Forecasting International Demand for Tourism to South Korea:
a cointegration and error correction approach

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ABSTRACT

This study uses the cointegration and error correction approach to analyse the long-run and short-run inbound tourism demand in South Korea by four major tourist generating countries, Japan, USA, UK and Germany. The estimated income elasticities ranging from 1.525 to 2.998 in the long-run models imply that travelling to South Korea is a luxurious tourist good for residents of the four tourist generating countries in question. The trade volume variable is found to be significant in all models while the return air fare is only significant in the Japanese equation. The prices/costs of tourism in Korea also play a significant role in determining the number of tourists visiting Korea from the USA and UK, but this is not the case for Japanese and German tourists. In terms of the significance of substitution prices in the demand models, Malaysia and China turn out to be the most favourite substitute destinations while Singapore and Thailand are found to be complementary destinations. Ex post forecasts with five different time horizons are generated from seven model specifications and the results show that the error correction models in general outperform other models, though the ARIMA(p,q) and VAR models provide reasonable forecasts for certain time horizons. Contrary to other studies, the empirical results of this study suggest that the naive model is the worst among the competing alternatives.
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List of Abbreviations

ACML: Autocorrelation Maximum Likelihood
ACF: Autocorrelation Function
ADF: Augmented Dickey Fuller
AIC: Akaike Information Criterion
AIDS: Almost Ideal Demand System
AR: Autoregressive
ARCH: Autoregressive Conditional Heteroskedasticity
ARMA: Autoregressive Moving Average
ARIMA: Autoregressive Integrated Moving Average
CPI: Consumer Price Index
CRDW: Cointegration Regression Durbin Watson
DF: Dickey Fuller
d-w (DW): Durbin Watson
ECM: Error Correction Mechanism (or Model)
FIML: Full Information Maximum Likelihood
GDP: Gross Domestic Product
GNP: Gross National Product
IMF: International Monetary Fund
JTB: Japan Travel Bureau
KNTC: Korea National Tourism Corporation
KNTO: Korea National Tourism Organisation
LM: Lagrange Multiplier
MA: Moving Average
MAE: Mean Absolute Error
MAPE: Mean Absolute Percentage Error
MOCS: Ministry of Culture and Sports
MOT: Ministry of Transportation
MPE: Mean Percentage Error
MSE: Mean Square Error
NDI: National Disposable Income
NI: National Income
NNP: Net National Product
OECD: Organisation for Economic Cooperation and Development
OPEC: Organisation of Petroleum Exporting Country
PACF: Partial Autocorrelation Function
PATA: Pacific Area Travel Association
PI: Personal Income
PDI: Personal Disposable Income
RESET: Regression Error Specification Test
RMSE: Root Mean Square Error
RMSPE: Root Mean Square Percentage Error
SC: Schwartz Criterion
SES: Simple Exponential Smoothing
SMA: Simple Moving Average
USTTA: US Travel & Tourism Administration
VAR: Vector Autoregressive
WPI: Whole Price Index
WTO: World Tourism Organisation
CHAPTER I

INTRODUCTION
1.1. Importance of Tourism Forecasting

Although there can be many good motives for encouraging the growth of international tourism, the overwhelming reason why countries volunteer themselves as tourist destinations is for economic benefits (Archer & Fletcher, 1990). International tourism is the largest single item in the world's foreign trade and for some countries is already the most important export industry and earner of foreign exchange. For other countries tourism represents a promising new resource for economic development. Although the state-owned KNTO has supported inbound tourism as an important source of foreign exchange since its establishment in 1962, political rhetoric surrounding the concept of 'tourism' marginalised its economic significance (Waitt, 1996).

Forecasting the level of international and domestic demand for tourism is important for planning and development. However, measuring the future level of international demand for tourism is compounded by a number of factors since those factors are difficult to identify and quantify like many other social sciences.

Archer (1994) noted that managers must use forecasts in order to plan. He then emphasised that the accuracy of the forecast will affect the quality of the management decision. Hence, accuracy seems to be the most significant factor in terms of forecasting. If the longer term demand for tourism were not predicted accurately for the supply side, disbenefits might take the form of shortages of hotel accommodation, passenger transportation capacity and trained staff, and these often cannot be increased rapidly (Witt & Witt, 1992). In addition, Latham (1994) warned that even short-term forecasts can be wildly inaccurate due to unexpected changes in trend and unforeseen circumstances. The consequences of misjudged forecasts may lead to severe
loss and missed opportunities. Therefore, decision makers should not be either too optimistic or pessimistic about forecasts. Nevertheless, forecasting in the tourism industry is inevitably necessary for planning and management, but needs to be prudently interpreted when used for decision making.

Latham (1994) predicted that although Europe will continue to be a dominant destination region in terms of international tourism, it will lose considerable market share, especially to the East Asia and Pacific regions. Likewise, the number of international tourists to South Korea (hereafter Korea) have increased greatly since the 1960s. For example, as shown in Table 1.1, the number of tourists in 1995 recorded 3.7 million which is over two and half times of the number of tourists in 1985.

In Korea, the tourism industry is now being highlighted because of its substantial contribution to the balance of payments and its influence on related industrial sectors. Tourist receipts in 1995 increased to 5,586 million US dollar, which is seven times the 1985 value. In order to cope with this increasing international demand for tourism in Korea, an integrated and sustainable approach to tourism planning and development is required for the benefit of both tourists and residents. In this context, it is important to be able to estimate the future level of international demand, as an initial stage of tourism planning and development.

Table 1.1 International Arrivals to Korea 1965-1995

<table>
<thead>
<tr>
<th>Year</th>
<th>No. of Arrivals</th>
<th>Tourist Receipts (million US$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1965</td>
<td>33,464</td>
<td>20</td>
</tr>
<tr>
<td>1975</td>
<td>632,846</td>
<td>140</td>
</tr>
<tr>
<td>1985</td>
<td>1,426,045</td>
<td>784</td>
</tr>
<tr>
<td>1995</td>
<td>3,753,197</td>
<td>5,586</td>
</tr>
</tbody>
</table>

Source: Ministry of Culture and Sports & Korea National Tourism Organisation (1996), Annual Statistical Report on Tourism
However, few forecasting methods have been applied to practical tourism planning and management in Korea. Some managers in the tourism industry might believe their intuition is the best tool for forecasting. Nevertheless, a quantitative forecasting approach might be able to provide decision makers with insight to some extent. A series of historical data may exhibit a certain regularity or pattern, although this may easily be overlooked. This kind of regularity or pattern can be generalised and expressed in a mathematical form which we can be used for prediction. This implies that quantitative methods might be able to be more precise than guesswork. However, a combination of quantitative and qualitative approach may be more acceptable (Archer, 1987).

Although precise future predictions are virtually impossible, the minimisation of errors, i.e. forecasting with minimum variation from the actual, will lend credibility to the procedures. Accordingly, forecasting can certainly give us an idea of what future conditions may be like if we fail to take corrective action, and it can provide us with an assessment of the possible outcomes of alternative courses of action.
1.2. Objectives of the Study

The present study has several objectives, uses a different methodology for each objective and pays much attention to the following aspects: 1) the study tries to overcome the problem of spurious regression when non-stationary data are used and to identify correctly the determinants of the inbound tourism demand in Korea; 2) both the long-run and short-run demand elasticities are estimated using the cointegration and error correction techniques in order to examine their economic implications; and 3) the forecasting performance (or accuracy) of the error correction models (ECMs) and that of the alternative specifications are compared over different forecasting horizons.

Some of the previous studies of tourism demand modelling and forecasting conclude, that simple univariate time series models such as naive/autoregressive models often outperform causal specifications (see for example, Martin & Witt, 1989; Witt & Witt, 1992). However, Song, Romilly and Liu (1997a) argued that the superior performance of the simple time series analysis over the econometric models in forecasting tourism demand is often caused either by model mis-specification or by inappropriate use of modelling methodology. This study tries to examine whether the forecasting performance of the international tourism models could be improved by incorporating some of the recent developments in econometrics.

Although Kulendran (1996) and Song et al. (1997a) have used cointegration and error correction mechanism for the analysis of tourism demand (the details of these research are reviewed in section 4.2.2.2), this study differs from those in the following aspects: First, the cointegration and ECM approach is applied to model and forecast international tourism demand in Korea. Second, the international tourism demand
considered in this paper relates to both leisure travel and business travel. Thus, a trade volume variable and National Disposable Income (NDI) or Gross Domestic Product (GDP) instead of Personal Disposable Income are used in the specifications of the demand models. Third, this model can be distinguished from others in that six competing tourist destinations are incorporated into the model in order to examine whether they have either substitutional or complementary effects on Korean inbound tourism demand. Finally, this study not only evaluates the forecasting performance of the competing models, but also compares the models' forecasting performance over a number of forecasting periods. This allows us to see whether the models will have different forecasting power when the lengths of the forecasting periods vary.

Obviously, the major contribution of the research is aimed for the successful planning and development of tourism in Korea. It should prove an invaluable source of information for both KNTO (Korea National Tourism Organisation) and practitioners concerned with modelling and forecasting tourism demand. Waitt (1996) argue that the fundamentals of strategic place marketing have been overlooked by KNTO. KNTO strategies have focused on increasing domestic awareness of the economic values of tourism and addressing the complaints of foreign tourists visiting Korea. However, KNTO should be more concerned with identifying potential demand for tourism through reliable quantitative forecasting techniques and overseas market research.

Although Korea has experienced a couple of major declines since 1962, the international demand for tourism toward Korea has been steadily increasing. However, the tourism business is getting more and more competitive, and Korea's attractiveness is relatively low compared to other competitive destinations in South East Asia such as Thailand, Singapore, Malaysia etc. Under these circumstances,
comprehensive planning and development of tourism both by the public and the private sectors in Korea is needed. Prior to this tourism planning and development, it is regarded that sound forecasts are important contribution to success.
1.3. Method & Scope of the Study

Personal interviews are undertaken in order to find out about what in practice was expected of forecasting. Interviews averaging 40 to 60 minutes yielded the information in Appendix 1.1 to 1.4. The first interviewee was the Director in the Department of Research & Development in KNTO (Korea National Tourism Organisation). The interviewee is the most relevant person to forecasting tourism demand. In the process of the interview, the author found two forecasting experts who were actually involved with forecasting tourism demand to Korea requested by KNTO. Although the author also carried out interview with these two forecasting preparers, the interviews are turned out to be unsatisfactory, because it transpired that KNTO did not have clear forecasting objectives. However, it is obvious that KNTO is interested in the future level of international demand for tourism in the long run, and, therefore, puts more emphasis on mid-term and long-term forecasts than short-term forecasts.

The uniqueness of this research lies in that cointegration and ECM (Error Correction Mechanism) approach is used for the analysis of international demand for tourism to Korea. This technique detects the true long-run equilibrium relationship between dependent and independent variables and overcomes spurious regression problem when non-stationary data is used in classical regression analysis. In addition, general-to-specific approach is used to identify most parsimonious and appropriate regression equation. These approaches are the new development of econometric analysis and the detailed use of them is described in Chapter 4 & 5. For the empirical analysis, four major tourist generating countries are considered: Japan, USA, UK, and Germany. The annual data of total tourist arrivals by country is used as a dependent variable. The statistical source of the dependent variable is the Annual Statistical Report on Tourism jointly published
by KNTO and Ministry of Culture and Sports. Yearly data for 33 years from 1962 to 1994 were obtained for the analysis. Although the tourist expenditure variable is often used as a dependent variable for forecasting tourism demand, it is excluded here since some parts of the data are not available. In order to explain the demand for business travel, trade volume variable and National Disposable Income (or Gross Domestic Product) variable are used. The explanatory variables associated with this research are collected from IMF (International Monetary Fund) statistics, OECD (Organisation for Economic Cooperation and Development) statistics, and ABC World Airways Guide. For other empirical analysis, two forecasting software programs are used. "Forecast Pro" is utilised to analyse the univariate time series models such as naive, simple moving average and simple exponential smoothing models. "Eviews 2.0" is used for the estimation of the causal models.

Furthermore, this study also considered the value of ECM as a forecasting tool and this was undertaken by empirical analysis. For the comparison of forecasting performance (or accuracy), seven different techniques were employed and those include 1) Naive I, 2) Simple Moving Average, 3) Simple Exponential Smoothing, 4) AR(1), 5) ARMA (p,q), 6) VAR (Vector Autoregressive), and 7) ECM. In particular, five different time horizons are considered for the comparison of forecasting performance; short-term (1 year horizon), mid-term (3 & 5 years horizons) and long-term (7 & 10 years horizons). This is attempted to examine whether a model will have a different forecasting power when forecasting time horizon changes and to provide the objective evidence for suggestions about the best technique for a particular time horizon.
1.4 Limitations of the Research

First, this study confines the analysis to economic variables which are quantifiable and available. Obviously, it is unreasonable to explain the flow of international tourism demand merely with economic variables. Human motivation and the process of making travel decisions can also be influenced by, for example, personal preferences, cultural background, linguistic ties etc. Therefore, the economic variables might represent just a small part of all the causes of travel phenomena. The sole countermeasure to cope with this problem is the ceteris paribus assumption in the model in which all other unexplained variables are assumed incorporated in the constant value term.

Second, qualitative forecasting techniques are not undertaken because of the limited research period. The combination of quantitative and qualitative forecasting techniques might have produced better forecasts. Furthermore, the range of forecasting techniques is limited to seven techniques. The inclusion of artificial neural network (ANN) models for the comparison of forecasting performance might be of interest. The reasons for not using ANN models are the absence of sufficient data and lack of a proper forecasting software program employing ANN models. However, for this purpose, it is unlikely that an ANN models would be effective, since the model is obtained by an empirical learning process which may require an extended period of time, as well as substantial quantities of data.

Last, the origin countries included for this research are limited to Japan, USA, UK and Germany. The main reason for not including other origins is that data required are neither available nor sufficient. This seems to be a major obstacle for economists who wish to analyse the level of tourist demand. Moreover, if the range of data could be extended, more reliable econometric forecasts might have been made.
CHAPTER II

OVERVIEW OF INTERNATIONAL DEMAND FOR KOREAN TOURISM
2.1. Introduction

Worldwide, the demand for tourism has been increasing steadily over the last two decades. By 1990, tourism had become, behind oil and motor cars, the third most important industry in the world in terms of export earnings. In spite of undesirable economic and political aspects, the growing demand for tourism seems to be unstoppable. For example, there was an oil crisis bringing about substantial economic recession in 1970s and the Gulf War in the early 1990s. Obviously, these had a negative effect on the growth of the tourism industry, but it did not seem to last long.

