

Appendix A

**FORECASTING EMPLOYMENT
IN CLARK COUNTY'S HOTEL SECTOR**

Lezay / Mai - red.

FORECASTING EMPLOYMENT IN CLARK COUNTY'S HOTEL SECTOR

Guy Ragan

November 20, 1998

INTRODUCTION

The short-term accuracy of a forecast made by a Regional Economic Models, Inc. (REMI) model of Clark County, Nevada is likely to be improved by a supplemental forecast of employment in the Hotel Sector (Ragan 1998). The Center for Business and Economic Research (CBER) at the University of Nevada, Las Vegas established a local precedent for basing a supplemental forecast on hotel construction plans. This paper builds on established precedent to develop a model to explain Hotel Sector employment as a function of the inventory of guest rooms in hotels and the US civilian unemployment rate. Coupled with a forecast of hotel room inventory, which is based on construction plans, and a naïve forecast of the US unemployment rate, the model provides a forecast of the Hotel Sector thru 2000.

METHOD AND RESULTS

The present forecast relies on a linear regression of historical Hotel Sector employment in Clark County (the number of jobs in hotels, motels, and other lodging places, including hotel-casinos) against Clark County guest-room inventory and the US civilian unemployment rate (Table 1). The employment figures are annual averages. However, the room inventory figures pertain to December 31 of each year. Typically, the final room inventory is greater than the average room inventory for the year. A particularly severe problem arises in years in which large increases in room inventory occurred late in the year, so that the final room inventory is significantly greater than the average over the year. In 1993, for example, the Luxor opened on October 15, adding 2526 rooms to the inventory; followed on October 27 by Treasure Island, with 2900 rooms; and by the 5005-room MGM Grand on December 17 (McCracken 1997, pp. 101, 103, 104). To approximate annual average room inventories, I smoothed the room inventory data by averaging the December 31 value for each year with the previous year's December 31 value.

Room inventory figures at least as far back as 1981 are available (LVCVA). However, historical Hotel Sector employment data before 1985 is not reliable, and has not been used below to estimate the model. According to remarks made to me on November 3, 1998 by Mike Clark of the Nevada Department of Employment, Training, and Rehabilitation, erroneous classification of some hotel-casino employment in the Amusement and Recreation Sector rather than Hotel Sector before 1985 led to underestimates of Hotel Sector employment. As of January 1, 1985, the errors in classification were rectified. To appreciate the severity of the problem, note that from 1984 to 1985, employment in Amusement and Recreation appeared to decline by 8,000

jobs from 24,000 to 16,000 (REMI 1998). The apparent decline in Amusement and Recreation is reflected in the exaggerated increase in Hotel employment of 12,000 jobs (REMI 1998).

A linear regression of employment against the smoothed room inventory from 1985 to 1997 and the US civilian unemployment rate (Figure 1) gives employment E as a function of room inventory, I , and the unemployment rate, U , as follows:

$$E = 17,100 + 1.35I - 3,150U \quad (1)$$

The interpretation of the coefficients is as follows: each additional hotel room leads to about 1.35 jobs in the Hotel Sector; each percentage point increase in the US civilian unemployment rate means roughly three thousand fewer jobs in the Hotel Sector than there otherwise would have been. The adjusted R^2 statistic for the model indicates that 99 percent of the variation in Hotel Sector employment can be explained by variation in the explanatory variables. The standard error of the room-inventory coefficient is estimated at 0.048. Multiply by 2.228, the appropriate ordinate of Student's t distribution with 10 degrees of freedom to yield a 95 percent confidence interval of 1.35 ± 0.11 . The standard error of the unemployment coefficient is 1150, which leads to a 95 percent confidence interval of -3150 ± 2560 .

The supplemental forecast (Table 2, Figure 1) uses Equation 1 and projected room inventory thru the year 2000 (MRA 1998, p. 77) to forecast future employment in the Hotel Sector. Unemployment is assumed to remain constant thru the forecast period at the average seasonally adjusted monthly rate for January 1998 thru October 1998 (BLS 1998). The forecast also assumes that there are no subtractions of existing rooms from the room inventory between the years 1998 and 2000. Assuming that the room inventory and unemployment forecasts are free of error, the model will allow predictions of Hotel Sector employment to a precision of plus or minus 8000 or so jobs (about 5 percent of the predicted employment levels). The forecast calls for employment growth of about 11,000 Hotel Sector jobs per year thru the year 2000.

DISCUSSION

The CBER approach is to multiply projected increases in room inventory by an estimate of the number of Hotel Sector jobs expected to be created for each hotel or motel room added to the inventory, then add the resulting change in employment to the previous year's hotel sector employment. The CBER had been using 1.5 jobs per room for many years, but switched to 1.6 in 1998, observing that "historical evidence points to an average of 1.6 jobs per hotel room for larger hotel-casino properties" (Schwer 1998). The CBER ratio is nearly 20 percent greater than 1.35 (the ratio from Equation 1). To place the two differing values in context, turn now to other evidence.

