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MEASURING EFFICIENCY OF HOTEL INDUSTRY IN TURKEY USING DATA ENVELOPMENT ANALYSIS

Ph. D. Thesis

Nilsun Tümer

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ONAY SAYFASI

Enstitümüz AB İktisatı Anabilim Dalı Doktora programı öğrencisi Nilsun TÜMER'in "MEASURING EFFICIENCY OF HOTEL INDUSTRY IN TURKEY USING DATA ENVELOPMENT ANALYSIS" konulu tez çalışması 26.09.2008 tarihinde yapılan tez savunma sınavında aşağıda isimleri yazılı jüri üyeleri tarafından oybirliği/ ~~oyçokluğu~~ ile başarılı bulunmuştur.

Onaylayan:

Prof. Dr. Suut DOĞRUEL	Danışman	.....
Prof. Dr. Osman KÜÇÜKAHMETOĞLU	Jüri Üyesi	.....
Doç. Dr. Murat DONDURAN	Jüri Üyesi	.....
Doç. Dr. Murat ÇOKGEZEN	Jüri Üyesi	.....
Prof. Dr. Fatma DOĞRUEL	Jüri Üyesi	.....

Onay Tarihi

Abstract

The aim of this thesis was to compare the current situation of the Turkish tourism industry to global industry with particular emphasis on Mediterranean countries of the European Union (EU) and to analyze the technical efficiency of resort hotels in Turkey in order to provide some insight about the performance of Turkish resort hotel industry.

The review of world tourism indicates that tourism will continue its growth in the coming years. As for the EU, the geographical enlargement and Schengen Agreement contributed the tourism growth. However, in the future, the growth will be dominated by the less developed tourism destinations rather than Western Europe. Turkish tourism, on the other hand, will benefit from EU membership in terms of structural funds and country perception. Nevertheless, the role of planned investment decisions and appropriate marketing strategies is more important for the sustainable growth of Turkish tourism.

Besides, analyzing industry dynamics in detail, this thesis further attempts to examine the performance of Turkish resort hotel industry. For this purpose, it uses data envelopment analysis (DEA) to measure the technical efficiency of 28 resort hotels in Turkey for the years 2004 and 2005. The average technical efficiency scores were found to be 72.7 percent and 71.4 percent in 2004 and 2005 respectively. As another result of this study, it was found out that the smaller hotels were more efficient than larger ones within the dataset. It is also remarkable that the efficient hotels have neither the highest not the lowest personnel cost per available room. The study also verifies that hotels with low F&B cost per room have higher level of efficiency scores. Based on the findings, it is notable that average efficiency scores of 4 star and/or individual hotels are higher than the efficiency scores of 5 star and/or local chain hotels respectively. It is believed that these results might have important implications for investors at the planning stage of their hotel.

Özet

Bu tezin amaci, Türkiye'deki turizm sektörünün mevcut durumunu dünya turizmi ve özellikle de AB üyesi Akdeniz ülkeleri ile karsilastirarak incelemek ve Türkiye'deki tatil otellerinin teknik etkinligini ölçerek sözü edilen otellerin performanslari hakkinda bilgi sunmaktir.

Dünya turizmi incelendiginde büyümenin takip eden yillarda da sürecegi belirlenmistir. Avrupa Birligi'nde ise cografi genisleme ve Schengen Anlasmasi, turizm sektörünün büyümesine önemli katki saglamaktadir. Ancak gelecekte, turizm sektöründeki büyümenin, Bati Avrupa'daki büyümeden ziyade az gelismis turizm merkezleri odakli olacagi görülmektedir. Avrupa Birligi üyeliginin Türkiye turizmine özellikle yapisal fonlar ve ülke imaji açisindan faydasi olacaktir. Bununla beraber, Türkiye'nin turizm sektöründeki sürdürülebilir büyümesinde; planli yatirim kararlarinin ve uygun pazarlama stratejilerinin, Avrupa Birligi üyeliginden daha faydali olacagi düsünülmektedir.

Turizm sektörünün dinamiklerinin detayli incelenmesinin yani sira, bu tez çalismasi Türkiye'deki tatil otellerinin performanslarini ölçmeyi de amaçlamistir. Bu amaçla, Türkiye'de bulunan 28 tatil otelinin teknik etkinligi, 2004 ve 2005 yillari için, veri zarflama yöntemi ile ölçülmüstür. 2004 ve 2005 yillarina ait ortalama teknik etkinlik dereceleri sirasiyla yüzde 72,7 ve yüzde 71,4 olarak hesaplanmistir. Bu arastirmanin bir baska sonucu da verisetinde bulunan oteller arasinda daha küçük olanlarin daha etkin çikmis olmasidir. Bir diger dikkat çekici sonuç ise etkin otellerin ne en yüksek ne de en düsük oda basi personel maliyetine sahip otellerden olusmamasidir. Ayrica satilan oda basina düsük yiyecek ve içecek maliyetine sahip otellerin digerlerine kiyasla daha etkin oldugu teyit edilmektedir. Arastirma sonuçlari ortaya koymustur ki 4 yildizli ve/veya münferit isletilen oteller, 5 yildizli ve/veya otel zincirleri altinda isletilen otellere kiyasla daha yüksek etkinlik derecelerine sahiptir. Söz konusu sonuçlarin, Türkiye'deki tatil otellerinin planlanmasi asamasinda yatirimcilara faydali olacagi düsünülmektedir.

Acknowledgement

This study was conducted under the supervision of Prof. Dr. Suut Dogruel to whom I wish to express my deep gratitude for his invaluable guidance, support and patience.

I would also like to express my deep gratitude to Prof. Dr. Osman Küçükahmetoglu, Assoc. Prof. Dr. Murat Donduran and Prof. Dr. Nurhan Davutyan for their invaluable contributions. In addition, I would like to thank the personnel of Ministry of Tourism for sharing data and statistics.

In particular, I would like to thank to my spouse Serkan Tümer and to my parents for their continuous encouragement and support during all phases of this thesis.

Table of Contents

List of Tables

List of Figures

List of Abbreviations

ADR: Average Daily Rate

AE: Allocative Efficiency

ARR: Average Room Rate

BCC: VRS Model

CAGR: Compounded Annual Growth Rate

CCR: CRS Model

CIS: Commonwealth of Independent States

CRS: Constant Returns to Scale

DEA: Data Envelopment Analysis

DFA: Distribution Free Approach

DMU: Decision Making Unit

DRS: Decreasing Returns to Scale

EE: Economic Efficiency

EFF: European Fisheries Fund

ERDF: European Regional Development Fund

ESF: European Social Fund

EU: European Union

Eurostat: Statistical Office of European Communities

F&B: Food and beverage

GDP: Gross Domestic Product

ICT: Information and Communication Technologies

IRS: Increasing Returns to Scale

ISO: International Organization for Standardization

MFP: Multifactor Productivity

OECD: Organization for Economic Cooperation and Development

PPF: Production Possibility Frontier

RevPAR: Revenue per available room

SARS: Severe Acute Respiratory Syndrome

SFA: Stochastic Frontier Analysis

TE: Technical Efficiency

TFA: Thick Frontier Approach

TSA: Tourism Satellite Accounts

TSG: Tourism Sustainability Group

T&T : Travel and Tourism

TTCI: Travel Tourism Competitiveness Index

UN: United Nations

UNSC: United Nations Statistical Commission

UNWTO: World Tourism Organization

VFR: Visiting Friends and Relatives

VRS: Variable Returns to Scale

WTTC: World Travel and Tourism Council

Chapter 1: Introduction

Today, Turkey is among the top twelve most visited countries in the world[1]. Especially during the last decades, the number of international tourists visiting Turkey increased substantially. The development of Turkish tourism industry started in 1980s, with the programs through Tourism Incentive Law numbered 2634. Following this initial step, the number of tourism licensed accommodation establishments increased from 56 thousand in 1980 to 508 thousand in 2006.

In terms of marketing strategy, Turkish hotel industry adopted the ''all inclusive'' concept in 1995 to attract more international tourists and this resulted in a significant success for capacity utilization. However, the increase in the number of international visitors to more than 22 million in 2007 from its level of 8 million in 1996 was achieved by sacrificing revenue per international tourist receipt. In the last decade, revenues per international tourist receipt has decreased from 862 € to 467 €. One of the main reasons of this deterioration is the unplanned expansion of ''all inclusive'' concept. That is, Turkish hotels started to compete more on pricing rather than the product that they serve. As a result, reducing costs as much as possible damaged the product quality and today, Turkey faces the threat of becoming a cheap destination. Furthermore, under ''all inclusive'' concept even some of the luxurious hotels started to market their product as a mid level hotel. They began to lose their wealthier customers who look for customized service. At this point, hotels began to feel the pressure of competition more than ever since revenues were diminishing and hotel capacity was growing continuously.

[1] UNWTO (2007b)

In addition, competition in the world tourism industry is also intensifying with the discovery of new destinations and modernization of transportation. Under this highly competitive environment, both country and company level performance is of importance. Therefore, this thesis examines the global tourism industry in a macro perspective first and then it attempts to analyze the efficiency of Turkish resort hotels at micro level. Findings of this study is believed to be useful at company level for managers and investors to determine the factors that need improvement for a better performance.

In this thesis, the technical efficiency of 28 resort hotels in Turkey is evaluated by using output oriented Data Envelopment Analysis (DEA) which is a non-parametric and multi factor method to evaluate technical efficiency. This methodology forms the efficiency frontier by the best performing units in the group and rest of the unit efficiencies are calculated accordingly. Therefore, efficiency measurement of this thesis is a relative one with reference to efficiency frontier. DEA is preferred for being suitable for multi input and multi output applications. It calculates technical efficiency by the ratio between the actual outputs to the maximum outputs that a company can produce with its set of inputs and existing technology. Additionally, it decomposes technical efficiency as "pure" and "scale" in order to differentiate the sources of inefficiencies. For each inefficient hotel, a benchmark set among the efficient peers is allocated to guide the inefficient unit to reach efficiency.

This thesis aims to provide background information on world tourism industry and to focus on Turkish tourism along with its competitors in the Mediterranean countries of EU. Secondly, it analyses the efficiency of 28 resort hotels in the provinces of Antalya, Mugla and Aydin by using output oriented DEA for years 2004 and 2005. The study is conducted by using outputs

of Revenue per available room (RevPAR) and other revenue per room sold by incorporating inputs of room capacity, personnel cost, F&B cost, energy cost and other cost.

The study employs financial input and output factors rather than physical determinants. The only exception of this is the use of room capacity, which is a physical factor, as one of the input factors. The use of financial factors is justified with the assumption that similar wage levels and commodity prices are applicable in all resort hotels. While this might not prove to be fully accurate, since all hotels are located in the coastal line of Turkey, it is believed that the assumption of similar price levels among the hotels in the dataset is valid.

Furthermore, the study uses room capacity instead of investment cost as one of its input factors. In order to do this, the study assumes that investment cost per room is almost similar for each hotel in the data set which might be regarded as a strong assumption. Nevertheless, the study limited its data set with only 4 and 5 star hotels which helped to provide homogeneous investment cost structure to a high extent.

Moreover, the dataset is limited with 28 resort hotels. If the dataset were larger, it would be more appropriate to generalize the conclusions and eliminate problems such as self identifiers.

This thesis is structured in five chapters. In the first chapter, brief introduction of the research subject is presented.

The second chapter provides background information on world and EU tourism industries. It includes economic impact of tourism, tourism demand and future prospects of the industry. It

also reviews EU tourism in terms of legal, competition and enlargement aspects. The chapter concludes with a comprehensive analysis of Turkish tourism industry.

The third chapter presents the technical concepts of efficiency, productivity and effectiveness with a service industry perspective. Afterwards, DEA is introduced and other types of efficiency measurement techniques are compared to DEA. Finally, efficiency studies in Turkey and efficiency studies in hotel industry are discussed.

The fourth chapter covers the technical efficiency measurement of 28 resort hotels in Turkey by using DEA output oriented method. This chapter provides an in-depth analysis of the results and underlines certain important findings.

Finally, the fifth chapter includes conclusions based on the previous chapter and suggestions for the extensions of the study.

Chapter 2: Tourism Industry

2.1. Tourism Industry in the World

2.1.1. Definition and Classification

United Nations Statistical Commission (UNSC) and the World Tourism Organization (UNWTO) together provide a common system of definitions, concept and classifications related to tourism to eliminate duplications and minimize the burden on countries to create differentiated data for various sources. United Nations (UN) is accepted as the central agency for tourism statistics whereas UNWTO recognized as the authorized organization to improve the integration of these statistics within the sphere of the UN's system.

The latest document[2] presented by UN and UNWTO described 'visitors' as travelers arranging tourism trips outside their usual environment for personal or business purposes for less than a year. Visitors are classified as:[3]

a. International Visitor: International visitors are classified based on their country of residence, not by nationality.

a.i. International Tourists (overnight)

a.ii. Same-day visitors

[2] United Nations (2007)
[3] UNWTO (n.a.)

b. Domestic Visitor: A visitor can be classified under domestic visitor if she/he is residing in a country and traveling within this country

b.i. Domestic Tourist (overnight)

b.ii. Same-day domestic visitor

During these domestic and international visits, all activities such as purchasing goods and services that satisfy the needs and wants of individuals such as accommodation, food and beverages, fuel, domestic transport, entertainment and shopping are referred as tourism expenditure. The tourism expenditures can be generated either from same-day visitors or from overnight visitors.

However, certain transactions are not considered as tourism expenditure. Some examples of such non tourism expenditures are purchasing of consumer durables exceeding the custom threshold, receipts from international passenger transport contracted from companies outside the travelers' countries of residence or any kind of purchases having commercial purposes like resale or investment.

The report also categorizes tourism trips under two main headings; business & professional and personal.

Table 2.1.1: Purpose of Tourism Trips

Business & Professional	Personal
Conferences	Holidays, leisure and recreation
Meetings	Visit to friends and relatives
Fairs	Education and training
Giving lectures	Health Care
Gov and non gov missions	Religion/ pilgrimages
Other	Shopping
	Transit
	Other

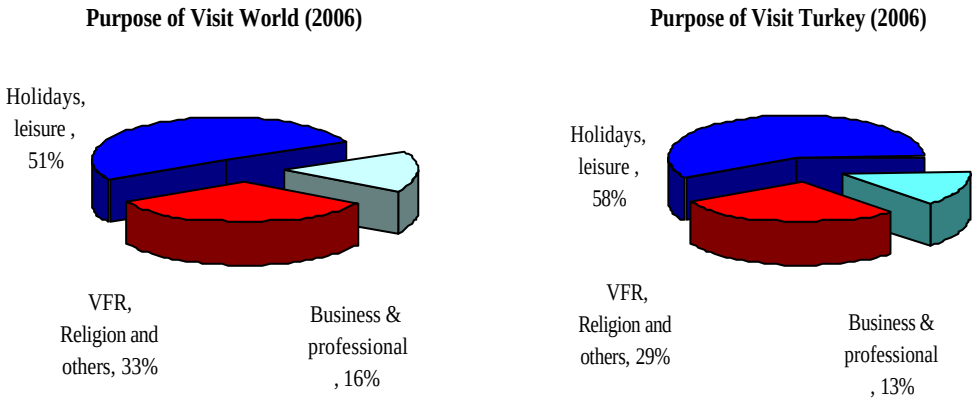
Source: United Nations (2007), p. 30

Business and professional tourism trips are activities such as attending meetings, conferences, trade fairs, giving lectures, concerts and plays, being part of crews, participating in governmental and non-governmental missions, etc.

Personal category includes different kinds of tourism trips such as holiday, leisure and recreation which involve activities such as sightseeing, culture visits, sporting, sea-sun visits, using beaches, visiting spas and wellness centers, etc.

This thesis concentrates on the personal group because of its high contribution to the tourism receipts of Turkey. In a recent survey conducted in 2006, 58 percent of international visitors coming to Turkey reported that their main purpose of visit was holiday and leisure.[4]

Figure 2.1.1: Comparison of Purpose of Visit



Source: UNWTO (2007a); TUIK (2007)

Visiting friends and relatives (VFR) includes attending family events such as weddings, funerals or short-term caring activities for old and sick people. However, the main purpose of a visit becomes confusing when visitors come for holidays but stay at their relatives. Religious

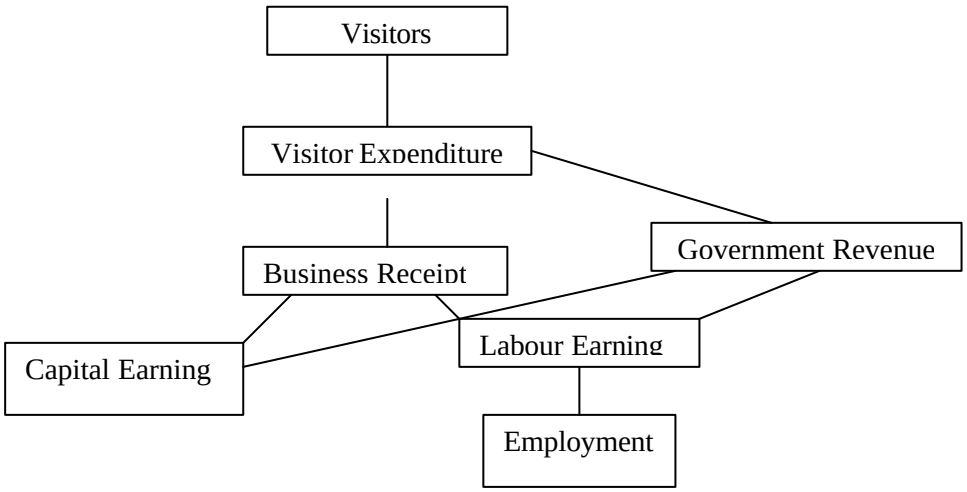
[4] TUIK (2007)

visits/pilgrimage covers events such as attending religious meetings and visiting religious sites whereas other covers any other temporary non-remunerated activities. All these categories help to understand the purpose of tourism trips of visitors and are used as indicators of tourism demand, however, they can not be differentiated perfectly since there can be confusing situations as in the above mentioned example of visitors coming for holidays but staying at relatives.

2.1.2. Economic Impact of World Tourism

Tourism activities create economic growth through a chain reaction as visitors usually have the tendency to make spending in the places that they visit. Those expenditures not only contribute to government revenues in terms of various tax gains but also create business revenues for private sectors, which results in capital earnings in terms of dividends or rent income for the individuals. In addition, such business receipts generate significant amount of employment for the local economy. All these economic activities once again enlarge the revenue of government through direct and indirect taxes resulting from capital and labor earnings.

Figure 2.1.2 : Chain of Tourism Economy



Source: Organization of American States (1997), p.6

As a result, tourism expenditures have a significant impact on Gross Domestic Product (GDP) of countries. Direct impact of travel and tourism (T&T) accounted for 3.6 percent of the global GDP whereas combined direct & indirect contribution was 10.4 percent of the global GDP in 2007.[5] Direct effects are the immediate monetary transactions created by tourism activities namely accommodation payments, travel costs, wages paid for tourism services, hotel sales and related taxes. On the other hand, any service or product supporting tourism industry is accepted as indirect. Sales of linen supplies or sales of construction material for hotel investments are good examples of indirect impact[6]. With its high level of GDP share, tourism is among the top three largest industries in the world[7].

Tourism has a significant effect on balance of payments of countries as well. Net tourism receipt of a country might be as significant as exports and imports in a country's current account in its balance of payments. Over the last decades, tourism increased its share in world trade from 4.3 percent in 1980 to 5.3 percent in 2005. Changes in life-styles, ease of transportation and globalization can be considered as the main drivers of growth for the global tourism industry.

Table 2.1.2: World Trade of Merchandise and Commercial Services

Billion $	1980	Share (%)	2005	Share (%)
TOTAL	**2,399**		**12,919**	
Merchandise	2,034	85%	10,468	81%
Commercial	365	15%	2,451	19%
Tourism-Travel	*103*	*4.3%*	*686*	*5.3%*

Source: World Trade Organization (2005)

[5] WTTC (2007)
[6] Sustainable Travel International (2007)
[7] Ennew, C. (2003)

Labor is the main factor of production especially in labor intensive industries such as tourism. Therefore, tourism is highly related with employment since it creates jobs directly through hotels, restaurants and travel agents and indirectly through the supply of goods and services needed by tourism related businesses.

Today, tourism industry employs over 76 million directly and 231 million people indirectly in the world which accounts for 2.7 and 8.3 percent of the total employment respectively. Furthermore, each year, 6.5 million jobs are created directly and indirectly by tourism industry.[8]

The nature of tourism industry helps to create part-time and temporary jobs as well as full time employment. Even though tourism has significant contribution to job creation, its seasonal characteristic sometimes cause economic downturns for destinations that are heavily dependent on tourism. Seasonal personnel usually face the lack of employment guarantees for the next season, they also have less training opportunities and limited social security. These drawbacks can be minimized either by creating alternative tourism demand to eliminate seasonality within the country or free movement of seasonal staff between countries. The former has a limited potential since it depends on the specifications of a particular country whereas the latter presents difficulties in terms of regulations and international relations.

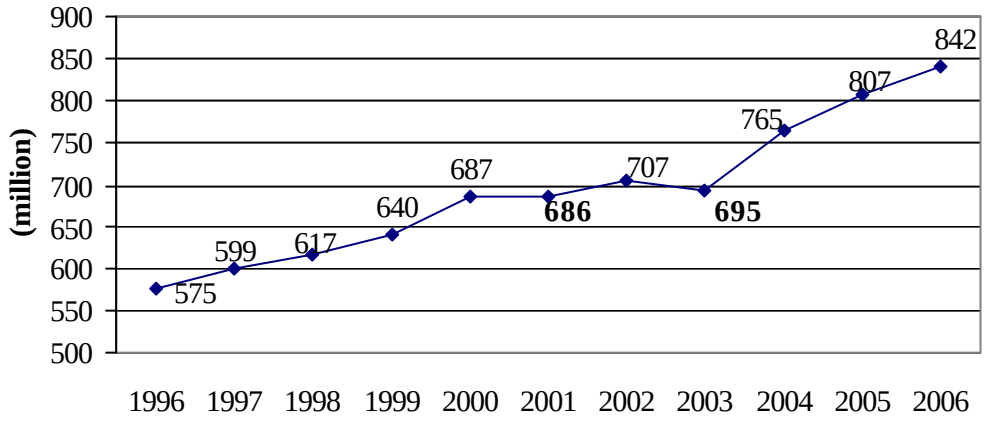
2.1.3. International Tourists

Since 1950, there has been a rapid increase in the number of international tourists[9] and the number of countries visited. The number of international tourists increased from 25.3 million to 842 million between 1950 and 2006, indicating an average annual growth rate of 6.5 percent.

[8] The 5th Global Travel & Tourism Summit (2005)
[9] International tourist definition is based on UN and UNWTO standards which excludes same-day visitors.

Number of international tourists has a sustainable growth rate as well, with the exception of years 2001 and 2003. 9/11 terrorist attack in 2001 and Iraq war as well as Severe Acute Respiratory Syndrome (SARS) epidemic in 2003 were the reasons for the global decline in tourism demand for relevant years. Tourism is more sensitive than the other industries as it shrinks dramatically in response to events such as terrorism, war, earth-quakes and health concerns.

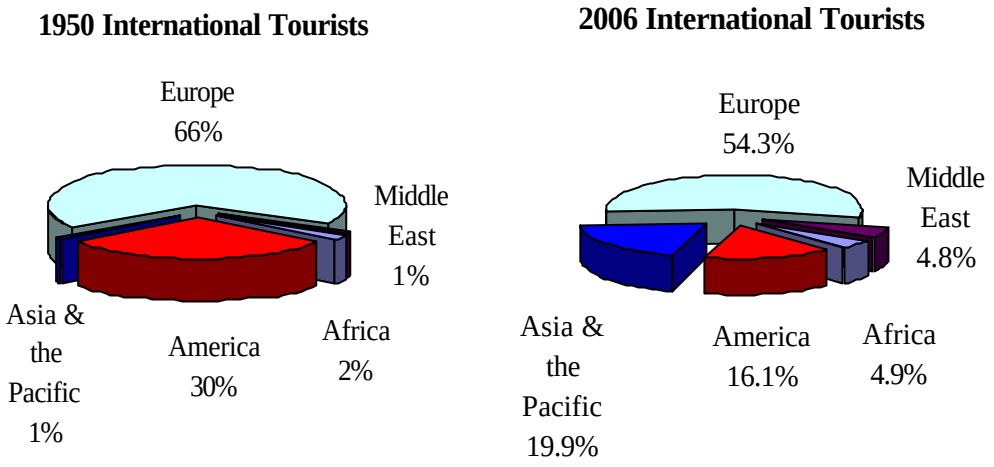
Figure 2.1.3: International Tourist Growth



Source: UNWTO (2006b)

In 1950s, the main destinations of international tourists were Europe and America representing 96 percent of the total visits. Over the decades, the predominant structure of these two continents in world tourism has changed and other regions such as Asia & the Pacific gained an important share of international tourist arrivals. Figure 2.1.4 indicates the destination changes in the world over time.

Figure 2.1.4: Market Structure in Historical Perspective



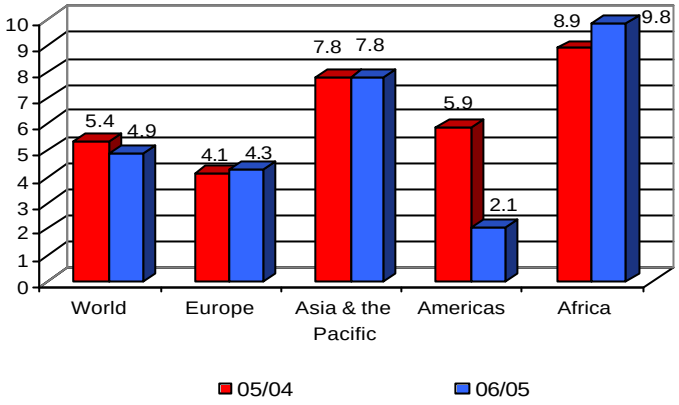
Source: UNWTO (2006a)

The industry overcame the problems such as terrorism, avian flu and rising oil prices in 2006 and experienced a 5 percent annual growth in international tourists. Even though the growth performances among the regions were different, all regions enjoyed a rise in their number of international tourists. Africa experienced the highest growth of 9.8 percent whereas Americas had the weakest growth of 2.1 percent with respect to the previous year.

In 2006, Europe remained as the most attractive global destination accounting for approximately 54.3 percent of total world tourists. On the other hand, growth rates over the last three years indicate that tourism demand increased by 4.4 percent in Europe, which is less than the growth rate of 6.6 percent in global tourism.

These figures show evidence that Europe is a mature tourism market with steady growth. In fact, Europe is not expected to lose its charm for international tourists since most of the European cities have the advantage of easy accessibility. Nevertheless, it is believed that other destinations will continue to get a share from international tourists.

Figure 2.1.5: Changes (%) in Number of International Tourists by Region



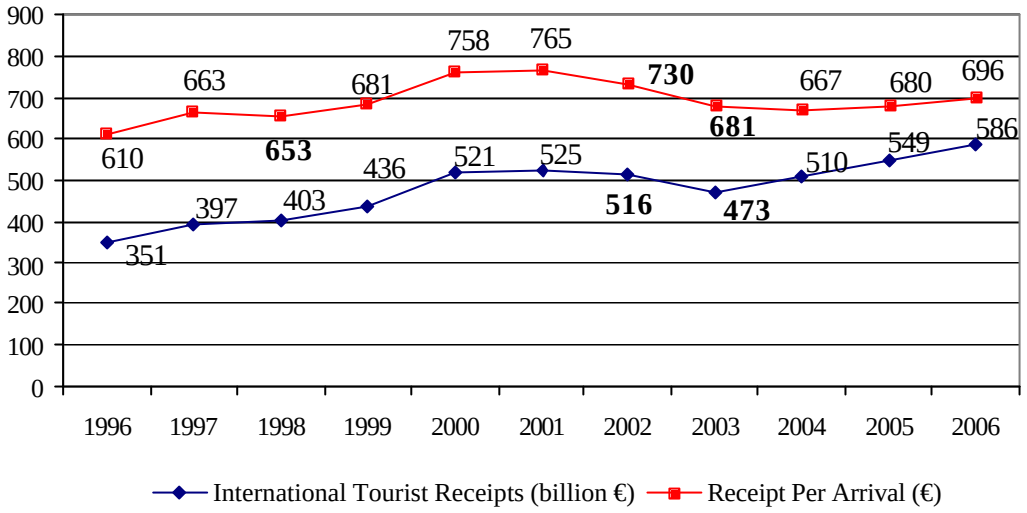
Source: UNWTO (2007b)

2.1.4. International Tourism Receipts

As for the global tourism industry, it is noteworthy that the international tourism receipts[10] rose by 6.7 percent when compared to the previous year and reached to 586 billion Euros in 2006. Growth in 2006 was remarkable when compared to 4.4 percent of CAGR for the last ten years. In fact, during the last decade, there were only two years with negative growth in international tourism. The damaging influence of 9/11 terrorist attack was felt especially in 2002. The effects of this incidence were so remarkable, WTTC, for instance, reported that 9/11 terrorist attack caused the heaviest monetary loss being 37.5 times more damaging than Tsunami on the Indian Ocean in 2004. The tourism receipts further decreased in 2003 with another drop of 8 percent as a result of Iraq war and SARS epidemic.

[10] World tourism receipts include receipts both from international tourists and international same-day visitors.

Figure 2.1.6 :International Tourism Receipts (1996-2006)



Source: UNWTO (2006c)

International receipt per tourist is also a good indicator to understand the industry dynamics. It is noteworthy that during the last decade, CAGR of "receipt per tourist" increased by only 0.5 percent. This minor change indicates that the growth of international tourist receipts stems from the increase in the number of international tourists rather than the receipt per tourist.

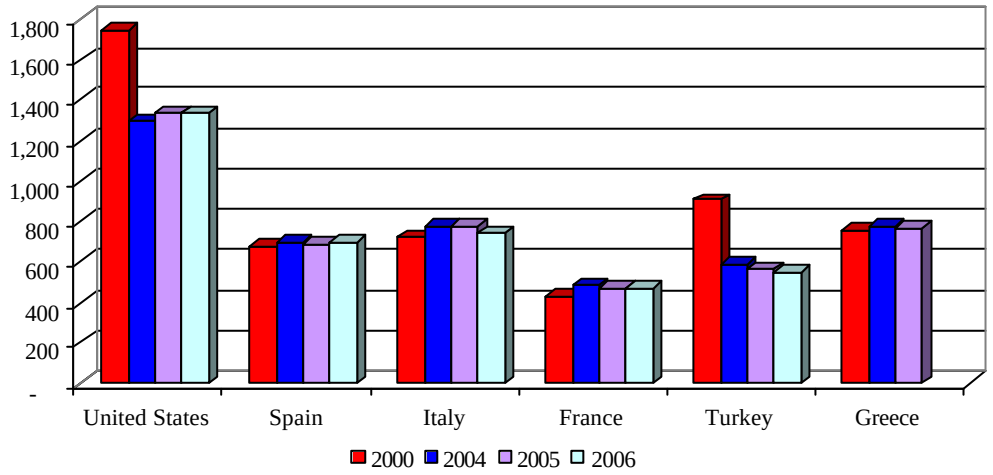
Europe, similar to previous years, had the highest tourism receipt in absolute terms but receipt per tourist was only € 658 which is far beyond Americas and Asia & the Pacific. It is also interesting that the average spending per tourist in Americas and Asia & the Pacific has always been higher than the global average. For instance, in 2006, the average worldwide receipt per tourist was € 696 whereas it was € 898 and € 730 in Americas and Asia & the Pacific respectively.

When tourism receipt on country basis is examined, the US, Spain and France are the first three countries which totally account for 25 percent of the worlds total tourism receipt. In 2006, the

United States received € 68.2 billion which accounts to 11.6 percent of this year's global tourism revenue. Spain and France followed the United States with € 40.7 billion and € 36.9 billion respectively. In 2006, with the exception of Turkey, all countries in the top ten in terms of tourism revenue recorded an increase in revenue compared to year 2005.

The worldwide receipt per tourist was € 696 in 2006, while it was € 1,336 in the US and €466 in France which was the lowest receipt per arrival among the top ten countries. France is easily accessible from most parts of Europe probably as a result of this people tend to stay shorter in France. On the other hand, other top countries such as Spain and Italy recorded € 696 and € 738, respectively which indicates a better performance than Turkey's € 544 per tourist.

Figure 2.1.7: Receipt per International Tourist (€)



Source: UNWTO (2007b); Ministry of Culture and Tourism (2008)

2.1.5. International Tourism Expenditure

As in previous years, countries with high per capita income such as Germany, the United States and the United Kingdom were ranked in top three in terms of outbound tourism expenditure. In

2006, these countries accounted for approximately one third of all tourism expenditure in total. Among the top ten countries, China and Korea improved their ranking to 6th and 10th position replacing Italy and the Netherlands. In the same year, Turkey's tourism expenditure was around € 2.2 billion, representing a share of 0.4 percent of world's total tourism expenditure.

Average tourism expenditure per capita was approximately € 1,555 for EU-15 in 2004 whereas it was € 265 for a Turkish citizen as of 2006.[11] The spending performance of Turkey is quite similar to other developing countries including Czech Republic, Lithuania, Slovenia, Slovakia and Poland. On average, tourism expenditure per capita in 2004 amounted to € 298 in these countries.[12]

2.1.6. Top Tourism Destinations

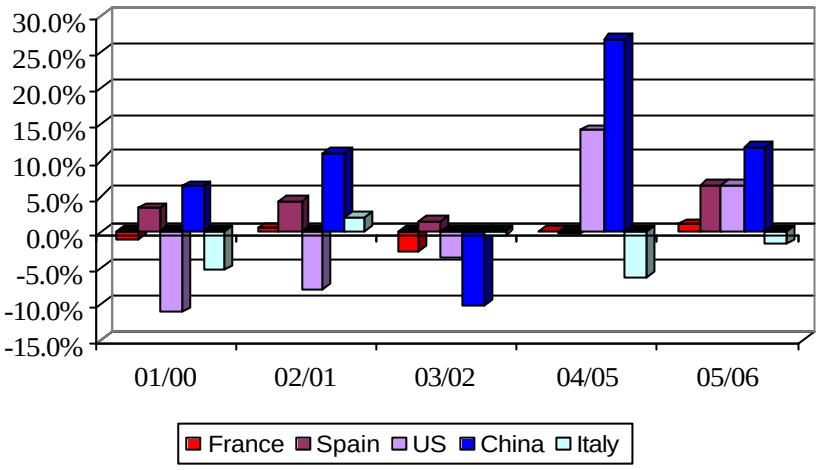
Despite the increased demand for new destinations, the most popular destinations in the world remained as France and Spain as of year 2006. France with 79 million visitors was the top destination in the world followed by Spain with 59 million visitors.

France attracts various leisure travelers not only with Cote d'Azur but also with Paris being a cultural capital of world's famous sites; such as the Eiffel Tower, the Louvre and Notre Dame Cathedral. France is also attractive for business travelers since it hosts the biggest meetings and fairs such as world's biggest real estate summit (Mipim) and Cannes Film Festival. Therefore, success of France can not be attributed to a single feature, but to the country in general.

[11] Ministry of Culture and Tourism (2008)
[12] Leidner, R. (2007)

France and Spain were followed by the USA and China in the ranking of the most popular destinations in 2006. Estimates of the UNWTO indicate that, by 2010 China will be the second most popular destination in the world and by 2020 this country will be in number one position.

Figure 2.1.8: Change (%) in Number of International Tourists by Top Destinations



Source: UNWTO (2007b)

As indicated in Figure 2.1.8, the CAGR of the change in international tourists for France is only around 0.4 percent during the last six years. However, it should be kept in mind that France's share from the world international tourists arrivals is almost 10 percent and it is not possible for such mature markets to grow at a fast pace. On the contrary, Spain performs parallel to world tourism averages with its 3.4 percent CAGR. The USA experienced serious declines after 9/11 and only in 2006, managed to reach to the number of tourist arrivals of year 2000.

On the other hand, China experienced the highest CAGR among the top five destinations with a yearly growth of 8 percent in the last six years. China replaced Italy in 2004 and holds the title of fourth most popular destination since then.

Table 2.1.3: Top Destinations

Million		Number of Tourist Arrivals		
		2004	2005	2006
1	**France**	75.1	75.9	79.1
2	**Spain**	52.4	55.9	58.5
3	**US**	46.1	49.2	51.1
4	**China**	41.8	46.8	49.6
5	**Italy**	37.1	36.5	41.1
6	**UK**	25.7	28	30.1
7	**Germany**	20.1	21.5	23.6
8	**Mexico**	20.6	21.9	21.4
9	**Austria**	19.4	20	20.3
10	**Russia**	19.9	19.9	20.2
	Turkey	**16.8**	**20.3**	**18.9**
	World	761	802	842

Source: UNWTO (2007b)

2.1.7. Future Prospects of World Tourism

As discussed in the previous sections, the growth of tourism industry is crucial for world economy in order to create jobs and thus improve living standards of people. As for the expectations for the future, UNWTO, for instance, forecasts that the number of international tourists will reach to 1.6 billion in 2020 which indicates an annual world average growth of 4.1 percent. Asia, the Pacific, Middle East and Africa are expected to grow particularly faster in the coming years with an average annual growth rate over 5 percent. Strong demand is expected for Asia and the Pacific and the market share of this region is expected to reach 25 percent in 2020 from its current level of 19.9 percent.

Market share of Europe is expected to decrease from 54.3 percent in 2006 to 46 percent in 2020. Nevertheless, the enlargement of EU, Schengen Agreement and converting local currencies to Euro would ease the cross border traveling and spending. The enlargement of EU is expected to have a positive effect on the tourism demand of especially Central and Eastern European members.

2.2. EU Tourism

This thesis aims to give a general idea on EU tourism, however the main focus would be on the Mediterranean countries and comparison of their tourism industry with Turkish industry, particularly in the context of resort hotels. Therefore, before getting into details about the efficiency of resort hotels in Turkey, it is crucial to analyze the main tourism indicators of the other Mediterranean countries of EU. Turkey competes with all Mediterranean countries to attract international tourists and tries to capture higher levels of tourism receipts. Since Turkey is a candidate country for EU, the competing countries within the framework of this thesis has been narrowed down to the Mediterranean countries of EU, namely Greece, Spain, France, Italy, South Cyprus and Malta.

2.2.1. Tourism and its Economic Impact in EU

Direct and indirect impact of tourism is expected to reach to 4.3 percent and 13 percent of GDP of EU by 2010. On the regional scale, there are also destinations which generate a much significant portion of their GDP from tourism activities, such as Mallorca-Spain which generates 70 percent of its GDP from tourism.[13]

Table 2.2.1: GDP Contribution of T&T Industry in Mediterranean Countries of EU (2007)

GDP	EU15	Greece	Spain	France	Italy	S. Cyprus	Malta	Turkey
Direct	4.1%	7.4%	6.8%	4.1%	4.2%	9.8%	11.8%	4.9%
Direct & Indirect	12.5%	16.5%	18.2%	10.9%	10.2%	21.5%	23.7%	11.9%

Source: WTTC (2007)

[13] European Environment Agency (2001)

In the EU, tourism industry directly employs 9 million people, that is, 6 percent of the total employment which is estimated to increase to 12 million by 2010.[14] Within the EU27, 66 percent of the 9 million employed are working in Germany, Spain, France, Italy and UK. It is not surprising that in terms of international tourists, these five countries are the top destinations in EU and also in the top seven destinations in the world.[15]

Table 2.2.2: T&T Industry Employment at Mediterranean Countries of EU (2007)

Employment	EU27	Greece	Spain	France	Italy	S. Cyprus	Malta	Turkey*
Direct (000)	9,072	450	1,494	1,284	1,052	55	25	1,100
% of total Employment	4.1%	10.3%	7.7%	5.2%	4.6%	13.7%	16.5%	5.3%
Direct & Indirect (000)	25,091	869	3,899	3,257	2,625	110	44	2,658
% of total Employment	11.4%	20.0%	20.0%	13.2%	11.5%	27.4%	28.8%	13.0%

*: Estimate
Source: WTTC (2007); TURSAB (2004)

On the other hand, some EU economies, namely Malta, South Cyprus and Greece, are more dependent on tourism industry even though less employment is created by tourism compared to top ranking countries mentioned above. All these three countries employ more than 10 percent of their total labor force directly in tourism industry. Since tourism demand is highly influenced by external factors such as security and health issues, dependence on tourism can cause volatility and fragileness in these economies.

Despite the high number of international tourists coming to Turkey, tourism can be considered as relatively a modest contributor to the country's GDP (4.9 percent) and employment (5.3 percent) compared to Spain, Malta, South Cyprus and Greece. This is because of the fact that Turkey's GDP is generated mainly by manufacturing industries and employment is dominated by agricultural industries. Similar to Turkey, Spain and Greece also have various other industries contributing to their economies.

[14] The 5th Global Travel & Tourism Summit (2005)
[15] UNWTO (2007b)

Turkey differs from above mentioned Mediterranean countries as of its significant level of informal employment and related unrecorded economy. If the share of informal employment and economy in the Turkish tourism industry is assumed to be larger than the other industries in the country, this could also explain a part of the difference among Turkey, Greece and Spain in terms of the significance of tourism industry compared to other industries. This might also stem from the number of family-run tourism businesses in Turkey which is probably higher than Spain and Greece. Family-run businesses usually create informal employment especially for family members and lack of corporate structure of these businesses also creates informal economy.

Another indicative ratio could be the employee per bed capacity. This ratio provides a clue on the job creation performance of tourism industry as well as the efficient use of employees.

Table 2.2.3 Employee per Bed Capacity for Mediterranean Countries of EU

	EU27	Greece	Spain	France	Italy	S. Cyprus	Malta	Turkey
Direct Employment (000)	9,072	450	1,494	1,284	1,052	55	25	1,100
Bed Capacity (000)	11,800	682	1,580	1,740	2,000	93	39	904
Employee per Bed Cap.	0.77	0.66	0.95	0.74	0.53	0.59	0.64	1.22

Source: WTTC (2007); Eurostat (2007a); TURSAB (2004); South Cyprus Tourism Organization (2006); Malta Tourism Authority (2007); Ministry of Culture and Tourism (2007d); Ministry of Culture and Tourism (2007b)

Table 2.2.3 illustrates that Italy has least number of employee per bed capacity whereas Turkey has the highest with 0.53 and 1.22 employees per bed capacity respectively. The concept of the hotel can also lead to a significant difference in the number of employee per bed capacity. As an illustration, a particular hotel needs to hire more staff if it has "all inclusive" concept or it has a luxury standard in comparison to limited service hotels. Therefore without getting into detail of the countries' bed capacity structure, such comparisons can only give a general idea about the countries. Turkey has the highest number of employee per bed capacity probably as a

result of the "all inclusive" concept in the coastal lines of Turkey. Along with the "all inclusive" concept, inefficient use of employee could be an alternative explanation of higher personnel per bed capacity.