Likewise, Korean tourism has developed despite various negative influences. For example, it is obvious that threats from North Korea and the domestic political unrest have delayed some potential visitors from foreign countries. Nevertheless, the number of international tourists has been increasing for the last few decades. In order to meet the increasing demand, the Korean government has made vigorous efforts into developing the tourism industry. These efforts are reflected in various aspects such as hosting international sporting events, conferences, cultural festivals etc.

In this chapter, section 2.2 deals with the overall international tourism demand to Korea in order to examine how demand has changed over the past four decades. Then, international demand by the principal four origin countries selected for the empirical analysis is examined. These countries are Japan, USA, Germany and the UK. In fact, they accounted for approximately 60% of total tourist arrivals in 1995 (MOCS & KNTC, 1995). Some preliminary statistics and graphs is used to illustrate the general trend in tourism and propensity to travel to Korea.
2.2. Overview of International Demand

International demand for Korean tourism over the past thirty years or so can be broken down into four periods: the 1960s, 1970s, 1980s and 1990s.

Figure 2.1 shows the total number of international tourists to Korea for the period from 1962 to 1995. The number of international tourists did not reach substantial numbers until the 1970s. Thereafter, it rose steadily until the early 1980s followed by a stagnant period of several years.

Figure 2.1 Tourist Arrivals in Korea (1962-1995)


Since 1985, the number of international tourists has increased dramatically. As the number of international tourists increases, tourism receipts have risen commensurately (see Figure 2.2).
2.2.1. 1960s

Chronologically, Korean tourism might have started from the 1950s since the 1950s was the age of economic reconstruction following World War II and the Korean War (1950 - 1953). However, not much attention was paid to the development of Korean tourism, and there was no official statistics of tourism until 1962. During that period tourism organisations and travel agents were rudimentary, and did not gain a foothold in carrying out marketing activities. As a result, the tourism industry in Korea suffered from the lack of reception facilities (Kim, 1989).

In 1962, foreign visitors to Korea totalled 15,184 with an average duration of stay of 5.2 days, and they spent 4.6 million US($) dollars of tourism receipts at current prices.
(see Table 2.1). In the same year, the KNTC (Korea National Tourism Corporation), which is a non-profit public sector organisation, was founded. KNTC is largely responsible for resort development, tourism marketing, manpower training and the operation of its overseas offices that promote Korean tourism.

Surprisingly, the total number of international tourist arrivals to Korea was 33,464 with approximately 21 million US dollars of tourism receipts at current prices in 1965.

2.2.2. 1970s

During the 1970s Korean tourism experienced a high growth rate of 27.6% under comparatively favourable conditions, with improved reception facilities and related services. In 1973, 679,221 international visitors arrived in Korea, marking an 83.3% increase over the previous year, and the tourism receipts reached 269 million US dollars accounting for a 224.5% rise over the previous year (see Table 2.1). However, the travel industry encountered a decline in international tourism demand between 1973 and 1974, primarily due to economic recessions caused by the oil crisis. In 1974, tourism in Korea experienced its first decline as a result of the world economic recession. It seems that the effect of oil crisis on international tourism demand to Korea was delayed by one year.

The first oil crisis in 1973 was resulted from the Fourth Middle East War between Israel and the Arab nations. The Arab oil-producing nations belonging to OPEC (Organisation of Petroleum Exporting Countries) imposed restrictions on the production and supply of oil, a key factor in world travel. The impact of this spread rapidly and turned the world into economic discontinuity. The second oil crisis pushed the prices of oil to the $40 - $45 US dollar per barrel
(expressed in 1990 prices). Since then, the decline of OPEC's market power has been manifest in a gradual fall of prices, nearly back to their pre-1973 level, in real terms.

In 1973, nevertheless, the Japanese share of the total number of international tourists accounted for approximately 70 per cent, followed by US accounting for 11.4 per cent. These two countries led in the demand for Korean tourism throughout the 1970s and 1980s. In 1978, Korea received 1,079,396 visitors, exceeding one million for the first time in Korean tourism. At this juncture, Korea ranked sixth as a tourist destination country in the Asian region. Furthermore, this marked the turning point of Korean tourism, since then Korea became one of the leading nations in tourism in Asia (KNTC, 1983).

2.2.3. 1980s

Again, from 1979 to 1980, Korea experienced decline due to the world economic recession caused by second oil price shock and internal political upheaval (Lee, 1996). Thereafter, there had been sluggish growth in Korean tourism industry until mid 1980s. The sluggish trend recorded a low growth, below an average of 5% for the period from 1980 to 1983. In the latter half of the 1980s, Korean tourism industry recovered, achieving a 16.4% growth rate in 1986 and a 12.9% growth rate in 1987 (MOT & KNTC, 1988).

In order to promote Korea as a tourist destination, government and other tourism organisations put much effort into hosting international meetings providing many opportunities of discovering Korea to foreign academics and practitioners related to tourism. In 1983, Korea hosted many large international conventions and conferences since KNTC opened its Convention Bureau in 1979. In the same year, the Bureau also hosted the annual conference of the Pacific Area Travel Association (PATA).
In 1986, the Asian Games were hosted by Korea, which brought about 1.7 million visitors and US$ 1.5 billion representing 16.4% and 97.3% respectively over the previous year (see Table 2.1). According to the WTO (World Tourism Organisation), a total of 340 million tourists travelled world-wide in 1986, with a 4.6% growth rate. Unfavourably, however, the East Asia and Pacific regions received a total of 39.5 million tourists in the same year, achieving merely 11.6% share of the world total. Consequently, the annual growth rate of tourist arrivals in Korea during the past decade follows the trend set by the East Asia and Pacific region (see Figure 2.3).

The economic importance of international inbound tourism had not been fully recognised until the Korean government held the 1988 Seoul Olympics. The number of foreign tourist arrivals surpassed 2.3 million, and foreign tourism receipts exceeded US$ 3.2 billion in 1988. This represents a growth of 24.9% and 42%, respectively, over the previous year (see Table 2.1). There is no doubt that the tourism industry is significant for the Korean economy as an earner of foreign exchange.

In 1988, the ratio of foreign tourism receipts to gross national product (GNP) was 1.9% and to exports was 4.8% (IMF, 1991; MOT & KNTO, 1989). For the 1988 Seoul Olympic Games, a range of infrastructure was constructed not only to pave the way for success as a host nation but also to meet the forthcoming international demand for tourism. The Seoul Olympics were also intended to develop awareness and enhance a favourable image all over the world. Since hosting the 1988 Olympic Games, tourism has been a significant source of construction, employment and foreign income.
Table 2.1 International Tourist Arrivals and Receipts in Korea (1961 - 1995)

<table>
<thead>
<tr>
<th>Year</th>
<th>Foreign Tourist Arrivals</th>
<th>Annual Growth Rate (%)</th>
<th>Nominal Tourism Receipts (US$ 1000)</th>
<th>Annual Growth Rate (%)</th>
<th>Real Tourism Receipts* (US$ 1000)</th>
<th>Annual Growth Rate (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1961</td>
<td>11,109</td>
<td>28.1</td>
<td>1,353</td>
<td>210.3</td>
<td>37,583</td>
<td>N.A.</td>
</tr>
<tr>
<td>1962</td>
<td>15,184</td>
<td>36.7</td>
<td>4,632</td>
<td>242.4</td>
<td>121,895</td>
<td>224.3</td>
</tr>
<tr>
<td>1963</td>
<td>22,061</td>
<td>45.3</td>
<td>5,212</td>
<td>12.5</td>
<td>115,822</td>
<td>-5.0</td>
</tr>
<tr>
<td>1964</td>
<td>24,953</td>
<td>13.1</td>
<td>15,704</td>
<td>201.3</td>
<td>270,759</td>
<td>133.8</td>
</tr>
<tr>
<td>1965</td>
<td>33,464</td>
<td>34.1</td>
<td>20,798</td>
<td>32.4</td>
<td>315,121</td>
<td>16.4</td>
</tr>
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<td>1966</td>
<td>67,965</td>
<td>103.1</td>
<td>32,494</td>
<td>56.2</td>
<td>433,253</td>
<td>37.5</td>
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<td>1967</td>
<td>84,216</td>
<td>23.9</td>
<td>33,817</td>
<td>4.1</td>
<td>407,434</td>
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<td>102,748</td>
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<td>35,454</td>
<td>4.8</td>
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<td>1969</td>
<td>126,686</td>
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<td>32,809</td>
<td>-7.5</td>
<td>315,471</td>
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<td>1970</td>
<td>173,335</td>
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<td>46,772</td>
<td>42.6</td>
<td>386,545</td>
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<td>232,795</td>
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<td>52,383</td>
<td>12.0</td>
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<td>1972</td>
<td>370,656</td>
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<td>83,011</td>
<td>58.5</td>
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<td>1973</td>
<td>679,221</td>
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<td>269,434</td>
<td>224.6</td>
<td>1,705,278</td>
<td>214.3</td>
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<td>517,590</td>
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<td>158,571</td>
<td>-41.1</td>
<td>809,036</td>
<td>-52.6</td>
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<td>1975</td>
<td>632,846</td>
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<td>140,627</td>
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<td>1976</td>
<td>834,239</td>
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<td>95.6</td>
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<td>949,666</td>
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<td>370,030</td>
<td>34.6</td>
<td>1,182,204</td>
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<td>408,106</td>
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<td>1,126,100</td>
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<td>326,006</td>
<td>-20.1</td>
<td>770,700</td>
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<td>1980</td>
<td>976,415</td>
<td>-13.3</td>
<td>369,265</td>
<td>13.3</td>
<td>677,550</td>
<td>-12.1</td>
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<td>1,093,214</td>
<td>12.0</td>
<td>447,640</td>
<td>21.2</td>
<td>677,216</td>
<td>0.0</td>
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<td>1,145,044</td>
<td>4.7</td>
<td>502,318</td>
<td>12.2</td>
<td>709,489</td>
<td>4.8</td>
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<tr>
<td>1983</td>
<td>1,194,551</td>
<td>4.3</td>
<td>596,245</td>
<td>18.7</td>
<td>813,431</td>
<td>14.7</td>
</tr>
<tr>
<td>1984</td>
<td>1,297,318</td>
<td>8.6</td>
<td>673,355</td>
<td>12.9</td>
<td>897,807</td>
<td>10.4</td>
</tr>
<tr>
<td>1985</td>
<td>1,426,045</td>
<td>9.9</td>
<td>784,312</td>
<td>16.5</td>
<td>1,021,240</td>
<td>13.7</td>
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<tr>
<td>1986</td>
<td>1,659,972</td>
<td>16.4</td>
<td>1,547,502</td>
<td>97.3</td>
<td>1,961,346</td>
<td>92.1</td>
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<tr>
<td>1987</td>
<td>1,874,501</td>
<td>12.9</td>
<td>2,299,156</td>
<td>48.6</td>
<td>2,827,990</td>
<td>44.2</td>
</tr>
<tr>
<td>1988</td>
<td>2,340,462</td>
<td>24.9</td>
<td>3,265,232</td>
<td>42.0</td>
<td>3,748,831</td>
<td>32.6</td>
</tr>
<tr>
<td>1989</td>
<td>2,728,054</td>
<td>16.6</td>
<td>3,556,279</td>
<td>8.9</td>
<td>3,861,324</td>
<td>3.0</td>
</tr>
<tr>
<td>1990</td>
<td>2,958,389</td>
<td>8.5</td>
<td>3,558,666</td>
<td>0.1</td>
<td>3,558,666</td>
<td>-7.8</td>
</tr>
<tr>
<td>1991</td>
<td>3,196,340</td>
<td>8.0</td>
<td>3,426,416</td>
<td>-3.7</td>
<td>3,134,873</td>
<td>-11.9</td>
</tr>
<tr>
<td>1992</td>
<td>3,231,081</td>
<td>1.1</td>
<td>3,271,524</td>
<td>-4.5</td>
<td>2,817,850</td>
<td>-10.1</td>
</tr>
<tr>
<td>1993</td>
<td>3,331,226</td>
<td>3.1</td>
<td>3,474,640</td>
<td>6.2</td>
<td>2,855,086</td>
<td>1.3</td>
</tr>
<tr>
<td>1994</td>
<td>3,580,024</td>
<td>7.5</td>
<td>3,806,051</td>
<td>9.5</td>
<td>2,943,582</td>
<td>3.1</td>
</tr>
<tr>
<td>1995</td>
<td>3,753,197</td>
<td>4.8</td>
<td>5,586,536</td>
<td>46.8</td>
<td>4,135,112</td>
<td>40.5</td>
</tr>
</tbody>
</table>

Note: *Real tourism receipts were calculated by dividing the nominal tourism receipts by the CPI(1990 = 100). N.A. = Not Available
Figure 2.3 Trends of Tourist Arrivals in Korea, East Asia & Pacific Region, and World. (Unit: million people)

South Korea

East Asia & Pacific

World Total

2.2.4. 1990s

Korea witnessed a sluggish increase in the number of foreign visitors from 1990 to 1995 (see Figure 2.1). The growth rate was 1.1% in 1992 and 3.1% in 1993, which are considerably low compared to those from 1984 to 1991. KNTOC (1993) explained that this might be due to a decrease in arrivals from the US and Taiwan. For 1992, the tourism industry gross earnings were around US$ 3,270 million in foreign exchange (or 1% of GNP); in comparison the automobile industry contributed only US$ 2,800 million. Interestingly, real tourism receipts decreased while the number of tourist arrivals increased during the period from 1990 to 1992. This implies that the international tourists' expenditure per capita has declined in this period. In 1993, the annual growth rate of real tourist receipts turned into positive value. In 1994, Korea welcomed a total of 3,580,024 inbound visitors, a 7.5% increase from the previous year. This was spurred by the government's vigorous efforts to attract more foreign visitors and to hold many festivals and sporting and cultural events during 'Visit Korea Year 1994'.

Figure 2.3 shows the trends of foreign tourist arrivals in Korea, the East Asia & Pacific region and the world during the period from 1970 to 1992. As can be seen from the charts, the three areas under consideration have a similar trend in tourism arrivals.

Japanese tourists has dominated Korean tourism since 1971. 1.6 million Japanese tourists visited Korea in 1994, which is a 10.2% increase over the previous year. The United States was the second largest source of tourists in the same year, generating 332,428 visitors and occupying a 9.3% share of the total. Unexpectedly, Russia was the third largest generator of visitors to Korea in 1994. Approximately 154 thousand Russian visited Korea in 1994, recording a 31.6% growth rate
over the previous year. Although Russia was relegated to fifth in 1995 in terms of the number of visitors, the growth rate remained constant over the previous year. The number of Philippine and Chinese visitors are steadily increasing ranking 4th and 5th respectively. The number of Taiwanese visiting Korea decreased by 5.4% in 1994, following a sharp decrease in 1993 and a small increase in 1992, as compared with growth rates ranging from 26.0% to 34.8% during the period 1981 - 1991. KNTC (1995) explained that these recent decreases result from the severing of diplomatic ties between Seoul and Taipei in August 1992 and the resultant closing of civil airline services between them. Despite the decrease in Taiwanese visitors to Korea, Taiwan was the 6th largest generator of visitors to Korea in 1994 and 1995.

