FORECASTING
OUTBOUND TOURISM
FROM AUSTRALIA TO GREECE

To Helen and Maria

VICTORIA UNIVERSITY OF TECHNOLOGY

FACULTY OF BUSINESS

FORECASTING OUTBOUND TOURISM FROM AUSTRALIA TO GREECE

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SUMMARY

With the view of stressing the importance of forecasting and discovering underlying patterns in Tourism data series - for the purpose of assisting management and policy makers in the Tourism Industry - a multiple regression model and one classical decomposition model were constructed in order to investigate Outbound Tourism from Australia to Greece.

In the process of the construction and estimation of the models and of the assessment of the forecasting performance of each model many significant outcomes came to light. However, the main findings of this study (regarding Greece as tourist destination for Australians) are the following:

1. Greece has been relinquishing its image as a European tourist destination for the Australian traveller.
2. The Australian traveller treats a trip to Greece as a necessary good rather than as a luxury (an attribute that usually is given to long haul destinations).
3. Exchange rate fluctuations and cost of living in Greece are not decisive factors when an Australian traveller is thinking of visiting Greece.

Finally, the forecasting performance of each method was investigated in the light of some established

assessment criteria resulting in contradictory outcomes.

STATEMENT OF AUTHORSHIP

I Konstantinos Theodossiou hereby declare that this thesis has not previously been submitted by me for the award of any other degree or diploma in any other tertiary institution.

No other person's work has been used without due acknowledgment in the main text of the thesis.

[redacted]

Konstantinos Theodossiou

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CHAPTER 1

INTRODUCTION

1.1. THE NEED FOR FORECASTING AND DISCOVERING PATTERNS IN TOURISM DATA.

If there is one complicated industry to be researched, it is that of Tourism.

Businesses producing services (i.e., hotels, resorts, airlines, tour operators, coach companies, e.t.c.) and tangible products (i.e., handicrafts, clothes, linen e.t.c.) have created a giant sector of microindustries (SMITH, 1989). Undoubtedly these microindustries constitute the body of Tourism but the heart that gives life to this body is the people; the tourists. The survival of the body of these related microindustries depends heavily on the tourists' preferences and attitudes towards the destination country, as well as volume of arrivals and the hard currency inflow that they are likely to create (JUD & KRAUS, 1976).

Unfortunately the Tourism operational year is significantly less than twelve months. This is because most tourists, either foreign or nationals, decide to visit a place mainly whenever climatic conditions and/or working obligations allow. As a result most businesses servicing tourists are affected by seasonality (PHELPS, 1988).

Even though the suppliers of Tourism services and products can operate throughout the year regardless of weather conditions and/or period of time, it is mainly the demand side that does not "respond to the call". It is the "consumer's - the tourist's - indifference or incapability" that leads to "spatial-temporal mismatching of supply and demand and the associated over-under utilisation of capacity - constant attributes of the tourist industry" (see HUBBARD & JEFFREY, 1986, p.177). These facts partially explain the severe financial and operating problems (i.e., liquidity, difficulties in borrowing and finding permanent staff) in the sector (BARON, 1973).

Nevertheless, spatial and temporal mismatching of supply and demand in Tourism may have also been caused by the irrational expansion of the supply sector. This is a problem that usually occurs when there is inefficient planning and a failure in forecasting accurately tourist flows towards a destination. This can occur when the destination under consideration either faces strong competition from other regions or is only intended to temporarily fulfil the tourists' expectations like fashion. Nevertheless, the determination of the range over which the mismatching of demand and supply usually takes place is primarily determined by factors that affect tourists' attitudes and perceptions about a destination.

As a result an accurate estimation of Tourism demand and the identification of its characteristics and determinants warrant serious consideration for the future of a Tourism dependent country, prior to the development of any related businesses.

More specifically the need for forecasting tourist flows has gained wide acceptance by experts in the field. Indeed, the need to forecast the impact of economic (WITT & MARTIN, 1987c) or social (KUCUKKURT, 1981) factors in addition to the estimation and identification of underlying patterns in Tourism data (BARON, 1972) has become an important element for the economic and financial viability of businesses servicing tourists.

Overall demand forecasting and the need to reveal associated relationships between demand and causal factors is not simply essential but of vital importance in the process of securing and enhancing a profitable future for a Tourism business. Planning and expectations always go along but planning that is based on merely intuitive speculations without a market analysis and research is usually deemed to fail.

1.2. TOURISM BUSINESSES ATTITUDES TOWARDS FORECASTING.

Small Tourism enterprises are not willing or capable of spending money and time on carrying out the task of forecasting. As a result National Tourism Organisations (NTOs) and generally governmental bodies - whose purpose is to plan and facilitate the expansion of international Tourism in their countries - act as safeguards for these small and/or medium domestic tourism organisations by carrying out the task of forecasting (POOLE, 1988).

From the other hand, large multinational companies may not need the NTOs assistance even though they have been using it as a part of their corporate existence in a country. Yet, even for these giant multinational companies the need to identify the characteristics of the market and forecast demand is of primary importance (VAN DOORN, 1982).

For instance, tour operators must know the suitable period and the expected level of demand in order to make reservations for hotel accommodation or airline tickets. They must know when the suitable period for advertising is which consequently presupposes amongst the other things the identification and measurement of seasonal characteristics of the specific destination. Finally they must know what the attitudes of a specific market towards a destination country are; especially, when it faces intense competition by other countries and there are indications of adverse movements in the trend patterns in the destination country. Thus most of these multinational companies have established their own forecasting departments (VAN DOORN, 1984a).

Forecasting (and the associated analysis) nowadays can really assist in securing investments (MAKRIDAKIS, 1990) in Tourism. However this is an arduous task.

1.3. THE DILEMMA IN SELECTING AN ANALYTICAL FRAMEWORK.

Given the need for i) identifying and measuring the determinants of demand and ii) estimating seasonality then the task of selecting a method for accomplishing these goals adds a new puzzle for the analyst.

The cost and simplicity of each method are important factors in the process of selecting the appropriate analytical framework. However, the forecasting horizon (MAKRIDAKIS, 1983) and the degree of accuracy (VAN DOORN, 1984a) of an analytical framework will clearly be decisive criteria.

Even though the need for selecting the appropriate method is obvious, the task of making a choice is very complex. However, at the end of the day what really matters (from the policymakers' perspective) is accuracy (VAN DOORN, 1984a). In addition, as tourists' attitudes change and competition increases, the forecasting method must be able to deal with the changing nature of the market (KUCUKKURT, 1981). Finally, it is also vital that the selected method is feasible to both large and small Tourism organisations (GUERTS, 1982).

1.4. FORECASTING METHODS IN TOURISM - AN OVERVIEW.

The study of trends in Tourism time series data has become an integral part in the process of understanding what determines the growth and effectiveness of businesses related to the Tourism industry (BARON, 1972).

The "art of forecasting" (MAKRIDAKIS & WHEELWRIGHT, 1973, ARCHER, 1976), is relatively new in Tourism. A number of previous studies have illustrated overviews of the forecasting methods that are being used in the Tourism area. Most of the literature refers to qualitative and quantitative forecasting (ARCHER, 1976 & 1980, UYSAL & CROMPTON, 1985, WITT & MARTIN, 1989c) or Exploratory and Speculative forecasting (VAN DOORN, 1982, CALANTONE et.al., 1987). In this thesis, however, the forecasting methods will be classified as qualitative and quantitative.

Qualitative forecasting methods depend upon the accumulated experience of individual experts or groups of people assembled together to predict the likely outcome of events. This approach is most appropriate where data are insufficient or inadequate for forecasting, or where changes of a previously unexperienced dimension make numerical analysis inappropriate (ARCHER, 1980, p.9-10).

The main qualitative forecasting techniques in Tourism are the Scenario writing or the Judgment Aided Models (JAM) (BARON, 1979), and the Delphi technique (DALKEY & HELMER, 1963, DYCK & EMERY, 1970, SHAFER & MOELER & GETTY, 1974, LINSTONE & TUROFF, 1975, KRIPPENDORF, 1980, SEELY & IGLARSH & EDGELL, 1980, VAR, 1984).

Quantitative forecasting techniques deal with past trends extrapolation in the future using the assistance of statistical, mathematical and economic models (MAKRIDAKIS & WHEELWRIGHT, 1985).

This quantitative approach deals with time series data analysis in two forms. Forecasting that is undertaken without reference to the causes or determinant factors of historical values of the variable (that is being forecast) requires the use of the Univariate (WITT & MARTIN, 1989c) time series (non-causal) methods. Otherwise the Multivariate or multiple regression explanatory (causal) methods are more appropriate.

A literature review of the univariate time series methods indicates that the most common ones are the moving average and various exponential smoothing techniques (WITT & MARTIN, 1989c). However Trend Curve Analysis (LI-CHENG & TIE-SHENG, 1985), variation of Decomposition methods (BARON, 1972 & 1973 & 1975, MAKRIDAKIS & HIBON, 1984, VAN DOORN, 1984), the Box and Jenkins univariate method (CANADIAN GOVERNMENT OFFICE OF TOURISM, 1977 & 1983, D'AMOR, 1977) and the Gravity and Trip generation models (CESARIO, 1969, ELLIS & VAN DORREN, 1966, WOLFE, 1972, ARMSTRONG, 1972, CRAMPON & TAN, 1973, FREUND & WILSON, 1974) are also greatly applied in Tourism (ARCHER, 1976 & 1980, UYZAL & CROMPTON, 1985, CALANTONE & BENEDETTO & BOJANIC, 1987, WITT & MARTIN, 1989c).

Multivariate methods (which represent the most common quantitative technique (GRAY, 1966, DIAMOND, 1977, LITTLE, 1980, QUAYSON & VAR, 1982)) are used in Tourism

(UYSAL & CROMPTON, 1985) and employ the causal approach. Multivariate methods cover the whole spectrum of multiple regression and econometric models. However the Box and Jenkins multivariate or transfer function approach (WANDER & VAN ERDEN, 1980, CANADIAN GOVERNMENT OFFICE OF TOURISM, 1977 & 1983), is also used in Tourism forecasting.

Each of the abovementioned forecasting approaches has been directly applied in the area of Tourism and many studies that have employed these approaches are very notable in the field of Tourism forecasting. A review of these studies is presented in chapter 3.

1.5. THE PURPOSE OF THIS STUDY

Greece as an overseas destination for Australian tourists in 1990 represented only 1.5 per cent (see section 4.5.2) of the total Australian Resident Short Term Departures[1] (ARSTDs); this is despite the fact that hundreds of thousands of Greek migrants reside in Australia (V.E.A.C, 1986). The evolution of Greece as a tourist destination has not been as one would have expected.

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[1].The Australian Bureau of Statistics classifies as Short Term Departures all departures related to visits overseas for a period of less than twelve months.

The need for discovering underlying patterns in the ARSTDs to Greece historical data is as clear as the need for the construction of an appropriate forecasting model for the purpose of assisting management (of i.e. tour operators, airlines) in decisions related to Tourism products[2] including Greece.

More specifically the purpose of this study, which takes Greece as a sample destination, is to:

a. quantify and interpret the underlying patterns of seasonality and the long term trend in ARSTDs to Greece;

b. to quantify and interpret relationships of major demand determinants in ARSTDs to Greece; and

c. to construct and evaluate the suitability of multivariate causal and time series methods in forecasting Australian Tourism demand in Greece.

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[2]. Tourism products include any man-made goods and services and natural resources that satisfy primary biological or secondary psychological needs of the tourists (KUCUKKURT, 1981).

1.6. THE STRUCTURE OF THIS STUDY

In the light of the above mentioned, this chapter (the first chapter) constitutes the introduction of the study and aims at stressing the importance and the need for discovering underlying patterns in Tourism data and forecasting for the purpose of assisting management and policy makers to make decisions and plan efficiently the future of tourist related businesses.

In the second chapter, an attempt will be made to both identify and look into the framework of Tourism forecasting as well as discuss the role of the components of this framework in forecasting, the factors that a forecaster must consider while making forecasts and finally the role of forecasting in decision making and planning.

The third chapter reviews the forecasting methods that have been applied widely in Tourism forecasting up to now.

In the fourth chapter a discussion will be made on the rationale of the analytical framework that will be used in discovering underlying patterns and relationships in the ARSTDs to Greece. In addition there will be sections presenting discussions about the nature of the data, sources of data and the history of the market under study.

In the fifth chapter I will demonstrate an application of the classical decomposition model in order to identify and quantify underlying patterns (i.e., trend, seasonality) in the ARSTDs to Greece. Their extrapolation in the future will furnish the forecasts.

In the sixth chapter an application of a multiple regression model will be presented for the purpose of i) identifying and quantifying relationships between ARSTDs to Greece and its major demand determinants and finally ii) forecasting ARSTDs to Greece.

The forecasting performance of the explicitly discussed models in the previous two chapters is being assessed in the seventh chapter while conclusions and recommendations for further studies are incorporated in chapter 8.

The Appendix includes most of the calculations involved in chapters 5, 6 and 7.

CHAPTER 2

THE FRAMEWORK OF TOURISM FORECASTING

FOREWORD

In the first chapter I pointed out that there is a need for forecasting in the tourism industry for the purpose of predicting demand and increasing the effectiveness of the resource capacity of Tourism related businesses. In order however to further investigate the use of forecasting methods in Tourism I will identify and define the components of tourism on which forecasting techniques have been applied; the factors that affect forecasting; and finally the factors that policy makers must consider while making forecasts. However before I proceed any further it is appropriate to clearly define the terms Tourism and Tourism forecasting.

2.1. TOURIST, TOURISM AND TOURISM FORECASTING

The ambiguity that exists in the process of defining the terms tourist and Tourism (as an industry) has been stressed by many researchers in the field (HUNT & LAYNE, 1991). Going back to 1971 in the United Nations Conference on Tourism (UNCTAD, 1971) Tourism was defined as an industry representing the sum of those industrial and commercial activities producing goods and services wholely or mainly consumed by foreign visitors or domestic tourists. Leiper (1979) gave a broader and in a sense more ambiguous definition in which the Tourism industry consists of all those firms, organisations, and facilities which are ... intended ... to serve specific needs and wants of tourists (LEIPER, 1979, p.400).

However, I must now consider another related problem; that of defining the term tourist. The existence of this problem can be seen when we pose the following questions. Do restaurants which serve both locals and foreigners belong to the Tourism industry and if not what are the main criteria that should be used in order to distinguish a tourist business from a non-tourist business? Do we regard both locals and foreigners making use of a tourist related business as tourists?

Consequently it follows from the previous arguments that the definition of the term "tourist" is essential for the purpose of gathering data which will assist researchers to assess the impact and future of Tourism at a destination. According to the Bureau of Industry Economics in Australia (1984, p.4) a tourist is "a person visiting a location at least 40 kms from their usual place (of residence), for a period of at least 24 hours and not exceeding 12 months". This is however a definition of Tourism which is domestically oriented.

A description of the term international tourist is found in the World Tourism Organisation (WTO, 1981) guidelines. They describe the international tourist (or initially the "international Visitor") as any individual entering a country that is not his/her usual place of residence and who is not:

1. Intending to emigrate or to obtain employment in the destination country;
2. Visiting in the capacity of a diplomat or a member of the armed forces;
3. A dependent of anyone in the above categories;
4. A refugee, nomad, or border worker;
5. Going to, stay for more than a year

but who is or may be

6. Visiting for purposes recreation,medical treatment, religious observances, family matters, sporting events, conferences, study, or transit to another country;
7. A crew member of foreign vessel or aircraft stopped in the country on any lay-over;
8. A foreign commercial or business traveller staying for less than one year, including technicians arriving to install machinery or equipment;
9. An employee of international bodies on a mission lasting less than one year, or a national returning home for a temporary visit.

However, an international visitor who satisfies all of the abovementioned requirements can only be considered as an international tourist if he/she has spend at least one night in accommodation in the destination country (WTO, 1981).

Employing a similar approach to the WTO the Bureau of Tourism Research (BTR) in Australia and the Australian Bureau of Statistics (ABS) define the international tourist as any "temporary visitor staying at least 24 hours in the country visited and whose purpose can be classified under one of the following headings" (BTR, 1989):

A. Leisure (e.g. holiday, sport, study, recreation e.t.c.);

B. Business;

C. Family (e.g. Visiting Friends and Relatives (VFR));

D. Mission;

E. Meeting.

The Australian definition of the term tourist describes and characterises the tourist data in this study. In addition it should be said that "***Tourism is defined as a process. As the integration of the Tourist, the industry and the attractions, tourism flows in a direction from origin to destination with linkages within***" (REIMER, 1990, p.501). This process is defined clearly by the fact that the Tourism sector is "***primarily a collection of service oriented activities spread across a variety of industrial classifications, consumer expenditure*** " (EADINGTON & REDMAN, 1991, p. 42) and attitudes.

These activities or attractions correspond to a particular segment of a market, at a specific period of time. However, the future is not certain; thus forecasting needs to take place, not only to eliminate possible losses and disturbances in the Tourism process, but also to predict a variation in the process that would lead <u>a particular tourist to visit a particular destination</u>, and finally to analyse the factors that would contribute in the change of the current situation.

Consequently "*Forecasting can be defined as the art of predicting the occurrence of events before they actually take place* (ARCHER, 1976, p. 10), for the purpose of i) estimating the range of the anticipated demand and ii) manipulating the Tourism process so that a destination can achieve the desired level of demand.

I will now proceed to deal with the components and the identification of this process in the next two sections.

2.2. THE COMPONENTS OF THE TOURISM PROCESS

According to Van Doorn (1982), when it comes to forecasting Tourism one must distinguish at least four components:

1. The consumer - Tourist;
2. The mediators or intermediate framework(i.e. tour operators, travel agencies);
3. The suppliers (hotels,airlines,resorts e.t.c);
4. The societal context of 1-3 (tourist,mediators and suppliers).

Management must consider all of the abovementioned components when thinking of predicting demand and proceeding with the implementation of a proposed plan. Each component can provide information that must be encompassed in the forecasting process which is intended to guide policymakers in making and implementing a decision.

More specifically, information about the tourist's age, the propensity of the disposable income and education (factual information); interest in sports, activities and sentimental ties with the destination (behavioural information); and choice of transport and accommodation (adaptive behaviour information) play a significant role for the identification of the characteristics of the potential tourist.

In addition, knowledge about the distribution channels in the market (intermediate framework) including not only agents and tour operators but also Tourism organisations and recreation clubs are also of primary importance. Nevertheless, the base of the supply sector (i.e. hotels, airlines e.t.c.) should not be ignored. The level of the competition (among businesses) for the purpose of maximising their share in this very competitive industry determines the limits within which prospective expansion plans must fall. Finally as Van Doorn stated, information must also be taken "by the most neglected category, the societal context" (VAN DOORN, 1982, p.153) (i.e., the influence from developments in other sectors, apart from Tourism, in our society) which usually disturb the process of Tourism. This subject however,is being dealt next.

2.3. THE FORECASTING ENVIRONMENT

The Tourism environment can be defined by the participants involved in the process of a specific market's demand and supply equilibrium. It then follows that the forecasting environment should take into account all the determinants that affect demand and supply. In other words it should consist of all the economic forces that influence costs, capacity levels, the availability of resources, rates of production and the level of consumer demand. Of course, demand is the key player of the expansion of Tourism at a specific destination.

The explicit analysis of the economic factors, past trends and their extrapolation to the immediate future (in order to accurately predict) is the main and primary task of FORECASTING. However - apart from the pure economic influences - social, political and technological factors also affect tourism demand (ARCHER, 1976).

Social factors like demographic changes (with extreme consideration to population changes), consumer attitudes and time availability for leisure are mainly taken into account when forecasting tourism demand.

In addition, technological changes may affect considerably consumer demand especially in the Tourism industry which is an area where transportation and access costs to a destination determine to a very large extent the level of consumer demand. Indeed, public access to cheap transportation has made it possible for millions of people to travel abroad creating one of the most profitable and "cheerful" industries ever created, the Tourism industry. However, one of the drawbacks of the technological advancements for the Tourism industry has been the creation of an even more competitive environment.

Lastly, I quote the political factors. These are the most unpredictable determinants. Eventhough a country can be readily approached by the majority of travellers, erratic events, as in Cyprus in 1973 with the invasion of Turkish troops (PAPADOPOULOS & WITT, 1985, WILLIAMS & SHAW, 1991) and the political instability in Fiji in 1987, may discontinue the bright future of a tourist destination, at least in the short run.

The multifaceted nature of the forecasting environment in Tourism has made the technocrats' task very hard and open to any possible error and shortcoming (ARCHER, 1976). As a result any projection should be taken into account very cautiously having always in mind that the characteristics of the factors under examination may not remain unchanged during the period which is being forecast.

2.4. FORECASTING FOR MANAGEMENT DECISION MAKING AND PLANNING

Uncertainty about the level of anticipated demand for tourist services nationally or regionally represents one of the main obstacles in the process of developing planning procedures in the Tourism industry (ARBELL & BARGUR, 1975).

As a result forecasting and more specifically accurate forecasting has become an important element in Tourism planning and management (CALANTONE et. al., 1988). This is due to the fact that all businesses in providing tourist services sell products that cannot be stored; forecasting plays significant role in minimising the risk of mismatching supply and demand and the associated loss of opportunities and profits. For a resort or an airline or a tour operator if time passes without selling accommodation or an airfare or a package tour that becomes equivalent to lost sales which cannot be recovered; the same service cannot be rendered the following day as it can't be stored.

Forecasting, however, provides at least indications of the expected level of demand which consequently leads businesses to plan and control (FRITZ & BRANDON & XANDER, 1984) their resources accordingly, in order to service the lower or higher level of demand with the minimum cost and loss.

At the national level, any government decision for capital investments (e.g. to build new roads and airports in a region in order to facilitate the expansion of Tourism) is by definition related to expectations for increased tourist flows in the future. Indeed, not many governments would spend money on projects that can't bring at least an equivalent amount of money into the national current account. With such huge infrastructure investments, eventhough they may ultimately serve all parts of the national or regional society, the contribution of international and/or domestic Tourism in maximising the returns of these investment projects is high and probably the only encouragement for their implementation.

Forecasting, economic analysis and more specifically cost, multiplier and demand analysis can provide invaluable information (EADINGHTON & REDMAN, 1991) and guidance before taking such strategic decisions. This is especially true for small economies where such projects are usually being financed by overseas loans and by definition Tourism needs to be heavily relied upon in the reduction of the foreign debt. The governments of these economies are primarily counting on the future hard currency inflow in their countries in order to pay off instalments to their debtors. If forecasts prove wrong then enormous economic and consequent political problems appear, while the domestic economy is unable to pay off the large part of the debt.

Major tourist dependent countries, like Greece, have recognised the importance of forecasting in planning and marketing and periodically conduct surveys for market analysis and prospects for international Tourism. Indeed, forecasting represents a major component in the Greek National Tourism Organisation's Tourism-Marketing plan (BUCKLEY & PAPADOPOULOS, 1986). The major objective of this plan was to develop a comprehensive list of the Greek tourist sectors' supply side such as tourist infrastructure, tourist accommodation and a host of other facilities and services necessary to sustain a growing number of foreign tourists. The two co-authors stress however that this had been " ***because failure of the tourist sector to meet the future demand at the right time, place and price could have led to social and environmental problems, as well as the loss of much needed foreign tourist receipts*** " (BUCKLEY & PAPADOPOULOS, 1986, p.96)

At this point, it is worth mentioning that forecasting and planning may be considered as two separate functions in business. However, it is forecasting that sets the boundaries within which the plans must be constructed and focused upon, which in turn will determine the nature of the decision making process (MAKRIDAKIS & WHEELRIGHT, 1985).

Nevertheless dynamic - periodically reassessed - forecasting is undoubtedly a primary input in the planning and decision making process. A process that will determine and manipulate not only demand but also the supply sector.

CHAPTER 3

FORECASTING METHODS IN THE LITERATURE OF TOURISM

3.1. QUANTITATIVE FORECASTING METHODS.

3.1.1. MULTIVARIATE CAUSAL METHODS.

A. Econometric-Multiple Regression Models.

When economic and social factors have been found to influence tourism demand then an econometric approach to forecasting is necessary (WITT & MARTIN, 1989a). This approach involves the use of regression analysis to calculate the quantitative relationship between the variable to be forecast and all possible influential ones, known as explanatory variables.

Multiple regression analysis in general is a method of determining the degree of influence exerted upon the dependent variable by each of several variables (UYSAL & CROMPTON, 1985). This is the most commonly employed quantitative method (GRAY, 1966, DIAMOND, 1977, LITTLE, 1980, QUAYSON & VAR, 1982, UYSAL & CROMPTON, 1985, CALANTONE et.al., 1987), in Tourism.

