books.

One of Babson's earliest and most renowned works, *Business Barometers for Anticipating Conditions*, was first published in 1909. Although written over a century ago, it expresses his vision of a world in which business statistics could chart a path to business success, and remains quite relevant today. In this book, he identified two general classes of business statistics, comparative statistics and fundamental statistics.

Babson defined 'comparative statistics' as those that are used in determining the current financial condition of a subject being reviewed and are useful for making buy, sell, or hold decisions for particular investment assets. In the case of the hospitality industry, this would be analysis based on standard financial statements (such as profit and loss state-

ments) and other internal performance measures generated by the business itself (such as occupancy percentage or average daily rate).

Babson had a mixed opinion of comparative statistics, which he believed only measured surface conditions. He argued that such statistics were worthless for determining the general course of the stock market and inappropriate for investors seeking to sell at a profit, and were only acceptable for buy and hold investors. He believed that if general market conditions remained stable, comparative statistics might be useful in forecasting rises and declines in the market, but noted that the markets are far too unstable for such statistics to be used in this manner.

Babson defined 'fundamental statistics' as those related to the broader underlying conditions of a subject being studied. These included statistics in categories such as new construction and real estate, labor conditions, money conditions, and manufacturing.

Babson viewed fundamental statistics in a much more positive light, believing these contextual factors were critical to the ultimate success of individual companies. The astute reader will recognize that, although some of these measures have changed over time due to the growth and decline in specific in-

dustries, these closely mirror the statistical categories used in the reporting of economic conditions today. His studies in this area represent perhaps his greatest contributions to the business community.

Federal Reserve Bank of Boston

The Federal Reserve Bank of Boston (FRBB) is one of a dozen such institutions in the United States. It was established in 1916 and currently serves the First Federal Reserve District, an area that includes the six New England states of Connecticut (excluding Fairfield County), Massachusetts, Maine, New Hampshire, Rhode Island, and Vermont.

The stated goal of the FRBB is to promote economic growth and stability. Due to its unique focus on New England, it publishes a wealth of statistical information regarding the financial health of the region. Its "Summary of National Economic Data" is based on information collected from a variety of federal agencies and updated almost daily. This offers a particularly interesting point of comparison to the fundamental statistical categories defined by Babson a century ago, as demonstrated in Exhibit 1.

In addition to national data series, the Federal Reserve also publishes regional statistics that are even more closely aligned with the statistics pre-

Roger W. Babson



EXHIBIT 1

Comparison of Statistical Categories

Business Barometers for Anticipating Conditions Roger W. Babson 1909	"Summary of National Economic Data" Federal Reserve Bank of Boston 2012
New Construction and Real Estate	New Residential Construction Home Sales Construction Put in Place FHFA House Price Index S&P/Case-Shiller HPI
Bank Clearings and Check Transactions	
Business Failures	
Labor Conditions	Employment Situation Unemployment Insurance Employment Cost Index Productivity and Costs Hourly Earnings
Money Conditions	Wages and Prices Personal Consumption Expenditures Producer Price Index Personal Income
Foreign Trade	
Gold Movements and Money Rates	Exchange & Interest Rates
Commodity Prices	Oil and Commodity Prices
Investment Statistics	
Manufactures (sic)	Retail Sales Auto and Truck Sales Manufacturer's Shipments & Durable Goods Orders Manufacturing & Trade ISM Manufacturing ISM Non-Manufacturing
Railroad and Industrial Profits	
Social and Religious Factors	Consumer Sentiment

ferred by Babson. These include additional categories such as business and consumer bankruptcy filings, merchandise exports, and state tax collections.

Application to Forecasting in the Lodging Industry

Previous work by hospitality industry practitioners has identified and formalized a long-known relationship between Gross Domestic Product (GDP) and hotel room demand. Hospitality industry researchers have also studied the impact of macroeconomic variables on hospitality stock returns. As an example, Jeong-Gil Choi conducted an extensive study in 2003 regarding forecasting for the hotel industry. This attempted to develop a system that would identify early signals of recession or recovery based on 32 economic indicators.