Table 2.2 Visitor Arrivals from Top 10 Origin Countries (1991-1995)

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Japan</td>
<td>Japan</td>
<td>Japan</td>
<td>Japan</td>
<td>Japan</td>
</tr>
<tr>
<td>2</td>
<td>USA</td>
<td>USA</td>
<td>USA</td>
<td>USA</td>
<td>USA</td>
</tr>
<tr>
<td>3</td>
<td>Taiwan</td>
<td>Taiwan</td>
<td>Hong Kong</td>
<td>Russian Fed.</td>
<td>China</td>
</tr>
<tr>
<td>4</td>
<td>Philippines</td>
<td>Philippines</td>
<td>Taiwan</td>
<td>Philippines</td>
<td>Philippines</td>
</tr>
<tr>
<td>5</td>
<td>China</td>
<td>Hong Kong</td>
<td>Philippines</td>
<td>China</td>
<td>Russian Fed.</td>
</tr>
<tr>
<td>6</td>
<td>Hong Kong</td>
<td>Russian Fed.</td>
<td>Russian Fed.</td>
<td>Taiwan</td>
<td>Taiwan</td>
</tr>
<tr>
<td>7</td>
<td>Russian Fed.</td>
<td>China</td>
<td>China</td>
<td>Hong Kong</td>
<td>Hong Kong</td>
</tr>
<tr>
<td>8</td>
<td>Thailand</td>
<td>Thailand</td>
<td>Thailand</td>
<td>Thailand</td>
<td>Thailand</td>
</tr>
<tr>
<td>9</td>
<td>UK</td>
<td>UK</td>
<td>Singapore</td>
<td>Germany</td>
<td>UK</td>
</tr>
<tr>
<td>10</td>
<td>Germany</td>
<td>Germany</td>
<td>UK</td>
<td>UK</td>
<td>Germany</td>
</tr>
</tbody>
</table>


As shown in Table 2.2 and Figure 2.5, Korea depends heavily upon the Japanese market. Japanese tourists take up more than 50% share of the total. It seems that high disposable income and the strength of the Japanese Yen against the US dollar contributed to the increase of Japanese demand for Korean tourism.
Figure 2.4 Share of the Arrivals by Region

![Pie chart showing the share of arrivals by region](image)

Source: KNTC (1994).

Figure 2.5 Share of the Arrivals by Selected Origin Countries

![Pie chart showing the share of arrivals by origin country](image)

Source: KNTC (1994).
Kim (1988) pointed out that travelling to Korea is no longer a superior good for Japanese tourists because of the favourable exchange rate. This also implies that if the exchange rate differentials between Yen and Korean currency diminishes, Japanese demand for Korean tourism would be expected to decrease. As a result, this effect may damage tourism business in Korea, since most of the tourist products in Korea are aimed at Japanese market. In order to cope with this problem, it is arguable that Korea would be advised to pursue market diversification rather than rely heavily on a single market.

On the other hand, the number of German and UK tourists has been increasing rapidly for the last five years. The reasons for this could be partly due to the improved marketing strategy performed by KNTC in London and Frankfurt and diplomatic and business relationships between Korea and the European countries. In 1994, for example, the KNTC dispatched tourism missions to Berlin, London and Paris with their programme of mini-trade shows, dinners and traditional Korean dance (Waitt, 1996). In addition, positive diplomatic relationships between Western European countries and Korea have been fostered, and Korean conglomerates have made considerable investment in UK and Germany. For example, Daewoo Motor established its Research and Development (R&D) centres in Worthing (UK) and Munich (Germany) in the early 1990s as its first step into global automotive R&D, manufacturing and marketing. Hyundai and LG (Lucky Goldstar) are to construct semiconductor plants in Scotland and South Wales respectively in the foreseeable future. As a result, more frequent visits to Korea by UK and German business tourists are expected.

As shown in Figure 2.4, Asia represents 68.6%, followed by the Americas and Europe showing 10.7% and 10.6% respectively, in terms of the share of the arrivals by region. It is
obvious that the Asian market is most important for Korean tourism.

Figure 2.6 Visitor Arrivals by Purpose of Visit in 1994

One interesting recent trend is the substantial increase in numbers of visitors from socialist and former communist countries. A total of 355,276 persons from these countries visited Korea in 1994, a 35% rise over 1993. This increase is probably due to the government's sustained efforts to improve relations with communist states and the new positive image of Korea. In 1994, visitors from Russia and China accounted for more than 80% of the total from the communist countries. Russia topped the list in 1994, generating 153,777 tourists to Korea, up 31.6% from 1993. Tourists from China rose to 140,985, a 41.0% increase from 1993.

As shown in Figure 2.6, pleasure tourists accounted for 57% of all visitors to Korea, business travellers 11%, visiting friends and relatives 10%, official business 1% and others 21% in 1995. The number of pleasure tourists to Korea in 1994 stood at 2,040,259, an increase of 7.3%, whereas business travellers decreased by 2.4%. Almost 90%
(1,476,031) of Japanese visitors come for pleasure, as do 33.4% (110,919) of American visitors.

Figure 2.7 Visitor Arrivals by Month (1992 - 1994)

![Visitor Arrivals Graph](image)


Of all the visitors, pleasure tourists seem to be the most heavily influenced by various internal and external factors associated with economics, politics and society. Despite the tensions surrounding the North Korea nuclear issue, 'Visit Korea Year 1994' contributed not only to the development of nation-wide travel industry but also to the increase of international and domestic tourists in Korea.

In 1994, excluding those long-term visitors who stayed more than 90 nights, 31.6% out of total overseas visitors spent two nights in Korea, while 24% of visitors stayed three nights. The average length of stay was 5.2 nights in 1994. Approximately, four out of ten (43.4%) Japanese visitors enjoyed a two-night visit. Looking at the average length of stay by nationality, Japan's average was 3.2 nights, Taiwan
4.4 nights, Hong Kong 4.1 nights, the US. 13.6 nights, Canada 11.3 nights and Europe 8.2 nights.

Figure 2.7 shows the seasonality of international tourists in Korea. The number of foreigners arriving each month fluctuates with the four seasons. October in 1994 attracted the largest number of foreign tourists, accounting for 9.5% of the year's arrivals or 340,990 visitors. In the past, May also used to be a peak month for foreign arrivals, but recently August has emerged as a more popular month, thus spreading arrivals more evenly throughout the year, except for the winter off-season (December to February). KNTC (1995) reported that the recent emergence of the summer high season is due to the increase in Japanese tourists coming to Korea for their summer holiday. March, however, did show the highest growth rate of 27.7% for the year.

The present seasonal fluctuation might be reduced by such as developing new tourism products and marketing strategies. It has been suggested that market diversification should be developed by accelerating overseas marketing promotion in order to redress the imbalance of international market share (Kim, 1989, p.44).

In fact, KNTC attempted to induce more international tourists in 1994 by marketing 'Visit Korea Year 1994' as a 'world festival'. However, it is criticised that the visual image (twee cartoon style 'Chongsa Chorong Children') and slogan ('Korea, More than Seoul') are meaningless, or worse, interpretable in less complimentary ways. In addition, international, long-term, high-profile, media-based advertising campaign have been absent from KNTC strategies so far. Therefore, new marketing slogans, new visual symbols and an international advertising campaign should be developed in order to boost the tourism industry in Korea (Waitt, 1996).
2.3. Demand for Korean Tourism by Selected Countries

2.3.1. Japan

The number of Japanese outbound tourists has been increasing significantly over time, and this trend appears likely to continue to do so, as illustrated in Figure 2.8. For Japanese tourists, Korea was the second most popular destination followed by Hawaii in 1994 (JTB, 1995).

Figure 2.8 Japanese Outbound Tourists (1970-1994) (unit: million people)

![Bar chart showing the number of Japanese outbound tourists from 1970 to 1994, indicating an increasing trend.](chart)


When KNTC officially started to keep the records of statistical data on Korean tourism in 1962, the total number of inbound tourists in Korea was 15,184. In the same year, Japanese tourists were 12% while US tourists were 48% out of the total. It was obvious that US was the major tourist generating country for Korean tourism industry in the 1960s.

However, the number of Japanese tourists surpassed that of US tourists sharing 41.5% out of the total in 1971, whilst the US share dropped to 24.9%. KNTC (1991) reported that this
may stem from the fact that the Japanese government encouraged their people to travel abroad particularly by changing their policy on outbound tourism in 1964. Since then, the number of Japanese tourists has been increasing dramatically. In 1995, approximately 1.7 million Japanese tourists visited Korea, accounting for 8% in terms of Korea's share of the Japanese market.

Figure 2.9 Japanese Tourist Arrivals in Korea (1962-1995)
(unit: thousand people)


The other catalyst which helped to increase the number of Japanese tourists in Korea may be the high disposable income (KNTC, 1991). In particular, the Japanese high disposable income attributed from its economic development and the favourable rate of exchange seemed to play a significant role in boosting the tourism industry in Korea.

Furthermore, the Korean government lifted restrictions through no-visa entry policy for Japanese tourists in 1994. The difficulty of obtaining visa and passport approval can act as disincentives to travel (Edgell, 1990). KNTC (1995)
anticipated that no-visa policy may have a major impact on the growth of Japanese tourism to Korea.

The trend cycle and seasonality of Japanese pleasure tourists are illustrated in Figure 2.10. The monthly data by country and purpose only covers the period from the January 1988 to December 1993. The main reasons for this are that the data of 1987 are missing and KNTC stopped recording data from July 1994. The rationale for not keeping this particular data is that a considerable number of tourists visit Korea with multi-purposes. Therefore, KNTC seems to insist that not much importance should be laid on segmenting tourists by country and purpose on monthly base.

Figure 2.10 can be seen to be periodic with a cycle of a year. These yearly cycles are reasonably predictable each having a similar shape. For example, the cycle of years 1989, 1990 and 1991 look similar, but the pattern of the cycle in 1992 seems to behave in a slightly different way.

Noticeably, the autumn term from early September to mid November is the peak season for Japanese pleasure tourists in Korea. Japanese people tend to enjoy beautiful and breathtaking natural scenery; at that time of year, they can see Korean mountains covered with colourful leaves. On the other hand, winter, from December to February, is the least popular season. In general, October is the most popular month while January is the least popular.

In spite of the considerable gap between high and low season, the supply side such as accommodation always needs to be geared to the high season in order to meet demand. Hotels that are busy with customers in the high season are likely to be faced with problems when the low season comes. Although many hotels in Korea employ various marketing strategies to cope with the problems, they eventually end up targeting domestic people rather than Japanese or other international
tourists. For example, during the Christmas holiday hotels in Korea target domestic market by offering special dining combined with lodging.

Figure 2.10 Trend cycle & Seasonality of Japanese Pleasure Tourists in Korea (1988-1993)

Table 2.3 shows that although the Japanese pleasure tourists dominate the market, the demand for pleasure tourism by Japanese visitors varies. Incentive tours, cultural tours and recreational tours have recently gained a relatively high popularity with Japanese holiday seekers. In order to respond to these demands, Japanese tour operators concentrate their marketing efforts on shopping, recreation, food and events which are different from those in Japan while Korea provides a variety of tourist products such as golf tourism, health spa tourism, exotic food tourism, etc.

Recently, a number of tourist destinations in Pacific and East Asia such as Australia, New Zealand, Thailand, Philippines etc. have started to cater for the Japanese golf
holiday market. Such holidays are attractive to the Japanese golfers in terms of monetary cost because playing golf in these destinations is much less expensive than in Japan. It is not unusual to pay several hundred US dollars for a round at a local course in Japan. Although a number of resorts and hotels are setting their sights on this market, catering for this market is not a guaranteed recipe for success. The market demand is fickle and is also subject to rapid change. First, it is far from clear how many Japanese go abroad specifically to play golf as opposed to including some golfing element in a more general overseas leisure or business trip. Secondly, many golfing elements are included as part of corporate incentives, meetings and conferences, and resorts need to market themselves to the latter segment (Sullivan, 1996).

<table>
<thead>
<tr>
<th>Purpose</th>
<th>1993</th>
<th>1994</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pleasure</td>
<td>1,331,541 (89.2%)</td>
<td>1,476,031 (89.8%)</td>
</tr>
<tr>
<td>Business</td>
<td>112,137 (7.5%)</td>
<td>114,762 (7.0%)</td>
</tr>
<tr>
<td>VFR</td>
<td>5,426 (0.4%)</td>
<td>5,077 (0.3%)</td>
</tr>
<tr>
<td>Official</td>
<td>1,510 (0.1%)</td>
<td>1,336 (0.1%)</td>
</tr>
<tr>
<td>Others</td>
<td>41,455 (2.8%)</td>
<td>46,891 (2.8%)</td>
</tr>
<tr>
<td>Total</td>
<td>1,492,069</td>
<td>1,644,097</td>
</tr>
</tbody>
</table>

Source: MOCS & KNTC (1994).

Although there are some golf courses available in Korea such as on Che-ju island and in the Kyong-ju area, they are not good enough to accommodate or meet Japanese demand in terms of capacity and quality. In terms of quantity, since the golf courses are also shared by domestic residents, less chance is likely to be given to Japanese tourists who want to play golf. In terms of quality, it is extremely difficult for Korea to compete with other destinations where the natural environment and climate are more suitable for golf.
KNTC periodically conducts two important annual surveys: the Foreign Visitors Survey and the National Travel Survey. The former is undertaken to examine general preferences of international visitors by origin, and the latter is to investigate the travel propensity and volumes of Korean domestic people. The questionnaires for Foreign Visitors Survey are distributed at least twice a year for a six-day period each time in the departure lounges of the three international airports. Undertaking the field survey twice a year is for the reliability of the data to be collected. Questionnaires covering 24 items ask about purpose of visit, length of stay, expenditures, shopping, impressions, opinions on Korean tours, etc. The Foreign Visitors Survey was launched in 1981 in order to examine the degree of tourists' satisfaction and their consuming behaviour. For further details of this survey, see Appendix 2.1.