I. Regression variables.

In the literature the most frequently used dependent variable is the total number of visits (KLIMAN, 1981) or visits per head of (origin country) population

(PAPADOPOULOS & WITT, 1985, WITT & MARTIN 1985, 1987). Another type of dependent variable is the total expenditure (LOEB,1982, UYSAL & CROMPTON,1984) and per capita tourist expenditure (LOEB, 1982).

Theoretically speaking, any set of explanatory variables in the form of time series could be included in a multiple regression model in order to explain and predict Tourism demand levels (McINTOSH & GUPTA, 1980).

In the literature of Tourism forecasting according to Johnson and Ashworth (1990), the explanatory variables that are most often used and are statistically significant have been real per capita income in the origin country, relative exchange rates, relative prices (or the relative cost of tourism), the relative cost of travel, lagged dependent variables, dummy variables accounting for the occurrence of erratic events, time trend variables, travel time and promotional expenditure [3].

II. Regression methods.

The most widely used method of regression is the Ordinary Least Squares (OLS) (KRAUSE et.al., 1973). However

[3].Most of these variables are explicitly reviewed in chapter 6.

OLS may only be used when certain conditions are satisfied and only then will the regression estimates be Best Linear Unbiased Estimators (BLUE). Whenever there are two jointly dependent variables or one of the independent variables is highly correlated with the residuals then two stages least square method (2SLS) is used (MAK & MONCUR & YONAMINE, 1977).

Another possible problem which occurs often when using time series data is serial correlation. Serial correlation occurs when the disturbances in one period are correlated with the disturbances in one of the preceeding periods. Serial correlation is usually corrected for by using Generalised Least Squares (GLS). Several GLS techniques are anailable, of which the most common is the Cochran-Orcutt method (UYSAL & CROMPTON, 1984, WITT & MARTIN, 1985 & 1987a,b,c & 1988a,b & 1989a).

In the case that there is a large number of independent variables then the stepwise regression method can be also applied (CHEUNG, 1972, CHRISTENSEN & YOESTING, 1976, FESENMAIER & GOODCHILD & LIEBER, 1981).

III. Regression models in the literature of Tourism.

In the literature of Tourism forecasting there is a fairly large number of studies using the multiple regression causal methods. However Askari (1971), Artus (1970 & 1972), Smith and Toms (1979), Loeb (1982), Uysal and Crompton (1984), Papadopoulos and Witt (1985) and Witt and Martin (1987) have made a significant contribution in the field of forecasting in the Tourism area.

Askari (1971), using a linear model for describing interstate tourism, was able to investigate the relationship between income levels, daily cost of the tour, the number of attractions and the number of travellers undertaking a particular type of tour. He specified a set of equations which describe demand for a specific tour in a particular state in relation to two particular variables: per capita income and the round trip fare to the point of origin of tour, price per day and attractiveness of a tour, measured by the number of attractions inclusive in each tour. The most significant determinants were found to be per capita income, price per day, and attractiveness of the tour. From this outcome, the cost of travel proved to be less important for tourists while the components of a tour (i.e., attractions, price per day) and their income propensity to spend on travel were found highly significant of travel demand. Askari concluded that the success of a tour operator will greatly depend on where he/she advertises, how he/she prices, and how he/she puts together a particular tour.

Artus 1972, in the field of international travel, in an attempt to specify the short run determinants of international travel flows, specified a world travel model. His focus centred on the determinant factors of tourism expenditure and receipts in a number of countries. The real disposable income, relative prices were found once more highly significant determinants of International Tourism demand.

The 1972 study was actually complementary to his earlier 1970 econometric analysis (of the factors influencing the tourism expenditure by German travellers abroad and of German receipts from foreign visitors) in order to predict the effects of the revaluation of the Deutschemark in October 1969, on the travel sector and in the related category of the then West Germany's balance of payments accounts. The real disposable income and relative prices had also been found significant determinants of International Tourism demand for the German travellers and travellers to Germany.

A similar approach to Artus' (1972) study was that of Loeb (1982) who investigated the effects of real per capita income, exchange rates, and relative prices on the exports of travel services from the U.S.A. to seven foreign countries. Supplementary to his study were the effects of real income, exchange rates and relative prices on the total level of the U.S.A. receipts from foreign travel also examined. Specifically the model that he developed had the following form :

$$\mathbf{T_{j,z} = (RYPC_j\ ,EX\ ,RPI\ ,D_i)}, \ i=1,\ k$$

where:

$T_{j,z}$ is a measure of the demand for travel services by country j from country z,i.e., a measure of the exportation of travel services by country z to country j.

$RYPC_j$ is a measure of real per capita income in country j.

EX is the relative exchange rate (measured as units of z's currency/unit of j's currency).

RPI is the relative prices ratio,i.e. the ratio of prices in the exporting or host country to prices in alternative travel locations (including the country of origin of the tourists).

D_i is the variable portraying special event i.

j is a subscript denoting the country importing travel services.

z is a subscript denoting the country exporting. travel services.

The Real per capita income, relative exchange rate and relative prices were found to be significant determinants of the U.S exports of travel services. However the degree of responsiveness of the demand for travel which was attributed to the various variables, varied from country to country.

Even though the aforementioned studies have explicitly analysed the economic determinants of international Tourism, Papadopoulos and Witt in 1985, used a set of models to explain tourist demand from various origins to Greece looking (in addition) at ways for a more efficient allocation of promotional expenditure in overseas countries by the Greek Organisation of Tourism. Consequently the main variable in their study was the relative effectiveness of promotional spending by the Greek Organisation of Tourism in different origin countries. Promotional expenditure was also included as an explanatory variable in the Uysal and Crompton (1984) study for the purpose of determining international Tourism demand, in terms of arrivals and tourist expenditures in Turkey; in addition income, relative prices and exchange rate variables were also incorporated in their models. In the case of Turkey, promotional expenditure was found to be significant in only six out of the eleven countries that were examined, the exchange rate in ten countries while the income and relative prices were significant in all countries.

The cost of travel variable was absent in the previous study due to multicollinearity and inaccuracy of data gathered (UYSAL & CROMPTON, 1984). However, it was included in Smith and Toms' (1979) study. In an occasional paper for the Australian Bureau of Transport Economics, they attempted to investigate factors affecting demand for international travel to and from Australia. The principal aim of their study was to provide a means for forecasting the effect on demand of various alternative packages of fares and conditions. The model they specified (SMITH & TOMS, 1979, pp.22-27) is given next:

$$DP = f\ (Y, F, E, MA, MO)$$

where:

DP is per capita demand for travel to an overseas country.

Y is real disposable income per capita in the country of residence.

F is the equivalent real fare in the country of residence.

E is the exchange rate between Australia and the overseas country.

MA is the proportion of the Australian population born in the overseas country, and

MO is the number of Australian-born permanent residents in the overseas country.

Separate regression equations were estimated for Australians travelling overseas and overseas visitors travelling to Australia in order to estimate the various coefficients which in this case represented demand elasticities since the equations were in the logarithmic form. The effect of seasonality was picked up by using dummy variables. Real income, equivalent real fares, an index of the exchange rates, and the proportion of the Australian population born in the relevant overseas country all proved to have been significant determinants of demand in the pooled time-series and cross-section regressions they were applied on.

Finally, Witt and Martin in 1987a and 1987c, in two separate studies constructed a set of regression equations to forecast international tourism demand. Their studies represent the most explicit representation of an econometric model up to date. Firstly their models were developed for tourist visits from the former West Germany and the U.K. to their respective tourist destinations. Their second study complements and extends the previous one by examining the French and the U.S.A outbound tourism. The primary objective in the latter study was the evaluation of the performance of proxy variables compared with a specific tourists' cost of living variable that was used within the context of tourism demand forecasting models. The following model for each origin-destination pair, was constructed and estimated:

$$\ln(V_{ijt}/P_{it}) = a_1 + a_2\ln(Y_{it}/P_{it}) + a_3\ln C_{jt} + a_4\ln CS_{it} + a_5\ln EX_{ijt}$$
$$+ a_6\ln TA_{ijt} + a_7\ln TAS_{it} + a_8\ln TS_{ijt} + a_9\ln TSS_{it}$$
$$+ a_{10}DV1_t + a_{11}DV2_t + a_{12}DV3_{it} + U_{ijt}$$

t=1,2,...16 (1=1965...16=1980)

where :

V_{ijt} is the number of tourist visits from origin i to destination j in year t.

P_{it} is the origin i population in year t.

Y_{it} is personal disposable income in origin i in year t (1980 prices).

C_{jt} is the cost of living for tourists in destination j in year t (1980 prices).

CS_{it} is a weighted average of the cost of tourism in substitute destinations for residents of origin i in year t (1980 prices).

EX_{ijt} is the rate of exchange between the currencies of origin i and destination j in year t.

TAS_{it} is a weighted average of the cost of travel by air to substitute destinations from origin in year t (1980 prices).

TS_{ijt} is the cost of travel by surface from origin i to destination j in year t (1980 prices).

TSS_{it} is a weighted average of the cost of travel by surface to substitute destinations from origin i in year t.

DV1,2,3 are dummy variables .

U_{ijt} is a random disturbance term and

$a_1, a_2, \ldots a_{12}$ are unknown parameters.

In addition a trend term, $a_{13}t$, and/or lagged dependent variable term, $a_{14}\ln(V_{ijt-1}/P_{it-1})$, was incorporated in the model. The empirical results presented in their study reflect that the consumer price index either alone or together with the exchange rates is a reasonable proxy for the cost of tourism. On the contrary, the exchange rate was found not to be an acceptable proxy. Income was overwhelmingly significant and usually greater than unity indicating that international travel is perceived as a luxury good.

Overall, econometric models can really play a significant role in quantifying relationships in Tourism demand. However as pure forecasting tools they have been found less accurate than other less sophisticated techniques in Tourism (VAN DOORN, 1984, WITT & MARTIN, 1989a).

The use of econometrics in forecasting is more like an art (ARCHER,1976, MAKRIDAKIS & WHEELWRIGHT,1985) than a simple application of a method. It is not only the forecast that an analyst seeks from the implementation of such models but also the relationships revealed are more important as they express a dynamic perception of the Tourism environment. Moreover, other methods may be better at forecasting, but the econometric models are still useful in explaining Tourism flows. For example, an econometric model can explain how much Tourism "types" are likely to decrease or increase for a given change in say exchange rates, other things held constant.

However, as businesses care about minimising costs and increasing effectiveness in decision making, the inability of econometric models to forecast accurately compared with other significantly less complicated methods (VAN DOORN, 1984a, WITT & MARTIN,1988b) cannot be ignored.

B. Gravity and Trip Generation Models

An expansion of the multiple regression model is the Gravity and Trip generation model. It was said that multiple regression demand models explain the demand of Tourism as a function of several explanatory variables. However, gravity models are more precise about the form that such functional relationship might take (ARCHER, 1976). Their main focus is on the effect of distance as a determinant of travel. The idea under this approach is based on the principles of the well known Newton's law of gravity : two bodies attract each other in proportion to the product of their masses and inversely by the square of their distance apart. The latter, the distance of a journey, acts as a constrain for the development of a Tourism destination. For example, Australia although it can offer holidays almost all periods of the year while in addition offers a variety of attractions cultural and physical like nowhere in the world, the long distance that the main international holidayers like Germans and western Europeans have to travel consists one of the most significant impendiment for fattracting more European travellers.

The next step is to deal with the trip generation models which are essentially hybrids as they can evolve from either demand models or from gravity models. It can be said that trip generation models cannot be distinguished from the multiple regression models, however the emphasis given to the distance between the origin and the destination areas have created a distinctive characteristic in the literature of forecasting in Tourism.

The basic assumption (UYSAL & CROMPTON, 1985), of the gravity and trip generation models is that the number of trips taken by a given population from an origin to a particular destination is related to both the total population and the distance.

A representative example of a gravity model was presented by Van Doren (1967). His model took the following form :

$$I_{ij} = G \, (A_j \, P_i \; / \; d_{ij} \, b)$$

where:

I_{ij} is the number of trips made in some time between origin i and destination j

P_i is the population of origin area i

A_j is the attraction index of j

G is gravitational constant

b is an empirically estimated exponent

The study aimed to predict the number of travellers from 77 counties to 55 Michigan state parks. The attraction index was estimated taking into account the location of the park, natural features, and man-made features. This index was then used in the gravity or interaction model together with the population of the counties and the time-distance measurement between each of the centres of origin and 55 state parks.

In another study Ellis and Van Doren (1966) endeavoured to test the forecasting power of the gravity models against the system theory models. In the process they developed two gravity models and a set of simultaneous equations that they were to describe the behaviour of each variable within the system in relation to the other two variables.

The first gravity model was a simple model expressing the actual flow of visitors from each county of origin to each of the parks as a function of factors such as the population of the origin county, the attractiveness of the park and the minimum time in hours taken to travel from the county of origin to the park.

The second gravity model, incorporated the first one in addition to an expression of the relative attractiveness of other parks and their proximity to each of the origin counties. They concluded that whilst gravity models were easier to construct and use, their results were not as "good a fit" to the data as the system theory models.

The criticisms against the previously stated gravity models seemed to have inspired Armstrong (1972) and Crampon (1973).

Armstrong's aim was to develop and test a model to forecast the size and direction of international tourist flows between 18 tourist generating countries and 27 destinations areas. He first constructed a series of simple gravity models to explain tourist arrivals at each of the selected destination countries. Then, he introduced (progressively) explanatory variables in order to achieve the best outcome. The explanatory variables that he used were: per capita income, language similarity, attractions and distance. Additional cross-sectional, log linear multi variable regressions were run in respect of each destination. An additional variable, representing the influence of time, was introduced and the equations then produced improved forecasts that were statistically and intuitively acceptable (ARCHER, 1976).

Generally speaking, the gravity and trip generation models are used quite often in Tourism (ROSKILL TEAM, 1971,MANSFIELD, 1973, GORDON & EDWARDS, 1973, DURBEN & SILBERMAN, 1975, PETERSON et.al., 1982, PETERSON et.al., 1985).

Eventhough these models are considered as more precise compared to multiple regression models (ARCHER,1976) they still seem to have a number of weaknesses which are stated in Chapter 4.

C. The Transfer Function - Box - Jenkins Multivariate Method

The Box - Jenkins (B-J) transfer function model can be considered as an extension of the multiple linear regression model (WITT & MARTIN, 1989c). The transfer function model incorporates complicated mathematical and statistical algorithms as well as autoregressive and moving average terms allowing variables other than the one to be forecast to influence the analysis and finally the forecast.

A representative example of a transfer function model was presented by Wander and Van Erden (1980). They attempted to forecast Tourism demand in Puerto Rico constructing two models; one transfer function model in which arrivals to Puerto Rico were based on other explanatory variables; and one univariate B-J model.

They found that, eventhough the highly sophisticated transfer function model is quite accurate for the first six months, the univariate (and in a sense "naive") time series model was accurate for the <u>whole forecasting period of twelve months.</u> However, they stressed that the multivariate model may take into account discrete changes in the forecasting system and incorporate these discrete changes in order to extract meaningful forecasts.

Another application of this approach was made by the Canadian Government Office of Tourism (1977, 1983). A forecast of two years into the future was attempted for Canada's major travel markets. A set of four separate economic performance scenarios was produced in accordance with outcomes that were derived from the extrapolation of existing economic trends. Once again the results were not as expected despite the sophistication in the procedures and the costs involved.

3.1.2. UNIVARIATE - TIME SERIES METHODS

A. Box - Jenkins Univariate Method.

This method is a highly sophisticated technique, less complicated in comparison to the transfer function model but rather more difficult to apply than other univariate time series methods which I will present later in this chapter.

The B-J model (BOX & JENKINS, 1970) incorporates autoregressive and moving average procedures. Each procedure relates the forecasting value to the past actual values of the variable to be forecast and to the previous values of the error term. This AutoRegressive Integrated Moving Average (ARIMA) model is very flexible and can be applied to any kind (stationary and nonstationary) time series (WITT & MARTIN, 1989c) providing accurate forecasts (CANADIAN GOVERNMENT OFFICE OF TOURISM 1977 & 1983, WANDER & VAN ERDEN, 1980).

B. **Trend Curve Analysis.**

Trend curve analysis is widely used in Tourism/ Recreation forecasting situations (WITT & MARTIN, 1989c). The methodology of Trend Curve Analysis involves a series of regression analyses till the best representative line of the actual data is found.

A classical example (in the area of Tourism) of Trend Curve Analysis is given by Li-Cheng and Tie-Sheng (1985). While attempting to forecast domestic Tourism in China and more specifically in the Chinese city Hangzhou, they used a simple linear regression model to explain the strong relationship between tourists arriving to Hangzhou and per capita national income. However, when it came to forecasting Tourism demand they used a simple exponential regression model since (as they stated) in the context of making time-series analysis and forecasting one must deal with exponential relationships (LI-CHENG & TIE-SHENG, 1985, p.15).

C. Exponential smoothing

These methods produce a weighted moving average of past data which can then be extrapolated into the future in order to produce a forecast. The weights are assigned in geometric progression with the heaviest weights given to the most recent information and with past data discounted quite significantly. Usually adjustments are made for eliminating and isolating trend and seasonal effects[4]. It is also worth mentioning that exponential smoothing techniques are being used for short term forecasts due to the assumptions for compound growth inherent in geometric progressions. Consequently, they are not suitable for medium and long-term forecasts (WITT & MARTIN, 1989c).

Important studies using the exponential smoothing technique for forecasting are those of Ibrahim and Guerts (1975) and Guerts (1982). Their aim was to produce a model for forecasting tourist arrivals in Hawaii which (arrivals) appeared to be seasonal and were affected by unspecified outliers. In the follow up study of Guerts in 1982 - when he indicated the atypical periods and removed the corresponding outliers - the B-J model was found less accurate compared to the double exponential smoothing model.

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[4].Refer to Appendix 1 for a demonstration of an exponential smoothing technique and more specifically of a double exponential smoothing, the Holt's two parameter exponential smoothing on deseasonalised data.

The major thrust of his study was to look at what is required for the Tourism industry and what is economically efficient planning for the existing tourist operations. In addition the accuracy of the forecasts (and more importantly the value for money) of the exponential smoothing technique may provide many small tourist operations with the ability to plan efficiently by forecasting the future of their own businesses.

D. Decomposition methods

Eventhough decomposition methods are very old in business forecasting (FRITZ & BRANDON & XANDER, 1984) and despite the fact that they are not based on sophisticated statistical procedures (MAKRIDAKIS & WHEELWRIGHT,1985), their forecasting performance is still exceptional in the field of forecasting (MAKRIDAKIS & WHEELWRIGHT & McGEE 1978 & 1983).

The forecasting accuracy and the simplicity of the application of this method (MAKRIDAKIS & HIBBON, 1984) make it by far more efficient compared with the most advanced and sophisticated structured econometric models. The same holds true for other time series methods (BARNARD, 1971, ARCHER, 1976, WITT & MARTIN 1989a).

A Pure application of the classical decomposition model appear very rarely in the literature of Tourism forecasting. However one application worth mentioning was incorporated in Van doorn (1984a) study, in which the classical decomposition method was applied as an incorporated method of the standardised computer program "SIBYL/RUNNER". However, the methodology of the model has been implemented in various studies as an assisting method to analyse seasonally affected time series data by measuring seasonality and long trend-cycle components. Thus the next step is to present variations and extensions of the basic decomposition method.

In 1972, 1973 and 1975 Baron addressed the importance and necessity for studying trends in tourist time series for the sake of accurate and reliable forecasts in the air travel industry that is heavily affected by seasonality. Baron implemented the multiplicative decomposition model to isolate, measure and finally use the estimated components (TREND-CYCLE, SEASONALITY and IRREGULARITY) for the extraction of reliable forecasts.

The need to decompose time series appears very often whenever seasonality and trend exist. Most studies that tried to investigate and analyse patterns in time series data (which is characterised by seasonality), primarily tackled the problem by smoothing out the seasonal variations from the examined time series. This is an approach that is derived from the classical decomposition model's methodology. However, there are various alternatives for isolating the model's components.

For example, Baron (1972 & 1973 & 1975) specifically studied the time series of

1. Tourist arrivals in Israel;
2. Foreign currency brought in Israel;
3. Tourist arrivals and departures by air;
4. Residents departing; and
5. Bed nights in tourist recommended hotels, classified into overseas visitors, Israelis and total.

Baron used the X-II time series analysis computer program which used a multiple smoothing procedure of the aforementioned time series data, guaranteeing the isolation, estimation and projection of the seasonal and trend-cycle components. Finally, he pointed out that in most types of analytical work trend and cycles are combined together under the term trend-cycle and the remaining irregular fluctuations are treated as residuals.

The general model studied by Baron may be summarised in the following equation:

$$Y = C * S * I$$

where "Y" represents the actual time series values, "C" the trend cycle component and "I", irregularity.

While Baron's study relied upon the X-II time series analysis program, MAKRIDAKIS and HIBON (1984) in their attempt to investigate the accuracy of various quantitative forecasting methods, found that the ratio to moving average technique - which is being used in this study - produced seasonal indexes not inferior to the X-II program. That was achieved without resorting to the more sophisticated and complex method (of isolating and estimating the components) that was employed by the X-II program.

In addition, Van Doorn (1984a), using the "SIBYL/RUNNER" computer program found out that eventhough the classical decomposition cannot be considered as the ultimate forecasting tool, it is still amongst the best when compared to Census (i.e. X-II) decomposition and Multiple regression models.

Overall there have been few studies that have applied the classical decomposition model's methodology, primarily for estimating seasonality in Tourism; however no attempt was made to forecast.

There are two applications of the classical decomposition model's methodology to Greece. In 1987, DRACATOS used indirectly the decomposition method to isolate and estimate seasonality in the overseas arrivals classified by nationality in Greece. He used a twelve month moving average to express the trend-cycle component and calculate a seasonal factor for each monthly period which does not change through time.

The author pointed out that the use of arrivals (rather than bed nights spent) did not express adequately the real picture of the situation in Tourism in Greece. That criticism seemed to have been the sparking element for the DONATOS and ZAIRIS (1991) study which is a work very much similar to the DRACATOS one.

The two coauthors examined seasonality of foreign Tourism in the Greek island of Crete using time series based on nights spent by foreign tourists (including Greek permanent overseas residents), in all Greek islands, classified in types of accommodation. The method and assumptions of their study are exactly the same to the DRAKATOS one, assuming constant seasonal factors and satisfactory usage of a twelve month moving average for identifying the trend-cycle component. Both studies are descriptive and made no attempt at forecasting.

In 1988, Phelps, in an effort to distinguish his position from Hartman, 1986, pointed out that greater consideration needs to be given to the functions of the Tourism resources in terms of what they provide rather than in terms of whom they provide for and for how long (HARTMANN,1986). Phelps took a similar approach as the previous two studies. He applied a mean moving average to smooth out the time series in order to remove the "cycle" (which in other studies is called seasonality) and expose the long term trend.

Finally Carman (1990), by considering the problems of isolating the various components of a time series in the leisure industry, and their effects on each other, based his study on the classical multiplicative decomposition model.
He argued that if the moving average trend is statistically significant to the least squares trend then the projection can be made by basing each forecast point on the corresponding confidence interval. The cycle component attaches itself to the trend (which is in agreement with Baron (1972 & 1973 & 1975)) and it is detectable by a simple observation of the fluctuations of a moving average trend against the linear (OLS) trend and the period of the cycle (long term) estimated from the observations.

Overall, Carman, does agree with the decomposition methodology in time series analysis, on the precondition that the OLS trend is statistically significant to the moving average trend and secondly all forecast points would be accompanied by a confidence interval.

3.2. QUALITATIVE FORECASTING

3.2.1. QUALITATIVE FORECASTING DEFINED

Qualitative forecasting methods differ from quantitative ones in the sense that the experts' accumulated experience (UYSAL & CROMPTON, 1985) and opinions are incorporated into the forecasting processes.

In qualitative or speculative (VAN DOORN,1984a) forecasting, it is the instinct or feeling of the expert or a group of experts that assesses and influences the path towards projection for more reliable forecasting. It is here that science gets married to the intuitive power of the experienced professional in order to produce the most trustworthy forecasts for determining and controlling the destiny, in this case, of the Tourism industry.

3.2.2. METHODS IN QUALITATIVE FORECASTING

Scenario writing or Judgement Aided models and the Delphi technique constitute the main core of the qualitative approach to forecasting. Both methods are used mainly for medium and long term forecasting (BARON, 1983, POOLE, 1988).

