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Forecasting Regional Investment in the Hotel Industry: An Input-Output Approach

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Abstract. The tourism industry is characterized by severe shifts in demand that play havoc with forecasting future investment. Within the tourism industry, the need for large-scale initial capital investment in the hotel sector, make the latter particularly vulnerable to the vagaries of the tourism market. Given an up-turn in demand, the hotel industry cannot always respond immediately and its' response is likely to vary across regions. There is therefore a need for a forecasting tool that can estimate the magnitude of the demand 'push' that can stimulate the hotel sector into new investment and the extent to which this response is regionally differentiated. Using a multi-regional input output (MRIO) augmented by an investment matrix, this paper demonstrates the capabilities of such an approach. Regional hotel industry outputs for four classes of hotels in the six regions of Israel are estimated. Expected regional rates of return to hotel investment are compared with actual (reported) rates of return and the discrepancy between the two explained. Regional hotel (per room) capacity coefficients are also estimated and regional responses to an increase in demand of 100,000 extra tourists are calculated in terms of additional hotel rooms and capital investment.

1. Introduction

The volatility of the tourism industry is well known. Demand for tourism services is particularly sensitive to both price competition and non-predictable shocks such as terror, political unrest and natural disasters. The hotel industry is one of the infrastructural backbones of the tourist industry. It reflects the volatility and sensitivity to demand characteristic of tourism while on the supply side it is particularly 'sticky' in response. Hotel investment demands a long-term perspective and once hotel stock has deteriorated or been taken out of commission it becomes particularly difficult and costly to restore it to its previous state.

Public tourism officials are therefore faced with a dilemma. In the aftermath of a recession in the tourism industry and in anticipation of an upturn in demand, how are they to act? If the stock of hotel facilities has shrunk in a recessionary cycle~~s~~ this is likely to act as a serious bottleneck in a time of renewed growth. As the investment process takes place over the long term while demand signals require a short-term response, it becomes necessary to try and identify the tipping point in demand beyond which new hotel investment is necessary.

This paper presents an attempt at developing an I-O based forecasting tool that can estimate the magnitude of the demand 'push' that will stimulate the hotel sector into new investment and the extent to which this response is regionally differentiated. Using a multi-regional input output (MRIO) model augmented by an investment matrix we demonstrate the capabilities of such an approach. The model is tested on Israeli data and is calibrated for six regions and four classes of hotel. Inter-alia, the model presents estimates for regional rates of return to hotel investment and attempts to reconcile the disparity between actual and expected (estimated) rates of return. While the model is 'regional' in that hotel outputs are regionally differentiated, the absence of regional components of investment coefficients, limit its claim to be a fully regionalized model. This fact notwithstanding, we feel that in a small country such as Israel, the difference in magnitude in those investment

items that comprise hotel investment (both hard and soft costs) is likely to be negligible.

The paper proceeds by outlining some of the salient features of hotel investment and differentiating this investment from other real-estate based initiatives. The forecasting model is then elaborated and the data needs of each stage of the analytic process are described. The findings section then reports the results of a simulated scenario of an increase in demand of 100,000 extra tourists and the regional response that this calls for, in terms of new hotel rooms and the capital investment that they would demand.

2. Literature Review

The literature dealing with hotel investment tends to stress two main themes. The first highlights the unique characteristics of the hotel market in the general landscape of property sub-markets. The second deals with the rate of return from hotel investment in contrast to that yielded by other alternatives (whether in capital investment or real estate). This literature focuses on the advantages and disadvantages of investing in hotels and the justification for including hotels in a real estate based investment portfolio.

Perhaps the most unique attribute of hotel investment relates to the large up-front cost of construction. This dictates a particular form of developer behavior. Heavy initial costs generate considerable dependence on the future revenue streams expected to cover this initial outlay. The need to create a revenue stream is immediate and this creates instability especially when demand is volatile. As hotel investment is characterized by a large share of fixed to total costs, this forces hotels to immediately adopt an aggressive sales-oriented strategy based on price competition. In contrast, developers in other property markets where the share of initial fixed investment to total investment is lower (such as residential construction), can afford to behave differently. As they are less dependent on the vagaries of the market, they can adopt a strategy of cost reduction and increasing efficiency.

Hotel investment is therefore characterized by a 'high operating leverage'. The cost composition of hotels includes a large component of fixed costs and a small share of variable (operating) costs. In these circumstances it becomes difficult to rely on a pricing system as operating costs are not a good indicator of prices (Wanhill 1994). This also makes hotels vulnerable to down-turns in demand. Hotels with a high operating leverage will therefore be volatile in their profit levels.

This volatility however can act as a two-edged sword. On the one hand, the fact that hotel revenue sources are the result of short term 'rental contracts' allows for maximum flexibility in pricing and in reacting to market changes. In other real estate markets such as the office or commercial property markets where rental contract are longer term, this flexibility does not exist. On the other hand, this intimate coupling with the market causes sharp movements in occupancy rates, prices, profits etc. Hotel investment is thus characterized by higher volatility and risk margins than other forms of property investment.