The annual survey results from 1981 to 1995 were able to be obtained apart from 1986 and 1992 survey results. The attempts to use survey results of 1985 and 1995 to examine how the expenditure patterns of Japanese travellers has been changed over the 10-year period. The unit of data observed was US dollar by category. However, the proportion spent on each category, such as shown in Figure 2.11, is focused on the actual expenditure figures. The sample is relatively small. The sample size of each country was determined proportionately to its actual share of the total in previous year. For example, let us assume the total sample size for a survey is about 2,000. If the number of Japanese tourists takes up about 50% of the total, approximately 1000 questionnaires would be allocated to Japanese tourists.

In the survey, six activities (including "miscellaneous") of the tourists in 1985 and 1995 were identified as shown in Figure 2.11. It shows that Japanese pleasure tourists in 1995 tend to spend more money on shopping and miscellaneous out of their total expenditures than in 1985.
Figure 2.11 Expenditure Patterns of Japanese Tourists in Korea (1985 & 1995)

1985

- Lodging: 26%
- Dining: 17%
- Tours: 9%
- Entertainment: 5%
- Shopping: 22%
- Miscellaneous: 21%


1995

- Lodging: 49%
- Dining: 18%
- Tours: 12%
- Entertainment: 9%
- Shopping: 8%
- Miscellaneous: 4%

KNTC (1991) reported that it is a traditional custom for Japanese (sometimes they feel obligatory) to give a gift to their relatives, friends, senior staffs, etc. Therefore, the average expenditure spent by a Japanese tourist is relatively high. For example, in 1990, it reached 2,267 US($) dollars at current prices. Japanese tend to purchase high quality products, require instructions of a product in Japanese, look for a Japanese speaking staff, prefer attractive wrap, etc. Waitt (1996) stated that Korea is largely dominated by city tourism which is characterised by shorter average length of stay, but higher daily per capita expenditures owing to sizeable shopping expenditures.

On the other hand, they spent a more proportion of their total expenditure on Accommodation, Food & Beverage, Admission & Transportation, Entertainment in 1995.
2.3.2. USA

Figure 2.12 shows the trend of US outbound tourists. In the long term, prospects for the continued growth of US outbound pleasure travel appear to be promising. This assertion can be probably justified, when some general trends are considered such as changing consumer demographics, the increasing use of technology in travel planning, the general broadening of consumer tastes, and the increasingly apparent interest in foreign destinations for pleasure travel (Rao, et al., 1992). The same may be applied to Korea bound tourism of US tourists, and it is reassured by the trend of last three years (see Figure 2.13).

Figure 2.12 US Outbound Tourists (1970-1994)
(unit: million people)

![Bar chart showing US Outbound Tourists (1970-1994)](chart)


In terms of tourist expenditure and number of arrivals, the United States has been the second largest next to Japan for the last few decades within the context of inbound tourism to Korea. After the second oil shock, the number of US pleasure tourists to Korea increased rapidly until the 1988 Seoul Olympic Games (see Figure 2.13). However, the number of US visitors to Korea seems to stop growing since 1989. This
might be due to the Gulf War and economic recession in the US in the early 1991. These political and economic conditions may drastically affect the decision making of pleasure tourists in the short-term.

Table 2.4 Top Destinations of US Residents Travelling Abroad (1990 - 1991)

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<th></th>
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<td>1</td>
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<td>France</td>
<td>1,681</td>
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<td>6</td>
<td>Japan</td>
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<td>494</td>
<td>-0.5</td>
</tr>
<tr>
<td>12</td>
<td>South Korea</td>
<td>544</td>
<td>436</td>
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</tr>
<tr>
<td>13</td>
<td>Jamaica</td>
<td>480</td>
<td>436</td>
<td>-9.3</td>
</tr>
<tr>
<td>14</td>
<td>Australia</td>
<td>448</td>
<td>436</td>
<td>-2.8</td>
</tr>
<tr>
<td>15</td>
<td>Switzerland</td>
<td>753</td>
<td>421</td>
<td>-44.0</td>
</tr>
<tr>
<td>16</td>
<td>Colombia</td>
<td>240</td>
<td>392</td>
<td>63.2</td>
</tr>
<tr>
<td>17</td>
<td>Spain</td>
<td>592</td>
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<tr>
<td>18</td>
<td>Taiwan</td>
<td>304</td>
<td>378</td>
<td>24.1</td>
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<td>19</td>
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<td>384</td>
<td>363</td>
<td>-5.5</td>
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<tr>
<td>20</td>
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<td>21</td>
<td>Brazil</td>
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</tr>
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<td>22</td>
<td>Austria</td>
<td>544</td>
<td>261</td>
<td>-52.0</td>
</tr>
</tbody>
</table>

Total overseas travel* 15,990 14,521 -9.2

Source: US Travel and Tourism Administration.
* Excludes travel to Mexico and Canada.

Recession, preoccupation with the Gulf crisis, and fear of terrorism cast a pall over the travel industry world-wide as the 1990s got underway (Davidson, 1992). By early 1991, travel agents in US were noting the dearth of summer bookings and cancellations were widespread. Even the Bahamas, an easily accessible near-offshore destination which had been attracting 1 million US residents annually, experienced trip cancellations. Airlines that normally filled half their
seats in low-season January filled just a third of them on trans-Atlantic flights during January 1991. Companies which had already cubed business travel because of the recession made further cuts, particularly for overseas trips, in the name of safety (Fockler, 1993).

When the US Travel & Tourism Administration (USTTA) released its Inflight Survey for US residents travelling abroad in 1991, it showed a 9.2% drop in overseas (excluding Canada and Mexico) outbound traffic by US residents. Traditionally favoured European destinations such as UK, Germany, France, Italy, Switzerland and Spain had seen declines ranging from 17% to 44%. In the Asia Pacific area, such destinations as Japan, Korea and Australia suffered declines of 18.5%, 20% and 2.8% respectively, as shown in Table 2.4. Some European countries such as Switzerland, Spain and Austria experienced severer declines, while some other countries in South America seemed take advantage of the Gulf crisis (see Table 2.4).

**Figure 2.13 US Tourist Arrivals in Korea (1962-1995)**

[unit: thousand people]

As in the case of Japanese, US pleasure tourists to Korea are dominant in terms of the purpose of trip, as shown in Table 2.5. Rao et al. (1992) undertook research on the relative importance of activity preference for the four destinations. The four destinations included Mexico, Canada, Caribbean Islands and Europe. They found that factors such as "having more predictable weather" and "sampling the local cuisine" were most important for US pleasure tourists in selecting a destination.

Korea does not seem to put much effort into inducing US tourists to Korea. Chon (1991) examined how the Korea's image as a tourist destination and US tourist perceptions are modified and enhanced through the stages of 'travel to' and 'return travel'. He found that there was a large perceptual differences about safety and security concerns associated with Korea between those who had visited Korea and those who had not. He concluded that the perceived reality of the product (Korea as a tourist destination) was not favourable for US tourists, and the perceived image of the product (expectations about Korea as a tourist destination) was even more negative.

Table 2.5 US Travellers to Korea: Purpose of Trip

<table>
<thead>
<tr>
<th></th>
<th>1993</th>
<th>1994</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pleasure</td>
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<td>5,077 (0.3%)</td>
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<tr>
<td>Official</td>
<td>1,510 (0.1%)</td>
<td>1,336 (0.1%)</td>
</tr>
<tr>
<td>Others</td>
<td>41,455 (2.8%)</td>
<td>46,891 (2.8%)</td>
</tr>
<tr>
<td>Total</td>
<td>1,492,069</td>
<td>1,644,097</td>
</tr>
</tbody>
</table>

Source: MOCS & KNTC (1994).
In terms of seasonality of US pleasure tourists, the pattern is rather consistent and predictable. October, during the Autumn, and June, during the Spring, are considered to be the most popular months in the year for US pleasure tourists to Korea.

Figure 2.14 Trend cycle & Seasonality of US Pleasure Tourists in Korea (1988-1993)


In 1985, US pleasure tourists spent 41% of their total expenditure on shopping, while they consumed only 28% of total on lodging. The money spent on shopping relative to other categories has decreased since 1985, and a greater proportion of their total expenditure was spent on lodging and dining in 1995.
Figure 2.15 Expenditure Patterns of US Tourists in Korea (1985 & 1995)

1985

- Lodging: 41%
- Dining: 4%
- Tours: 6%
- Entertainment: 3%
- Shopping: 18%
- Miscellaneous: 28%

1995

- Lodging: 13%
- Dining: 7%
- Tours: 10%
- Entertainment: 13%
- Shopping: 20%
- Miscellaneous: 37%

2.3.3. Germany

The German outbound market is the world's largest and has great underlying strength. Before the reunification of West and East Germany, the West Germans had been the world's most frequent travellers for many years and they attach great importance to their annual holiday even in times of recession. In 1986, nearly two-thirds of all holidays of 5 or more days had foreign destinations, and German tourists spent DM 44.9 billion abroad. This sum corresponds to about 4 per cent of private consumption and to about 20 per cent of the total tourist expenditures of industrialised Western countries (Schnell, 1991). Germany overtook US in terms of outbound tourists in 1988, and it generated 7.3 million outbound tourists in 1994 and ranked first in the world.

Figure 2.16 German Outbound Tourists (1970-1994)

(unit: million people)


1.2 million German tourists travelled to East Asia and the Pacific region in 1992, accounting for an average increase of 8.8 per cent and 2 per cent of total arrivals from Germany.
Table 2.6 Market Share of German Tourists by Region (Unit: %)

<table>
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<th>Region</th>
<th>1980</th>
<th>1992</th>
</tr>
</thead>
<tbody>
<tr>
<td>Europe</td>
<td>93</td>
<td>92</td>
</tr>
<tr>
<td>Africa, Middle East, South Africa</td>
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<td>2</td>
</tr>
<tr>
<td>Americas</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>East Asia and Pacific</td>
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</tr>
<tr>
<td><strong>Total</strong></td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

Source: WTO (1993), Tourism Trends Worldwide and in East Asia and the Pacific, p.27.

In terms of German outbound tourism, over 90 per cent of all holidays are taken abroad and the majority of trips are to other European countries, particularly, Italy, Austria, and Spain. Table 2.7 shows that Spain is the most popular holiday destination for German tourists.

The general pattern of West German overseas holiday taking in recent years has been a slow decline in the proportion going to its traditional Mediterranean destinations, and an increase in the proportion travelling outside Europe. The proportion taking holidays outside Europe increased from 4 per cent in 1976 to 9 per cent in 1987 and a further increase to 18 percent in 1992 (Devas, 1993a).

Thailand, Hong Kong and Singapore ranked among the top three destinations both in 1980 and 1992, whereas Indonesia and China improved their position in 1994 versus 1980 (see Table 2.8).
### Table 2.7 Destination choice of West German holidaymakers

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</table>

Source: Devas (1993a), Tourism Planning and Research, p.6-3, adapted from BNTS (British National Travel Survey).

### Table 2.8 Top Destinations of German Tourists in East Asia and the Pacific (EAP)

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<td>11</td>
<td>Macao</td>
<td>9</td>
<td>46</td>
<td>42</td>
<td>-8.7</td>
</tr>
<tr>
<td>11</td>
<td>South Korea</td>
<td>11</td>
<td>35</td>
<td>41</td>
<td>17.1</td>
</tr>
<tr>
<td></td>
<td>Others</td>
<td>22</td>
<td>65</td>
<td>70</td>
<td>7.7</td>
</tr>
<tr>
<td></td>
<td>EAP</td>
<td>452</td>
<td>1478</td>
<td>1619</td>
<td>9.5</td>
</tr>
</tbody>
</table>

The destinations which have seen the greatest increase in numbers of German tourists during the 1993 - 1994 period were Thailand, Indonesia, Australia, Malaysia and Korea all with double figure growth, although from a relatively small basis.

Less than 3% (1.6 million) of all outbound German tourists made a visit to East Asia and Pacific area in 1994. Among German travellers to East Asia and Pacific, only about 2.5% (41 thousand) of them visited Korea in the same year (see Table 2.8). However, the number of German tourists to Korea has been rapidly increasing since mid 1970s (see Figure 2.17).

Figure 2.17 German Tourist Arrivals in Korea (1962-1995)

![Graph showing German tourist arrivals in Korea (1962-1995)]


The seasonality of German pleasure tourists is rather less regular than that of Japan and US pleasure tourists. No similarities in the actual monthly data from January 1988 to December 1993 could be found. In other words, the peak month differs from year to year, although trough month seems to repeat regularly each year.
Devas (1991) reported that climate, tradition and school holidays are possibly the main determinants of the pattern of seasonal demand for holidays. These influences mean that throughout Europe, the major proportion of holidays continue to be taken during the summer months. However, additional holidays tend to be taken outside the summer seasons and consequently as the number of additional holidays rises, so the concentration on the summer months has tended to fall. EC statistics show that for France and Italy, August remains by far the most popular starting month for a main holiday while in the UK and West Germany, two other major markets, the main starting period is spread fairly evenly across July and August. Overall across the EC countries, 64 per cent of main holidays begin in either July or August. The month in which additional holidays started were also monitored by the EC, showing that in general these were in the shoulder months before and after the main holiday season. Of course, these shoulder months indicate Spring and Autumn. However, some
countries show high levels of departure in the winter months, which is attributable to skiing holidays.

In terms of German trip purpose to Korea, pleasure tourists take up about 90 per cent and business tourists 7 percent in 1993 and 1994 respectively.

Table 2.9 German Travellers to Korea: Purpose of Trip (1993 & 1994)

<table>
<thead>
<tr>
<th>Purpose</th>
<th>1993</th>
<th>1994</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pleasure</td>
<td>1,331,541 (89.2%)</td>
<td>1,476,031 (89.8%)</td>
</tr>
<tr>
<td>Business</td>
<td>112,137 (7.5%)</td>
<td>114,762 (7.0%)</td>
</tr>
<tr>
<td>VFR</td>
<td>5,426 (0.4%)</td>
<td>5,077 (0.3%)</td>
</tr>
<tr>
<td>Official</td>
<td>1,510 (0.1%)</td>
<td>1,336 (0.1%)</td>
</tr>
<tr>
<td>Others</td>
<td>41,455 (2.8%)</td>
<td>46,891 (2.8%)</td>
</tr>
<tr>
<td>Total</td>
<td>1,492,069</td>
<td>1,644,097</td>
</tr>
</tbody>
</table>

Source: MOCS & KNTC (1994).

German tourists to Korea spent only 3 per cent of their total holiday expenditures on tours in 1985. At that time, a few tourist products were developed and few tour guides for German tourists were available. However, expenditures on tours increased to 16 per cent out of the total in 1995, following the development of tourist products and qualified tour guides for German tourists.