2.2.2. Legal Framework of Tourism in EU

Tourism was not considered among the industries to establish member co-operation in the EU until the early 1980s. The establishment of Tourism Advisory Committee with the representative of member states in 1986 is the initial step for co-operation at the Community level (Council Decision 86/664/EEC of 22 Dec 1986). In the third article of this decision, it was clearly defined that it is obligatory for all member states to submit annual tourism reports to the Commission which would then inform all the other member states.

The announcement of year 1990 as 'The European Year of Tourism' was the second sign of the growing importance of tourism in the EU. In 1996, European Commission proposed the First Multi-annual Program to assist European Tourism however this program was later withdrawn in 2000 as a result of dispute in the Council of Ministers. In 1999, the European Commission identified the positive relationship between tourism and employment with a report[16]. In the following two years, working groups were set up for studies on the ways of improvement for the tourism industry. The five topics of these working groups are specified as follows:

- Sharing of information with the help of new technologies
- Concentrate on training people
- Improving tourism products
- Taking care of environment for sustainable development
- Implementing new technologies to tourism

[16] Enterprise and Industry (1999)

The first resolution specifically on the tourism industry was adopted by the Council of Ministers in 2002. This resolution was about the closer monitoring of EU legislation based on its impacts on tourism.

In 2004, European Commission initiated the establishment of Tourism Sustainability Group (TSG) which is responsible to set up a framework for sustainable tourism development growth. TSG is composed of experts from within and outside of EU and is entitled to prepare the European Agenda 21 for tourism which aims to clarify the long term process. Aside from the efforts of the European Commission for the elaboration of European Agenda 21, European Commission also intends to set up a new European tourism policy.

The EU tourism policy identified in "Lisbon Strategy" is based on two key issues: competitiveness and job creation. Tourism destinations can be competitive only if they manage to have sustainable economic, social and environmental structure. Job creation is one of the biggest contributions of tourism to economies with regard to the employment of less skilled people or young work force and job creation rate of tourism is higher compared to other industries.[17] Therefore Lisbon Strategy also indicated the importance of tourism to reach its target of 2010.[18]

In 2005, along with the focused target of Lisbon Strategy on growth and job creation, the European Commission proposed a renewed EU tourism policy and it was publicized as of March 2006 by the European Commission.

[17] Europa (2006)
[18] At Lisbon Strategy, EU aimed to be the most competitive economy of the world with full employment by 2010.

Furthermore, European Commission intends to support tourism and therefore financed the European Tourist Destination Portal at its creation stage. Meanwhile, Council Presidencies are organizing Tourism Ministerial meetings, conferences and organizing the annual European Tourism Forums. European Tourism Forums are useful for collaboration in the framework of new EU tourism policy. Each year in those Forums, a destination is chosen as the 'European Destinations of Excellence' since 2005. This has been launched by the European Commission in order to promote destinations with their differentiated values. European Commission is responsible of informing the Parliament and the Council about the policies and actions related to tourism.

Establishing a European Tourism Policy is a challenging task since it should not only comply with national policies of member states but also with various related policies of EU such as Environment Policy, Fishery Policy or Transportation Policy although it is directed through the Enterprise policy[19].

In addition to above mentioned incentives and activities in EU, various structural funds, namely European Regional Development Fund (ERDF) and European Social Fund (ESF) finance numerous tourism related projects in support of socio-economic development and educational-training. Furthermore, any kind of infrastructure requirement for environment and transportation are financed by the Cohesion Fund. Even the agricultural funds such as European Agricultural Fund for Rural Development and European Fisheries Fund (EFF) are supportive for tourism since tourism has differentiated products such as rural tourism and eco-tourism.

[19] Enterprise policy covers competitiveness, automotive industry, chemical industry, pharmaceutical industry, textile industry and tourism.

EU programs on culture, education, youth and vocational training also support tourism at the Union level.

2.2.3. EU and Tourism Competitiveness

Competitiveness reports in all industries are popular since they give good indications about the performance of the companies and countries and clarify the factors driving competitiveness. These reports help countries or regions to choose the right way to progress in order to ensure the sustainable industry development and the productivity growth.

On a yearly basis, EU Commission prepares European Competitiveness Reports to maintain and improve the global competitiveness position of EU and its individual members. This report aims to highlight the factors affecting sustainable development and productivity growth and to direct the EU policies on this perspective. Lisbon Strategy is also a supportive agenda to increase productivity growth to maintain sustainable long term development.

Despite above mentioned initiatives in the EU, the focus on service industries is rather limited compared to manufacturing industries. Among the service industries, telecommunication and software are the ones creating the fastest productivity growth in the EU. In a recent study, labor productivity has been used to measure the comparative competitiveness performance of the industries within EU. As a result of this study, it was reported that hotel and restaurant industry in EU has a negative contribution to labor productivity growth between the years 1995-2004. This is a negative result for EU because of the positive contribution of hotel and restaurant industry to the productivity growth in US.

Table 2.2.4: Annual Growth of Labor Productivity (1995-2004)

Contributions by Industry	EU25	US
Hotels & Restaurants	**-0.14**	**1.24**
Water Transport	10.68	-4.18
Telecommunication & Post	8.82	3.83
Financial Intermediation	4.26	5.86
Transport & Communications	4.15	2.94

Source: Blanke, J and Chiesa, T (2007)

The World Economic Forum has prepared its first report on Travel & Tourism Competitiveness Index (TTCI) covering 124 countries as of 2007. This report compares and measures the competitiveness of the countries in light of comprehensive tools and factors. Under three main headings, 13 sub-categories are clarified for TTCI to be used for identifying and ranking the tourism competitiveness among countries. These are:

1. Regulatory Framework
    1.1 Policy rules & regulations
    1.2 Environmental regulation
    1.3 Safety and security
    1.4 Health & hygiene
    1.5 Prioritization of travel & tourism
2. Business Environment and Infrastructure
    2.1 Air transport infrastructure
    2.2 Ground transport Infrastructure
    2.3 Tourism infrastructure
    2.4 ICT infrastructure
    2.5 Price competitiveness in the T&T industry
3. Human, Culture and Natural Resources

3.1 Human resources

3.2 National tourism perception

3.3 Natural & cultural resources

All these criteria have governmental, business and civil society related aspects. The first five categories are considered under regulatory framework, the following five under business environment and infrastructure and the last three under human, cultural & natural resources.

Table 2.2.5: Performance of EU27 Countries in TTCI

EU27	Overall Index	Regulatory	Business Env. & Infras.	Human & Nat. Res.
Austria	2	3	12	1
Germany	3	6	3	6
Luxembourg	9	17	9	8
UK	10	21	6	10
Denmark	11	8	16	9
France	12	13	5	28
Spain	15	25	7	19
Finland	16	7	18	33
Sweden	17	19	13	27
Netherlands	19	22	15	25
Cyprus	20	29	23	3
Belgium	21	24	29	4
Portugal	22	11	22	30
Greece	24	20	32	15
Malta	26	23	31	21
Ireland	27	14	26	46
Estonia	28	32	25	34
Italy	33	42	30	32
Czech Rep.	35	40	37	22
Slovakia	37	37	45	18
Hungary	40	26	51	51
Slovenia	44	44	38	53
Lithuania	51	57	43	61
Turkey	***52***	***53***	***63***	***48***
Latvia	53	60	41	77
Bulgaria	54	66	56	41
Poland	63	63	62	60
Romania	76	87	74	71

Source: Blanke, J and Chiesa, T (2007)

According to TTCI rankings, four of the EU countries ranked among the top ten competitive countries. Austria and Germany ranked 2nd and 3rd respectively after the most competitive

country, namely, Switzerland. It is rather surprising that France ranked at 12th place and Spain at 15th place since, as discussed earlier, these countries are the top two most popular destinations in the world. France obtained the highest rankings for infrastructural issues and cultural resources whereas the shortcomings in this country stemmed from policy rules and regulations. The least score for France was for the price competitiveness of the industry and the national tourism perception meaning the unfriendly attitude of French citizens to visitors.

Spain has all the strengths of France and however, this country also gives priority to travel and tourism as a country vision. Similar to France, Spain also has the weakness of price competitiveness. Being less competitive in pricing is actually a common problem among Euro countries. All of the Euro countries[20] excluding Luxembourg have a ranking over 90 among 124 countries. Probably the ranking of Luxembourg (56th) is not as low as the rest of the Euro countries because of its lower levels of leisure travelers. In general, leisure travelers are more price-sensitive compared to business travelers.

Turkey is ranked 52nd in TTCI and this ranking is below most EU27 countries however still better than Latvia, Bulgaria, Poland and Romania. This result is not in accordance with expectations when the importance of tourism for Turkey is considered. None of the mentioned four counties that perform below Turkey are as significant tourism destinations as Turkey which has a modest performer ranking between 43rd and 86th in every criterion.

The low tourism competitiveness score of Turkey is difficult to improve since there is a problem in almost every aspect. Despite the low competitiveness score of Turkey, it is notable

[20] Austria, Belgium, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain and Slovenia

that Turkey attracts over 20 million international tourists per year. One of the main reasons of this would be the location advantage of Turkey since it is in close proximity of Europe.

It is also remarkable that Turkey ranked 43rd in national tourism perception. Although Turkish people are proud of their hospitality, this ranking below certain EU countries such as Southern Cyprus (5th), Malta (16th), Luxembourg (22nd), Greece (23rd), Bulgaria (30th), Estonia (31st) and Austria (33rd). The ranking of Turkey on national tourism perception could be a result of the stereotypes of the research participants who never visited Turkey or indeed, Turkish nation is having difficulties to draw the line between being hospitable and being unceremonious.

As stated in TTCI report, all countries have to concentrate on their weaknesses and take necessary actions to improve their competitiveness. This report also indicates that on infrastructural issues initial responsibility belongs to governments. After infrastructural issues are dealt with, the governments should plan the steps, set up the policies and regulations for the quality and quantity of the tourism services. All the steps should be taken by the support of private sector to ensure that they are economically and environmentally beneficial for all stakeholders.

2.2.4. Enlargement Effects on EU Tourism

The continent of Europe is the number one tourism destination for decades, attracting almost 55 percent of the worldwide demand. Majority of the international tourists coming to Europe continent are visiting EU. Although in the earlier years EU had a higher share of international tourists, the enlargement process of EU, which resulted in 27 member countries as of January 2007, still helps to defend EU's share of international tourists.

Table 2.2.6: Enlargement in EU

1951	1973	1981	1986	1995	2004	2007
Belgium	Denmark	Greece	Spain	Austria	Czech Republic	Romania
Germany	Ireland		Portugal	Sweden	Estonia	Bulgaria
France	UK			Finland	South Cyprus	
Luxembourg					Latvia	
Netherlands					Lithuania	
Italy					Hungary	
					Malta	
					Poland	
					Slovakia	
					Slovenia	

Source: European Commission (2008)

In 2003, the number of international tourists visiting Europe[21] was around 400 million while 72 percent of these came to EU15[22] countries. As of May 2004, 10 new members[23] joined EU and the geographical enlargement of EU increased its share to 83 percent of total Europe's international tourists. Among the new members Poland (15.7 million) and Hungary (9.3 million) ranked as the top two countries in terms of international tourist arrivals. The fifth enlargement of EU in January 2007 made a minor improvement in the international tourist arrivals in EU27 since the total arrivals to Bulgaria and Romania do not exceed 8 million in total.

Geographical enlargement automatically increases the number of international tourists coming to EU. Aside from that, visitor flow among EU members is also increasing. New members have comparatively low price levels and high GDP growth therefore they create competition for existing members in the sense that they are not only new and affordable tourism destinations

[21] UNWTO includes 42 countries into the statistics of Europe.
[22] EU15: Austria, Belgium, Denmark, Germany, Greece, Spain, Finland, France, Ireland, Italy, Luxemburg, Netherlands, Portugal Sweden and United Kingdom
[23] Czech Republic, Cyprus, Estonia, Latvia, Lithuania, Hungary, Malta, Poland, Slovenia, Slovakia

but also a profitable alternative for tourism enterprises. European structural funds were also supportive for the growth of tourism in the new member states. The number of bed capacity between 1996 and 2004 in the new member states[24] increased by 36 percent whereas in EU15 only 11.3 percent increase was experienced.[25]

High GDP growth of new member countries contributes to the per capita income of their residents which, in turn, supports not only domestic tourism but also intra EU tourism. One of the fundamental stimulating factors that increase intra EU tourism is the ease of border crossing among member states. Abolishing border controls at internal borders has been a fragile topic among EU27. As described in the EU Community law, free movement is to travel and to settle freely among member states regardless of the reason for travel. Although free movement of people is one of the basic aims of the EU, at the implementation stage, it has never been totally achieved. The initial step for the free movement of people among members was the gradual abolishment of internal border controls between Belgium, Germany, France, Luxembourg and Netherlands in 1985 upon the signing of Schengen Agreement.[26] Following this in 1995, Schengen Convention[27] came into force in order to totally abolish internal border control, to create a single external frontier and to introduce a common policy on visa regime, police and judicial cooperation among seven EU countries. As of March 2001, the Schengen acquis was applicable in full in 13 EU members and 2 non-EU members.

Countries such as UK and Ireland took part in police and judicial cooperation of Schengen acquis. The situation of UK and Ireland is not about being incapable of fulfilling the Schengen requirements but not being voluntary to sign it. On the other hand, all twelve new members of

[24] Countries in the fifth enlargement
[25] Leidner,R. (2007)
[26] European Commission (n.a.)
[27] The Schengen Convention did not aim at regulating the right of EU citizens for their long term residencies or work permits.

the fifth and the sixth enlargement were not accepted to be in the Schengen area simultaneously with their membership accession. Ensuring the security of borders to eliminate illegal immigration and other unlawful activities is achieved by a standard and effective external frontier system within Schengen area and countries have to fulfill all the requirements to be a part of Schengen area.

Schengen Convention is binding both for non EU nationals and for EU nationals. For non EU nationals, a uniform short stay visa (Schengen visa) that can be issued by all Schengen countries is required to travel in the Schengen area. Being a part of Schengen area is useful for EU countries to attract more foreign travelers. Foreign travelers with a valid Schengen can easily travel in EU countries without losing time for separate visa applications for each country that they are willing to visit.

EU nationals are able to cross internal borders of EU with presenting a valid passport or identity card and can stay in another EU country for three months without further documentation. While, being a part of EU eased the traveling for EU citizens, it did not eliminate the long queues of people waiting to present valid passport or identity cards.

The nine new members of EU; Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Slovenia, Slovakia and Czech Republic; joined the Schengen area only from land and sea borders as of December 2007, and from air borders in March 2008. Nationals of these new Schengen members will have the right to move freely within Schengen countries without any internal border checks. On the other hand, Southern Cyprus, Romania and Bulgaria still have to complete the Schengen requirements before being a Schengen member.

Table 2.2.7: Countries Fully Applying Schengen Rules

1995	1998	2000	2001	2008
Belgium	Austria	Greece	Denmark	Czech Republic
Luxembourg	Italy		Finland	Estonia
Netherlands			Sweden	Hungary
Germany			Iceland (non EU)	Latvia
France			Norway (non EU)	Lithuania
Spain				Malta
Portugal				Poland
				Slovakia
				Slovenia

Source: European Council (2007) p.3-7

Another stimulus to increase intra EU tourism is the single currency. The single currency creates a positive motivation for Euro zone[28] nationals to travel since it eliminates currency conversion costs, bank commissions and other financial exchange rate obstacles within the EMU. Aside from EMU's direct effects on tourism, it also has some indirect effects on real income and growth on countries.[29]

The study of Smeral (1999) identified the effects of EMU by analyzing the developments in balance of tourism receipt and spending for the period from 1999 to 2003 relative to the GDP. He indicated that Austria would benefit from the single currency by increasing its cumulative balance of tourism travel by 1.5 percent of GDP whereas Finland and Italy were expected to suffer by -1.3 and -1.2 percent of GDP respectively. The study concluded that hard currency countries, such as Austria are more likely to benefit from EMU compared to soft currency countries from tourism point.

[28] Euro is the currency of thirteen EU countries, namely: Belgium, Germany, Greece, Spain, France, Ireland, Italy, Luxembourg, the Netherlands, Austria, Portugal, Slovenia and Finland. As of 1 Jan 2008, South Cyprus and Malta became Euro zone countries.
[29] Smeral, E. (1999)

A recent research, which has been conducted by Pareja, Vivero, Serrano and Alonso (2004), stated that the euro had a positive effect of 6.5 percent on intra-EMU tourist flows over the period 1995-2002. Unlike the findings of Smeral (1999), this research found out that the positive impact is valid almost across all EMU countries.

Being a part of EMU also increases the transparency of tourism services. Prices of tourism services can easily be compared in a single currency structure which leads to price transparency, higher competitiveness and more market driven prices within the EMU. However, as a result of rounding up of prices in all industries including tourism, the implementation of single currency caused significant price increases in Euro zone countries in the short run. This could be viewed as the other side of the coin indicating that Euro zone countries may become less competitive compared to non Euro zone countries. [30]

Furthermore, before being a member of Euro zone, EU countries had control on the exchange rates of their own currencies, which might be used to create competitiveness in their pricing. After being a member of Euro zone however, member countries lost such flexibilities with respect to their currencies. For instance, the strength of Euro against US dollar hit all time high in 2008 creating a negative effect on all Euro zone countries in terms of competitive tourism pricing.

In sum, there is no doubt that the geographical enlargements of EU as well as the expansion of Schengen area have positive effects on tourism revenues and tourism arrivals of the member countries. On the other hand; the effects of joining to Euro zone with a tourism focus is a debatable issue and requires country specific further research.

[30] Ratz, T. and Hinek, M. (2005)

2.2.5 Tourism in Mediterranean Countries of EU

As of 2005, the total number of international tourists visiting Mediterranean countries of EU amounted to 186 million which accounts for 55 percent of the total international tourists coming to EU. As previously mentioned; France, Spain and Italy are among the top five destinations in the world and they capture 21 percent of the global international tourists.

Table 2.2.8: International Tourists and Receipts (2005)

Country	Num of Int Tourists	Tourism Receipts (million €)	Tourism Receipt / Num of Int Tourist (million €)
Greece	14,300	11,025	771
Spain	55,900	38,629	691
France	75,900	35,410	467
Italy	36,500	28,489	781
South Cyprus	2,470	1,875	759
Malta	1,171	610	521
Total Mediterranean EU	**186,241**	**116,037**	**623**
EU27	341,800	232,529	680
Turkey*	***19,670***	***11,195***	***569***

*Receipt per tourist is calculated based on tourists leaving the country not based on tourists arriving to country. There is a slight difference between the two. For instance number of international tourists leaving the country was 19.6 million and arriving to the country was 20.3 million as of 2005.
Source: UNWTO (2007b), p.8; Hussain, M and Bylinski, G. (2007); Southern Cyprus Tourism Organization (2006); Malta Tourism Authority (2007); Ministry of Culture and Tourism (2008)

Italy performs as a benchmark among the Mediterranean Countries of EU for its receipt per international tourist. The receipt per international tourist is not continuously increasing in any of the countries because of the changing market structure. In the past, only wealthier people were traveling abroad but along with the increased number of low cost airlines, ease of transportation and increase in number of accommodation alternatives, number of people making international travels increased. Compared to the top six countries, Turkey's receipt per international tourist is lower because of the wide spread "all inclusive" concept in the country.

All these locations have "all inclusive" concept but in a limited segment of their hotel industries.

Table 2.2.9: Main Tourism Markets for Mediterranean Countries of EU (2005)

Country	Origin of Nights Spent by non-residents (2005)				Top Two Origins (%)
Greece	Germany	22.7%	UK	19.0%	41.7%
Spain	UK	31.0%	Germany	28.8%	59.8%
France	UK	21.9%	US	9.9%	31.8%
Italy	Germany	26.5%	UK	10.4%	36.9%
South Cyprus	UK	55.6%	Germany	10.5%	66.1%
Malta	UK	45.7%	Germany	11.9%	57.6%
Turkey	***Germany***	***35.9%***	***Russia***	***8.6%***	**44.5%**

Source:Eurostat (2007b); Ministry of Culture and Tourism (2007c)

The table 2.2.9 illustrates that German and British visitors dominate the international nights spent in all six countries. Among them, France and Italy have relatively more balanced international visitor structure since the total of German and British visitors' nights spent is 31.8 percent and 36.9 percent, respectively.

Each year approximately 60 million German citizens make holiday trips and 36 percent of them prefer to have sun and sea holidays.[31] For UK citizens, Mediterranean countries are the most popular destination and almost 60 percent of their holiday trips are made to these destinations.[32] The results indicate that majority of the nights spent in the Mediterranean countries of EU are generated by sun and sea holiday seekers.

Another indicator of tourism is the bed capacity/supply of the countries. As of 2005, bed capacity in EU27 is around 11.8 million whereas 52 percent of that bed capacity is in the Mediterranean countries of EU.

[31] IPK International (2001)
[32] Tourism Ireland (2007)

Table 2.2.10 Receipt per Bed Capacity for Mediterranean Countries of EU

Country	Bed Capacity (000)	Tourism Receipts (million €)	Tourism Receipt / Bed Capacity (million €)
Greece	682	11,025	16,166
Spain	1,580	38,629	24,449
France	1,740	35,410	20,350
Italy	2,000	28,489	14,244
South Cyprus	93	1,875	20,161
Malta	39	610	15,641
Total Mediterranean EU	**6,134**	**116,037**	**18,917**
EU27	11,800	232,529	19,706
Turkey*	***882***	***14,590***	***16,542***

*Tourism receipt (14,590 million €) includes receipts from international tourists (11,195 million €) and receipts from Turkish people residing abroad (3,395 million €)
Source: Eurostat (2007a); Southern Cyprus Tourism Organization (2006); Malta Tourism Authority (2007); Ministry of Culture and Tourism (2007d); Ministry of Culture and Tourism (2007b); Ministry of Culture and Tourism (2008)

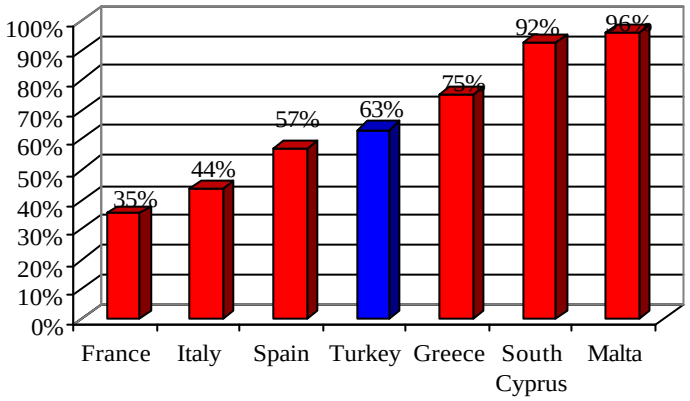
Bed capacity provides an indication of how much a country invested for its hotel industry. In Europe, Italy has the highest bed capacity among all Mediterranean countries of EU with 2 million beds. Tourism receipt per bed capacity can be evaluated as a performance indicator of the countries. It reflects how much the country receives per each bed investment. While making these kinds of comparisons it should be noted that investment cost per room and hotel qualities among countries may differ significantly. Countries having higher investment costs per room or with higher quality hotel supplies would need to aim for higher receipts per room.

For the sake of simplicity assuming the investment costs and hotel qualities are similar, Spain receives the best return for its investments whereas Italy has the lowest receipt per bed capacity. The situation of Italy needs to be analyzed in detail in order to find out if there is over capacity problem. Turkey could be considered as an average performer in terms of tourism receipt per bed capacity.[33]

[33] The bed capacity in Turkey is taken as the sum of tourism (483,000) and municipality licensed (399,000) accommodation establishments for 2005.

Lower tourism receipt per bed capacity is meaningful if the county has high level of nights spent by its own residents. This means that local residents create a significant amount of nights spent so that the international arrivals become less important for the owners of tourism establishments. On the other hand, tourism receipt from international visitors contributes to the economy and the balance of payment of the country.

Figure 2.2.1: Share of Nights Spent by International Tourists in Mediterranean Countries of EU (2006)



Source: Eurostat (2008); Ministry of Culture and Tourism (2007c)

Figure 2.2.1 above clearly outlines that bed capacity of France and Italy are mainly utilized by their residents. Non-residential nights spent for these two countries are below 50 percent. On the contrary, Southern Cyprus and Malta are mostly dependent on non-residents nights spent. Spain and Turkey have a more balanced structure on their nights spent which in a sense protects their tourism industry and makes them less vulnerable to external or internal shocks.

Table 2.2.11: Nights Spent by International Tourists in Mediterranean Countries of EU (2006)

Countries	Nights Spent
Spain	151,800
Italy	109,100
France	69,600
Turkey	56,894
Greece	42,500
South Cyprus	13,200
Malta	7,000

Source: Eurostat (2008); Ministry of Culture and Tourism (2007c)

2.3. Turkish Tourism

2.3.1 Historical Background of Turkish Tourism

Until 1980s, Turkish tourism industry was relatively a small industry mainly dependent on Turkish residents' demand. In the 1980s, tourism investments accelerated with the incentive programs through Tourism Incentive Law numbered 2634. The incentive law encouraged entrepreneurs to invest in tourism establishment by providing advantageous loans, allocating 49 years utilization right of Turkish Treasury lands especially on the coastal line of Turkey and allowing some exemptions on taxes and discounts on utility costs[34].

All these incentives paid off and Turkish tourism investments, job creation, number of international tourists and GDP contribution of tourism to Turkish economy increased tremendously after 1984. From 1980 to 2007, the number of tourism licensed establishments and the number of international visitors[35] increased with a CAGR of 9 percent and 11 percent respectively[36]. In addition, GDP contribution of international tourism revenues increased from

[34] Turizmi Tesvik Kanunu 2634 (1982)
[35] International visitor means international tourists and international same-day visitor.
[36] Ministry of Culture and Tourism (2008); Ministry of Culture and Tourism (2007c)

0.6 percent to 2.8 percent between the years 1980 to 2007. According to the report of, WTTC direct GDP contribution of Turkish tourism as a whole is 4.9 percent as of 2007.

2.3.2 International Tourism Receipts of Turkey

Tourism receipts can be divided into three categories, namely revenues from same-day international visitors, revenues from international tourists and revenues from Turkish citizen residing abroad.

As of 2001, official classification started to include the revenues from Turkish people residing abroad to the calculation of total tourism revenue which is in line with UNWTO standards. This caused a jump in the tourism revenues from 8.2 billion € in 2000 to 11.2 billion € in 2001.

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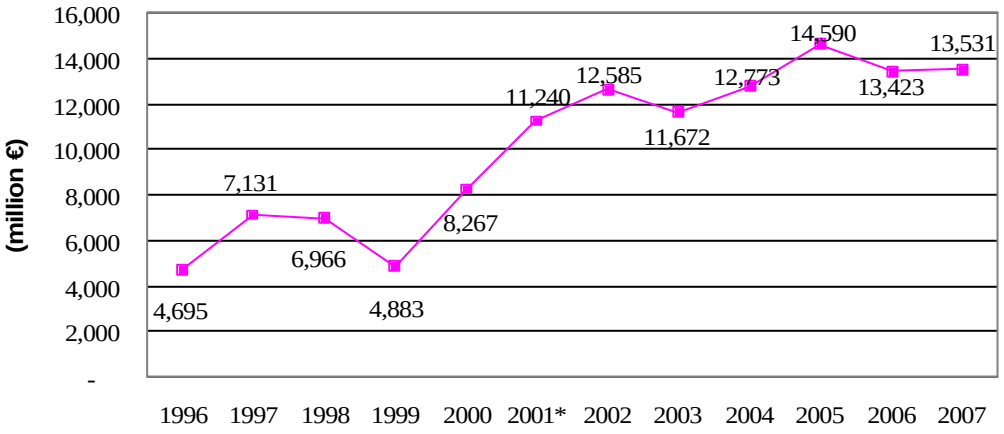
Figure 2.3.1: Tourism Revenues in Turkey



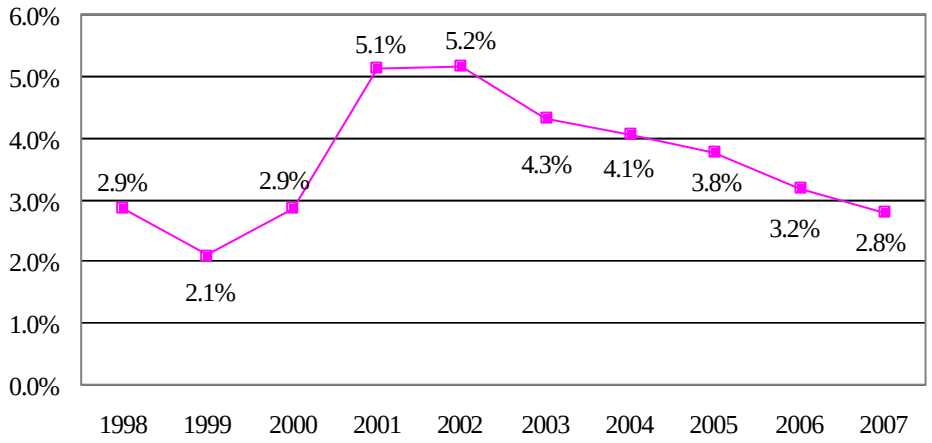
Source: Ministry of Culture and Tourism (2008)

The contribution of international tourism revenue to GDP is following a declining trend since 2002. Losing share reflects that other industries in Turkey are better performing so that the

contribution of international tourism receipt and the importance of the tourism industry is losing ground in Turkey.

Turkey experienced an economic down turn in 2001 and 2002 which caused sharp declines in its GDP. The share of international tourism revenue reached to 5 percent for both years not resulting from the outstanding performance of tourism but from the poor performance of total GDP.

Figure 2.3.2: Share of International Tourism Revenue in GDP



Source: TUIK (2008); Ministry of Culture and Tourism (2008)

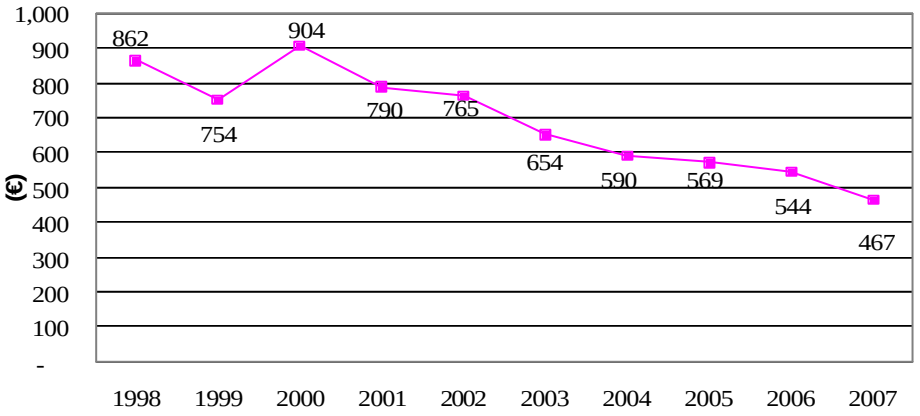
Nevertheless these percentage shares do not clearly indicate the total direct contribution of tourism to the Turkish economy. The researches of WTTC display that the total direct contribution of tourism to Turkish economy is around 5 percent.

With the current formulations in place, it is difficult to comment on receipt per international tourist based on the total tourism revenue. As discussed earlier, this is because, the number of Turkish citizens residing abroad and coming to Turkey for a visit is not included in the number of international tourists whereas their revenue is included. Due to the difference between two

approaches, dividing tourism revenue to international tourists in order to find out receipt per international tourists may cause misleading results.

In reality, the receipt per international tourist[37] and receipt per Turkish citizens residing abroad can be evaluated separately. The below figure clearly indicates that Turkey is facing a revenue problem as receipt per international tourist is declining rapidly since 2000. These results display why tourism experts are extensively indicating that Turkey is in the threat of becoming a cheap destination. Many tourism experts believe that the profile of international tourists changed after the closing down of casinos in 1998. They believe that wealthier tourists shifted their demand from Turkey to other Mediterranean countries. Probably not only closing down of casinos but also other dynamics such as wide spread use of "all inclusive" concept, attracted tourists with low income and damaged the receipt per international tourists in Turkey.

Figure 2.3.3: Receipt per International Tourist in Turkey



Source: Ministry of Culture and Tourism (2008)

On the other hand, receipt per Turkish citizens residing abroad is also facing a declining trend. Despite this fact, in 2007, receipt per Turkish citizens residing abroad was € 784 which is quite higher than the receipt per international tourists.

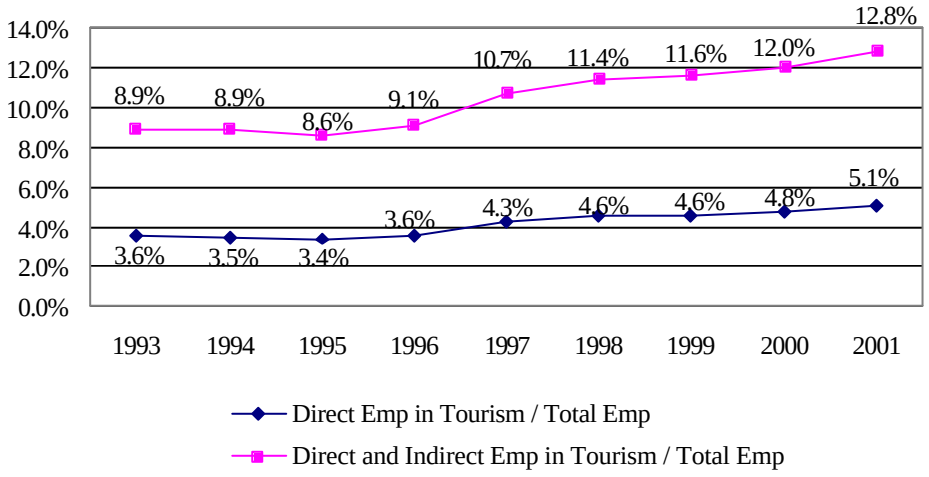
[37] Receipt per international tourist equals to revenues from international tourists and same day international visitor (excluding Turkish people residing abroad) divided by international tourist leaving the country.

2.3.3 Employment in Turkish Tourism Industry

Tourism industry is a major contributor to employment creation in Turkish economy. The latest research of TURSAB(2004) illustrates that around one million people are directly employed in tourism industry as of 2001.

If indirect employment[38] is also added; the employment created by tourism reaches to 2.5 million accounting for 12.8 percent of the total employment in the country.

Figure 2.3.4: Employment in Turkish Tourism Industry



Source: TURSAB (2004)

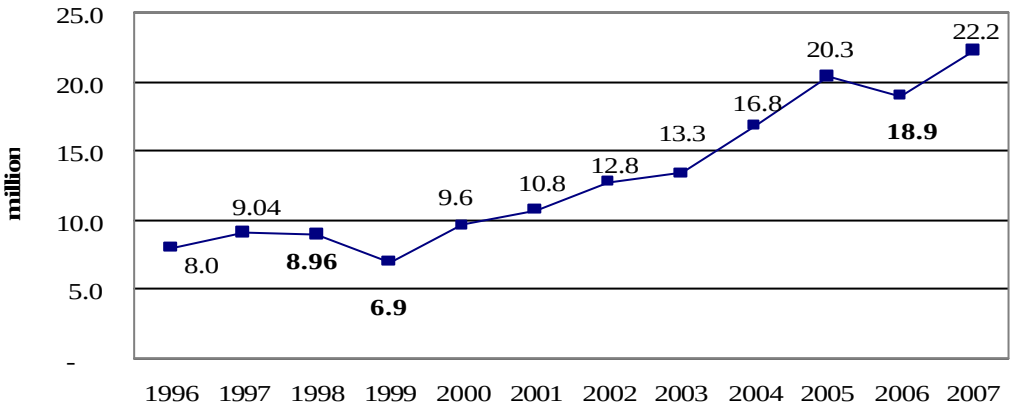
Based on the trend in the employment figures, it can be estimated that direct employment in the tourism industry is around 1.1 million and the total of indirect and direct employment reached to 2.7 million in 2007.

[38] TURSAB calculates indirect employment with the formula of UNWTO and WTTC. Indirect employment equals direct employment x 1.5

2.3.4 International Tourism Demand to Turkey

During last two decades, international tourism revenues improved substantially as a result of increase in number of international tourists.

Figure 2.3.5: Turkey's International Tourist Growth



Source: Ministry of Culture and Tourism (2008)

Between the years 1996 to 2007, the number of international tourists [39] visiting Turkey increased with a CAGR of 9.7 percent and reached to 22.2 million as of 2007. During this time interval, number of international tourists fell in years 1998, 1999 and 2006. In 1998, terrorist actions started against Turkey. In 1999, those illegal actions increased in number and especially after the arrestment of the terrorist leader, security became a significant concern for international tourists and number of international tourists dropped by 23 percent in comparison to 1998. The earthquake in August 1999 was another negative event causing the severe drop in

[39] International tourist numbers for Turkey exclude same-day visitors as UNWTO standardized. On the other hand, the number of international tourists do not include the trips of Turkish people residing abroad. According to the definiton of UNWTO, an intemational visitor is a person arranging tourism trips outside their usual environment for personal or business purposes for less than a year. The main concern to be accepted as an international visitor is not the nationality but the county of residence. This question has been asked to Ministry of Culture and Tourism and they reported that they are sending the number of international tourists based on nationalities. This confusing situation makes difficulties when comparing Turkey with the rest of the world. The thesis will use the official data that Ministry of Culture and Tourism is reporting to UNWTO. Nevertheless, the number of arrivals to Turkey (Turkish people residing abroad) is around 4.2 million as of 2007. This huge number of arrivals is more than 15 percent of the total number of international arrivals which could really make differences in the comparisons and performance of Turkey with respect to other EU countries.

the number of international tourists. Recently in 2006, Turkey faced a 6.9 percent decline in international tourists because of SARS epidemic arising in Turkey, terrorist attacks in coastal regions and the Football World Cup hosted by Germany. The effect of World Cup on Turkish tourism was mainly negative due to the loss in the number of German tourists coming to Turkey with a drop of 11.3 percent in 2006. On the other hand, the World Cup boosted Germany's tourism demand, and international tourists increased by 9.6 percent in Germany in 2006.

The main sources of international tourists for Turkey are Germany, Russia, UK, Bulgaria and Iran. These top five countries account for 48 percent of the total international tourists coming to Turkey as of 2006. During the last decade, top three countries did not change whereas the second place of UK was taken by Russia. The number of visitors coming from Russia increased with a CAGR of 18.4 percent until 2000. Number of Bulgarians improved tremendously with 20.7 percent growth on a yearly basis. This shows that Turkey became an attractive destination for Bulgarians without the same-day cross border visitors.

Table 2.3.1: Main Sources of International Tourists

Top Five	**2000**	**2006**	**CAGR (%)**
Germany	2,219	3,674	8.7%
Russia	668	1,842	18.4%
UK	768	1,549	12.4%
Bulgaria	380	1,177	20.7%
Iran	381	865	14.6%
Top Five Countries	**4,416**	**9,107**	**12.8%**
Total Int. Tourists	9,586	18,916	12.0%
% of Total Int. Tourists	46%	48%	

Source: Ministry of Culture and Tourism (2008)

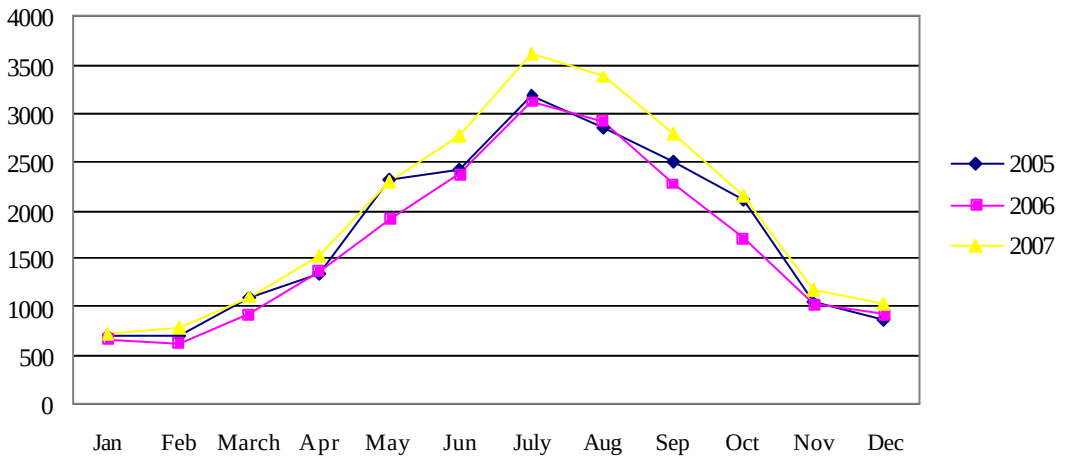
On the regional basis, EU is the main source of international tourists with its 63 percent share. The main sources of the remaining demand are Commonwealth of Independent States (CIS) and other Organization for Economic Cooperation and Development (OECD) countries.

2.3.5 Seasonality of Turkish Tourism

Turkish tourism faces a serious seasonality problem. Almost 73 percent of all international visitors visit Turkey between May to October whereas on a monthly basis, July is the month with highest visitor arrivals. In year 2007, 3.6 million international visitors visited Turkey in July.

As emphasized in the earlier sections, 58 percent of international visitors are coming to Turkey for their holidays whereas 13 percent for business and 29 percent for visiting relatives, religious or for other reasons. Among these groups, international visitors for business purposes are the least seasonal group since they do not change their meeting and business schedules according to weather conditions.

Figure 2.3.6: Seasonality of International Visitors

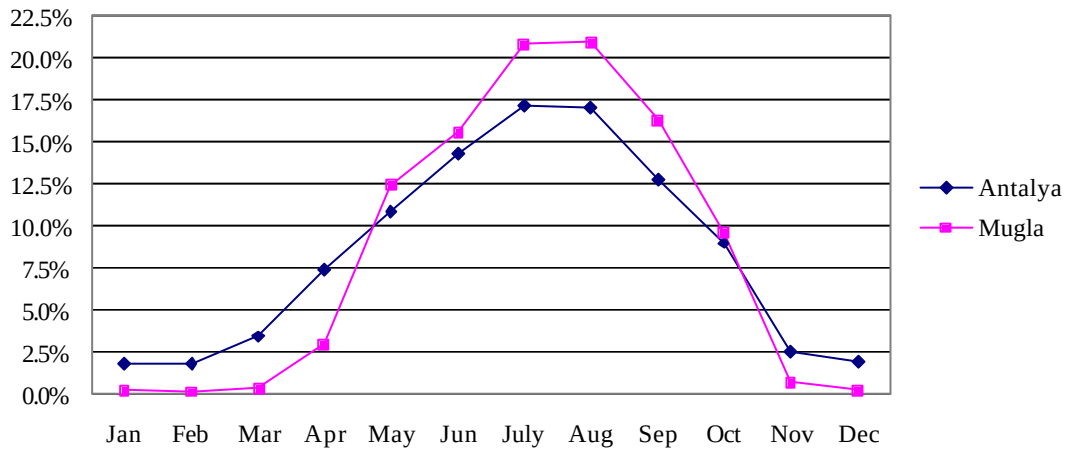


Source: Ministry of Culture and Tourism (2008)

Turkish tourism industry tries to overcome the seasonality problem with generally accepted applications. The main practice is making discounts in off-seasons which is mainly related with the price elasticity of the product. A hotel in the coastal line of Turkey can easily be very

successful in summer with high occupancy and high average daily rate (ADR) whereas in winter it can face operational losses because of low occupancy and low ADR. Most of the hotels in the Aegean coast of Turkey prefer to close their hotels at the end of October and open back in May. This prevents to have operational losses during off seasons but on the other hand they have difficulty to find qualified and trained staff at the start of the new season. Looking for new staff at the beginning of each season is not easy and creates problems to provide sustainable and standardized service as well.