These attributes beg the question of the essence of hotel investment: is it real estate investment or is it a form of business investment with real estate as a non-dominant factor? In the past, hotel investment was considered as an investment in an operating business and its' real estate character was not considered unique (Corgel and de Roos 1997). However, with the advent of real-estate driven hotel investment, other motives for hotel investment start to surface. For example, the aim of protecting or realizing property rights on the land on which a hotel is built can serve as a motive for hotel construction. Thus, it has become increasingly difficult to view hotel investment as simply a form of investment in an operating business.

Proof of this change of perception can be found in the growing literature on the place of hotels in investment portfolios. Studies that compare the performance of hotels in relation to commercial office, industrial or residential projects show that variability in hotel investment is higher than for the other categories (Corgel and de Roos 1997). However, this investment is considered efficient for the purpose of creating diversified portfolios and may even act as a good hedge against inflation (Petersen and Singh 2003). There is also evidence to show that while hotel investment may be considered a volatile component in a real estate portfolio it is considered a risk-moderating influence in a regular investment portfolio (Quan, Li and Seghal 2002).

The returns to hotel investment are inextricably linked to tourist demand (local and foreign). Therefore the relationship between the hotel industry and the wider tourism industry is two-directional. Without tourists there can be no hotel industry and without hotels there can be no tourism industry. This symbiotic relationship is reflected on the supply side as well. Local and foreign investment in the hotel sector can be stimulated by public incentives for construction, expansion etc. The complementarity between the supply/demand schedules of the various agents in the hotel market means that hotel investment cannot be considered investment in a 'pure' private good and illustrates some 'quasi' public elements as well. Thus, returns to hotel investment cannot be treated in the same way as returns to other pure private goods.

The case for some public involvement in the private investments in the tourist industry has been presented by Wanhill (1994, 1995). He finds that public sector subsidies in the hotel sector have two purposes: the first is to reduce operating costs through tax breaks, employment premiums, accelerated depreciation and the like. The second is to reduce the heavy up-front capital costs that accompany hotel construction via grants, soft loans, input subsidies, subsidized infrastructure etc,. In comparing across three key instruments, tax breaks input subsidies and grants, Wanhill (1994) finds the latter to be the most efficient, direct and risk-deflecting instrument for hotel investment.

A comparative study of hotel returns across 400 hotels in the US show considerable variability across both equity yields (from 5.6 percent to 38.4 percent) and total property yields from (9.8 percent to 22.7 percent) (Lesser and Rubin) . These rates are of course partially determined by the standard, size, location and market orientation of the hotel with the larger hotels (above 75 rooms) generally out-performing the smaller ones. Recently, Nicolau (2005) has shown that the rate of return on an individual hotel investment can influence the performance of the whole chain with which it is affiliated. This is mainly due to the large fixed costs than have a direct effect on the operating leverage of the whole chain.

In sum, we note that while the role of hotel investment has been addressed and its intricate relationship to demand patterns has been noted, there does not seem to have been any interest in attempting to forecast the level of demand that would induce further investment. Additionally, the regional variation inherent in this has not been addressed. Not all regions are able to respond equally due to both supply and demand side constraints. These two issues form the crux of this paper.

3. Model

Regional input-output models are the work-horse tools of regional economic analysis. They also increasingly feature in the tool-box of techniques for the economic analysis of tourism (BTR 1999, Dwyer, Forsyth and Spurr 2004) along with other tools such as cost- benefit analyses (Burgan and Mules 2001), integrated I-O/ econometric models (West 2000) and CGE models (Adams and Parmenter 1995, Blake Gilham and Sinclair 2005). Here we utilize a multi-regional input-output (MRIO) that is augmented by an investment matrix. The MRIO model is calibrated for the 6 regions of Israel. The basis of the model is the regionalization of the 1995 national input-output tables updated for the year 1999, with on-going adjustment and modifications to the trade and technological coefficients.

The incremental extension to the model presented here relates to expanding its' capability to estimate the investment response needed for a given increase in tourism demand. This is achieved by coupling the MRIO model with an investment model. The former estimates the regional output of all sectors of the economy and their contribution to national and regional GDP. The second estimates the size of the regional investment and number of rooms needed in the four hotel branches defined in the MRIO model, in order to serve an 'average tourist'. The interaction between the two models enables the estimation of the magnitude of investment in response to direct, indirect and induced demand. This investment-enhanced MRIO tourism model therefore allows us to analyze different regional tourism development scenarios in relation to budget constraints.

3.1 The MRIO model

The MRIO model comprises 26 sectors and uses two direct column coefficient matrices. One is the standard input-output matrix for a given region and the other is a trade flow matrix. The regional I-O technological matrices ($\mathbf{A}^n = \mathbf{A}_{ij}^n$) are arranged along the diagonal of the matrix. In an NM*NM multi-regional matrix (N regions and M sectors), off-diagonals are zeros. The matrix expression for the inter-sectoral relationships and end uses (of government, households, investment and exports) to gross output is:

$$X = AX + Y \qquad (1)$$

where X is gross output, A = direct coefficients and Y= end uses.