A. Scenario Writing.

Scenario writing can be considered as complementing the short term forecasting methods. The task of setting up a chance based scenario of occurrence of event(s) or situation(s), provides the analyst with significant information about the way a specific industry behaves in response to several alternatively applied scenarios. As a result scenario writing incorporates three components (VAN DOORN, 1982):

1. Description of the current situation;
2. Description of potential situation(s); and
3. The individual way that each alternative could develop into the eventual future image.

The most explicit demonstration and application of the scenario writing approach was made by BARON in 1979 and 1983. The first study can be considered as quantitative (VAN DOORN, 1984b), as three possible scenarios were implemented on a set of variables that could have influenced Tourism in Thailand. This famous Israeli statistician's findings were proved accurate in a later study (VAN DOORN, 1984b). Subsequently a classic demonstration of a pure qualitative approach was taken in 1983 when Baron asked a group of experts in this field to construct three scenarios, an optimistic, an intermediate and a pessimistic, in order to forecast Tourism in Israel. The way in which this method was carried out and the results that flowed from it made this application the best example of scenario writing in Tourism forecasting (CALANTONE et.al., 1987).

B. Delphi Technique.

The Delphi technique is very popular nowadays as many national and/or governmental organisations have implemented this approach (WITT & MARTIN, 1989c), including Australia (POOLE, 1988). It is a special type of survey that is used in order to forecast the occurrence of specified long term and short term events and to generate estimates of the probability of specified conditions prevailing in future times (UYSAL & CROMPTON, 1985). This method requires the experts' opinion about the probability of certain situations or events occurring in the future. The basic procedure involves a questionnaire, asking respondents (experts with vast amount of knowledge and experience in the field) for the probability of the occurrence of certain events or their predictions on a number of variables. The responses are tabulated and sent back to the same experts who are asked to make new estimations that are based on the outcome of the findings of the first round.

Eventhough the Delphi technique has been widely used, there are major concerns about how properly the procedure has been carried out each time (CALANTONE et.al., 1987) and how objective the experts' opinions are (POOLE, 1988). However, I can't ignore the fact that the Delphi technique can deal with a large number of factors, non-quantifiable effects, and most importantly the utilisation of the experts' knowledge and experience for reliable forecasts.

In the literature of Tourism forecasting we can distinguish some important applications of the Delphi technique. For example, one such application relates to the U.S. Forest Service, when Shaffer, Moeller and Getty (1974) attempted to obtain experts' opinions on the leisure environment of the future and how that would relate to the management of natural resources, pollution management and urban environment (VAR, 1984).

The second representative application of the Delphi technique was conducted by the Canadian Office of Tourism (1983) combining it with quantitative techniques as well. Another study which is worth mentioning was carried out by Seely, Iglarsh and Edgell (1980), in which an attempt was made to obtain forecasts from attendees at a Tourism symposium.

Finally I would like to mention the Dyck and Emery study (1970). They tried to forecast the likelihood and probable dates of the occurrence of events in Alberta associated with leisure and recreation over the years 1970 - 2005. In their study a group of 305 experts were selected to form six panels, each addressing a different subject area like social goals and values, the needs of the individual, political life, family life and child rearing, leisure and recreation, and intercultural relations. Two rounds of questionnaires were conducted in order to have the occurrence of each event assigned and the final dates determined for estimating the forecasts.

3.3. SUMMARY.

It is obvious from the previously mentioned studies that besides the fact that the "art of forecasting" (MAKRIDAKIS & WHEELWRIGHT, 1973, ARCHER, 1976), is relatively new in Tourism, it is however very explicit.
The endless economic, econometric and statistical theory have facilitated the analysts in the application and creation of a wide range of forecasting methods in Tourism.

In most studies, the forecast is derived by one - the most accurate - method. However, it has been noted by many researchers that, apart from the previously in this chapter reviewed methods, an integrative appoach is needed for the generation of more accurate and reliable forecasts.

Nevertheless , multiple regression, econometric and gravity trip generation models appear very often in the literature of Tourism forecasting. However, B-J models (transfer function and ARIMA) and variation of exponential smoothing methods have also been applied in this area. The most neglected method as forecasting tool it seems to have been the classical decomposition model due to the presence of the X-II time series analysis program which incorporates more sophisticated smoothing procedures than the classical decompostion model's.

Qualitative techniques (i.e. delphi technique and scenario writing), adapted mainly by national Tourism organisations, have been also applied in Tourism forecasting, producing excellent results.

It is not clear which method can perform better or more efficiently than the other. Issues like i.e. cost, accuracy, simplicity or complexity are few of the issues that an analyst must consider when selecting the most appropriate analytical framework for the generation of the most accurate forecasts. All of the methods reviewed in this chapter hold some advantages and disadvantages against the others that direct the analyst in the choice of the most appropriate method(s) for his/her case. This task, however, is undertaken in the next chapter.

CHAPTER 4

THE DATABASE AND THE ANALYTICAL FRAMEWORK

Foreword

In the previous chapter I have presented an overview of forecasting techniques used in the literature of Tourism. I will now proceed to demonstrate the pros and cons of the methods that I have reviewed which will provide in a sense an introduction to the rationale for this particular study. I will also discuss aspects (sources and limitations) of the database and market this study will be based on.

4.1. A CRITICAL OVERVIEW OF FORECASTING METHODS AND THE RATIONALE FOR THE CHOICE OF THE ANALYTICAL FRAMEWORK IN THIS STUDY.

Without doubt historical data manipulation for the purpose of extracting useful information about a variable's relationship to other explanatory variables can provide reliable forecasts. However, unconventional (or abnormal) changes in such functional relationships (in the future) cannot be captured by the forecasts unless experts in the field express their opinion. As a matter of fact this is the main advantage of the qualitative approach to forecasting.

The Delphi and the JAM models (scenario writing) have proved to provide fairly accurate medium and long term forecasts (SEELE & IGLARSH & EDGELL, 1980, BARON, 1983). However, despite the fact that the Delphi technique has been used extensively (especially at the national Tourism level) there are major concerns about the procedures adopted in the process of obtaining the experts' opinions (CALANTONE et.all,1987) and the objectiveness of these opinions (POOLE, 1988). In addition, the high running cost, the complexity and the uncertainty of the occurrence of each of the special events (specified by the experts) also represent principal concerns when the Delphi or JAM approaches are being carried out.

Nevertheless, as qualitative forecasting techniques can be considered to complement the quantitative methods, both can be profitably combined (EDGELL & SEELY & IGLARSH, 1980)

I now shift the focus on to the quantitative techniques and in particular to trend curve analysis and the simple regression model. These have been found generally easy to interpret, implement and inexpensive to run (MAKRIDAKIS & WHEELWRIGHT,1979). However, empirical results have shown that the explanatory ability of these models is low and the forecasts that they provide are for a very short time horizon of up to three months (CALANTONE et.al., 1987). However, these arguments cannot constitute a rule as forecasting performance varies from one data series to another (WITT & MARTIN, 1989a), depending on the market's characteristics and its peculiarities as well as the time period that is covered by the data points (monthly, quarterly or annual).

Multiple regression and econometric models are more complex than the previously mentioned methods and they involve higher costs but they can have a forecasting horizon of 1 to 2 years (MAKRIDAKIS et.al, 1978 & 1979 & 1983 & 1985, WITT & MARTIN, 1989a). However, comparative studies have shown that the marginal gains in the explanatory ability of multiple regression and econometric models may be outweighed by the complexity and the sophistication of the procedures involved in the development of these models. Indeed, these models have been found sometimes to be inferior to the univariate and more specifically to the Naive methods, e.g. Naive 1 and Naive 2 which are easier and less costly in their application (WITT & MARTIN, 1989c).

Gravity and trip generation models are generally considered as more precise when compared to the multivariable regression models (ARCHER, 1976) but they have a number of weaknesses (ARCHER, 1976, UYSAL & CROMPTON, 1985) :

1. a lack of a sound theoretical underpinning;
2. a lack of sophistication, resulting in problems in the methods of finding the values of the parameters and independent variables which provide the best fit to the actual data;
3. the distance alone may not always be an accurate measure of frictional retardation. Time and travel have been used as alternatives by some researchers (MANSFIELD, 1973, ROSKILL TEAM, 1971);
4. a lack of accurate basic data and danger of multicollinearity;
5. difficulties in estimating the precise value of

distance and

6. short forecasting time horizon.

Box's and Jenkins' univariate and multivariate models presuppose skilful analysts as these methods incorporate highly sophisticated and complex mathematical procedures. The cost of running these models is high but the results are easy to interpret and understand.

Although the B-J technique is widely used in tourism with significant forecasting performance, exponential smoothing has proved to be superior in some cases (GUERTS, 1982). Of course, one must also take into consideration the low cost and the low degree of complexity of the exponential smoothing technique.

In general, time series and causal methods (quantitative or qualitative) differ in that the latter range of methods can be used to provide answers to "what if" questions. Analysts can use causal methods to forecast, in the presence of different scenarios, what is likely to happen if the independent variables move towards several possible directions.

For example, the researcher may produce forecasts using one optimistic and one pessimistic scenario, in order to estimate the most likely effect on a dependent variable when the explanatory variables move in various directions. The results that flow from this analysis can provide useful information to management and policy makers; e.g. to what extent is promotional expenditure needed in order to manage (efficiently) fluctuations in demand either for packaged tours or just airline tickets. The advantage of undertaking forecasting in the presence of alternative scenarios is not offered by any time series forecasting method; they are "philosophically blind". However, time series forecasting methods provide information on the underlying patterns in Tourism time series data; e.g. underlying patterns in trend, seasonality, cycle and irregularity which are much easier to estimate and interpret.

The above mentioned reasons rationalise my choice of the Classical Decomposition Model (as a time series method) and a multiple regression model (as a representative of the Multivariate causal methods) as forecasting tools for ARSTDs to Greece. I will examine these methods individually and I will evaluate their performance in forecasting and at the same time I will extract information from the data series on the behaviour of ARSTDs to Greece and the demand determinants.

In addition, it is also worth noting that it appears that in the literature of Tourism there has been a neglect as far as the explicit use of the classical decomposition model as a forecasting tool is concerned. Consequently, in this study it will be applied not only for seasonal and trend-cycle estimation (DRACATOS, 1987, DONATOS & ZAIRIS, 1991) but also for forecasting in order to test its usefulness in Tourism forecasting.

4.2 METHODS FOR DATA ANALYSIS

This study's rationale is to stress the importance of identifying patterns and relationships in Tourism time series data and extrapolating these patterns and relationships for the sake of forecasting in order to assist the policy maker in planning efficiently.

In this spirit the analysis of the data will be accomplished mainly by two quantitative methods: the classical decomposition and a multiple regression model. More specifically the classical decomposition model will reveal the underlying patterns - trend and seasonality - in Australian Residents Short Term Departures (ARSTDs) to Greece while the multiple regression model will attempt to explain the relationship of ARSTDs to major demand determinants. In addition, relative attractiveness will also enter the regression model in order to measure the travellers' attitudes towards Greece in relation to other destinations in Europe.

The Mean Absolute Percentage Error (MAPE) and the U Theil's statistic will be used as the forecasting accuracy criteria in order to i) assess the best of these two main methods that I will use and ii) test their suitability for forecasting ARSTDs to Greece (for a visit less than 12 months).

However, I will also undertake (in Chapter 7) a comparison of the forecasting accuracy of these two methods (that will be explicitly used in this study) with the forecasting accuracy of some other methods. More specifically, results from the forecasting performance of the Holt's two parameter exponential smoothing on deseasonalised data, a seasonal time regression model, Naive 1 and 2 methods[5]. As I have already mentioned a comparative analysis of these results will be undertaken in Chapter 7.

4.3 SOURCES OF DATA

The Australian Bureau of Statistics (ABS) publications on tourist Arrivals and departures was the main source for gathering data for departures to Greece and Europe. The quarterly publication of the International Monetary Fund provided data on exchange rates, Consumer Price Indexes of Greece and Australia; while ABS

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[5].Refer to Appendix for explicit estimation of each method's MAPE and U statistic.

publications provided data on the Australian Gross Domestic Product, Consumer Price Index and population of Australia. The period covered by the database is from 1981 to 1991.

4.4 SHORTCOMINGS OF THE DATABASE

I. The short term departures may not accurately reflect the actual tourist demand measure as the ARSTDs classification ignores Australians that visit Greece as a stop over country.

II. Data on ARSTDs are not actual but are based largely on sample (9 per cent samplin error), a method that the ABS follows and which involves the taking of a sample from travel cards that travellers have to fill in while flying to/from Australia.

4.5. THE BACKGROUND OF THE MARKET UNDER STUDY.

4.5.1. TRAVEL TO EUROPE

The decade of the 1980s revealed that the most promising tourist region for Australia has been Asia. Europe seems to be reaching its saturation level in terms of

Australian tourists, achieving only an overall low increase of 44 percent (Annual Growth (AG) of 4%), during the 1980s, while Asia experienced a 120 percent increase for the same period (AG of 8%).

However looking at the very latest figures in 1990 (BTR, 1991), when the overall ARSTDs increased by 9 percent in 1989, the ARSTDs to Europe increased to a level above the 9 percent national annual growth rate, at 10 per cent, while Asia experienced only 6 per cent and Oceania 8 per cent increase in ARSTDs.

That is an auspicious sign for the European destinations which have been suffering badly from the Australian Tourist turnaround towards Asian and Oceanian destinations during the 1980s. However, the region that really proved to have gained most of the increase in total ARSTDs was America with a 17 per cent increase during 1989. Indeed, America as a destination has experienced a remarkable growth not only in 1990 but also for the last four years (see Table 1 and figure 1,2).

Table 1: Total Departures and Growth Rates by Region

YEAR	TOTAL	EUROPE	ASIA	AMERICA	OCEANIA	GREECE
1980	1194768	350616	345500	165400	354400	31500
1981	1181387	290760	362300	165500	361200	27127
1982	1259643	300437	386400	181900	386100	27385
1983	1252974	314305	378400	163800	377400	24963
1984	1418600	375300	425400	174000	422500	28500
1985	1512000	410200	466600	171600	439300	32400
1986	1539600	396700	520200	185600	415400	31700
1987	1622300	408200	547400	215000	417400	33900
1988	1697600	416900	599900	243900	407100	33600
1989	1989800	460000	714900	293100	492400	31600
1990	2169900	505300	759300	348100	529900	33100
ANNUAL GROWTH RATES						
1980						
1981	(0.01	(0.17)	0.05	0.00	0.02	(0.14)
1982	0.07	0.03	0.07	0.10	0.07	0.01
1983	(0.01	0.05	(0.02)	(0.10)	(0.02)	(0.09)
1984	0.13	0.19	0.12	0.06	0.12	0.14
1985	0.07	0.09	0.10	(0.01)	0.04	0.14
1986	0.02	(0.03)	0.11	0.08	(0.05)	(0.02)
1987	0.05	0.03	0.05	0.16	0.00	0.07
1988	0.05	0.02	0.10	0.13	(0.02)	(0.01)
1989	0.17	0.10	0.19	0.20	0.21	(0.06)
1990	0.09	0.10	0.06	0.19	0.08	0.05
AAG	0.06	0.04	0.08	0.08	0.04	0.01
80-90	0.82	0.44	1.20	1.10	0.50	0.05

AAG = Average Annual Growth
Source: Australian Tourism Trends, BTR (1990-91)
Overseas Arrivals and Departures (1980-1991)

Values in parentheses are negative.

Figure 1: ARSTDs to Major Destinations

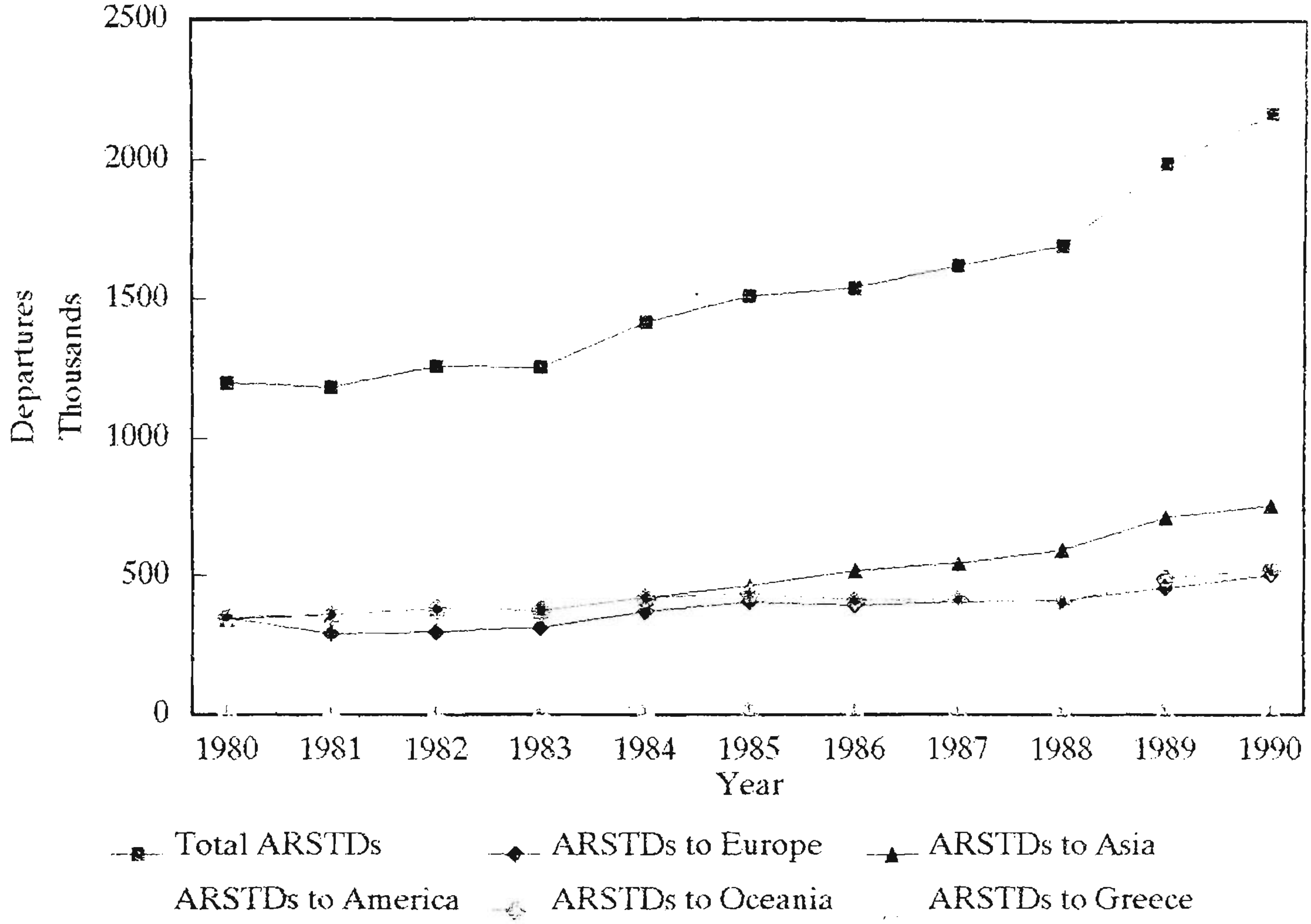
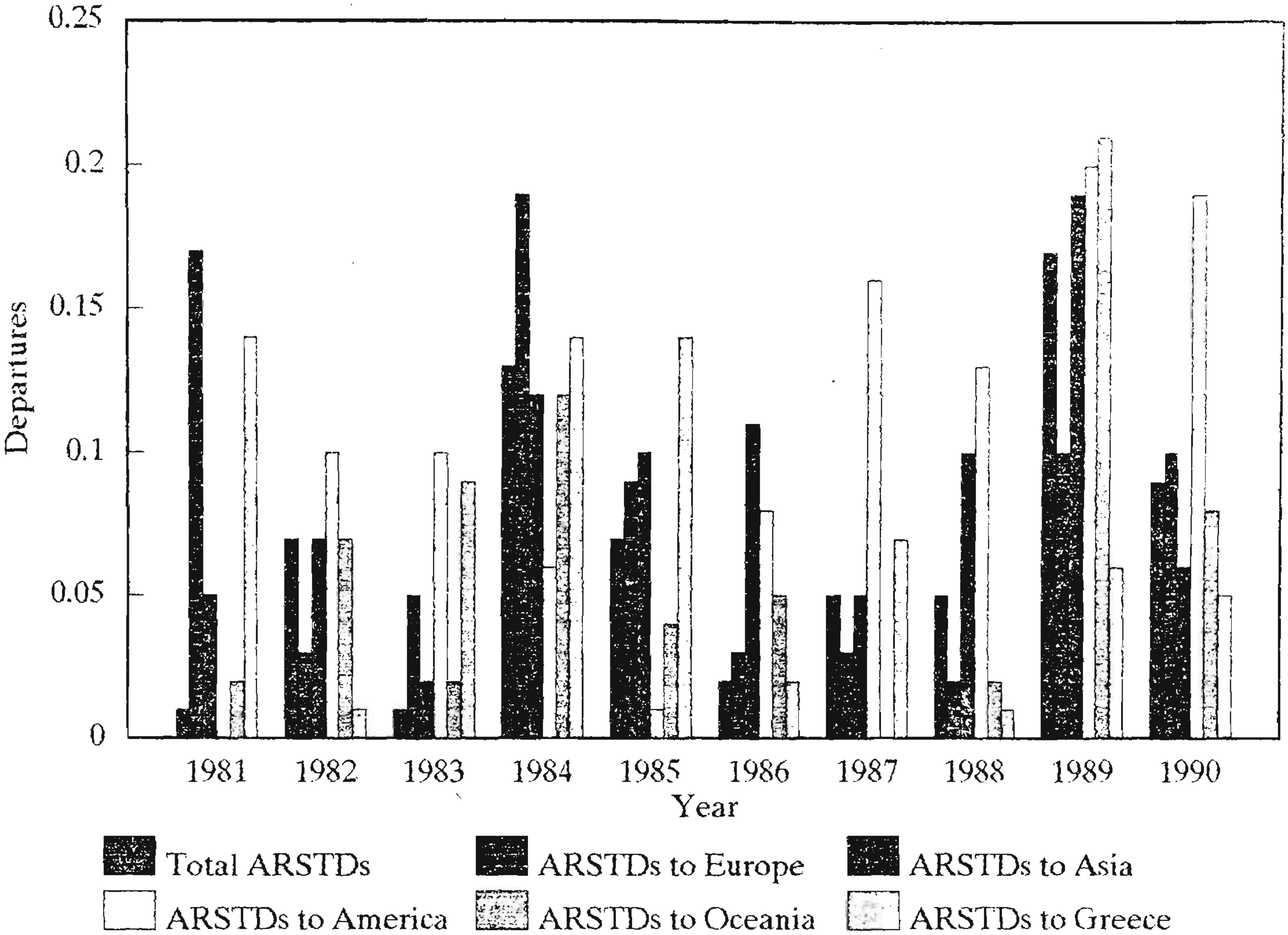


Figure 2: ARSTDs to Major Destinations Annual Growth Rates



4.5.2. TRAVEL TO GREECE

Southern Europe, and more specifically Greece did not actually experience a remarkable overall increase in ARSTDs. As it is reflected in Table 1 only a 5% increase in ARSTDs to Greece was recorded from 1980 to 1990, while the 1990 increase in relation to 1989 was again 5% which is significantly lower than the 9% increase in ARSTDs for the world as a whole and much lower than the 10% increase in ARSTDs to Europe.

Going back again, to 1980, destination Greece represented the 2.6% (31,500) of the total ARSTDs (1,194,768) while in 1990 despite the increase in overseas travelling (to 2,169,900 ARSTDs) only 1.5% (33,100) of the travellers abroad for short term visits stated Greece as their main destination.

Neither the temporary establishment of a third flight to Greece in a week in 1990-91 by the Greek aircarrier nor the fact that every day of the week there is a flight to Greece by other airlines was enough to stimulate more travellers to Greece.

From the above it is obvious that the proportion of the ARSTDs to Greece has been stabilised despite the large and financially dynamic Greek Community in Australia.

However, the Greek Community's strong relations (cultural and financial) with Greece should have induced a remarkable growth rather than stability.

Air travel to Greece indicates that it is the Greek community that mainly supports Greece as a destination. Combined information from the Australian Department of Transport and Communications and the Australian Bureau of Statistics publications indicate that Olympic Airways (OA), the national Greek air carrier, carries almost 90 per cent of travellers to Greece (see Table 2).

Considering the fact that 90 per cent of OA travellers are of Greek origin[6] it may be concluded that at least 80 per cent of the total market is of Greek origin. Consequently from Greece's point of view the Australian market has not been exploited yet.