First, as shown in Table 1, the comprehensive data for Clark County can be used directly to construct an annual ratio of jobs to rooms. The ratio has been slowly climbing, but, since 1994, has been within 5 percent of 1.35, the jobs-to-rooms ratio from Equation 1.

Second, every lodging place has its own jobs-to-rooms ratio. The data in Table 3 is taken from a list of the largest employers in Clark County (DETR 1998) and a list of

accommodations in Clark County (Nevada Commission on Tourism 1998). While the size of the jobs-to-rooms ratio varies widely, even among the largest hotel-casinos, the overall average for these large hotel-casinos, 1.44, is closer to 1.35 than to 1.6. A simple observation is that the hotel-casinos that are the most oriented toward locals can be identified by their large jobs-to-rooms ratios. The variation in the ratio is large enough that a forecaster wishing to manipulate a forecast could strongly influence the average ratio by the choice of properties to include in the average.

Third, the *Nevada Gaming Abstract 1997* (State Gaming Control Board 1997) presents data for casinos that grossed more than a million dollars in gaming revenue during the fiscal year that ended June 30, 1997 (Table 4). The room counts from the *Gaming Abstract* do not include rooms in lodging places that lack casinos that gross over \$1 million in gaming revenue. Geographical specialization is apparent in Table 4. The Boulder Strip area has a much higher ratio than elsewhere, indicating an orientation toward locals. The Laughlin area shows the smallest ratio, which is consistent with its heavy orientation toward overnight tourists. The ratios for the Las Vegas strip area are close to 1.35. This suggests that Equation 1 is consistent with the kinds of hotel-casinos that are found in the Las Vegas Strip area. The overall ratio for Clark County in Table 4 is equal to the CBER ratio, 1.6. However, recall that the room count from the *Gaming Abstract* excludes non-casino hotels, and should cause an overestimate of the overall jobs-to-rooms ratio.

The jobs-to-rooms ratios in Tables 2 thru 4 seem to point to a representative ratio closer to 1.35 than to 1.6. Also, unlike the CBER approach, the model represented by Equation 1 can reasonably claim to specify an enduring relationship. Other advantages of the present approach are that (a) the forecast is not sensitive to errors or peculiarities in the estimated employment for the last historical year, (b) the model is transparent and reproducible given the publicly available data that is reproduced in Table 1, and (c) the model provides evidence to support the reasonable notion that Clark County's economy, which is heavily dependent on tourism, is not immune to fluctuations in national macroeconomic conditions.

REFERENCES

BLS (US Bureau of Labor Statistics) 1998. Labor Force Statistics from the Current Population Survey, Unemployment Rate—Civilian Labor Force: Series ID LFS21 000 000. [Online] Available <http://stats.bls.gov/top20.html>, November 20.

Council of Economic Advisors, The Executive Office of the President 1998. *Economic Report of the President: Transmitted to the Congress February 1998*.

DETR (Nevada Department of Employment Training and Rehabilitation) 1998. Clark County Nevada (Las Vegas Area)—Top 50 Employers: Forth Quarter 1997 [Online] Available http://www.state.nv.us/detr/lmi/data/top_003.htm, October 12.

DETR b. *Nevada Employment and Payrolls 1997*.

DETR a. *Nevada Employment and Payrolls 1996*.

LVCVA (Las Vegas Convention and Visitor Authority). *Las Vegas Marketing Bulletin, Fourth Quarter 1997 Summary.*

McCracken, Robert D. 1997. *Las Vegas: The Great American Playground.* Expanded edition. Las Vegas, Nevada: University of Nevada Press.

MRA (Metropolitan Research Association). *1998 Las Vegas Perspective.*

Nevada Commission on Tourism 1998. *Las Vegas Territory Accommodations* [Online] Available http://www.travelnevada.com/territories/lasvegas/lv_accom1.html, October 13.

Nevada State Gaming Control Board 1997. *Nevada Gaming Abstract: 1997*, December.

Ragan, Guy E. 1998. "Evaluating Regional Economic Forecasts of Southern Nevada," Proceedings of the 1998 International High-Level Radioactive Waste Management Conference, 853-856, May 11-14, Las Vegas, Nevada.

REMI (Regional Economic Models, Inc.) 1998. Proprietary EDF5-53 software, including historical data, specific to Clark, Lincoln, and Nye Counties separately and the Rest of Nevada as a fourth region, February.

Schwer, R. Keith 1998. *Clark County Population Forecasts: 1998-2035*, Las Vegas, Nevada: Center for Business and Economic Research, University of Nevada, Las Vegas.