In order to integrate a trade flow matrix, the right hand side of (1) above is multiplied by trade flow matrix C where $\mathbf{C} = \mathbf{C}_i^{gh}$, i.e the flow of a good from sector *i* from region *g* to region *h* that has the foregoing dimensions NM* NM and includes N*N 26 branch trade matrices in which the rows and columns are the 6 regions. Each element in the trade matrices is moved over 26 columns and downwards 26 rows, which causes the coefficients in each M*M size sub-matrix to be arranged along the its diagonal. This arrangement becomes an NM*NM Trade matrix. Combining the two matrices by multiplication, yields:

$$X = CAX + CY \qquad (2)$$

This can be expressed as

$$(I\text{-}CA)X = CY \qquad (3)$$

Using the Leontief inverse in order to show the dependence of gross output on end uses, yields:

$$X = (I\text{-}CA)^{-1}\, CY \qquad (4)$$

The output multiplier (K) is therefore:

$$K = (I\text{-}CA)^{-1}C \qquad (5)$$

This gives the model its multi-regional perspective and allows for the estimation of 'reverse' and 'loop' flows of trade between the regions where the demand is initially generated and other regions.

As a regional simulation tool, this model has been extensively used and up-graded in the past. Many of these applications and methodological extensions are described in the literature (Freeman et al 1985, 1990). Recent development of the model has led to its use in the context of tourism. Using detailed survey data on the expenditure and travel patterns of both Israeli and foreign tourists, the model has been extended to include a forecasting capability for this sector (Freeman and Sultan 1997). Applications have included estimating the impact of rural tourism in Israel (Fleischer and Freeman 1997) and simulating the effects of casino gambling on tourist locations (Felsenstein and Freeman 1998). In this variant of the model, the service sector is disaggregated into ten sectors in which tourist activity is particularly pronounced such as hotels (by four different grades), air transport, car rentals, tour operators, restaurants and so on. The other sectors of the economy such as industry and agriculture are left aggregated. The tourism variant of the multi-regional model is a particularly important feature for a variety of reasons. First, tourism is an economic activity not readily identifiable on the basis of standard economic classification codes. Second, tourism in Israel is a key sector of the economy. It accounts for 11 percent of national exports, 8 percent of GDP and nearly 8 percent of the civilian labor force, including the total impact of direct, indirect and induced output (Freeman and Sultan 1997). Third, by incorporating not only outward flows from the origin region but also the feedback loops to the origin region from secondary demand created in other regions (in their attempts to supply the demand generated by the origin region), the model addresses a regional economic effect that is often overlooked in tourism analyses (Fletcher 1989).

3.2 The Investment Model

This model estimates a P matrix which represents the size of investment in response to an increase in tourist demand for hotel accommodation. Six regional matrices (Pi) for four different direct coefficients of derived hotel output $X = [(I\text{-}CA)^{-1}\, CY]$ due to an additional number of tourists per region, are estimated[1]. These coefficients represent the number of guests, guest nights, capital stock and number of rooms needed to annually service an 'average tourist'. The P matrix yields regional investment coefficients for number of guests, guest nights, capital stock and rooms for each shekel of output. In the absence of regionally differentiated components of investment (e.g. planning, construction, finance, licensing etc), this approach captures the true regional variation in the investment response of different regions to an external demand stimulus, such as an increase of 100,000 new tourists. As regions are differentiated by the distribution of hotel rooms by grade and as there is a noted regional difference in the weighted average of investment costs per room based on this difference in share-mix, the P matrix is a good proxy for regionally differentiated components of investment.

For example, over 50% of investment stock in Tel Aviv is in Grade I hotels while in the Haifa, Northern and Central regions this figure varies between 12% and 25%. Therefore an exogenous demand of say 100,000 extra visitors, will elicit very different investment responses in the two regions. The proxy investment coefficients are estimated for each of the four grades of hotel from Grade I (highest standard) to Grade IV (lowest) for the base year, 1999. Tourism demand and expenditures come from government surveys for both local and foreign tourists (see below). Multiplying the P matrix by expected regional output differentiated by grade of hotel gives us the amount of capital stock in the base year (T_0) for each unit of output,

$$T_0 = PX \qquad (6)$$

Diagonalizing the inter-industry output matrix and multiplying by P from Equation (6) yields:

$$T_0 = P\,(I\text{-}CA)^{-1}CY \qquad (7)$$

The difference between the investment in the base year and the target of additional number of tourists,

[1] Other branches could be added to the P matrix, given data on capital stock in the air transportation, restaurant, car rental or tour operator branches

for example 100,000 tourists, (T_1) reflects the additional investment, the number of rooms, guest nights etc needed in hotel infrastructure for the given level of tourist demand in each region. Relating the regional variation in hotel share-mix and capital stock to a projected number of visitors creates a forecasting tool. The combination of the two models results in regional outputs (estimated by the MRIO model) augmented by the regional coefficients which together make for an investment-enhanced MRIO model. Differences between regions are expressed in terms of the distribution of capital stock between hotels of different grades and in the number of rooms and guest nights due to the differences in the regional tourist mix and the differences in tourist demand for grades of hotels.

4. Data and Analytic Process

The MRIO model at the base of our forecasting system is a hybrid-type model based on survey and non-survey sources. Regionalization of the model is based on the process of bi-proportional matrix adjustment to generate symmetry in the I-O table. This is achieved by ensuring that the intermediate sum of columns and the intermediate sum of the rows of the branch to branch quarter of the table is an identity (Miller and Blair 1985). We use the national Israeli I-O table for 1995 (CBS 2002a) with prices updated to 1999. This year represents the base year for the current model and the last peak tourism year before the recession of the early 2000's.