The following analysis provides an example of how the system of business statistics pioneered by Roger Babson can be used to forecast the perfor-

mance of lodging markets, in this case for the New England region. My study takes a different approach than typical academic articles, because it is designed to be understood and replicated by practitioners, as well as academics. It is also the first study to utilize data on a state-by-state basis.

Three scenarios were prepared for each of the six states in New England – Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, and Vermont – in addition to the entire New England region and the United States as a whole. Regression analysis was performed to determine if 'revenue per available room' or REVPAR could be predicted using simple business statistics.

REVPAR is the most common performance metric in the hotel industry and may be calculated in two different ways. First, revenue from overnight guest rooms is divided by the number of rooms available during a given period. Available rooms are considered to be all guest rooms physically located

ABOUT THE RESEARCH

Primary sources for this article included publications by Roger W. Babson, such as *Business Barometers for Anticipating Conditions* (1909) and *Business Fundamentals: How to Become a Successful Business Man* (1923). Data were obtained from Smith Travel Research, and from the websites of the Federal Reserve Bank of Boston and the Bureau of Economic Analysis at the United States Department of Commerce. Regression analysis was conducted using PASW Statistics 18 (formerly SPSS Statistics). Secondary sources included a variety of academic journal articles and the website of Babson College.

within the hotel, including those that are temporarily unavailable for sale due to being out of service or under renovation. Second, the occupancy percentage of a hotel can be multiplied by the average daily rate of the hotel during a given period.

For those whose statistical knowledge may be a little rusty, regression utilizes an association between two variables to predict the value of one of the variables, which is called the dependent variable. In this manner, we can predict the outcome of a dependent variable from any number of regressor, or independent, variables. This may include linear regression for one independent variable along a line, or multiple regression for several independent variables within a multi-dimensional plane.

Simple data easily obtainable from public

sources were utilized in this study. For all scenarios, REVPAR data was obtained from Smith Travel Research for the period 2001 to 2012 for the entire United States and each of the six states that comprise the New England region. The independent variables were 'lagged' by one year in order to determine how they impacted REVPAR in the following year. Lagging, or autoregressive regression, is a technique whereby data from a prior period is used to make predictions for a dependent variable in a future period.

For the first scenario, Gross Domestic Product (GDP) for the United States, New England, and each of the six states that comprise the New England region were obtained from the Bureau of Economic Analysis (BEA). For the second scenario, the Consumer Price Index (CPI) for the Boston area and the United States were obtained from the FRBB. For the third scenario, GDP data from the BEA was utilized along with Total Employment Data obtained from the FRBB for the United States and each of the six states that comprise the New England region.

As previously mentioned, there has been a noted relationship between GDP and hotel demand. However, this relationship does not address supply which, when taken together with demand, might

EXHIBIT 2

Regression of Single Economic Factor and REVPAR for 2001 to 2011

State/Region	Factor	R ²	Statistical Significance	Factor	R ²	Statistical Significance
Connecticut	State GDP	0.01	.737	Boston CPI	0.00	.855
Massachusetts	State GDP	0.61	.005***	Boston CPI	0.61	.005***
Rhode Island	State GDP	0.34	.061	Boston CPI	0.39	.040**
Maine	State GDP	0.68	.002***	Boston CPI	0.70	.001***
New Hampshire	State GDP	0.37	.049**	Boston CPI	0.36	.053
Vermont	State GDP	0.60	.005***	Boston CPI	0.67	.002***
New England	Region GDP	0.51	.013**	Boston CPI	0.51	.014**
United States	US CPI	0.53	.011**	US CPI	0.47	.020**

REVPAR Data Source: Smith Travel Research, Inc.