Figure 2.3.7: Seasonality of International Visitors (Antalya and Mugla)



Source: Ministry of Culture and Tourism (2008)

Almost 81 percent of all international visitors visiting Antalya arrived between May to October whereas for Mugla the same indicator reveals an extreme with 96 percent. Hotels at the Mediterranean coast are facing less seasonality compared to hotels at the Aegean coast. One of the main reasons behind this situation is the climate as Mediterranean coast has a longer summer season which allows visitors to enjoy sun and sea for longer periods. This geographical advantage of Mediterranean coast helped the development of the region and attracted more hotel investments compared to Aegean coasts. Improvements in bed capacity

had a positive impact for seasonality in the sense that it helped tour operators as well as aviation companies perceive the Mediterranean coast as a major destination. These intermediaries believed and persuaded their customers that there is quality supply to meet the needs of off season tourists. The majority of these off season international tourists are elderly people looking for budget holidays. In addition to this group of tourists, during off-season certain foreign companies organize corporate meetings and some international conferences take place in the hotels at the Mediterranean coast of Turkey.

Along with the qualified bed capacity, transportation is also crucial. Tour operators and aviation companies arranged charter carriers and low cost scheduled flights especially for off season international tourists. As a result, Antalya International Airport had the second place after Mallorca Airport as the busiest airport within the Mediterranean region based on its yearly passenger traffic in 2003.[40]

As a result of quality bed supply, not only international tourists but also domestic tourists began to perceive Mediterranean coast as a destination for off season period. Most of the domestic tourists coming to Mediterranean coast at off season are business travelers for domestic and international academic conferences, dealer meetings, launching events and football trainings.

Unfortunately, the demand generated by domestic tourists for holiday and leisure activities are very limited during off seasons. And thus, they have insignificant effect to mitigate the seasonality. Domestic tourists only come to Mediterranean and Aegean coast for holiday and leisure activities at winter school break and during religious holidays. A suggestion could be

[40] Antalya Havalimani Uluslararasi Terminali (n.a.)

the differentiated winter school breaks for each city to expand the demand to a wider time interval which is practiced in Germany to a certain extent.

2.3.6 Top Destinations in Turkey

The most common way of traveling to Turkey for international visitors is air-transportation. The portion of air transportation is 72 percent and followed by highway (20 percent), sea (7.5 percent) and railway (0.5 percent).[41] The largest shares of international visitors, almost 80 percent of total international visitors, are coming through the borders of Antalya, Istanbul, Edirne and Mugla.

Table 2.3.2: City of Entry

Cities	Int Visitors (000)	(% of total)
Antalya	6,011	30%
Istanbul	5,346	27%
Mugla	2,345	12%
Edirne	2,068	11%
Other	4,049	20%
Total	**19,819**	**100%**

Source: Ministry of Culture and Tourism (2008)

Having the highest border crossings do not necessary indicate that these four cities are the most popular tourism destinations in Turkey. In comparison to Istanbul and Edirne; Antalya and Mugla are final destinations for most of the international visitors. On the other hand, Istanbul is a center for most of the international flights to connect to domestic flights. Edirne also has a similar role with Istanbul for international visitors coming from Europe by highways. Therefore it is more difficult to asses the international tourist demand for Istanbul and Edirne from the border statistics.

[41] Ministry of Culture and Tourism (2008)

On contrary to border crossings, international nights spent is a good indicator on the international tourism demand of the cities. In line with previous years, Antalya hosted 59 percent of the total international night spent in Turkey in 2006. In general, four of the top destinations are on the coastal line of Turkey being especially suitable for holiday and leisure tourism. Approximately, 80 percent of the total international nights spent are hosted by the three main coastal cities. The table illustrates the importance of holiday and leisure tourism for Turkey.

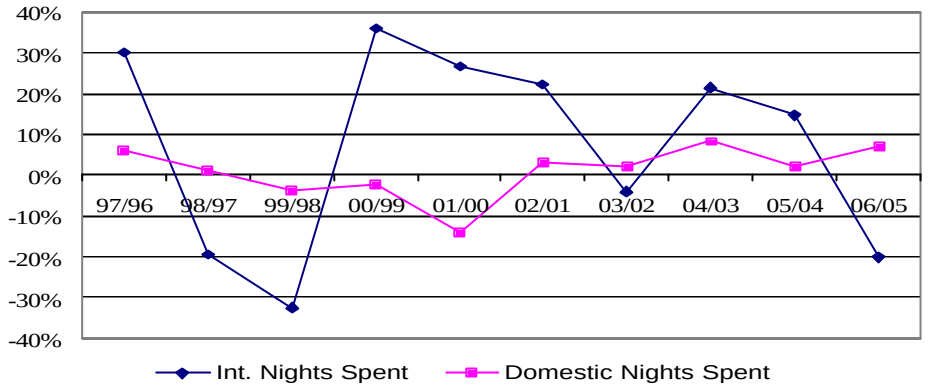
Table 2.3.3: Nights Spent in Turkey (000)

Destination	Int. Nights Spent	Domestic Nights Spent	Total	(% of total)
Antalya	33,789	6,318	40,107	44%
Istanbul	7,140	3,551	10,691	12%
Mugla	9,276	2,421	11,697	13%
Aydin	2,291	1,945	4,236	4%
Other	4,398	19,921	24,319	27%
Total	56,894	34,156	91,050	100%

Source: Ministry of Culture and Tourism (2007c); Ministry of Culture and Tourism, (2007a)

The demand in the above four cities are dominated by international tourists. On the other hand, rest of the destinations in Turkey are dependent on domestic demand. International tourist demand always grew faster than domestic demand favoring the performance of the above four cities. In the last decade CAGR of international and domestic nights spent were 4.6 and 0.7 percent respectively.

Figure 2.3.8: Growth Performance of Nights Spent in Turkey



Source: Ministry of Culture and Tourism (2007c); Ministry of Culture and Tourism, (2007a)

The Figure 2.3.8 indicates an interesting finding related to the fluctuation margin of the two groups. International nights spent in the country experienced a sharp volatility in the last decade. This indicates that there is a significant potential for the growth of international tourists however this international demand is very sensitive. It has been experienced that when the external environment of Turkey is stable, the growth of international night spent has an average of 25 percent on a yearly basis. However, any health or security issue automatically causes sharp decreases as experienced in 1999 and 2006.

On the other hand, domestic tourists have a very modest growth in nights spent during the last decade. Domestic tourism is steady and declines occur only when Turkish economy shrinks significantly. Although Turkish economy experienced a positive growth and a sustainable performance till 2002 even in these years domestic tourism did not show an outstanding performance.

The structure of domestic and international tourism are not similar and these affected by different factors or events. In fact, this can be considered as a significant advantage for the

Turkish tourism industry as it enjoys high growth rates with international night spent and on the other side, almost 40 percent of the total demand is originates from domestic nights spent. Assuming the structure and cycles of both groups would not change significantly in the near future, Turkey has three choices on its strategy. In case Turkey aims for high growth in nights spent, there is need for concentration on marketing strategies favoring international night spent and only welcome automatically generated domestic demand without any significant support. In fact, it could be noted that this strategy is favored by the Turkish tourism industry in Turkey. Certain hotels, both in Mediterranean and Aegean coasts, even adopt an extreme practice of not accepting any domestic tourists. As explained earlier this marketing strategy is rather risky considering the threats in security and health issues.

The second alternative for Turkish tourism could be focusing mainly on domestic demand and making efforts to convince Turkish people to have holidays in hotels. Under this strategy, international demand would have a secondary importance. However, this would not be a good alternative for Turkish tourism since the country has a significant potential to attract international night spent as well as domestic demand.

On the other hand, focusing on Turkish people and creating demand for hotels is important to prevent the industry from external demand shocks. However, it has been only a few years that hotels and tour operators started to offer alternatives to Turkish citizens. Early bird discounts, packages including transportation and airline alternatives had positive effects on domestic demand and resulted in a growth of 6 percent in 2006 compared to the previous year. Turkey has a sizeable young population with changing consumption habits; therefore this potential can be utilized with right marketing strategies and products.

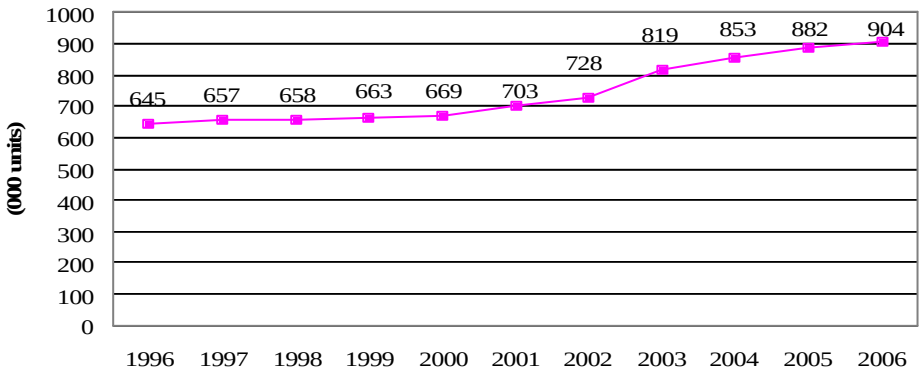
The third and the best strategy of Turkey would be to focus on both domestic and international demand at the same time.

2.3.7 Tourism Supply in Turkey

Along with the demand, supply side is also important for sustainable growth of Turkish tourism. The bed capacity of Turkey has a growth rate of 3.6 percent[42] on the average. The bed capacity in Turkey has two components nearly 45 percent of the total bed capacity is composed of municipality licensed hotels and the rest of the capacity is tourism establishments licensed from the Ministry of Culture and Tourism.

Municipality licensed hotels are not regulated by the Ministry of Culture and Tourism. This situation causes difficulties in establishing standards for stars and services. Municipalities are in charge of these places, therefore different practices among municipalities are observed. On the other hand, Ministry of Culture and Tourism has plans to include all municipality licensed hotels under its control in the coming years.

Figure 2.3.9: Bed Capacity[43] in Turkey



Source: Ministry of Culture and Tourism (2007d); Ministry of Culture and Tourism (2007b)

[42] This growth includes both municipality licensed and tourism licensed hotels. The change in the number of municipality licensed hotels is minor.
[43] Bed capacity includes municipality licensed and tourism licensed hotels

The growth in the bed capacity of Turkey is mainly generated by the investments in the coastal cities of Turkey. This investment growth is inline with the night spent figures. As discussed earlier, Antalya has been perceived as the main destination for international tourists and within the last decade the number of bed capacity in this city almost doubled. However, Mugla and Aydin experienced a modest growth during the last decade.

Table 2.3.4: Bed Capacity for Main Destinations

Destination (* 000)	1997	2006	CAGR (%)
Antalya	151	302	8%
Mugla	101	132	3%
Aydin	47	50	0.7%
Sub Total	299	484	5.5%
Rest of Turkey	358	420	1.8%
Turkey	657	904	3.6%

Source: Ministry of Culture and Tourism (2007d); Ministry of Culture and Tourism (2007b)

The important issue to consider is whether the investment growth in these cities is inline with the growth of night spent. The below table indicates that Antalya has 33 percent of the total bed capacity in Turkey whereas it captures the 44 percent of all night spent. This demonstrates that investments in Antalya are more successful in terms of occupancy compared to other cities. For the last decade, Antalya experienced an 8 percent CAGR in its bed supply but managed to cope with this significant increase.

Istanbul has a similar picture like Antalya in the sense that its share of nights spent exceeds its share of bed capacity. On the contrary, Mugla and Aydin have relatively excess supply with their current levels of night spent. These figures justify the slow investment growth in tourism investments in Mugla and Aydin.

Table 2.3.5: Balance of Night Spent and Bed Capacity in Turkey (2006)

Destination	Int and Domestic Nights Spent	City Share of Nights Spent	Bed Capacity	City Share- Bed Capacity
Antalya	40,107	44%	302,684	33%
Istanbul	10,691	12%	90,775	10%
Mugla	11,697	13%	132,768	15%
Aydin	4,236	4%	50,281	6%
Other	24,319	27%	327,795	36%
Total	**91,050**	**100%**	**904,303**	**100%**

Source: Ministry of Culture and Tourism (2007d)'; Ministry of Culture and Tourism (2007b), Ministry of Culture and Tourism (2007c); Ministry of Culture and Tourism (2007a)

Based on these figures, it can not be concluded that Antalya and Istanbul have excess demand and new investment are needed as the figures only provide a relative occupancy performance among cities. That is, in reality, the occupancy rates in any of the cities including Antalya may not be sufficient to support new investments. However, it can be concluded that Antalya and Istanbul are performing relatively better than rest of the cities in Turkey in terms of occupancy.

2.3.8 Future Prospect of Turkish Tourism

The main growth driver of Turkish tourism has been the increase in the number of international tourists rather than tourism receipts per tourist. In the last decade, the number of international tourists jumped from 9 million to 22.2 million with a CAGR of 9.2 percent. In line with the forecasts of UNWTO, it is believed that Turkey will continue to grow with an average rate of over 5 percent in the coming years.

It is remarkable that Turkey faces continuous decline in its receipt per international tourist which requires further attention. It could therefore be argued that Turkey is experiencing difficulties in differentiating its tourism products.

Focusing totally on mid income level, budget customers automatically creates a perception of a cheap destination in the tourism market. On the other hand, there is such a mid-level demand in the market which will be utilized either by Turkey or other countries and this mid-level market has a significant growth potential in the number of tourists. It is believed that Turkey should not be ignoring this opportunity if a reasonable pricing strategy would be set. However, this mid-level customer group is keen on purchasing "all inclusive" products which create sizeable amount of bookings especially from Russia and Germany.

Even though, many Turkish tourism experts and the government authorities are against to the trend of "all inclusive", it should be accepted that the speed of this growth maintained by the help of this concept.

Turkey should definitely have hotels with luxurious brands for wealthier people. For this target segment, marketing strategy, transportation facilities and service quality should be totally different from the "all inclusive" segment. All organization for wealthier people should be personalized and handled very delicately. Turkish industry manages to attract a share of this group in domestic tourism and this segment of domestic tourists also have some specific holiday destinations such as Türkbükü, Çesme, etc.

In the case of international tourists, the first step to succeed in attracting wealthier tourists could be classifying hotels based on the target customer and organizing the marketing activities and regulatory requirements accordingly. Trying to accommodate the two customer profiles in a single hotel would lead to losing wealthier tourists and ending up with mid level tourists even in luxurious hotels.

Additionally, domestic tourism should be supported and more residents should be attracted to have holidays at hotels. The domestic demand could be encouraged by products such as early-booking discounts and holiday packages especially at low seasons to increase capacity utilization.

On the supply side, in the nearest future all bed capacity needs to be licensed by Ministry of Culture and Tourism. The existing municipality licensed hotels should be reevaluated and either turned into tourism licensed properties or should be closed. As a result, standardization of star ratings in all establishments would help to improve Turkish tourism infrastructure as well as competitiveness.

In order to improve the competitiveness of human resources, public and private sector should collaborate for training staff and increasing service quality. Young and sizeable labor force of Turkey can be utilized by tourism, since it is a good means to create part-time as well as full-time employment.

Finally, becoming a member to EU would contribute to the international tourist flow in Turkey but is not expected to create dramatic improvements as the most important factors to attract tourists remain to deliver right product with the right service and price while creating secure environment and caring for health and hygiene. If Turkey manages to achieve these goals, being an EU member would complete the picture in terms of marketing, structural funds and country perception. In addition, as soon as Turkey becomes an EU member, more scheduled flights would start within Turkey and from other EU countries. Also with Turkey's EU accession, international tourists would be able to enter freely at borders with the Schengen

membership and would feel price transparency with the Eurozone membership. All of these factors are believed to contribute to Turkish tourism to sustain a higher growth rate.

Chapter 3 : Conceptual Framework and Efficiency Measurement

3.1. General Background on Productivity, Efficiency and Effectiveness

3.1.1. Productivity

As a general notion, productivity is the ratio between output and input use.[44] The purpose of measuring productivity is mainly to present relative performances among different kinds of units. Each unit of interest such as hotels, banks, financial intermediaries, universities, hospitals or firms are named as the decision-making units (DMU). Measuring performance is actually based on results (outputs) and the costs of achieving them (inputs). Although the most widely used measure for country's performance is gross domestic product (GDP) per capita, most of the economists favor productivity as a performance measurement tool as it takes into consideration the input usage to achieve that output level.[45]

Measures of productivity are not only used for aggregate economy at country level, but also at industry and company level, particularly in manufacturing. Actually, the initial research on productivity was more than two hundred years ago in manufacturing industry. Not surprisingly, the origin of productivity measurement comes from mass production which outlines the quantity oriented structure of manufacturing industry[46]. In manufacturing industries, productivity measures solely focus on quantity aspect of production. Since the quality aspect is appreciated as a component of the product. As a result, the existing literature determines the

[44] OECD (2001)
[45] O'Mahony, M. (2002)
[46] Rutkauskas, J. and Paulaviciene, E. (2005)

sources of productivity as ‘‘economies of scale’’, ‘‘pure technical efficiency’’ and ‘‘technological level’’ without making any emphasis on quality.[47]

Economies of scale is an important tool to trace the appropriate production level for a firm. Firms increase their productivity at levels where there is increasing returns to scale (IRS) and reach to maximum productivity at constant returns to scale (CRS). After this point, as a result of decreasing returns to scale (DRS), firms will be less productive.

Pure technical efficiency applies to the ratio of actual output to potential output with existing set of inputs and technology that is used. This indicates the potential of a firm to increase its production with its existing resources to improve its efficiency. Potential output of a firm is limited with its effective capacity.[48]

Technological change is the third component of productivity. Technology has been described as ‘‘the currently known ways of converting resources into outputs desired by the economy’’.[49] Productivity is dependent on technology and automation in order to reduce costs, standardize services/products and increase availability (24 hour access to service)/capacity utilization.[50] The most important issue related to technological change is whether firms are affected with the same rate by technological change or not.

Productivity studies on service industries did not start before the end of twentieth century. The time lag between productivity studies on manufacturing and service industries might have

[47] Taymaz, E. (2005)
[48] Johnston, R. And Jones, P. (2004)
Effective capacity is calculated by deducting planned losses (maintenance, planned shut downs) from design capacity
[49] OECD (2001)
[50] Rutkauskas, J. and Paulaviciene, E. (2005)

resulted from the mass production structure of manufacturing industry since products are more homogeneous and tangible.[51] Moreover the development of service industry is relatively new. Some researchers defend that productivity measures are only applicable to manufacturing industry and results in service industry can be misleading[52], while others support that including customer component to productivity will be the appropriate approach to measure service productivity.[53]

The complexity of measuring productivity at service industries mainly result from the intangible features of services, heterogeneity, simultaneity and perishability.[54] All these features make it difficult to quantify and to qualify services. However, in manufacturing industry, quantity is easy to measure and quality is assumed to be constant.[55]

As opposed to manufacturing industry, the quality and quantity aspects in service industry do not necessarily act in concurrence. Even in some occasions, customers appreciate a service mostly by its quality rather than its quantity. Customer component comes into the picture with quality concerns. At this point the simplicity of measuring productivity solely with quantity aspects as in the case of manufacturing industry is not appropriate. As a result of this confusion, opposing opinions has risen in the literature whether quality is a component of productivity or not. Some researchers support that quality and productivity are unrelated concepts whereas majority believes that quality is a component of service productivity.[56]

[51] Sahay, B. (2005)
[52] Rubalcaba-Bermejo, L. (1999)
[53] Sahay, B (2005)
[54] Keh, H., Chu, S. and Xu, J. (2006)
[55] Grönross, C. and Ojasalo, K. (2004)
[56] Rutkauskas, J. and Paulaviciene, E. (2005)

Accepting quality as a component of service productivity creates additional problems such as how to measure the quality of inputs and outputs.[57] Since measuring quality is a difficult task because of its subjective nature. The interpretation of quality from customers' point of view can be expressed by different tools. Sahay (2005) for instance, stated that comparison of customer experience with customer expectation is a possible alternative to measure quality. Johnston et. al (2004) , however suggested distinguishing customer aspect from productivity and defining it as customer productivity and separating it from the operational productivity. They defined customer productivity as a ratio of customer inputs (time, effort and cost) to customer outputs (experience, satisfaction, outcome and value). While doing so, they also emphasized an important point on the relationship between customer and operational productivity. They indicated that increasing operational productivity, which is the second component of service productivity along with customer productivity, does not necessarily support the increase in customer productivity. They provide an accurate example on task simplification. Task simplification is a proved method to increase operational productivity however in case of service productivity it can have a damaging effect because of the diminishing customer satisfaction. A good example from the hotel industry could be assigning different staff for check in and check out process but causing dissatisfaction of customer where check in staff refuses to deliver check out process even though she/he is available. Thus, it has been realized that operational and customer productivity not always positively or negatively related. In order to improve service productivity, all decisions and actions should consider the effects on components, namely customer and operational productivity.

Rutkauskas et. al (2005) adjusted the definition of productivity to be applicable for service industries. According to them, the role of customer and its perception of quality are different in

[57] Sahay, B. (2005)

service and manufacturing industries. In manufacturing industry, the contribution of customer to productivity improvement is neglected with the constant quality assumption. In service industry, however customers affect service productivity both through inputs such as information, customer preferences, inquiries and complaints effecting quality of input and through outputs such as customer satisfaction effecting quality of outputs.[58]

$$\text{Productivity} = \frac{\text{Quantity of output}}{\text{Quantity of input}} \text{ (constant quality of outputs)}$$

$$\text{Service Productivity} = \frac{\text{Quantity of output and quality of output}}{\text{Quantity of input and quality of input}}$$

Based on the above discussions, it could be derived that excluding quality/customer perceived quality aspect from service productivity studies can cause inadequate results since quality and quantity are the two inseparable dimensions of service industry.

3.1.2. Types of Productivity Measures

Productivity measures can be categorized under two main headings namely single factor productivity and multifactor productivity measures when the input side is considered. Single factor productivity measures relate total output to a single measure of input (e.g. labor, capital, material, energy) where multifactor productivity measures relate total output to multiple inputs. The choice of productivity type depends on the aim of the study and the availability of data. The below table illustrates the most frequently used productivity measures selected by OECD.

[58] Grönross, C. and Ojasalo, K. (2004)

Table 3.1.1: Main Productivity Measures

Type of output measure	Type of input measure			
	Labour	Capital	Capital & Labour	Capital, labour & intermediate inputs (energy, materials, services)
Gross Output	Labour Productivity	Capital Productivity	Capital & Labour- MFP	MFP
Value Added	Labour Productivity	Capital Productivity	Capital & Labour- MFP	MFP
	Single Factor Productivity Measures		Multifactor Productivity (MFP) Measures	

Source: OECD (2001), p. 13

Single factor productivity measures reflect limited information about the productivity performance of the inputs. Despite the constraints of single factor productivity measures in general, labor productivity is regularly used as it is an easily identified input and the largest component of production cost. However, in most industries higher labor productivity does not necessarily reflect a better labor productivity level because of the joint effects of other inputs or technology. Countries having higher quantity of physical capital per unit of labor input can be perceived as having higher labor productivity levels. Hence, level of capital deepening in a country has an effect on explaining a country's labor productivity level. On the other hand, capital productivity is not a preferable method in productivity studies since measurement of physical capital is very difficult. Because of deficiencies of single factor measures, multifactor productivity measure is accepted as the most appropriate method since all factors of production are taken into account.

On the output side, productivity measures can either use gross output or value added as the outcome. Gross output is a sum of value of good and services sale and the net addition to inventories where value added is calculated by deducting the purchase of intermediate inputs

from the gross output. Neither one of the above applications have an advantage over the other therefore either of them is used, based on data availability.

3.1.3. Efficiency

The concept of pure technical efficiency is often used interchangeably with productivity. As discussed earlier, the traditional productivity concept has been developed for manufacturing industry and consequently has strong links with technical efficiency concept. Even International Organization for Standardization (ISO) 9000 series defines pure technical efficiency and productivity very similarly, like same subject to different titles.[59]

Actually, pure technical efficiency is a component of productivity and it is simply defined as ''doing things right''.[60] Meaning that pure technical efficiency aims to maximize output (output oriented) with given resources and technology or to minimize resources (input oriented) for a targeted amount of output.[61] Pure technical efficiency aims successful allocation of resources and provides information for comparisons among units.

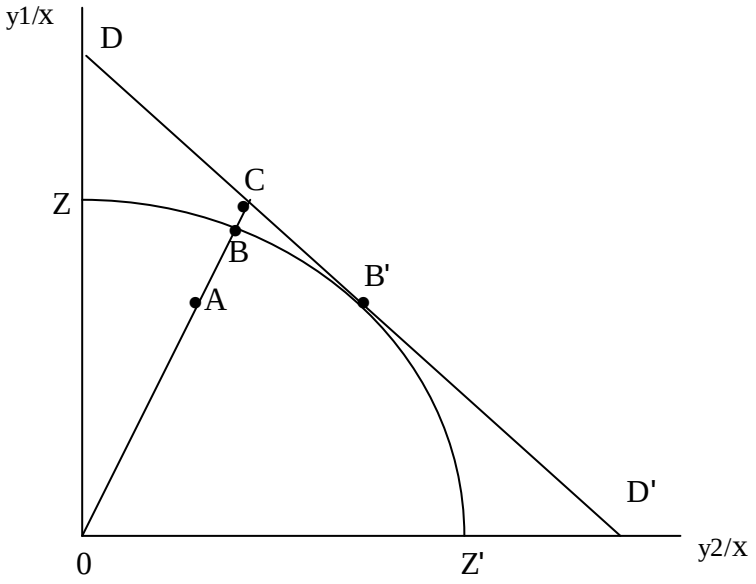
In order to illustrate the difference between pure technical efficiency and productivity, it is useful to imagine a simple production function. Any point on production function represents the maximum output at each input level which indicates all pure technical efficient points. However, all pure technical efficient points do not indicate the maximum possible productivity. Productivity reaches maximum, where the slope of production function is the highest. Therefore, it can be concluded that a company may be pure technical efficient but can improve its productivity only by reaching constant returns to scale.

[59] Rutkauskas, J. and Paulaviciene, E. (2005)
[60] Rutkauskas, J. and Paulaviciene, E. (2005)
[61] Avkiran, N. (1999)

Another important difference between pure technical efficiency and productivity is the time component. Performance of a single period can be measured by technical efficiency while productivity measures the change among years since it has technological change component. Technological change is the time component of productivity.

Efficiency is usually defined with reference to actual output to potential output. In the literature, efficiency usually defines technical efficiency. Besides technical efficiency, allocative efficiency gains importance when price levels of input and outputs are considered. Allocative efficiency measures the right combination of inputs and outputs with respect to their price levels. In case of output oriented approach, allocative efficiency aims to maximize revenues without causing any increase in input costs whereas in input oriented approach, it aims to minimize input costs without causing any reduction in revenue. The combination of technical and allocative efficiency provides economic efficiency. [62] DMU can not be economically efficient without being technical and allocative efficient.

Figure 3.1.1: Technical and Allocative Efficiencies



Source: Coelli, T. (1996), p. 7

[62] Coelli, T. (1996)

The above figure indicates a production possibility frontier (PPF) ZZ' for a single input (x) to produce two outputs (y1 and y2) under output oriented approach. Point A represents the production of an inefficient firm, lying below the PPF. DD' represents the isorevenue line.

Hence, technical efficiency and allocative efficiency ratios for firm A are

Technical Efficiency (TE) = 0A/0B
Allocative Efficiency (AE) = 0B/0C

Furthermore the economic efficiency is defined as

Economic Efficiency (EE) = TE * AE = 0A/0B * 0B/0C = 0A/0C

3.1.4. Effectiveness

Effectiveness is usually described as ‘‘doing the right things’’[63]. In other words, it means setting the right goals, objectives and strategies. Effectiveness is concerned with determining the right way and the correct task among possible alternatives.

Effectiveness considers creating value for the customer. For example, a seasonally operated resort hotel decides to give an advertisement on a newspaper where the cost of publishing an advertisement on a newspaper does not change between seasons. The marketing team of the hotel works with the best agencies to prepare the perfect content for the advertisement at the lowest possible cost. The effort of marketing team was marvelous and they were very efficient. However, at the decision stage, management made a mistake and the hotel gave the advertisement to a newspaper at the beginning of winter when the hotel was already closed.

[63] Rutkauskas, J. and Paulaviciene, E. (2005)

The hotel was doing the wrong thing efficiently. If they had been effective, customer would have chance to perceive the quality that they were trying to deliver. As a result the hotel was ineffective but efficient.

The question of effectiveness deals with whether outputs meet the requirements of customers. As long as the customer involvement becomes a part of the production/service industry, quality becomes a determining factor on productivity. Under these circumstances, the basic principle to increase productivity would be achieving a combination of efficiency and effectiveness.

Additionally, it has been observed that literature perceives effectiveness and productivity as two separate concepts. However for service industries, it is obvious that customer aspect can not be separated from productivity.

3.2. Efficiency Measurement Techniques

Proper allocation of scarce resources in order to create more output is one of the fundamentals of economics. Along with the globalization, global competition has increased and efficiency has become a determining factor of success. Comparing efficiency of units provides information about their performance. As long as the weak performers are determined, it would be easier to find out the reasons leading to inefficiency and to create solutions for further improvements in their efficiency performance.

In the literature, there are essentially four major methods to assess efficiency[64]:

[64] Bauer, P., Berger, A.N., Ferrier, G.D. and Humphrey, D.B. (1998)

1. Data Envelopment Analysis (DEA)

2. Stochastic Frontier Analysis (SFA)

3. Distribution Free Approach (DFA)

4. Thick Frontier Approach (TFA)

All the above methods are frontier measures of performance. All of the above techniques measure efficiency as variations from the efficient frontier. Hence, the fundamental differences among techniques stem from the underlying assumptions about the shape of the efficiency frontier and the treatment of random error. Frontier efficiency methods usually use quantitative measures since all the background of efficiency studies are based on manufacturing industries.

However, in the empirical study presented in Chapter 4 of this thesis, a combination of financial and physical measures is used to indicate efficiency for resort hotels. Financial measures such as RevPAR and costs are used since physical measures ignore quality aspect. Financial measures seem to be the only indicator to reflect perceived quality unless the business is subsidized by government or the competition is monopolistic.[65] By using financial measures, the perceived quality is also included into the study. This being the case, the empirical study keeps the assumption of homogenous wage levels and commodity prices across resort hotels.

In the literature, none of the above methods are considered to be the best model.[66] DEA can be grouped separately from the other three methods since it is a non-parametric linear programming approach as remaining methods are parametric econometric approaches.

[65] Grönross, C. and Ojasalo, K. (2004)
[66] Inan, E.A. (2000)

All parametric methods; SFA, TFA and DFA impose a structure on the shape of the efficient frontier whereas DEA does not impose such a limitation. This can be considered as the main advantage of DEA with respect to parametric methods. On the other hand, all parametric methods are superior to DEA in terms of random error. Parametric methods are capable of separating random error from inefficiency. Each of the methods uses different distributional assumptions to separate random error. On the other hand, DEA ignores the possibility of random error and considers random errors as inefficiency which causes lower average efficiency with respect to parametric methods.[67]

SFA is a popular parametric econometric approach to estimate the parameters of efficiency frontier. Deviations from efficiency in SFA approach composed of random error and inefficiency. Random fluctuations are represented by two-sided error term, a normal distribution whereas inefficiency is represented by one-sided error term, half normal distribution. Half normal distribution assumption on inefficiencies imposes that most of the units are gathered near full efficiency.[68] This assumption creates a negative aspect on the SFA approach. The assumptions of SFA method is criticized, since many researchers found out that inefficiencies have a normal distribution and random errors do not have a normal distribution.[69]

As a result of the criticisms to the assumptions of SFA, DFA method was more favored by the researchers. Unlike the SFA approach, DFA has no assumptions on the distribution shape of random error and inefficiencies. However, DFA can only be used if panel data is available and it assumes that each unit has either a core or an average efficiency which is constant over time. In other words, each unit has a stable and steady efficiency in the long run. Random error also converges to zero over time.

[67] Bauer, P., Berger, A.N., Ferrier, G.D. and Humphrey, D.B. (1998)
[68] Bauer, P., Berger, A.N., Ferrier, G.D. and Humphrey, D.B. (1998)
[69] Inan, E.A. (2000)

TFA is the least common method among all parametric approaches.[70] Similar to all parametric approaches, TFA specifies the shape of the efficient frontier. This method assumes that random error is represented by the deviations from predicted performance while inefficiency is represented by deviations in predicted performance within the highest and the lowest performance of units. Therefore, individual efficiency of units can not be identified with TFA approach but it is a suitable method to indicate the best, worst and the overall efficiency of a group.

Last but not least, all the parametric methods have a common weakness with respect to DEA. None of the parametric methods can generate multiple outputs. Therefore, they are either limited with a single output or a composite output has to be created to measure efficiency levels.

3.3. Data Envelopment Analysis

The first use of DEA started in non-profit industries since cost minimization and profit maximization are not appropriate tools to measure performance in those businesses. In the following years, it has been recognized that even commercial businesses can not solely focus on profitability because it fails to give a whole perspective.[71] This is because of the fact that firms can easily manipulate current profitability by sacrificing service quality which in the longer run will damage customer satisfaction and cause negative consequences for the firm. As a result, because of its ability, DEA became a popular method in the efficiency measurement in various fields such as hospitals, schools, hotels, banking, agencies and retail stores. In addition

[70] Inan, E.A. (2000)
[71] Metters, R., King-Metters, K. and Pullman, M. (2003)

to the firms operating in the above industries, today, numerous consulting companies including PricewaterhouseCoopers and Boston Consulting Group also apply DEA.[72]

DEA is the only non parametric approach among the main efficiency measurement methods and thus, with respect to parametric models has two major advantages. Initially, it does not impose any assumption on the shape of the efficiency frontier since efficiency frontier is estimated by the best performer units of the group and efficiency of the remaining units are determined accordingly. As a result, the researchers do not need to worry about the accuracy of the imposed functional form of efficiency frontier which will affect the efficiency scores of DMUs.[73] Secondly, the model is suitable for multi input and multi output applications while parametric models are based on only multi input and single output applications which causes application difficulties to represent all output variables by a single output.

The origins of DEA go back to the non parametric efficiency approach of Farrell (1957). As discussed earlier, Farrell (1957) introduced the main components of economic efficiency as technical and allocative. Farrell (1957) proposed that technical efficiency is to obtain maximum output from a given set of input whereas allocative efficiency is to use inputs in optimum amounts considering their cost. All these measures are based on the assumption that efficient production function is known which in practice, is not the case. Therefore, Farrell (1957) suggested to use either a parametric function or a non parametric piecewise linear convex isoquant to estimate efficiency frontier. The former is the basis for SFA, DFA and TFA methods while the latter is the origins of DEA.

[72] Metters, R., King-Metters, K. and Pullman, M. (2003)
[73] Drake, L. and Simper, R. (2003)

DEA, which uses the non parametric piecewise linear frontier to measure efficiency, was introduced by Charnes, Cooper and Rhodes in 1978 as an input oriented constant returns to scale (CRS) model[74].

This model is designed to evaluate the relative performance of DMUs, based on observed performance of m = 1,…,n.

s outputs denoted by yj, j = 1,…,s

r inputs denoted by xi, i = 1,…,r

The efficiency measurement of a single DMU, o is

$$\max e_o = \frac{S_{j=1,..s}\, w_j\, y_{jo}}{S_{i=1,.r}\, v_i\, x_{io}}$$

subject to

$$\frac{S_{j=1,..s}\, w_j\, y_{jm}}{S_{i=1,.r}\, v_i\, x_{im}} = 1 \qquad m = 1,....,n$$

$$w_j = 0\ ,\ j = 1,\ldots,s$$

$$v_i = 0\ ,\ i = 1,\ldots,r$$

In cases, when the ratio for unit o is less than 1, the subset of units whose ratio is equal to 1 is the peer group for unit o.

[74] Norman, M. and Stoker, B. (1991)

The weights are denoted by w and v for outputs and inputs respectively. These weights are unknown and are determined by solving linear programming problem. Initially, the denominator of the function will be maximized with the constraint that the weighted sum of inputs is equal to 1. Introducing such a constraint will not cause any loss of generality since it is possible to multiply all v_i and w_j by a constant. The problem can then be expressed as:

$$\max e_o = S_{j=1,..s}\, w_j\, y_{jo}$$

subject to

$$S_{i=1,.r}\, v_i\, x_{im} - S_{j=1,..s}\, w_j\, y_{jm} = 0 \quad m = 1,....,n$$

$$S_{i=1,.r}\, v_i\, x_{io} = 1$$

$$w_j = 0\ ,\ j = 1,\ldots,s$$

$$v_i = 0\ ,\ i = 1,\ldots,r$$

The above form is known as the primal form of DEA linear programming problem. All linear programming has both primal and dual formulations. The objective of the dual model is to minimize the inverse of efficiency instead of maximizing the efficiency which has identical solutions.

The dual problem is:

$$\min f_o$$

subject to

$$-S_{m=1,.n}\, L_{om}\, x_{im} + f_o\, x_{io} = 0 \quad i = 1,....,r$$

$$S_{m=1,.n}\, L_{om}\, y_{jm} = y_{jo} \quad j = 1,....,s$$

This form involves fewer constraints than the primal form so it is usually more preferred to solve. L_{om} being the dual weights, f_o is a measure of how much all of the inputs of unit o can be reduced in the same proportion to produce a performance in line with the weighted combination. For each DMU, the dual problem will be solved.

CRS assumption is only appropriate if all DMUs are operating at optimal scale which in practice is not the case. Therefore, Barker, Charnes and Cooper introduced an alternative model with variable returns to scale (VRS) in 1984.[75] The CRS linear programming problem can be modified to VRS by adding a constant in the numerator.

$$\max e_o = \frac{S_{j=1,..s}\, w_j\, y_{jo} + c_o}{S_{i=1,.r}\, v_i\, x_{io}}$$

subject to

$$\frac{S_{j=1,..s}\, w_j\, y_{jm} + c_o}{S_{i=1,.r}\, v_i\, x_{im}} = 1 \qquad m = 1,....,n$$

$$w_j = 0\ ,\ j = 1,\ldots,s$$

$$v_i = 0\ ,\ i = 1,\ldots,r$$

The problem can then be expressed as the following LP:

$$\max e_o = S_{j=1,..s}\, w_j\, y_{jo} + c_o$$

[75] Coelli, T., Rao, D.S.P. and Battase, G.E. (1998)

subject to

$$S_{i=1,.r}\, v_i\, x_{im} - S_{j=1,..s}\, w_j\, y_{jm} - c_o = 0 \quad m = 1,....,n$$

$$S_{i=1,.r}\, v_i\, x_{io} = 1$$

$$w_j = 0\ ,\ j = 1,\ldots,s$$

$$v_i = 0\ ,\ i = 1,\ldots,r$$

The dual of this LP is

$$\min f_o$$

subject to

$$-S_{m=1,.n}\, L_{om}\, x_{im} + f_o\, x_{io} = 0 \quad i = 1,....,r$$

$$S_{m=1,.n}\, L_{om}\, y_{jm} = y_{jo} \quad j = 1,....,s$$

$$S_{m=1,.n}\, L_{om} = 1$$

Hence the dual is identical to the dual under CRS but with the additional constraint that L_{om} sum to 1. This has the effect of eliminating the constaint in CRS model that all DMUs are scale efficient.

Input oriented models aim to minimize input without causing any reduction in output, while output oriented models aim to maximize output without causing any increases in inputs. In output oriented cases, the reciprocal formulation of input oriented model is used.

$$\min e'_o = \frac{S_{i=1,.r}\, v_i\, x_{io} - c_o}{S_{j=1,..s}\, w_j\, y_{jo}}$$

subject to

$$\frac{S_{i=1,.r}\, v_i\, x_{im} - c_o}{S_{j=1,..s}\, w_j\, y_{jm}} = 1 \qquad m = 1,....,n$$

$$w_j = 0\ ,\ j = 1,\ldots,s$$

$$v_i = 0\ ,\ i = 1,\ldots,r$$

The problem can then be expressed as the following LP:

$$\min e'_o = S_{i=1,.r}\, v_i\, x_{io} - c_o$$

subject to

$$S_{i=1,.r}\, v_i\, x_{im} - S_{j=1,..s}\, w_j\, y_{jm} - c_o = 0 \quad m = 1,....,n$$

$$S_{j=1,..s}\, w_j\, y_{jo} = 1$$

$$w_j = 0\ ,\ j = 1,\ldots,s$$

$$v_i = 0\ ,\ i = 1,\ldots,r$$

The dual of this LP is

$$\max f'_o$$

subject to

$$S_{m=1,.n}\, L'_{om}\, y_{jm} - f_o\, y_{jo} = 0 \quad j = 1,....,s$$

$$- S_{m=1,.n}\, L'_{om}\, x_{im} = -x_{io} \qquad i = 1,....,r$$

$$S_{m=1,.n}\, L'_{om} = 1$$

The decision to choose input or output oriented approach is based on the aim of the study as well as on the factors that managers has influence on. For instance, industries having particular

orders to fulfill, such as electricity generation prefers to use input oriented models to minimize input usage while DMUs having fixed quantity of resources prefer to use output oriented models to maximize output.

It is suggested that output oriented approach is appropriate if outputs are controllable or vice-versa.[76] Input and output technical efficiency results are different. The only exception is the CRS when both the input and output oriented approaches give the same result.