Table 1. Historical Clark County Hotel Sector Data

Year	Room Inventory ^a	Smoothed Room Inventory ^b	US Civilian Unemployment Rate ^c	Hotel Sector Employment (Number of Jobs) ^d	Ratio of Jobs to Smoothed Inventory
1984	55,555	-	-	-	-
1985	55,168	55,362	7.2	66,772	1.21
1986	58,595	56,882	7.0	70,762	1.24
1987	62,243	60,419	6.2	78,666	1.30
1988	66,334	64,289	5.5	88,752	1.38
1989	72,822	69,578	5.3	94,617	1.36
1990	81,828	77,325	5.6	105,216	1.36
1991	86,027	83,928	6.8	110,309	1.31
1992	85,727	85,877	7.5	111,225	1.30
1993	96,343	91,035	6.9	115,642	1.27
1994	99,595	97,969	6.1	135,329	1.38
1995	103,395	101,495	5.6	139,787	1.38
1996	112,828	108,112	5.4	146,748	1.36
1997	119,272	116,050	4.9	152,879	1.32

^aNumber of hotel and motel guest rooms as of December 31 of the year indicated. Source: LVCVA no date, p. 11.

^bAverage of December 31 room inventory of the given year and the December 31 inventory of the previous year.

^cSource: Council of Economic Advisors 1998, p. 405.

^dNumber of full and part time jobs in hotels, motels, and other lodging places, including those associated with integral casinos, restaurants, bars, etc. Sources: for 1985-1995, REMI 1998; for 1996-1997, DETR 1996 and DETR 1997 (1995-1997 DETR growth rates build on 1995 REMI data; e.g., the 1996 employment is the ratio of DETR figures for 1996 to 1995 times the REMI figure for 1995).

Table 2. Clark County Hotel Sector Employment Forecast

Year	Planned Room Inventory Additions ^a	December 31 Room Inventory	Smoothed Room Inventory	US Civilian Unemployment Rate ^b	Room-Based Employment Forecast ^c
1997	-	119,272	-	-	-
1998	4,418	123,690	121,481	4.5	167,400 ± 8,400
1999	11,531	135,221	129,456	4.5	178,200 ± 8,700
2000	5,100	140,321	137,771	4.5	189,400 ± 9,000

^aNumber of guest rooms expected to be added to the Clark County inventory by December 31 (MRA, p. 77).

^bAssumed constant over the forecast period at the average of the seasonally adjusted monthly 1998 rates thru October.

^cNumber of full- and part-time jobs from Equation 1 corresponding to the smoothed room inventory. The 95 percent confidence interval for 10 degrees of freedom is given by ± 2.228 times the estimated standard error.

Table 3. Jobs-to-Rooms Ratios for Individual Hotel-Casinos in Clark County

Corporation or Property Name	Number of Jobs 1997-Q4	Number of Rooms	Ratio of Jobs to Rooms
MGM Grand Hotel, Inc.	8,350	5,005	1.67
Mirage Casino-Hotel	7,250	2,765	2.62
Rio Suite Hotel & Casino	4,950	2,569	1.93
Treasure Island at the Mirage	4,750	2,900	1.64
Caesars Palace	4,650	1,486	3.13
Luxor	4,350	4,427	0.98
Excalibur Hotel & Casino	4,050	4,032	1.00
Las Vegas Hilton Corporation	4,050	3,174	1.28
Flamingo Hilton Corporation	3,750	3,642	1.03
Circus-Circus Casinos, Inc.-LV	3,550	3,808	0.93
Primadonna Corporation	3,550	2,679	1.32
Harrah's Las Vegas, Inc.	3,350	2,700	1.24
Monte Carlo Resort & Casino	3,350	3,014	1.11
Bally's Casino/Hotel-Las Vegas	2,850	2,814	1.01
Tropicana Hotel & Country Club	2,650	1,875	1.41
Stardust Hotel & Casino	2,550	2,334	1.09
Horseshoe Club, The	2,450	369	6.64
Riviera Hotel & Casino	2,350	2,100	1.12
Imperial Palace Inc.	2,350	2,700	0.87
Sam's Town	2,250	650	3.46
New York, New York Hotel & Casino	2,250	2,035	1.11
Stratosphere Tower Casino & Hotel	2,150	1,440	1.49
Orleans Hotel & Casino	1,950	840	2.32
Riverside Resort & Casino	1,950	1,405	1.39
Gold Coast Hotel & Casino	1,950	712	2.74
Palace Station Hotel & Casino	1,750	1,029	1.70
Flamingo Hilton-Laughlin, Inc.	1,750	2,000	0.87
Boulder Station Hotel & Casino	1,750	300	5.83
Sheraton Desert Inn	1,650	715	2.31
Sahara Hotel & Casino	1,550	1,716	0.90
Sunset Station Hotel & Casino	1,550	450	3.44
Ramada Express, Inc., Laughlin	1,550	1,501	1.03
Colorado Belle Hotel & Casino, Laughlin	1,450	1,238	1.17
Texas Gambling Hall & Hotel	1,450	200	7.25
Edgewater Hotel & Casino	1,450	1,450	1.00
Sum	103,533	72,074	1.44

Sources: DETR 1998 and Nevada Commission on Tourism 1998.