Economic Factor Data Source: Federal Reserve Bank of Boston and Bureau of Economic Analysis

** p < .05

***p < .01

EXHIBIT 3

Regression of Single Economic Factor, Total Employment, and REVPAR for 2001 to 2011

State/Region	Factors	R ²	Statistical Significance	Factors	R ²	Statistical Significance
Connecticut	GDP + Total Employment	0.20	.401	CPI + Total Employment	0.22	.362
Massachusetts	GDP + Total Employment	0.69	.009***	CPI + Total Employment	0.76	.004***
Rhode Island	GDP + Total Employment	0.58	.032**	CPI + Total Employment	0.56	.037**
Maine	GDP + Total Employment	0.69	.010***	CPI + Total Employment	0.72	.007***
New Hampshire	GDP + Total Employment	0.38	.148	CPI + Total Employment	0.38	.151
Vermont	GDP + Total Employment	0.72	.007***	CPI + Total Employment	0.75	.005***
New England	GDP + Total Employment	0.58	.032**	CPI + Total Employment	0.62	.021**
United States	GDP + Total Employment	0.71	.007***	CPI + Total Employment	0.73	.005***

REVPAR Data Source: Smith Travel Research, Inc.

Economic Factor Data Source: Federal Reserve Bank of Boston and Bureau of Economic Analysis

** p < .05

***p < .01

provide insight into the cost of hotel rooms as expressed by the average daily rate (ADR). In order to address this, we have utilized REVPAR as the dependent variable and run two regressions using GDP and CPI as separate independent variables. The results are shown in Exhibit 2.

These results indicate significant similarity between the use of GDP and CPI as predictors of REVPAR from 2001 to 2011. This is not particularly surprising given the close relationship between these two economic indices. The explanatory power of these relationships is quite high, with GDP or CPI explaining over 50% of the variance in REVPAR for Massachusetts, Maine, Vermont, the New England region combined, and the United States as a whole.

Perhaps the most interesting findings in Exhibit 2 are the comparatively low relationships between REVPAR in Connecticut, New Hampshire, and Rhode Island versus their state GDPs. One could hypothesize this is due partly to the interwoven relationship between these states and their neighboring states, Massachusetts and New York, whereby the drivers of their economies may not be fully reflected in their own state data.

In an effort to make the model more robust, meaning to enhance its predictive ability, an additional regressor was added. In multiple regression models, care must be taken to ensure that the variables are not highly correlated with each other. Several other additional economic variables were tested, and Total Employment for each geographical area was identified as an appropriate variable. The results are shown in Exhibit 3.

It should be noted that the explanatory value (R^2) increased significantly by the addition of Total Employment to the model. Interestingly, while GDP was the better predictor in the single-variable linear regression model, the combination of CPI and Total Employment is a better predictor when Total Employment is added. In the same manner, additional variables could be added to the model to make it even more robust in predictive value. The output from these regression models provides us with an equation that can be used for future predictions.

As an example, consider the regression analysis for Massachusetts. The model with the highest explanatory value as measured by R^2 (CPI + Massachusetts Total Employment) could be used to pre-

dict REVPAR for Massachusetts using the derived calculation $REVPAR = -240.76 + .491*(Boston\ CPI) + .065*(Massachusetts\ Total\ Employment)$. The CPI and Total Employment statistics at the end of a given year would be entered into the model to predict REVPAR for Massachusetts for the following year. A model such as this is not expected to be completely accurate, as it only explains 75.6% of the variance. However, it might be a very good starting place in terms of a forecast, particularly a multi-year forecast based on economic data provided by outside agencies. A likely application at the property level might be to check an assumption of REVPAR growth being prepared as part of the annual budget process.

Conclusion

This article has provided some background about the history and importance of business statistics in the New England region, and identified potential uses for the data in analyzing and predicting future results for the lodging industry overall, as well as for specific applications. It has also explained a simple application of business statistics that derives from work originally conceived over a century ago, which is still useful today. Simple business statistics can be utilized by hotel operators as an additional tool for budgeting and forecasting. ■



Barry A.N. Bloom, Ph.D. is an Associate Professor of the Practice in the School of Hospitality Administration at Boston University. He teaches courses in lodging operations and technology, asset management, franchising, and management contracts and negotiation. His academic research is focused on hospitality stock performance, hotel operating performance, and personal financial literacy. Prior to joining the faculty, Dr. Bloom spent over 25 years in the hotel investment industry, where he focused on hotel asset management with a number of leading firms including CNL Hotels & Resorts, Hyatt Hotels Corporation, and Tishman Hotel Corporation. Email banb@bu.edu