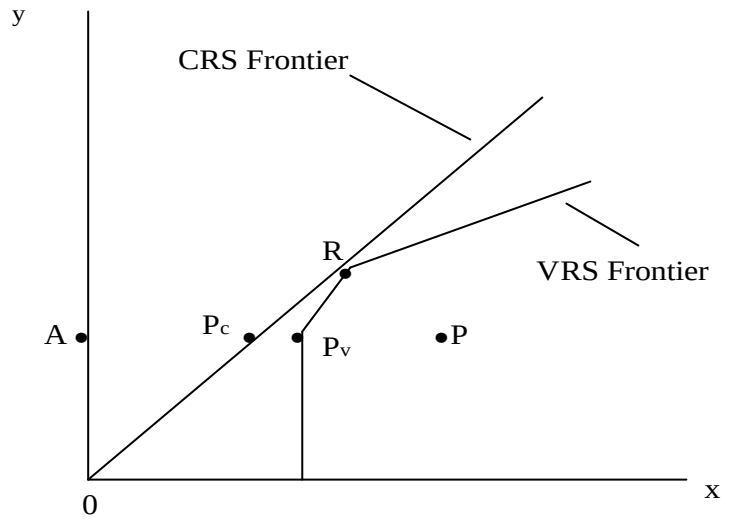
In the empirical study in Chapter 4, output oriented model has been preferred over input oriented model. The choice of output oriented approach is related with the industry's dynamics. As discussed in Chapter 2, most of the industry experts believe that Turkish tourism is facing the threat of becoming a cheap destination. This being the case, hotel industry should concentrate on output maximization in terms of improving perceived quality, occupancy and prices rather than looking for alternatives to minimize its input usage. Furthermore, all outputs in the empirical study are controllable by the management. Similar to the empirical study in Chapter 4, Johns, N., Howcroft, B. and Drake, L. (1997), Barros, C. (2005) and Barros, C and Mascarenhas, M. (2005) preferred to use the output oriented approach while measuring efficiency of hotels.

Technical efficiency has two components, namely, pure technical and scale efficiency. In case of CRS assumption, technical efficiency means pure technical efficiency since all DMUs are operating at the optimum scale meaning that they are all scale efficient. If efficiency score of a particular DMU differs under CRS and VRS assumptions, this indicates the scale inefficiency of that DMU.

[76] Coelli, T., Rao, D.S.P. and Battase, G.E. (1998)

Pure and scale efficiency can be illustrated with the below one input and one output example.

Figure 3.1.2: Scale versus Pure Technical Efficiency



Source: Coelli, T., Rao, D.S.P. and Battase, G.E. (1998) p. 152

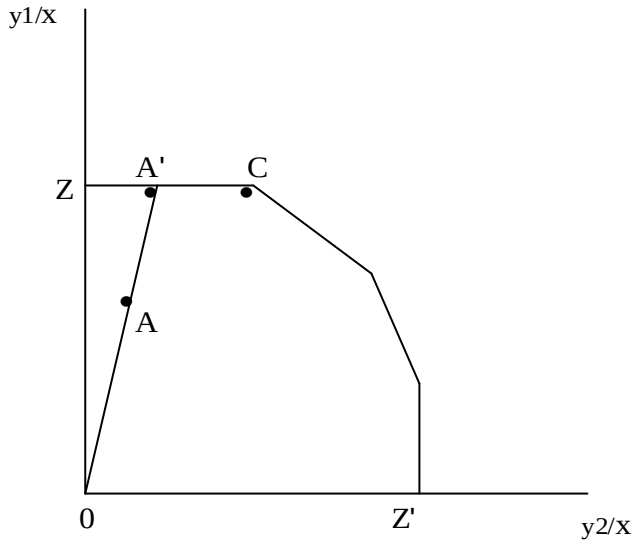
Under CRS assumption, technical efficiency of unit P equals APc / AP. However under VRS, technical efficiency is APv / AP. The difference between these two equals to scale inefficiency. Thus, scale efficiency is APc / APv.

In another notation, it could be summarized that;

Technical Efficiency under CRS = Technical Efficiency under VRS * Scale Efficiency

Farrell (1957) illustrated a piecewise linear non parametric frontier to measure efficiency. The piecewise linear frontier causes some efficiency measurement problems when the frontier runs parallel to axes. This causes slack problem which is illustrated in the below figure.

Figure 3.1.3: Efficiency Measurement and Slacks



Source: Coelli, T., Rao, D.S.P. and Battase, G.E. (1998) p. 152

The technical efficiency of unit A is 0A/0A'. However, the efficiency of A' is questionable since one could increase the amount of y2 output by CA' without using any additional input. This is known as slacks in the literature.

In order to eliminate slack problems, second stage linear programming was introduced to move all inefficient DMUs to efficient points (A' to C). While doing so, the second stage linear programming maximizes the sum of slacks rather than minimizing them. This means that, the technically inefficient DMUs on the frontier are benchmarked with the furthest efficient point on the piecewise-linear frontier rather than the nearest efficient point. As a result of this crucial drawback of the second stage linear programming approach, many researchers still prefer to use first stage linear programming rather than the second. In the first stage approach, the slacks are calculated residually and no action is taken to eliminate them. A third method has been introduced as the multi-stage linear programming approach which is the most recommended among all, since it clearly identifies the efficient projected points. Although multi stage DEA is

the most recommended, it is not the most preferred method because of its more computational demand.

Nevertheless, Coelli, T., Rao, D.S.P. and Battase, G.E. (1998) believe that the importance of slack problem is exaggerated and first stage approach is sufficient to measure technical efficiency scores. They support the view that slacks are the side effect of DEA and can be eliminated if infinite sample size or alternative frontier construction method is used.

Besides it advantages, DEA model has certain limitations. First of all, relative efficiency scoring of DEA is an important limitation of the model. In DEA process, best-performing units are accepted as hundred percent efficient. DEA uses best-performing DMUs to form efficiency frontier and evaluate other DMUs' efficiency accordingly. Thus, basing efficiency on the best-performing DMUs rather than on an ideal or an average can be considered as a limitation of the model. This approach may cause misleading results in cases where all DMUs in the sample are actually inefficient at different ratios. Because of the relative efficiency scoring, DEA automatically ignores inefficiencies for the best-performing DMUs and accepts them as totally efficient.[77] Drake, L. and Simper, R. (2003) pointed out another criticism of DEA related with the relative efficiency issue. They pointed out that DEA model does not allow to make further comparisons between efficient DMUs. This point indeed makes sense especially when too many efficient DMUs are present in the data set.

Second weakness of DEA is what is referred as the self-identifier problem. This problem usually arises when the number of DMUs is limited. In this case, some DMUs may seem hundred percent efficient because no other DMUs are comparable. As discussed earlier, the efficiency score of each inefficient DMU is determined based on its efficient peers. Self-

[77] Abbot, W. and Wu, S. (2002)

identifier problem can be overcome by increasing the number of DMUs which however, in some cases, is impossible to achieve.[78]

Third potential problem with DEA is the fact that it does not recognize random errors. DEA perceives any deviation from the efficient frontier as inefficiency and ignores any random error possibility.[79] This cause lower average efficiency under DEA model since all random errors will be perceived as inefficiencies of DMUs.

On top of the above limitations of DEA, this method can also result in misleading results if some points are not handled delicately at the application stage. First of all, the choice of inputs and outputs is crucial as eliminating an important input or output can cause biased results. Therefore, before giving a start to the empirical study in Chapter 4, similar hotel efficiency studies are examined and evaluated based on their input and output selection.

Benchmarking other studies in order to choose input and output factors is a good start for an appropriate research. However comparing the efficiency scores of different studies may lead to misjudgments, since each study measures relative efficiency of its group of DMUs. Therefore while making comparisons among different studies, additional attention is required.

A third point is that all DMUs that are chosen as the data set have to be homogenous as much as possible. For instance, resort hotels and business hotels should not be grouped together while measuring their relative efficiency since the industry dynamics of both groups are totally different. However there is no doubt that, it is almost impossible to set up a hundred percent

[78] Bauer, P., Berger, A.N., Ferrier, G.D. and Humphrey, D.B. (1998)
[79] Drake, L. and Simper, R. (2003)

homogenous group to measure efficiency. Therefore, researchers can set up their DMUs on best effort basis.

3.4. Efficiency Studies

3.4.1. Survey on Efficiency Studies in Turkey

Efficiency measurement methods started to be popular in Turkey with manufacturing industries since Turkey foresee the development of manufacturing industry as the significant objective of economic policy since 1930s.[80]

One of the pioneer studies on the measurement of total factor productivity for manufacturing industries was conducted by Krueger, A.O. and Tuncer, B (1982) for the period during 1963 and 1976. The inputs of this study included; physical capital stock, number of workers and purchased input whereas outputs were in terms of value added. As a result of their study, they reported that Turkish manufacturing industry experienced a productivity growth during the years 1963 and 1976. In addition, the study illustrated that public companies had higher productivity growth compared to private companies. However, they also pointed out that some of this finding was related to the differentiated industrial weights in public and private companies.

A more comprehensive research on public and private companies was conducted by Zaim, O. and Taskin, F. (1997) on manufacturing industries by using DEA- type Malmquist Total Factor Productivity approach for the period between 1974 and 1991. Similar to Taymaz, E. (2005) and Taymaz, E. and Saatci, G. (1997), they used aggregated output in value terms at constant 1988

[80] Krueger, A.O. and Tuncer, B. (1982)

prices. As inputs; total capacity of power equipment installed, value of fuel and electricity consumption and raw material costs were used. In this study, opposite to the findings of Krueger, A.O. and Tuncer, B (1982), which analyzed years 1963-1976, private companies were found to have better productivity growth than public companies for the years 1974-1991. The study revealed that productivity improvement is due to technological progress rather than technical efficiency for both public and private companies.

The study of Taymaz, E. and Saatci, G. (1997) is also worth mentioning since it compares the technical efficiency scores and the effects of technology change on three main industries in Turkey. They used the SFA in Turkish textile, cement and motor vehicle industries using panel data for the years 1987 to 1992. The study defined aggregated output in value terms at constant 1987 prices and inputs as depreciation charges, labor hours worked, value of fuel and electricity consumption, raw material costs, share of technical personnel and share of administrative personnel. Moreover, in order to explain the efficiency differences between DMUs; region, ownership, overtime, subcontracting, advertising, communication, international technology, size of plant and years of the study were considered as the dummy variables of the model.

The results of the study illustrated that cement industry had the highest mean efficiency level among the industries (cement 83.7 percent, textile 79.3 percent and motor vehicle 79.5 per cent). Furthermore, textile industry had the highest technological progress of 6 percent whereas it was 4.1 percent and zero progress in motor vehicle and cement industry respectively. Additionally, the study showed that factors influencing the technical efficiency varied among industries. The only exception was the use of subcontracted inputs. In all industries subcontracted inputs had a positive effect on efficiency. Another important finding of the study

was that large establishments in the cement and motor vehicle industry were more efficient than small establishments.

Following the research in 1997, Taymaz, E. (2005) presented a more specific paper on the relationship of firm size and productivity in the Turkish manufacturing firms. He used a data set of manufacturing establishments in the years 1987 to 1997. The choice of output and input measures were exactly the same with the previous study of Taymaz, E. and Saatci, G. (1997). However, in this study ''communication'' was excluded from the list of dummy variables and instead, average wage level was added. Further, ''share of female personnel'' was added as a controllable variable. The study found out that establishment size has a positive impact on efficiency in about one third of the analyzed sectors. In addition, Taymaz et al. (1997) found a positive correlation between entry size and entry level of efficiency. Moreover, the study showed that higher wage levels lead to higher technical efficiency in most of the industries.

By looking at the last two studies, it can be concluded that higher technical efficiency score is more frequent in larger firms in the Turkish manufacturing industries.

As mentioned above, most of the efficiency studies conducted in Turkey are related to manufacturing industries. Efficiency studies on services industries are very limited and majority of them are focused on financial institutions. Investigating the performance of banks and financial intermediaries are relatively easy with respect to other service industries since these institutions have more homogenous structures and relatively less intangible services.

The study of Aslantas, S. (2004) covered 90 financial intermediaries and used the DEA and Malmquist productivity index for years 1999 to 2002 to identify the efficiency levels among

DMUs[81]. Number of personnel, general administration costs and equity were accepted as inputs whereas commission revenues and trading volume of company stocks were taken as the outputs.

This study found out that smaller financial intermediaries were more efficient compared to larger ones because of their flexible cost structure and their ability to adopt themselves to changing environments. He also pointed out that productivity increases were mostly a result of technological change rather than pure technical efficiency or scale efficiency improvements. The study illustrated that financial intermediaries in Turkey experienced technical efficiency deterioration for years 1999 to 2002.

Similar to the findings of Aslantas, S. (2004); Isik, I. and Hassan, M. K. (2003) recorded that Turkish banks experienced productivity improvements during the period of 1981 to 1990. However, both studies indicated different reasons for productivity improvement. The former study on financial intermediaries found out that technological progress was the reason while the latter on banks illustrated that pure technical efficiency was the reason for productivity improvements. The study of Isik, I. and Hassan, M. K. (2003) reported that pure technical efficiency scores were 76 percent between 1981-1986 and they increased to 85 percent during 1987-1990. They employed an input oriented DEA- type Malmquist Total Factor Productivity approach with three inputs; labor, capital and loanable funds and as for outputs; short term loans, long term loans, risk adjusted off balance sheet items and other earning assets.

[81] Input oriented DEA, CRS (constant returns to scale)

3.4.2. Survey on Efficiency Studies in Hotel Industry

To date, there are only two efficiency studies which have been conducted regarding the hotel industry in Turkey. The primary research was conducted by Tarim, S., Dener, H. I. and Tarim, A. (2000); using DEA to measure the pure technical efficiency of 21 hotels in Antalya. The second study was undertaken by Önüt, S. and Soner, S. (2006); using DEA to evaluate the energy efficiency of 32 hotels in Antalya.

The study of Tarim et al. (2000) used number of personnel, investment cost and total expenses excluding personnel costs as inputs and repeat customer ratio, occupancy rate and profit as outputs. The study was based on output oriented CRS and the results of the study illustrated that four-star hotels were technically more efficient when compared to five-star hotels in 1997. The main efficiency difference between these two groups resulted from the lower customer satisfaction and profit performance of five-star hotels. As in other similar studies in the literature, this study used repeat customer ratio to represent customer satisfaction. In the literature, it is seen that as there is no single tool to measure customer satisfaction therefore repeat customer ratios, customer surveys or mystery guest surveys are used.

According to the study, the average efficiency score for four and five-star hotels was 72 and 52 percent, respectively. The findings of Tarim et al. (2000) illustrated that Turkish hotels had lower levels of efficiency when compared with the other studies in Portugal by Barros, C.P. (2005), in the USA by Anderson, R.I., Fish, M., Xia, Y. and Michello, F. (1999) and Morey, R. and Dittman, D. (1995). However, it should also be considered that because of the relative efficiency approach, different studies are not perfectly comparable. Moreover, different input-output combinations and differentiated categories of hotels that were used for each referred study create difficulties to compare these.

The second efficiency study on the Turkish hotel industry focused on energy efficiency of the 32 five-star hotels in the city of Antalya. Onut et al. (2006) narrowed down their research to energy efficiency rather than the overall efficiency of the hotel. Their research was similar to the work of Keh. et al. (2006) in the sense that both concentrated on minimizing a single component of cost, energy and marketing expenses respectively.

In the study of Onut et al. (2006), input oriented CRS model was used. Number of personnel, electricity consumption, water consumption and liquefied petroleum gas consumption were selected as inputs, while occupancy rate, annual total revenue and total number of guests were selected as outputs. As a result of the analysis, eight hotels were found to be technically efficient. The study also pointed out that the use of liquefied petroleum gas caused inefficiency with respect to other energy sources. As a conclusion, the study suggested the use of solar energy to improve efficiency since Antalya is a suitable location to utilize solar energy with its high number of sunny days within a year.

The overview of the literature reveals that, efficiency measurement in the hotel industry has been limited not only in Turkey but all around the world. As discussed earlier, efficiency measurement in hotel industry is a challenging task since intangible features of services make it difficult to identify input and output factors and as far as the difficulties in data collection are concerned.

Among all efficiency measurement models, DEA is the most popular model to measure hotel efficiency in the literature.

The study of Morey et al. (1995) is one of the pioneer implementations of DEA to measure pure technical efficiency in the hotel industry. Previous use of DEA in service industries mainly focused on assessing efficiency in hospitals, banks and educational institutions. The study of Morey et al. (1995) was original since it was the first analysis that measured efficiency of 54 geographically dispersed hotels of a chain in the USA by using input oriented DEA. The study aimed to achieve homogeneity among the hotels in the data set by using a single chain hotel group. Although this kind of approach provided a level of homogeneity for the service quality in the hotels, it is believed that homogeneity of the data is still challengeable since the star classification of the hotels in the group is not clearly identified.

The inputs of the study were chosen as room division expenses, other room division expenses, energy cost, cost of administration personnel, general administration cost, advertising expenses, marketing expenses, salaries for property, operation and maintenance and other property, operation and maintenance expenses while total room revenue and level of guest satisfaction were assigned as outputs for a data set of year 1993. The use of guest satisfaction questionnaires for output was very consistent with the nature of the hotel industry as discussed earlier. Moreover, the content of the guest satisfaction questionnaire was comprehensive, including the level of service satisfaction as well as the physical facility satisfaction of the hotels.

The findings of the study exhibited that thirty-four hotels out of fifty-four were inefficient while the average pure technical efficiency score of the group was 89 percent. The performance of the hotel managers was evaluated by keeping the uncontrollable factors exactly the same for sound evaluation results. This approach was meaningful to create a homogenous structure in order to measure managerial performance. Morey et al. (1995) pointed out that measuring

managerial performance could be achieved by separating dynamics of the market from the process.

Studies of Morey et al. (1995) and Tarim et al. (2000) have a common point since both took into account qualitative factors while measuring efficiency. As mentioned previously, Grönross et al. (2004) indicated that customers influence service efficiency both through inputs and outputs. Hence, the study suggested the use of financial measures to capture quality aspect. The idea behind this was the fact that different levels of service qualities are priced differently in the hospitality market.

For instance, customers are ready to pay higher prices in a restaurant not solely for the food served but also for the ambiance and the quality service. Therefore, it is believed that studies having financial measures such as revenue as output to some extent include customer satisfaction in their research. However, one should keep in mind that price level does not reflect the perceived service quality in cases where price regulations, government subsidized products or monopolistic markets exist.[82]

Barros, C. (2005) had conducted a recent study using DEA for measuring efficiency in 43 Portuguese hotels for the year 2001. The hotels were publicly-owned small hotels under same brand name ranging from 9 to 41 rooms and most of them were situated outside the city centers.

The fundamental difference between Morey et al (1995) and Barros, C. (2005) was the aim of the study. Morey et al (2005) evaluated the efficiency scores of the hotels to measure the direct performance of management while Barros, C. (2005) focused on the performance of the hotels

[82] Grönross, C. and Ojasalo, K. (2004)

in a wider perspective. Thus, Barros, C. (2005) did not hesitate to include factors outside the control of the management into his model. The inputs for the study were number of personnel, cost of personnel, number of rooms, surface area, book value, operational costs and external costs, whereas outputs were sales, number of guests and number of nights sold.

The study indicated that the choice of input or output oriented DEA was based on the market conditions of the DMU. Moreover, it suggested the use of input oriented DEA for monopolist markets and output oriented DEA for competitive markets. As a result, the study was based on output oriented DEA. Additionally, VRS method was chosen to measure scale efficiency as well as pure technical efficiency.

The study found out that Portuguese hotels had an average pure technical efficiency score of 90.9 percent. However when scale efficiency was included into the analysis, the average technical efficiency score increased to 94.5 percent. This result indicated that scale sizes of the hotels were close to ideal.

Other important findings of the study were related to the location and property structure of DMUs. Hotels which are outside city centers or historical buildings were less efficient with respect to others. As Barros, C. (2005) also pointed out, the main questionable part of the study was the homogeneity of the DMUs. All hotels in the data set had different sizes, characteristics and locations. On the other hand, they had a level of homogeneity since they were operated under same brand and common administration.

A second research was conducted by Barros, C. and Mascarenhas, M. (2005) by using the same 43 Portuguese hotels for the year 2001. The scope of the study was expanded by using price

information to measure allocative efficiency in addition to technical efficiency. As mentioned earlier, allocative efficiency indicates the optimum use of input and outputs with their given prices. Same set of output was used with the previous study on Portuguese hotels and inputs were identified as number of personnel, book value and number of rooms. In addition price information for each input is derived by dividing flows of expenditure by stocks.

The research presented that only four hotels among 43 were both technically and allocatively efficient under VRS. Average technical efficiency score of DMUs dropped to 86.8 percent with respect to the efficiency score of 94.5 percent in the previous study. The only reason that could lead to this difference is the decreased number of inputs in the second study since, all other components were kept as same. Another important finding of the research was that larger hotels have higher technical efficiencies.

While the study identified high technical efficiency, mean of allocative efficiency was quite low with 27.5 percent. This illustrates that hotels are not using their resources according to prices. Thus, the study concluded that publicly owned Portuguese hotels were negatively affected by the government regulations and polices.

Another efficiency study on a chain hotel group by using DEA was conducted by Johns, N., Howcroft, B., and Drake, L. (1997) for 15 hotels in the UK in which the number of rooms ranged from 90 to 350. The researchers of the study also underlined the difficulties of measuring efficiency in the service industry resulting from quality concerns.

The analysis used number of nights sold, total covers served and total beverage revenue as the output whereas number of room nights available, total personnel hours, utility costs and food &

beverage costs were chosen as the inputs. The main difference of the study compared to other hotel efficiency studies was the use of quarterly data rather than annual. Even though the study aimed to identify a trend in efficiency levels, no significant efficiency change was observed over the four quarters which might also indicate that there was no seasonality problem in analyzed hotels. In addition, opposite to the findings of Barros et. al (2005), the study did not find any significant efficiency difference based on number of rooms.

The study of Johns et al (1997) found out an average technical efficiency score of 99 percent. Additionally, six hotels out of fifteen were identified as technically efficient. The study also carried out a comparison between DEA results and profitability for each hotel. The study showed that some of the hotels' DEA scores are not inline with their profitability. The abovementioned differences could be resulted from the different input and output combination that are used to calculate DEA and profitability.

It is believed that the major weakness of the study was the limited number of hotels in the analysis with regard to input and output factors. In the literature, three different applications for the minimum number of DMU were recognized. Similar to the study of Johns et. al (1997), Tarim et. al (2000), also preferred to use the number of DMUs greater than twice the number of inputs and outputs, in this case minimum 15 DMUs (15= 2(3+4)) is required in order to reach acceptable findings. On the contrary, Barros, C. (2005) cited to the study of Raab, R. and Lichty, R. (2002) indicating that the outcome would be meaningful if the minimum number of hotels is greater than three times the number of inputs and outputs. Based on the second approach, the study of Johns. et al. (1997) should have at least 21 DMUs (21= 3(3+4)) in its data set. The last approach recently used by Sigala, M., Jones, P., Lockwood, A. and Airey, D. (2005) suggests that the number of DMUs should be greater than number of inputs times

number of outputs. Under these circumstances, the study of Johns. et al. (1997) should have had at least 12 (3*4) DMUs which is already the case.

One of the efficiency studies on Asian hotel industry was introduced by Hwang, S. and Chang, T. (2003) using DEA under CRS for 45 hotels in Taiwan for years 1994 to 1998. The study is unique since it added a time perspective of four years. The study pointed out that input and output factors had to be assigned depending upon the objectives of the measurement. The inputs were number of personnel, number of rooms, total area for restaurants and all operating expenses while outputs were room revenues, food and beverage revenues and other revenues.

The results of the study showed that the average pure technical efficiency was 79 percent with eleven hotels being technically efficient. Also, among these 11 hotels, 8 of them were international chains servicing mainly to foreign tourists. The study illustrated that pure technical efficiency was affected by the differences in sources of customers (domestic or foreign), management style (independent or international chain) and market conditions (city or resort). The results indicated that those hotels which served mostly foreign tourists, or hotels under international chains that operate as resorts, had higher technical efficiencies compared to others.

Finally, when time constraint was added to the efficiency study, the analysis indicated that around 56 percent of the hotels faced a decline in their pure technical efficiency during 1994 to 1998.

A more recent study from Asia was introduced by Keh, Chu and Xu (2006) to measure the effects on marketing expenses on hotel efficiency. For this purpose, the study analyzed a hotel

chain which had 49 Asia-Pacific hotels with sizes ranging from 84 to 2,046 rooms. The hotels were situated in different countries namely, Australia, China, Fiji, Japan, Malaysia, New Zealand, the Philippines, South Korea, Singapore, Thailand and Indonesia which caused homogeneity problems within the data set.

They developed a triangular DEA model which concentrated on the ways to minimize marketing expenses, then use marketing expenses to maximize output and maximize output with all given inputs. In the first stage, they looked for the appropriate portion of the total expenses to allocate to marketing expenses. In the next stage, with the predetermined marketing expenses, they tried to achieve the maximum revenue that could be reached. In the last stage they conducted an output oriented DEA to maximize output with all given inputs.

The study used total expenses and number of rooms as inputs in the 1st and the 3rd stage, marketing expenses as output in the 1st stage and as input in the 2nd stage and room revenues and food and beverage revenues as output in the 3rd stage. As a result of the analysis, it was reported that only 10 percent of the DMUs were efficient at all stages. The median efficiency scores for each stage were 52, 42 and 56 percent respectively. The median rather than average DEA was preferred as DEA scores were not normally distributed.[83] The findings also showed that among the inefficient DMUs, two thirds exhibited DRS at 1st and the 3rd stages. On the contrary, in the 2nd stage 98 percent of the DMUs exhibited IRS. The study concluded that efficiency of a hotel deteriorated when marketing expenses exceed more than 12 percent of the total expenses.

[83] Sigala, M., Jones, P., Lockwood, A. and Airey, D. (2005)

Sigala, et al. (2005) approached the efficiency concept from another perspective and developed a stepwise DEA approach to identify the appropriate input and output factors. They concentrated on identifying the right inputs and outputs because of the perishability and heterogeneity problem of services. As the second step, they measured efficiency of room division by using a data set of 93 three star hotels in the UK for 1999.

Initially, all factors that might affect the level of efficiency were included into the model. However after a stepwise DEA application, input and output factors that significantly determine efficiency were chosen to use in the DEA under CRS model. The research determined appropriate outputs as average room rate (ARR), number of nights spent, non-room revenues. Number of rooms, front office payroll, other payroll, administrative expenses, other expenses and demand variability (seasonality) were chosen as inputs.

In addition to stepwise DEA, statistical test were conducted to find factors that stepwise DEA had not so far considered. Contrary to the findings of Barros, C. (2005), location of a hotel was not found to affect efficiency. However, it should not be neglected that hotel location can have an indirect effect by influencing the seasonality. In accordance with the study of Barros. C. (2005) and Hwang et al. (2003) respectively, hotel design and ownership structure were found to affect efficiency levels. However, surprisingly, repeat customers, market segments served and distribution channels used were not found to have significant impact on efficiency.

Anderson et al. (1999) estimated the managerial efficiency of hotels by using SFA model which is not very popular in the hospitality literature. The applicability of this model is debatable for hotel efficiency studies since it prevents the use of multi output. The use of multi

output is important since hotel efficiencies can not easily be explained by single output. In cases where single output is used, perceived customer satisfaction is usually neglected.

Only total revenue may be considered as a single output that involves customer satisfaction since price element gives a notion about the customer's appreciation of the service. However, in the empirical study on chapter 4, outputs with and without customer satisfaction will be evaluated to find out if including customer satisfaction will create any differences along with the revenues.

In determining the efficiency levels of the hotels, Anderson et al. (1999) used cost function to minimize cost for a given level of output. They claimed the importance of using an input oriented model, since they supported the idea that inputs are relatively endogenous compared to relatively exogenous outputs in the hotel industry. This view is conflicting with the views of Barros, C. (2005). Based on the industry experience, it is believed that management level have a control on total revenue so output oriented methods are more suitable for hotel industry, if researchers do not aim to concentrate on a single input control such as energy costs (Onut et al 2006) or marketing costs (Keh et al 2006). A translog cost function with five inputs (cost of personnel, number of rooms, total gaming related expenses, food & beverage expenses and other expenses) and one output (total revenue) was employed in the study conducted by Anderson et al (1999). The limitation of the study is that the input prices were not known therefore they were determined as a percentage of total revenue rather than actual figures.

Anderson et al. (1999) adopted stochastic cost frontier approach to 48 US hotels for the year 1994. The results of the study indicated that average efficiency score of the data set was 89.4 percent. Another outcome of the study was that the hotels might reduce their input costs on

average at most by 10.6 percent along with their current level of output. In particular, the most efficient hotel in the data set had an efficiency score of 92.1 percent. The results were similar to those prevailed in the study by Morey et al. al (1995). The study also concluded that efficiency scores in hotel industry were higher than the industries such as banking and insurance. Anderson et al (1999) claimed that the reason behind such an outcome could be the level of entry and exit barriers in the latter mentioned industries compared to hotel industry.

The literature review shows evidence that DEA is the most preferred efficiency measurement method in the hotel industry since it gives room to handle multi inputs and outputs and does not require any assumption on the functional form of the efficiency frontier. Furthermore, it is believed that output oriented method is more suitable while measuring the overall efficiency of the hotel since hotel industry is a competitive industry that requires improvement in the service quality as well as in total revenues.

Chapter 4: Empirical Study

4.1 Research Design and Methodology

4.1.1. Research Objectives

The purpose of this thesis is to analyze the current situation of the Turkish tourism industry with respect to Mediterranean countries of EU and to examine the performance of Turkish resort hotel industry by analyzing their technical efficiency.

The reason behind this focus on the hotel industry is the fact that this industry is vital for Turkey as it is one of the top leisure tourism destinations in the world. Besides its importance for Turkey, tourism industry is also among the top three largest industries in the world and has an average annual average growth rate of 4 percent.[84]

Turkish tourism industry competes with all countries in the world to attract more international tourists and thus to capture higher levels of tourism receipts. However, as a result of growing global competition and discovery of new tourism destinations, Turkey faces a more competitive tourism market. Therefore, Turkish tourism industry needs to be capable of understanding its own performance, the main dynamics of the industry as well as defining its value drivers.

In order to analyze the performance of the Turkish resort hotel industry, technical efficiency is used for a cluster of resort hotels located in the coastline of Turkey. By focusing on technical

[84] Ennew, C. (2003)

efficiency, the thesis identified the inefficient resort hotels with the data set and determined the output factors that could be improved to reach higher levels of efficiency. Moreover, the study distinguishes the sources of technical inefficiencies as pure and scale.

The writer of this thesis hopes that the findings of the study would be useful for the managers, investors and experts to clearly understand the reasons for weak performance at individual hotel level and help to draw conclusions that could improve the efficiency of the resort hotel industry in general.

4.1.2. Data Collection Method

This thesis utilizes a relatively recent data comprising years 2004 and 2005. The data was collected through a financial institution. Those hotels, with proper financial reporting systems and relatively professional business structures, were considered as eligible to be included in this study.

The owners/ top managers of the hotels were contacted and questionnaires were sent via email in 2006. The original questionnaire of the financial institution was focused on the operational performance of the hotel and neglects the physical structure of the property. Therefore, the questionnaire of the financial institution for credit application process has been revised according to the objective of the study.[85] As an example, specifications on hotel's physical structure and other informative features have been added to the original questionnaire.

Although the data requested through the questionnaire was of confidential nature, the survey achieved a very high response rate of 77.3 percent. Actually, this is mainly due to the sound

[85] See Appendix 1

business relationship between the financial institution and the hotel owners/management. Otherwise, similar to the case of Tarim et al (2000), it would have been extremely difficult to obtain desired data in reliable form.

The number of hotels contacted was 53 and 41 questionnaires were received back. Among these 41 hotels, 13 of them were eliminated because of sending back incomplete and inconsistent questionnaires. The questionnaires were also overviewed with some of the hotel owners to ensure that there existed a mutual understanding between the researcher and the hotel owners.

As a result, there were a total of 28 resort hotels left for the study however the identities of the resort hotels are not disclosed due to confidentiality reasons.

4.1.3. Data Analysis

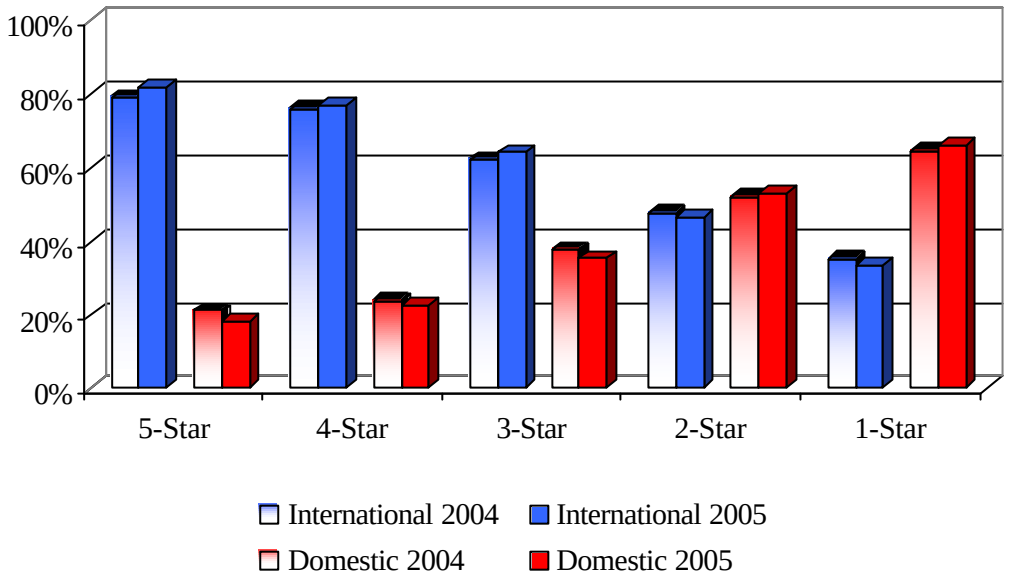
In this thesis, technical efficiency performance of 28 resort hotels in Turkey have been evaluated for the years 2004 and 2005 by using output oriented DEA. In order to set up a relatively homogenous group of data, only 4 and 5 star hotels[86] are included in the data set. Within the data set, 11 of the DMUs are 4 star hotels while 17 of them are five star hotels.

There are mainly two reasons to limit the study with 4 and 5 star resort hotels. Primarily, the customer profile of 4 and 5 star hotels are in line with the objective of this thesis. The study aims to identify the existing situation of Turkish resort hotel industry with respect to its

[86] In the rest of the thesis, 4 star hotels and 2. class holiday villages will be named as 4 star whereas 5 star hotels and 1. class holiday villages will be grouped under 5 star hotels. The difference between a hotel and a holiday village is the structure of the buildings. Hotels are composed of a single mono block whereas holiday villages are composed of individual single storey buildings such as bungalows.

competitors and measure technical efficiency to find out the weaknesses that represent rooms for improvement. Another reason of this selection is the fact that 4 and 5 star hotels have dominance in the international market as illustrated in the below figure.

Figure 4.1.1: Customer Profile by Hotel Category



Source: Ministry of Culture and Tourism (2007c)

Nights spent by international tourists account for 77 percent and 79 percent of the total accommodation in 4 and 5 star hotels, respectively. On the other hand, 2 and 1 star hotels' customer profile is totally different and mainly dominated by domestic tourists. The most balanced customer profile is in 3 star hotels with approximately 60 percent international and 40 percent domestic tourists.

Secondly, there exists a structural difference between 4 and 5 star hotels compared to other hotels. In Turkey, the hotels operating under 1 to 3 star categories are usually family-owned properties with less professional financial reporting and business structure. Thus, it is more difficult to reach the complete and adequate data resources for this group of hotels.

Besides their segment based on ‘‘stars’’, another tool to create homogeneity among DMUs was the location. Hotels operating close to each other have similar environmental factors that could affect their efficiency level. In fact, numerous factors affect the homogeneity of the data set and it is almost impossible to eliminate all factors. However, it is believed that location is a determining factor since it totally affects the concept of the hotel, its customer profile and pricing strategy. It is not appropriate to compare a city hotel with respect to a resort hotel since their pricing, customer profile, profit margins, investment cost and occupancy rates are totally different. This thesis preferred to limit its data set with hotels at the coastline of Turkey. A more conservative approach would be to limit the study with a single city, probably with Antalya, however in this case the number of DMUs would be 20 rather than 28 hotels. However, still, all the hotels in the data set are resort hotels and located in the three top leisure cities of Turkey.

Table 4.1.1: Location of the Hotels

City	District	Number of Hotels	%
Antalya	Belek	8	28.6%
Antalya	Kemer	6	21.4%
Antalya	Side	3	10.7%
Antalya	Lara	2	7.1%
Antalya	Alanya	1	3.6%
Mugla	Marmaris	2	7.1%
Mugla	Fethiye	2	7.1%
Mugla	Bodrum	1	3.6%
Aydin	Kusadasi	3	10.7%
Total		**28**	**100%**

Previous tourism related efficiency studies in Turkey that were conducted by Tarim et al. (2000) and Onut et al. (2006), focused solely on Antalya. From this perspective, their studies have relatively more homogeneous data set with respect to this thesis. Although location

disperses the homogeneity of the data set, almost all previous studies reviewed ignore the location limitation. (Morey et al. (1995), Barros, C. (2005), Barros et al. (2005), Keh et al (2006), Anderson et al (1999)) In particular, Keh et al. (2006) has the extreme application of composing their data set with hotels situated in different countries.

This thesis also marked out the data set in terms of number of rooms. Number of rooms is not as defining as the location and the star categories in terms of homogeneity however, it can still influence the results especially in situations where differences are very significant. Past experience of the writer of this thesis is that hotels under 100 rooms are not suitable for professional management because of the fixed costs. Therefore, the data set of this study is comprised of hotels over 100 rooms ranging from 179 to 888 rooms.

The data set is also a good sample for Turkey since the distribution of number of rooms with respect to locations is quite similar to Turkish average. In the data set almost 70 percent of the rooms are located in Antalya which only differs slightly from the real situation among these three cities. In order to have an exact fit with the actual distribution, the study should have had fewer hotels in Aydin and more in Antalya.

Table 4.1.2: Number of Rooms in 4 & 5 Star Hotels[87]

City	Data Set		Turkey	
Antalya	7,657	70%	58,781	77%
Mugla	2,155	20%	13,521	18%
Aydin	1,111	10%	4,226	6%
Total	**10,923**	**100%**	**76,528**	**100%**

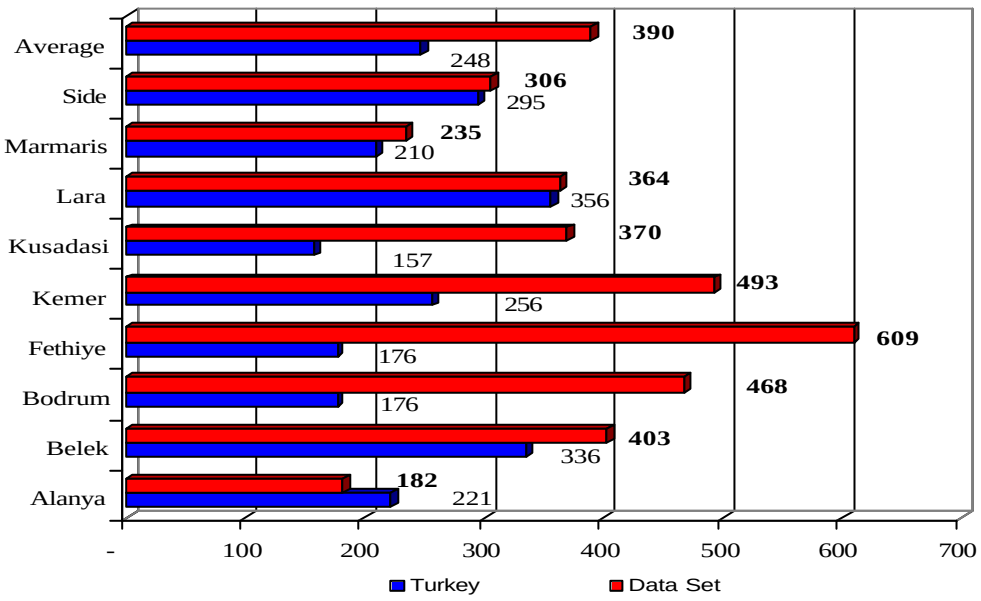
Source: Ministry of Culture and Tourism (2007d)

[87] All the data covers only tourism licenced hotels for the year 2005

As of 2005, the total number of rooms in 4 and 5 star hotels in the specified three cities was 76 thousand. Although the data set may seem very limited with 28 resort hotels, it covers 14 percent of the total capacity in the selected cities which can be considered as a significant coverage in capacity terms.

When the number of rooms per hotel is compared to the location's average, it can be verified that number of rooms in the data set are larger with respect to remaining hotels in their locations. The below figure illustrates that the average number of rooms in the data set is 390 whereas 4-5 star hotels in these destinations have the average number of 248 rooms.

Figure 4.1.2: Comparison of Number of Rooms



Source: Ministry of Culture and Tourism (2007d)

As a result, there are a total of 28 resort hotels in this thesis which provides a very suitable data size for DEA. As discussed previously in the literature review, three approaches have been introduced to calculate the minimum number of DMUs. This thesis uses the most conservative approach which is also used by Barros, C. (2005) rather than the method used by Johns et al.

(1997), Tarim et al. (2000) and Sigala et al (2005). The main purpose of using the most conservative approach is to minimize the problems such as the self identifier problem that may arise in case of small data sets. Data set of this study verifies the test that the minimum number of DMUs is to be greater than three times the number of inputs plus output (28= 3*(3+5)).

4.1.3.1. Determining Outputs and Inputs

Measuring hotel performance beings with the selection of the right set of input and output factors. For this fundamental selection, dynamics of hotel industry in Turkey as well as the previous studies in the literature were analyzed. However, as all previous researches, this thesis, to some extent is also limited by the availability of data. Although previous studies were useful in the selection of factors, this thesis used its own unique set of inputs and outputs.

In general, output and inputs can be determined either in physical or financial terms. In this thesis, mostly financial data has been preferred both for inputs and outputs. The only physical data that has been used was the room capacity input. The core assumption justifying the use of financial data is the similar wage levels and commodity prices across resort hotels.