The model uses detailed tourist expenditure data collected on the basis of a wide-scale survey of foreign tourists commissioned by the Ministry of Tourism in 1993 (Taskir 1993) and a similar survey relating to the expenditures of Israeli tourists (Mertens Hoffman 1994). Hotel industry data relating to occupancy rates and investments (capital stock) comes from the quarterly survey of tourism and lodging services conducted by the Central Bureau of Statistics (CBS 2002b) and stratified by type of tourist (foreign, local) and grade of hotel. Data on hotel product, revenues and capital returns come from CBS (2003).

The analytic process involves the following stages as outlined in Figure 1.

(a) *estimating hotel outputs* by means of the MRIO model for four classes of hotel (I-IV)

(b) *estimating hotels' capital stock* by four grades of hotel (I-IV). Average investment per room by grade of hotel comes from an internal Ministry of Tourism consultant's report. This 2003 data was adjusted to 1999 levels. Given the average per- room investment and the grade of the hotel, multiplication by the number of hotel rooms in each region gives an account of the value of regional capital hotel stock.

(c) *estimating expected capital returns*; this involves the construction of a matrix of the composition of investment stock. The source of this data is the same consultants report as above. This provides information on the eight leading components of investment in hotel construction, ranging from 'soft' costs such as planning, licensing and permits to 'hard' costs such as building frame, elevators, furniture and the like. The total value of capital stock is distributed across these investment items by class of hotel. Investment coefficients are obtained by dividing the cost of investment item by the value of output for each class of hotel (section a above). Finally, annual capital returns are estimated based on a 30 year depreciation rate for most investment items and assuming a 7 percent rate of return.

(d) *estimation of actual capital returns*: the data for this is reported in CBS (2003) which provides information on revenues per room, capital returns, product and labor costs for hotels by size, occupancy rates and location. Comparing the actual and estimated (expected) rate of return allows for analysis of hotel profitability by region, size and occupancy level.

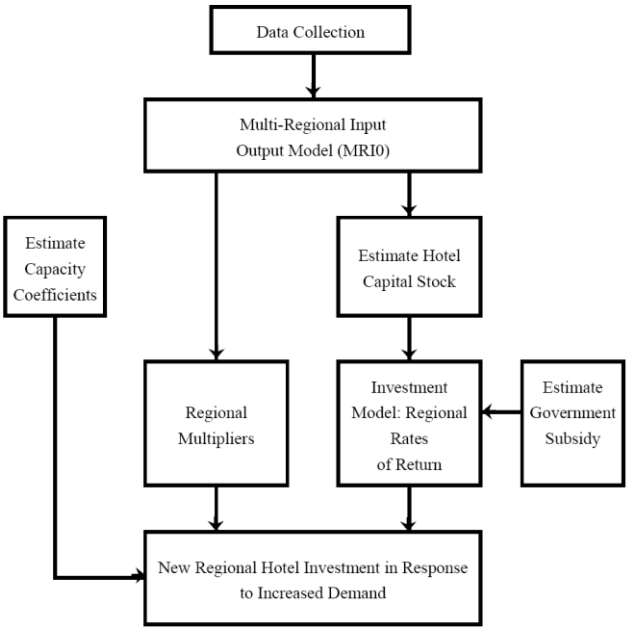

Figure 1. Schematic Representation of the Analytic Process.

(e) *estimation of level of government subsidy*; any discrepancy between expected and actual returns may be partially explained by public support for hotel investment. This data come from internal unpublished sources in the Ministry of Tourism that oversees the administration of government grants to hotel construction under the Law for the Encouragement of Capital Investment.

(f) *estimation of the multiplier effects of hotel investment;* obviously much of the regional demand generated by hotels in region *i* is met by suppliers in regional *j*. Additionally in a small country such as Israel 'reverse' flows from destination region *j* back to origin *i*, in response to demand generated at *i* also need to be taken into account.

(g) *estimation of regional hotel infrastructure capacities*; this gives an indication of existing regional hotel infrastructure and the regional response necessary in the event of a rise in demand. Per-room capacity coefficients are estimated and the data source for this is CBS (2003).

(h) *forecasting regional hotel investment and output*: in the absence of regional components of investment matrices, we use proxy regional coefficients based on the regional distribution of rooms per grade of hotel and the weighted regional average of the investment cost per room. This yields regional investment coefficients for number of guests, guest nights, capital stock and rooms for each shekel of output. A test of the forecasting capability of this model is presented here based on the sum of the MRIO-derived outputs multiplied by the afore-mentioned regional coefficients per grade of hotel.

5. Findings

5.1 Estimating hotel output

This is estimated using the MRIO model. Direct hotel output based on both foreign and domestic demand is estimated as $1.34b (Table 1) and is divided roughly equally between the two sources. Hotel output comprises 24.4% of the direct output of the total tourism sector ($5.5b). But as the tourism industry cannot really operate in the absence of hotels, the remaining direct demand of the tourism industry ($4.2b) is also intimately connected to the hotel sector. When indirect and induced effects are taken into account, tourism industry output rises from $5.5b to $9.7b while the hotel sector output only increases marginally from $1.34b to $1.35b. This is because the hotel sector has no real 'internal' multiplier aside from the small effect of hotel lobby stores and the like.