Table 4. Jobs-to-Rooms Ratios for Hotel-Casinos in Clark County by Location and Revenue Class

Location	FY 1997 Gaming Revenue Class	Number of Jobs	Number of Rooms	Ratio of Jobs to Rooms
Clark County	\$1M and Greater	142,790	89,401	1.60
Las Vegas Strip Area	\$1M and Greater	82,379	58,614	1.41
Las Vegas Strip Area	\$1M to \$72M	10,973	8,038	1.37
Las Vegas Strip Area	\$72M and Greater	71,406	50,577	1.41
Downtown Las Vegas Area	\$1M and Greater	19,549	9,837	1.99
Downtown Las Vegas Area	\$1M to \$12M	1,068	491	2.18
Downtown Las Vegas Area	\$12M and Greater	18,481	9,346	1.98
Laughlin Area	\$1M and Greater	11,567	10,949	1.06
Boulder Strip Area	\$1M and Greater	11,294	1,646	6.86
Balance of County	\$1M and Greater	18,006	8,355	2.16
Sum of Subareas	\$1M and Greater	142,795	89,401	1.60

Source: Nevada State Gaming Control Board 1997.

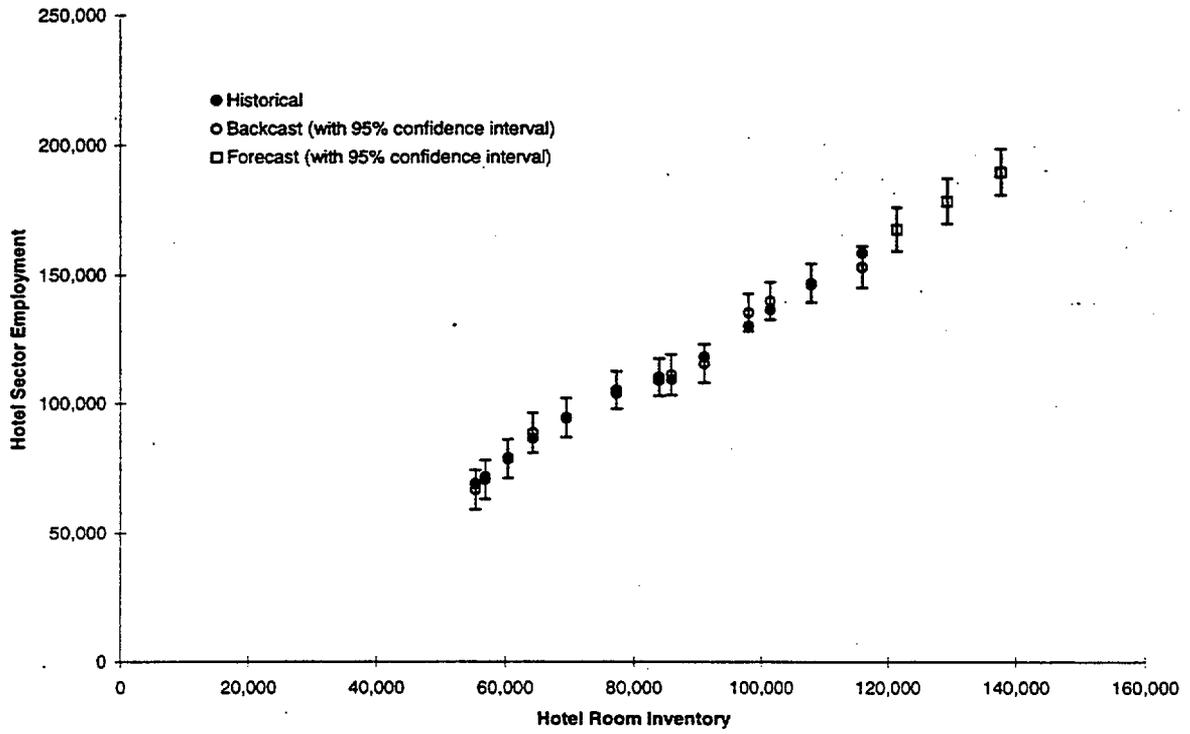


Figure 1. Hotel Employment Backcast and Forecast Versus Room Inventory