Table 4.1.3: Efficiency Studies in Hotel Industry

Study	Years	DMU	Method	Inputs	Outputs
Morey, R. and Dittman, D. (1995)	1993, USA	54	DEA (CRS-input oriented)	*total expenses under 10 subtitles	*total room revenue *level of guest satisfaction
Anderson, R., Fish, M., Xia, Y. and Michello, F. (1999)	1994, USA	48	SFA (input oriented)	*cost of personnel *number of rooms *total gaming related expense *food&beverage expenses *other expenses	*total revenue
Hwang, S. And Chang, T. (2003)	1994-1998, Taiwan	45	DEA (CRS) and Malmquist Index	*number of personnel *number of rooms *total area for restaurants *all operating expenses	*room revenue *food&beverage revenue *other revenue
Tarim, S., Dener, H. I. and Tarim, A. (2000)	1998, Turkey	21	DEA (CRS-output oriented)	*number of personnel *investment cost *total expenses excl. pers. co	*repeat customer ratio *occupancy rate *profit
Johns, N., Howcroft, B. and Drake, L. (1997)	UK	15	DEA (VRS-output oriented)	*num of rooms available *total personnel hours * total f&b cost *total utility cost	*number of room nights sold *total covers served *total beverage revenue
Keh, H., Chu,S. and Xu,J. (2006)	1999-2000, Asia Pasific Countries	49	DEA (VRS-output oriented)	*total expenses *number of rooms *marketing expenses (intermediate input)	*marketing expenses (intermediate output) *room revenues *food & beverage revenue
Sigala, M., Jones, P. Lockwood, A. and Airey, D. (2005)	1999, UK	93	Stepwise DEA (CRS-output oriented)	*front office salary *other salary *number of rooms *demand variability *administration expenses *other expenses	*average room rate ARR *nights spent *non room revenues
Barros (2005)	2001, Portugal	43	DEA (VRS-output oriented)	*number of personnel *cost of personnel *number of rooms *surface area of hotel *book value *operational cost *external cost	*sales *number of guests *number of nights spent
Barros, C. and Mascarenhas, M. (2005)	2001, Portugal	43	DEA (VRS-output oriented) Technical & Allocative	*number of personnel *number of rooms *book value	*sales *number of guests *number of nights spent
Onut, S. and Soner, S. (2006)	2004, Turkey	32	DEA (CRS-input oriented)	* number of personnel *electricity consumption *water consumption *liquid petroleum gas cons.	*occupancy rate *annual total revenue *total number of guests

Grönroos et al. (2004, p.421) emphasized the importance of using financial terms as

> *''…financial measures seem to be the only ones that manage to incorporate the quality variations caused by the heterogeneity of services and the effects on perceived quality by customer participation in the service process. In fact, if service productivity is defined as a function both of internal efficiency and cost effective use of production resources and of external efficiency and customer perceived quality, financial measures are probably the only valid measures available...''*

In fact, financial measures are suitable to measure efficiency in hotel industry since it is almost impossible to measure some of the factors in physical terms. For instance, food and beverage consumption in terms of physical units can not easily be obtained from any hotel. Probably, significant portion of hotels do not even keep a record on all items that they purchase. Even if the hotels would provide such information, how to process this kind of data would be problematic. As a result, all the literature regarding to hotel industry efficiency, preferred to use financial rather than physical factors.

With regard to the selection of inputs and outputs, the approach of Grönroos et al. (2004) is justified since price of a product is related with the perceived quality. At the initial stage of operation, price is determined by the producer however after the product or the service is introduced in the market, its price strategy is affected by the perceived quality of the customer. However, it would not be right to conclude that price level is an exact reflector of perceived quality especially in the short run. For instance, a hotel with low customer satisfaction may insist on its high price level in the short run if the management believes that customer satisfaction can be improved by time. Alternatively, a hotel with high customer satisfaction may not increase its price level because of the high competition in the market.

4.1.3.2. Determining Outputs

Key indicators of performance in a hotel are occupancy rate, ARR, restaurant revenues and banquet revenues. The former two elements are the main indicators of room revenue while the latter are the main components of food & beverage revenue. Generally, room revenues and food & beverage revenues constitute more than 90 percent of total revenues of the hotels,

particularly in resort hotels. The remaining 10 percent is generated through fitness, spa, business center, room service, laundry, sport activities and other miscellaneous facilities.

As a result, the primary output factors of the thesis are determined as:

- Revised RevPAR
- Other revenue per room sold

RevPAR

Revenue per available room (RevPAR) is the most widely used indicator to measure hotel performance.[88] It is a combination of ARR and occupancy rate. RevPAR includes revenues solely from rooms and do not take into account any food & beverage and other revenue. Therefore, it provides limited information on the whole picture of hotel performance.

This study could be regarded as unique since it expanded the scope of RevPAR with food & beverage revenue as it would not be possible to evaluate a hotel's performance throughly without food & beverage revenue. Furthermore, the dynamics of "all inclusive" concept in the Turkish resort hotel industry do not give any chance to researchers to separate room and food & beverage revenue.[89]. As a result, this study adopted the RevPAR definition to "all inclusive" concept and used it accordingly. The difference between the original RevPAR and the revised RevPAR is as follows:

Original RevPAR: Total Room Revenue[90] / Yearly Room Capacity

Revised RevPAR: (Total Room Revenue + Total F&B Revenue)/Yearly Room Capacity

[88] Brown, J and Dev, C.S. (1999)
[89] The pros and cons of "all inclusive" concept are beyond the scope of this study. For literature survey, see Issa, J and Jayawardena, C. (2003), Naylor, G. and Frank, K. E. (2001)
[90] Total Room Revenue: Room Capacity* Number of Days Open* Room Occupany* ARR

Other revenue per room sold

Other revenue per room includes all kind of revenues except room and food & beverage revenue. Other revenues usually do not exceed 10 percent of the hotel's total revenue with the exception of hotels having golf facilities, conference centers or extremely large retail areas. Generally, other revenues include fitness, spa, business center, laundry, sport activities, rent revenue from hotel shops and other miscellaneous facilities.

Customer satisfaction

In order to include the quality aspect directly into the study, customer satisfaction was added to the output factors as the third factor. Although most of the hotel efficiency studies emphasize the importance of quality along with quantity[91], only a limited number of the researches (Tarim et al. (2000) and Morey et al. (1995)) included customer satisfaction as an additional output factor. Lack of data availability is the main reason why many studies do not have such an output factor in their work.[92]

While certain researches, that have access to data, employ the customer satisfaction as a factor, some others such as Prof. Peter Jones from University of Surrey believes that customer satisfaction should not be used as an output in any industry for efficiency measurement since efficiency is solely a measure based on quantity. The followers of this view support that keeping quality dimension constant and focusing solely on quantity, is the best way to measure efficiency.

[91] Sigala et al. (2005), Keh et al (2006), Barros, C. (2005)
[92] Barros, C. (2005)

As discussed earlier, in manufacturing industries, without any discussions, quality is assumed to be constant since products are tangible, homogeneous and durable. However, service industries have different characteristics and the role of customer in the service industry is more dominant and effective. Therefore, constant quality assumption might not to be appropriate in service industries and thus, this thesis includes qualitative factors while measuring technical efficiency. For this reason a two step approach is taken; with and without the qualitative factor of customer satisfaction. In the first approach, the study will focus only on financial outputs on the idea that these financial outputs also involve a degree of customer satisfaction because of their price component. While in the second approach, the study will include customer satisfaction as the third output factor in addition to RevPAR and other revenue.

The most common tool that is used as an indicator of customer satisfaction is the number of repeat customers.[93] Repeat customer information is difficult to obtain since it requires many consecutive years of customer information. If processed correctly, it can be a good indicator for customer satisfaction. It can only lead misleading results in cases where majority of the customers prefer different hotels in their next holidays not because of their dissatisfaction but because of their willingness to stay in another hotel.

This thesis could not reach repeat customer information since many of the resort hotels in the data set do not keep such information. Therefore, the hotel scoring of an independent web site, 'holidaycheck' is used to reflect direct customer satisfaction.

[93] Tarim et al. (2000), Cizmar, S. and Weber, S. (2000)

Although there are similar sides on the internet[94] that ranks hotels, the web site of the 'holidaycheck' is perceived as more trustworthy and professional with the earliest establishment among its peers in year 1999. Furthermore, the number of reviews for each hotel is more than the other sites and in total there are more than 50,000 reviews on Turkish hotels. In addition, all the hotels in this study were present in 'holidaycheck' which created a great opportunity not to eliminate any of the DMUs because of inadequate data.

'Holidaycheck' determined six criteria for evaluating the hotels. Those are based on general, room, service, location, F&B and sport facilities of the hotels. The scoring is between 100 representing unsatisfactory to 600 being very good. The arithmetic average of these six criteria was used as the customer satisfaction output of this thesis.

As a result, the second set of output factors of the thesis are determined as:

- Revised RevPAR
- Other revenue per room sold
- Customer satisfaction

4.1.3.3 Determining Inputs

Hotel industry has two main input components; initial investment cost and operational costs. Initial investment is composed of construction, furniture and fixture of the hotel and it is usually a significant amount compared to the total annual revenue. On the other hand,

[94] http://www.holidayrating.de, http://www.hotelkritiken.de, http://www.hotelbewertungen.net, htttp://www.otelpuan.com

operational costs are relatively lower and this leads to higher gross operating profit margins in the industry compared to other service industries.

Room Capacity

While evaluating the performance of a hotel, value of its property is the most important input since this requires significant initial investment. Such initial investment costs could best be defined in financial terms. However, assessing the value of a property could be significantly expensive as this needs to be done with a real estate valuation approach by appraisal companies. Therefore, researchers preferred two methods while using investment cost as an input component. Barros, C. (2005) and Barros et al. (2005) used book value of the hotels as the investment cost. Book value of a property is usually less than its actual market value since in most of the cases the book value of the property has not been revaluated based on the market conditions. The second method is more popular among researchers (Anderson et al. (1999), Hwang et al. (2003), Johns et al. (1997), Keh et al. (2006) and Sigala et al. (2005)) because of its easy accessibility. In this approach, number of rooms is employed as the representative of the investment cost.

As in above mentioned studies, this thesis also used room capacity[95] as an indicator of initial investment cost rather than the balance sheet data. However, using number of rooms has an important assumption indicating that investment cost per room is almost the same for each hotel in the data set. In fact, this assumption is rather too strong in most of the cases especially when hotels with various star categories are compared to each other. However, this study limited its data set with only 4 and 5 star hotels in an effort to compose a dataset with hotels having a homogeneous investment cost structure to extent possible.

[95] Room capacity: Number of rooms* 365 days

Personnel Costs

Hotel industry is a labor intensive business which results in personnel costs being one of the main operational inputs affecting efficiency. In this thesis, parallel to many studies in the literature (Morey et al. (1995), (Anderson et al. (1999), Sigala et al. (2005)), the labor input is measured as personnel cost in financial terms. Certain previous studies on hotel efficiency also used the number of personnel as their labor input (Hwang et al. (2003), Barros et al (2005). However, this practice has a drawback since the seasonal personnel and interns are the main source of personnel along with full time. All of the three personnel groups have differentiated features in terms of working hours and payment systems. Using the number of personnel therefore, distorts the findings of the study when share of each group changes among different hotels.

For this reason, if labor input is desired to be measured in physical terms, the most appropriate method would be the use of total personnel hours as in the study of Johns et al. (1997).

As mentioned above, this study preferred to use personnel cost as labor input aiming to minimize misleading findings. Nevertheless, this implies a strong assumption that wage levels among DMUs are similar to each other. Another questionable aspect of using personnel cost as labor input is that it ignores the possibility of off-record payments to personnel. Although off-record payments to personnel is an important concern in hotel industry, it is believed that the current data set has minimum level of distortion on personnel cost since the data collection is through a financial institution.

Energy Cost

Energy is measured as the financial cost of all utility consumption. It is assumed that all DMUs are experiencing similar levels of pricing which is probably the case since government is the main source of energy pricing strategy in Turkey. Energy costs of a hotel increases in parallel to the size of the hotel, size of swimming pools, presence of aqua parks and other energy consuming facilities. In general, energy cost of a resort hotel range between 5 to 15 percent of its total operational costs.

F&B Cost

Food & beverage cost includes all costs related with all restaurants, bar, room service and banquet facilities and they are the foremost important cost item along with the personnel costs. Between 25 to 30 percent of the total operational cost of a hotel stems from food & beverage supplies. Therefore, hotel managements give particular attention to food & beverage costs since it can easily damage the performance of a hotel. Such focus is particularly observed in resort hotels having "all inclusive" concept as these hotels can not change their pricing strategy in the middle of the season to reflect the changes in their F&B costs.

Other Cost

Aside from personnel, F&B and energy costs, hotels have various costs such as marketing, auxiliary materials, transportation and maintenance. All such costs are included in the input named as "other cost".

As a result, the output factors of the thesis are determined as:

- Room Capacity
- Personnel Cost
- Energy Cost
- F&B Cost
- Other Cost

Above mentioned output and input factors are discretionary (controllable) factors under the control of either management or the hotel owner. In terms of output, the most difficult task of the management is to increase the RevPAR level. The pricing strategy and occupancy rate of a hotel generates the RevPAR. The initial instinct indicates that management should be capable of influencing both of these components. However, the dominance of tour operators in the resort tourism market creates price pressures on the hotels while determining their pricing strategy. For instance as of 2006, 95 percent of all foreign visitors coming to Antalya came with package tours and 40 percent of them through the largest five tour operators.[96] As a consequence, tour operators have more negotiating power compared to hotel management since they are the main suppliers of tourist arrivals. Nevertheless, it is believed that since the study is based on measuring relative efficiency, all the pressure of tour operators do not totally distort the discretionary feature of RevPAR. Management of each hotel actually competes with the management of another hotel which means that inefficient hotels are not competing with the ideal performers but with the best performers among the DMUs. Therefore, it can be concluded that pressure of tour operators on hotel pricing is a common problem among DMUs and being a better negotiator and pursuing higher price levels are related to the managerial skills.

On the input side, the only debatable issue is the validity of the "room capacity" as a discretionary factor. In this study, room capacity is accepted as a discretionary factor for two

[96] Kofteoglu, F. (2008)

reasons. At the investment stage, the room capacity is determined by the owner without significant influence or limitation from the outside factors. In addition, at the operational stage, with a reasonable amount of investment, room capacity could be changed. If the management or the hotel owner believes that there is over capacity, then excess room supply can be converted to meeting rooms or other activity areas. On the other hand, if there is limitation in room supply, then room capacity can be increased by constructing additional blocks. However naturally, it is more difficult to change the room capacity in the operational stage.

Along with the input factors, there are various non discretionary factors that may negatively or positively influence the technical efficiency of the DMUs. Some examples of non discretionary factors are ownership differences, location characteristics and opening dates. This study however considers these non-discretionary factors while evaluating the results.

Table 4.1.4 illustrates the characteristics of the variables in more detail. Even though the data set is composed of either 4 or 5 star hotels, RevPAR changes in a wide range between 15.96 € and 101.8 € The hotel with the lowest RevPAR has the lowest occupancy rate of 30 percent. However, it has a room rate of 53 € which is better than the three hotels in the data set. On the other hand, the hotel having the highest RevPAR of 101.8 € has the highest occupancy rate of 87 percent. As in the case of lowest performer, its room rate is 117 € which is among the top three hotels in the data set. It can be realized that successful hotels sustain a balance between room price and occupancy rather than trying to focus on single item.

"Other revenue" also changes drastically among DMUs ranging from 0.42 € to 34.05 € in 2005. In "all inclusive" concept hotels, it is very common that other revenue is low since all F&B revenues are included in RevPAR. When the data set is examined in more detail, it was found

out that the mean of other revenue is more than expected as a result of the two extreme DMUs. One of these hotels have over 30 € because of its golf facilities while the other is very popular among wealthy domestic tourists. Although the mean of the other revenue per room is 6.51 €, its median is 3.68 € which is more reasonable indicator in case of extremes.

Customer satisfaction scores of DMUs are relatively closer to each other ranging from 290 to 550 in a scale of 600. None of the hotels in the data set totally satisfies customers however the mean of 466 over 600 indicates that hotels in general are successful to fulfill customer expectations.

Table 4.1.4: Main Characteristics of the Outputs and Inputs

Variables	Units	Range	Mean	Range	Mean
Outputs		**2004**		**2005**	
RevPAR	Value in €	15.96 - 101.8	47.25	15.07 - 104.73	49.24
Other Revenue	Value in €	0.18 - 34.53	6.13	0.42 - 34.05	6.51
Customer Satisfaction	Number	290 - 550	466	290 - 550	466
Inputs					
Room Capacity	Number	179- 888	390	179 - 888	390
Personnel Cost	Value in (000) €	287 - 4,489	1,505	305 - 6,108	1,839
F&B	Value in (000) €	259 - 4,370	1,369	204 - 4,918	1,579
Energy cost	Value in (000) €	57 - 1,011	480	74 - 1,224	519
Other Cost	Value in (000) €	207 - 8,069	1,437	346 - 7,941	1,563

By feeding the above mentioned inputs and outputs to the DEAP version 2.1[97], the technical efficiencies of each DMU were determined. Not only pure technical efficiency but also scale efficiency of the DMUs were presented by using VRS.

In this study, output oriented approach, which aims to maximize output without changing the input quantities is employed. As discussed previously, the choice of output oriented approach is related with the vision that Turkey should follow. Turkey is facing the threat of becoming a

[97] Coelli, T. (1996)

cheap destination by solely focusing on cost controls at individual hotel level. Focusing on cost controls distorts the perception of customers and in the mean time damages the revenue components. As a result, the pricing strategy of the market is dominated by the tour operators. In order to create a wider vision and to have sustainable tourism growth, resort hotels should concentrate on output maximization strategies.

4.2 Research Findings and Discussions

Before presenting the details of DEA findings, initially the correlation between inputs and outputs needs to be examined. The selection of right inputs and outputs is an important phase of DEA to reach consistent results. The thesis applied Eviews at 0.05 significance level to find out the correlation between inputs and outputs.

Table 4.2.1: Eviews Correlation Coefficient of Selected Input /Output Variables

		Input				
Year	**Output**	Room Capacity	Personnel Cost	Energy Cost	F&B Cost	Other Cost
2004	RevPAR	0.2254	0.6207	0.5664	0.7281	0.5366
	Other Revenue	0.1402	0.5926	0.4133	0.1719	0.2951
	Customer Satisfaction	0.1428	0.4332	0.2304	0.1853	0.0629
2005	RevPAR	0.1937	0.6053	0.5631	0.7028	0.5680
	Other Revenue	0.1768	0.5629	0.4430	0.2036	0.2880
	Customer Satisfaction	0.1428	0.4567	0.4713	0.2768	0.1827

The correlation results prove that output variable of RevPAR is highly correlated with inputs of personnel cost, energy cost, F&B cost and other costs. This high level of correlation represents that any increase in RevPAR also affects the personnel, energy and F&B cost to increase. On the contrary, RevPAR is not highly correlated with room capacity. The low level of correlation between RevPAR and room capacity indicates that capacity increase in the hotels is not

contributing enough for positive changes in RevPAR. That is, for a higher RevPAR one does not need to invest heavily during initial investment stage.

Other revenue per room sold is found to be highly correlated with only personnel and energy cost in parallel to the expectations. As mentioned earlier other revenues include fitness, spa, business center, laundry, sport activities, rent revenue from hotel shops and other miscellaneous facilities. Other revenue is also related with other costs but still the correlation between the two is less significant than expected. Probably, this resulted mainly from the dominance of maintenance and marketing costs within other costs. As might have been expected these two components of other costs are mostly related with room revenues.

Not surprisingly, customer satisfaction is the least correlated output with respect to inputs. In the hospitality industry, it is a common view that customer satisfaction increases as long as there exists a positive interaction between personnel of the hotel and the customer. Negative attitude of personnel can also distort the positive perception of customers created through physical conditions of a hotel. Therefore, high correlation between customer satisfaction and personnel cost should be taken into consideration while employing the personnel. Employing unskilled and intern personnel in key positions or reducing the number of personnel in order to minimize personnel cost can damage the quality as well as the customer satisfaction.

The correlation analysis between inputs and outputs were conducted for 2004 and 2005 and between the two years only one remarkable difference was observed. This difference was the positive correlation between customer satisfaction and energy cost has been increased between two years. It is believed that this finding could be explained by the fact that more customers

look for air conditioned rooms, aqua parks and high energy consuming facilities along with well trained and polite personnel.

The output oriented technical efficiency for the years 2004 and 2005 are presented in the below Table 4.2.2 by using DEA with the primary output and input set. The primary output set composed of two outputs, RevPAR and other revenue per room sold and five inputs room capacity, F&B cost, personnel cost, energy cost and other cost.

Table 4.2.2: DEA Technical Efficiency Scores for Resort Hotels in Turkey

	2004			2005		
No	Technical efficiency CRS (CCR MODEL)	Technical efficiency VRS (BCC MODEL)	Technical efficiency Scale Index	Technical efficiency CRS (CCR MODEL)	Technical efficiency VRS (BCC MODEL)	Technical efficiency Scale Index
4	1.000	1.000	1.000	0.996	1.000	0.996
5	1.000	1.000	1.000	1.000	1.000	1.000
12	1.000	1.000	1.000	1.000	1.000	1.000
15	1.000	1.000	1.000	1.000	1.000	1.000
20	1.000	1.000	1.000	1.000	1.000	1.000
22	1.000	1.000	1.000	1.000	1.000	1.000
24	1.000	1.000	1.000	1.000	1.000	1.000
27	0.984	1.000	0.984	1.000	1.000	1.000
23	0.962	1.000	0.962	0.877	1.000	0.877
10	0.955	0.975	0.979	0.926	0.940	0.985
21	0.953	1.000	0.953	0.930	1.000	0.930
3	0.840	0.918	0.915	0.741	0.852	0.869
1	0.777	0.878	0.885	0.875	0.991	0.883
26	0.740	0.747	0.991	0.549	0.642	0.854
17	0.683	0.767	0.891	0.587	0.655	0.895
13	0.636	0.688	0.925	0.634	0.645	0.982
2	0.603	0.742	0.813	0.482	0.637	0.757
11	0.595	0.700	0.849	0.589	0.756	0.779
8	0.549	0.599	0.915	0.675	0.771	0.876
14	0.529	0.811	0.652	0.536	0.790	0.678
6	0.503	0.716	0.703	0.500	0.679	0.736
9	0.488	0.598	0.816	0.532	0.590	0.902
7	0.481	0.630	0.763	0.537	0.636	0.844
16	0.453	0.526	0.861	0.430	0.536	0.803
19	0.443	0.646	0.686	0.385	0.561	0.687
18	0.412	0.527	0.781	0.462	0.563	0.820
25	0.387	0.552	0.701	0.329	0.379	0.869
28	0.380	0.472	0.805	0.426	0.488	0.872
Mean	**0.727**	**0.803**	**0.887**	**0.714**	**0.790**	**0.889**

The first column in Table 4.2.2 indicates the technical efficiency scores of each DMU. The study aims to find the sources of technical inefficiency therefore the technical efficiency score presented in the first column is decomposed into scale and pure technical efficiency. Under VRS model, which is employed in this study, technical efficiency is referred as "pure" to signal that it is net of any scale effects. In other words, the second column represents the pure technical efficiency score of DMUs. The third column illustrates the scale efficiency scores of DMUs. As presented in Chapter 3, technical efficiency score of a DMU can be calculated by multiplying its scale and pure technical efficiency scores.

In this study, CRS assumption is not preferred since assuming that all DMUs are at optimal scale is not realistic. However, it should be kept in mind that at optimal scale, pure technical efficiency scores presented in the second column will be exactly the same as the technical efficiency scores in the first column.

The study verified that, ten hotels were purely technically efficient for both years. From the scale efficiency point of view, only seven hotels were efficient. Efficient hotels are indicated with the value of 1 and rest of the data set was ranked accordingly. The picture changes when total technical efficiency is considered. As presented in the first column, only seven hotels were technically efficient (having efficiency score of 1) for both years. This means that only seven hotels are both pure technical and scale efficient.

The average technical efficiency score equals to 72.7 percent and 71.4 percent in 2004 and 2005 respectively. The scores verify that the hotels can improve their outputs by 27.3 percent and 28.6 percent respectively in 2004 and 2005 without increasing their inputs. When the reason of inefficiency is investigated it can be realized that the average pure technical

efficiency has a pull down effect on the average technical efficiency. The average pure technical efficiency scores are 80.3 percent and 79 percent in 2004 and 2005 with respect to scale efficiency scores of 88.7 percent and 88.9 percent respectively.

The high levels of scale efficiency scores are indicating that all hotels are close to being scale efficient. The lowest scale efficiency scores are 65.2 percent and 67.8 percent in 2004 and 2005 respectively. All hotels, with the exception of two, are experiencing DRS (decreasing returns to scale) for both years.

There is a slight technical efficiency distortion from 72.7 percent to 71.4 percent which is less than one percent between 2004 and 2005. When Table 4.1.4 is examined in detail, it is realized that the problem is input based rather than output.

In 2005, outputs increased by 4 to 6 percent whereas inputs used to generate that level of output increased significantly by 8 to 22 percent. The mismatch between input usage and output generation caused efficiency deterioration in 2005. Under normal circumstances, it would be expected that efficiency level of all DMUs would improve in 2005 since in this year Turkey experienced 20 percent international tourist growth compared to 2004.[98] The core reason behind this significant increase in costs is macro economic. The revenues of resort hotels in Turkey is mainly in € while costs are in YTL denominated. The 5.5 percent devaluation of € with respect to YTL in 2005 negatively affected the costs of all hotels. As a result, all resort hotels experienced a technical efficiency distortion in 2005.

[98] Ministry of Culture and Tourism (2008)

Despite these distortions in efficiency levels, the results are higher than what is found in various manufacturing industries. Taymaz, E. (2005) reported that paper and printing industry has a pure technical efficiency score of 83.1 percent which is the only industry in his study having higher efficiency score than the resort hotels within the scope of this study. Rest of the industries such as food and tobacco, textile, wood products, chemicals, glass, cement, basic metals and engineering have lower efficiency levels with respect to resort hotels.

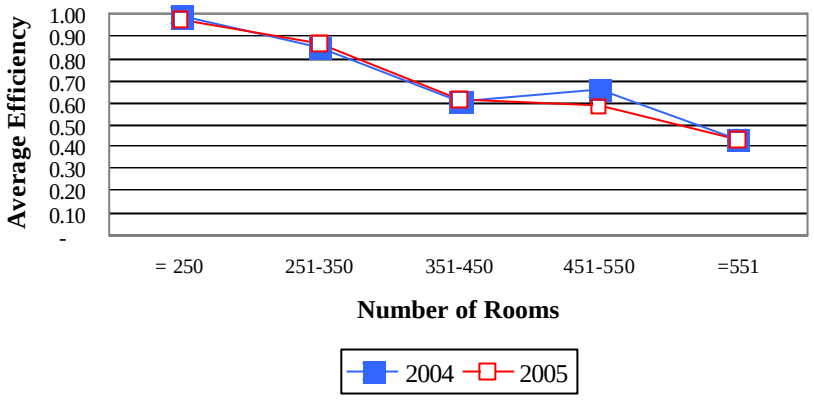
In fact, higher efficiency scores are consistent with the competitive market structure of hospitality industry (Anderson et al 1999). Hotel industry is believed to be highly competitive as there are less entry-exit barriers compared to tobacco, chemicals, cement and basic metals.

Table 4.2.3: Overall Technical Efficiency Score

Number of Rooms	**Number of Hotels**	**Average of technical efficiency**	
		2004	2005
179-250	6	0.99	0.98
251-350	6	0.85	0.87
351-450	7	0.61	0.61
451-550	5	0.66	0.58
=551	4	0.44	0.43

The table 4.2.3 indicates a declining efficiency performance as the number of rooms increased. This trend shows that hotels having less than 250 rooms are experiencing the highest levels of efficiency. In addition, hotels having room numbers ranging from 251 to 350 also have relatively high efficiency scores whereas hotels over 350 rooms are facing serious efficiency problems. A graphical illustration of the same data can be more informative.

Figure 4.2.1 Technical Efficiency Scores versus Number of Rooms



Similar to the findings of this study, Aslantas, S. (2004) reported that smaller financial intermediaries are more efficient with respect to larger ones. The advantage of being small in service industries could be explained as increased flexibility, faster decision making and faster adaptation to changes. On the contrary to these findings, Taymaz et al (1997) and Taymaz, E. (2005) presented that larger establishments are more efficient especially in cement and motor vehicle industries. This probably is a result of the high amount of fixed costs in these industries and thus economies of scale reached with increased volumes.

Personnel or labor is one of the main inputs in the hotel industry since it represents between 30 to 35 percent of the total operational cost of a hotel. It is remarkable that the efficient hotels have neither the highest nor the lowest personnel cost per available room. This indicates that hotel managements should aim a balanced approach in terms of cost saving and service quality rather than a strict emphasis on each of these aspects.

Table 4.2.4: Personnel Cost versus Technical Efficiency

Number of Hotels	Mean Technical efficiency CRS (CCR MODEL) 2005	Personnel Cost per Available Room (€)
7	1.00	12.29
5	0.92	14.02
6	0.63	10.97
5	0.52	12.94
5	0.41	11.92

Particularly, for "all inclusive" resort hotels, F&B cost is as important as personnel cost. Its share in total operational cost is between 25 to 30 percent. F&B cost is totally related to the occupancy of the hotel and therefore has a variable cost nature, that is if a particular hotel operates at a high level of occupancy, its F&B costs increases accordingly. Therefore, F&B cost of hotels can be evaluated in terms of room sold. Efficiency of a hotel is expected to increase if its F&B cost per room sold is lower compared to its level of RevPAR. The below table verifies this view since hotels with lower F&B cost per room sold have higher level of efficiency scores. The only exception is the last group of hotels which have the lowest technical efficiency average of 41 percent but not the highest F&B cost per room sold. This means that solely having low level of F&B cost per room sold does not guarantee the efficiency if a hotel can not generate reasonable level of RevPAR in the first place.

Table 4.2.5: F&B Cost versus Technical Efficiency

Number of Hotels	Mean Technical efficiency CRS (CCR MODEL) 2005	F&B Cost per Room Sold (€)
7	1.00	17.06
5	0.92	17.48
6	0.63	19.25
5	0.52	22.38
5	0.41	17.66

The energy cost in resort hotels is found to be very standardized. The average energy cost per room sold is 6.54 € and accounts between 5 to 15 percent of the hotels' total costs. Only hotels at full efficiency have slightly less energy costs but in general energy costs are stabilized in the industry at 6 € level per room sold and almost all hotels are capable of achieving these levels. With regard to the Table 4.2.6, it should be noted that in the second tier group, the average energy cost of 8.32 € per room sold is a result of a hotel having golf facilities that require additional energy consumption.

Table 4.2.6: Energy Cost versus Technical Efficiency

Number of Hotels	Mean Technical efficiency CRS (CCR MODEL) 2005	Energy Cost per Room Sold (€)
7	1.00	5.40
5	0.92	8.32
6	0.63	6.69
5	0.52	6.37
5	0.41	6.33

Other cost includes all operational costs of a hotel other than the above mentioned costs of personnel, F&B and energy. Table 4.2.7 does not illustrate any significant finding regarding the other cost per room sold. This is probably a result of the mixed cost structure of other costs such as marketing or maintenance costs.

Table 4.2.7: Other Cost versus Technical Efficiency

Number of Hotels	Mean Technical efficiency CRS (CCR MODEL) 2005	Other Cost per Room Sold (€)
7	1.00	18.25
5	0.92	14.25
6	0.63	14.91
5	0.52	26.37
5	0.41	18.83

With regard to star categories of hotels, 4 star hotels are more efficient when compared with the 5 star hotels both for years 2004 and 2005. This finding is inline with the finding of Tarim et al. (2000) who found out the same result under CRS. In their study, 4 star hotels were found to be more efficient with respect to 5 star hotels with average efficiency score of 72 percent and 52 percent respectively. Although the data set for each study is different, it is interesting that both of the studies came to a similar conclusion regarding the star categories.

Table 4.2.8: Efficiency Scores of Star Categories

Cities	Technical efficiency CRS (CCR MODEL) 2004	Technical efficiency CRS (CCR MODEL) 2005
5 Star	0.673	0.661
4 Star	0.811	0.797

This finding also indicates that 4 star hotels have a more balanced cost and revenue structure. In fact, this finding verifies the threats that were mentioned in the second chapter. As mentioned in that chapter, Turkey faces decline in its receipt per international arrival which is a result of the marketing strategy of Turkey. Turkish hotel industry focuses on mid-level customer demand which actually is the right customer profile for 4 star hotels. However, for 5 star hotels, this customer profile creates inefficiency since 5 star hotels are ending up with mid level tourists. By the same token, it could be concluded that if the current customer does not change through time, the investors should consider investing in 4 star hotels rather than 5 star hotels.

If the efficiency scores are reviewed on city basis, the most efficient city is Mugla for years 2004 and 2005 in terms of both scale and pure technical efficiency. However, further research

is required with a larger dataset in order to analyze this result as the number of hotels located in these cities was different in the dataset of this thesis.

Table 4.2.9: Efficiency Scores of Cities

Cities	Technical efficiency CRS (CCR MODEL) 2004	Technical efficiency CRS (CCR MODEL) 2005
Antalya	0.718	0.707
Mugla	0.829	0.782
Aydin	0.617	0.653

When the efficiencies are investigated on district basis, the findings are more difficult to evaluate since some districts in the data set such as Alanya-Antalya and Bodrum-Mugla are represented by a single hotel. Despite this drawback, it can be concluded that hotels operating in Belek-Antalya are technically more efficient than Kemer-Antalya. Belek is relatively new destination and closer to airport than Kemer which could be the main reasons behind this efficiency difference. It is believed that it would not be appropriate to compare other locations since the number of hotels is quite few for each district.

Table 4.2.10: Efficiency Scores of Districts

City	Districts	Technical efficiency CRS (CCR MODEL) 2004	Technical efficiency CRS (CCR MODEL) 2005	Number of Hotels
Antalya	Alanya	1.000	1.000	1
Antalya	Belek	0.731	0.716	8
Antalya	Kemer	0.680	0.616	6
Antalya	Lara	0.736	0.750	2
Antalya	Side	0.834	0.734	3
Aydin	Kusadasi	0.617	0.653	3
Mugla	Bodrum	0.955	0.549	1
Mugla	Fethiye	0.562	0.715	2
Mugla	Marmaris	0.897	0.965	2

Concerning the opening date of the establishments which is among other non discretionary factors, the results do not provide a clear indication that new hotels are more efficient with respect to older ones. However, there is a clue that hotels that are built after 2000 are more efficient.

Table 4.2.11 Opening Dates and Efficiency Scores

Opening Date	Technical efficiency CRS (CCR MODEL) 2004	Technical efficiency CRS (CCR MODEL) 2005
After 2000	0.813	0.827
2000-1995	0.633	0.589
1994-1990	0.747	0.726
Before 1990	0.719	0.731

Another interesting finding of the study is that individual hotels within data set of this study are more efficient compared to chain hotels[99]. In the data set of this study, twenty hotels out of twenty-eight are members of local chains. This finding is interesting since there is a general perception that chain hotels are more efficient than individual hotels. In fact, it is still believed that this finding is related to only local chains. If the study is repeated with a dataset of international chain hotels versus individual hotels, the findings would probably be parallel to Hwang et al (2003) who found out that hotels belonging to international chains are more efficient than individually operated hotels.

[99] In this study chain hotel is considered as at least three hotels managed by a single owner.

Table 4.2.12: Type of Hotels and Efficiency Scores

Type of Hotel	Technical efficiency CRS (CCR MODEL) 2004	Technical efficiency CRS (CCR MODEL) 2005
Member of a Chain	0.713	0.700
Individual	0.762	0.749

As mentioned in Chapter 2, in order to encourage tourism investments, lands of Turkish Treasury started to be rented to hotel investors in the 1980s. This kind of incentive is very common in the industry and it is still utilized by investors. The dataset of this study covers 28 hotels, 22 of which are constructed on the lands of Turkish Treasury. The findings indicate that hotels that pay rent to government are less efficient than hotels that own their land. This finding is very logical since at operational state, owning a land does not create additional operational costs. However, if the initial investment cost of land is included into efficiency studies, most probably hotels with their own land would came out to be less efficient.

Table 4.2.13: Type of Land Ownership and Efficiency Scores

Type of Land Ownership	Technical efficiency CRS (CCR MODEL) 2004	Technical efficiency CRS (CCR MODEL) 2005
Lease Holder	0.696	0.676
Landlord	0.842	0.853

From this point onwards, all the study will be based on pure technical efficiency results. The performance of the inefficient hotels could be improved by using a reference set for each hotel. The summary of peers indicates that each hotel is capable of improving its efficiency by benchmarking the performance of its peer group. Peer groups are composed of hotels having

efficiency score of one, indicating 100 percent efficiency. Based on 2005 results, ten hotels in the data set are found to be technically efficient. Table 4.2.14 illustrates how many times each efficient hotel is benchmarked as a peer for inefficient hotels. It can be realized that although Hotel 4 and Hotel 23 are efficient, they are not peer to any of the inefficient hotels. An efficient hotel is chosen as peer for inefficient hotels that surround it.

In light of this information, it is noted that none of the DMUs are comparable to Hotel 4 and Hotel 23 at their dimensions. It is most probable that this is a result of the self identifier problem mentioned earlier in Chapter 3. If this is the case, Hotel 4 and Hotel 23 are efficient not because they actually are but since no other DMU is comparable at their dimensions. As discussed in Chapter 3, self identifier is one the weaknesses of DEA model and can be eliminated by increasing the number of DMUs.

Table 4.2.14: Peer Count Summary (2005)

Efficient Hotels (VRS)	Number of times as peer
Hotel 12	14
Hotel 15	14
Hotel 22	11
Hotel 24	4
Hotel 20	3
Hotel 21	3
Hotel 5	2
Hotel 27	1
Hotel 4	0
Hotel 23	0

Among the efficient hotels, Hotel 12 and Hotel 15 are the most benchmarked hotels. If an inefficient hotel has more than one peer, the peer weights that are presented in Appendix 3, will be used.

DEA provides separate information how each hotel can reach efficiency. In this study, output oriented model is used therefore DEA introduces new output levels to reach to efficiency for each inefficient hotel while keeping the input levels constant. The new output level that helps to reach full efficiency is calculated by benchmarking the peers' performance and the weights allocated to each of them.

Table 4.2.15 illustrates the results for an inefficient hotel, namely Hotel1, in the data set.

Table 4.2.15: DEA Results for Hotel 1 (2005)

Technical efficiency = 0.991					
Scale efficiency = 0.883 (drs)					
PROJECTION SUMMARY:					
variable		**original value**	**radial movement**	**slack movement**	**projected value**
output	1	8121.000	71.004	0.000	8192.004
output	2	584.000	5.106	0.000	589.106
input	1	122640.000	0.000	-32404.931	90235.069
input	2	2433.000	0.000	-921.270	1511.730
input	3	948.000	0.000	-539.206	408.794
input	4	2396.000	0.000	-212.360	2183.640
input	5	1152.000	0.000	0.000	1152.000
LISTING OF PEERS:					
peer	**lambda weight**				
15	0.033				
12	0.606				
22	0.361				

The technical efficiency score of Hotel 1 is 99.1 percent and it can reach efficiency by benchmarking Hotel 15, Hotel 12 and Hotel 22 with the suggested weights. Currently, Hotel 1 operates with a RevPAR of 81.21 € and with other revenue per room sold of 5.84 €. If the hotel manages to make slight increases for both outputs, it can reach to full efficiency. This hotel will be efficient if RevPAR and other revenue per room reaches to 81.92 € and 5.89 € respectively.

If table 4.2.15 is examined in detail, it can be realized that projected value for inputs are also different than original values which should not be the case since output oriented models aim to improve outputs without increasing inputs. However, the results do not suggest any radial movement for inputs but all suggested input reduction is in slack movements. As mentioned in Chapter 3, the slack issue is a drawback of piecewise linear form of the non-parametric frontier in DEA. When the frontier runs parallel to axes, either output or input slacks or both can occur. The slack problem would be eliminated only if infinite sample size were available.

The input slacks for Hotel 1 indicate that outputs can reach to their projected values when room capacity (input 1), personnel cost (input 2), energy cost (input 3) and F&B cost (input 4) decrease to their projected values. This means that these costs are unnecessarily high and are not contributing to the efficiency of the Hotel 1. On the contrary, other cost (input 5) is at is ideal value.

DEA results provide details on which outputs to focus on in order to improve efficiency however they do not specify how to do that. As discussed earlier, the efficiency scores in this study are relative efficiencies therefore higher efficiency levels are attainable for inefficient hotels since they have a peer group to follow. In case of inefficient hotels, hotel managers should be capable of introducing new strategies and overcome the pressures of tour operators on RevPAR to the extent that their peers have already achieved.

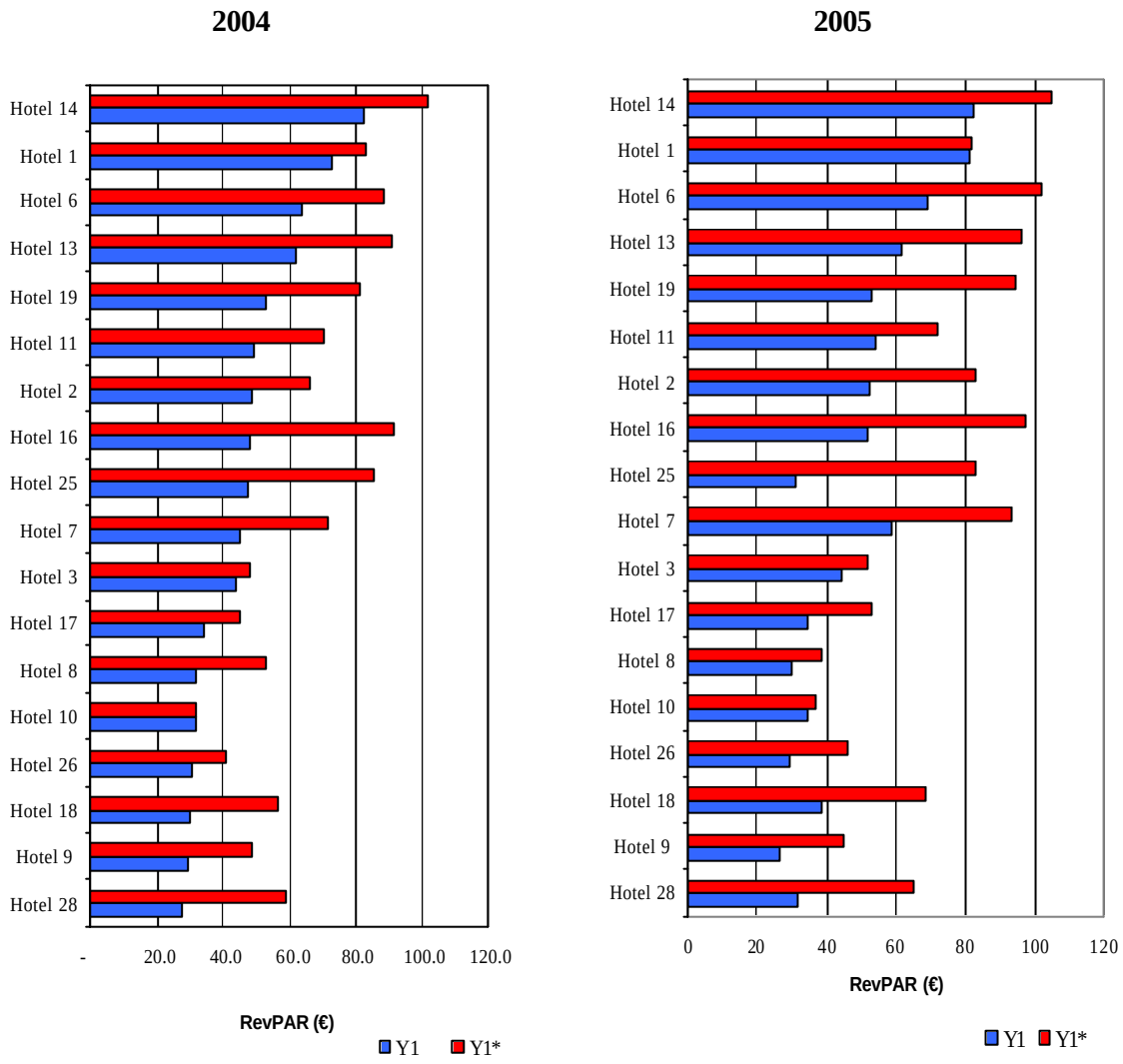
On the other hand, for efficient hotels improving efficiency levels are more difficult since they do not have any benchmark. It is possible that all the efficient hotels in the data set are also inefficient in reality since the best performing hotels in the data set are accepted as efficient

hotels due to the employed methodology. As previously discussed, tour operators have pressure on room rates and occupancy which forces most of the hotels to focus on inputs rather than outputs. In practice, most of the resort hotels in Turkey try to overcome problems by cost control which leads to cheap destination image.