Grade I hotels contribute nearly 37% of direct output and when Grade II hotels are added this figure rises to nearly 70% of all direct output. Likewise, hotels in the Southern region (Eilat and the Dead Sea) contribute nearly 40% of output and this increases to 63% when the Jerusalem hotels are added.

Table 1. Regional Distribution of Direct Hotel Output by Grade of Hotel (local and foreign demand in 1999 Million $)

	Grade of Hotel				
Region	**I**	**II**	**III**	**IV**	**Total**
North	22.0	69.3	68.8	30.0	190.1
Haifa	12.8	18.4	8.0	6.5	45.7
Central	6.5	20.3	21.5	6.0	54.3
Tel Aviv	117.9	55.3	20.3	21.0	214.5
Jerusalem	152.9	75.1	54.1	16.4	299.0
South	183.6	199.5	49.8	108.0	540.8
Total	495.7	437.9	222.5	187.9	1344.4

5.2 Estimating hotel capital stock by grade of hotel

As can be seen from Table 2, the stock of hotel rooms in 1999 was 43,111. Of this, over one third was in the Southern region and Grade II hotels comprised the largest single class (36%). The value of hotel investment in 1999 is estimated as $4.1b (Table 3). In terms of spatial distribution, the picture derived on the basis of hotel rooms, is repeated. The Southern region has nearly one third of all hotel investment and rooms and is followed by Jerusalem with 23% of capital stock and 21% of all rooms. While Grade II hotels are the single largest class in terms of gross capital stock (36%), the magnitude of per room investment in Grade I hotels is, as expected, much higher than in all other Grades of hotel.

5.3 Estimating expected capital returns

Using a 7% discount rate and adopting the depreciation rate of the Israeli Income Tax Authority, enables the estimation of expected annual capital returns needed to return an investment of $4.1b. Our estimates in Table 4 show that expected returns ($380m) represent 28% of annual hotel output ($1.34m). These returns are differentiated by Grade of hotel and investment item ranging from soft investment in fees, licensing, planning etc through to hard investment in building structure, systems and equipment.

5.4 Estimation of actual capital returns

Revenues, profits and occupancy rates for hotels by leading tourist locations are presented in Table 5. The reported data come from institutional sources (CBS 2000) and are an important component in the comparison of our estimated capital returns to investment in the hotel sector (section 5.3 above) with those reported in reality. The important figure to note here is the national average return to capital in the hotel sector, reported at 11.3% of revenue. There is distinct regional variation in terms of profits. Capital returns to the hotel sector in Tel Aviv are 18.6% while in Eilat they are only 9.5, despite the fact that Eilat's hotels revenues account for a quarter of all national hotel revenues. This discrepancy is a result of the very different average levels of output per hotel room. In Tel Aviv this stands at $43,000 per year while in Eilat this is only $34,300.

Note also from Table 5 that in Tel Aviv, hotel product is 64% of revenues and labor costs are 36%. Profits account for most of the difference (18.6% out of 28%) but hotels also have other sources of capital returns such as hall and facilities rentals to external sources so that the sum of labor and profits does not account for all hotel product. In contrast, Eilat hotels product is nearly totally subsumed by labor and profits. In the Dead Sea, most of hotel product is labor, leaving capital returns at less than 5%.

Profit margins of hotels are highlighted in Table 6 for three leading tourist centers: Tel Aviv, Eilat and the Dead Sea by (a) occupancy rates and (b) hotel size. Profit levels are highest in Tel Aviv across all rates of occupancy with the 75%+ occupancy class yielding the highest rates of return (25% p.a.). In Eilat in contrast, this occupancy level only yields average profits rates of 13.0%. In the Dead Sea area, the situation is even more accentuated with only the highest occupancy hotels reporting rates of return close to those in Eilat.
In terms of hotel size, smaller and medium sized hotel (with lower overheads) would seem to report higher rates of return. In Tel Aviv, hotels in the 40-79 room category report the highest profit levels (34.9%) followed by those in the 140-299 group (22.6%). In Eilat, relatively small hotels (80-149 rooms, 13.6%) do not report rates of return much lower than the large hotels (300-399, 14.9%) while the largest hotels (400+ rooms) have considerably lower profit levels.

5.5 Estimation of level of government subsidy

At this stage of the analysis, we have established that the hotel industry needs an annual (estimated) return to capital of $380m (section 5.3 above) while the average reported rate of return is only 11.3% of sector output, i.e. $152.m (section 5.4 above). Part of this discrepancy could come from the fact that substantial government assistance is available for hotel construction under the Law for the Encouragement of Capital Assistance. This might account for the large gap between expected rates of return to hotel investment and those reported in practice.

To investigate this issue, we estimated the average level of public support to hotel construction based on data internal Ministry of Tourism data aggregated to our 6 regions over the period 1985-2003. The data show that over the 18 year period, government support amounted to $478.2m (1999 prices) out of a total investment in hotel construction of $1.9b (i.e. an average level of support of 27.5%). Given this level of assistance, the annual return estimated above reduces by 27.5% from $376m to $275m. If the reported level of return ($152m) is discounted, this figure is further reduced to $123m. This figure represents a profit level that would seem to be attainable for many hotels.