This study will attempt to construct a time series and a regression model in order to explain relationships and identify patterns. However, the ultimate purpose of the study will be to construct a model that forecasts effectively ARSTDs to Greece.

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[6].The manager of the Greek aircarrier Mr.J. IOANNIDIS, when interviewed by the writer, stated that 90 per cent of the tickets sold in 1989,1989,and 1990 in Australia were bought by members of the Greek community.

Table 2: Total Departures to Greece by the Main Air Carriers.

DEPARTURES	1987	1988	1989	1990	1991
ARD TO GR[1]	36320	36050	34140	35700	29630
V.VIS.DP[2]	6200	8000	7200	7300	7350
TOTAL DEP[3]	42520	44050	41340	43000	36980
O.A. DEP[4]	30016	33261	40079	39708	26442
" % "[5]	70.59%	75.51%	96.95%	92.34%	71.50%
OTHER[6]	12504	10789	1261	3292	10538
" % "[7]	29.41%	24.49%	3.05%	7.66%	28.50%

1. Australian Resident (Short/Long term and permanent Departures to Greece
2. Overseas Visitors Departures to Greece
3. Total Departures to Greece
4. Olympic Airways Departures to Greece.
5. Percentage of O.A. of the total Departures to Greece.
6. Other airlines portion of the total Departures to Greece.
7. Percentage of other airlines of Total Departures to Greece.

Source: Overseas Arrivals and Departures, ABS (1987-91) Department of Transport and Communications.

CHAPTER 5

AN APPLICATION OF THE CLASSICAL DECOMPOSITION MODEL

5.1. CHARACTERISTICS OF THE ARSTDs to GREECE TIME SERIES.

Time series data describes the movement of a variable over time, in this case over a quarter of a year.

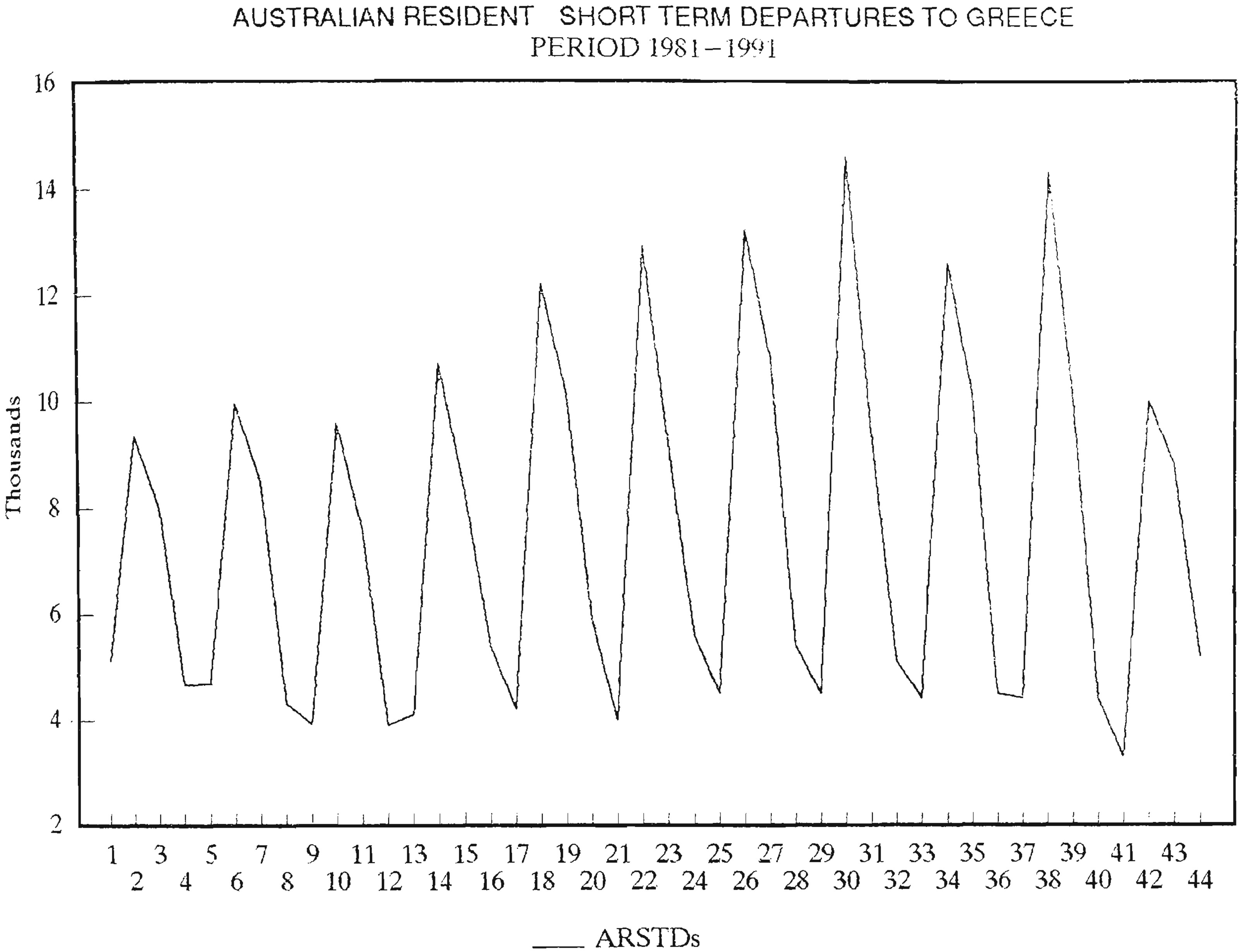
The sharp quarterly (short term), downward and upward movements in the series, which can be seen by observing *Table 3* and *Figure 3* indicate the existence of strong seasonal patterns while the slightly increasing values of each quarter indicate the trend existence.

The historical data illustrated in the aforementioned table are ***a composite of a number of factors that must be disentangled prior to the development of meaningful forecast*** (BAILS & PEPPERS 1982, p.107). That "composite of a number of factors" has to be segregated and analysed in a systematic way in order to have the relationships unveiled.

The classical decomposition model functions in such a way that these factors (or components) of the model can be isolated and measured. More importantly this analysis reveals the manner in which these components interact as well as their contribution to forecasting.

Table 3 : Smoothing procedure and Estimation of Seasonal factors.

QUARTER	GREECE	4p. M/A	C.M.A	SEASONAL FACTORS	SEASONAL INDEXES	DES/SED DATA
1	2	3	4	5	6	7
MAR 81	5126				.556318	
JUN	9333				1.57539	
SEP	8009	6781.75	6725.375	1.190863	1.210424	6616.691
DEC	4659	6669	6743.5	.6908875	.657868	7081.968
MAR 82	4675	6818	6876.25	.6798764	.556318	8403.467
JUN	9929	6934.5	6890.375	1.440996	1.57539	6302.565
SEP	8475	6846.25	6750.125	1.255532	1.210424	7001.681
DEC	4306	6654	6608.875	.6515481	.657868	6545.386
MAR 83	3906	6563.75	6452.875	.6053116	.556318	7021.164
JUN	9568	6342	6291.25	1.520842	1.57539	6073.415
SEP	7588	6240.5	6264.75	1.211222	1.210424	6268.879
DEC	3900	6289	6430.5	.6064847	.657868	5928.241
MAR 84	4100	6572	6661	.6155232	.556318	7369.886
JUN	10700	6750	6937.5	1.542342	1.57539	6791.967
SEP	8300	7125	7137.5	1.162872	1.210424	6857.103
DEC	5400	7150	7337.5	.7359455	.657868	8208.334
MAR 85	4200	7525	7750	.5419355	.556318	7549.639
JUN	12200	7975	8037.5	1.517885	1.57539	7744.112
SEP	10100	8100	8075	1.250774	1.210424	8344.186
DEC	5900	8050	8137.5	.7250384	.657868	8968.365
MAR 86	4000	8225	8112.5	.4930663	.556318	7190.132
JUN	12900	8000	7962.5	1.620094	1.57539	8188.447
SEP	9200	7925	7987.5	1.1518	1.210424	7600.644
DEC	5600	8050	8087.5	.6924266	.657868	8512.347
MAR 87	4500	8125	8325	.5405405	.556318	8088.899
JUN	13200	8525	8500	1.552941	1.57539	8378.876
SEP	10800	8475	8475	1.274336	1.210424	8922.496
DEC	5400	8475	8650	.6242775	.657868	8208.334
MAR 88	4500	8825	8650	.5202312	.556318	8088.899
JUN	14600	8475	8437.5	1.73037	1.57539	9267.544
SEP	9400	8400	8387.5	1.120715	1.210424	7765.876
DEC	5100	8375	8125	.6276923	.657868	7752.316
MAR 89	4400	7875	7962.5	.5525903	.556318	7909.145
JUN	12600	8050	7975	1.579937	1.57539	7998.018
SEP	10100	7900	7900	1.278481	1.210424	8344.186
DEC	4500	7900	8112.5	.5546995	.657868	6840.278
MAR 90	4400	8325	8312.5	.5293233	.556318	7909.145
JUN	14300	8300	8287.5	1.72549	1.57539	9077.115
SEP	10000	8275			1.210424	8261.57
DEC	4400				.657868	6688.272
MAR 91	3300				.556318	5931.859
JUN	10000				1.57539	6347.633
SEP	8800				1.210424	7270.182
DEC	5200				.657868	7904.322


AUSTRALIAN RESIDENT SHORT TERM DEPARTURES TO GREECE
PERIOD 1981–1991
Thousands
16
14
12
10
8
6
4
2
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44
ARSTDs

5.2. HYPOTHESIS 1 AND THE DECOMPOSITION METHODOLOGY

It is expected that seasonality must be present mainly during the Greek summer; while taking into consideration the evolution of the ARSTDs to Greece that was presented in the previous chapter, the trend of ARSTDs to Greece must be low. The testing of this hypothesis will be undertaken by estimating seasonality and trend in the context of the classical decomposition methodology.

Generally the classical decomposition model is specified by five variables. In a time series data each data point (Y) consists of the trend (T), the cyclical (C), the seasonal (S) and the irregular (I) components. Their identification, isolation and measurement provides a set of four time series the respective product of which specifies the forecast value of the ARSTDs for the in-sample period. The extrapolation of these components beyond the sample period will provide the forecasts.

Initially a smoothing procedure takes place in order to smooth out the data by removing as much as possible irregular and seasonal fluctuations. The smoothed series forms the basis for estimating seasonality. After seasonality has been measured the actual data points are being deseasonalised and (on these deseasonalised data points) a simple time regression takes place in order to estimate the trend (or trend-cycle) component.

In the absence of an event that might have caused a significant change in our data (at a specific period) one can assume that the irregular component represents the residual or deviation of the forecast value from the actual data. However, in the case of Greece one must not ignore that Qantas' withdrawal from the route to/from Greece (in October 1990) there may have acted as an exogenous influence on airtravel to Greece.

5.3. THE DEFINITION OF THE CLASSICAL DECOMPOSITION MODEL

The model for predicting ARSTDs to Greece may take an additive or multiplicative or a combined form. In my case, according to *Figure 3* which illustrates the actual historical observations it is obvious that there is an increasing rate of seasonal fluctuations and a slightly upward tendency of the time series in the long run. This fact justifies the implementation of the multiplicative model, which takes the following formulation:

$$Y = T * S * C * I \qquad (1)$$

where

Y = The observed value of the series in specific period of time;

T = The Trend component in the same period;

S = The Seasonal component;

C = The Cyclical component;

I = The Random or Irregular component.

The Trend component, represents the long-run (upward or downward) movement. Usually it follows the general economy's long run fluctuations and is affected by changes in travellers' preferences, real income changes, population shifts, technological advances or constrains in airtravel e.t.c. .

The cyclical component in business refers to non-periodic, recurring oscillations around a long run trend. It is measured by a cycle factor which is the ratio of the deseasonalised data by the long term trend. A sophisticated interpretation of the cycle factor movement could assist in projecting efficiently where the industry is going and when the next turning point (of the business cycle) may occur. However, as most studies have indicated (BARON, 1972, 1973, DRACATOS, 1987, DONATOS & ZAIRIS, 1991) the cyclical component attaches to the trend one, so I will be treating the two components as one, the trend-cycle[7] component.

Seasonality is defined as a cyclical behaviour that occurs on a regular short term basis (i.e., in cycles with periodicity that is annual, semiannual, quarterly, monthly, or any other unit of calendar year (PINDYCK & RUBINFIELD, 1976)). The seasonal variation occurs within a year and represents periodic changes in the values of the data used.

Finally, the irregular component represents the irregular movement in time series data due to unpredictable disturbances (e.g. the pilots' dispute in Australia in 1989) and erratic events (e.g. the 1973 Cyprus invasion by the Turkish army forces directly affected Greece (PAPADOPOULOS & WITT, 1985)).

Overall, by taking into consideration the abovementioned points, the model on which I shall base the estimations is described by the following formula :

$$Y = TC * S * I \qquad (2)$$

where TC = Trend-Cycle component while
Y,S,I have already been defined previously.

---

[7].The terms, either Trend-cycle or Trend will be used from now on interchangeably.

5.4. THE SMOOTHING PROCEDURE.

The first task is to smooth out the data series freeing it from seasonal or other unspecified irregular effects. This can be achieved by using a 2-stage moving average (MA) *(see Table 3, columns 3,4)*. The first stage involves the derivation of four period moving averages where each four period moving average incorporates values of four consecutive actual observations.

The following mathematical formula:

$$MA_t = (Y_{t-2} + Y_{t-1} + Y_t + Y_{t+1}) / 4 \qquad (3)$$

indicates that each moving average at period "t" contains an element of four consecutive quarters - two from the immediate past, one from the present and the immediately following actual value. As a result little or no seasonality and irregularity will be incorporated in these calculated values. This smoothing procedure is called the "moving average technique".

This first attempt to smooth out the data seems to fulfil (to a great extent) the aim of eliminating seasonality. Indeed, the time series now appears smoother (see Table 3, 3rd column) which is an indication that the seasonal and irregular (if any) fluctuations have been substentially removed.

However, further smoothing is necessary in order to have the Moving Average centred. The Centred Moving Average (CMA) is the average of the first and second MAs. The CMA for the "t" period is given by the following formula:

$$\mathbf{CMAt = (MAt + MAt{+}1) / 2} \qquad (4)$$

The CMAs series (refer to column 4) is mostly free from seasonal and, to a large extent irregular fluctuations; this can be best illustrated in *Figure 4,* where the difference between the actual and CMA series of ARSTDs is clearly displayed. As one can see the fluctuations between quarters have been minimised.

The CMA values will form the basis for estimating the model's components.

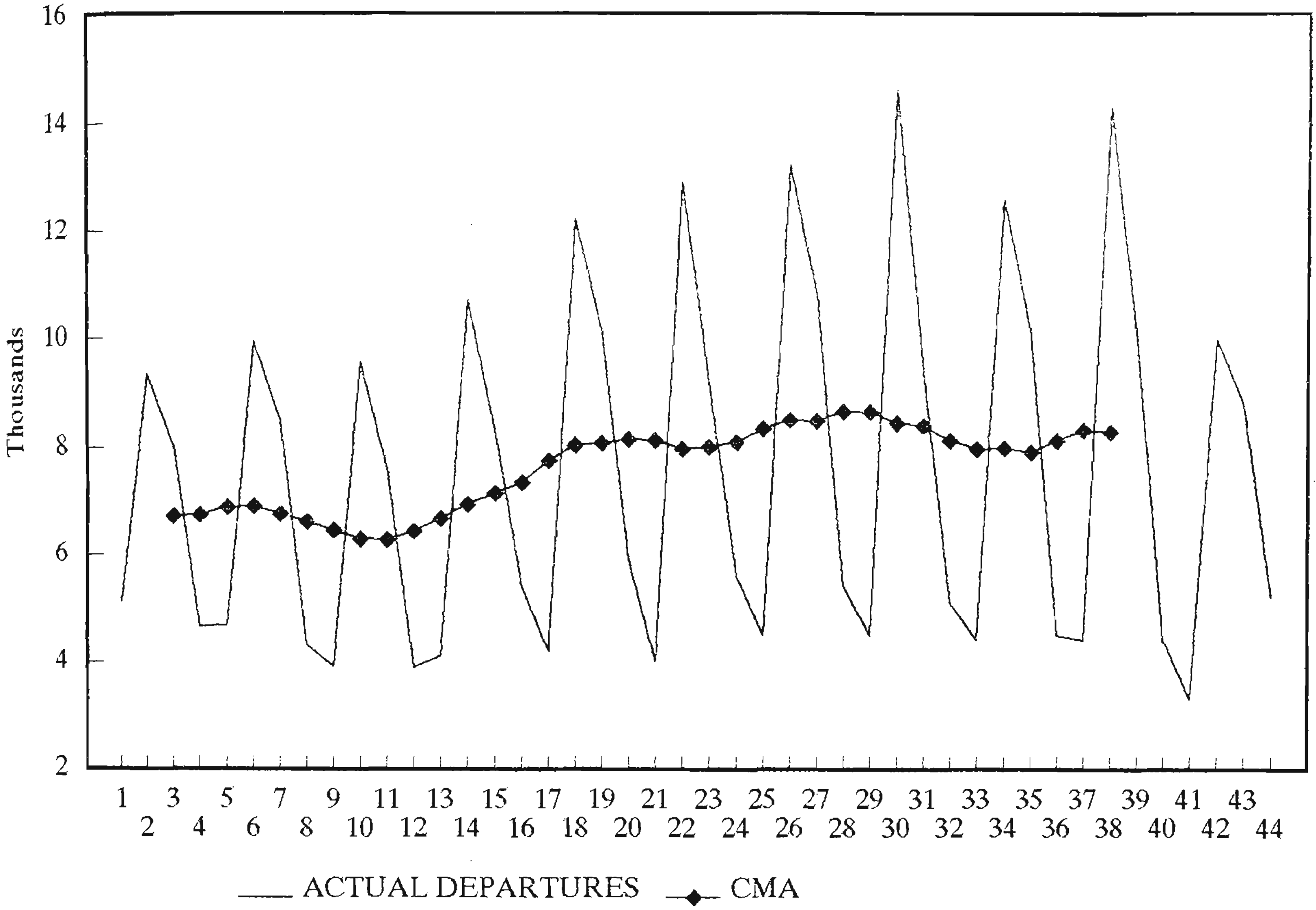
5.5. THE ESTIMATION OF THE COMPONENTS AND THE TESTING OF THE HYPOTHESIS 1

5.5.1. THE SEASONAL COMPONENT.

A. Isolation and estimation.

ACTUAL AND CMA of the ARSTDs to GREECE

PERIOD 1981–1991



As the CMA series is expected to be free from seasonal and other irregular fluctuations then I could represent the CMA by the following formula:

$$CMA_t = Y_t / (S_t * I) \qquad (5)$$

which can be rewritten as

$$(S_t * I) = Y_t / CMA_t \qquad (6)$$

Equation (6) implies that seasonality is measured by the ratio of the actual data divided by the corresponding CMA value.

The next step is to note that the fifth column of *Table 3* exhibits the seasonal factors (**SFt**). The seasonal factors measure the extent to which the actual observation for each quarter is greater or lower than the CMA.

From equation (6) the following formula is derived in order to estimate the **SFt**:

$$SFt = Yt/CMAt \qquad (7)$$

where SFt = Seasonal factor and

Yt = Actual data.

It is now important to note that *Table 3 (column 2)* reflects a concentration of Australian departures to Greece and this is readily noticeable during the second and the third quarters of the year (i.e., Greek spring and summer).

Eventhough, the seasonal factor alone can give a real indication of the magnitude of seasonality in the consecutive quarters - which in this case shows that seasonality changes but not greatly as the coefficient of variation is relatively low (*see Tables 4 and 5*) - I will estimate a value which does not vary for the same quarter of a year and is somewhat free of possible random fluctuations. Indeed, the CMA series cannot separate the seasonal and the irregular components. However, if I count out the extreme values then the remaining values will indicate that the series of SFs is mostly free from irregularity as the coefficients of variability have decreased in the face of the above procedure (see *Tables 4 and 5)*. If I additionally derive the average of the Sfs for each quarter I will have estimated the Seasonal Index (SI) which is representative of seasonality for each annual quarter. The seasonal index (SI) expresses adequately seasonality (BARON, 1972 & 1973, DRACATOS, 1987, DONATOS & ZAIRIS, 1991) and is to a great extent free from irregularity.

Tables 4 and 5 exhibit the calculated values of the seasonal indexes. Note that it was necessary to use a normalisation factor in order to round up to 4 the sum of the initial seasonal indexes which is in line with the four quarters of a year. The rationale for taking the sum of the SIs to be equal to 4, is based on the fact that if no seasonality appears then each quarter must have SI=1; in that caser there would be no deviation of the actual data from the CMA and therefore no seasonality. This outcome is derived from equation (7). No seasonality appears whenever the actual data points do not differ from the CMA values or when the nominator and denominator are equal (i.e., $Y_t=CMA_t$) which gives $SF_t=1$. However, there are four quarters in a year and therefore the sum of the seasonal indexes must equal to 4.

In addition I excluded the highest and lowest values (these values are denoted by "*" in the table) for each quarter's seasonal factor series in order to eliminate (even) further possible random fluctuations. These fluctuations can be seen in the exhibit of seasonal factors in *Table 4*.

Now that I have estimated the Seasonal Indexes I can proceed to deseasonalise the actual data in order to eliminate seasonality. The deseasonalised data will be helpful in the process of calculating the trend-cycle component, in the next section.

Table 4 : Primary Seasonal Factors

Table No:4	MAR	JUN	SEP	DEC
1981	.00	.00	1.19	.69
1982	**.68***	**1.44***	1.26	.65
1983	.61	1.52	1.21	.61
1984	.62	1.54	1.16	**.74***
1985	.54	1.52	1.25	.73
1986	**.49***	1.62	1.15	.69
1987	.54	1.55	1.27	.62
1988	.52	**1.73***	**1.12***	.63
1989	.55	1.58	**1.28***	**.55***
1990	.53	1.73	.00	.00
AV/GE QRT[1]	.56	1.58	1.21	.66
ST. DEV[2]0	.05	.09	.05	.06
C of V[3]	9.76	5.76	4.50	8.56

Table 5 : Estimation of Seasonal Indexes

Table 5.	MAR	JUN	SEP	DEC	
SEASONAL FACTORS	0.6053	1.5208	1.1909	0.6909	
	0.6155	1.5423	1.2555	0.6515	
	0.5419	1.5179	1.2112	0.6065	
	0.5405	1.6201	1.1629	0.7250	
	0.5202	1.5529	1.2508	0.6924	
	0.5526	1.5799	1.1518	0.6243	
	0.5293	1.7255	1.2743	0.6277	
AV/GE QRT[1]	0.5579	1.5799	1.2139	0.6598	4.0115
ST. DEV[2]	0.0346	0.0679	0.0443	0.0405	
C.VAR[3]	6.2225	4.3107	3.6607	6.1586	
NRM FAC[4]	0.9971				
SEAS IND[5]	0.5563	1.5754	1.2104	0.6579	4.0000

* Extreme values of seasonal factors not included in table No:5

1. Average quarter.
2. Standard Deviation of the quarterly series.
3. Coefficient of variability (DRACATOS,1987)
4. Normalisation factor.
5. Seasonal Indexes.

In addition, at this stage I must also mention that it is assumed that seasonality will remain constant in the short run. This is a standard assumption in the relevant literature (BARON, 1975 & DRACATOS, 1989).

B. Interpretation of the seasonal indexes

For comparative purposes, the estimated seasonal indexes for the quarters that are shown in *Table 6* are accompanied by the seasonal indexes of the general international tourist movement in Greece (DRACATOS, 1987), for the period 1981-85.

Table 6: ***Seasonal Indexes of ARSTDS to Greece and Total Arrivals of International Tourists in Greece.***

Table 6	SEASONAL INDEXES	
	ARSTDs	TOTAL
QUARTERS	ESTIMATED	GREECE
MARCH	0.56	0.27
JUNE	1.58	1.26
SEPTEMBER	1.21	2.02
DECEMBER	0.65	0.45

Source : Greek Statistical Society (1985)

As it was expected the ARSTD series for Greece appears to be heavily dependent on seasonal fluctuations and this is mainly due to the climatic peculiarities which have given rise to the general tourist period between May and September (DRACATOS, 1987).

It is obvious, that the estimated seasonal indexes of ARSTDs to Greece do not follow the pattern of the total tourist movement in Greece. The total tourist movement to Greece escalates in the September quarter and then drops dramatically. This fact is not consistent with the case of the Australian tourists provided that ARSTDS to Greece thoroughly represent Australian tourist movements to Grrece. Indeed, Australian departures intensify in the June quarter and then they gradually decline as the summer progresses. This pattern is not only reflected in the seasonal indexes but also in all the annual seasonal factors (see Tables 4 and 5).