Apart from tours, the proportion of expenditure on lodging in 1995 has slightly increased compared to 1985, whilst the proportion of expenditure on food & beverage, shopping and entertainment has fallen.
Figure 2.19 Expenditure Patterns of German Tourists in Korea (1985 & 1995)

1985

18% Lodging
13% Dining
3% Tours
24% Entertainment
3% Shopping
32% Miscellaneous

1995

8% Lodging
5% Dining
17% Tours
16% Entertainment
16% Shopping
38% Miscellaneous

2.3.4. UK

UK outbound tourism continued to grow during the 1980s despite the effects of the sharp downturn in the UK economy since 1979 (Shaw et al., 1991). The number of trips abroad doubled, from over 15 million in 1979 to over 31 million in 1989. Travel expenditure spent by UK residents on holidays abroad more than trebled from 4.5 billion US($) dollars in 1979 to 15 billion US($) dollars in 1989 at current prices (WTO, 1982 & 1994).

However, after the boom of the late 1980s, the UK outbound market in the first few years of the 1990s has been undergoing important changes against the background of recession. In addition, 1991 began with the Gulf war, which led to a sudden and marked decline in bookings for overseas holidays. Middleton (1991) stated that the effects of the Gulf War, coinciding with the peak bookings season for international travel of UK tourists, wreaked havoc on the package tour business in the first quarter of 1991. However, he argued that the main underlying problem for 1991 and 1992 is the depth and duration of recession in the UK economy.

The poor trading situation, combined with high interest rates and oversupply in the market-place, reduced profit margins and led to a number of company collapses, the biggest of which was that of the International Leisure Group. Together with a growth in the unemployment rate, these poor market conditions led to a loss in consumer confidence and put further pressure on the travel industry throughout 1992 and the first half of 1993 (Lavery, 1993).

Throughout the 1980s the total number of holidays taken by the British population increased steadily. However, this overall growth masks a slow but gradual decline in the numbers taking holidays of four nights or more in Britain,
compensated by a strong growth in the numbers taking holidays abroad.

Figure 2.20 UK Outbound Tourists (1970-1994)

(unit: million people)


In 1992, the number of UK tourist arrivals in East Asia and the Pacific area amounted to approximately 1.8 million, accounting for 6 per cent of all UK outbound tourists.

Table 2.10 Market Share of UK Tourists by Region

<table>
<thead>
<tr>
<th>Region</th>
<th>1980</th>
<th>1992</th>
</tr>
</thead>
<tbody>
<tr>
<td>Europe</td>
<td>81</td>
<td>78</td>
</tr>
<tr>
<td>Africa, Middle East, South Africa</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Americas</td>
<td>10</td>
<td>12</td>
</tr>
<tr>
<td>East Asia and Pacific</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>Total</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

Source: WTO (1993), Tourism Trends Worldwide and in East Asia and the Pacific, p.27.

In 1991, 23 per cent of UK foreign holidays (i.e. trips lasting for one or more nights) were to Spain, including the Balearics, 15 per cent to France, and 7 per cent to Greece. 26 per cent of trips were to destinations outside Europe, and more people went to the USA (9%) than went to Greece (7%) in the same year. Major recent trends have been a sharp
increase in UK long haul holidays probably at the expense of short haul. 1993 saw a rise in popularity of many long-haul destinations (Cooper & Latham, 1995). As shown in Table 2.11, a decline in UK holidays to Spain occurred whilst there was a rise in UK holidays to France.

Table 2.11 Destination Choice in UK Overseas Holidays (Unit: %)

<table>
<thead>
<tr>
<th></th>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Spain including islands</td>
<td>34</td>
<td>23</td>
<td>31</td>
<td>34</td>
<td>34</td>
<td>32</td>
<td>29</td>
<td>23</td>
<td>23</td>
<td>24</td>
</tr>
<tr>
<td>France (including Monaco)</td>
<td>10</td>
<td>14</td>
<td>12</td>
<td>12</td>
<td>11</td>
<td>10</td>
<td>12</td>
<td>14</td>
<td>15</td>
<td>13</td>
</tr>
<tr>
<td>Greece (including islands)</td>
<td>3</td>
<td>7</td>
<td>8</td>
<td>9</td>
<td>10</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>7</td>
<td>9</td>
</tr>
<tr>
<td>Italy</td>
<td>7</td>
<td>8</td>
<td>5</td>
<td>5</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Portugal</td>
<td>1</td>
<td>2</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>3</td>
<td>3</td>
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<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Germany</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>3</td>
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<td>3</td>
<td>2</td>
<td>4</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Yugoslavia</td>
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<td>3</td>
<td>2</td>
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<td>Austria</td>
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<td>4</td>
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<td>2</td>
<td>3</td>
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<td>2</td>
</tr>
<tr>
<td>Republic of Ireland</td>
<td>4</td>
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<td>3</td>
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<td>3</td>
<td>4</td>
<td>3</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Malta</td>
<td>2</td>
<td>4</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>2</td>
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<td>2</td>
</tr>
<tr>
<td>Netherlands</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Switzerland</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Other European Countries</td>
<td>8</td>
<td>6</td>
<td>6</td>
<td>2</td>
<td>5</td>
<td>8</td>
<td>6</td>
<td>5</td>
<td>7</td>
<td>8</td>
</tr>
<tr>
<td>Total Europe</td>
<td>83</td>
<td>80</td>
<td>84</td>
<td>84</td>
<td>84</td>
<td>81</td>
<td>79</td>
<td>77</td>
<td>74</td>
<td>77</td>
</tr>
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<td>USA</td>
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<td>7</td>
<td>2</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>6</td>
<td>6</td>
<td>7</td>
<td>9</td>
</tr>
<tr>
<td>Canada</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Other Rest of the World</td>
<td>5</td>
<td>3</td>
<td>6</td>
<td>3</td>
<td>6</td>
<td>5</td>
<td>7</td>
<td>7</td>
<td>7</td>
<td>6</td>
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<tr>
<td>Total</td>
<td>94</td>
<td>93</td>
<td>93</td>
<td>91</td>
<td>95</td>
<td>93</td>
<td>94</td>
<td>93</td>
<td>92</td>
<td>93</td>
</tr>
</tbody>
</table>

Source: Devas (1993b), Tourism Planning and Research, p.6-1, adapted from BNTS (British National Travel Survey).

Note: Total add to less than 100: the basis of this BNTS table is a survey of all persons taking holidays abroad of 1 or more nights, and a proportion of these could by definition not have spent 4 nights in any one country, which accounts for the under recording.

Devas (1993b) mentioned that the effect of exchange rate fluctuations is evident in trips to the USA which peaked at 7 per cent in 1980, falling to 2 per cent by 1985 but increasing again to take a 9 per cent share in 1991. The
success of the United States has impacted on the pattern of travel within Europe: in particular the Canaries and Madeira have lost business, but other shorter haul destinations have also seen some diversion. 1992 saw continued strength, gradually weakening in the latter half of the year due to sterling devaluation, together with a number of well publicised crimes against British and other foreign tourists.

As shown in Table 2.12, the top five destinations represented 67 per cent of total UK tourist arrivals in East Asia and Pacific area. Thailand shows the biggest loss in ranking position whereas Japan and Hong Kong strengthened their position among the top five destinations. Indonesia was the fastest growing destination of UK tourists in the region with double figure growth in 1995. China and Malaysia are also emerging tourist destination for UK tourists. However, Korea solely achieved negative growth rate in 1992.

Table 2.12 Top Destinations of UK Tourists in East Asia and the Pacific (EAP)

<table>
<thead>
<tr>
<th>Rank</th>
<th>Country of Destination</th>
<th>UK Tourist Arrivals (Thousand)</th>
<th>Growth Rate (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>3</td>
<td>Singapore</td>
<td>128</td>
</tr>
<tr>
<td>2</td>
<td>4</td>
<td>Hong Kong</td>
<td>121</td>
</tr>
<tr>
<td>3</td>
<td>2</td>
<td>Australia</td>
<td>131</td>
</tr>
<tr>
<td>4</td>
<td>1</td>
<td>Thailand</td>
<td>139</td>
</tr>
<tr>
<td>5</td>
<td>6</td>
<td>Japan</td>
<td>91</td>
</tr>
<tr>
<td>6</td>
<td>8</td>
<td>China</td>
<td>37</td>
</tr>
<tr>
<td>7</td>
<td>7</td>
<td>Indonesia</td>
<td>41</td>
</tr>
<tr>
<td>8</td>
<td>12</td>
<td>Malaysia</td>
<td>7</td>
</tr>
<tr>
<td>9</td>
<td>9</td>
<td>New Zealand</td>
<td>34</td>
</tr>
<tr>
<td>10</td>
<td>5</td>
<td>Macao</td>
<td>120</td>
</tr>
<tr>
<td>11</td>
<td>10</td>
<td>Philippines</td>
<td>20</td>
</tr>
<tr>
<td>12</td>
<td>11</td>
<td>South Korea</td>
<td>12</td>
</tr>
<tr>
<td>12</td>
<td>11</td>
<td>Others</td>
<td>115</td>
</tr>
<tr>
<td>10</td>
<td>5</td>
<td>EAP</td>
<td>996</td>
</tr>
</tbody>
</table>


The number of UK tourists to Korea is increasing rapidly after the stagnant period (economic recession and Gulf crisis) in the early 1990s. 47 thousand UK tourists paid a
visit to Korea in 1995 recording 14.5% growth over 1994 (see Figure 2.21).

Figure 2.21 UK Tourist Arrivals in Korea (1962-1995)

( unit: thousand people)


Figure 2.22 Trend cycle & Seasonality of UK Pleasure Tourists in Korea (1988-1993)

The patterns of trend cycle and seasonality of UK tourists are rather unpredictable (see Figure 2.22). In particular, the number of UK tourists in August 1988 and 1991 are over three times higher than that of UK tourists in August the other years. The number of UK tourist arrivals in August 1988 can be explained by 1988 Seoul Olympics. However, the number of UK tourist arrivals in August 1991 seems to be resulted from rigorous overseas marketing promotion conducted by KNTC in London. Even if those two outstanding months are put aside, not much clear pattern of the monthly data is given.

<table>
<thead>
<tr>
<th>Purpose of Trip</th>
<th>1993</th>
<th>1994</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pleasure</td>
<td>1,331,541 (89.2%)</td>
<td>1,476,031 (89.8%)</td>
</tr>
<tr>
<td>Business</td>
<td>112,137 (7.5%)</td>
<td>114,762 (7.0%)</td>
</tr>
<tr>
<td>VFR</td>
<td>5,426 (0.4%)</td>
<td>5,077 (0.3%)</td>
</tr>
<tr>
<td>Official</td>
<td>1,510 (0.1%)</td>
<td>1,336 (0.1%)</td>
</tr>
<tr>
<td>Others</td>
<td>41,455 (2.8%)</td>
<td>46,891 (2.8%)</td>
</tr>
<tr>
<td>Total</td>
<td>1,492,069</td>
<td>1,644,097</td>
</tr>
</tbody>
</table>

Source: MOCS & KNTC (1994).

As in the case of German tourists, approximately 90 per cent of total UK arrivals were for pleasure and about 7 per cent of them were for business in 1995. The rest of the number for other purpose are small enough to be neglected.

In terms of expenditure patterns, the interesting point which can be distinguished from the other origin countries is that UK tourists tend to spend over half of their total expenditures on lodging, showing not much change between 1985 and 1995. The rate of expenditures on entertainment and tours has been increased while that of expenditures on shopping and dining has been decreased.
Figure 2.23 Expenditure Patterns of UK Tourists in Korea (1985 & 1995)

1985

- Lodging: 20%
- Dining: 13%
- Tours: 4%
- Entertainment: 5%
- Shopping: 3%
- Miscellaneous: 5%
- Total: 55%

1995

- Lodging: 17%
- Dining: 11%
- Tours: 6%
- Entertainment: 5%
- Shopping: 5%
- Miscellaneous: 1%
- Total: 56%

2.4. Chapter Summary

In this chapter, the outline of international demand for tourism to Korea focusing on four origin countries has been reviewed in order to identify their trends and travel propensity. Examining the historical background of generating countries based on statistical data seems critically important for forecast in that quantitative predictions are unlikely to be made without relevant past data or information. Therefore, the collection of statistical data or information are essential for the analysis of tourism demand.

For international demand for Korean tourism, the number of total arrivals are steadily increasing year by year, and the Japanese and US markets occupied over 50% out of the total in 1994. It is obvious that Korea has been heavily depend upon Japanese and US markets. It has been suggested that market diversification should be developed by accelerating overseas marketing promotion in order to redress the imbalance of international market share (Kim, 1989, p.44). There was some change in rank among markets showing the staggeringly increased number of tourists from socialist and former communist countries. Russia topped the list in 1994, generating 153,777 tourists to Korea, up 31.6% from 1993. Tourists from China rose to 140,985, a 41.0% increase from 1993.

In terms of tourism by purpose, pleasure tourists accounted for 57% followed by business tourists(11%) and VFR (10%) in 1994. The number of pleasure tourists to Korea in 1994 stood at 2,040,259, an increase of 7.3%, whereas business travellers decreased by 2.4%. Almost 90% (1,476,031) of Japanese visitors come for pleasure, as do 33.4% (110,919) of American visitors.
The seasonal pattern of tourist arrivals indicates that August and October are regarded as peak month while December through February are still showing low volume, and this seasonal fluctuation should be tackled by developing new tourist products and marketing strategies. The expenditure patterns of the four countries was broken down into six categories and was reviewed in order to compare the consuming behaviour in 1985 with that in 1995.
CHAPTER III

FRAMEWORK FOR TOURISM FORECASTING
3.1. Introduction

This chapter looks at the contents in which tourism forecasting is carried out. This is important because there are a number of considerations which alter the choice of forecasting method and the quality of the forecast. In the course of this chapter, the following questions are addressed.

1. Why does the tourist industry need forecasts?
2. What kind of steps are involved in the process of tourism forecasting?
3. What are the general restraining elements of forecasting?
4. What are the determinants of tourism demand?

In order to answer to the questions above, this chapter first deals with the rationale for tourism forecasting. Secondly, the process of forecasting is broken down into five steps to provide a framework for practical forecasting. Thirdly, the some restraining elements of forecasting are briefly identified. The determinants of tourism demand are critically reviewed, since these determinants are to be represented by the variables which are incorporated into a forecasting model. Finally, the problems of tourism forecasting are discussed.
3.2. The Rationale for Tourism Forecasting

There are many ways of justifying the use of forecasting techniques in tourism, but the most frequently cited reason is that forecasting tourism demand is required for competent decision making.