Table 2. Hotel Rooms by Grade of Hotel and Region

Grade of Hotel	North	Haifa	Center	Tel Aviv	Jerusalem	South	Total
I	549	298	230	2,649	2,782	2,691	9,200
II	2,601	604	513	2,090	2,874	4,949	13,630
III	1,682	222	636	943	2,727	1,447	7,657
IV	863	178	509	939	869	3,559	6,916
Main Centers	5,695	1,302	1,888	6,621	9,252	12,646	37,404
Outside Centers	2225	705	355	669	0	1753	5,707
Overall Total	7,920	2,007	2,243	7,290	9,252	14,399	43,111

Table 3: Hotel Investment (Capital Stock) by Grade of Hotel and Region ($m, 1999 prices)

Region	I	II	III	IV	Total
North	83.1	292.3	202.4	79.2	657
Haifa	42.5	70.3	42.5	20.3	175.6
Central	34.3	56.5	58	31.2	180
Tel Aviv	450.5	234.8	93.7	59.2	838.2
Jerusalem	405.3	298.8	195.9	44.7	944.7
South	406.8	523.4	167.9	206.5	1304.6
Total	1422.5	1476.1	760.4	441.1	4100.1
Invest per Room ($)	159,274	105,722	72,690	51,828	97,942

Table 4. Estimated Rates of Return by Investment Category and Grade of Hotel ($m)

Investment Category	Depreciation (yrs)*	Discount Rate (7%)	Capital return by Grade of Hotel I	II	III	IV	Total
Plans	30	0.08	5.34	5.78	2.99	1.74	15.86
Licenses	30	0.08	4.57	4.94	2.56	1.49	13.55
Structure	30	0.08	49.32	53.32	27.62	16.1	146.38
Systems (Elec., water)	20	0.09	34.16	36.95	19.13	11.15	101.4
Elevators	20	0.09	1.96	2.12	1.09	0.64	5.56
Land Development	30	0.08	2.78	3.01	1.56	0.91	8.26
Equipment, Furniture	10	0.14	26.75	28.93	14.98	8.73	79.4
Management	30	0.08	2.56	2.77	1.43	0.84	7.6
Miscellaneous	30	0.08	0.78	0.84	0.44	0.25	2.31
Annual Return	→		128.22	138.69	71.8	41.85	380.32

* Based on Israeli Income Tax Regulations 91/14, 1991, Section 5

Table 5. Revenues, Profits and Occupancy Rates: Hotels by Selected Locations*

	Jerusalem	Tel Aviv	Haifa	Eilat	Herzliya	Tiberias	Netanya	Dead Sea	Total
Revenue per room ($Th)	33.8	43.2	30.4	34.3	52.6	20.5	17.3	33.3	30.9
Room Occupancy Rates (%)	63.9	66.5	49.6	70.3	63.7	60.9	62.6	70.4	61.8
As Percent of Total Revenue									
- Hotel Product	58.3	64.4	56.6	50.8	55.8	55.8	48.4	49.5	55.3
- Labor Costs	42.1	36.4	45.8	41.2	42.8	42.8	39.0	44.3	40.4
- Profits and Capital Returns	14.2	18.6	7.7	9.5	9.7	9.7	5.2	4.8	11.3

* Source: Quarterly Tourism Statistics 28 (2000), CBS, Jerusalem

Table 6. Capital Returns for Hotels in Select Locations (%) by (a) % annual room occupancy rates and (b) size of hotel

(a) Annual Room Occupancy Rates (%)

Location	1-54	55-64	65-74	75+	Total
Tel Aviv	21.0%	21.0%	14.1%	25.0%	18.6%
Eilat	11.1%	7.0%	7.4%	13.0%	9.5%
Dead Sea	0.0%	-12.0%	4.3%	14.1%	4.8%

(b) Size of Hotel (Number of Rooms)

Location	40-79	80-149	150-299	300-399	400 +	Total
Tel Aviv	34.9%	12.3%	22.6%	17.2%	14.1%	18.6%
Eilat		13.6%	7.4%	14.3%	5.6%	9.5%
Dead Sea				7.1%	2.6%	4.8%

5.6 Multiplier effects of hotel investment

National level output multipliers for the hotel sector and for a composite 'other tourism' sector with which it interacts is presented in Table 7. The estimates come from the MRIO model and serve to stress the central role of the hotel sector within the wider tourism industry. In the absence of the hotel sector, many ripple-through effects in the tourism industry would be lost. As can be seen, the total output (type II) multiplier for the tourism industry is 3.56 (7078/1988) while for the hotel sector it is 3.80 (7078/1064).

5.7. Regional hotel infrastructure capacities

We present hotel capacity coefficients in 'per-room' terms and illustrate the regional differences in this capability. The capacity coefficients are national averages for each Grade of hotel in 1999. The data relate to both foreign and domestic tourists. As can be seen from Table 8, each room had on average 169 visitors who stayed a total of 446 nights and generated revenues of nearly $32,120. The average investment per room was $97,942. Naturally, these capacity coefficients vary by grade of hotel. The higher standard hotels (Grades I and II) have on average more visitors per room but not necessarily more visitor-nights per room than the lower grade hotels.