In addition, the evenly dispersed Australian departures throughout the year may reveal some possible reasons about the Australian travellers' purpose of visit to Greece. For example, the large Greek community in Australia produces a stable flow of travellers to Greece throughout the year which increases during the general Tourism period (i.e., in the second and third quarters) and declines gradually as the summer progresses. This is contrast to the sharp downward movement that has been observed in the total inbound tourist flow of Greece.

Generally speaking, as long as the reason for visiting a place is not necessarily holidaying then all seasons can be deemed as appropriate for a visit. This is a rule that applies (in the first instance) to Greek migrants but also to businessmen from Australia.

Nevertheless, the June and September quarters are still strong in terms of seasonality and account for 70 per cent of the Australian tourists to Greece, while at the same period Greece receives 82 per cent of its total tourist movement. This phenomenon creates many operational problems for tourist related enterprises due to the spatial-temporal mismatching of supply and demand. As a result one observes a substantial underutilisation of tourist facilities (HUBBARD & JEFFREY, 1986) during the low tourist seasons (like autumn and winter).

Of course, the occurrence of the Australian workers' holidays (during the Australian summer) is another reason that the December and March quarters reflect a higher seasonality, a consequence of the so called institutionalised seasonality (BARON, 1972). During this period, travellers of Greek origin as well as native Australians have more free time for a trip abroad, and why not to Greece.

C. The Significance of the SI in Forecasting, Planning and Decision Making.

The use of the SIs is valuable as they can indicate the annual ARSTDs to Greece when the first quarter's figures become available - by dividing the quarterly figure by the respective SI - on the condition that seasonality remains unchangeable (DONATOS, 1987,DRACATOS & ZAIRIS, 1990). Indeed, as the coefficient of variability of the SF is low (according to Tables 4 and 5) this gives an additional indication that seasonality is not expected to change dramatically at least in the short run.

Although the previously mentioned precondition (that seasonality remains constant) in reality does not apply fully, the calculated SI can still give an indication as to where the industry is heading for the rest of the year.

For example, an airline or tour operator could react according to the projected figures. Consider the case where an increase in the number of travellers is being reflected in the first quarter. Then an airline must make the appropriate arrangements for an additional aircraft or charter flight for the summer period while the tour operator must make more reservations for accommodation and air transport and exploit any economies of scale that might exist.

On the other hand, a prediction of a fall in the number of travellers would justify less scheduled flights and reservations for the airline and tour operators respectively and/or a rise in the level of expenditure on promotion in order to increase awareness and the temptation to visit Greece.

However, it is worth mentioning (the fact) that the dominant purpose for visiting Greece in the first quarter may not be the same as in the second and third quarters for the majority of travellers. Consequently the observation that relates to the first quarter doesn't imply that the same forces that produced this observation will interact to produce a proportionate change in the flow of travellers for the rest of the year. Therefore the aforementioned strategic decisions may be very risky unless one identifies a seasonal pattern of ARSTDs to Greece for each particular purpose of visit. Nevertheless (in the case of Greece) the Visiting Friends and Relatives' (VFR) and the Holidayers' (HOL) ARSTDs to Greece appear to follow quite closely the same seasonal pattern with the total departures as it can be seen in *Table 7*.

Table 7: Seasonal Indexes of ARSTDs to Greece by purpose of visit[8].

Table 7	VFR	HOL	TOTAL
MAR	0.65	0.50	0.56
JUN	1.47	1.63	1.58
SEP	1.17	1.24	1.21
DEC	0.71	0.63	0.65

It is also noticeable in the context of Table 7 that the VFR seasonality is lower than the Holidayers' one. The VFR ARSTDs to Greece seasonality range is 0.65 to 1.47 while the Holidayers' is from 0.50 to 1.63, mainly because Holidayers are oriented by Summer Holidays while the VFR market does not give the same level of consideration to this aspect when they decide visiting Greece.

Finally, the measurement of seasonality does not only provide assistance in forecasting but may also encourage and facilitate the implementation of a policy in order to broaden the seasonal cycle of a particular destination (e.g., by organising cultural or sports events). This is a fact that (mainly) regional Tourism organisations must consider thoroughly if they want their regional economies to function effectively throughout the year and not only for a few months with the known consequences of increasing unemployment and regional or

[8].Refer to Appendix for detailed estimation of VFR and HOL seasonal Indexes.

national income deterioration.

5.5.2 THE TREND-CYCLE COMPONENT

A. Isolation and Estimation

As I have already mentioned, in the light of previous studies, findings and recommendations (BARON, 1972 & 1973, DRACATOS, 1987, DONATOS & ZAIRIS, 1990) I will estimate the trend and cycle components of the series as a unified component, the trend-cycle or just trend component.

The trend is estimated by regressing the deseasonalised data (MAKRIDAKIS & WHEELWRIGHT, 1985, NEWBOLD & BOSS, 1990), of the CMA series of ARSTDs. The series of data is mostly free of seasonal and irregular fluctuations and represents the upward or downward movement which is explained by supply and demand factors in the Tourism industry.

I have already shown that the model takes the following form:

$$Y = S * TC * I$$

In order to isolate the trend I will assume that the trend is adequately represented by the OLS trend of the deseasonalised data; consequently I will regress the deseasonalised data with respect to time.

Figure 5 exhibits the deseasonalised data line and reflects a situation where there is no constant growth in the short run, particularly after the 20th quarter. However, in the long run there is a slow growth rate of 1 per cent (see Table 1, figure 2) in ARSTDs. These observations imply that a linear trend may best fit the deseasonalised data series of the Australian Short Term Departures to Greece.

By using the OLS[9] method I obtained the following trend equation:

$$TC_{ARSTDs} = 6901.5 + 35.5 * t \qquad (7)$$

$$(27.13) \quad (3.67)^{10}$$

where TC_{ARSTDs} = Trend-Cycle of ARSTDs

t=time, and t=1 for the 1981 1st quarter,

SEE[11] = 847.6 T^{*12} = 2.02 at 95 % significance level.

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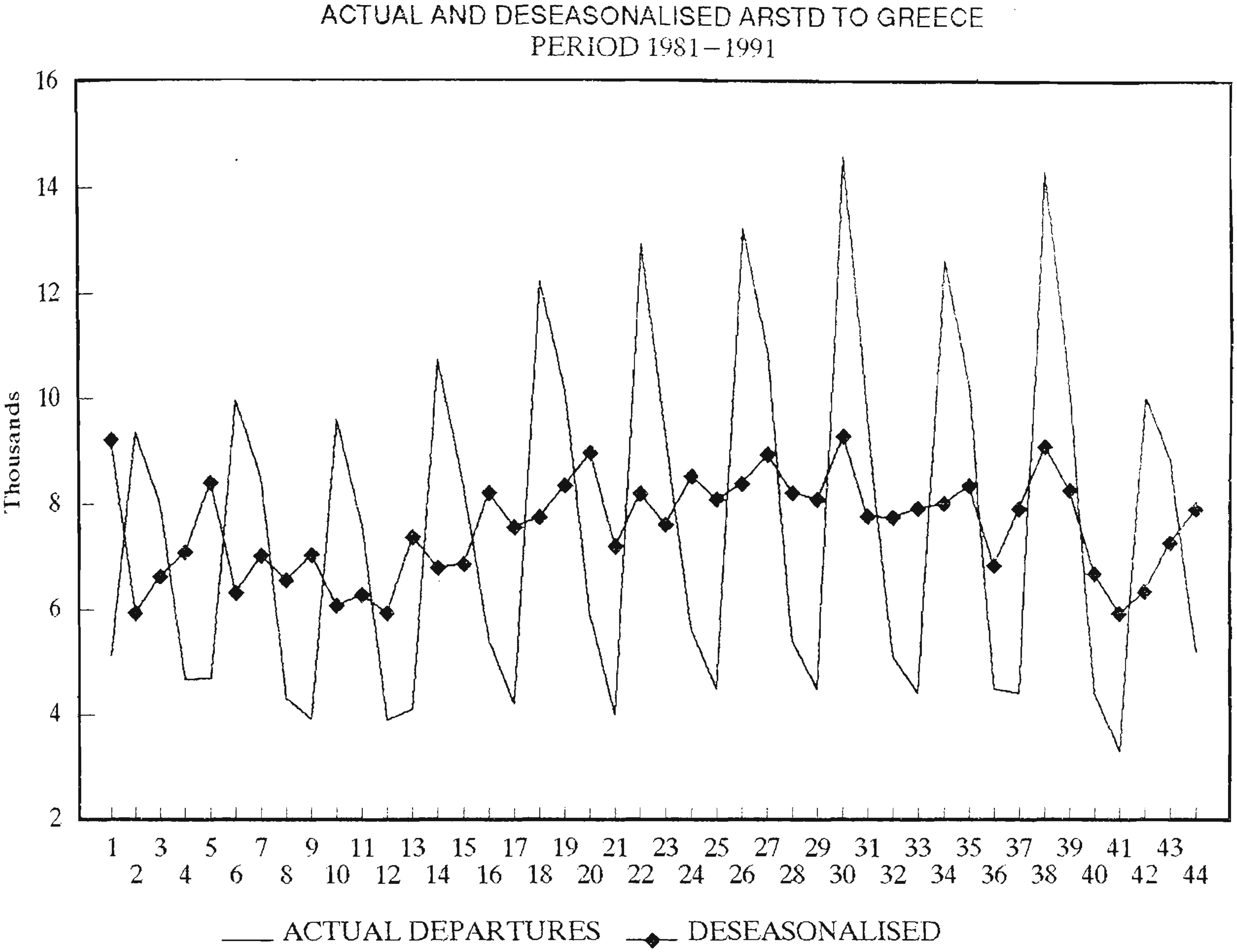
[9]. OLS stands for the Ordinary Least Squares method. This approach to estimating the parameter values in an equation minimises the squares of the deviations that result from fitting that particular model. In this case that a trend line is being estimated to fit a data series (i.e. the deseasonalised ARSTDs) the OLS minimises the mean square error. This would give a line whose estimated values would minimise the sum of the squares of the actual deviations from that line for the historical data.

[10].Values in parenthesis are t ratios. The equation was derived by the econometric program SHAZAM.

[11]."S.E.E." denotes Standard Error of the Estimate.



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[12]. "T*" is the critical value for testing the significance of the coefficients. The "t ratio" of each coefficient must be greater than the "T*", if it is to be significant.

R^2=0.20, Ftest=1625,

DW[13]=1.59 (du[14]=+1.54 at 1 and 40 df)

The statistical findings that accompany the regression equation indicate that with a 99 per cent certainty there is an overall significant relationship between the deseasonalised data and time. Quite clearly the regression line does not head in a zero direction (since the F test is extremely high at 1625) and explains almost 20 per cent of the variance of the deseasonalised series (which is very low). This is consistent with the observation that in the long run there is a slow growth rate of 1 per cent (see Table 1) in ARSTDs. In addition, the low R^2 indicates that there are other strong unspecified contributors that may explain the rest of the variance in the deseasonalised ARSTDs to Greece.

B. The Interpretation of the Trend-Cycle and Validity of the OLS Regression Equation.

It is evident from the above regression equation that there is an increase in each additional deseasonalised quarter of approximately 36 travellers; a small but

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[13].DW denotes the Durbin-Watson test.

[14]."du" is the upper limit for evaluating the estimated DW test.

nevertheless positive growth.

The explanatory power and the goodness of fit of the trend-cycle equation is disappointing. The regression equation explains only 20 per cent of the dependent variable's variation with an average error of 847 (Standard Error of the Estimate) tourists per deseasonalised quarter at a 68% confidence level, while the average error is 1694 (i.e., 2*847) at the 95% confidence level. In addition, as the DW test indicates (DW=1.59) the errors between the linear trend and the deseasonalised data are free of autocorrelation. Another sign that the DW test is valid and that the regression equation is overall significant (and does not head to a zero value) is reflected by the F test of the equation which is extremely high, Ftest = 1625[15]

Assuming that the general trend of the Australian and the world economy and the level of competition from other destinations remain stable then from the trend equation one can derive relatively sound information about the evolution of the specific time series, in this case, the ARSTDs to Greece.

Thus, if there is a negative or a small positive

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[15].The value of F test as well as the values of all other statistical criteria e.g. DW, R^2 e.t.c have been derived by the econometric program SHAZAM. All outputs can be obtained by the writer.

trend coefficient (as is the case here) this will be taken to imply that the destination (under consideration) has already reached its saturation level. The possibility of an improvement in this trend is highly unlikely in the short run unless a new marketing strategy is constructed (i.e. cheap airfares) or an extraordinarily attractive event (Olympic Games, World Soccer Cup, e.t.c) takes place.

If the trend had instead been high then tour operators and airlines could have reacted immediately in order to increase their share in the promising market. As it is, they only need to conservatively expose themselves in the light of the low trend.

C. The Significance of the Trend-cycle Equation in Forecasting, Planning and Decision Making.

The value of the standard error of the estimate can be used by policy makers and experts in the particular destination for efficient planning. Specialists in the Tourism field may have the ability to make specific strategic movements when they suspect the range within which the actual values of the estimate may fall. In my case, the expected deviation of 1694 (plus or minus) from the forecasted trend value may be used by airlines and tour operators to evaluate the prospects of a specific destination thereby minimising costs and taking advantage of any economies of scale that may be present.

However, whether the lowest or the highest projected level of the range will be chosen is not clearcut. For example, when dealing with the 41st quarter's projection the corresponding range is 8357 $\pm$ 1694 (or 5663 to 10051). The accountants of the airline or the tour operator may choose a point close to the lowest level in order to i) minimise costs and ii) produce a budget with an expected low income flow. However, the management may feel that the market will respond to the call and consequently a more optimistic approach may be considered as appropriate. Overall, projections must always be guided by the range and one must keep in mind that the range changes and enlarges while projections step forward in the future. As a result, the model must be periodically reassessed and redeveloped (in the light of anticipated changes in the pattern of the trend) in order to minimise possible errors.

In addition, it is also important to note that the market of airtravel to Greece is i) primarily dominated by the Greek national air-carrier Olympic Airways and ii) most of the travellers to Greece are from the large Greek community. These facts may discourage new competitors to penetrate the market especially since the trend is not overwhelmingly positive as it happens in the case of Greece.

5.5.3. IRREGULAR COMPONENT.

A. Isolation and estimation.

The Irregular (I) component has the characteristic that it can't be measured before it happens. No scientific method could have predicted the Gulf War in August 1990, or the withdrawal of Qantas scheduled flights to/from Greece in October 1990 and finally the ethnic unrests in Greece's neighbour country, the former Yugoslavia. The extent to which these erratic events might have influenced the tourist movement to Greece is measurable only after their occurrence. However, the estimation of the irregular component can give an indication as to what extent these events might have influenced the time series data under consideration. The irregular component can be obtained from the decomposition model (see equation 1) and is given below:

$$I = Y / (TC * S) \qquad (8)$$

In the above equation "I" plays the role of the residual.

B. Interpretation of Irregularity

It is clear from *Table 8* that all "I" values remain very close to unity, throughout the examined period, which reflects the absence of any erratic events that may have influenced ARSTDs to Greece. However, in the last five quarters the irregular component is significantly far from the neutral value of "1". This may be justified by the occurrences of the Gulf War and the withdrawal of Qantas. The effect of these events started to feed through to ARSTDs to Greece one quarter after they had actually occurred[16].

As the adverse effects of these erratic events started to subside by the 1991 December quarter one can reasonably assume that those events no longer affect tourist movement to Greece.

The split of the former Yugoslavia does not seem to have affected ARSTDs to Greece during the period under consideration, as the ethnic unrests started in June 1991 and the irregular components' values since then tend to approach unity rather than deviate from it.

However, the apparent underestimation of ARSTDs to Greece by the decomposition model may have been due to the model's forecasting inefficiency, as a consequence of a change in factors that play an important role in the determination of the pattern of the trend and which factors were considered to have remained constant. In addition the

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[16].The Gulf War started in August 1990 and Qantas withdrawal in September 1990.

Table 8: Estimation of the Irregular Component and Forecasts.

Table 8 PERIOD	OLS TREND	SI	FORECAST TC*S	ACTUAL	IRREG
MAR 81	6937.00	.56	3859.18	5126	1.33
JUN	6972.50	1.58	10984.41	9333	.85
SEP	7008.00	1.21	8482.65	8009	.94
DEC	7043.50	.66	4633.69	4659	1.01
MAR 82	7079.00	.56	3938.18	4675	1.19
JUN	7114.50	1.58	11208.11	9929	.89
SEP	7150.00	1.21	8654.53	8475	.98
DEC	7185.50	.66	4727.11	4306	.91
MAR 83	7221.00	.56	4017.17	3906	.97
JUN	7256.50	1.58	11431.82	9568	.84
SEP	7292.00	1.21	8826.41	7588	.86
DEC	7327.50	.66	4820.53	3900	.81
MAR 84	7363.00	.56	4096.17	4100	1.00
JUN	7398.50	1.58	11655.53	10700	.92
SEP	7434.00	1.21	8998.29	8300	.92
DEC	7469.50	.66	4913.94	5400	1.10
MAR 85	7505.00	.56	4175.17	4200	1.01
JUN	7540.50	1.58	11879.23	12200	1.03
SEP	7576.00	1.21	9170.17	10100	1.10
DEC	7611.50	.66	5007.36	5900	1.18
MAR 86	7647.00	.56	4254.16	4000	.94
JUN	7682.50	1.58	12102.94	12900	1.07
SEP	7718.00	1.21	9342.05	9200	.98
DEC	7753.50	.66	5100.78	5600	1.10
MAR 87	7789.00	.56	4333.16	4500	1.04
JUN	7824.50	1.58	12326.64	13200	1.07
SEP	7860.00	1.21	9513.93	10800	1.14
DEC	7895.50	.66	5194.20	5400	1.04
MAR 88	7931.00	.56	4412.16	4500	1.02
JUN	7966.50	1.58	12550.35	14600	1.16
SEP	8002.00	1.21	9685.81	9400	.97
DEC	8037.50	.66	5287.61	5100	.96
MAR 89	8073.00	.56	4491.16	4400	.98
JUN	8108.50	1.58	12774.05	12600	.99
SEP	8144.00	1.21	9857.69	10100	1.02
DEC	8179.50	.66	5381.03	4500	.84
MAR 90	8215.00	.56	4570.15	4400	.96
JUN	8250.50	1.58	12997.76	14300	1.10
SEP	8286.00	1.21	10029.57	10000	1.00
DEC	8321.50	.66	5474.45	4400	.80
MAR 91	8357.00	.56	4649.15	3300	.71
JUN	8392.50	1.58	13221.46	10000	.76
SEP	8428.00	1.21	10201.45	8800	.86
DEC	8463.50	.66	5567.87	5200	.93

low explanatory power of the trend-cycle regression equation may be another reason for the apparent underestimation of ARSTDs to Greece and not the previously mentioned erratic events. Nevertheless, while it is possible that the improvement in the forecasting accuracy of the model after the September quarter of 1990 might have been a random coincidence it is still inexplicable that the fact the forecasting accuracy of the model increases after the September quarter of 1990 while in addition the forecasted values are all underestimated of the actual ARSTD to Greece.

Although, there are no clearcut answers to the abovementioned considerations, I conclude with some reservations that the progressive accuracy of the model during the period of September 90 to December 91 may be explained by the Gulf war and the withdrawal of Qantas.

5.6 SUMMARY

The Australian Short Term Departures to Greece appear to be affected by heavy seasonality during the June and September quarters. Although there is a large Greek community in Australia the trend line specifies a very slow growth (of only 36 travellers per deseasonalised quarter) while in addition it explains only 20 % of the variation in ARSTDs to Greece. These results on seasonality and trend tend to be in agreement with the hypothesis that was stated at the outset of this chapter.

The Gulf war and/or Qantas withdrawal seem to have affected negatively ARSTDs to Greece as the irregular components for December 1990, March 1991, June 1991 September 1991 and the December 1991 quarters are less than unity. However, the aforementioned erratic events no longer affect ARSTDs to Greece given the small deviations of the estimated values of the irregular components from unity in the last two quarters of the period to be forecast. The split of the former Yugoslavia appears to have had no effect on ARSTDs to Greece, at least within the sample period under consideration.

Table 9: Classical Decomposition model's forecasting performance

In sample	Out of Sample
MAPE = 0.08	MAPE = 0.24
U Stat = 0.16	U stat = 0.48

However, the magnitude of the effects by the specified events must be carefully taken into consideration as the progressive increase in accuracy may indicate poor performance of the model. Nevertheless, the MAPE and U statistic tests of accuracy (see *table 9*) do not indicate either poor or excellent forecasting performance of the model specified (see section 7.2). Therefore most probably the aforementioned events may have caused the high deviation of the forecasts from the actual figures

CHAPTER 6

AN APPLICATION OF A MULTIPLE REGRESSION MODEL

Foreword

In this chapter, in contrast to the previous one I will generate a model which seeks to explain how Tourism demand (ARSTDs) is being determined. The main aim of this chapter is to discover and quantify relationships between the variable to be forecast and the determinant factors such as the disposable income, the price of Tourism and tourist attitudes towards Greece as a destination. The selection of the regression model will be made making use of the econometric program SHAZAM.

6.1 THE SPECIFICATION OF THE MODEL.

6.1.1. THE IDENTIFICATION OF THE VARIABLES.

"While economic analysis of the impact of Tourism is sufficiently established in methodology, the same cannot be said of research into determination of demand" (BOEY & GUNADHI, 1986, p.239).

The tourist's thinking in the process of reaching decisions that relate to choice of destinations (KUCUKKURT, 1981) is highly complex. This may have acted as the main impediment in the process of constructing a theoretical framework which appropriately reflects how tourists shape and/or change their attitudes towards a destination.

The Tourism industry is the only industry in which the consumption of the product occurs at the supply point within a specific region. This implies that the demand for a particular tourist destination will be influenced (among other things) by economic factors that prevail in this regional economy. For example, the general cost of living at a tourist destination, theoretically must influence the tourists' way of thinking.

Kalter & Grosse (1970) have argued that the demand function of Tourism for each potential tourist must include variables like (KALTER & GROSSE, 1970, p.43):

1. preferences and more specifically the value of satisfaction derived from participating in the activity;
2. personal circumstances (e.g. health, disposable income and the amount of leisure time available);
3. the disutility, such as money, time and the inconvenience incurred while engaging in the activity (or when consuming the good associated with it); and
4. the availability of alternative uses of time, money and energy (e.g. spending more time at work, or purchasing other goods and services).

In addition, the presence of relatives at a destination (as it happens with countries with migrants abroad), climatic conditions (snow or sun), culture, special events (Olympic Games) could also shape the image of a destination at a particular time and consequently influence the tastes and the opinions of the potential tourists. However, most of the abovementioned variables are not subject to short-run change or control (BOEY & GUNADHI, 1986) while in addition it is very difficult for an analyst to quantify most of them.

In this spirit, I will consider (in this study) the Australian real per capita income as proxy for the

Australian tourist's disposable income, prices at the point of destination and the exchange rate between the origin and the destination country as main determinants of the demand function for the ARSTDs to Greece. Indeed, it is widely accepted that as far as the destination area is concerned these factors influence the tourist's opinion quite significantly (LOEB, 1982). Moreover data about income, prices and exchange rates can be easily found in certain publications (e.g. International Monetary Fund).

In addition, I will include in the ARSTDs demand model i) Dummy variables that account for seasonality (since the data series in this particular study is quarterly) and ii) a variable that represents the relative attractiveness of Greece as a tourist destination for Australians in relation to other European destinations.

A. The Dependent Variable

In the Tourism literature the most frequently used dependent variables are the total number of visits (KLIMAN, 1981), visits per capita (PAPADOPOULOS & WITT, 1985, WITT & MARTIN, 1985 & 1987a,b,c), total or per capita tourist expenditure (ARTUS, 1972 & 1973, LOEB, 1982, UYSAL & CROMPTON, 1984).

Data on annual basis have been the most common data that appear in the literature (LOEB, 1982, QUAYSON & VAR, 1982, UYSAL & CROMPTON, 1984, PAPADOPOULOS & WITT 1985, WITT & MARTIN, 1985 & 1987 a,b,c & 1988 a,b & 1989 a,b). This is, because explicit international tourism data are published mainly on annual basis in most international publications. In addition, the use of yearly data provides the convenience of avoiding the effect of seasonality.

The presence of seasonality in the data series under considerati8on requires the inclusion of additional dummy variables in the model and this (inevitably) leads to a reduction in the degrees of freedom for the tests of significance of the estimated demand model's coefficients[17]. This argument (among others) was put forward by Uysal and Crompton (1984) to support their decision on excluding transportation cost when modelling Tourism demand, to Turkey in their case.