This decision-making is largely done during the procedure of either planning or management. In forecasting tourism demand, government policymakers are usually concerned with tourism planning, while in the private sector main task is likely to be tourism management. In Table 3.1, planning and management is divided into two categories, the design stage and the implementation stage. At the design stage, government policymakers are involved with tourism policy and the development of infrastructure, while managers in tourism businesses might undertake feasibility studies to examine whether planned business ventures are financially viable or not.

| Table 3.1 The Purposes of Forecasting in Tourism by Policymakers and Managers |
|---------------------------------------------------------------|---------------------------------------------------------------|
| **Design Stage**                                              | **Implementation Stage**                                      |
| * Tourism Policy                                             | * Demand management for the optimal use of infrastructure     |
| * Development of infrastructure                               | * Human resource management                                  |
| * Cost and benefit analysis                                   | * Demand management for profit maximisation                  |
| * Human resource management                                   | * Human resource management                                  |

The following two sections describes the need for forecasting of tourism demand in detail, from the perspective of tourism planning and management.
3.2.1. Tourism Planning Perspective

Physical construction for the tourism industry often involves a considerable amount of financial investment, whether it is incurred by government or business. In particular, the massive investment cost for infrastructure sometimes daunts the authorities concerned, and the private sector would not be prepared to step into such a high-risk investment.

Infrastructure includes all forms of construction above and below ground needed by an inhabited area, with extensive communication with the outside world as a basis for tourism activity in the area. Adequate infrastructure is essential for destination areas and mainly comprises transportation (road, railway, airport, car parks), utilities (electricity, water, communications) and other services (health care and security). It is normally shared by residents and visitors at the same time.

Whereas infrastructure tends to be provided by the public sector, superstructure is normally owned by the private sector, as it is the profit-generating element of the destination. It includes accommodation, built attractions, retailing and other services. In a capitalist or mixed economy, the development of superstructure is usually the responsibility of the private sector, or in some areas, of public corporations (Inskeep, 1991). Likewise, to some extent, public-sector finances are invested to provide incentives to the private sector. For example, public sectors are constructing infrastructure in order to encourage the private sector to join the development of a tourist destination area.

The success of tourism planning and development, particularly the construction of infrastructure and superstructure will heavily depend upon the accuracy of either long-term or mid-
term forecasting for tourism demand. If the demand for tourism were not predicted accurately for longer term planning, there might be shortages of hotel accommodation, passenger transportation capacity and trained staff, and these often cannot be increased rapidly (Witt & Witt, 1992).

A large number of tourism plans are likely to be unsuccessful if poor forecasts are generated. Given the fact that such plans are made in an environment which is constantly changing because of forces acting outside the control of the authorities, often outside the geographical area of the destination, perhaps this is not surprising (Cooper et al., 1993).

Choy (1991) pointed out that there has been little follow-up research on actual accomplishments of tourism plans. He examined the tourism plans of three representative Pacific island destinations which were implemented but failed to succeed. He concluded that poor projection or inaccurate forecasting played a significant role in their failures. He also concluded that government tourism plans have little chance of influencing market forces, and unrealistic assumptions about this had also been responsible. Therefore, the physical planning and development must be cautiously implemented based on reliable forecasts.
3.2.2. Tourism Management Perspective

The main concern of managers in the tourism industry may be appropriate resource allocation (human and facilities) and marketing (such as planning, pricing, advertising, etc.). For successful marketing and efficient management, forecasting is inevitable:

A manager must plan for the future in order to minimise the risk of failure or, more optimistically, to maximise the possibilities of success. In order to plan, the manager must use forecasts. Forecasts will always be made, whether by guesswork, teamwork, or the use of complex models, and the accuracy of the forecasts will affect the quality of the management decision (Archer, 1994, p.105).

However, the characteristics of tourist products are different from that of other business products. Not only is the fixed cost of facilities in the tourism supply side normally very high but also some products such as hotel rooms and airline seats cannot be stored for later use. Although hotel rooms and airline seats can be part of a tourist product, they may not be able to represent a tourist product.

Tourist products are also associated with services which are intangible. Therefore, defining the tourist product is confounded by some of its unique nature such as intangibility and perishability. Tourist products are often called an 'amalgam of total experience' (Holloway, 1989) because they cannot be delivered to consumers for them to experience; in other words, the consumer is taken to a tourist product before he or she can appreciate it. That is why a number of travel agencies often use the image of a tourist destination for the advertisement of holiday package.
Nevertheless, it may sound obscure to define tourist products as an amalgam of total experience. Middleton (1988) made an attempt to define tourist products systematically. He breaks tourist products down into five components as follows:

* Destination attractions
* Destination facilities & services
* Accessibility of the destination
* Images and perceptions of the destination
* Price to the consumer

(Middleton, 1988, p.79)

Among these five components, destination facilities and services and the accessibility of the destination need to be developed carefully since the fixed cost is very high. The destination facilities include accommodation, restaurants, etc. while the accessibility of the destination encompasses infrastructure such as roads, airports, railways, seaports and so on. Planners need to take into account the future demand before the establishment of these facilities and infrastructure.

Witt (1994, p. 337) highlighted that tourism products have to be understood on two levels, the overall and the specific standpoint. Firstly, the overall tourism product comprises a combination of all the service elements a visitor consumes from the beginning to the end of their stay. This product is an idea, an expectation, or a mental construct in the consumer's mind, at the point of sale. Secondly, the specific product implies mainly commercial products. Certainly, these products are always components of the overall tourism product, and include core products offered by accommodation, transport, attractions, and other facilities for tourists, such as car rental and ski hire.

One of the most distinct features of the tourist product is its perishability. Airline seats and hotel rooms are
regarded as one of the most representative tangible tourist products. However, they cannot be stored for later sale because of their perishability. For example, Kotas (1975) emphasised the importance of forecasting by explaining the nature of hotel products. Not only the hotel rooms but also food, to some extent, are perishable products from his point of view.

In order to carry on a hotel and catering business successfully, managers should be aware of the customers' demand. The customers' demand indicates not only the quality of intangible service but also the volume of products. Wanhill (1980) mentioned that accommodation is non-storable, so the peak demand will determine supply. Jones and Lockwood (1989) also emphasised that the success of the hotel is in the maximum use of its resources. The maximum use of resources can be achieved by knowing the nature of demand and its planned capacity. Although they did not mention forecasting methods, they stressed the difficulty and importance of prediction.

Managers nowadays are likely to be successful if they have knowledge about a range of forecasting techniques. Although this can be argued in a sense that what managers require is the accurate forecasts, not the details of the whole forecasting process. However, forecasting techniques used in businesses need to be monitored and refined to achieve better forecasts. Therefore, the feedback effect which may be produced by the communication between forecast specialists and managers is essential for better forecasts, and this communication is unlikely to be successful without the knowledge of his or her counterpart's work. Barron and Targett (1985) pointed out that bringing forecasting non-specialists into the process and maintaining their participation is a key factor for the future of business forecasting.
Accordingly, the success of hotel business is likely to depend on how to forecast the level of rooms and foods demand accurately. Kim (1994) found that managers in most of luxurious hotels in Seoul used either simple trend projection or intuition. He concluded that Box-Jenkins and Winters exponential smoothing were the best among univariate time-series models for forecasting hotel rooms demand on monthly base, and suggested that the combination of the quantitative and qualitative approach might be able to produce better forecasts.
3.3. Forecasting Process

The forecasting process can be a formal structure of sequential steps that leads to a defined objective. Forecasting might be broken down into three stages: design stage, specification stage and evaluation stage. Although the selection of an appropriate forecasting technique in the specification stage is a core part, the other stages should not be underestimated because they also affect the performance of forecasting.

Winklhofer et al. (1996) attempted to summarise the findings of 41 studies related to forecasting practice. Based on these research, they develop a basic framework for the organisational forecasting process. Largely, they broke down the issues into three categories: design issues, selection/specification issues and evaluation issues (see Figure 3.1). Design issues comprise the purpose and type of forecast required, the resources committed to forecasting, the characteristics of forecasting preparers and users and the data sources used. Selection/specification issues are concerned with forecasting techniques and address questions of familiarity, selection and usage of alternative forecasting methods. Finally, evaluation issues focus on the outcomes of forecasting activity as reflected in the presentation and review of forecasts, the evaluation of forecast performance and the forces adversely affecting forecast accuracy.

On the other hand, Frechtling (1996) divided the forecasting process into four phases: design phase, specification phase, implementation phase and evaluation phase. The design phase guides the forecaster in choosing the appropriate forecasting method. This phase examines the problem, the resources and relationships that help determine a preliminary choice of method.
Figure 3.1 Framework for Organisational Forecasting Practice

DESIGN ISSUES
* Purpose/use of forecast
* Forecast level
* Time horizon and frequency of forecast preparation
* Resources committed to forecasting
* Forecast preparers
* Forecast users
* Data sources

SELECTION/SPECIFICATION ISSUES
* Familiarity with forecasting techniques
* Criteria for technique selection
* Usage of alternative forecasting methods

EVALUATION ISSUES
* Forecast presentation to management
* Forecast review and use of subjective judgement
* Standards for forecast evaluation
* Forecast performance
* Forecasting problems and forecast improvement

Figure 3.2 The Forecasting Process

### Design Phase
- A. Define the problem
- B. Determine user needs
- C. Determine variables to be forecast
- D. Determine resources available
- E. Hypothesize relationships
- F. Determine data availability
- G. List available forecasting methods
- H. Apply preliminary selection criteria
- I. Make a preliminary selection of method

#### Quantitative method specification phase
- A. Specify relationships if a causal method
- B. Collect, prepare and verify input data
- C. Select the starting model and program it
- D. Estimate model parameters
- E. Verify their reasonableness
- F. Determine the model's accuracy in the past
- G. Test other models
- H. Compare their accuracies and choose the best model
- I. Document results to date

#### Qualitative method specification phase
- A. Specify the method to be implemented
- B. Detail how the experts will be selected
- C. Indicate what phenomena will be covered
- D. Document the plan

### Implementation phase
- A. Obtain the forecast
- B. Make subjective adjustments, if necessary
- C. Document the model and its results
- D. Present the forecast to management

### Evaluation phase
- A. Monitor forecast accuracy
- B. Determine the causes for any deviations
- C. Revise the forecast, if warranted
- D. Determine if parameters have changed
- E. Generate a new forecast from existing model or develop a new model

Source: Adapted from Frechtling (1996), pp. 38-49.
As shown in Figure 3.2, the specification phase includes determining the relationships that will comprise the appropriate forecasting model and selecting an appropriate model. The implementation phase comprises employing the selected model to generate forecasts and preparing these forecasts for presentation to management. The evaluation phase covers monitoring the forecasts over time to determine if adjustments should be made and making the appropriate adjustments to secure the most accurate series of forecasts.

Frechtling (1996) attempted to break down the forecasting process in detail by adding the implementation phase between the specification and evaluation phases. It is assumed that the implementation stage might be regarded as the part of evaluation stage in Winklhofer's process. Although Frechtling process is described more specifically than Winklhofer's one, both forecasting processes have similarities in general.

The following three sub-sections will describe the design, specification and evaluation stages within the context of forecasting.

3.3.1. Design Stage

The first thing to do in the design stage is clearly to identify the purpose of forecasting; What is the purpose of making forecast?. This question must be given iteratively until it becomes as clear as possible. In terms of tourism demand forecasting, there are some distinct objectives. For example, the future level of tourists demand toward a certain destination, demand for hotel rooms, airline seats, theme parks are frequent subjects of tourism forecasting. This is closely associated with the choice of dependent and independent variables for forecasting.
The next step is to determine the forecast horizon. In general, a time horizon can be divided into three categories; short-term, medium-term and long-term. Makridakis and Wheelwright (1989) add the immediate-term forecast, which is less than one month.

Once this classification is accepted, the length of time in each case must be determined. Archer (1987) defined short-term demand forecasts as up to two or three years, while Makridakis and Wheelwright (1989) limit short-term forecast to one or three months. However, the type of measurement should be initially considered in order to define the time horizon. For example, if one makes forecasts on a daily base, forecasting a year later would be considered as long-term forecast. On the other hand, if a forecast is made on a yearly base, one year horizon would be regarded as short-term forecast.

In addition, the resources such as money (for purchasing data and computer software) and time (for completing and presenting the forecasts) should be considered. In general, costs are incurred in the development and operation of application (computer software program for forecasting), and data preparation. There can be also opportunity costs in terms of other applications that might have been used. The variation in costs is likely to affect the attractiveness of different methods in different situations. Nowadays, a number of quantitative forecasting techniques are being programmed by computer languages and released for commercial use. A software package of univariate time series analysis usually costs less than that of econometric analysis in monetary terms. The more sophisticated functions a software program has, the higher is the expected cost. On the other hand, the cost of qualitative forecasting is less likely to be measured appropriately.
Understanding the pattern of a data series can be very important when choosing a proper method for forecasting it. For example, some data series may contain a seasonal attribute or trend pattern. On the other hand, others may just have an average value with random fluctuations, as is found frequently in social science research. It is vital to link the presumed pattern (or patterns) in the data with the appropriate technique because different forecasting methods vary in their ability to predict different types of patterns.

3.3.2. Specification Stage

Even though a range of forecasting techniques are available, users have to be familiar with those techniques or they may find it impossible to analyse the results.

Several studies have been conducted which focus on companies' familiarity with forecasting techniques (e.g. Wheelwright and Clark, 1976; Mentzer and Cox, 1984a; Sparkes and McHugh, 1984; Sanders, 1992; Fildes and Hastings, 1994; Sanders and Manrodt, 1994). They all conclude that managers in firms are more familiar with judgmental forecasting techniques than quantitative ones. They found that the least familiar judgmental forecasting methods appear to be cross-impact analysis and the Delphi method, while Box-Jenkins was one of the least known quantitative methods.

Amongst quantitative methods, Witt and Witt (1992) found that multiple regression and moving average techniques seem most popular, with moving average being preferred for short-term forecast horizons and multiple regression for long-term forecast horizons. On the other hand, Box-Jenkins was not used by any of the tourism practitioners whom they surveyed.
In this stage, the criteria for choosing a forecasting technique need to be considered. Although there might be a number of criteria for technique selection, accuracy seems to be the most popular criterion. For example, Witt and Witt (1992) discovered in their survey that accuracy was clearly the criterion most frequently ranked and most important for all three forecasting horizons (short, medium and long-term). There were three cases where accuracy was not ranked first. Tourist offices and government departments rated 'speed' more highly than 'accuracy' for short-term forecasts, and both the consultancy and "other practitioner" groups ranked accuracy below 'ease of use' for the long-term forecasts. 'Cost' was found to be less important than three other categories (accuracy, ease of use, speed) for short and medium-term forecasts, becoming more important than 'speed' for long-term forecasts (see Appendix Table A3.1).