Furthermore, there is always a limit to cost minimization as even the least quality inputs have their costs. However, RevPAR has almost no limitation since room prices are determined based on high quality and marketing success.

In Figure 4.2.2, RevPARs are illustrated as Y1 (original) and Y1*(targeted by the results of DEA model) respectively. The below figure indicates that inefficient hotels have to improve their original RevPAR around 50 percent on average in order to reach efficient hotels. The huge difference between the original and the target RevPAR shows that the pricing strategy and the related occupancy rates of the resort hotels are not set correctly. Although the required RevPAR increase is less than 10 percent for some of the hotels, majority of these hotels need serious improvement.

Figure 4.2.2: Actual versus Target RevPAR



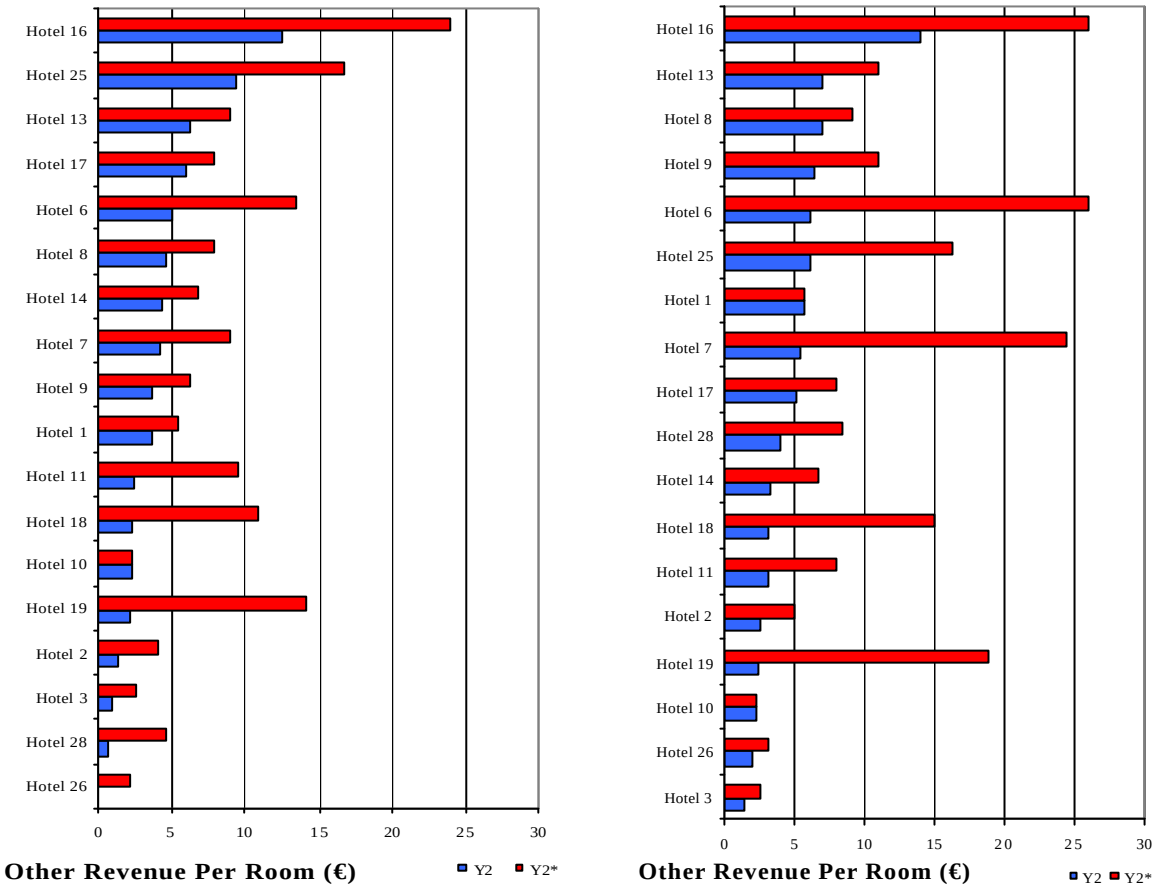
For instance, Hotel 28, has a RevPAR of 31.8 € while its target RevPAR is 65.2 € in 2005. When the performance of Hotel 28 is examined in more detail, it is realized that Hotel 28 is facing a pricing problem rather than an occupancy problem. As of 2005, Hotel 28 has an occupancy rate of 55 percent which is inline with the average occupancy rate of 56 percent of the dataset. However its room rate is 57.6 € which is quite incompatible with respect to ARR of 88 € of the dataset. Therefore, all hotels are examined one by one in order to find out either room rate or the occupancy is the reason for their low RevPAR. As a result, it was found out that one third of the inefficient hotels are facing both occupancy and ARR problems. This

indicates that those hotels do not have a focus on either of them and therefore experiencing two way problem. This could be an advantage to improve efficiency if occupancy and ARR are slightly different than the average of the dataset. If this is the case, with minor changes, hotels can increase their efficiency without changing their customer profile or marketing strategy. On the other hand, hotels with extremely low occupancy rate and ARR are the most difficult group that could realize efficiency improvement since they have to make significant changes in management.

Among the remaining two third of inefficient hotels, half of them are facing low occupancy while the other half are troubled with low ARR. Hotels with low occupancy rates need to focus on solutions to attract and enlarge its customer profile while hotels with low ARR should focus on solutions how to convince its customer profile to pay more, if not they change the whole profile of customers.

Figure 4.2.3 Actual versus Target Other Revenue

2004 **2005**



In the case of other revenue per room, inefficient hotels have to improve their original values more than double on average in order to reach efficient hotels. The average of other revenue per room for inefficient hotels is 4.9 € which is targeted to reach to 11.5 €. Other revenue per room can be improved by individual decisions of the hotel management since it is not related to negotiations with tour operators or any country specific marketing strategies.

As mentioned earlier, the study also takes into consideration the "customer satisfaction" as the third output factor and a second data set is used for this purpose. The table 4.2.16 presents the DEA results with this second data set.

Table 4.2.16 DEA Technical Efficiency Scores with Customer Satisfaction

	2004			2005		
No	Technical efficiency CRS (CCR MODEL)	Technical efficiency VRS (BCC MODEL)	Technical efficiency Scale Index	Technical efficiency CRS (CCR MODEL)	Technical efficiency VRS (BCC MODEL)	Technical efficiency Scale Index
4	1.000	1.000	1.000	0.996	1.000	0.996
5	1.000	1.000	1.000	1.000	1.000	1.000
12	1.000	1.000	1.000	1.000	1.000	1.000
15	1.000	1.000	1.000	1.000	1.000	1.000
20	1.000	1.000	1.000	1.000	1.000	1.000
22	1.000	1.000	1.000	1.000	1.000	1.000
24	1.000	1.000	1.000	1.000	1.000	1.000
27	1.000	1.000	1.000	1.000	1.000	1.000
23	0.962	1.000	0.962	0.927	1.000	0.927
10	0.955	0.975	0.979	0.961	0.972	0.989
21	0.953	1.000	0.953	0.930	1.000	0.930
26	0.863	0.944	0.914	0.684	0.935	0.732
3	0.840	1.000	0.840	0.747	1.000	0.747
1	0.777	0.967	0.803	0.875	1.000	0.875
17	0.683	0.803	0.851	0.587	0.765	0.767
8	0.644	0.918	0.702	0.675	0.918	0.735
13	0.640	0.893	0.717	0.637	0.871	0.731
11	0.613	0.945	0.649	0.589	0.946	0.622
2	0.603	0.960	0.628	0.482	0.950	0.507
9	0.540	0.826	0.654	0.577	0.833	0.693
18	0.535	1.000	0.535	0.533	1.000	0.533
14	0.529	0.903	0.586	0.536	0.876	0.611
6	0.503	0.927	0.543	0.500	0.905	0.552
7	0.490	0.868	0.565	0.538	0.859	0.626
16	0.453	0.960	0.472	0.430	0.959	0.449
19	0.444	0.916	0.485	0.385	0.913	0.422
28	0.419	0.907	0.463	0.428	0.892	0.479
25	0.387	0.569	0.680	0.329	0.535	0.615
Mean	**0.744**	**0.939**	**0.785**	**0.727**	**0.933**	**0.769**

The second data set composed of three outputs, RevPAR, other revenue per room sold and customer satisfaction and five inputs room capacity, F&B cost, personnel cost, energy cost and other cost.

After including customer satisfaction into the model, no change was observed in terms of hotels that were chosen as technically efficient and all hotels which were efficient with the primary dataset were still efficient. The picture changed slightly for inefficient hotels in the

data set and the average technical efficiency of the DMUs increased from 71.4 percent to 72.7 percent for the year 2005.

Including customer satisfaction into outputs did not cause any efficiency distortion for efficient hotels. None of the efficient hotels in the primary data set became inefficient as a result of their customer satisfaction performance although some of them experienced very poor customer satisfaction ranking. Table 4.2.17 illustrates the customer satisfaction rankings of the efficient hotels in 2005.

Table 4.2.17 Efficient Hotels (2005)

Hotel No	Customer Satisfaction Score	Customer Satisfaction Ranking
15	550	1
5	510	8
22	503	9
12	462	20
27	445	22
20	400	24
24	333	27

The mean of customer satisfaction for efficient hotels is 457 in 2005, which is even lower than the mean of 469 for inefficient hotels. As Table 4.2.17 illustrates, Hotel 24 and Hotel 20 are among the five worst performers in terms of customer satisfaction but still found to be as technically efficient. The findings through efficient hotels lead to a conclusion that the main drivers of technical efficiency are RevPAR and other revenue per room.

The main reason why customer satisfaction did not change the efficiency rankings of the hotels could be the weak correlation between customer satisfaction and most of the inputs. For this reason, it might be argued that including customer satisfaction as another output did not provide additional information.

Chapter 5: Conclusion

5.1 Summary of Findings and Conclusions

This thesis aimed to analyze the current situation of Turkish tourism industry with respect to Mediterranean countries of EU and also to measure technical efficiency of resort hotels in Turkey. The obtained results provide some important insights not only in terms of the relative efficiency of resort hotels but also on Turkish tourism industry in general. Based on the detailed literature review conducted, it could be argued that no previous study on hotel efficiency included a sectoral coverage as broad as this study provided.

The first section of this thesis concentrated on tourism industry and initially some background information on world and EU tourism was provided. In this part, it is noted that the world tourism industry is growing by the increase in the number of international tourists rather than the tourism receipt per tourist. Over the last decade, CAGR of the number of international tourists and receipt per tourist increased by 3.9 percent and 0.5 percent respectively.

On top of the increase in the number of international tourists, the increase in destinations also helps tourism industry grow. Strong growth in tourism demand is expected in less developed destinations such as Africa, Asia and the Pacific while modest growth in mature destinations such as Europe and America in the coming years.

Despite the modest growth in the continent of Europe, the geographical enlargement of EU continuously increased the number of tourists visiting EU and also accelerated the intra EU tourism as a consequence of Schengen agreement.

In this study, Mediterranean countries of EU, namely Greece, Spain, France, Italy, Southern Cyprus and Malta have been examined in detail since Turkey mainly competes with these countries in the resort hotel industry. It is notable that among these six EU countries, Greece, Spain, Southern Cyprus and Malta are more dependent on tourism industry than Turkey in terms of both GDP contribution and employment.

Considering the competitiveness performance, Turkey ranked 52nd in TTCI among 124 countries which is below most of the EU27 countries except Latvia, Bulgaria, Poland and Romania. The TTCI report illustrates that Turkey does not provide sufficient attention on environmental regulations, infrastructure and human resources.

On the other hand, Turkey is extremely successful in attracting international tourists with a CAGR of 9.2 percent in the last decade. However it faces a serious decline in its receipt per international tourist since year 2000. As of 2007, the receipt per international tourist is only half of what has been received in year 2000. This illustrates that Turkey is in the treat of becoming a cheap destination. It is believed that cost oriented approach of "all inclusive" concept is one of the main factors of this distortion. One way of overcoming this problem is product differentiation. "All inclusive" concept needs to be kept with reasonable pricing strategy to maintain the mid level tourist demand which is the main driving force to create volume. In addition, Turkish hotel industry needs to create a luxurious concept to attract wealthier tourist demand which is the main source to increase receipt per tourist. However, it is critical that, these two customer profiles should not be mixed in a single hotel with a single concept.

Additionally, the potential of domestic tourists should be utilized better. Currently domestic tourists are not considered as a source for steady tourism growth since their demand is growing less than 1 percent each year. However, domestic tourism demand could be a life saver in cases when international tourism demand shrinks as a result of health or security issues in the region. While international tourism demand may be volatile, becoming a member to EU would nevertheless be an additional advantage for Turkish tourism in terms of marketing, structural funds and perception.

The second part of this thesis aimed to examine the measurement of relative efficiency and to present an insight of how a resort hotel can improve efficiency with its current resource base. For this purpose, the thesis adopted output oriented DEA under VRS to 28 resort hotels in Turkey by using 2004 and 2005 results. These hotels were located in the provinces of Antalya, Mugla and Aydin and were all 4 or 5 star properties. The study employed RevPAR, other revenue per room as output factors while input factors comprised of room capacity, personnel cost, food & beverage cost, energy cost and other operational costs.

The general conclusion is that only seven hotels among twenty eight are technically efficient in both years. The average technical efficiency scores equal to 72.7 percent and 71.4 percent in 2004 and 2005, respectively. This score suggests that hotels could only increase their outputs by 27.3 percent and 28.6 percent respectively without using additional inputs. Separate information is provided for each inefficient hotel on how much to improve in each output factor to reach efficiency.

With regard to the comparison of efficiency scores between 2004 and 2005, it is observed that in 2005, a minor decrease in technical efficiency score has occurred mainly as a result of

devaluation of € with respect to YTL. Exchange rate changes affect hotel performances since the revenues of resort hotels in Turkey are mainly in € while their costs are in YTL.

The study also decomposed technical efficiency into scale and pure technical efficiency. The high levels of scale efficiency scores indicated that majority of the hotels are close to being scale efficient. It is realized that pure technical efficiency scores had a pull down effect on the overall technical efficiency scores.

One of the major findings of the analysis is that smaller hotels are more efficient. The results indicate that efficiency score of hotels decrease as the number of rooms increased. The average room capacity of efficient hotels is 260 compared to 433 in inefficient hotels.

It is also remarkable that the efficient hotels have neither the highest not the lowest personnel cost per available room. This finding suggests that a balanced approach is more appropriate than focusing on personnel cost savings or aiming to maximize service quality at the expense of increased personnel cost. The study also verifies that hotels with low F&B cost per room have higher level of efficiency scores. This finding is not surprising since F&B cost accounts for 25 to 30 percent of the total operational costs of a hotel. On the other hand, the results indicate that there is a standard level of energy cost in the industry which does not vary among DMUs with respect to their technical efficiency scores.

The study also indicates that inefficient hotels have to improve their RevPAR around 50 percent on average in order to reach efficient hotels. It has been verified that low RevPAR resulted from both occupancy rate and ARR for one third of the inefficient hotels. The

remaining two third is suffering from the problems with a single component, either occupancy rate or ARR.

It is also realized that 4 star hotels have higher efficiency scores with respect to 5 star hotels. This result is similar to those obtained by Tarim et al. (2000) who conducted a study on 21 hotels in Antalya. Based on this finding it could be concluded that current customer profile in Turkey is not appropriate for 5 star hotels to be efficient. Under the current circumstances, investing in 4 star hotels could be concluded as more suitable for investors.

When efficiency scores of resort hotels are evaluated with location perspective, it is realized that hotels in Mugla are more efficient than those located in Antalya and Aydin. However, further research is required with a larger dataset in order to analyze this result as the number of hotels located in these cities was different in the dataset of this thesis.

A surprising finding of this study is that the average efficiency score of individual hotels are higher than chain hotels. This finding is on the contrary of the study conducted by Hwang et al (2003) who reported that international chains are more efficient than individual hotels. It is believed that the results are not similar to the study of Hwang et al (2003) since the chain hotels in our dataset are operated under local chains rather than international ones. An interesting further research could be the comparison of efficiency scores hotels operating under local chains and international chains. However, this might prove to be difficult for resort hotels and more applicable in city hotels as international chains usually operate in this segment of the industry.

Finally, no significant change was noted in the efficiency scores of DMUs when the customer satisfaction was added as a third output. Nevertheless, the study did not totally exclude the effects of customer satisfaction since it employed financial measures as its outputs.

5.2 Suggestions for Further Research

There are two important further research areas that can be pursued as an extension of this thesis. The first one is to apply DEA to city hotels in Turkey. This kind of future research may illustrate whether same conclusions can be replicated in different hotel segments and findings can be generalized for Turkish hotel industry as a whole.

Second, different models could be used to assess the efficiency scores of the resort hotels in the dataset. Combining results of DEA with parametric methods may help finding additional results.

Appendices

Appendix 1

Travel & Tourism Employment in EU27 Countries

	Employment (000)			
Countries	**Direct**	**% of Total**	**Direct & Indirect**	**% of Total**
Germany	1,240	14%	4,173	17%
Spain	1,494	16%	3,899	16%
France	1,284	14%	3,257	13%
Italy	1,052	12%	2,625	10%
UK	950	10%	2,599	10%
Poland	273	3.0%	1,129	4.5%
Portugal	396	4.4%	945	3.8%
Greece	450	5.0%	869	3.5%
Austria	292	3.2%	783	3.1%
Netherlands	230	2.5%	612	2.4%
Czech Republic	109	1.2%	587	2.3%
Romania	273	3.0%	516	2.1%
Belgium	146	1.6%	487	1.9%
Bulgaria	107	1.2%	380	1.5%
Sweden	118	1.3%	354	1.4%
Slovakia	44	0.5%	309	1.2%
Hungary	197	2.2%	307	1.2%
Denmark	108	1.2%	283	1.1%
Finland	84	0.9%	255	1.0%
Ireland	52	0.6%	154	0.6%
Slovenia	37	0.4%	138	0.5%
Cyprus	55	0.6%	110	0.4%
Lithuania	17	0.2%	103	0.4%
Estonia	17	0.2%	95	0.4%
Latvia	12	0.1%	56	0.2%
Malta	25	0.3%	44	0.2%
Luxembourg	7	0.1%	23	0.1%
Total	**9,072**	**100%**	**25,091**	**100%**

Source: WTTC (n.a.)

Appendix 2 Questionnaire

Please fill out the form

Monthly Distribution of Beds or Rooms Sold in 2005
January
February
March
April
May
June
July
August
September
October
November
December
Total Number of Beds or Rooms Sold in 2005

	2004	**2005**
Number of Days Open		
Rooms Sold		
Beds Sold		

USD, € or YTL (Please Verify)	**2004**	**2005**
Total Revenues		
A. Room Revenue		
B. F&B Revenue (Based on Sales structure, All-Incl, HB, FB)		
C. Extra F&B Revenue		
D. Other Revenue (Sport facilities, leasable area, laundry...etc)		
Total Operational Cost		
A. F&B Cost		
B. Staff Cost (Including Administrative staff)		
C. Utility Cost (Water, electiricity...etc)		
D. Marketing		
E. Land Rent		
F. Other Cost		

Please do not include depreciaiton, amortisation and financial expenses into operational costs

Indicate the sales structure of the hotel

All Inclusive
Full Board
Half Board
Bed & Breakfast

HOTEL								
Name	Category Location	Date for Start of Construction	Opening Dat Ownership	Land Size	Total Construction Area (sqm)	Average Room Size (sqm)	Room Capacity	Bed Capacity

TOTAL INVESTMENT COST				Number of Staff			Number of Staff		
Construction	Mechanics Electrical	Fixture, Equipment	Furniture	Administrative	Other	Total	Permanent	Seasonal	Total

Do not include financial expenses into the investment cost

INORDER: 2004

Output1: Revpar
Output2: Other revenue per room
Input1: Room Capacity
Input2: Staff Cost
Input3: Energy Cost
Input 4: F&B Cost
Input5: Other Cost

Results from DEAP Version 2.1

Instruction file = set1.ins
Data file = set1.dta

Output orientated DEA

Scale assumption: VRS

Slacks calculated using one-stage method

EFFICIENCY SUMMARY:

firm	crste	vrste	scale
1	0.777	0.878	0.885 drs
2	0.603	0.742	0.813 drs
3	0.840	0.918	0.915 drs
4	1.000	1.000	1.000 -
5	1.000	1.000	1.000 -
6	0.503	0.716	0.703 drs
7	0.481	0.630	0.763 drs
8	0.549	0.599	0.915 drs
9	0.488	0.598	0.816 drs
10	0.955	0.975	0.979 irs
11	0.595	0.700	0.849 drs
12	1.000	1.000	1.000 -
13	0.636	0.688	0.925 drs
14	0.529	0.811	0.652 drs
15	1.000	1.000	1.000 -
16	0.453	0.526	0.861 drs
17	0.683	0.767	0.891 drs
18	0.412	0.527	0.781 drs
19	0.443	0.646	0.686 drs
20	1.000	1.000	1.000 -
21	0.953	1.000	0.953 drs
22	1.000	1.000	1.000 -

23	0.962	1.000	0.962	drs
24	1.000	1.000	1.000	-
25	0.387	0.552	0.701	drs
26	0.740	0.747	0.991	drs
27	0.984	1.000	0.984	irs
28	0.380	0.472	0.805	drs
mean	0.727	0.803	0.887	

Note: crste = technical efficiency from CRS DEA
vrste = technical efficiency from VRS DEA
scale = scale efficiency = crste/vrste

Note also that all subsequent tables refer to VRS results

SUMMARY OF OUTPUT SLACKS:

firm	output:	1	2
1		0.000	133.439
2		0.000	229.820
3		0.000	159.184
4		0.000	0.000
5		0.000	0.000
6		0.000	651.011
7		0.000	244.033
8		0.000	0.000
9		0.000	0.000
10		0.000	0.000
11		0.000	591.304
12		0.000	0.000
13		0.000	0.000
14		0.000	143.048
15		0.000	0.000
16		0.000	0.000
17		0.000	0.000
18		0.000	654.665
19		0.000	1088.597
20		0.000	0.000
21		0.000	0.000
22		0.000	0.000
23		0.000	0.000
24		0.000	0.000
25		0.000	0.000
26		0.000	178.373
27		0.000	0.000
28		0.000	317.638
mean		0.000	156.825

SUMMARY OF INPUT SLACKS:

firm	input: 1	2	3	4	5
1	25321.787	345.442	341.285	0.000	0.000
2	91002.742	620.581	245.968	747.129	0.000
3	30245.380	492.555	68.414	342.953	0.000
4	0.000	0.000	0.000	0.000	0.000
5	0.000	0.000	0.000	0.000	0.000
6	95851.001	774.204	296.964	0.000	0.000
7	53243.911	490.355	109.708	0.000	0.000
8	43743.075	0.000	0.000	194.774	171.629
9	48544.509	0.000	24.808	0.000	519.208
10	64155.761	298.530	230.501	418.783	0.000
11	27639.831	518.274	306.149	0.000	0.000
12	0.000	0.000	0.000	0.000	0.000
13	43183.130	206.583	0.000	778.397	751.546
14	132860.000	597.000	185.000	1654.000	6840.000
15	0.000	0.000	0.000	0.000	0.000
16	211466.984	2216.607	497.513	735.185	9.433
17	52016.818	0.000	0.000	0.000	54.630
18	59338.222	14.098	0.000	0.000	0.000
19	93376.163	621.291	304.758	0.000	0.000
20	0.000	0.000	0.000	0.000	0.000
21	0.000	0.000	0.000	0.000	0.000
22	0.000	0.000	0.000	0.000	0.000
23	0.000	0.000	0.000	0.000	0.000
24	0.000	0.000	0.000	0.000	0.000
25	137616.980	0.000	457.060	108.534	918.354
26	96598.591	0.000	39.124	473.377	314.445
27	0.000	0.000	0.000	0.000	0.000
28	118712.760	0.000	0.000	0.000	1136.113
mean	50889.916	256.983	110.973	194.755	382.691

SUMMARY OF PEERS:

firm	peers:			
1	21	22	12	
2	22	12		
3	12	22		
4	4			
5	5			
6	12	15	21	
7	21	12	15	
8	15	12	20	24
9	23	12	15	22
10	27	5	22	

11 21 15 12
12 12
13 12 15 20
14 12
15 15
16 15 12
17 24 22 23 15 12
18 12 21 15 20
19 21 12 15
20 20
21 21
22 22
23 23
24 24
25 15 12 23
26 22 12
27 27
28 22 12 20 15

SUMMARY OF PEER WEIGHTS:
(in same order as above)

firm peer weights:
1 0.321 0.051 0.629
2 0.581 0.419
3 0.123 0.877
4 1.000
5 1.000
6 0.538 0.276 0.186
7 0.575 0.271 0.154
8 0.076 0.278 0.249 0.397
9 0.093 0.067 0.109 0.731
10 0.095 0.540 0.365
11 0.593 0.172 0.235
12 1.000
13 0.738 0.117 0.145
14 1.000
15 1.000
16 0.650 0.350
17 0.183 0.517 0.123 0.126 0.052
18 0.014 0.293 0.282 0.411
19 0.320 0.365 0.315
20 1.000
21 1.000
22 1.000
23 1.000
24 1.000
25 0.375 0.472 0.153
26 0.995 0.005

27 1.000
28 0.218 0.273 0.450 0.059

PEER COUNT SUMMARY:
(i.e., no. times each firm is a peer for another)

firm	peer count:
1	0
2	0
3	0
4	0
5	1
6	0
7	0
8	0
9	0
10	0
11	0
12	17
13	0
14	0
15	12
16	0
17	0
18	0
19	0
20	4
21	6
22	8
23	3
24	2
25	0
26	0
27	1
28	0

SUMMARY OF OUTPUT TARGETS:

firm	output: 1	2
1	8310.272	549.294
2	6620.065	398.355
3	4804.780	258.308
4	7192.000	3453.000
5	2957.000	279.000
6	8862.253	1346.364
7	7152.555	902.341
8	5272.344	785.846

9	4885.979	621.609
10	3226.141	229.633
11	7036.985	944.153
12	10180.000	673.000
13	9073.806	898.800
14	10180.000	673.000
15	8679.000	3322.000
16	9204.635	2394.346
17	4492.900	794.246
18	5695.695	1089.292
19	8149.276	1407.690
20	3767.000	93.000
21	5319.000	362.000
22	4049.000	200.000
23	3210.000	735.000
24	2130.000	814.000
25	8549.285	1675.088
26	4081.172	202.482
27	1596.000	63.000
28	5867.088	463.944

SUMMARY OF INPUT TARGETS:

firm	input: 1	2	3	4	5
1	97318.213	1477.558	428.715	1934.000	1084.000
2	84197.258	959.419	370.032	1428.871	724.000
3	77064.620	564.445	320.586	773.047	467.000
4	167900.000	3957.000	940.000	1772.000	2532.000
5	65335.000	858.000	240.000	258.000	326.000
6	104533.999	1852.796	469.036	1943.000	1581.000
7	102246.089	1522.645	424.292	1301.000	1278.000
8	80721.925	918.000	266.000	1062.226	875.371
9	81030.491	730.000	337.192	751.000	714.792
10	69434.239	636.470	244.499	350.217	327.000
11	102665.169	1526.726	423.851	1238.000	1299.000
12	98185.000	1734.000	467.000	2715.000	1228.000
13	96976.870	1651.417	426.000	2212.603	1278.454
14	98185.000	1734.000	467.000	2715.000	1228.000
15	120450.000	2561.000	537.000	1322.000	2717.000
16	112653.016	2271.393	512.487	1809.815	2195.567
17	80113.182	728.000	313.000	696.000	795.370
18	93961.778	1285.902	320.000	750.000	1205.000
19	105548.837	1805.709	459.242	1608.000	1597.000
20	71905.000	498.000	128.000	376.000	375.000
21	99280.000	1145.000	374.000	630.000	916.000
22	74095.000	400.000	300.000	500.000	360.000
23	77015.000	456.000	302.000	643.000	789.000
24	66430.000	296.000	160.000	286.000	590.000
25	103283.020	1848.000	467.940	1875.466	1718.646

26	74221.409	407.000	300.876	511.623	364.555
27	74825.000	286.000	57.000	299.000	206.000
28	82402.240	935.000	282.000	1097.000	741.887

FIRM BY FIRM RESULTS:

Results for firm: 1
Technical efficiency = 0.878
Scale efficiency = 0.885 (drs)
PROJECTION SUMMARY:

variable	original value	radial movement	slack movement	projected value
output 1	7294.000	1016.272	0.000	8310.272
output 2	365.000	50.855	133.439	549.294
input 1	122640.000	0.000	-25321.787	97318.213
input 2	1823.000	0.000	-345.442	1477.558
input 3	770.000	0.000	-341.285	428.715
input 4	1934.000	0.000	0.000	1934.000
input 5	1084.000	0.000	0.000	1084.000

LISTING OF PEERS:

peer	lambda weight
21	0.321
22	0.051
12	0.629

Results for firm: 2
Technical efficiency = 0.742
Scale efficiency = 0.813 (drs)
PROJECTION SUMMARY:

variable	original value	radial movement	slack movement	projected value
output 1	4910.000	1710.065	0.000	6620.065
output 2	125.000	43.535	229.820	398.355
input 1	175200.000	0.000	-91002.742	84197.258
input 2	1580.000	0.000	-620.581	959.419
input 3	616.000	0.000	-245.968	370.032
input 4	2176.000	0.000	-747.129	1428.871
input 5	724.000	0.000	0.000	724.000

LISTING OF PEERS:

peer	lambda weight
22	0.581
12	0.419

Results for firm: 3
Technical efficiency = 0.918

Scale efficiency = 0.915 (drs)

PROJECTION SUMMARY:

variable		original value	radial movement	slack movement	projected value
output	1	4411.000	393.780	0.000	4804.780
output	2	91.000	8.124	159.184	258.308
input	1	107310.000	0.000	-30245.380	77064.620
input	2	1057.000	0.000	-492.555	564.445
input	3	389.000	0.000	-68.414	320.586
input	4	1116.000	0.000	-342.953	773.047
input	5	467.000	0.000	0.000	467.000

LISTING OF PEERS:

peer	lambda weight
12	0.123
22	0.877

Results for firm: 4

Technical efficiency = 1.000

Scale efficiency = 1.000 (crs)

PROJECTION SUMMARY:

variable		original value	radial movement	slack movement	projected value
output	1	7192.000	0.000	0.000	7192.000
output	2	3453.000	0.000	0.000	3453.000
input	1	167900.000	0.000	0.000	167900.000
input	2	3957.000	0.000	0.000	3957.000
input	3	940.000	0.000	0.000	940.000
input	4	1772.000	0.000	0.000	1772.000
input	5	2532.000	0.000	0.000	2532.000

LISTING OF PEERS:

peer	lambda weight
4	1.000

Results for firm: 5

Technical efficiency = 1.000

Scale efficiency = 1.000 (crs)

PROJECTION SUMMARY:

variable		original value	radial movement	slack movement	projected value
output	1	2957.000	0.000	0.000	2957.000
output	2	279.000	0.000	0.000	279.000
input	1	65335.000	0.000	0.000	65335.000
input	2	858.000	0.000	0.000	858.000
input	3	240.000	0.000	0.000	240.000
input	4	258.000	0.000	0.000	258.000
input	5	326.000	0.000	0.000	326.000

LISTING OF PEERS:

peer	lambda weight

5 1.000

Results for firm: 6
Technical efficiency = 0.716
Scale efficiency = 0.703 (drs)
PROJECTION SUMMARY:

variable		original value	radial movement	slack movement	projected value
output	1	6347.000	2515.253	0.000	8862.253
output	2	498.000	197.352	651.011	1346.364
input	1	200385.000	0.000	-95851.001	104533.999
input	2	2627.000	0.000	-774.204	1852.796
input	3	766.000	0.000	-296.964	469.036
input	4	1943.000	0.000	0.000	1943.000
input	5	1581.000	0.000	0.000	1581.000

LISTING OF PEERS:

peer	lambda weight
12	0.538
15	0.276
21	0.186

Results for firm: 7
Technical efficiency = 0.630
Scale efficiency = 0.763 (drs)
PROJECTION SUMMARY:

variable		original value	radial movement	slack movement	projected value
output	1	4509.000	2643.555	0.000	7152.555
output	2	415.000	243.308	244.033	902.341
input	1	155490.000	0.000	-53243.911	102246.089
input	2	2013.000	0.000	-490.355	1522.645
input	3	534.000	0.000	-109.708	424.292
input	4	1301.000	0.000	0.000	1301.000
input	5	1278.000	0.000	0.000	1278.000

LISTING OF PEERS:

peer	lambda weight
21	0.575
12	0.271
15	0.154

Results for firm: 8
Technical efficiency = 0.599
Scale efficiency = 0.915 (drs)
PROJECTION SUMMARY:

variable		original value	radial movement	slack movement	projected value
output	1	3160.000	2112.344	0.000	5272.344

output	2	471.000	314.846	0.000	785.846
input	1	124465.000	0.000	-43743.075	80721.925
input	2	918.000	0.000	0.000	918.000
input	3	266.000	0.000	0.000	266.000
input	4	1257.000	0.000	-194.774	1062.226
input	5	1047.000	0.000	-171.629	875.371

LISTING OF PEERS:

peer	lambda weight
15	0.076
12	0.278
20	0.249
24	0.397

Results for firm: 9
Technical efficiency = 0.598
Scale efficiency = 0.816 (drs)

PROJECTION SUMMARY:

variable		original value	radial movement	slack movement	projected value
output	1	2924.000	1961.979	0.000	4885.979
output	2	372.000	249.609	0.000	621.609
input	1	129575.000	0.000	-48544.509	81030.491
input	2	730.000	0.000	0.000	730.000
input	3	362.000	0.000	-24.808	337.192
input	4	751.000	0.000	0.000	751.000
input	5	1234.000	0.000	-519.208	714.792

LISTING OF PEERS:

peer	lambda weight
23	0.093
12	0.067
15	0.109
22	0.731

Results for firm: 10
Technical efficiency = 0.975
Scale efficiency = 0.979 (irs)

PROJECTION SUMMARY:

variable		original value	radial movement	slack movement	projected value
output	1	3147.000	79.141	0.000	3226.141
output	2	224.000	5.633	0.000	229.633
input	1	133590.000	0.000	-64155.761	69434.239
input	2	935.000	0.000	-298.530	636.470
input	3	475.000	0.000	-230.501	244.499
input	4	769.000	0.000	-418.783	350.217
input	5	327.000	0.000	0.000	327.000

LISTING OF PEERS:

peer	lambda weight

27	0.095
5	0.540
22	0.365

Results for firm: 11
Technical efficiency = 0.700
Scale efficiency = 0.849 (drs)
PROJECTION SUMMARY:

variable		original value	radial movement	slack movement	projected value
output	1	4926.000	2110.985	0.000	7036.985
output	2	247.000	105.849	591.304	944.153
input	1	130305.000	0.000	-27639.831	102665.169
input	2	2045.000	0.000	-518.274	1526.726
input	3	730.000	0.000	-306.149	423.851
input	4	1238.000	0.000	0.000	1238.000
input	5	1299.000	0.000	0.000	1299.000

LISTING OF PEERS:

peer	lambda weight
21	0.593
15	0.172
12	0.235

Results for firm: 12
Technical efficiency = 1.000
Scale efficiency = 1.000 (crs)
PROJECTION SUMMARY:

variable		original value	radial movement	slack movement	projected value
output	1	10180.000	0.000	0.000	10180.000
output	2	673.000	0.000	0.000	673.000
input	1	98185.000	0.000	0.000	98185.000
input	2	1734.000	0.000	0.000	1734.000
input	3	467.000	0.000	0.000	467.000
input	4	2715.000	0.000	0.000	2715.000
input	5	1228.000	0.000	0.000	1228.000

LISTING OF PEERS:

peer	lambda weight
12	1.000

Results for firm: 13
Technical efficiency = 0.688
Scale efficiency = 0.925 (drs)
PROJECTION SUMMARY:

variable		original value	radial movement	slack movement	projected value
output	1	6239.000	2834.806	0.000	9073.806

output	2	618.000	280.800	0.000	898.800
input	1	140160.000	0.000	-43183.130	96976.870
input	2	1858.000	0.000	-206.583	1651.417
input	3	426.000	0.000	0.000	426.000
input	4	2991.000	0.000	-778.397	2212.603
input	5	2030.000	0.000	-751.546	1278.454

LISTING OF PEERS:

peer	lambda weight
12	0.738
15	0.117
20	0.145

Results for firm: 14
Technical efficiency = 0.811
Scale efficiency = 0.652 (drs)

PROJECTION SUMMARY:

variable		original value	radial movement	slack movement	projected value
output	1	8260.000	1920.000	0.000	10180.000
output	2	430.000	99.952	143.048	673.000
input	1	231045.000	0.000	-132860.000	98185.000
input	2	2331.000	0.000	-597.000	1734.000
input	3	652.000	0.000	-185.000	467.000
input	4	4369.000	0.000	-1654.000	2715.000
input	5	8068.000	0.000	-6840.000	1228.000

LISTING OF PEERS:

peer	lambda weight
12	1.000

Results for firm: 15
Technical efficiency = 1.000
Scale efficiency = 1.000 (crs)

PROJECTION SUMMARY:

variable		original value	radial movement	slack movement	projected value
output	1	8679.000	0.000	0.000	8679.000
output	2	3322.000	0.000	0.000	3322.000
input	1	120450.000	0.000	0.000	120450.000
input	2	2561.000	0.000	0.000	2561.000
input	3	537.000	0.000	0.000	537.000
input	4	1322.000	0.000	0.000	1322.000
input	5	2717.000	0.000	0.000	2717.000

LISTING OF PEERS:

peer	lambda weight
15	1.000

Results for firm: 16

Technical efficiency = 0.526
Scale efficiency = 0.861 (drs)
PROJECTION SUMMARY:

variable		original value	radial movement	slack movement	projected value
output	1	4840.000	4364.635	0.000	9204.635
output	2	1259.000	1135.346	0.000	2394.346
input	1	324120.000	0.000	-211466.984	112653.016
input	2	4488.000	0.000	-2216.607	2271.393
input	3	1010.000	0.000	-497.513	512.487
input	4	2545.000	0.000	-735.185	1809.815
input	5	2205.000	0.000	-9.433	2195.567

LISTING OF PEERS:

peer	lambda weight
15	0.650
12	0.350

Results for firm: 17
Technical efficiency = 0.767
Scale efficiency = 0.891 (drs)
PROJECTION SUMMARY:

variable		original value	radial movement	slack movement	projected value
output	1	3445.000	1047.900	0.000	4492.900
output	2	609.000	185.246	0.000	794.246
input	1	132130.000	0.000	-52016.818	80113.182
input	2	728.000	0.000	0.000	728.000
input	3	313.000	0.000	0.000	313.000
input	4	696.000	0.000	0.000	696.000
input	5	850.000	0.000	-54.630	795.370

LISTING OF PEERS:

peer	lambda weight
24	0.183
22	0.517
23	0.123
15	0.126
12	0.052

Results for firm: 18
Technical efficiency = 0.527
Scale efficiency = 0.781 (drs)
PROJECTION SUMMARY:

variable		original value	radial movement	slack movement	projected value
output	1	3001.000	2694.695	0.000	5695.695
output	2	229.000	205.627	654.665	1089.292
input	1	153300.000	0.000	-59338.222	93961.778
input	2	1300.000	0.000	-14.098	1285.902

input	3	320.000	0.000	0.000	320.000
input	4	750.000	0.000	0.000	750.000
input	5	1205.000	0.000	0.000	1205.000

LISTING OF PEERS:

peer	lambda weight
12	0.014
21	0.293
15	0.282
20	0.411

Results for firm: 19
Technical efficiency = 0.646
Scale efficiency = 0.686 (drs)

PROJECTION SUMMARY:

variable		original value	radial movement	slack movement	projected value
output	1	5261.000	2888.276	0.000	8149.276
output	2	206.000	113.093	1088.597	1407.690
input	1	198925.000	0.000	-93376.163	105548.837
input	2	2427.000	0.000	-621.291	1805.709
input	3	764.000	0.000	-304.758	459.242
input	4	1608.000	0.000	0.000	1608.000
input	5	1597.000	0.000	0.000	1597.000

LISTING OF PEERS:

peer	lambda weight
21	0.320
12	0.365
15	0.315

Results for firm: 20
Technical efficiency = 1.000
Scale efficiency = 1.000 (crs)

PROJECTION SUMMARY:

variable		original value	radial movement	slack movement	projected value
output	1	3767.000	0.000	0.000	3767.000
output	2	93.000	0.000	0.000	93.000
input	1	71905.000	0.000	0.000	71905.000
input	2	498.000	0.000	0.000	498.000
input	3	128.000	0.000	0.000	128.000
input	4	376.000	0.000	0.000	376.000
input	5	375.000	0.000	0.000	375.000

LISTING OF PEERS:

peer	lambda weight
20	1.000

Results for firm: 21

Technical efficiency = 1.000
Scale efficiency = 0.953 (drs)
PROJECTION SUMMARY:

variable		original value	radial movement	slack movement	projected value
output	1	5319.000	0.000	0.000	5319.000
output	2	362.000	0.000	0.000	362.000
input	1	99280.000	0.000	0.000	99280.000
input	2	1145.000	0.000	0.000	1145.000
input	3	374.000	0.000	0.000	374.000
input	4	630.000	0.000	0.000	630.000
input	5	916.000	0.000	0.000	916.000

LISTING OF PEERS:

peer	lambda weight
21	1.000

Results for firm: 22
Technical efficiency = 1.000
Scale efficiency = 1.000 (crs)
PROJECTION SUMMARY:

variable		original value	radial movement	slack movement	projected value
output	1	4049.000	0.000	0.000	4049.000
output	2	200.000	0.000	0.000	200.000
input	1	74095.000	0.000	0.000	74095.000
input	2	400.000	0.000	0.000	400.000
input	3	300.000	0.000	0.000	300.000
input	4	500.000	0.000	0.000	500.000
input	5	360.000	0.000	0.000	360.000