In this study, quarterly data (like SMITH & TOMS, 1978, CHADEE & MIECZKOWSKI, 1987) of ARSTDs to Greece were used, in order to quantify not only demand determinants but also the seasonal effect on airtravel to Greece.

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[17].The highest the number of the degrees of freedom the lowest the value of t-ratio is required.

B. Explanatory Variables

I. Real per capita Income.

International travel is expensive and has been generally classified among luxury goods and services (SMITH & TOMS, 1978). Undoubtedly, the level of income determines the likelihood that an individual will undertake an overseas trip.

Theoretically, the larger the real per capita income of a country is, the more likely the citizens are to be able to spend on pleasure and entertainment and consequently the more likely the undertaking of an overseas trip, *ceteris paribus* (GRAY, 1966, SMITH & TOMS, 1978, LOEB, 1982, UYSAL & CROMPTON, 1984, VAR & MOHAMMAD & ICOZ,1990).

The majority of Tourism studies have shown that the demand for Tourism is invariably highly income elastic (BOEY & GUNADHI, 1986). However, there were cases in which an inverse relationship between the Real per capita income and arrivals at a destination had emerged. For example, Chadee & Mieczkowski (1987) found an inverse relationship between U.S. income and U.S. tourist arrivals from the U.S.A. to Canada. They justified their findings by making the assumption that Canada had been a quasi-domestic destination for Americans and they further concluded that in the face of a rise in U.S. per capita income U.S. travellers were likely to visit other international destinations. The same situation emerged in the Var & Mohammad & Icoz (1990) study when they examined the relationship between Canadian per capita income and arrivals of Canadians to Turkey.

Nevertheless, the findings of the abovementioned studies cannot constitute a rule (as far as the relationship between per capita income and arrivals is concerned).

Indeed, other empirical studies have shown that whenever the real per capita income is being used as proxy for the disposable income, the respective regression coefficient is positive and usually more than unity (STRONGE & REDMAN, 1982, LOEB, 1982, UYSAL & CROMPTON, 1984, LIN & SUNG, 1983 cited in BOEY & GUNADHI, 1986, ANASTASOPOULOS, 1991). These findings are in agreement with the relevant economic theories.

II. The price of Tourism

The appropriate form of the price variable is by no means clear (WITT & MARTIN 1987a). The cost that tourists bear for undertaking an overseas trip can be classified into two categories. Firstly, the associated cost prior to the departure from the origin country and secondly the cost that emerges while at the destination. The determination of the cost that is classified in the second category is a complex one. This is because there is a need to estimate many influential factors that determine this cost component (i.e., time spend at the destination, quality of services, amenities used e.t.c.) and this can become a very troublesome task (WITT & MARTIN, 1987a).

Most studies in this area use retail price indexes (i.e., Consumer Price Indexes (CPIs)) of the origin and the destination countries (WITT, 1980a,b, KLIMAN, 1981, WITT & PAPADOPOULOS, 1985, LOEB, 1982, UYSAL & CROMPTON, 1984, ANASTASOPOULOS, 1991), and/or exchange rates (LOEB, 1982, UYSAL & CROMPTON, 1984, CHADEE & MIECZKOWSKI , 1987, VAR & MOHAMMAD & ICOZ, 1990) as proxies for the cost that tourists bear or the prices that tourists are likely to pay while at the destination.

The dilemma that one faces in including the exchange rate and/or relative prices[18] has been addressed by many researchers that have expressed their views from different perspectives. Gray (1966) (cited in WITT & MARTIN, 1987a, p.234) in agreement with LOEB (1982) argues that

"Prices are seldom completely known in advance by travellers

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[18]. A Relative Prices variable is usually defined by the ratio of CPIs between the origin and destination economies (LOEB, 1982).

so that the price level foreseen by the potential traveller will depend predominantly upon the rate of exchange of his domestic currency and hearsay evidence. Thus, while the influence of the price variable is undoubtedly complex, the rate of the exchange rate can be expected to be a prime indicator of expected prices" (GRAY, 1966 cited in WITT & MARTIN 1987a, p.234).

In addition, ARTUS (1970) (cited in WITT & MARTIN 1987a, p.233) stated that:

"The consequences of a change in the exchange rate are immediately perceived by potential foreign travellers. On the other hand these per sons are not well informed about recent price developments in foreign countries" (ARTUS, 1970).

However, the inclusion of relative prices (as a variable) in determining Tourism demand for a particular destination was adopted by other researchers and bolstered by LOEB (1982) who attempted to express international Tourism demand (in the form of travel exports) as a function of the exchange rate, real per capita income and relative prices. His findings provided evidence that:

"... relative prices, and not just exchange rates and real per capita income are an important contributing factor to

real travel exports" (LOEB, 1982, p.18).

The use of relative prices (in the form of CPIs of the origin and destination countries) was also adopted and critically analysed by WITT & MARTIN (1987a). In their attempt to investigate the choice of an appropriate variable that would represent the tourists' cost of living, their results were found to be in agreement with those of Loeb's (1982). They stated that the empirical results that stemmed from their study did not "***provide evidence of clear superiority (between CPIs and exchange rates), but rather indicate that the consumer price index either alone or together with the exchange rate, is a reasonable proxy for the cost of tourism***" (WITT & MARTIN, 1987a, p.245). In their conclusion, they stressed that the exchange rate on its own is not an acceptable proxy.

Overall it can be said that both variables have been found to be significant determinants of Tourism demand at a destination. There is no clear evidence to exclude one or the other. In addition the inclusion of both variables (i.e., relative prices and exchange rates) has been recommended so far, by researchers in the field of Tourism forecasting. Consequently, it will be assumed that both variables are expected to exert an influence on ARSTDs to Greece.

III. Dummy variables

As the data series that will be examined is quarterly, the inclusion of variables that account for the seasonal effect, in the estimated model, is essential.

So far most of the studies have dealt with annual data (LOEB, 1982, QUAYSON & VAR, 1982,UYSAL & CROMPTON, 1984, PAPADOPOULOS & WITT 1985, WITT & MARTIN, 1985 & 1987a,b,c). However, two studies (that stand out) that have used dummy variables to account for seasonality are those of SMITH & TOMS (1978), and CHADEE & MIECZKOWSKI (1987). In the first study, two dummy variables were included in order to extract the effect of seasonality in the June and September quarters, while in the second study an additional seasonal dummy variable was incorporated in the estimated models for the December quarter.

In this study, it is reflected by the data (see Table 3) that the fourth quarter (i.e., December quarter) does not show a significant variation in comparison to the first one. As a result there is no need for a dummy variable for the fourth quarter[19].

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[19].The third dummy variable that accounts for seasonality in the December quarter was insignificant determinant of the ARSTDs to Greece.

VI. Relative attractiveness.

I will include the relative attractiveness (total ARSTDs to Europe) of Greece for three reasons :

i. to show the relationship of the total ARSTDs to Europe on ARSTDs to Greece;

ii. to improve the explanatory power of the model; and

iii. to reduce multicollinearity and increase significance of the model.

C. Variables Excluded

I. Travel Cost

It is widely acknowledged (by many researchers) that international travel also depends upon major transportation costs. However, the transportation cost factor will be excluded from the analysis mainly because:

a. the acquisition of data on transportation costs was not feasible;

b. the inclusion of the transportation cost as a variable has proved to be statistically insignificant in most studies (GRAY, 1966, LITTLE, 1980); and

c. according to UYSAL & CROMPTON (1984) it creates multicollinearity and leads to a decline in the degrees of freedom.

II. Expenditure on promotion

The model sidesteps the interrelationship between ARSTDs to Greece and promotional activities. This is due to the fruitless efforts of gathering such information from the respective organisations (i.e., the Greek Tourism Organisation, airlines, tour operators e.t.c.).

6.1.2 DEFINITION OF THE DEPENDENT AND INDEPENDENT VARIABLES.

Australian Resident Short Term Departures to Greece (ARSTDs): is the dependent variable of the regression model and is measured by the total number of travellers that intend to stay overseas less than a year and Greece is the main destination that they will visit[20].

Real per capita income (RPCI): is the total Gross Domestic Product (GDP) of Australia divided by the product of the respective quarter's Australian Consumer Price Index (ACPI) multiplied by the population of Australia in that

[20].This definition has been set by the the ABS.

particular quarter. The estimation of the RPCI data points has been undertaken in Appendix by using the following formula:

$$\mathbf{RPCI= (GDP/POP)/ACPI}\ , \qquad (1)$$

where "GDP" is the Australian Gross Domestic Product and "POP" denotes Population at a particular quarter.

Exchange rate (EX)[21]: is the cross-rate of the Australian dollar and the Greek currency (drachmas) and represents the number of units of the Greek currency (Drachmas) per Australian dollar. Because all currencies are quotes against the U.S. dollar the EX estimation will be made using the U.S. dollar as basis. More specifically the following formula will be used to estimate the number of Drachmas per Australian Dollar:

$$\mathbf{EX = EX_{US,G} * EX_{US,A}} \qquad (2)$$

where "$EX_{US,G}$" denotes the units of Greek Drachmas per USD

and "$EX_{US,A}$" units of AUD per USD

Relative prices (RP): is the real cost of Tourism in Greece in terms of Australian dollars. It is estimated by

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[21].Refer to Appendix for explicit estimations.

making use of the following formula:

$$RP = (EX_{G,AUD} * 100 * GCPI) / ACPI \qquad (3)$$

where $EX_{G,AUD} = 1 / EX$ and

GCPI is the Greek CPI.

The nominator of equation (3) represents the nominal price of Tourism in Greece expressed in terms of Australian Dollars. Indeed, assuming that the GCPI represents adequately the cost of Tourism in Greece, the product of the GCPI multiplied by the exchange rate expressed in Australian dollars per 100 units[22] of the Greek currency, depicts the price that an Australian would have to pay while at the destination (i.e., Greece). Therefore when the "$EX_{G,AUD}$ * 100 *GCPI" increases, the Australian traveller would most probably rethink his/her visit and therefore the number of ARSTDs to Greece would deteriorate. The reverse would happen if there was a decline in the price of Tourism in Greece.

In addition, due to the fact that the price of Tourism is not in real terms for the Australian tourists, I

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[22].One unit of the Greek currency (drachmas) equals to a very small portion of an Australian Dollar. Thus in this study, and particularly the exchange rate incorporated in the relative prices variable refers to Australian Dollars per 100 Drachmas.

will divide it by the ACPI, in order to transform the nominal price of Tourism to a real one. This will assist in examining the reactions of the Australian travellers to Greece in relation to their real purchasing power fluctuations.

At this point, however, I must also say that the reason that justifies the apparent use of two forms of exchange rates as variables (i.e., EX directly and $EX_{AUD,G}$ indirectly in the context of equation 3) is that this combination in a preliminary study was found to decrease the degree of multicollinearity between the nominal exchange rate (EX) and the relative prices (RP).

Relative Attractiveness (RA): is the ARSTDs to Europe.

Dummy Variables (S2,S3) : These are variables that are equal to unity for the second and third quarter of the year and they account for the effect of seasonality on ARSTDs.

6.2. HYPOTHESIS 2

In the light of the definition of the abovementioned variables it is expected that:

1. Real Per Capita Income and Exchange Rate fluctuations are positively related to tourist flow to Greece while
2. Relative Prices fluctuations will influence negatively tourist flow to Greece.

This hypothesis will be tested by observing the sign and magnitude of the variables' coefficients after I have simulated the model.

6.3. THE FUNCTIONAL FORM OF THE MODEL AND THE ESTIMATION TECHNIQUE

Taking into consideration what the literature review suggests, an international travel model in general and more specifically for ARSTDs to Greece would be a function of the prementioned variables. Consequently, the model would take the following form :

$$ARSTDs_t = f(RPCI_t, EX_t, RP_t, RA_t, D_2, D_3), \quad t=time \quad (5)$$

where

$RPCI_t$= A measure of Real Per Capita Income in Australia.

EX_t = Exchange Rate, measured in units of the Greek currency per Australian dollar.

RP_t = Relative Prices (as previously defined).

RA_t = Relative Attractiveness.

$D_{2,3}$ = Dummy variables accounting for seasonality in the second (S2) and third (S3) quarters.

In econometric modelling the most widely used method for estimating Tourism demand equation is the Ordinary Least squares (OLS) method. However, there are variations in the functional forms of models that have been derived in the area of Tourism. The log-linear models have been widely used by researchers of international Tourism whenever an attempt was made to use an econometric model (GRAY, 1966, ARTUS, 1970, BARRY & O'HAGAN, 1972, JUD, 1974, SMITH & TOMS, 1978, LITTLE, 1980, LOEB, 1982, UYSAL & CROMPTON, 1984, BOEY & GUNADHI, 1986, CHADEE & MIECZKOWSKI, 1987, VAR & MOHAMMAD & ICOZ, 1990). The log-linear approach possesses the advantage that the independent variables' coefficients represent elasticities with respect to the dependent variable.

In this spirit I begin by presenting (initially) the basic specification of the model (for ARSTDs to Greece) which is given as

$$ARSTDs_t = a * RPCI_t^{b1} * EX_t^{b2} * RP_t^{b3} * RA_t^{b4} * k_t \quad (6)$$

where k= random e rror term and

a= constant term

$RPCI_t, EX_t, RP_t, RA_t$ as were defined previously.

The logarithmic transformation of the multiplicative form of model (given by equation (6)) yields the following:

$$\mathbf{logARSTDs_t = A + b1 * logRPCI_t + b2 * logEX_t + b3 * logRP_t + b4 * logRA_t + Z_t} \qquad (7)$$

where A=loga and Z=logk is a random disturbance term.

Given the model that I have specified for ARSTDs to Greece, it is expected that the coefficients of elasticity of the relevant variables will take the following signs :

(dlogARSTDs/dlogRPCI) >0

(dlogARSTDs/dlogEX) >0

(dlogARSTDs/dlogRP) <0

(dlogARSTDs/dRA) >0

For example, the number of the ARSTDs to Greece is expected to increase if the Australian RPCI or the exchange rate increases. On the contrary the number of the ARSTDs to Greece will decrease if there is a rise in relative prices, *ceteris paribus*. The sign of Relative Attractiveness must be positive as while ARSTDs to Europe increases most probably ARSTDs to Greece will increase.

Equation (7) reflects a linear relationship between the logarithms of the variables that have been included in the model and sets the scene for the application of the OLS regression analysis to the model. However, as I have already noted in addition to the explanatory variables, dummy variables have to be included in the model in order to capture any seasonal fluctuations. Consequently, the final version of the model for explaining ARSTDs to Greece would be :

$$\log ARSTDs_t = A + b1 * \log RPCI_t + b2 * \log EX_t + b3 * \log RP_t + b4 * \log RA_t + b5 * S2 + b6 * S3 + Z_t \qquad (8)$$

while the expected signs of he coefficients must be:
$b1 > 0$, $b2 > 0$, $b3 < 0$, $b4 > 0$, $S2,3 > 0$.

Except for the dummy variables' coefficients (S2,S3) all other coefficients express the respective explanatory variables' elasticity with respect to the independent variable.

6.4. EMPIRICAL RESULTS.

In the process of estimating the best OLS regression model the constant term was found always to be insignificant and highly correlated with the logarithm of RPCI, while its standard error was high. As a result the initially estimated model was obtained without a constant term and is exhibited below:

$$\begin{aligned}\log ARSTDs_t = \; & 1.1504 * \log RPCI_t + 0.20657 * \log EX_t \\ & (20.51)^{\wedge\wedge} \qquad (2.28)^{\wedge} \\ & + 0.28631 * \log RP_t + 0.64148 * \log RA \\ & (2.45)^{\wedge} \qquad (3.14)^{\wedge\wedge} \\ & + 0.77893 * S2 + 0.62295 * S3 \qquad (9) \\ & (16.72)^{\wedge\wedge} \qquad (14.15)^{\wedge\wedge}\end{aligned}$$

$R^2=0.95$ $DW=1.92$ $SEE=0.081$

Tcrit = 2.02 at 95% level

^ significant at 95 per cent confidence level

^^ significant at 99 per cent confidence level

The Exchange rate has the expected sign (i.e., $+0.20657*\log EX_t$) which is in agreement with the literature (LOEB, 1982, UYSAL & CROMPTON, 1984) and is a statistically significant determinant of ARSTDs to Greece at the 95 per cent confidence level.

Likewise relative prices were found to be statistically a significant variable. However, the positive (rather than negative) sign of the respective coefficient (i.e., + $0.28631*\log RP_t$) is not in accordance with economic theory in this particular case. A possible explanation for this paradoxical result is that although Australians (in general) pay attention to the exchange rate movements, on the contrary they may not be interested in (or aware of) price changes. Indeed, while prices in Greece have increased by almost five times since 1981 (see appendix, table 20), this fact had no effect on the Australian tourists' decisions to visit Greece, all other things held constant. This reflects the idiosyncratic nature of Tourism flows to Greece; Greek Australians visit Greece for family and/or cultural reasons rather than purely as a holiday destination. A possible reason could be that the majority of travellers to Greece are most likely to have relatives in Greece. This advantage reduces their expenditure on hotel accommodation (which is a major expenditure component) to the minimum and this may explain (in this case) the tourists' apparent indifference to prices fluctuations in Greece.

Finally, it is important to note that the validity of the estimated values of the coefficients is confirmed by the fact that the standard errors of the corresponding coefficients are low while there is neither an indication of multicollinearity nor autocorrelation of the residuals as the correlation matrix (see table 10) and the value of the DW statistic indicates.

Table 10: Initial Regresion Model's Correlation MAtrix.

logRPCI	1.000					
logRP	-0.177	1.000				
logEX	-0.381	-0.12	1.000			
logRA	0.169	0.01	0.821	1.000		
S2	-0.453	-0.03	-0.672	-0.03	1.000	
S3	-0.365	-0.09	-0.523	-0.601	0.675	1.000
	logRPCI	logRP	logEX	logRA	S2	S3

6.5 EMPIRICAL RESULTS WITH A REVISED MODEL

It is evident that the exchange rate is a significant determinant of ARSTDs to Greece but the same cannot be said about relative prices. This justifies the exclusion of relative prices from the regression model and the estimation of the new regression model which is exhibited next:

$$
\begin{aligned}
\mathbf{logARSTDs}_t = \; & 1.1590 * \mathbf{logRPCI}_t + 0.22151 * \mathbf{logEX}_t \\
& (14.745)^{\wedge\wedge} \qquad (2.255)^{\wedge} \\
& + 0.2745 * \mathbf{logRA}_t + 0.78352 * S2 \\
& (3.193)^{\wedge\wedge} \qquad (16.852)^{\wedge\wedge} \\
& + 0.62802 * S3 \\
& (15.879)^{\wedge\wedge}
\end{aligned} \qquad (10)
$$

R^2=0.93 DW =1.76 SEE = 0.09

Tcrit = 2.02 at 95% and 40 degrees of freedom

Fstat =218 (Fcrit=3.89,at 99% with 4 and 35 df)

^ significant at 95 per cent confidence level

^^significant at 99 per cent confidence level

Here income is found to be a significant estimator of airtravel to Greece at the 99 per cent confidence level. This result is an agreement with the majority of the studies which have attempted to construct a suitable model for forecasting Tourism demand (GRAY, 1966, SMITH & TOMS, 1978, LOEB, 1982, UYSAL & CROMPTON, 1984, PAPADOPOULOS & WITT, 1985, GUNADHI & BOEY, 1986, VAR & MOHAMMAD & ICOZ, 1990).

In addition the standard error of the Income coefficient (0.04) and the partial correlation coefficient (0.97) are significantly low and high respectively. These indicate the high degree of relationship between RPCI and ARSTDs to Greece and that the RPCI is an overwhelmingly significant determinant of ARSTDs to Greece. Moreover, the values of DW (=1.76) and Fstat (=218) denote that the regression model shown in equation 10 does not suffer from autocorrelation of the residuals or multicollinearity (see Table 11) and definitely does not head to a zero direction (Fstat=218).

Overall the RPCI coefficient value is slightly greater than unity in both models (b1=1.15 in the first

Table 11: Final Regression Model's Correlation Matrix.

logRPCI	1.000				
logEX	-0.541	1.000			
logRA	0.413	0.597	1.000		
S2	-0.210	-0.532	-0.708	1.000	
S3	-0.201	-0.436	-0.501	0.626	1.000
	logRPCI	logEX	logRA	S2	S3

model (see equation 9) and b1 = 1.159 in the second model (see equation 10)). With respect to the second model when b1 = 1.159 one can say that when RPCI rises by 1 percent it is expected that the number of ARSTDs to Greece will increase by approximately 1.16 per cent. This means that the Australian market treats airtravel to Greece as a necessity rather than as a luxury item[23]. This may be attributed to the fact that i) Greece (and Europe in general) is considered as a long haul destination and ii) Australians (especially Greek-Australians) regard travel to Greece as a necessity that needs to be fulfilled. Indeed, for most Greek-Australians a trip to Greece for a short reunion with relatives or a short holiday break (to the so "tempting"

[23].The income elasticity of a luxury good is greater than 1. While in the case of necessary goods (i.e. milk, bread e.t.c) it is in the range 0-1. Whilst inferior goods have negative income elasticity i.e. < 0.

Greek islands) acts as a substitute to the dream of a permanent settlement in Greece.

The exchange rate was found to be significant determinant of the ARSTDs to Greece. The coefficient of the exchange rate variable (the same stands for the RPCI and RA coefficients) denotes constant elasticity in respect to ARSTDs to Greece. The small positive sign means that for 1 per cent revaluation of the Australian dollar there will be only a 0.22 per cent increase in Tourism flows to Greece. All other things held constant, the exchange rate has only a minor impact on Tourism flows. This is another indication (and in line with the previously mentioned about the relative prices) that Australian visitors to Greece do not give great consideration to the cost of living in Greece.

The next step is to provide an interpretation with respect the value of the coefficient that has been obtained for relative attractiveness of Greece as a European destination. The relationship between relative attractiveness (total ARSTDs to Europe) and ARSTDs to Greece was found to be positive one which denotes that Greece has not lost completely its image amongst other European destinations. However, the 0.27 coefficient of the logarithm of the RA (i.e. ARSTDs to Europe) indicates that Greece is not a favourable destination compared to other European destinations. This is because the value of the coefficient (of the logarithm of the RA variable) which is 0.27 reflects that when ARSTDs to Europe increase by 1 percent ARSTDs to Greece will rise by only 0.27 per cent.

The abovementioned findings (that are associated to relative attractiveness) have important policy implications and should be treated carefully by the management either of the Greek Tourism Organisation or other Tourist related companies that are closely related to Greece as a tourist destination. Otherwise the decline in Greece's relative attractiveness as a European destination (which goes some way towards explaining Qantas' withdrawal from flying to/from Greece) may continue to adversely affect ARSTDs to Greece.

More specifically, as Greece loses its image as a European destination other measures (that have been neglected so far) must be put into operation (e.g. advertising and promotional activities). A movement in this direction is already reflected by the decision of Olympic Airways to acquire fifty per cent equity of a local Tour operator (obviously) with the view of penetrating the Australian market by exploiting i) the "know-how" of the Australian tour operator's marketing experience and ii) the tour operator's knowledge of the Australian market's distribution channels. This strategic movement that has already cost millions of dollars to Olympic Airways implies that the task of regenerating Greece as a tourist destination (by lifting its relative attractiveness) is "under careful treatment".

As it was expected the dummy variables[24] that were introduced in the model to capture the effects of seasonality on ARSTDs to Greece (i.e., S2 and S3) really picked up the effect of seasonality which was strong for the second and third quarters. For example, S2 (=0.78) indicates that in the second quarter there will be an increase in the logarithm of ARSTDs to Greece by an additional 0.78 units attributable to the seasonal effect. A similar increase of 0.62 units it is expected to be added on the third quarter.

Both seasonal dummy variables were found significant at a 99 per cent confidence level which indicates the strong presence of seasonality in the middle quarters of the year. Moreover, the values of the coefficients were also in agreement with the seasonal indexes that were estimated in chapter 5. In other words, the June quarter seems to attract more visitors than the September quarter which is the reverse of what happens for the total international arrivals to Greece (see Table 6).

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[24].The Dummy variables took the value of one for the second and third quarter while they equal to zero in the first and fourth quarter.

The goodness of fit of the model is substantially high. The explanatory variables can explain (based on the corrected R^2) 93 per cent of the variation in ARSTDs to Greece. The whole model is also significant as the F statistic indicates. Moreover, as the DW statistic[25] shows the model is mostly free from autocorrelation. This adds more validity to the F and T tests of significance of the model as whole and to the coefficients individually.