Additionally, Mahmoud et al. (1988) found that respondents rated accuracy as the most important criterion, followed by ease of use, data requirements, time horizon, data pattern, number of items to be forecast and availability of software.

This study also focuses on the accuracy for the evaluation criterial of forecasting performance, and the details are described in section 5.4.

3.3.3. Evaluation Stage

In the evaluation stage, forecast performance and forces adversely affecting forecast accuracy need to carefully monitored. Forecast performance might differ from technique to technique depending upon the criteria chosen for measuring accuracy. These criteria will be addressed in detail in Chapter Five.
Winklhofer (1996) attempted to identify factors influencing forecast accuracy systematically. He broke these factors down into two categories (company characteristics and forecasting process characteristics), and made an agenda of factors influencing forecast accuracy based on the past research. He found that company characteristics include firm size and age, competition in the market and size of market area served; while forecasting process characteristics encompass the time horizon of forecasts, individual function of the forecast, number of products forecast, number of applications of the forecast, sales volume forecast, number of people preparing forecasts etc.

Not much research has been done on forecasting performance in the tourism field. Notably, however, Witt and Witt (1992) concluded in their research on forecasting international tourism demand that the naive I and autoregressive models consistently outperform the other forecasting methods selected and examined for their research. This implies that the degree of complexity of a forecasting technique does not necessarily go together with its accuracy.

Once the performance has been checked, the forecast users and preparers need to examine the problems and improvements of the forecasting technique currently being used. From the survey results of the Dalrymple (1987), Mentzer and Cox (1984), and Wheelwright and Clarke (1976), there are significant differences between a users' and a preparers' perception. Users are more concerned about forecasting accuracy. They prefer simple rather than sophisticated methods, but they depend more upon subjective than objective methods, particularly for aggregate forecasting tasks. Forecast preparers, on the other hand, prefer more sophisticated techniques and believe that forecasting accuracy can be improved through more complex methods.
Forecasting problems are not only caused by the use of an inappropriate forecasting technique but also may arise from the management side. Makridakis and Wheelwright (1989) attempted to characterise forecasting problems seen by management and possible improvements. They divide problems into five major categories and these are shown in Table 3.2.

Table 3.2 A Framework for Matching Forecasting Problems and Solutions

<table>
<thead>
<tr>
<th>Major Classes of Problems</th>
<th>Major Elements of Solutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bias, gaming, negotiating, politics</td>
<td>Incentive for forecasters, rewards, punishments</td>
</tr>
<tr>
<td>Credibility, impact</td>
<td>Relevance of forecasts, when, where and how: Interpersonal, users and preparers, organisational positioning</td>
</tr>
<tr>
<td>Lack of improvement, plateaued, stale</td>
<td>Resource commitment, development plan, periodic reviews</td>
</tr>
<tr>
<td>Base of experience, data knowledge</td>
<td>Getting started, good practice, forecasting strategy</td>
</tr>
<tr>
<td>Major weaknesses, opportunities to improve</td>
<td>Response to change, environment, completeness</td>
</tr>
</tbody>
</table>


Makridakis and Wheelwright (1989) discussed five major classes of problems, and these problems are summarised as follows.

**Bias:** Forecasting is often caught up in an organisational whirlwind that biases its representation of future outcomes and decreases its accuracy considerably.

**Credibility and Impact:** Forecasting often has little impact on decision making because the forecast lacks relevance in terms of what, when, how, and in what form such forecasts are provided. The problem may be interpersonal (for example, when those who prepare the forecasts and those who use them fail to communicate effectively), or it may be one of
organisational structure, that is, forecasting may be unlikely to have much impact on decision making because of the level at which it is performed.

Lack of Recent Improvements in Forecasting: Sometimes forecasting is no longer improving simply because the resources committed to it have become so stretched in maintaining ongoing forecasting procedures that no new development is possible. At other times, it may not improving because there is not enough commitment to attain the next level of substantial progress or because organisational change and managerial interface problems are not recognised.

Lack of Firm Base on Which to Build: Resources or emphasis committed to forecasting may be insufficient for it to make substantial impact. The resources here include such as a data base and a computer software program which provides various forecasting techniques. Even when the resources have been committed, knowledge of good forecasting practice and available methods may be lacking during start-up.

Weaknesses and Major Opportunities for Improvement: Organisations may not be quite satisfied with what is being done if certain areas were not being handled systematically as part of the forecasting system, or if performance was not yet at the expected level.

Sanders (1992) and Sanders and Manrodt (1994) emphasised that improvement can be achieved by better data, greater management support and better training, in that order. On the other hand, Fildes and Hastings (1994) state that improvement of forecasts depends on the structure of an organisation. For example, better connection with the market research department might improve forecasting performance.
3.4. Restraining Elements for Forecasting

Most of the restraining elements seem to be related to the issues in the forecasting process previously mentioned. Several elements of forecast restraint exist and they are likely to determine the choice of an appropriate forecasting technique. In this section, seven major elements will be pointed out and explained. These elements include the time horizon, pattern of data available, accuracy, resources, cost, simplicity of application, and forecaster.

3.4.1. Time Horizon

The choice of appropriate forecasting method is constrained by the time horizon (how far into the future the forecast extends). The univariate time series model is regarded as a rigorous technique for short-term forecasting, while causal models are often at their most useful in making longer-term (medium-term and long-term) forecasts. For short term (a few months or one year), delays in the causal effects as well as the time before new data are available would probably imply that it may not be worthwhile trying to determine the causal influence (Barron & Targett, 1985). On the other hand, for the long-term (over ten years) there is always a possibility that causal effects may alter, raising doubts about the validity of this type of forecast. Therefore, the farther away the time horizon, the more the likelihood of the forecast being dependent on the qualitative forecasting techniques.
3.4.2. Data

Forecasters can be frustrated by the unavailability, inaccessibility or lack of data. Furthermore, the choice of an appropriate forecasting method is restricted by the reliability and accuracy of the data available. No matter how trustworthy the forecasting method, the results are unlikely to be accurate if the underlying data are unreliable or contain biases that cannot be eliminated. The less data available to forecasters, the more they are dependent on qualitative methods rather than quantitative forecasting techniques.

3.4.3. Accuracy

The main purpose of forecasting by tourism planners and practitioners is to help formulate and improve managerial decisions. In principle, therefore, such predictions ought to be assessed according to the degree to which they succeeded in reducing errors in the decisions. It seems reasonable to measure the quality of the forecasts principally by their accuracy. Although it may not be sufficient to know the size of forecasting errors in order to determine the consequences of these errors for the decision based on the forecasts, the decision maker, in general, will rightly prefer forecasts from a source which proved to have a significant advantage in accuracy over others.

3.4.4. Resources

The main resources here refer to money for obtaining data, computer hardware and computer software. No matter how expensive and sophisticated a given quantitative forecasting method is, it is seldom possible to apply it without
appropriate computer programs. Therefore, the availability and simplicity of computer programs is also important. In addition, such programs must be easy to use with less "bugs" (program errors). In the hotel industry, for example, yield management is unlikely to be efficient without effective forecasting of demand for rooms. Although yield management is neither a computer system nor a set of mathematical techniques, computer-based tools can be a key component of a yield management (Lieberman, 1993). For a small hotel, not only can it hardly afford to have a high technological yield management system but it might require one less than a large establishment.

3.4.5. Cost

The cost involved in the application of forecasting procedures can be categorised into two aspects: data preparation and acquisition of a forecasting tool. Although it is relatively easy to obtain data for econometric analysis, some analysis requires specific data which are not available and need to be gained by a survey. In this case, the cost will depend upon the sample size, time length, area, etc. Forecasting tools can be obtained either by purchase of software programs available or by the development of a particular forecasting technique. The latter way normally costs more than the former. However, the latter is unavoidable when a forecasting technique is not available as a product.

3.4.6. Simplicity and Ease of Application

The ease of application will be another restraining element since a great number of decision makers who need forecasts are familiar with neither statistics nor computer software programs. The more knowledge on the use of forecasting tools
the decision makers have, the more information they are likely to have for their decisions. Software companies contribute a lot to this by creating software programs which are easier and more friendly to use. For example, most software programs now run under the Windows with its Graphic User Interface (GUI).

3.4.7. Forecaster

It is possible that undesirable forecasts can be generated because of human mistakes. In computer technical terms, there is GIGO (Garbage In Garbage Out). This implies that the one responsible for an error is not computer itself but computer user. For example, it is likely to affect the quality of forecast when a causal model is misspecified. There may be a bias towards the rejection of economic hypothesis. In some cases, important omissions of negative results may be encouraged by the experts but in others, it may be deliberate on the part of forecaster(s), or due to a lack of effort in evaluating the model (Bewley, 1997).
3.5. Determinants of Tourism Demand

Although a number of determinants of tourism demand were identified by researchers, few of them seem to be practically employed for forecasting. The most likely reason for this seems to be that the statistical and chronological data of a certain determinant were neither collected or were difficult to quantify. Therefore, proxy or surrogate variables are applied to a forecasting model instead of using genuine variables which were identified and assumed to be effective.

In this section, determinants which were practically employed for tourism forecasting will be examined based on the past research.

3.5.1. Dependent Variables

The choice of the right dependent variables representing the tourism demand is critically important, and it will represent the travel propensity of a specific group or country. The prerequisites of using a dependent variable are its availability and adequacy. Some people attempt to forecast a specific dependent variable, whilst others are just concerned with identifying the interrelationship between independent variables and a dependent variable.

In terms of demand for tourism, Cooper and Wanhill (1993) noted that travel propensity and travel frequency are useful indicators of tourism participation. Travel propensity gives the proportion of the population who actually engage in tourism, while travel frequency refers to the average number of trips taken by those participating in tourism, during a specific period. For detailed calculation of travel propensity and travel frequency see Appendix 3.1.
Amongst the various possible dependent variables, the most frequently used in empirical studies are the number of tourist arrivals and tourist expenditure. Many researchers have studied forecasting or measuring the level of tourism demand by using various quantitative and qualitative techniques. For econometric analysis, notably Jud and Joseph (1974), Bechdolt (1973), Blackwell (1970), Witt and Martin (1985), Gunadhi and Boey (1986), Lim (1986), Haitovsky, Salomon and Silman (1987) and Kim (1988) used the number of tourist arrivals as a dependent variable. On the other hand, Gray (1966), Artus (1970, 1972), Stronge & Redman (1982), Chadee & Mieczkowski (1987) and Summary (1988) preferred to use the amount spent by tourists as a dependent variable.

Kim (1988) classified the measurement criteria for all types of travel demand into four categories:

- A doer criterion; number of tourist arrivals, number of visits, visit rate, etc.

- A pecuniary criterion; the amount of expenditure (receipt), share of expenditure (receipt) over income, etc.

- A time-consumed criterion; visitor-days, visitor-nights, etc.

- A distance-travelled criterion; distance travelled in mile or kilometre, etc. (Kim, 1988, p.25)

Although most types of travel demand can fall into the above categories, doer criterion and pecuniary criterion seem to be dominant among these criteria.
3.5.2. Independent (Explanatory) Variables

An important element of any definition of tourism is travel. The decision to travel is affected by a range of factors such as economic factors, social/demographic factors, political factors, technological factors etc. It would be very important to test the significance of an explanatory variable in order to examine whether it influences the demand for tourism or not. However, this is not a simple issue to resolve and is complicated by many factors such as lack of proper data. Apart from the economic factor, other factors such as policy change and special events have qualitative characteristics. Therefore, the inclusion of these factors in demand analysis may depend upon how to quantify them. The use of these qualitative factors by quantifying may lead to invalid estimation of the tourism demand model.

This section mainly focuses on economic factors. The explanatory variables used in international tourism demand analysis can be selected, defined and sometimes modified in order to fit the model and explain the dependent variable as accurately as possible. Although the price of a commodity and the level of income are still regarded as important elements of demand from the perspective of economics, other monetary variables, such as exchange rates should not be underestimated. Although marketing expenditure variable is also considered in this section, very few research were undertaken mainly due to the lack of data. Lagged dependent variable and dummy variables are also considered because of their frequent use in demand analysis. Nevertheless, the degree of significance of these elements may differ from country to country or individual to individual.
3.5.2.1. Income

Income is regarded as one of the critical economic factors among the determinants of demand for tourism. The responsiveness of demand for a product to changes in income is termed income elasticity of demand, and is defined as

\[ \eta_y = \frac{\text{percentage change in quantity demanded}}{\text{percentage change in income}} \]  (3-1)

For most products, increases in income lead to increases in quantity demanded, and income elasticity is therefore positive. If the percentage change in quantity demanded is larger than the percentage increase in income, \( \eta_y \), will exceed unity. The product's demand is then said to be income-elastic. For the opposite case, the product's demand is said to be income-inelastic.

Archer (1976) described the relationship between the demand for tourism and the level of household disposable income through time. He divided the relationship into three stages as depicted in Figure 3.3.

Stage (i) indicates that the tourist product can be regarded as normal goods, which means quantity demanded increases as income increases. As income grows beyond a certain point, people will switch their demand from relatively low quality tourist products to alternative higher quality ones. However, further rises in incomes do not affect any additional demand beyond OA which is the starting point of stage (ii). Stage (iii) is possible if the tourist product is regarded as inferior goods.
Figure 3.3 The Relationship between the Demand for Tourism and the Level of Household Disposable Income through Time

The quantity of tourism per period of time

Figure 3.3 seems to be derived from the Engel curve which is logical and reasonable. However, Cooke (1994) criticised that the Engel curve does not lend itself to practical application for two reasons. First, economists tend to be interested in broader categories of goods and services for which there is no common unit of measurement. The items which can be included in a general category of 'leisure goods and services' are extremely varied. Second, consumers may not change the actual number of units they consume of a particular commodity in response to a change in income but simply switch between high- and low-quality brands within the same product category. For example, a rise in salary may prompt joining a squash club as opposed to going to the local public leisure centre. Thus, although the number of games played has not actually changed, the amount of money spent on the activity has. Therefore, the quality of a tourist product should be considered as well as its quantity, when
analysing the relationship between income and demand for tourist products.

In many quantitative demand models, personal disposable income is frequently used as an independent (or explanatory) variable. Although the personal disposable income was described by many authors of economic related books, Burda & Wyplosz (1993) seem to explain the concept of it logically. They explained disposable income as follows with a comprehensive graph:

Depreciation is stripped away from GNP to obtain net national product (NNP), Indirect taxes are removed from, and firm subsidies added to, NNP, yielding national income at factor prices (NI). After this, national income is distributed; firms' savings (retained earnings), corporate taxes, and contributions to social security are subtracted from national income, and what remains is paid to households as various forms of income. The government also transfers income to households (social security, unemployment insurance, etc.). This results in personal income (PI). After income taxes and some miscellaneous fees, we are left with personal disposable income (PDI), that is, resources available to households for spending or saving (M. Burda & C. Wyplosz, 1993:p.31).