LISTING OF PEERS:

peer	lambda weight
22	1.000

Results for firm: 23
Technical efficiency = 1.000
Scale efficiency = 0.962 (drs)
PROJECTION SUMMARY:

variable		original value	radial movement	slack movement	projected value
output	1	3210.000	0.000	0.000	3210.000
output	2	735.000	0.000	0.000	735.000
input	1	77015.000	0.000	0.000	77015.000
input	2	456.000	0.000	0.000	456.000
input	3	302.000	0.000	0.000	302.000
input	4	643.000	0.000	0.000	643.000
input	5	789.000	0.000	0.000	789.000

LISTING OF PEERS:

peer	lambda weight

23 1.000

Results for firm: 24
Technical efficiency = 1.000
Scale efficiency = 1.000 (crs)
PROJECTION SUMMARY:

variable		original value	radial movement	slack movement	projected value
output	1	2130.000	0.000	0.000	2130.000
output	2	814.000	0.000	0.000	814.000
input	1	66430.000	0.000	0.000	66430.000
input	2	296.000	0.000	0.000	296.000
input	3	160.000	0.000	0.000	160.000
input	4	286.000	0.000	0.000	286.000
input	5	590.000	0.000	0.000	590.000

LISTING OF PEERS:

peer	lambda weight
24	1.000

Results for firm: 25
Technical efficiency = 0.552
Scale efficiency = 0.701 (drs)
PROJECTION SUMMARY:

variable		original value	radial movement	slack movement	projected value
output	1	4721.000	3828.285	0.000	8549.285
output	2	925.000	750.088	0.000	1675.088
input	1	240900.000	0.000	-137616.980	103283.020
input	2	1848.000	0.000	0.000	1848.000
input	3	925.000	0.000	-457.060	467.940
input	4	1984.000	0.000	-108.534	1875.466
input	5	2637.000	0.000	-918.354	1718.646

LISTING OF PEERS:

peer	lambda weight
15	0.375
12	0.472
23	0.153

Results for firm: 26
Technical efficiency = 0.747
Scale efficiency = 0.991 (drs)
PROJECTION SUMMARY:

variable		original value	radial movement	slack movement	projected value
output	1	3047.000	1034.172	0.000	4081.172
output	2	18.000	6.109	178.373	202.482
input	1	170820.000	0.000	-96598.591	74221.409

input	2	407.000	0.000	0.000	407.000
input	3	340.000	0.000	-39.124	300.876
input	4	985.000	0.000	-473.377	511.623
input	5	679.000	0.000	-314.445	364.555

LISTING OF PEERS:

peer	lambda weight
22	0.995
12	0.005

Results for firm: 27
Technical efficiency = 1.000
Scale efficiency = 0.984 (irs)

PROJECTION SUMMARY:

variable		original value	radial movement	slack movement	projected value
output	1	1596.000	0.000	0.000	1596.000
output	2	63.000	0.000	0.000	63.000
input	1	74825.000	0.000	0.000	74825.000
input	2	286.000	0.000	0.000	286.000
input	3	57.000	0.000	0.000	57.000
input	4	299.000	0.000	0.000	299.000
input	5	206.000	0.000	0.000	206.000

LISTING OF PEERS:

peer	lambda weight
27	1.000

Results for firm: 28
Technical efficiency = 0.472
Scale efficiency = 0.805 (drs)

PROJECTION SUMMARY:

variable		original value	radial movement	slack movement	projected value
output	1	2767.000	3100.088	0.000	5867.088
output	2	69.000	77.306	317.638	463.944
input	1	201115.000	0.000	-118712.760	82402.240
input	2	935.000	0.000	0.000	935.000
input	3	282.000	0.000	0.000	282.000
input	4	1097.000	0.000	0.000	1097.000
input	5	1878.000	0.000	-1136.113	741.887

LISTING OF PEERS:

peer	lambda weight
22	0.218
12	0.273
20	0.450
15	0.059

INORDER:2005

Output1: Revpar
Output2: Other revenue per room
Input1: Room Capacity
Input2: Staff Cost
Input3: Energy Cost
Input 4: F&B Cost
Input5: Other Cost

Results from DEAP Version 2.1

Instruction file = seta1.ins
Data file = seta1.dta

Output orientated DEA

Scale assumption: VRS

Slacks calculated using one-stage method

EFFICIENCY SUMMARY:

firm	crste	vrste	scale
1	0.875	0.991	0.883 drs
2	0.482	0.637	0.757 drs
3	0.741	0.852	0.869 drs
4	0.996	1.000	0.996 drs
5	1.000	1.000	1.000 -
6	0.500	0.679	0.736 drs
7	0.537	0.636	0.844 drs
8	0.675	0.771	0.876 drs
9	0.532	0.590	0.902 drs
10	0.926	0.940	0.985 irs
11	0.589	0.756	0.779 drs
12	1.000	1.000	1.000 -
13	0.634	0.645	0.982 drs
14	0.536	0.790	0.678 drs
15	1.000	1.000	1.000 -
16	0.430	0.536	0.803 drs
17	0.587	0.655	0.895 drs
18	0.462	0.563	0.820 drs
19	0.385	0.561	0.687 drs
20	1.000	1.000	1.000 -
21	0.930	1.000	0.930 drs

22	1.000	1.000	1.000	-
23	0.877	1.000	0.877	irs
24	1.000	1.000	1.000	-
25	0.329	0.379	0.869	drs
26	0.549	0.642	0.854	drs
27	1.000	1.000	1.000	-
28	0.426	0.488	0.872	drs
mean	0.714	0.790	0.889	

Note: crste = technical efficiency from CRS DEA
vrste = technical efficiency from VRS DEA
scale = scale efficiency = crste/vrste

Note also that all subsequent tables refer to VRS results

SUMMARY OF OUTPUT SLACKS:

firm	output:	1	2
1		0.000	0.000
2		0.000	93.227
3		0.000	102.860
4		0.000	0.000
5		0.000	0.000
6		0.000	1690.767
7		0.000	1598.747
8		0.000	0.000
9		0.000	0.000
10		0.000	0.000
11		0.000	391.154
12		0.000	0.000
13		0.000	0.000
14		0.000	258.359
15		0.000	0.000
16		0.000	0.000
17		0.000	0.000
18		0.000	941.198
19		0.000	1427.737
20		0.000	0.000
21		0.000	0.000
22		0.000	0.000
23		0.000	0.000
24		0.000	0.000
25		0.000	0.000
26		0.000	0.000
27		0.000	0.000
28		0.000	0.000

mean 0.000 232.287

SUMMARY OF INPUT SLACKS:

firm	input:	1	2	3	4	5
1		32404.931	921.270	539.206	212.360	0.000
2		85389.635	472.815	265.013	442.494	0.000
3		29348.193	649.051	54.676	282.362	0.000
4		0.000	0.000	0.000	0.000	0.000
5		0.000	0.000	0.000	0.000	0.000
6		86463.943	545.253	242.895	0.000	539.691
7		42047.511	118.038	112.344	0.000	0.000
8		50253.167	76.954	143.308	567.186	0.000
9		48012.324	0.000	40.696	293.865	0.000
10		60972.584	574.752	248.695	347.359	0.000
11		28573.620	788.718	457.100	0.000	0.000
12		0.000	0.000	0.000	0.000	0.000
13		40320.587	109.831	0.000	505.208	293.708
14		132860.000	606.000	215.000	1703.000	6416.000
15		0.000	0.000	0.000	0.000	0.000
16		211667.622	3437.748	685.435	1189.659	0.000
17		49228.465	0.000	25.471	208.746	270.988
18		59314.074	0.000	0.000	0.000	93.773
19		90213.079	782.176	498.198	0.000	0.000
20		0.000	0.000	0.000	0.000	0.000
21		0.000	0.000	0.000	0.000	0.000
22		0.000	0.000	0.000	0.000	0.000
23		0.000	0.000	0.000	0.000	0.000
24		0.000	0.000	0.000	0.000	0.000
25		141341.812	0.000	31.872	30.492	418.878
26		94210.033	0.000	74.020	384.467	295.311
27		0.000	0.000	0.000	0.000	0.000
28		113979.205	0.000	0.000	200.967	566.765

mean 49878.600 324.379 129.783 227.434 317.683

SUMMARY OF PEERS:

firm	peers:			
1	15	12	22	
2	12	22		
3	22	12		
4	4			
5	5			
6	15	12		
7	15	12	21	
8	15	24	5	
9	15	5	24	22

10	20	22	24	
11	15	21	12	
12	12			
13	27	12	15	
14	12			
15	15			
16	15	12	22	
17	15	22	24	
18	22	15	12	20
19	15	21	12	
20	20			
21	21			
22	22			
23	23			
24	24			
25	15	22	12	
26	22	12	15	
27	27			
28	20	12	15	22

SUMMARY OF PEER WEIGHTS:
(in same order as above)

firm	peer weights:			
1	0.033	0.606	0.361	
2	0.652	0.348		
3	0.839	0.161		
4	1.000			
5	1.000			
6	0.707	0.293		
7	0.676	0.139	0.185	
8	0.153	0.390	0.456	
9	0.232	0.042	0.381	0.344
10	0.234	0.640	0.126	
11	0.127	0.646	0.226	
12	1.000			
13	0.097	0.726	0.177	
14	1.000			
15	1.000			
16	0.723	0.200	0.076	
17	0.190	0.808	0.002	
18	0.405	0.400	0.068	0.127
19	0.464	0.173	0.362	
20	1.000			
21	1.000			
22	1.000			
23	1.000			
24	1.000			
25	0.406	0.318	0.276	

26 0.928 0.037 0.035
27 1.000
28 0.199 0.234 0.169 0.398

PEER COUNT SUMMARY:
(i.e., no. times each firm is a peer for another)

firm	peer count:
1	0
2	0
3	0
4	0
5	2
6	0
7	0
8	0
9	0
10	0
11	0
12	14
13	0
14	0
15	14
16	0
17	0
18	0
19	0
20	3
21	3
22	11
23	0
24	4
25	0
26	0
27	1
28	0

SUMMARY OF OUTPUT TARGETS:

firm	output: 1	2
1	8192.004	589.106
2	8286.695	504.657
3	5193.479	263.652
4	7548.000	3294.000
5	3852.000	324.000
6	10217.152	2604.460
7	9308.372	2458.682

8	3895.900	910.730
9	4525.267	1102.939
10	3688.936	243.659
11	7209.850	805.225
12	10473.000	675.000
13	9586.780	1095.322
14	10473.000	675.000
15	10111.000	3405.000
16	9731.197	2612.402
17	5307.258	798.302
18	6895.033	1507.937
19	9442.513	1884.087
20	3509.000	203.000
21	5496.000	338.000
22	4184.000	185.000
23	2271.000	342.000
24	1507.000	617.000
25	8325.592	1627.083
26	4624.177	315.957
27	2036.000	42.000
28	6522.263	848.324

SUMMARY OF INPUT TARGETS:

firm	input: 1	2	3	4	5
1	90235.069	1511.730	408.794	2183.640	1152.000
2	89810.365	1501.185	406.987	2270.506	1120.000
3	77961.807	670.949	326.324	935.638	547.000
4	167900.000	4249.000	1149.000	2110.000	2685.000
5	65335.000	1116.000	248.000	278.000	405.000
6	113921.057	2782.747	548.105	2127.000	2529.309
7	113442.489	2573.962	522.656	1724.000	2372.000
8	74211.833	1099.046	244.692	463.814	784.000
9	81562.676	1014.000	290.304	651.135	969.000
10	72617.416	420.248	240.305	454.641	359.000
11	101731.380	1588.282	402.900	1444.000	1308.000
12	98185.000	2088.000	464.000	3214.000	1525.000
13	99839.413	2092.169	447.000	2667.792	1672.292
14	98185.000	2088.000	464.000	3214.000	1525.000
15	120450.000	3071.000	583.000	1676.000	2946.000
16	112452.378	2670.252	537.565	1894.341	2464.000
17	82901.535	908.000	353.529	723.254	852.012
18	93985.926	1600.000	405.000	1150.000	1471.227
19	108711.921	2376.824	498.802	2078.000	2078.000
20	71905.000	538.000	148.000	465.000	346.000
21	99280.000	1121.000	346.000	779.000	909.000
22	74095.000	400.000	300.000	500.000	360.000
23	77015.000	479.000	249.000	530.000	347.000
24	66430.000	305.000	108.000	205.000	378.000

25	99558.188	1950.000	460.128	1726.508	1731.122
26	76609.967	556.000	315.980	641.533	493.689
27	74825.000	350.000	74.000	396.000	462.000
28	87135.795	1274.000	356.000	1326.033	1067.235

FIRM BY FIRM RESULTS:

Results for firm: 1
Technical efficiency = 0.991
Scale efficiency = 0.883 (drs)
PROJECTION SUMMARY:

variable		original value	radial movement	slack movement	projected value
output	1	8121.000	71.004	0.000	8192.004
output	2	584.000	5.106	0.000	589.106
input	1	122640.000	0.000	-32404.931	90235.069
input	2	2433.000	0.000	-921.270	1511.730
input	3	948.000	0.000	-539.206	408.794
input	4	2396.000	0.000	-212.360	2183.640
input	5	1152.000	0.000	0.000	1152.000

LISTING OF PEERS:

peer	lambda weight
15	0.033
12	0.606
22	0.361

Results for firm: 2
Technical efficiency = 0.637
Scale efficiency = 0.757 (drs)
PROJECTION SUMMARY:

variable		original value	radial movement	slack movement	projected value
output	1	5277.000	3009.695	0.000	8286.695
output	2	262.000	149.430	93.227	504.657
input	1	175200.000	0.000	-85389.635	89810.365
input	2	1974.000	0.000	-472.815	1501.185
input	3	672.000	0.000	-265.013	406.987
input	4	2713.000	0.000	-442.494	2270.506
input	5	1120.000	0.000	0.000	1120.000

LISTING OF PEERS:

peer	lambda weight
12	0.652
22	0.348

Results for firm: 3

Technical efficiency = 0.852
Scale efficiency = 0.869 (drs)
PROJECTION SUMMARY:

variable		original value	radial movement	slack movement	projected value
output	1	4425.000	768.479	0.000	5193.479
output	2	137.000	23.792	102.860	263.652
input	1	107310.000	0.000	-29348.193	77961.807
input	2	1320.000	0.000	-649.051	670.949
input	3	381.000	0.000	-54.676	326.324
input	4	1218.000	0.000	-282.362	935.638
input	5	547.000	0.000	0.000	547.000

LISTING OF PEERS:

peer	lambda weight
22	0.839
12	0.161

Results for firm: 4
Technical efficiency = 1.000
Scale efficiency = 0.996 (drs)
PROJECTION SUMMARY:

variable		original value	radial movement	slack movement	projected value
output	1	7548.000	0.000	0.000	7548.000
output	2	3294.000	0.000	0.000	3294.000
input	1	167900.000	0.000	0.000	167900.000
input	2	4249.000	0.000	0.000	4249.000
input	3	1149.000	0.000	0.000	1149.000
input	4	2110.000	0.000	0.000	2110.000
input	5	2685.000	0.000	0.000	2685.000

LISTING OF PEERS:

peer	lambda weight
4	1.000

Results for firm: 5
Technical efficiency = 1.000
Scale efficiency = 1.000 (crs)
PROJECTION SUMMARY:

variable		original value	radial movement	slack movement	projected value
output	1	3852.000	0.000	0.000	3852.000
output	2	324.000	0.000	0.000	324.000
input	1	65335.000	0.000	0.000	65335.000
input	2	1116.000	0.000	0.000	1116.000
input	3	248.000	0.000	0.000	248.000
input	4	278.000	0.000	0.000	278.000
input	5	405.000	0.000	0.000	405.000

LISTING OF PEERS:

peer	lambda weight
5	1.000

Results for firm: 6
Technical efficiency = 0.679
Scale efficiency = 0.736 (drs)
PROJECTION SUMMARY:

variable		original value	radial movement	slack movement	projected value
output	1	6933.000	3284.152	0.000	10217.152
output	2	620.000	293.693	1690.767	2604.460
input	1	200385.000	0.000	-86463.943	113921.057
input	2	3328.000	0.000	-545.253	2782.747
input	3	791.000	0.000	-242.895	548.105
input	4	2127.000	0.000	0.000	2127.000
input	5	3069.000	0.000	-539.691	2529.309

LISTING OF PEERS:

peer	lambda weight
15	0.707
12	0.293

Results for firm: 7
Technical efficiency = 0.636
Scale efficiency = 0.844 (drs)
PROJECTION SUMMARY:

variable		original value	radial movement	slack movement	projected value
output	1	5921.000	3387.372	0.000	9308.372
output	2	547.000	312.936	1598.747	2458.682
input	1	155490.000	0.000	-42047.511	113442.489
input	2	2692.000	0.000	-118.038	2573.962
input	3	635.000	0.000	-112.344	522.656
input	4	1724.000	0.000	0.000	1724.000
input	5	2372.000	0.000	0.000	2372.000

LISTING OF PEERS:

peer	lambda weight
15	0.676
12	0.139
21	0.185

Results for firm: 8
Technical efficiency = 0.771
Scale efficiency = 0.876 (drs)
PROJECTION SUMMARY:

variable		original value	radial movement	slack movement	projected value
output	1	3003.000	892.900	0.000	3895.900

output	2	702.000	208.730	0.000	910.730
input	1	124465.000	0.000	-50253.167	74211.833
input	2	1176.000	0.000	-76.954	1099.046
input	3	388.000	0.000	-143.308	244.692
input	4	1031.000	0.000	-567.186	463.814
input	5	784.000	0.000	0.000	784.000

LISTING OF PEERS:

peer	lambda weight
15	0.153
24	0.390
5	0.456

Results for firm: 9
Technical efficiency = 0.590
Scale efficiency = 0.902 (drs)

PROJECTION SUMMARY:

variable		original value	radial movement	slack movement	projected value
output	1	2671.000	1854.267	0.000	4525.267
output	2	651.000	451.939	0.000	1102.939
input	1	129575.000	0.000	-48012.324	81562.676
input	2	1014.000	0.000	0.000	1014.000
input	3	331.000	0.000	-40.696	290.304
input	4	945.000	0.000	-293.865	651.135
input	5	969.000	0.000	0.000	969.000

LISTING OF PEERS:

peer	lambda weight
15	0.232
5	0.042
24	0.381
22	0.344

Results for firm: 10
Technical efficiency = 0.940
Scale efficiency = 0.985 (irs)

PROJECTION SUMMARY:

variable		original value	radial movement	slack movement	projected value
output	1	3467.000	221.936	0.000	3688.936
output	2	229.000	14.659	0.000	243.659
input	1	133590.000	0.000	-60972.584	72617.416
input	2	995.000	0.000	-574.752	420.248
input	3	489.000	0.000	-248.695	240.305
input	4	802.000	0.000	-347.359	454.641
input	5	359.000	0.000	0.000	359.000

LISTING OF PEERS:

peer	lambda weight
20	0.234

22	0.640
24	0.126

Results for firm: 11
Technical efficiency = 0.756
Scale efficiency = 0.779 (drs)
PROJECTION SUMMARY:

variable		original value	radial movement	slack movement	projected value
output	1	5450.000	1759.850	0.000	7209.850
output	2	313.000	101.070	391.154	805.225
input	1	130305.000	0.000	-28573.620	101731.380
input	2	2377.000	0.000	-788.718	1588.282
input	3	860.000	0.000	-457.100	402.900
input	4	1444.000	0.000	0.000	1444.000
input	5	1308.000	0.000	0.000	1308.000

LISTING OF PEERS:

peer	lambda weight
15	0.127
21	0.646
12	0.226

Results for firm: 12
Technical efficiency = 1.000
Scale efficiency = 1.000 (crs)
PROJECTION SUMMARY:

variable		original value	radial movement	slack movement	projected value
output	1	10473.000	0.000	0.000	10473.000
output	2	675.000	0.000	0.000	675.000
input	1	98185.000	0.000	0.000	98185.000
input	2	2088.000	0.000	0.000	2088.000
input	3	464.000	0.000	0.000	464.000
input	4	3214.000	0.000	0.000	3214.000
input	5	1525.000	0.000	0.000	1525.000

LISTING OF PEERS:

peer	lambda weight
12	1.000

Results for firm: 13
Technical efficiency = 0.645
Scale efficiency = 0.982 (drs)
PROJECTION SUMMARY:

variable		original value	radial movement	slack movement	projected value
output	1	6188.000	3398.780	0.000	9586.780
output	2	707.000	388.322	0.000	1095.322

input	1	140160.000	0.000	-40320.587	99839.413
input	2	2202.000	0.000	-109.831	2092.169
input	3	447.000	0.000	0.000	447.000
input	4	3173.000	0.000	-505.208	2667.792
input	5	1966.000	0.000	-293.708	1672.292

LISTING OF PEERS:

peer	lambda weight
27	0.097
12	0.726
15	0.177

Results for firm: 14
Technical efficiency = 0.790
Scale efficiency = 0.678 (drs)

PROJECTION SUMMARY:

variable		original value	radial movement	slack movement	projected value
output	1	8270.000	2203.000	0.000	10473.000
output	2	329.000	87.641	258.359	675.000
input	1	231045.000	0.000	-132860.000	98185.000
input	2	2694.000	0.000	-606.000	2088.000
input	3	679.000	0.000	-215.000	464.000
input	4	4917.000	0.000	-1703.000	3214.000
input	5	7941.000	0.000	-6416.000	1525.000

LISTING OF PEERS:

peer	lambda weight
12	1.000

Results for firm: 15
Technical efficiency = 1.000
Scale efficiency = 1.000 (crs)

PROJECTION SUMMARY:

variable		original value	radial movement	slack movement	projected value
output	1	10111.000	0.000	0.000	10111.000
output	2	3405.000	0.000	0.000	3405.000
input	1	120450.000	0.000	0.000	120450.000
input	2	3071.000	0.000	0.000	3071.000
input	3	583.000	0.000	0.000	583.000
input	4	1676.000	0.000	0.000	1676.000
input	5	2946.000	0.000	0.000	2946.000

LISTING OF PEERS:

peer	lambda weight
15	1.000

Results for firm: 16
Technical efficiency = 0.536

Scale efficiency = 0.803 (drs)

PROJECTION SUMMARY:

variable		original value	radial movement	slack movement	projected value
output	1	5215.000	4516.197	0.000	9731.197
output	2	1400.000	1212.402	0.000	2612.402
input	1	324120.000	0.000	-211667.622	112452.378
input	2	6108.000	0.000	-3437.748	2670.252
input	3	1223.000	0.000	-685.435	537.565
input	4	3084.000	0.000	-1189.659	1894.341
input	5	2464.000	0.000	0.000	2464.000

LISTING OF PEERS:

peer	lambda weight
15	0.723
12	0.200
22	0.076

Results for firm: 17

Technical efficiency = 0.655

Scale efficiency = 0.895 (drs)

PROJECTION SUMMARY:

variable		original value	radial movement	slack movement	projected value
output	1	3477.000	1830.258	0.000	5307.258
output	2	523.000	275.302	0.000	798.302
input	1	132130.000	0.000	-49228.465	82901.535
input	2	908.000	0.000	0.000	908.000
input	3	379.000	0.000	-25.471	353.529
input	4	932.000	0.000	-208.746	723.254
input	5	1123.000	0.000	-270.988	852.012

LISTING OF PEERS:

peer	lambda weight
15	0.190
22	0.808
24	0.002

Results for firm: 18

Technical efficiency = 0.563

Scale efficiency = 0.820 (drs)

PROJECTION SUMMARY:

variable		original value	radial movement	slack movement	projected value
output	1	3881.000	3014.033	0.000	6895.033
output	2	319.000	247.739	941.198	1507.937
input	1	153300.000	0.000	-59314.074	93985.926
input	2	1600.000	0.000	0.000	1600.000
input	3	405.000	0.000	0.000	405.000
input	4	1150.000	0.000	0.000	1150.000

input	5	1565.000	0.000	-93.773	1471.227

LISTING OF PEERS:

peer	lambda weight
22	0.405
15	0.400
12	0.068
20	0.127

Results for firm: 19
Technical efficiency = 0.561
Scale efficiency = 0.687 (drs)

PROJECTION SUMMARY:

variable		original value	radial movement	slack movement	projected value
output	1	5297.000	4145.513	0.000	9442.513
output	2	256.000	200.350	1427.737	1884.087
input	1	198925.000	0.000	-90213.079	108711.921
input	2	3159.000	0.000	-782.176	2376.824
input	3	997.000	0.000	-498.198	498.802
input	4	2078.000	0.000	0.000	2078.000
input	5	2078.000	0.000	0.000	2078.000

LISTING OF PEERS:

peer	lambda weight
15	0.464
21	0.173
12	0.362

Results for firm: 20
Technical efficiency = 1.000
Scale efficiency = 1.000 (crs)

PROJECTION SUMMARY:

variable		original value	radial movement	slack movement	projected value
output	1	3509.000	0.000	0.000	3509.000
output	2	203.000	0.000	0.000	203.000
input	1	71905.000	0.000	0.000	71905.000
input	2	538.000	0.000	0.000	538.000
input	3	148.000	0.000	0.000	148.000
input	4	465.000	0.000	0.000	465.000
input	5	346.000	0.000	0.000	346.000

LISTING OF PEERS:

peer	lambda weight
20	1.000

Results for firm: 21
Technical efficiency = 1.000
Scale efficiency = 0.930 (drs)

PROJECTION SUMMARY:

variable		original value	radial movement	slack movement	projected value
output	1	5496.000	0.000	0.000	5496.000
output	2	338.000	0.000	0.000	338.000
input	1	99280.000	0.000	0.000	99280.000
input	2	1121.000	0.000	0.000	1121.000
input	3	346.000	0.000	0.000	346.000
input	4	779.000	0.000	0.000	779.000
input	5	909.000	0.000	0.000	909.000

LISTING OF PEERS:

peer	lambda weight
21	1.000

Results for firm: 22
Technical efficiency = 1.000
Scale efficiency = 1.000 (crs)

PROJECTION SUMMARY:

variable		original value	radial movement	slack movement	projected value
output	1	4184.000	0.000	0.000	4184.000
output	2	185.000	0.000	0.000	185.000
input	1	74095.000	0.000	0.000	74095.000
input	2	400.000	0.000	0.000	400.000
input	3	300.000	0.000	0.000	300.000
input	4	500.000	0.000	0.000	500.000
input	5	360.000	0.000	0.000	360.000

LISTING OF PEERS:

peer	lambda weight
22	1.000

Results for firm: 23
Technical efficiency = 1.000
Scale efficiency = 0.877 (irs)

PROJECTION SUMMARY:

variable		original value	radial movement	slack movement	projected value
output	1	2271.000	0.000	0.000	2271.000
output	2	342.000	0.000	0.000	342.000
input	1	77015.000	0.000	0.000	77015.000
input	2	479.000	0.000	0.000	479.000
input	3	249.000	0.000	0.000	249.000
input	4	530.000	0.000	0.000	530.000
input	5	347.000	0.000	0.000	347.000

LISTING OF PEERS:

peer	lambda weight
23	1.000

Results for firm: 24
Technical efficiency = 1.000
Scale efficiency = 1.000 (crs)
PROJECTION SUMMARY:

variable		original value	radial movement	slack movement	projected value
output	1	1507.000	0.000	0.000	1507.000
output	2	617.000	0.000	0.000	617.000
input	1	66430.000	0.000	0.000	66430.000
input	2	305.000	0.000	0.000	305.000
input	3	108.000	0.000	0.000	108.000
input	4	205.000	0.000	0.000	205.000
input	5	378.000	0.000	0.000	378.000

LISTING OF PEERS:

peer	lambda weight
24	1.000

Results for firm: 25
Technical efficiency = 0.379
Scale efficiency = 0.869 (drs)
PROJECTION SUMMARY:

variable		original value	radial movement	slack movement	projected value
output	1	3152.000	5173.592	0.000	8325.592
output	2	616.000	1011.083	0.000	1627.083
input	1	240900.000	0.000	-141341.812	99558.188
input	2	1950.000	0.000	0.000	1950.000
input	3	492.000	0.000	-31.872	460.128
input	4	1757.000	0.000	-30.492	1726.508
input	5	2150.000	0.000	-418.878	1731.122

LISTING OF PEERS:

peer	lambda weight
15	0.406
22	0.318
12	0.276

Results for firm: 26
Technical efficiency = 0.642
Scale efficiency = 0.854 (drs)
PROJECTION SUMMARY:

variable		original value	radial movement	slack movement	projected value
output	1	2971.000	1653.177	0.000	4624.177
output	2	203.000	112.957	0.000	315.957
input	1	170820.000	0.000	-94210.033	76609.967
input	2	556.000	0.000	0.000	556.000
input	3	390.000	0.000	-74.020	315.980

input	4	1026.000	0.000	-384.467	641.533
input	5	789.000	0.000	-295.311	493.689

LISTING OF PEERS:

peer	lambda weight
22	0.928
12	0.037
15	0.035

Results for firm: 27
Technical efficiency = 1.000
Scale efficiency = 1.000 (crs)

PROJECTION SUMMARY:

variable		original value	radial movement	slack movement	projected value
output	1	2036.000	0.000	0.000	2036.000
output	2	42.000	0.000	0.000	42.000
input	1	74825.000	0.000	0.000	74825.000
input	2	350.000	0.000	0.000	350.000
input	3	74.000	0.000	0.000	74.000
input	4	396.000	0.000	0.000	396.000
input	5	462.000	0.000	0.000	462.000

LISTING OF PEERS:

peer	lambda weight
27	1.000

Results for firm: 28
Technical efficiency = 0.488
Scale efficiency = 0.872 (drs)

PROJECTION SUMMARY:

variable		original value	radial movement	slack movement	projected value
output	1	3183.000	3339.263	0.000	6522.263
output	2	414.000	434.324	0.000	848.324
input	1	201115.000	0.000	-113979.205	87135.795
input	2	1274.000	0.000	0.000	1274.000
input	3	356.000	0.000	0.000	356.000
input	4	1527.000	0.000	-200.967	1326.033
input	5	1634.000	0.000	-566.765	1067.235

LISTING OF PEERS:

peer	lambda weight
20	0.199
12	0.234
15	0.169
22	0.398

INORDER:2004

Output1: Revpar
Output2: Other revenue per room
Output3: Customer satisfaction
Input1: Room Capacity
Input2: Staff Cost
Input3: Energy Cost
Input 4: F&B Cost
Input5: Other Cost

Results from DEAP Version 2.1

Instruction file = setb1.ins
Data file = setb1.dta

Output orientated DEA

Scale assumption: VRS

Slacks calculated using one-stage method

EFFICIENCY SUMMARY:

firm	crste	vrste	scale
1	0.777	0.967	0.803 drs
2	0.603	0.960	0.628 drs
3	0.840	1.000	0.840 drs
4	1.000	1.000	1.000 -
5	1.000	1.000	1.000 -
6	0.503	0.927	0.543 drs
7	0.490	0.868	0.565 drs
8	0.644	0.918	0.702 drs
9	0.540	0.826	0.654 drs
10	0.955	0.975	0.979 irs
11	0.613	0.945	0.649 drs
12	1.000	1.000	1.000 -
13	0.640	0.893	0.717 drs
14	0.529	0.903	0.586 drs
15	1.000	1.000	1.000 -
16	0.453	0.960	0.472 drs
17	0.683	0.803	0.851 drs
18	0.535	1.000	0.535 drs
19	0.444	0.916	0.485 drs
20	1.000	1.000	1.000 -

21	0.953	1.000	0.953	drs
22	1.000	1.000	1.000	-
23	0.962	1.000	0.962	drs
24	1.000	1.000	1.000	-
25	0.387	0.569	0.680	drs
26	0.863	0.944	0.914	drs
27	1.000	1.000	1.000	-
28	0.419	0.907	0.463	drs
mean	0.744	0.939	0.785	

Note: crste = technical efficiency from CRS DEA
vrste = technical efficiency from VRS DEA
scale = scale efficiency = crste/vrste

Note also that all subsequent tables refer to VRS results

SUMMARY OF OUTPUT SLACKS:

firm	output: 1	2	3
1	0.000	368.103	0.000
2	0.000	304.159	0.000
3	0.000	0.000	0.000
4	0.000	0.000	0.000
5	0.000	0.000	0.000
6	0.000	1114.779	0.000
7	752.651	777.299	0.000
8	83.676	0.000	0.000
9	993.165	0.000	0.000
10	0.000	0.000	31.748
11	776.435	1024.372	0.000
12	0.000	0.000	0.000
13	0.000	1551.756	0.000
14	0.000	2021.824	0.000
15	0.000	0.000	0.000
16	2664.589	1274.910	0.000
17	188.902	0.000	0.000
18	0.000	0.000	0.000
19	812.506	1488.847	0.000
20	0.000	0.000	0.000
21	0.000	0.000	0.000
22	0.000	0.000	0.000
23	0.000	0.000	0.000
24	0.000	0.000	0.000
25	0.000	154.762	0.000
26	823.921	179.764	0.000
27	0.000	0.000	0.000
28	269.748	153.098	0.000

mean 263.057 371.917 1.134

SUMMARY OF INPUT SLACKS:

firm	input: 1	2	3	4	5
1	17876.712	277.285	327.750	68.373	0.000
2	67070.650	342.756	208.692	959.658	0.000
3	0.000	0.000	0.000	0.000	0.000
4	0.000	0.000	0.000	0.000	0.000
5	0.000	0.000	0.000	0.000	0.000
6	87591.125	812.677	301.619	609.835	0.000
7	43443.760	413.892	91.654	110.748	0.000
8	53051.437	0.000	0.000	877.124	522.360
9	44308.183	0.000	22.181	47.112	644.553
10	64155.761	298.530	230.501	418.783	0.000
11	18136.120	431.854	286.273	45.826	0.000
12	0.000	0.000	0.000	0.000	0.000
13	34516.868	0.000	0.000	1882.096	111.108
14	117521.238	27.265	136.776	2613.663	5814.201
15	0.000	0.000	0.000	0.000	0.000
16	206660.080	2269.244	506.678	1269.876	0.000
17	51472.583	0.000	0.000	96.428	95.746
18	0.000	0.000	0.000	0.000	0.000
19	85015.800	614.658	300.671	388.542	0.000
20	0.000	0.000	0.000	0.000	0.000
21	0.000	0.000	0.000	0.000	0.000
22	0.000	0.000	0.000	0.000	0.000
23	0.000	0.000	0.000	0.000	0.000
24	0.000	0.000	0.000	0.000	0.000
25	137333.711	0.000	458.926	333.481	903.830
26	96371.111	0.000	39.052	478.437	317.860
27	0.000	0.000	0.000	0.000	0.000
28	119866.890	0.000	0.000	595.193	1462.148

mean 44442.572 196.006 103.956 385.542 352.564

SUMMARY OF PEERS:

firm	peers:
1	15 3 12
2	12 3 15
3	3
4	4
5	5
6	15 3 12
7	3 15
8	27 5 22 15

```
 9    22   15    3
10     5   22   27
11     3   15
12    12
13    15   12   22   27
14    15   12
15    15
16    15    3
17    27   22   15   24
18    18
19    15    3
20    20
21    21
22    22
23    23
24    24
25    15   22   12
26    22    3
27    27
28    18    3    5
```

SUMMARY OF PEER WEIGHTS:
(in same order as above)

```
firm  peer weights:
  1   0.121 0.426 0.453
  2   0.050 0.853 0.097
  3   1.000
  4   1.000
  5   1.000
  6   0.470 0.455 0.075
  7   0.640 0.360
  8   0.036 0.748 0.133 0.083
  9   0.698 0.088 0.214
 10   0.540 0.365 0.095
 11   0.630 0.370
 12   1.000
 13   0.654 0.046 0.149 0.151
 14   0.689 0.311
 15   1.000
 16   0.772 0.228
 17   0.039 0.693 0.159 0.110
 18   1.000
 19   0.502 0.498
 20   1.000
 21   1.000
 22   1.000
 23   1.000
 24   1.000
```

25 0.453 0.196 0.351
26 0.989 0.011
27 1.000
28 0.062 0.248 0.689

PEER COUNT SUMMARY:
(i.e., no. times each firm is a peer for another)

firm	peer count:
1	0
2	0
3	10
4	0
5	3
6	0
7	0
8	0
9	0
10	0
11	0
12	6
13	0
14	0
15	13
16	0
17	0
18	1
19	0
20	0
21	0
22	7
23	0
24	1
25	0
26	0
27	4
28	0

SUMMARY OF OUTPUT TARGETS:

firm	output: 1	2	3
1	7541.814	745.504	504.580
2	5115.752	434.397	534.497
3	4411.000	91.000	537.000
4	7192.000	3453.000	522.000
5	2957.000	279.000	510.000
6	6849.881	1652.236	537.457

7	5949.377	1255.596	541.686
8	3527.576	513.316	510.046
9	4532.212	450.248	514.396
10	3226.141	229.633	501.266
11	5989.212	1285.752	541.807
12	10180.000	673.000	462.000
13	6988.646	2244.012	523.112
14	9145.934	2497.944	522.625
15	8679.000	3322.000	550.000
16	7707.793	2586.768	547.042
17	4480.761	758.706	489.608
18	3001.000	229.000	535.000
19	6554.484	1713.680	543.529
20	3767.000	93.000	400.000
21	5319.000	362.000	468.000
22	4049.000	200.000	503.000
23	3210.000	735.000	368.000
24	2130.000	814.000	333.000
25	8300.867	1781.176	509.903
26	4052.857	198.839	503.362
27	1596.000	63.000	445.000
28	3320.901	229.184	518.266

SUMMARY OF INPUT TARGETS:

firm	input: 1	2	3	4	5
1	104763.288	1545.715	442.250	1865.627	1084.000
2	108129.350	1237.244	407.308	1216.342	724.000
3	107310.000	1057.000	389.000	1116.000	467.000
4	167900.000	3957.000	940.000	1772.000	2532.000
5	65335.000	858.000	240.000	258.000	326.000
6	112793.875	1814.323	464.381	1333.165	1581.000
7	112046.240	1599.108	442.346	1190.252	1278.000
8	71413.563	918.000	266.000	379.876	524.640
9	85266.817	730.000	339.819	703.888	589.447
10	69434.239	636.470	244.499	350.217	327.000
11	112168.880	1613.146	443.727	1192.174	1299.000
12	98185.000	1734.000	467.000	2715.000	1228.000
13	105643.132	1858.000	426.000	1108.904	1918.892
14	113523.762	2303.735	515.224	1755.337	2253.799
15	120450.000	2561.000	537.000	1322.000	2717.000
16	117459.920	2218.756	503.322	1275.124	2205.000
17	80657.417	728.000	313.000	599.572	754.254
18	153300.000	1300.000	320.000	750.000	1205.000
19	113909.200	1812.342	463.329	1219.458	1597.000
20	71905.000	498.000	128.000	376.000	375.000
21	99280.000	1145.000	374.000	630.000	916.000
22	74095.000	400.000	300.000	500.000	360.000
23	77015.000	456.000	302.000	643.000	789.000

24	66430.000	296.000	160.000	286.000	590.000
25	103566.289	1848.000	466.074	1650.519	1733.170
26	74448.889	407.000	300.948	506.563	361.140
27	74825.000	286.000	57.000	299.000	206.000
28	81248.110	935.000	282.000	501.807	415.852

FIRM BY FIRM RESULTS:

Results for firm: 1
Technical efficiency = 0.967
Scale efficiency = 0.803 (drs)
PROJECTION SUMMARY:

variable		original value	radial movement	slack movement	projected value
output	1	7294.000	247.814	0.000	7541.814
output	2	365.000	12.401	368.103	745.504
output	3	488.000	16.580	0.000	504.580
input	1	122640.000	0.000	-17876.712	104763.288
input	2	1823.000	0.000	-277.285	1545.715
input	3	770.000	0.000	-327.750	442.250
input	4	1934.000	0.000	-68.373	1865.627
input	5	1084.000	0.000	0.000	1084.000

LISTING OF PEERS:

peer	lambda weight
15	0.121
3	0.426
12	0.453

Results for firm: 2
Technical efficiency = 0.960
Scale efficiency = 0.628 (drs)
PROJECTION SUMMARY:

variable		original value	radial movement	slack movement	projected value
output	1	4910.000	205.752	0.000	5115.752
output	2	125.000	5.238	304.159	434.397
output	3	513.000	21.497	0.000	534.497
input	1	175200.000	0.000	-67070.650	108129.350
input	2	1580.000	0.000	-342.756	1237.244
input	3	616.000	0.000	-208.692	407.308
input	4	2176.000	0.000	-959.658	1216.342
input	5	724.000	0.000	0.000	724.000

LISTING OF PEERS:

peer	lambda weight
12	0.050
3	0.853

15 0.097

Results for firm: 3
Technical efficiency = 1.000
Scale efficiency = 0.840 (drs)
PROJECTION SUMMARY:

variable		original value	radial movement	slack movement	projected value
output	1	4411.000	0.000	0.000	4411.000
output	2	91.000	0.000	0.000	91.000
output	3	537.000	0.000	0.000	537.000
input	1	107310.000	0.000	0.000	107310.000
input	2	1057.000	0.000	0.000	1057.000
input	3	389.000	0.000	0.000	389.000
input	4	1116.000	0.000	0.000	1116.000
input	5	467.000	0.000	0.000	467.000

LISTING OF PEERS:

peer	lambda weight
3	1.000

Results for firm: 4
Technical efficiency = 1.000
Scale efficiency = 1.000 (crs)
PROJECTION SUMMARY:

variable		original value	radial movement	slack movement	projected value
output	1	7192.000	0.000	0.000	7192.000
output	2	3453.000	0.000	0.000	3453.000
output	3	522.000	0.000	0.000	522.000
input	1	167900.000	0.000	0.000	167900.000
input	2	3957.000	0.000	0.000	3957.000
input	3	940.000	0.000	0.000	940.000
input	4	1772.000	0.000	0.000	1772.000
input	5	2532.000	0.000	0.000	2532.000

LISTING OF PEERS:

peer	lambda weight
4	1.000

Results for firm: 5
Technical efficiency = 1.000
Scale efficiency = 1.000 (crs)
PROJECTION SUMMARY:

variable		original value	radial movement	slack movement	projected value
output	1	2957.000	0.000	0.000	2957.000
output	2	279.000	0.000	0.000	279.000
output	3	510.000	0.000	0.000	510.000

input	1	65335.000	0.000	0.000	65335.000
input	2	858.000	0.000	0.000	858.000
input	3	240.000	0.000	0.000	240.000
input	4	258.000	0.000	0.000	258.000
input	5	326.000	0.000	0.000	326.000

LISTING OF PEERS:

peer	lambda weight
5	1.000

Results for firm: 6
Technical efficiency = 0.927
Scale efficiency = 0.543 (drs)

PROJECTION SUMMARY:

variable		original value	radial movement	slack movement	projected value
output	1	6347.000	502.881	0.000	6849.881
output	2	498.000	39.457	1114.779	1652.236
output	3	498.000	39.457	0.000	537.457
input	1	200385.000	0.000	-87591.125	112793.875
input	2	2627.000	0.000	-812.677	1814.323
input	3	766.000	0.000	-301.619	464.381
input	4	1943.000	0.000	-609.835	1333.165
input	5	1581.000	0.000	0.000	1581.000