Table 7. GDP Multipliers in the Tourism and Hotel Sectors

Output and Multipliers	Unit	GDP in Indirect Output				
		GDP in Direct Output Direct Demand	Indirect	Direct + Indirect	Induced	GDP in Total Output Direct, Indirect + Induced
GDP in output resulting from hotel demand	$m	639.6	310.6	950.2	915.0	1865.0
GDP in output resulting from other industries demand	$m	1351.7	1259.4	2611.1	2602.4	5213.3
GDP from total output	$m	1988.9	1570.3	3561.4	3517.2	7078.5
Hotel output multipliers	Ratio	3:11		3.75		3.80
Other industries output multiplier	Ratio		0.49	1.49	1.43	2.92
Total output multiplier	Ratio	1	0.79	1.79	1.77	3.56

The regional distribution of the four capacity variables (visitors, visitor-nights, revenues and capital stock) show considerable variance (Tables 9 and 10). In terms of visitors, visitor-nights and revenues per room the leading region is the South, far ahead of all the other regions. In terms of per room investment however, the Tel Aviv and Jerusalem areas both have more capital investment per room than the South. At the other end of the scale, the Haifa region ranks lowest in visitors, visitor-nights and revenues per room while the Central region is lowest in terms of investment per room. However, it should be noted that in absolute terms these are the two most marginal tourist regions together accounting for less than 10 % of all hotel rooms and only 7% of all direct hotel output.

5.8. Forecasting regional hotel investment and output

Based on existing capacity a simple increase in demand and its' necessary investment, can be easily calculated. Assuming the national per room average of 169 visitors (Table 8), means that an extra 100,000 visitors will demand 592 extra rooms (100,000/169). In terms of extra investment required the 592 extra rooms need to be multiplied by the national per room investment average ($97,942) to produce the average investment needed to meet the new demand, $57.9m. However, this calculation is simply based on national aggregates. It is devoid of any regional significance and glosses over the very real regional variation that exists in hotel investment stock across the regions.

As noted earlier, our regional forecasting approach involves coupling the MRIO output matrix ($X=(I-CA)^{-1}CY$) with a regional investment coefficient matrix (P). In the absence of regionally differentiated data on the components of investment we create a proxy matrix. This matrix combines the distribution of the number of hotel rooms by grade and region with the weighted average of investment per room and region. In both these instances there is great regional variation. For example, in Tel Aviv 54 % of investment stock is in Grade I rooms in Jerusalem this figure is 43%. In the Southern region Grades I and II comprise 71% of all investment. In contrast, in the Northern region, investment stock in Grade I rooms is only 12%. By relating this variation to visitor output, it is possible to generate regionally differentiated forecasts of total investment for a given increase in tourists. The MRIO model is run for 100,000 extra tourists (domestic and foreign) for each region. This yields their share in the output of tourism in the region. Combining this with regional (per $ output) coefficients for visitors, visitor-nights, capital stock and rooms results in a prediction of the impact of the extra demand and the investment needed to accommodate it.

Table 8. National Per-Room Capacity Coefficients by Grade of Hotel, 1999 prices

Per-Room Indicator	1999 Total	1999 Average by Grade of Hotel			
		I	II	III	IV
Visitors (Avg)	169	172	182	155	159
Nights (Avg)	446	441	454	406	489
Revenues ($)	32,120	55,480	31,435	21,249	22,080
Investment ($)	97,942	159,274	105,722	72,690	51,828

Table 9. Hotel Visitors & Visitor-Nights Per Room, by Region & Grade of Hotel

Region	Grade of Hotel				Total
	I	II	III	IV	
	Visitors (Nat. Avg. = 169)				
North	127	139	174	139	151
Haifa	137	153	94	113	125
Center	87	210	192	80	155
Tel Aviv	132	148	117	119	132
Jerusalem	163	153	150	119	152
South	225	223	149	194	202
	Visitor – Nights (Nat. Avg. = 446)				
North	326	347	451	427	399
Haifa	352	382	242	347	328
Center	217	524	497	245	405
Tel Aviv	338	369	304	366	345
Jerusalem	418	382	388	365	393
South	576	555	384	594	541

An example of the mechanics of this forecasting exercise for one of the six regions only (Northern region) is presented in Table 11. The result of the multiplication of the P and X matrices for each region can be seen in the right hand side panel (P_1X). Table 12 summarizes these estimates for all regions for ease of identification and presents results for hotel rooms and investment. In terms of the former, the estimates suggest that the Haifa region fares well while the Southern region seems to do best in meeting the demand increase. The Northern, Central and Jerusalem regions would all need to supply the same amount of rooms although in relative terms this points to a major shortfall in the first two regions that have a smaller absolute stock of rooms than Jerusalem.

The investment stock predictions show that the largest required investment would be in Tel Aviv ($87.1m) followed by Haifa ($70m). While Haifa is the region with the smallest hotel investment stock, Tel Aviv has the third largest level of capital investment across Israeli regions and has the highest relative concentration of Grade I hotels. The predicted demand for investment in Tel Aviv may be a result of the combination of a bi-furcated size structure of hotels and relative concentration of high grade hotels in the region along with very high levels of tourism output in the top grade hotels. At the other end of the scale the smallest predicted investment needed would be in the Southern region ($44.8) which has the highest absolute regional level of investment stock.