Taking for granted that in the short run the estimated (by the OLS) coefficients of the indepedent variables will remain constant I can forecast the ARSTDs to Greece by using the real recorded values of the indepedent variables (i.e. RPCI, Ex e.t.c.) for the year 1991.

Following the above procedure, one could initially lead to the conclusion that as a forecasting tool (see *Table 12*) Naive 1 seems to be superior to the multiple regression model (since Ustat=1.03) although the MAPE criterion denotes that forecasting performance of the multiple regression model is high. In addition, when the MAPE of the Naive 1

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[25]. The value of the DW statistic must be greater than 1.79 which is the upper limit at 95 per cent confidence level (one side test) with 5 variables and 40 observations (see MAKRIDAKIS et al., 1983, p.888). However in this case the estimated value of the DW is relatively lower. Nevertheless according to previous studies (see WITT & MARTIN, 1987, p.25) the value of 1.76 is very close to the upper limit and consequently it is more likely that the model (equation 10) does not suffer from autocorrelation of the residuals.

method is individually calculated the estimated regression model performs far better. However, these contradictory issues will be dealt with and discussed more extensively in the next chapter.

Table 12:Multiple regression model's Forecasting Performance.

Table 12		REGRESSION MODEL FORECAST	
In Sample		Out of sample	
MAPE	0.053	MAPE	0.062
Ustat	1.045	Ustat	1.147

6.6. SUMMARY.

With the exception of relative prices real per capita income, exchange rate and relative attractiveness are significant determinants of the ARSTDs to Greece. The coefficients of all variables (except for relative prices) have the expected sign and this shows that ARSTDs to Greece behave along the lines of most of the previous models that exist in the literature.

The RPCI elasticity shows that Greece is perceived more as a necessity rather than as a luxury good by the Australian market. On the other hand, variations in EXs are not expected to affect significantly ARSTDs to Greece.

The relative attractiveness of Greece as a European destination is not satisfactory as the rate of growth in ARSTDs to Greece is almost one third of the total ARSTDs to Europe, which additionally denotes the low trend in visiting Greece from Australia.

Seasonality as it was expected does influence considerably departures to Greece (especially) during the Mediterranean Spring and Summer.

I now proceed to the next chapter where I will use the estimated model (which is described by equation 10) for forecasting purposes will subsequently compare its performance with the forecasting performance of the classical decomposition model.

CHAPTER 7

THE FORECASTING PERFORMANCE OF THE MODELS

Foreword

So far I have employed two quantitative methobds for the purpose of forecasting ARSTDs to Greece. This chapter evaluates, compares and discusses the forecasting performance of the estimated classical decomposition and multiple regression models. The forecasting performance of the Holts two parameter and a simple seasonal time regression model are discussed in addition to the Naive 1 and 2 methods in order to evaluate with more certainty the performance of the explicitly estimated decomposition and multiple regression models.

7.1 THE ASSESSMENT CRITERIA

The evaluation and assessment stages of a forecasting method require that criteria (of usefulness to the policymakers) be set. The scientifically and theoretically advanced forecasting methods cannot claim such a distinction (i.e., of being useful) unless they are proved to be applicable and useful to the specific industries. Consequently if the method cannot assist the industry then the method may be regarded as inefficient.

Many researchers make use of only a limited number of criteria. Usually simplicity, cost and more importantly accuracy consist the main core of evaluating forecasting performance. However the latter, accuracy, is the predominant criterion. If the forecasts proved wrong then the associated strategic decisions of policymakers or the management of a company (especially of a tour operator), could prove disastrous.

As a result the accuracy of the forecasting method and its simplicity will be the two criteria for evaluating the two methods that I have employed in this study; the classical decomposition model and the causal regression model.

7.2. EVALUATION OF THE CRITERIA AGAINST EACH METHOD

It is expected that the classical decomposition model (time series model) will perform better than the multiple regression model (Hypothesis 3). In this spirit, the accuracy of each model will be tested using the Mean Absolute Percentage Error (MAPE) (WITT & MARTIN, 1989a, VAN DOORN, 1984a). On the other hand, simplicity will be tested comparing the forecasting performance of the aforementioned methods with the Naive 1 method's forecasting performance. The U Theil statistic will be used to assess the last criterion.

In many instances the word accuracy is associated with the "goodness of fit", which in turn refers to how well the forecasting model is able to reproduce the data for the same period. However, the performance of the model within the sample period (from which it was derived) may not be as good outside the sample period. It is the forecasting performance of the model outside the sample period that is important to management (WITT & MARTIN, 1989). Indeed, the main concern is what is going to happen tomorrow and not what happened yesterday. Of course, one cannot deny that the past directs (with some reservations) the future. As a result the final test will be based on the forecasting performance of the model outside of the sample period.

In the process of testing the hypothesis that the classical decomposition model will perform better than the multiple regression model I will additionally estimate the MAPE and the U statistics of a seasonal time regression model, the Holt's two parameter exponential smoothing method (on deseasonalised data) and Naive 1 and 2 methods.

The error (e) in forecast values will be defined as:

$$e_t = F_t - A_t$$

where F_t denotes the forecast values and A_t the actual ARSTDs to Greece.

The MAPE and U statistic are defined as follows :

$$\text{MAPE} = (1/n) \sum_{t=1}^{n} \left| \frac{A_t - F_t}{A_t} \right|$$

$$\text{Ustat} = \sqrt{\frac{\sum_{t=1}^{n-1} \left(\frac{F_{t+1} - A_{t+1}}{A_t} \right)^2}{\sum_{t=1}^{n-1} \left(\frac{A_{t+1} - A_t}{A_t} \right)^2}}$$

MAPE does give a relatively equal weight to all errors however the U statistic offers the advantage of the ability to compare the results with the Naive 1 method's forecasting performance. Consequently the U statistic seems to be the ultimate assessment criterion.

Table 13 exhibits the values of the forecasting criteria for each method. As it is shown a seasonal time regression model, the Holt's two parameter exponential smoothing on deseasonalised data, naive 1 and 2 methods' performance are exhibited. The estimation of the Holt's exponential smoothing forecasts is presented in Appendix.

The basic seasonal time regression model, derived by the econometric program SHAZAM, accounts for trend (representative of all dynamics that influence ARSTDs to Greece) and seasonality for the second and third quarter and found to be represented by the following equation :

$$\mathbf{ARSTDs_t = 35624.7 + 54.825\ T + 7311.8\ S2 + 4521.2\ S3}$$
$$\mathbf{(10.05) \quad (4.09) \quad (19.33) \quad (11.95)}$$

R2=92.16 DW=1.99 SEE=976

where T = time (1..n) where n=40 and T=1 in March 1981;
S2,S3 Dummy variables for the 2nd and 3rd quarter.
Values in parentheses are T-ratios.

The Naive 1 method's forecasts were estimated using the following formula:

$$F_t = A_{t-1} ,$$

while the Naive 2 method's forecasts were estimated using the following formula:

$$F_t = A_{t-4}$$

where "F_t" denotes the forecast value and

"A" denotes the actual value of period "t".

The forecasting performance will be tested on the out of sample period (in sample period 1981-1990) which is the four quarters of 1991.

The Appendix exhibits the calculation of the MAPE and U statistics, for the classical decomposition model, multiple regression model Holt's two parameter exponential smoothing, the seasonal time regression model, the naive 1 and 2 methods.

Table 13: Forecasting Performance of the Models

TABLE 11	REGR	DECOMP	TIME REG	HOLT	N1	N2
	IN SAMPLE					
MAPE	0.05	0.08	0.18	0.12	0.58	0.09
Ustat	1.04	0.16	0.29	0.12	1	0.16
		OUT OF SAMPLE				
MAPE	0.06	0.24	0.14	0.12	0.46	0.26
Ustat	1.15	0.48	0.16	0.09	1	0.63

REGR = MULTIPLE REGRESSION MODEL
DECOMP = CLASSICAL DECOMPOSITION MODEL
TIME REGR = SEASONAL TIME REGRESSION
HOLT = HOLT'S TWO PARAMETER DOUBLE EXPONENTIAL SMOOTHING
N1 = NAIVE 1
N2 = NAIVE 2

7.2.1. THE ASSESSMENT OF THE METHODS BY THE U STATISTIC.

Although the MAPE is very low for all methods (both in sample and out of sample periods) the multiple regression model's U statistic was found to be inferior to the naive 1 method, the classical decomposition model, the seasonal time regression model and Holt's two parameter exponential smoothing.

More specifically, Holt's smoothing proved to be the best estimator of ARSTDs to Greece, followed by the seasonal time regression model, the classical decomposition model, the naive 2 method, the naive 1 method and last the multiple regression model. At this stage, one could say that (once more) simple time series methods lead the forecasting field despite their blindness.

On the other hand, the multiple regression model performs disappointedly using the U statistic criterion. The reason for this could be an unexpected movement (in the short run) of real per capita income and exchange rates which are the main explanatory determinants of ARSTDs to Greece, in this study. This "excuse" is actually the main impediment for the establishment of the causal methods in the forecasting field.

It is also important to note that despite the presence of sophisticated procedures (in the literature) for the construction of econometric models, most of the time the accurate prediction of the values of the explanatory variables themselves adds to the difficulty in forecasting the dependent variable.

However, in this study the data used for the explanatory variables (for the in sample and out of sample period) were actual data and not predicted. This means that if the predicted values were used the forecasting performance may have been different and probably worse. Moreover, in addition to the fact that a regression model can explain its failure to predict accurately (while a time series cannot) the relationships revealed by the regression model are also of great importance.

In this study as the explanatory variables' values are overwhelmingly accurate - being the actual data - it is more likely that another variable that has been excluded from the model has caused the poor performance of the multiple regression model in relation to its inability to satisfy the U statistic criterion. Alternatively i) the relationship specified in the "in sample period" between RPCI, EX, RA, S2 and S3 in relation to ARSTDs to Greece might have changed in the out of sample period - which is very unlikely to have happened in the short period of 12 months - or ii) the U statistic's results are misleading; the latter possibility is tackled in the next section.

7.2.2. THE ASSESSMENT OF METHODS BY THE MAPE.

In Table 13 where I present an assessment of the same forecasting methods (as in the previous section) by using the MAPE, some of the previously presented findings (regarding the forecasting performance of the multiple regression model) do not hold.

Under the MAPE criterion the multiple regression model performs excellently in the presence of both the in and out of sample periods. On the other hand, the classical decomposition model is found to be inferior to most of the other tested models. Only compared to naive methods is the Classical decomposition model found to be superior forecaster.

One explanation for these contradictory outcomes may be the fact that MAPE does not square the errors while the U statistic does.

Overall, these findings reflect i) the ambiguity which surrounds the criteria for assessing the forecasting performance of time series and causal methods and ii) how careful an analyst must be in the process of choosing a forecasting method.

7.3. SUMMARY.

The criteria used in this study have not been helpful in providing a clearcut result. However, in all methods the use of the U statistic indirectly relies on a comparison of the MAPE of each method with the MAPE of the Naive 1 method. In this light one can be justified in using the MAPE of each model in order to select the best model. Consequently, I will classify the models presented in this study, taking into account the following classification for

MAPEs suggested by Lewis (1980):

MAPE<10	***highly accurate forecasts***
10<MAPE<20	***good forecasts***
20<MAPE<50	***reasonable forecasts.***

On the basis of the above the multiple regression model has produced highly accurate forecasts in both the in and out of sample periods. The classical decomposition model is also found to be an excellent forecaster in the in sample period and a reasonable one in the out of sample period. The seasonal time regression model produces good forecasts in the in sample period whereas outside the sample period its performance strengthens. Naive 2 loses its forecasting power while moving from the in sample to the out of sample period. The only other method (in addition to the multiple regression model) that does well is the Holt's two parameter exponential smoothing on deseasonalised data, which is found to be a good forecaster for both periods. The Naive 1 method provide only reasonable forecasts for both periods mainly due to the existence of seasonality in the data series.

CHAPTER 8

CONCLUSIONS AND RECOMMENDATIONS FOR FURTHER RESEARCH

8.1. CONCLUSIONS.

In this study, I have tried to stress (in the context of the literature in the area of Tourism) the need for demand forecasting. The modelling approaches that I have adopted (i.e., classical decomposition and multiple regression analysis) have gone some way towards revealing the associated relationships between demand and causal factors as well as the underlying patterns in Tourism data series. These issues are not simply essential but of vital importance in the process of securing and enhancing a profitable future for a Tourism business.

I have argued (along with others) that planning and expectations always go along but planning that is based on merely intuitive speculations without a market analysis and research is usually deemed to fail. Failure in expectations is not a rare phenomenon in business. This seems to have been the case (in this study) with Greece as a tourist destination for the Australian market.

Greece as an overseas destination for the Australian tourists in 1990 represented only 1.5 per cent (see section 4.5.2) of the total Australian Resident Short Term Departures (2.5 per cent in 1980); this was despite the fact that hundreds of thousands of Greek migrants reside in Australia (V.E.A.C, 1986). The evolution of Greece as a tourist destination for Australians has not been as one would have expected despite the presence of a large Greek community in Australia. The failure in the expectations can also be attributed to the fact that the Australian international air carrier, Qantas, announced in 1990 its definite withdrawal from travelling to/from Greece due to consecutive low capacity flights.

It is evident from the above that the need for discovering underlying patterns in the historical data of ARSTDs to Greece is as clear as the need for the construction of an appropriate forecasting model for the purpose of assisting management (of i.e. tour operators, airlines) in decisions related to Tourism products including Greece. That would reduce the possibility of a failure in expectations about tourist flows from Australia to Greece.

More specifically the purpose of this study, with Greece as a sample destination, was to:

a. quantify and interpret the underlying patterns of seasonality and the long term trend in ARSTD to Greece;

b. to quantify and interpret relationships of major demand determinants in ARSTDs to Greece; and

c. to construct and evaluate the suitability of multivariate causal and time series methods in forecasting Australian Tourism demand in Greece.

In the context of the above aims the initial task in the process of achieving the above goals involved an application of the classical decomposition model in order to identify and quantify underlying patterns (i.e., trend, seasonality) in the ARSTDs to Greece. The extrapolation of the identified underlying patterns in the future furnished the forecasts.

In the process of the application of the classical decomposition model the Australian Short Term Departures to Greece appeared to have been affected by heavy seasonality during the June and September quarters. Although there is a large Greek community in Australia the trend line specified a very slow growth.

In addition, in an attempt to interpret the magnitude of the values of the irregular component in the last 6 quarters of the examined period, the Gulf war and/or Qantas withdrawal seem to have most likely affected negatively ARSTDs to Greece as the irregular components for December 1990, March 1991, June 1991 September 1991 and the December 1991 quarters were less than a unity. However, the aforementioned erratic events no longer affect ARSTDs to Greece given the small deviations of the estimated values of the irregular components from unity in the last two quarters of the period that was forecast.

Following the identification of underlying patterns I proceeded to " explain" the demand for travel services (represented by the ARSTDs to Greece) by developing a multiple regression model for the specific purposes of i) identifying and quantifying relationships between ARSTDs to Greece and its major demand determinants and finally ii) forecasting ARSTDs to Greece.

In a nutshell, the multiple regression model revealed that (with the exception of relative prices) real per capita income, exchange rate and relative attractiveness are significant determinants of the ARSTDs to Greece. The coefficients of all variables (except for relative prices) had the expected sign which reflected that ARSTDS to Greece behave along the lines that have been set by most of the previous econometric models that exist in the literature of Tourism.

Although the application of the classical decomposition and the multiple regression models gave a clear picture on the behaviour of the ARSTDs to Greece data series, the models' capabilities could not have been fully utilised unless a test for their forecasting performance had taken place.

In the above spirit, the assessment criteria with which I confronted the methods that I used as forecasting tools in this study were proven to be in conflict with each other. Taking into consideration that the main concern for policy makers is accuracy (VAN DOORN, 1984a), in this study the presented models were classified differently when the MAPEs and U statistic criteria were individually employed. Moreover, even though theoretically the U statistic compares the predictability of a method in relation to naive 1 (MAKRIDAKIS & WHEELWRGHT & McGEE, 1983) the multiple regression model was found to be an excellent predictor and better than naive 1 following a comparison of the individual MAPEs. On the contrary U statistic showed that the multiple regression model was an inferior predictor to naive 1.

Nevertheless, I must mention that despite the ambiguity in the reliability of the forecasting accuracy criteria that has been addressed by many researchers in the forecasting field (VAN DOORN, 1984a, WITT & MARTIN, 1989a & 1987c) this study attempts not only to forecast but also to reveal relationships and underlying patterns in tourist data for the Australian Short Term Departures to Greece.

As a result, the underlying patterns in the ARSTDs to Greece time series and the economic influences described by the regression models must also be considered when assessing a method. More specifically the fact that Australians proved to have given significant attention to RPCI changes while they pay little attention to nominal exchange rates fluctuations, and hardly none to price changes in Greece, is an indicative attribute of the flow of Australian tourists to Greece, that management and policy makers must take into consideration while planning and making decisions.

Although the use of the classical decomposition model proved to be a moderate predictor of the ARSTDs to Greece it provided valuable information about the rate of seasonality and trend in the ARSTDs to Greece. The disappointing low trend-cycle indicates that Greece as a tourist destination for the Australian market loses its image. On the other hand, the value of the coefficient of the relative attractiveness adds more validity to the low trend (specified in the process of the estimating forecasts by the classical decomposition model) and indicates that Greece loses its image not only as a European but generally as a tourist destination for the Australian market.

The smoother distribution of seasonality amongst the Australian travellers to Greece in comparison with the total arrivals of foreign tourists in Greece, shows that

Greece as a destination for the Australian tourist market can facilitate the profitable operation of an airline throughout the year without significant fluctuations in the demand of travel services with regards to Greece.

Tour operators, airlines and the Greek Tourism organisation have to realise that the Australian market has not and will not be exploited fully unless new marketing strategies appear from all concerned parties.

Overall the constructed classical decomposition model and (more importantly) the multiple regression model provided accurate forecasts that can be used to determine and (why not) even control the future of Greece as a tourist destination.

8.2. RECOMMENDATIONS FOR FURTHER RESEARCH.

Eventhough the estimated regression model, seasonal indexes and trend equation can assist management in understanding the basic quantitative factors and underlying patterns that exist in Tourism data and affect Tourism demand to Greece, further studies that will centre their focus on the qualitative aspects (i.e., travellers' attitudes and expectations, experts' opinions) of the market are necessary.

The current study concentrated on forecasting Tourism demand by a variety of quantitative methods that can be used by the Tourism planners and policy makers effectively, particularly for forecasting ARSTDs to Greece. This quantitative approach to forecasting ARSTDs to Greece (that has been the focus of this study) needs to be complemented by an attempt to forecast ARSTDs to Greece by employing an integrated approach. This integrated approach will assist in the generation of a model that incorporates and combines various quantitative methods (FRITZ & BRANDON & XANDER, 1984).

More specifically the combined application of an econometric model (which includes travel cost and Australian travellers attitudes and perceptions (KUCUKKURT, 1981) towards Greece, and Delphi opinions on Australian Tourism to Greece) will act as a catalyst for subsequent research.

PART II

APPENDIX

In the appendix I shall include all tables in respect of the estimation of the MAPE and U statistic of the methods presented in part I. In addition the estimation of the VFR and HOL ARSTDs to Greece seasonal indexes and the estimation of the Regression model's variables values is also presented.

LIST OF TABLES INCLUDED IN APPENDICES

Table 14: ARSTDs to Greece by Purpose of Visit.

QUARTER	VFR	HOL	TOTAL
1981 MAR	1774	3039	5126
JUN	2696	5933	9333
SEP	2900	4494	8009
DEC	1507	2807	4659
1982 MAR	1401	2756	4675
JUN	2873	6322	9929
SEP	2450	5104	8475
DEC	1252	2627	4306
1983 MAR	1322	2184	3906
JUN	2568	5940	9568
SEP	2156	4706	7588
DEC	1500	2100	3900
1984 MAR	1400	2300	4100
JUN	2700	6400	10700
SEP	2400	5300	8300
DEC	1800	3100	5400
1985 MAR	1500	2300	4200
JUN	3400	7800	12200
SEP	2800	6300	10100
DEC	2200	3200	5900
1986 MAR	1500	2000	4000
JUN	4500	7500	12900
SEP	3000	5200	9200
DEC	2100	3200	5600
1987 MAR	1500	2300	4500
JUN	4700	7400	13200
SEP	4000	6000	10800
DEC	1900	2700	5400
1988 MAR	1900	2000	4500
JUN	3900	8900	14600
SEP	2600	6200	9400
DEC	1700	2900	5100
1989 MAR	1700	2200	4400
JUN	3600	7900	12600
SEP	2900	6000	10100
DEC	1500	2700	4500
1990 MAR	1600	2200	4400
JUN	4200	8600	14300
SEP	2900	6000	10000
DEC	1700	2100	4400
1991 MAR	1400	1600	3300
JUN	2900	6200	10000
SEP	3000	5200	8800
DEC			5200

Source: Overseas Arrivals and Departures Quarterly, ABS (1981-91).

Table 15: Seasonal Factors of the VFR ARSTDs to Greece

	SEASONAL FACTORS OF VFR DATA			
YEAR	MAR	JUN	SEP	DEC
1981	.00	.00	1.33	.70
1982	.66	1.42	1.23	.65
1983	.71	1.38	1.14	.78
1984	.71	1.33	1.15	.82
1985	.65	1.40	1.13	.84
1986	.54	1.61	1.08	.75
1987	.51	1.54	1.30	.63
1988	.69	1.53	1.04	.70
1989	.70	1.47	1.20	.61
1990	.63	1.63	.00	.00
AVERAGE	.64	1.48	1.18	.72
ST. DEV	.07	.10	.09	.08
C.VAR	10.87	6.80	7.86	11.19

Table 16: Estimation Of VFR ARSTDs to Greece Seasonal Indexes

	MAR	JUN	SEP	DEC	
SEASONAL FACTORS WITHOUT EXTREME VALUES	.66 .71 .65 .54 .69 .70 .63	1.42 1.38 1.40 1.61 1.54 1.53 1.47	1.23 1.14 1.15 1.13 1.08 1.30 1.20	.70 .65 .78 .82 .75 .63 .70	
AVERAGE	.65	1.48	1.18	.72	4.03
ST. DEV	.05	.08	.07	.07	
C.VAR	8.27	5.36	5.87	9.14	
NRM FAC	.99				
SEAS IND	.65	1.47	1.17	.71	

Seasonal factors were estimated following the procedure described in chapter 5.

Table 17: Seasonal Factors of the HOL ARSTDs to Greece

	SEASONAL FACTORS OF HOLIDAYS DATA			
YEAR	MAR	JUN	SEP	DEC
1981	.00	.00	1.11	.69
1982	.66	1.50	1.24	.65
1983	.56	1.56	1.26	.55
1984	.58	1.54	1.24	.70
1985	.48	1.60	1.30	.67
1986	.43	1.68	1.15	.71
1987	.50	1.59	1.32	.57
1988	.41	1.79	1.23	.59
1989	.46	1.67	1.28	.56
1990	.45	1.79	.00	.00
AV/GE QRT	.50	1.63	1.24	.63
ST. DEV	.08	.10	.06	.06
COEF.VAR	15.29	6.06	4.96	9.43

Table 18: Estimation of the HOL ARSTDs to Greece Seasonal Indexes

	MAR	JUN	SEP	DEC	
SEASONAL FACTORS WITHOUT EXTREME VALUES	.56	1.56	1.24	.69	
	.58	1.54	1.26	.65	
	.48	1.60	1.24	.70	
	.43	1.68	1.30	.67	
	.50	1.59	1.15	.57	
	.46	1.79	1.23	.59	
	.45	1.67	1.28	.56	
AV/GE QRT	.50	1.63	1.24	.63	4.00
ST. DEV	.05	.08	.04	.05	
C.VAR	10.29	4.87	3.39	8.39	
NRM FAC	1.00				
SEAS IND	.50	1.63	1.24	.63	

Table 19: Estimation of the Classical Decomposition Model's MAPE and U statistic.