LISTING OF PEERS:

peer	lambda weight
15	0.470
3	0.455
12	0.075

Results for firm: 7
Technical efficiency = 0.868
Scale efficiency = 0.565 (drs)

PROJECTION SUMMARY:

variable		original value	radial movement	slack movement	projected value
output	1	4509.000	687.726	752.651	5949.377
output	2	415.000	63.297	777.299	1255.596
output	3	470.000	71.686	0.000	541.686
input	1	155490.000	0.000	-43443.760	112046.240
input	2	2013.000	0.000	-413.892	1599.108
input	3	534.000	0.000	-91.654	442.346
input	4	1301.000	0.000	-110.748	1190.252
input	5	1278.000	0.000	0.000	1278.000

LISTING OF PEERS:

peer	lambda weight
3	0.640
15	0.360

Results for firm: 8
Technical efficiency = 0.918
Scale efficiency = 0.702 (drs)
PROJECTION SUMMARY:

variable		original value	radial movement	slack movement	projected value
output	1	3160.000	283.900	83.676	3527.576
output	2	471.000	42.316	0.000	513.316
output	3	468.000	42.046	0.000	510.046
input	1	124465.000	0.000	-53051.437	71413.563
input	2	918.000	0.000	0.000	918.000
input	3	266.000	0.000	0.000	266.000
input	4	1257.000	0.000	-877.124	379.876
input	5	1047.000	0.000	-522.360	524.640

LISTING OF PEERS:

peer	lambda weight
27	0.036
5	0.748
22	0.133
15	0.083

Results for firm: 9
Technical efficiency = 0.826
Scale efficiency = 0.654 (drs)
PROJECTION SUMMARY:

variable		original value	radial movement	slack movement	projected value
output	1	2924.000	615.047	993.165	4532.212
output	2	372.000	78.248	0.000	450.248
output	3	425.000	89.396	0.000	514.396
input	1	129575.000	0.000	-44308.183	85266.817
input	2	730.000	0.000	0.000	730.000
input	3	362.000	0.000	-22.181	339.819
input	4	751.000	0.000	-47.112	703.888
input	5	1234.000	0.000	-644.553	589.447

LISTING OF PEERS:

peer	lambda weight
22	0.698
15	0.088
3	0.214

Results for firm: 10
Technical efficiency = 0.975
Scale efficiency = 0.979 (irs)
PROJECTION SUMMARY:

variable		original value	radial movement	slack movement	projected value

output	1	3147.000	79.141	0.000	3226.141
output	2	224.000	5.633	0.000	229.633
output	3	458.000	11.518	31.748	501.266
input	1	133590.000	0.000	-64155.761	69434.239
input	2	935.000	0.000	-298.530	636.470
input	3	475.000	0.000	-230.501	244.499
input	4	769.000	0.000	-418.783	350.217
input	5	327.000	0.000	0.000	327.000

LISTING OF PEERS:

peer	lambda weight
5	0.540
22	0.365
27	0.095

Results for firm: 11
Technical efficiency = 0.945
Scale efficiency = 0.649 (drs)

PROJECTION SUMMARY:

variable		original value	radial movement	slack movement	projected value
output	1	4926.000	286.777	776.435	5989.212
output	2	247.000	14.380	1024.372	1285.752
output	3	512.000	29.807	0.000	541.807
input	1	130305.000	0.000	-18136.120	112168.880
input	2	2045.000	0.000	-431.854	1613.146
input	3	730.000	0.000	-286.273	443.727
input	4	1238.000	0.000	-45.826	1192.174
input	5	1299.000	0.000	0.000	1299.000

LISTING OF PEERS:

peer	lambda weight
3	0.630
15	0.370

Results for firm: 12
Technical efficiency = 1.000
Scale efficiency = 1.000 (crs)

PROJECTION SUMMARY:

variable		original value	radial movement	slack movement	projected value
output	1	10180.000	0.000	0.000	10180.000
output	2	673.000	0.000	0.000	673.000
output	3	462.000	0.000	0.000	462.000
input	1	98185.000	0.000	0.000	98185.000
input	2	1734.000	0.000	0.000	1734.000
input	3	467.000	0.000	0.000	467.000
input	4	2715.000	0.000	0.000	2715.000
input	5	1228.000	0.000	0.000	1228.000

LISTING OF PEERS:

peer	lambda weight
12	1.000

Results for firm: 13
Technical efficiency = 0.893
Scale efficiency = 0.717 (drs)
PROJECTION SUMMARY:

variable		original value	radial movement	slack movement	projected value
output	1	6239.000	749.646	0.000	6988.646
output	2	618.000	74.256	1551.756	2244.012
output	3	467.000	56.112	0.000	523.112
input	1	140160.000	0.000	-34516.868	105643.132
input	2	1858.000	0.000	0.000	1858.000
input	3	426.000	0.000	0.000	426.000
input	4	2991.000	0.000	-1882.096	1108.904
input	5	2030.000	0.000	-111.108	1918.892

LISTING OF PEERS:

peer	lambda weight
15	0.654
12	0.046
22	0.149
27	0.151

Results for firm: 14
Technical efficiency = 0.903
Scale efficiency = 0.586 (drs)
PROJECTION SUMMARY:

variable		original value	radial movement	slack movement	projected value
output	1	8260.000	885.934	0.000	9145.934
output	2	430.000	46.120	2021.824	2497.944
output	3	472.000	50.625	0.000	522.625
input	1	231045.000	0.000	-117521.238	113523.762
input	2	2331.000	0.000	-27.265	2303.735
input	3	652.000	0.000	-136.776	515.224
input	4	4369.000	0.000	-2613.663	1755.337
input	5	8068.000	0.000	-5814.201	2253.799

LISTING OF PEERS:

peer	lambda weight
15	0.689
12	0.311

Results for firm: 15
Technical efficiency = 1.000
Scale efficiency = 1.000 (crs)
PROJECTION SUMMARY:

variable		original value	radial movement	slack movement	projected value
output	1	8679.000	0.000	0.000	8679.000
output	2	3322.000	0.000	0.000	3322.000
output	3	550.000	0.000	0.000	550.000
input	1	120450.000	0.000	0.000	120450.000
input	2	2561.000	0.000	0.000	2561.000
input	3	537.000	0.000	0.000	537.000
input	4	1322.000	0.000	0.000	1322.000
input	5	2717.000	0.000	0.000	2717.000

LISTING OF PEERS:

peer	lambda weight
15	1.000

Results for firm: 16
Technical efficiency = 0.960
Scale efficiency = 0.472 (drs)

PROJECTION SUMMARY:

variable		original value	radial movement	slack movement	projected value
output	1	4840.000	203.204	2664.589	7707.793
output	2	1259.000	52.858	1274.910	2586.768
output	3	525.000	22.042	0.000	547.042
input	1	324120.000	0.000	-206660.080	117459.920
input	2	4488.000	0.000	-2269.244	2218.756
input	3	1010.000	0.000	-506.678	503.322
input	4	2545.000	0.000	-1269.876	1275.124
input	5	2205.000	0.000	0.000	2205.000

LISTING OF PEERS:

peer	lambda weight
15	0.772
3	0.228

Results for firm: 17
Technical efficiency = 0.803
Scale efficiency = 0.851 (drs)

PROJECTION SUMMARY:

variable		original value	radial movement	slack movement	projected value
output	1	3445.000	846.859	188.902	4480.761
output	2	609.000	149.706	0.000	758.706
output	3	393.000	96.608	0.000	489.608
input	1	132130.000	0.000	-51472.583	80657.417
input	2	728.000	0.000	0.000	728.000
input	3	313.000	0.000	0.000	313.000
input	4	696.000	0.000	-96.428	599.572
input	5	850.000	0.000	-95.746	754.254

LISTING OF PEERS:

peer	lambda weight
27	0.039
22	0.693
15	0.159
24	0.110

Results for firm: 18
Technical efficiency = 1.000
Scale efficiency = 0.535 (drs)
PROJECTION SUMMARY:

variable		original value	radial movement	slack movement	projected value
output	1	3001.000	0.000	0.000	3001.000
output	2	229.000	0.000	0.000	229.000
output	3	535.000	0.000	0.000	535.000
input	1	153300.000	0.000	0.000	153300.000
input	2	1300.000	0.000	0.000	1300.000
input	3	320.000	0.000	0.000	320.000
input	4	750.000	0.000	0.000	750.000
input	5	1205.000	0.000	0.000	1205.000

LISTING OF PEERS:

peer	lambda weight
18	1.000

Results for firm: 19
Technical efficiency = 0.916
Scale efficiency = 0.485 (drs)
PROJECTION SUMMARY:

variable		original value	radial movement	slack movement	projected value
output	1	5261.000	480.979	812.506	6554.484
output	2	206.000	18.833	1488.847	1713.680
output	3	498.000	45.529	0.000	543.529
input	1	198925.000	0.000	-85015.800	113909.200
input	2	2427.000	0.000	-614.658	1812.342
input	3	764.000	0.000	-300.671	463.329
input	4	1608.000	0.000	-388.542	1219.458
input	5	1597.000	0.000	0.000	1597.000

LISTING OF PEERS:

peer	lambda weight
15	0.502
3	0.498

Results for firm: 20
Technical efficiency = 1.000
Scale efficiency = 1.000 (crs)
PROJECTION SUMMARY:

variable		original value	radial movement	slack movement	projected value
output	1	3767.000	0.000	0.000	3767.000
output	2	93.000	0.000	0.000	93.000
output	3	400.000	0.000	0.000	400.000
input	1	71905.000	0.000	0.000	71905.000
input	2	498.000	0.000	0.000	498.000
input	3	128.000	0.000	0.000	128.000
input	4	376.000	0.000	0.000	376.000
input	5	375.000	0.000	0.000	375.000

LISTING OF PEERS:

peer	lambda weight
20	1.000

Results for firm: 21
Technical efficiency = 1.000
Scale efficiency = 0.953 (drs)

PROJECTION SUMMARY:

variable		original value	radial movement	slack movement	projected value
output	1	5319.000	0.000	0.000	5319.000
output	2	362.000	0.000	0.000	362.000
output	3	468.000	0.000	0.000	468.000
input	1	99280.000	0.000	0.000	99280.000
input	2	1145.000	0.000	0.000	1145.000
input	3	374.000	0.000	0.000	374.000
input	4	630.000	0.000	0.000	630.000
input	5	916.000	0.000	0.000	916.000

LISTING OF PEERS:

peer	lambda weight
21	1.000

Results for firm: 22
Technical efficiency = 1.000
Scale efficiency = 1.000 (crs)

PROJECTION SUMMARY:

variable		original value	radial movement	slack movement	projected value
output	1	4049.000	0.000	0.000	4049.000
output	2	200.000	0.000	0.000	200.000
output	3	503.000	0.000	0.000	503.000
input	1	74095.000	0.000	0.000	74095.000
input	2	400.000	0.000	0.000	400.000
input	3	300.000	0.000	0.000	300.000
input	4	500.000	0.000	0.000	500.000
input	5	360.000	0.000	0.000	360.000

LISTING OF PEERS:

peer	lambda weight

22	1.000

Results for firm: 23
Technical efficiency = 1.000
Scale efficiency = 0.962 (drs)
PROJECTION SUMMARY:

variable		original value	radial movement	slack movement	projected value
output	1	3210.000	0.000	0.000	3210.000
output	2	735.000	0.000	0.000	735.000
output	3	368.000	0.000	0.000	368.000
input	1	77015.000	0.000	0.000	77015.000
input	2	456.000	0.000	0.000	456.000
input	3	302.000	0.000	0.000	302.000
input	4	643.000	0.000	0.000	643.000
input	5	789.000	0.000	0.000	789.000

LISTING OF PEERS:

peer	lambda weight
23	1.000

Results for firm: 24
Technical efficiency = 1.000
Scale efficiency = 1.000 (crs)
PROJECTION SUMMARY:

variable		original value	radial movement	slack movement	projected value
output	1	2130.000	0.000	0.000	2130.000
output	2	814.000	0.000	0.000	814.000
output	3	333.000	0.000	0.000	333.000
input	1	66430.000	0.000	0.000	66430.000
input	2	296.000	0.000	0.000	296.000
input	3	160.000	0.000	0.000	160.000
input	4	286.000	0.000	0.000	286.000
input	5	590.000	0.000	0.000	590.000

LISTING OF PEERS:

peer	lambda weight
24	1.000

Results for firm: 25
Technical efficiency = 0.569
Scale efficiency = 0.680 (drs)
PROJECTION SUMMARY:

variable		original value	radial movement	slack movement	projected value
output	1	4721.000	3579.867	0.000	8300.867
output	2	925.000	701.414	154.762	1781.176
output	3	290.000	219.903	0.000	509.903

input	1	240900.000	0.000	-137333.711	103566.289
input	2	1848.000	0.000	0.000	1848.000
input	3	925.000	0.000	-458.926	466.074
input	4	1984.000	0.000	-333.481	1650.519
input	5	2637.000	0.000	-903.830	1733.170

LISTING OF PEERS:

peer	lambda weight
15	0.453
22	0.196
12	0.351

Results for firm: 26
Technical efficiency = 0.944
Scale efficiency = 0.914 (drs)

PROJECTION SUMMARY:

variable		original value	radial movement	slack movement	projected value
output	1	3047.000	181.936	823.921	4052.857
output	2	18.000	1.075	179.764	198.839
output	3	475.000	28.362	0.000	503.362
input	1	170820.000	0.000	-96371.111	74448.889
input	2	407.000	0.000	0.000	407.000
input	3	340.000	0.000	-39.052	300.948
input	4	985.000	0.000	-478.437	506.563
input	5	679.000	0.000	-317.860	361.140

LISTING OF PEERS:

peer	lambda weight
22	0.989
3	0.011

Results for firm: 27
Technical efficiency = 1.000
Scale efficiency = 1.000 (crs)

PROJECTION SUMMARY:

variable		original value	radial movement	slack movement	projected value
output	1	1596.000	0.000	0.000	1596.000
output	2	63.000	0.000	0.000	63.000
output	3	445.000	0.000	0.000	445.000
input	1	74825.000	0.000	0.000	74825.000
input	2	286.000	0.000	0.000	286.000
input	3	57.000	0.000	0.000	57.000
input	4	299.000	0.000	0.000	299.000
input	5	206.000	0.000	0.000	206.000

LISTING OF PEERS:

peer	lambda weight
27	1.000

Results for firm: 28
Technical efficiency = 0.907
Scale efficiency = 0.463 (drs)
PROJECTION SUMMARY:

variable		original value	radial movement	slack movement	projected value
output	1	2767.000	284.153	269.748	3320.901
output	2	69.000	7.086	153.098	229.184
output	3	470.000	48.266	0.000	518.266
input	1	201115.000	0.000	-119866.890	81248.110
input	2	935.000	0.000	0.000	935.000
input	3	282.000	0.000	0.000	282.000
input	4	1097.000	0.000	-595.193	501.807
input	5	1878.000	0.000	-1462.148	415.852

LISTING OF PEERS:

peer	lambda weight
18	0.062
3	0.248
5	0.689

INORDER: 2005

Output1: Revpar
Output2: Other revenue per room
Output3: Customer Satisfaction
Input1: Room Capacity
Input2: Staff Cost
Input3: Energy Cost
Input 4: F&B Cost
Input5: Other Cost

Results from DEAP Version 2.1

Instruction file = setc1.ins
Data file = setc1.dta

Output orientated DEA

Scale assumption: VRS

Slacks calculated using one-stage method

EFFICIENCY SUMMARY:

firm	crste	vrste	scale
1	0.875	1.000	0.875 drs
2	0.482	0.950	0.507 drs
3	0.747	1.000	0.747 drs
4	0.996	1.000	0.996 drs
5	1.000	1.000	1.000 -
6	0.500	0.905	0.552 drs
7	0.538	0.859	0.626 drs
8	0.675	0.918	0.735 drs
9	0.577	0.833	0.693 drs
10	0.961	0.972	0.989 irs
11	0.589	0.946	0.622 drs
12	1.000	1.000	1.000 -
13	0.637	0.871	0.731 drs
14	0.536	0.876	0.611 drs
15	1.000	1.000	1.000 -
16	0.430	0.959	0.449 drs
17	0.587	0.765	0.767 drs
18	0.533	1.000	0.533 drs
19	0.385	0.913	0.422 drs
20	1.000	1.000	1.000 -

21	0.930	1.000	0.930	drs
22	1.000	1.000	1.000	-
23	0.927	1.000	0.927	irs
24	1.000	1.000	1.000	-
25	0.329	0.535	0.615	drs
26	0.684	0.935	0.732	drs
27	1.000	1.000	1.000	-
28	0.428	0.892	0.479	drs
mean	0.727	0.933	0.769	

Note: crste = technical efficiency from CRS DEA
vrste = technical efficiency from VRS DEA
scale = scale efficiency = crste/vrste

Note also that all subsequent tables refer to VRS results

SUMMARY OF OUTPUT SLACKS:

firm	output: 1	2	3
1	0.000	0.000	0.000
2	227.281	641.717	0.000
3	0.000	0.000	0.000
4	0.000	0.000	0.000
5	0.000	0.000	0.000
6	2454.072	2720.261	0.000
7	1860.887	1986.591	0.000
8	1598.988	0.000	0.000
9	1881.800	0.000	0.000
10	151.772	0.000	0.000
11	468.678	842.856	0.000
12	0.000	0.000	0.000
13	0.000	1001.435	0.000
14	0.000	2474.487	0.000
15	0.000	0.000	0.000
16	3531.197	1288.702	0.000
17	589.392	0.000	0.000
18	773.476	0.000	0.000
19	2253.636	1942.268	0.000
20	0.000	0.000	0.000
21	0.000	0.000	0.000
22	0.000	0.000	0.000
23	0.000	0.000	0.000
24	0.000	0.000	0.000
25	583.319	162.211	0.000
26	1109.268	0.000	0.000
27	0.000	0.000	0.000
28	1178.454	0.000	0.000

mean 666.508 466.447 0.000

SUMMARY OF INPUT SLACKS:

firm	input: 1	2	3	4	5
1	0.000	0.000	0.000	0.000	0.000
2	64751.517	235.774	242.752	1385.607	0.000
3	0.000	0.000	0.000	0.000	0.000
4	0.000	0.000	0.000	0.000	0.000
5	0.000	0.000	0.000	0.000	0.000
6	79935.000	257.000	208.000	451.000	123.000
7	38183.960	39.955	100.332	157.584	0.000
8	47825.656	0.000	75.120	468.690	0.000
9	48853.383	0.000	0.000	282.020	133.529
10	59485.775	588.068	208.540	314.765	0.000
11	18826.788	501.556	414.922	80.715	0.000
12	0.000	0.000	0.000	0.000	0.000
13	37231.470	62.877	0.000	1971.556	260.949
14	117476.350	0.000	136.910	3278.805	5390.525
15	0.000	0.000	0.000	0.000	0.000
16	206310.050	3388.806	680.585	1500.020	0.000
17	47522.306	0.000	26.796	177.558	340.378
18	49393.247	211.912	26.739	0.000	911.407
19	83229.281	721.542	487.087	567.712	0.000
20	0.000	0.000	0.000	0.000	0.000
21	0.000	0.000	0.000	0.000	0.000
22	0.000	0.000	0.000	0.000	0.000
23	0.000	0.000	0.000	0.000	0.000
24	0.000	0.000	0.000	0.000	0.000
25	128862.302	0.000	38.322	374.214	739.853
26	91693.692	0.000	75.691	415.152	372.779
27	0.000	0.000	0.000	0.000	0.000
28	107260.006	0.000	0.000	592.136	944.190

mean 43815.742 214.553 97.207 429.198 329.165

SUMMARY OF PEERS:

firm	peers:
1	1
2	3 15
3	3
4	4
5	5
6	15
7	15 3
8	22 5 15 24

```
 9    27    5   22   15
10    23   24   22
11    15    3
12    12
13    15    5    3
14    15   12   22
15    15
16     3   15
17     3   15   22
18    15    3    5
19    15    3
20    20
21    21
22    22
23    23
24    24
25    15    3
26    15    3   22
27    27
28    22    5    3   15
```

SUMMARY OF PEER WEIGHTS:
(in same order as above)

```
firm  peer weights:
  1   1.000
  2   0.761 0.239
  3   1.000
  4   1.000
  5   1.000
  6   1.000
  7   0.761 0.239
  8   0.313 0.509 0.155 0.023
  9   0.042 0.193 0.586 0.179
 10   0.159 0.059 0.781
 11   0.317 0.683
 12   1.000
 13   0.498 0.260 0.242
 14   0.818 0.065 0.117
 15   1.000
 16   0.201 0.799
 17   0.098 0.156 0.745
 18   0.050 0.853 0.097
 19   0.638 0.362
 20   1.000
 21   1.000
 22   1.000
 23   1.000
 24   1.000
```

25 0.360 0.640
26 0.012 0.135 0.853
27 1.000
28 0.164 0.218 0.533 0.085

PEER COUNT SUMMARY:
(i.e., no. times each firm is a peer for another)

firm	peer count:
1	0
2	0
3	11
4	0
5	5
6	0
7	0
8	0
9	0
10	0
11	0
12	1
13	0
14	0
15	15
16	0
17	0
18	0
19	0
20	0
21	0
22	7
23	1
24	2
25	0
26	0
27	1
28	0

SUMMARY OF OUTPUT TARGETS:

firm	output: 1	2	3
1	8121.000	584.000	488.000
2	5783.098	917.560	540.105
3	4425.000	137.000	537.000
4	7548.000	3294.000	522.000
5	3852.000	324.000	510.000
6	10111.000	3405.000	550.000

7	8750.531	2623.078	546.890
8	4870.564	764.784	509.856
9	5088.929	781.670	510.307
10	3720.131	235.695	471.390
11	6228.687	1173.660	541.124
12	10473.000	675.000	462.000
13	7108.211	1813.573	536.447
14	9439.848	2850.026	538.768
15	10111.000	3405.000	550.000
16	8968.586	2748.403	547.388
17	5134.182	683.614	513.691
18	4654.759	319.023	535.039
19	8053.706	2222.581	545.296
20	3509.000	203.000	400.000
21	5496.000	338.000	468.000
22	4184.000	185.000	503.000
23	2271.000	342.000	368.000
24	1507.000	617.000	333.000
25	6470.791	1312.808	541.677
26	4287.580	217.165	508.145
27	2036.000	42.000	445.000
28	4745.188	463.911	526.662

SUMMARY OF INPUT TARGETS:

firm	input: 1	2	3	4	5
1	122640.000	2433.000	948.000	2396.000	1152.000
2	110448.483	1738.226	429.248	1327.393	1120.000
3	107310.000	1320.000	381.000	1218.000	547.000
4	167900.000	4249.000	1149.000	2110.000	2685.000
5	65335.000	1116.000	248.000	278.000	405.000
6	120450.000	3071.000	583.000	1676.000	2946.000
7	117306.040	2652.045	534.668	1566.416	2372.000
8	76639.344	1176.000	312.880	562.310	784.000
9	80721.617	1014.000	331.000	662.980	835.471
10	74104.225	406.932	280.460	487.235	359.000
11	111478.212	1875.444	445.078	1363.285	1308.000
12	98185.000	2088.000	464.000	3214.000	1525.000
13	102928.530	2139.123	447.000	1201.444	1705.051
14	113568.650	2694.000	542.090	1638.195	2550.475
15	120450.000	3071.000	583.000	1676.000	2946.000
16	117809.950	2719.194	542.415	1583.980	2464.000
17	84607.694	908.000	352.204	754.442	782.622
18	103906.753	1388.088	378.261	1150.000	653.593
19	115695.719	2437.458	509.913	1510.288	2078.000
20	71905.000	538.000	148.000	465.000	346.000
21	99280.000	1121.000	346.000	779.000	909.000
22	74095.000	400.000	300.000	500.000	360.000
23	77015.000	479.000	249.000	530.000	347.000

24	66430.000	305.000	108.000	205.000	378.000
25	112037.698	1950.000	453.678	1382.786	1410.147
26	79126.308	556.000	314.309	610.848	416.221
27	74825.000	350.000	74.000	396.000	462.000
28	93854.994	1274.000	356.000	934.864	689.810

FIRM BY FIRM RESULTS:

Results for firm: 1
Technical efficiency = 1.000
Scale efficiency = 0.875 (drs)
PROJECTION SUMMARY:

variable		original value	radial movement	slack movement	projected value
output	1	8121.000	0.000	0.000	8121.000
output	2	584.000	0.000	0.000	584.000
output	3	488.000	0.000	0.000	488.000
input	1	122640.000	0.000	0.000	122640.000
input	2	2433.000	0.000	0.000	2433.000
input	3	948.000	0.000	0.000	948.000
input	4	2396.000	0.000	0.000	2396.000
input	5	1152.000	0.000	0.000	1152.000

LISTING OF PEERS:

peer	lambda weight
1	1.000

Results for firm: 2
Technical efficiency = 0.950
Scale efficiency = 0.507 (drs)
PROJECTION SUMMARY:

variable		original value	radial movement	slack movement	projected value
output	1	5277.000	278.817	227.281	5783.098
output	2	262.000	13.843	641.717	917.560
output	3	513.000	27.105	0.000	540.105
input	1	175200.000	0.000	-64751.517	110448.483
input	2	1974.000	0.000	-235.774	1738.226
input	3	672.000	0.000	-242.752	429.248
input	4	2713.000	0.000	-1385.607	1327.393
input	5	1120.000	0.000	0.000	1120.000

LISTING OF PEERS:

peer	lambda weight
3	0.761
15	0.239

Results for firm: 3
Technical efficiency = 1.000
Scale efficiency = 0.747 (drs)
PROJECTION SUMMARY:

variable		original value	radial movement	slack movement	projected value
output	1	4425.000	0.000	0.000	4425.000
output	2	137.000	0.000	0.000	137.000
output	3	537.000	0.000	0.000	537.000
input	1	107310.000	0.000	0.000	107310.000
input	2	1320.000	0.000	0.000	1320.000
input	3	381.000	0.000	0.000	381.000
input	4	1218.000	0.000	0.000	1218.000
input	5	547.000	0.000	0.000	547.000

LISTING OF PEERS:

peer	lambda weight
3	1.000

Results for firm: 4
Technical efficiency = 1.000
Scale efficiency = 0.996 (drs)
PROJECTION SUMMARY:

variable		original value	radial movement	slack movement	projected value
output	1	7548.000	0.000	0.000	7548.000
output	2	3294.000	0.000	0.000	3294.000
output	3	522.000	0.000	0.000	522.000
input	1	167900.000	0.000	0.000	167900.000
input	2	4249.000	0.000	0.000	4249.000
input	3	1149.000	0.000	0.000	1149.000
input	4	2110.000	0.000	0.000	2110.000
input	5	2685.000	0.000	0.000	2685.000

LISTING OF PEERS:

peer	lambda weight
4	1.000

Results for firm: 5
Technical efficiency = 1.000
Scale efficiency = 1.000 (crs)
PROJECTION SUMMARY:

variable		original value	radial movement	slack movement	projected value
output	1	3852.000	0.000	0.000	3852.000
output	2	324.000	0.000	0.000	324.000
output	3	510.000	0.000	0.000	510.000
input	1	65335.000	0.000	0.000	65335.000
input	2	1116.000	0.000	0.000	1116.000
input	3	248.000	0.000	0.000	248.000

input	4	278.000	0.000	0.000	278.000
input	5	405.000	0.000	0.000	405.000

LISTING OF PEERS:

peer	lambda weight
5	1.000

Results for firm: 6
Technical efficiency = 0.905
Scale efficiency = 0.552 (drs)

PROJECTION SUMMARY:

variable		original value	radial movement	slack movement	projected value
output	1	6933.000	723.928	2454.072	10111.000
output	2	620.000	64.739	2720.261	3405.000
output	3	498.000	52.000	0.000	550.000
input	1	200385.000	0.000	-79935.000	120450.000
input	2	3328.000	0.000	-257.000	3071.000
input	3	791.000	0.000	-208.000	583.000
input	4	2127.000	0.000	-451.000	1676.000
input	5	3069.000	0.000	-123.000	2946.000

LISTING OF PEERS:

peer	lambda weight
15	1.000

Results for firm: 7
Technical efficiency = 0.859
Scale efficiency = 0.626 (drs)

PROJECTION SUMMARY:

variable		original value	radial movement	slack movement	projected value
output	1	5921.000	968.645	1860.887	8750.531
output	2	547.000	89.486	1986.591	2623.078
output	3	470.000	76.890	0.000	546.890
input	1	155490.000	0.000	-38183.960	117306.040
input	2	2692.000	0.000	-39.955	2652.045
input	3	635.000	0.000	-100.332	534.668
input	4	1724.000	0.000	-157.584	1566.416
input	5	2372.000	0.000	0.000	2372.000

LISTING OF PEERS:

peer	lambda weight
15	0.761
3	0.239

Results for firm: 8
Technical efficiency = 0.918
Scale efficiency = 0.735 (drs)

PROJECTION SUMMARY:

variable		original value	radial movement	slack movement	projected value
output	1	3003.000	268.576	1598.988	4870.564
output	2	702.000	62.784	0.000	764.784
output	3	468.000	41.856	0.000	509.856
input	1	124465.000	0.000	-47825.656	76639.344
input	2	1176.000	0.000	0.000	1176.000
input	3	388.000	0.000	-75.120	312.880
input	4	1031.000	0.000	-468.690	562.310
input	5	784.000	0.000	0.000	784.000

LISTING OF PEERS:

peer	lambda weight
22	0.313
5	0.509
15	0.155
24	0.023

Results for firm: 9
Technical efficiency = 0.833
Scale efficiency = 0.693 (drs)

PROJECTION SUMMARY:

variable		original value	radial movement	slack movement	projected value
output	1	2671.000	536.128	1881.800	5088.929
output	2	651.000	130.670	0.000	781.670
output	3	425.000	85.307	0.000	510.307
input	1	129575.000	0.000	-48853.383	80721.617
input	2	1014.000	0.000	0.000	1014.000
input	3	331.000	0.000	0.000	331.000
input	4	945.000	0.000	-282.020	662.980
input	5	969.000	0.000	-133.529	835.471

LISTING OF PEERS:

peer	lambda weight
27	0.042
5	0.193
22	0.586
15	0.179

Results for firm: 10
Technical efficiency = 0.972
Scale efficiency = 0.989 (irs)

PROJECTION SUMMARY:

variable		original value	radial movement	slack movement	projected value
output	1	3467.000	101.358	151.772	3720.131
output	2	229.000	6.695	0.000	235.695
output	3	458.000	13.390	0.000	471.390
input	1	133590.000	0.000	-59485.775	74104.225

input	2	995.000	0.000	-588.068	406.932
input	3	489.000	0.000	-208.540	280.460
input	4	802.000	0.000	-314.765	487.235
input	5	359.000	0.000	0.000	359.000

LISTING OF PEERS:

peer	lambda weight
23	0.159
24	0.059
22	0.781

Results for firm: 11
Technical efficiency = 0.946
Scale efficiency = 0.622 (drs)

PROJECTION SUMMARY:

variable		original value	radial movement	slack movement	projected value
output	1	5450.000	310.009	468.678	6228.687
output	2	313.000	17.804	842.856	1173.660
output	3	512.000	29.124	0.000	541.124
input	1	130305.000	0.000	-18826.788	111478.212
input	2	2377.000	0.000	-501.556	1875.444
input	3	860.000	0.000	-414.922	445.078
input	4	1444.000	0.000	-80.715	1363.285
input	5	1308.000	0.000	0.000	1308.000

LISTING OF PEERS:

peer	lambda weight
15	0.317
3	0.683

Results for firm: 12
Technical efficiency = 1.000
Scale efficiency = 1.000 (crs)

PROJECTION SUMMARY:

variable		original value	radial movement	slack movement	projected value
output	1	10473.000	0.000	0.000	10473.000
output	2	675.000	0.000	0.000	675.000
output	3	462.000	0.000	0.000	462.000
input	1	98185.000	0.000	0.000	98185.000
input	2	2088.000	0.000	0.000	2088.000
input	3	464.000	0.000	0.000	464.000
input	4	3214.000	0.000	0.000	3214.000
input	5	1525.000	0.000	0.000	1525.000

LISTING OF PEERS:

peer	lambda weight
12	1.000

Results for firm: 13
Technical efficiency = 0.871
Scale efficiency = 0.731 (drs)
PROJECTION SUMMARY:

variable		original value	radial movement	slack movement	projected value
output	1	6188.000	920.211	0.000	7108.211
output	2	707.000	105.137	1001.435	1813.573
output	3	467.000	69.447	0.000	536.447
input	1	140160.000	0.000	-37231.470	102928.530
input	2	2202.000	0.000	-62.877	2139.123
input	3	447.000	0.000	0.000	447.000
input	4	3173.000	0.000	-1971.556	1201.444
input	5	1966.000	0.000	-260.949	1705.051

LISTING OF PEERS:

peer	lambda weight
15	0.498
5	0.260
3	0.242

Results for firm: 14
Technical efficiency = 0.876
Scale efficiency = 0.611 (drs)
PROJECTION SUMMARY:

variable		original value	radial movement	slack movement	projected value
output	1	8270.000	1169.848	0.000	9439.848
output	2	329.000	46.539	2474.487	2850.026
output	3	472.000	66.768	0.000	538.768
input	1	231045.000	0.000	-117476.350	113568.650
input	2	2694.000	0.000	0.000	2694.000
input	3	679.000	0.000	-136.910	542.090
input	4	4917.000	0.000	-3278.805	1638.195
input	5	7941.000	0.000	-5390.525	2550.475

LISTING OF PEERS:

peer	lambda weight
15	0.818
12	0.065
22	0.117

Results for firm: 15
Technical efficiency = 1.000
Scale efficiency = 1.000 (crs)
PROJECTION SUMMARY:

variable		original value	radial movement	slack movement	projected value
output	1	10111.000	0.000	0.000	10111.000
output	2	3405.000	0.000	0.000	3405.000

output	3	550.000	0.000	0.000	550.000
input	1	120450.000	0.000	0.000	120450.000
input	2	3071.000	0.000	0.000	3071.000
input	3	583.000	0.000	0.000	583.000
input	4	1676.000	0.000	0.000	1676.000
input	5	2946.000	0.000	0.000	2946.000

LISTING OF PEERS:

peer	lambda weight
15	1.000

Results for firm: 16
Technical efficiency = 0.959
Scale efficiency = 0.449 (drs)

PROJECTION SUMMARY:

variable		original value	radial movement	slack movement	projected value
output	1	5215.000	222.388	3531.197	8968.586
output	2	1400.000	59.702	1288.702	2748.403
output	3	525.000	22.388	0.000	547.388
input	1	324120.000	0.000	-206310.050	117809.950
input	2	6108.000	0.000	-3388.806	2719.194
input	3	1223.000	0.000	-680.585	542.415
input	4	3084.000	0.000	-1500.020	1583.980
input	5	2464.000	0.000	0.000	2464.000

LISTING OF PEERS:

peer	lambda weight
3	0.201
15	0.799

Results for firm: 17
Technical efficiency = 0.765
Scale efficiency = 0.767 (drs)

PROJECTION SUMMARY:

variable		original value	radial movement	slack movement	projected value
output	1	3477.000	1067.790	589.392	5134.182
output	2	523.000	160.614	0.000	683.614
output	3	393.000	120.691	0.000	513.691
input	1	132130.000	0.000	-47522.306	84607.694
input	2	908.000	0.000	0.000	908.000
input	3	379.000	0.000	-26.796	352.204
input	4	932.000	0.000	-177.558	754.442
input	5	1123.000	0.000	-340.378	782.622

LISTING OF PEERS:

peer	lambda weight
3	0.098
15	0.156
22	0.745

Results for firm: 18
Technical efficiency = 1.000
Scale efficiency = 0.533 (drs)
PROJECTION SUMMARY:

variable		original value	radial movement	slack movement	projected value
output	1	3881.000	0.283	773.476	4654.759
output	2	319.000	0.023	0.000	319.023
output	3	535.000	0.039	0.000	535.039
input	1	153300.000	0.000	-49393.247	103906.753
input	2	1600.000	0.000	-211.912	1388.088
input	3	405.000	0.000	-26.739	378.261
input	4	1150.000	0.000	0.000	1150.000
input	5	1565.000	0.000	-911.407	653.593

LISTING OF PEERS:

peer	lambda weight
15	0.050
3	0.853
5	0.097

Results for firm: 19
Technical efficiency = 0.913
Scale efficiency = 0.422 (drs)
PROJECTION SUMMARY:

variable		original value	radial movement	slack movement	projected value
output	1	5297.000	503.070	2253.636	8053.706
output	2	256.000	24.313	1942.268	2222.581
output	3	498.000	47.296	0.000	545.296
input	1	198925.000	0.000	-83229.281	115695.719
input	2	3159.000	0.000	-721.542	2437.458
input	3	997.000	0.000	-487.087	509.913
input	4	2078.000	0.000	-567.712	1510.288
input	5	2078.000	0.000	0.000	2078.000

LISTING OF PEERS:

peer	lambda weight
15	0.638
3	0.362

Results for firm: 20
Technical efficiency = 1.000
Scale efficiency = 1.000 (crs)
PROJECTION SUMMARY:

variable		original value	radial movement	slack movement	projected value
output	1	3509.000	0.000	0.000	3509.000

output	2	203.000	0.000	0.000	203.000
output	3	400.000	0.000	0.000	400.000
input	1	71905.000	0.000	0.000	71905.000
input	2	538.000	0.000	0.000	538.000
input	3	148.000	0.000	0.000	148.000
input	4	465.000	0.000	0.000	465.000
input	5	346.000	0.000	0.000	346.000

LISTING OF PEERS:

peer	lambda weight
20	1.000

Results for firm: 21
Technical efficiency = 1.000
Scale efficiency = 0.930 (drs)

PROJECTION SUMMARY:

variable		original value	radial movement	slack movement	projected value
output	1	5496.000	0.000	0.000	5496.000
output	2	338.000	0.000	0.000	338.000
output	3	468.000	0.000	0.000	468.000
input	1	99280.000	0.000	0.000	99280.000
input	2	1121.000	0.000	0.000	1121.000
input	3	346.000	0.000	0.000	346.000
input	4	779.000	0.000	0.000	779.000
input	5	909.000	0.000	0.000	909.000

LISTING OF PEERS:

peer	lambda weight
21	1.000

Results for firm: 22
Technical efficiency = 1.000
Scale efficiency = 1.000 (crs)

PROJECTION SUMMARY:

variable		original value	radial movement	slack movement	projected value
output	1	4184.000	0.000	0.000	4184.000
output	2	185.000	0.000	0.000	185.000
output	3	503.000	0.000	0.000	503.000
input	1	74095.000	0.000	0.000	74095.000
input	2	400.000	0.000	0.000	400.000
input	3	300.000	0.000	0.000	300.000
input	4	500.000	0.000	0.000	500.000
input	5	360.000	0.000	0.000	360.000

LISTING OF PEERS:

peer	lambda weight
22	1.000

Results for firm: 23
Technical efficiency = 1.000
Scale efficiency = 0.927 (irs)
PROJECTION SUMMARY:

variable		original value	radial movement	slack movement	projected value
output	1	2271.000	0.000	0.000	2271.000
output	2	342.000	0.000	0.000	342.000
output	3	368.000	0.000	0.000	368.000
input	1	77015.000	0.000	0.000	77015.000
input	2	479.000	0.000	0.000	479.000
input	3	249.000	0.000	0.000	249.000
input	4	530.000	0.000	0.000	530.000
input	5	347.000	0.000	0.000	347.000

LISTING OF PEERS:

peer	lambda weight
23	1.000

Results for firm: 24
Technical efficiency = 1.000
Scale efficiency = 1.000 (crs)
PROJECTION SUMMARY:

variable		original value	radial movement	slack movement	projected value
output	1	1507.000	0.000	0.000	1507.000
output	2	617.000	0.000	0.000	617.000
output	3	333.000	0.000	0.000	333.000
input	1	66430.000	0.000	0.000	66430.000
input	2	305.000	0.000	0.000	305.000
input	3	108.000	0.000	0.000	108.000
input	4	205.000	0.000	0.000	205.000
input	5	378.000	0.000	0.000	378.000

LISTING OF PEERS:

peer	lambda weight
24	1.000

Results for firm: 25
Technical efficiency = 0.535
Scale efficiency = 0.615 (drs)
PROJECTION SUMMARY:

variable		original value	radial movement	slack movement	projected value
output	1	3152.000	2735.472	583.319	6470.791
output	2	616.000	534.597	162.211	1312.808
output	3	290.000	251.677	0.000	541.677
input	1	240900.000	0.000	-128862.302	112037.698
input	2	1950.000	0.000	0.000	1950.000
input	3	492.000	0.000	-38.322	453.678

input	4	1757.000	0.000	-374.214	1382.786
input	5	2150.000	0.000	-739.853	1410.147

LISTING OF PEERS:

peer	lambda weight
15	0.360
3	0.640

Results for firm: 26
Technical efficiency = 0.935
Scale efficiency = 0.732 (drs)

PROJECTION SUMMARY:

variable		original value	radial movement	slack movement	projected value
output	1	2971.000	207.312	1109.268	4287.580
output	2	203.000	14.165	0.000	217.165
output	3	475.000	33.145	0.000	508.145
input	1	170820.000	0.000	-91693.692	79126.308
input	2	556.000	0.000	0.000	556.000
input	3	390.000	0.000	-75.691	314.309
input	4	1026.000	0.000	-415.152	610.848
input	5	789.000	0.000	-372.779	416.221

LISTING OF PEERS:

peer	lambda weight
15	0.012
3	0.135
22	0.853

Results for firm: 27
Technical efficiency = 1.000
Scale efficiency = 1.000 (crs)

PROJECTION SUMMARY:

variable		original value	radial movement	slack movement	projected value
output	1	2036.000	0.000	0.000	2036.000
output	2	42.000	0.000	0.000	42.000
output	3	445.000	0.000	0.000	445.000
input	1	74825.000	0.000	0.000	74825.000
input	2	350.000	0.000	0.000	350.000
input	3	74.000	0.000	0.000	74.000
input	4	396.000	0.000	0.000	396.000
input	5	462.000	0.000	0.000	462.000

LISTING OF PEERS:

peer	lambda weight
27	1.000

Results for firm: 28
Technical efficiency = 0.892

Scale efficiency = 0.479 (drs)

PROJECTION SUMMARY:

variable		original value	radial movement	slack movement	projected value
output	1	3183.000	383.734	1178.454	4745.188
output	2	414.000	49.911	0.000	463.911
output	3	470.000	56.662	0.000	526.662
input	1	201115.000	0.000	-107260.006	93854.994
input	2	1274.000	0.000	0.000	1274.000
input	3	356.000	0.000	0.000	356.000
input	4	1527.000	0.000	-592.136	934.864
input	5	1634.000	0.000	-944.190	689.810

LISTING OF PEERS:

peer	lambda weight
22	0.164
5	0.218
3	0.533
15	0.085

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