Table 10. Hotel Revenues & Capital Stock per Room by Region & Grade of Hotel

Region	Grade of Hotel				Total
	I	II	III	IV	
	Revenue per Room ($ th) Nat. Avg = 31.88				
North	40.10	23.91	23.67	18.84	23.91
Haifa	43.00	26.33	13.04	15.94	22.71
Center	28.26	36.23	25.85	9.66	24.15
Tel Aviv	44.44	25.36	15.46	18.12	29.47
Jerusalem	55.07	26.33	19.81	18.84	32.37
South	68.12	38.65	20.77	26.09	37.44
	Capital Stock per Room ($ th) Nat. Avg = 97.82				
North	151.21	100.97	69.81	50.00	82.85
Haifa	143.00	100.97	69.81	50.00	87.44
Center	148.79	100.97	69.81	50.00	80.19
Tel Aviv	170.05	107.73	71.74	51.21	114.98
Jerusalem	145.65	103.86	71.74	51.45	102.17
South	151.21	100.97	69.81	50.00	90.58

Table 11. Forecasting Model – Visitor Nights, Investment and Rooms needed in Response to an Output Increase Generated by 100,000 extra Visitors (Northern Region)

	(P_1) Investment Coefficients (per $ Output)				(X) Regional Output (per 100,000 visitors)				(P_1X) Value of Investment (per 100,00 visitors)				
	Hotel Grade				Hotel Grade				Hotel Grade				
	I	II	III	IV	I	II	III	IV	I	II	III	IV	Total
Visitors (Th)	0.00735	0.00734	0.00580	0.00318	2,501	0	0	0	18.4	42.2	33.6	5.8	100.0
Nights (Th)	0.02257	0.01896	0.01447	0.00814	0	5,7490	0	0	56.5	108.9	83.7	14.9	264.1
Cap Stock(Th)	2.64564	2.93862	4.21667	3.77883	0	0	5,789	0	6617.4	16893.6	24410.9	6836.4	54858.3
Rooms (Th)	0.00005	0.00004	0.0004	0.00002	0	0	0	1,836	0.132	0.242	0.241	0.046	0.661

6. Conclusions

This paper has presented both a method and empirical results for forecasting regional investment in the hotel sector. We have shown how an MRIO model can be augmented by a proxy investment matrix in order to yield insights into the investment needed in response to increased tourism demand. Our empirical findings point to great variation in hotel profit levels across regions and that this is further confounded by hotel size and occupancy levels. We observe a discrepancy between the expected rates of return to hotel investment based on current capital stock and those reported in reality. Some of this gap can be attributed to the role of government subsidies to hotel construction. Finally, we relate regional variation in investment stock by grade of hotel to tourist output by grade of hotel in order to operationalize a forecasting model for hotel investment in response to a given demand increase of 100,000 extra tourists. We show which regions have capacity deficits and which are able to accommodate this increase with less investment.

Table 12. Summary Forecasting Results: Number of Hotel Rooms and Investment Required by Grade of Hotel and Region in Response to Demand Increase of 100,000 extra Tourists

Region	Grade of Hotel I	II	III	IV	Total
			Number of Rooms		
North	46	241	242	132	661
Haifa	119	277	242	162	800
Center	66	161	239	180	646
Tel Aviv	275	226	136	120	757
Jerusalem	198	204	194	62	658
South	92	178	82	142	494
			Investment Required ($m, 1999 prices)		
North	6.9	24.4	16.9	6.6	54.9
Haifa	17.0	28.1	16.9	8.1	70.0
Center	9.9	16.3	16.7	9.0	51.9
Tel Aviv	46.9	24.4	9.7	6.1	87.1
Jerusalem	28.9	21.2	13.9	3.2	67.1
South	14.0	18.0	5.8	7.1	44.8

The significance of our approach lies in three areas. First, it serves to stress the centrality of the hotel sector within the tourism industry. While the two are intricately inter-twined our analysis clearly suggests that without a sufficient hotel infrastructure the tourism industry cannot develop. Our MRIO model is sufficiently disaggregated in order to identify 4 hotel sectors (grades) and their impacts. The national level multiplier effects of the hotel sector and the other tourism-related sectors with which it trades (land and air transportation, car rental, restaurants, catering and the like) are of equal magnitudes suggesting that the former serves as a central axis for the latter.

Second, we should note that our approach has presented essentially a static analysis for what is inherently a dynamic process. While our projections are based on some future increase in demand, time is not an active factor in our model. However, we are very much aware that the supply side response to a demand increase for hotel investment is inherently a protracted and time-dependent process. Hotel construction takes on average seven years from the planning to the operational stage. Actively incorporating time into the forecasting process is a goal for future development of this model.

Finally, we feel that the use of 'proxy' regional investment coefficients is justified in a small country such as Israel. Anecdotal evidence, suggests that components of investment do not vary greatly cross regions: cost of capital has no regional expression and other inputs both hard and soft (licenses, planning, materials, systems) are also undifferentiated regionally. The only major factor likely to have a regional expression is land costs. However, even in this instance the central regulatory role of the Israel Lands Authority serves to smooth out some of the variation in this market. This factor notwithstanding, a more suitable treatment of the regional variation in land prices needs to be incorporated in any future development of this model.

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