QUARTER	FORECAST	ACTUA	APE	N/TOR	D/TOR
MAR 81	3859.178	5126	.247	.104	.6736
JUN	10984.41	9333	.177	.003	.0201
SEP	8482.649	8009	.059	0	.175
DEC	4633.693	4659	.005	.025	0
MAR 82	3938.175	4675	.158	.075	1.263
JUN	11208.11	9929	.129	0	.0214
SEP	8654.529	8475	.021	.002	.242
DEC	4727.11	4306	.098	.001	.0086
MAR 83	4017.172	3906	.028	.228	2.101
JUN	11431.82	9568	.195	.017	.0428
SEP	8826.41	7588	.163	.015	.2362
DEC	4820.527	3900	.236	0	.0026
MAR 84	4096.169	4100	.001	.054	2.591
JUN	11655.53	10700	.089	.004	.0503
SEP	8998.29	8300	.084	.003	.1221
DEC	4913.945	5400	.09	0	.0494
MAR 85	4175.167	4200	.006	.006	3.628
JUN	11879.23	12200	.026	.006	.0296
SEP	9170.17	10100	.092	.008	.1729
DEC	5007.362	5900	.151	.002	.1037
MAR 86	4254.164	4000	.064	.04	4.951
JUN	12102.94	12900	.062	0	.0823
SEP	9342.05	9200	.015	.003	.1531
DEC	5100.779	5600	.089	.001	.0386
MAR 87	4333.161	4500	.037	.038	3.738
JUN	12326.64	13200	.066	.009	.0331
SEP	9513.93	10800	.119	0	.25
DEC	5194.196	5400	.038	0	.0278
MAR 88	4412.158	4500	.02	.207	5.038
JUN	12550.35	14600	.14	0	.1269
SEP	9685.81	9400	.03	0	.2093
DEC	5287.614	5100	.037	0	.0188
MAR 89	4491.155	4400	.021	.002	3.473
JUN	12774.05	12600	.014	0	.0394
SEP	9857.691	10100	.024	.008	.3074
DEC	5381.031	4500	.196	.001	.0005
MAR 90	4570.152	4400	.039	.088	5.063
JUN	12997.76	14300	.091	0	.0904
SEP	10029.57	10000	.003	.012	.3136
DEC	5474.448	4400	.244	.094	.0625
MAR 91	4649.15	3300	.409	.953	4.122
JUN	13221.46	10000	.322	.02	.0144
SEP	10201.45	8800	.159	.002	.1674
DEC	5567.865	5200	.071		

IN SAMPLE
MAPE .085
Ustat .165

OUT OF SAMPLE
MAPE .24
stat.476

N/TOR and D/TOR denote the values of the nominator and denominator of the U statistic presented in chapter 7.

APE stands for the Absolute Percentage Error

Table 20: Primary Data for the Estimation of the Regression Model's Variables.

QRTR	ARSTDs GREECE	ARSTDs EUROPE	ACPI	GCPI	POP	GDP	DR/USD	AUD/ USD
MAR81	5126	63082	96.3855	93.4324	14873600	33488	49.95	1.168
JUN	9333	95665	98.506	98.4133	14926800	35391	55.48	1.145
SEP	8009	87998	100.434	100.341	14988600	37479	59.56	1.143
DEC	4659	54960	104.675	107.813	15053500	43370	56.64	1.141
MAR82	4675	58582	106.602	112.392	15117500	37457	60.55	1.087
JUN	9929	100277	109.108	120.265	15178400	39821	64.72	1.048
SEP	8475	99086	112.964	122.113	15235400	41514	70.15	.9834
DEC	4306	54021	116.241	129.022	15276100	46699	71.79	.9511
MAR83	3906	55798	118.747	136.092	15333200	40855	83.27	.9448
JUN	9568	98039	121.253	145.411	15378600	42558	84.18	.8744
SEP	7588	97968	123.373	146.535	15413400	45161	88.86	.8806
DEC	3900	62500	126.265	155.132	15451900	52326	95.95	.9105
MAR84	4100	57700	125.687	161.639	15510700	47852	102.22	.9306
JUN	10700	122700	126.072	170.637	15555900	49278	107.28	.904
SEP	8300	119200	127.614	173.609	15599400	51042	115.9	.838
DEC	5400	75600	129.542	183.25	15648900	58320	125.47	.8457
MAR85	4200	62800	131.277	191.524	15707700	51791	134.54	.7513
JUN	12200	143100	134.361	200.121	15758400	54906	135.85	.6667
SEP	10100	126900	137.446	205.262	15802500	57991	133.29	.6979
DEC	5900	77500	140.145	225.266	15858700	64542	148.8	.6873
MAR86	4000	59400	143.422	238.843	15919300	57735	144.32	.7014
JUN	12900	135100	145.735	249.207	15973900	59823	141.04	.713
SEP	9200	118600	149.59	254.268	16073100	62794	136.06	.6217
DEC	5600	83600	153.831	269.211	16134500	70489	138.21	.647
MAR87	4500	65700	156.916	277.967	16203000	63703	135.45	.6711
JUN	13200	134700	159.229	293.633	16263300	67641	134.27	.7142
SEP	10800	130500	161.928	294.919	16323800	71994	139.49	.7143
DEC	5400	77400	164.819	310.781	16395600	79213	133.51	.7039
MAR88	4500	59000	167.711	315.715	16478300	72630	133.91	.7196
JUN	14600	138900	170.602	330.103	16538200	75592	136.62	.7786
SEP	9400	132500	173.88	336.269	16604100	81040	150.18	.7995
DEC	5100	86600	177.349	354.562	16676800	89688	146.73	.8392
MAR89	4400	73300	179.084	359.084	16777200	82455	154.73	.8475
JUN	12600	147700	183.518	373.472	16833100	86651	165.02	.7777
SEP	10100	143600	187.759	403.07	16891800	90765	166.25	.7638
DEC	4500	95300	191.229	404.715	16957100	98705	163.66	.7811
MAR90	4400	75500	194.506	419.103	17026300	89566	159.47	.7659
JUN	14300	174500	197.59	448.907	17085400	92766	164.09	.7681
SEP	10000	161200	199.133	465.967	17148000	94805	156.87	.8087
DEC	4400	94000	204.337	496.387	17210800	101531	153.63	.7824
MAR91	3300	72400	203.952	507.075	17239400	91215	163.71	.7784
JUN	10000	142700	204.337	535.646	17292000	92020	189.19	.7719
SEP	8800	125700	205.494	549.212	17354200	94418	192.24	.7819
DEC	5200	96400	207.422	586.209	17414300	101537	183.92	.7841

Sources: International Financial statistics Quarterly, IMF (1980-91)
Overseas Arrivals and Departures Quarterly, ABS (1981-91)

Table 21: Estimation of the Multiple Regression Model's MAPE and U statistic.

logF	logA	APE	N/TOR	D/TOR
3.60	3.71	.0285	.0175969	.0049211
4.46	3.97	.124	.0102414	.0002801
4.31	3.90	.1029	.000104	.003633
3.71	3.67	.0109	.0002846	.0000002
3.61	3.67	.0169	.0167675	.0079459
4.47	4.00	.1189	.0074642	.000296
4.27	3.93	.0879	.0001001	.0056042
3.67	3.63	.0108	.0000324	.0001358
3.57	3.59	.0058	.0170395	.0117352
4.45	3.98	.1178	.0086453	.0006398
4.25	3.88	.0954	.0001536	.00555
3.64	3.59	.0134	.0000521	.0000366
3.64	3.61	.0072	.0165025	.013297
4.49	4.03	.1152	.008031	.0007494
4.28	3.92	.0921	.0000002	.0022691
3.73	3.73	.0005	.0000186	.0008551
3.64	3.62	.0044	.0128154	.016337
4.50	4.09	.1004	.0064873	.0004031
4.33	4.00	.0822	.0000285	.0033994
3.75	3.77	.0057	.0001284	.0020037
3.64	3.60	.0119	.0137798	.0199311
4.53	4.11	.1029	.0069333	.0012754
4.31	3.96	.0864	.0002158	.0029585
3.69	3.75	.0155	.0000249	.0006421
3.63	3.65	.0051	.0134507	.0163665
4.54	4.12	.1028	.0063167	.0004473
4.36	4.03	.0812	.0000068	.0055702
3.72	3.73	.0028	.0001193	.0004501
3.69	3.65	.0112	.0133499	.0195763
4.59	4.16	.1014	.00825	.0021086
4.35	3.97	.0952	.0000069	.0044674
3.72	3.71	.0028	.0000924	.0002991
3.68	3.64	.0098	.016601	.0157271
6.57	4.10	.1145	.0076999	.0005487
4.36	4.00	.0899	.0000052	.0076882
3.66	3.65	.0025	.0000131	.0000071
3.66	3.64	.0036	.0115309	.0197386
4.55	4.16	.0942	.0057092	.0013974
4.31	4.00	.0785	.0000162	.0079454
3.63	3.64	.0044	.0002134	.0011759
3.57	3.52	.0151	.0194229	.0187262
4.49	4.00	.1226	.009771	.0001926
4.34	3.94	.1002	.0001317	.0033552
3.67	3.72	.0122		

IN SAMPLE
MAPE .0539289 Ustat 1.045711
OUT OF SAMPLE
MAPE .0625347 Ustat 1.147426

LogF and LogA denote the logarithm of the forecasted and Actual ARSTDs to Greece data point.

HOLT TWO PARAMETER EXPONENTIAL SMOOTHING

The double exponential smoothing is actually a double moving average which is described and determined by two smoothing parameters. The set of the best pair of values of these two parameters was estimated by the trial-and-error process.

The basic set of equations are :

$$S_t = a\ Y_t + (1-a)(S_{t-1} + C_{t-1}) \qquad (1)$$

$$C_t = b\ (S_t - S_{t-1}) + (1-b)\ C_{t-1} \qquad (2)$$

$$F_{t+T} = S_t + C_t \qquad (3)$$

Equation 1 adjusts directly for the trend of the previous period C_{t-1}, by adding it to the last smoothed value S_{t-1}. This helps to eliminate the lag and brings S_t to the approximate base of the current data values. Equation 2, then comes up to revise the trend estimate (from the previous period), which is expressed as the difference between the last two smoothed values. The use of the parameter "b" is described by the fact that it reduces some remaining randomness in the estimations. How much the parameters eliminate randomness can only be specified by the trial-and-error process. The last equation produces the forecasts. "T" represents the number of periods ahead of the last S_t and C_t estimations.

Table 22 illustrates the Forecasting procedure using the two parameter Holt's double exponential smoothing.The first column shows the deseasonalised data derived by the application of the classical decomposition method in chapter 5.

The parameter values of a and b were found to produce minimum MAPE when they were equal to 0.9 and 0.1 .

Assumptions

The initial value of S_1 is equal to the first period of the deseasonalised data; while C_1 was estimated by the following formula :$C_1 = [(Y_2-Y_1)/2] + [(Y_4-Y_3)/2]$

The forecasted values F_{t+T} represent the deseasonalised forecasted ARSTD to Greece. Consequently in order to estimate the seasonal values of ARSTD the deseasonalised forecasted values are multiplied by the corresponding SI.

Table 23 illustrates the estimation of the final forecasts.

Table 22: Holt's Two Parameter Exponential Smoothing.

TIME	D/SED	a	b	S_t	C_t	F_{t+T}
1	9214	.9	.1	9214	-1412.32	
2	5924	.9	.1	6112	-1581.3	
3	6617	.9	.1	6408	-1393.56	4531
4	7082	.9	.1	6875	-1207.49	5015
5	8403	.9	.1	8130	-961.275	5668
6	6303	.9	.1	6389	-1039.22	7169
7	7002	.9	.1	6837	-890.564	5350
8	6545	.9	.1	6485	-836.614	5946
9	7021	.9	.1	6884	-713.104	5649
10	6073	.9	.1	6083	-721.871	6171
11	6269	.9	.1	6178	-640.188	5361
12	5928	.9	.1	5889	-605.06	538
13	7370	.9	.1	7161	-417.344	5284
14	6792	.9	.1	6787	-413.024	6744
15	6857	.9	.1	6809	-369.557	6374
16	8208	.9	.1	8031	-210.34	439
17	7550	.9	.1	7577	-234.77	821
18	7744	.9	.1	7704	-198.581	7342
19	8344	.9	.1	8260	-123.083	7505
20	8968	.9	.1	8885	-48.2799	8137
21	7190	.9	.1	7355	-196.495	8837
22	8188	.9	.1	8085	-103.784	7158
23	7601	.9	.1	7639	-138.075	7982
24	8512	.9	.1	8411	-47.0237	7501
25	8089	.9	.1	8116	-71.7968	8364
26	8379	.9	.1	8345	-41.7144	8045
27	8922	.9	.1	8861	13.97388	8304
28	8208	.9	.1	8275	-45.9895	8875
29	8089	.9	.1	8103	-58.5959	8229
30	9268	.9	.1	9145	51.49516	8044
31	7766	.9	.1	7909	-77.2805	9197
32	7752	.9	.1	7760	-84.4232	7832
33	7909	.9	.1	7886	-63.4247	7676
34	7998	.9	.1	7980	-47.6181	7822
35	8344	.9	.1	8303	-10.5967	7933
36	6840	.9	.1	6985	-141.293	8292
37	7909	.9	.1	7803	-45.4477	6844
38	9077	.9	.1	8945	73.34432	7757
39	8262	.9	.1	8337	5.223448	9018
40	6688	.9	.1	6854	-143.656	8342
41						6710
42						6566
43						6423
44						6279

Table 23: Estimation of the Holt's smoothing MAPE and U statistic.

F_{t+T}	S.I	FRCAST	ACTUA	APE	N/TOR	D/TOR
	.56		5126			
	1.58		9333			
4530.71	1.21	5484.07	800	.315	.029	.17496
5014.53	.66	3298.90	4659	.292	.107	.00001
5667.73	.56	3153.06	4675	.326	.085	1.263
7168.62	1.58	11293.37	9929	.137	.041	.02144
5349.95	1.21	6475.71	8475	.236	.002	.24198
5945.94	.66	3911.65	4306	.092	.031	.00863
5648.83	.56	3142.54	3906	.195	.002	2.1012
6170.83	1.58	9721.46	9568	.016	.013	.04282
5361.29	1.21	6489.43	7588	.145	.001	.23623
5537.93	.66	3643.23	3900	.066	.089	.00263
5284.15	.56	2939.67	4100	.283	0	2.5913
6743.97	1.58	10624.38	10700	.007	.003	.05031
6374.14	1.21	7715.41	8300	.07	.02	.12208
6439.25	.66	4236.18	5400	.216	.001	.04938
7821.09	.56	4351.01	4200	.036	.023	3.6281
7342.01	1.58	11566.54	12200	.052	.007	.02963
7505.32	1.21	9084.62	10100	.101	.003	.17292
8137.22	.66	5353.21	5900	.093	.024	.10371
8836.97	.56	4916.17	4000	.229	.165	4.9506
7158.32	1.58	11277.15	12900	.126	.001	.08227
7981.65	1.21	9661.18	9200	.05	.005	.15312
7500.67	.66	4934.45	5600	.119	.001	.03858
8364.16	.56	4653.13	4500	.034	.014	3.7378
8044.63	1.58	12673.43	13200	.04	.003	.03306
8303.74	1.21	10051.04	10800	.069	.002	.25
8874.59	.66	5838.31	5400	.081	0	.02778
8228.97	.56	4577.92	4500	.017	.183	5.0375
8044.31	1.58	12672.93	14600	.132	.014	.12685
9196.72	1.21	11131.92	9400	.184	0	.20926
7831.68	.66	5152.21	5100	.01	.001	.01884
7675.83	.56	4270.20	4400	.029	.004	3.4731
7822.39	1.58	12323.32	12600	.022	.002	.03937
7932.84	1.21	9602.09	10100	.049	.009	.30742
8292.45	.66	5455.34	4500	.212	.017	.00049
6844.20	.56	3807.55	4400	.135	.223	5.0625
7757.20	1.58	12220.62	14300	.145	.004	.09042
9018.47	1.21	10916.17	10000	.092	.012	.3136
8342.48	.66	5488.25	4400	.247	.01	.0625
6710.04	.56	3732.91	3300	.131	.011	4.1221
6566.38	1.58	10344.62	10000	.034	.011	.0144
6422.73	1.21	7774.22	8800	.117	.015	.16736
6279.07	.66	4130.80	5200	.206		

FORECASTING PERFORMANCE

IN SAMPLE		OUT OF SAMPLE	
MAPE	.123	MAPE	.121
Ustat	.118	Ustat	.092

Table 24 :Estimation of Seasonal Time Regression Model's Forecasts, MAPE and U statistic.

QRTR	S2	S3	ARSTD FORECAST	ARSTD ACTUAL	APE	N/TOR	D/TOR
MAR81	0	0	3524.7	5126	.3123878	.0860299	.6735779
JUN	1	0	10836.5	9333	.161095	.0000156	.0201249
SEP	0	1	8045.9	8009	.0046073	.0200585	.1749577
DEC	0	0	3524.7	4659	.2434643	.0609589	.0000118
MAR82	0	0	3524.7	4675	.2460535	.0376817	1.263039
JUN	1	0	10836.5	9929	.0913989	.0018677	.0214446
SEP	0	1	8045.9	8475	.0506313	.0084988	.2419827
DEC	0	0	3524.7	4306	.1814445	.0078413	.0086292
MAR83	0	0	3524.7	3906	.097619	.105467	2.101238
JUN	1	0	10836.5	9568	.1325773	.0022903	.0428241
SEP	0	1	8045.9	7588	.0603453	.0024463	.2362257
DEC	0	0	3524.7	3900	.0962308	.02176	.0026298
MAR84	0	0	3524.7	4100	.1403171	.0011084	2.591315
JUN	1	0	10836.5	10700	.012757	.000564	.0503101
SEP	0	1	8045.9	8300	.0306145	.0510488	.1220787
DEC	0	0	3524.7	5400	.3472778	.0156389	.0493827
MAR85	0	0	3524.7	4200	.1607857	.105393	3.628118
JUN	1	0	10836.5	12200	.1117623	.0283481	.0296291
SEP	0	1	8045.9	10100	.2033762	.0553088	.1729242
DEC	0	0	3524.7	5900	.4025932	.0064898	.1037058
MAR86	0	0	3524.7	4000	.118825	.266127	4.950625
JUN	1	0	10836.5	12900	.1599612	.008004	.0822667
SEP	0	1	8045.9	9200	.1254457	.0508846	.1531191
DEC	0	0	3524.7	5600	.3705893	.030332	.0385842
MAR87	0	0	3524.7	4500	.2167333	.2758584	3.737778
JUN	1	0	10836.5	13200	.179053	.0435323	.0330579
SEP	0	1	8045.9	10800	.2550093	.0301505	.25
DEC	0	0	3524.7	5400	.3472778	.0326204	.0277778
MAR88	0	0	3524.7	4500	.2167333	.6994534	5.037531
JUN	1	0	10836.5	14600	.257774	.0086019	.1268531
SEP	0	1	8045.9	9400	.1440532	.0280848	.2092576
DEC	0	0	3524.7	5100	.3088824	.029456	.0188389
MAR89	0	0	3524.7	4400	.1989318	.160637	3.47314
JUN	1	0	10836.5	12600	.1399603	.0265768	.0393676
SEP	0	1	8045.9	10100	.2033762	.0093247	.3074208
DEC	0	0	3524.7	4500	.2167333	.0378346	.0004938
MAR90	0	0	3524.7	4400	.1989318	.6196194	5.0625
JUN	1	0	10836.5	14300	.2422028	.0186733	.0904201
SEP	0	1	8045.9	10000	.19541	.0076615	.3136
DEC	0	0	3524.7	4400	.1989318	.002608	.0625
MAR91	0	0	3524.7	3300	.0680909	.0642546	4.12213
JUN	1	0	10836.5	10000	.08365	.0056867	.0144
SEP	0	1	8045.9	8800	.0856932	.0362426	.1673554
DEC	0	0	3524.7	5200	.3221731		

	IN	OUT
MAPE	.1845539	.1399018
Ustat	.290864	.1570721

Table 25: Estimation of Naive 1 forecasts, MAPE and U statistic.

QUARTER	ACT	FOR	APE	N/TOR	D/TOR	
MAR 81	5126					
JUN	9333	5126	.451	.020125	.020125	IN SAMPLE
SEP	8009	9333	.165	.174958	.174958	MAPE .503
DEC	4659	8009	.719	.000012	.000012	Ustat 1
MAR 82	4675	4659	.003	1.26304	1.26304	
JUN	9929	4675	.529	.021445	.021445	
SEP	8475	9929	.172	.241983	.241983	
DEC	4306	8475	.968	.008629	.008629	OUT OF
MAR 83	3906	4306	.102	2.10124	2.10124	SAMPLE
JUN	9568	3906	.592	.042824	.042824	
SEP	7588	9568	.261	.236226	.236226	MAPE=.458
DEC	3900	7588	.946	.00263	.00263	UstAT = 1
MAR 84	4100	3900	.049	2.59131	2.59131	
JUN	0700	4100	.617	.05031	.05031	
SEP	8300	10700	.289	.122079	.122079	
DEC	5400	8300	.537	.049383	.049383	
MAR 85	4200	5400	.286	3.62812	3.62812	
JUN	2200	4200	.656	.029629	.029629	
SEP	0100	12200	.208	.172924	.172924	
DEC	5900	10100	.712	.103706	.103706	
MAR 86	4000	5900	.475	4.95062	4.95062	
JUN	2900	4000	.69	.082267	.082267	
SEP	9200	12900	.402	.153119	.153119	
DEC	5600	9200	.643	.038584	.038584	
MAR 87	4500	5600	.244	3.73778	3.73778	
JUN	3200	4500	.659	.033058	.033058	
SEP	0800	13200	.222	.25	.25	
DEC	5400	10800	1	.027778	.027778	
MAR 88	4500	5400	.2	5.03753	5.03753	
JUN	4600	4500	.692	.126853	.126853	
SEP	9400	14600	.553	.209258	.209258	
DEC	5100	9400	.843	.018839	.018839	
MAR 89	4400	5100	.159	3.47314	3.47314	
JUN	2600	4400	.651	.039368	.039368	
SEP	0100	12600	.248	.307421	.307421	
DEC	4500	10100	1.24	.000494	.000494	
MAR 90	4400	4500	.023	5.0625	5.0625	
JUN	4300	4400	.692	.09042	.09042	
SEP	0000	14300	.43	.3136	.3136	
DEC	4400	10000	1.27	.0625	.0625	
MAR 91	3300	4400	.333	4.12213	4.12213	
JUN	0000	3300	.67	.0144	.0144	
SEP	8800	10000	.136	.167355	.167355	
DEC	5200	8800	.692	0	0	

Table 26: Estimation of Naive 2 forecasts, MAPE and U statistic.

QUARTE	ACT	FOR	APE	N/TOR	D/TOR
MAR 81	5126				
JUN	9333				
SEP	8009				
DEC	4659				
MAR 82	4675	5126	.096	.016253	1.26304
JUN	9929	9333	.06	.002203	.021445
SEP	8475	8009	.055	.001735	.241983
DEC	4306	4659	.082	.031894	.008629
MAR 83	3906	4675	.197	.008542	2.10124
JUN	9568	9929	.038	.008594	.042824
SEP	7588	8475	.117	.002863	.236226
DEC	3900	4306	.104	.002474	.00263
MAR 84	4100	3906	.047	.07623	2.59131
JUN	10700	9568	.106	.004428	.05031
SEP	8300	7588	.086	.032661	.122079
DEC	5400	3900	.278	.000343	.049383
MAR 85	4200	4100	.024	.127551	3.62812
JUN	12200	10700	.123	.021768	.029629
SEP	10100	8300	.178	.002451	.172924
DEC	5900	5400	.085	.001149	.103706
MAR 86	4000	4200	.05	.030625	4.95062
JUN	12900	12200	.054	.004867	.082267
SEP	9200	10100	.098	.001063	.153119
DEC	5600	5900	.054	.007972	.038584
MAR 87	4500	4000	.111	.004444	3.73778
JUN	13200	12900	.023	.014692	.033058
SEP	10800	9200	.148	.000343	.25
DEC	5400	5600	.037	0	.027778
MAR 88	4500	4500	0	.09679	5.03753
JUN	14600	13200	.096	.009195	.126853
SEP	9400	10800	.149	.001019	.209258
DEC	5100	5400	.059	.000384	.018839
MAR 89	4400	4500	.023	.206612	3.47314
JUN	12600	14600	.159	.003086	.039368
SEP	10100	9400	.069	.003529	.307421
DEC	4500	5100	.133	0	.000494
MAR 90	4400	4400	0	.149277	5.0625
JUN	14300	12600	.119	.000049	.09042
SEP	10000	10100	.01	.0001	.3136
DEC	4400	4500	.023	.0625	.0625
MAR 91	3300	4400	.333	1.69789	4.12213
JUN	10000	14300	.43	.0144	.0144
SEP	8800	10000	.136	.008264	.167355
DEC	5200	4400	.154	0	0

IN
MAPE .086
Ustat.159

OUT
MAPE .263
Ustat.632

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