However, it is argued that gross income gives little indication of the money available to spend on tourism, nor does disposable income. The demands on disposable income actually include essentials such as housing, food and clothing. Therefore, the most useful measure of the ability to participate in tourism is discretionary income. The discretionary income means the income left over when tax, housing and the basics of life have been accounted for. Accordingly, two households with the same gross incomes may have very different discretionary incomes (Latham, 1993a).
However, the statistical data on discretionary income is not available in practice.

Figure 3.4 From Expenditure to Income to Personal Disposable Income

Empirical evidence indicates that high growth rates of tourism in the past have been associated with high growth rates in the economies of the tourist generating countries and a consequent increase in personal incomes (in relation to increased leisure time). Theoretically, therefore, income is expected to have a significant positive effect on the demand for tourism.

In fact, Edwards (1976, 1982) introduced the discretionary income variable in his demand forecasting model. The reason why this variable has not been widely adopted by many researchers seems to be that it does not appear formally in the national accounts statistics. He pointed out the limitation of using the discretionary income variable by saying that "there is no generally used definition since what is not an essential is a matter of opinion, and it could vary among societies to societies" (Edwards, 1976, p.46). For convenience, he defined it, as an approximation; "total
disposable income at constant prices less expenditure on food, housing, fuel and light" (Edwards, 1976, p.49)

In practice, the most frequently employed measure for income has been per capita disposable income (at real prices). Gray (1966), for example, in a pioneer study, estimated the following models, using alternatively per capita disposable and national income of the tourist origin country, in order to study travel imports by Canada and the US:

\[
\begin{align*}
R_i &= a_{1i} Y_{ij} E_{ij} e^u \\
R_i &= a_{2i} Y_{ij} Y_{ij} C_{ij} e^u \\
R_i &= a_{3i} Y_{ij} e^u \\
\end{align*}
\]

where

- \(R_i\) = Tourist Revenue by Country \(i\)
- \(Y_{ij}\) = Per Capita Disposable / National Income in Country \(j\)
- \(E_{ij}\) = Exchange Rate of \(i\)'s Currency in terms of US dollar
- \(C_{ij}\) = Cost of Travel between \(i\) and \(j\)

Canadian and US travel imports were found to be extremely income elastic \((4.99 \leq \epsilon, \leq 7.01)\) for both disposable and national income. However, in a study aiming to estimate projections of numbers of tourists to Ireland for 1969-78 in order to forecast accommodation requirements (Blackwell, 1969), income elasticity was found to be around unity.

Artus (1970) was concerned with German tourist expenditure overseas and with German receipts from foreign visitors during 1960-69; German income elasticity was found to be 1.74. The model that was estimated was of the following form and the small letters denote variables in logs:

\[
\left( \frac{x_t}{p_t} \right) = a + b_1 y_{it} + b_2 p_{yt} + b_3 p_{yt(-1)} + b_4 e_{yt} + b_5 e_{yt(-1)} + b_6 t + u \quad (2-2)
\]

where
\[
\left( \frac{x_{jt}}{p_{jt}} \right) = \text{Per Capita Real Tourist Expenditure of } j
\]

\[Y_{jt} = \text{Per Capita Disposable Income of } j\]

\[p_{ij} = \text{Relative Prices (current and one-year lags)}\]

\[e_{ij} = \text{Relative Exchange Rates (current and one-year lags)}\]

\[t = \text{Time Trend}\]

In a subsequent study, Artus (1972) intended to improve and enrich the results of his earlier study (1970). This 1972 study attempted to undertake a systematic analysis of the short-run determinants of international travel flows by specifying a complete world travel model and by considering the level of tourist expenditure and receipts in several countries for 1955-70. The approach was based on the assumption that international travel is similar to international trade; thus, the structure of the world model was similar to the structure of previous world travel models. The income elasticities of European demand for international travel ranged from 1.36 (Switzerland) to 3.84 (Austria). For the US and Canada, however, income appeared to be an insignificant variable and this led Artus (1972, p.593) to conclude that "... the short-run variations in the aggregate disposable personal income of these countries do not reflect closely the variations in the income of the members of the professions, businessmen and students, who represent a large fraction of the US nationals and Canadians travelling in Europe ...".

Kim (1988) examined the demand for international travel and tourism to Korea by an econometric analysis. He selected three major origin countries including Japan, USA and Taiwan for the analysis. The number of tourist arrivals was used for the dependent variable while the level of income of origin countries, travel cost, exchange rate, and trade volume were the independent variables. In his model, real disposable (national) income or real per capita disposable
(national) income was employed for the analysis. Although he emphasised that discretionary income is the most suitable variable for the analysis, the variable was not available. One of the remarkable findings in his research is that for Japanese tourists travelling to Korea is not a normal good (i.e. it is an inferior good). In other words, the higher the income of the Japanese, the more they travel to other expensive and luxurious attractions; such countries as Europe or America (Kim, 1988).

The demand for tourism is expected to be influenced not only by current income levels but also by previous income levels (lagged income). Changes in income may take some time to affect tourism demand. Two relevant points could also be considered here. On the one hand, it seems plausible to assume that tourists who travel abroad for the first time are most likely to be the ones who most influence the number of tourists and tourism expenditure growth rates. However, while this may indicate that household planning and decisions to consume tourism abroad may be made well in advance, it may also be argued that consumers (usually purchasing package tours) tend to undertake last-minute decisions with a view to obtain "bargain" discounts. On the other hand, income changes also imply further, longer-term, impacts on issues such as increases in car ownership or urbanisation trends, which may take some time to exert (in an indirect way) their positive influence on tourism demand.
3.5.2.2. Relative Price

Apart from the income variable, relative prices have also been found to play an important role in explaining the demand for tourism. Tourists appear to be sensitive to changes in prices. As relative prices increase, tourist demand for a particular destination is expected to decrease. In some past studies relative prices have been adjusted to include exchange rate effects (Artus, 1970; Barry and O'Hagan, 1972; Kwack, 1972; Jud and Joseph, 1974; Witt, 1980a, 1980b; Stronge and Redman, 1982; Uysal and Crompton, 1984).

In economic books dealing with fundamental concepts, demand and supply of certain goods are explained by the association between price and quantity under the assumption that the other conditions are being equal, or *ceteris paribus*. In general, the relationship between price and demand is inversely proportional. Likewise, price is expected to affect tourism demand adversely. In practice, however, the relationship is complex since the dependent variable is affected by many factors such as the prices of other goods and services, level of income, tastes and preferences, etc.

The price of a commodity or service and the prices of all other goods and services, particularly those which are related to the item in question, either as complementary commodities (such as car and oil) or as competing substitutes, for example taxi and bus, can influence demand in tourism markets.

The slow changes in income levels in the tourism generating countries is not likely to affect tourism demand dramatically in the short-run. From a policy-making viewpoint, however, factors that can change rapidly and rather unpredictably, such as relative prices, exchange rates, transport costs, marketing expenditure and political instability, become crucial. Changes in labour costs, or in government policies...
related to inflation, for example, can affect relative price level; devaluation of a national currency relative to other foreign currencies would alter the relative exchange rates; sudden changes in the conditions prevailing in the world oil market or airline deregulation would influence transport costs.

The price of a "tourism product" is made up of three components: a) the price to travel from origin to destination (cost of transport); b) the price of the commodities and services (e.g. food, accommodation, entertainment, shopping etc.) on which tourists spend from the moment of arrival at the holiday destination (cost of living); and c) the price of the destination currency, usually in terms of the origin currency (exchange rate).

It can be argued that tourism demand is likely to be sensitive to changes in the prices of the commodities and services in the destination (e.g. food, accommodation, entertainment, shopping etc.) relative to prices in the origin country and/or alternative competing tourist destinations. As the relative price level increases, for instance, a decrease in demand for tourism should be anticipated. Moreover, the impact of changes in relative price levels on demand for tourism in a destination depends on the degree of complementarity and/or substitutability of that destination in relation to the origin and/or its closest competitors. It is plausible that, in cases in which the cost of transport from an origin to two alternative destinations is apparently the same, a comparative advantage can be gained by the destination where the cost of living is lower (ceteris paribus). Nevertheless, if the price level in a destination is higher than expected then the intended length of stay and/or planned expenditure may be reduced and the tourist may switch towards the closest (in distance and nature) and cheapest competing (substitute) destination.
It has been noted that the price elasticity of demand varies with the purpose of travel, business travel having a lower elasticity than pleasure travel (Gray, 1970). A classification of tourists by price elasticity of tourism demand into "sunlust" and "wanderlust" tourists was, furthermore, provided by Gray (1970). Sunlust tourism demand is directed towards destinations offering "sun-sea-sand" type of holidays and therefore tourism demand is expected to be highly responsive to price differentials between similar resorts. The sunlust tourist destinations face high competition between one another. Wanderlust tourists are motivated by desire for a particular, differentiated destination (cultural, social interests etc.) and are expected to have a lower price elasticity of tourism demand. The wanderlust tourist destinations enjoy a certain degree of monopoly.

A number of past studies used the consumer price index as an appropriate proxy for discrepancies in inflation rates, though some studies note that ideally a tourism price index would be more relevant for goods and services consumed by the tourist; due to the multi-facet nature of the tourism product and the inadequate data, however, such an index is lacking. Nevertheless, Martin and Witt (1987) experimented alternatively with the consumer price index and a tourist price index they constructed. The tourism price index was constructed using specific cost of tourism data. These cost of tourism data represented the average daily costs of board and lodging in a middle category hotel and were obtained by sampling several hotels in each category considered. They found that the consumer price index, compared with the proposed tourist price index, provided statistically satisfactory results and behaved reasonably well in most estimation. Therefore, they concluded that the consumer price index (either alone or together with the exchange rate) should be reasonable proxy for the cost of tourism.
Notably, Witt & Witt (1992) included price variable as an explanatory variable in demand functions for their econometric models. They suggested three alternatives for tourists' cost of living element of the price variable. These are as follows:

1. a specific tourists' cost of living variable; or
2. a consumer price index (proxy) variable; or
3. an exchange rate (proxy) variable

(Witt & Witt, 1992, p.30)

They emphasised that specific tourists' cost of living data must be shown to be clearly superior to the simple consumer price index proxy and/or the simple exchange rate proxy in order to make collection and prediction of tourists' cost of living data worthwhile. However, the data falling within the first category does not seem to exist, since it seems to be impossible to trace all the expenses of every tourist.

Most frequently, the price variable included in the past studies of tourism demand is the price level of the tourist destination country relative to the price level of the tourist origin country. Some studies, however, consider alternatively (or additionally) a "substitute price" variable to capture discrepancies in the price level of the destination country relative to its major competitors, as for example, in Blackwell (1969), Artus (1970), Barry and O'Hagan (1972), Kwack (1972), Jud and Joseph (1974), Little (1980), Loeb (1982), Stronge and Redman (1982), Quayson and Var (1982), Uysal and Crompton (1984), Martin and Witt (1988a), Witt and Witt (1992) etc. It has been argued, as in Gray (1966, p.86) for instance, that for many travellers there is a high price elasticity of substitution among countries so that higher than expected prices in one country may result in a change of destination rather than in a decision to forego overseas travel. For further example, Taplin (1980, p.19) also pointed out that "whereas habit gives the consumer a
tendency to ignore substitutes for the things he consumes daily, he often takes virtually the opposite approach when going on vacation ... he consciously assesses the relative merits (including prices) of the travel options open to him".

The ratio of the consumer price index in each of seventeen Latin American tourist destinations to a composite weighted consumer price index for competing destinations was used by Jud and Joseph (1974) and the price elasticity was found to be higher than unity; in a model explaining the number of US tourists to these Latin American destinations, the price elasticity was -1.53. US travel demand for México (Jud, 1974) was found to be highly price elastic and this led Jud to conclude that advertising expenditure was wasted if prices were not attractive. Prices, furthermore, appeared to explain the demand for the US travel imports more satisfactorily than income. One-year lagged prices also had a significant impact, according to a study by Little (1980); the price elasticity turned out to be higher than unity. US travel exports were also highly price elastic in the models that Loeb (1982) estimated, with price elasticities ranging from -0.50 (Canada) to -6.36 (UK) in the per capita tourism receipts model and lower price elasticities in the total tourism receipts model.

However, while Canadian demand for international travel (Kliman, 1981) appeared to be price elastic in the individual destination country model (price elasticities varied from -1.72 for the Netherlands to -8.53 for Portugal), the impact of price change on Canadian travel demand was weaker in the model in which destination countries were considered as a whole.

In the study of Mexican border tourism by Stronge and Redman (1982), two price indices were included simultaneously: a Mexican relative to US consumer price index and a Mexican to substitute destination countries weighted average consumer
price index. Although the demand for Mexican tourism relative to tourism overseas appeared to be price elastic, the interrelationship among the two price variables created problems of interpretation of the results.

In the case of the demand for Turkish tourism (Uysal and Crompton, 1984), tourism demand seemed to be more sensitive to price changes in the tourism expenditure model than in the number of tourists model, with price elasticities varying from -1.48 (for the UK and Swiss tourism demand) to -2.38 (for France).

Martin and Witt (1988a, p.267), dealing particularly with the impact of "substitute prices" on tourism demand, concluded that "the empirical results support the hypothesis that substitute prices play an important role in determining the demand for international tourism ... however, the importance varies considerably according to the origin under consideration ... therefore, there is no single substitute price variable or set of variables applicable to all origin-destination pairs". Among the various substitute price elasticities presented, the values varied considerably, as for example: for UK tourism demand, from 0.13 (Austria) to 1.41 (France); for French tourism demand, from 0.81 (Portugal) to 3.63 (Italy); and, for West German tourism demand, the substitute price variable appeared statistically insignificant.

Witt and Martin (1987b) criticised the relative price index proposed by Uysal and Crompton (1985). Uysal and Crompton (1985) used a weighted price index in a study of tourist flows to Turkey from eleven countries generating the highest number of tourist visits to Turkey. The relative price variable is defined as a weighted ratio which is consumer price index in the receiving country (Turkey) divided by weighted consumer price indices in the tourist generating countries. The weighting is obtained by dividing the
generating country's consumer price index by the generating country's rate of exchange, expressed in the number of domestic currency units per Turkish lira. However, Witt and Martin (1987b) criticised that weights had been arbitrarily assigned.

Likewise, there seems to be little consensus on the estimation of price elasticities because the results have been found to be vary considerably. Crouch (1994) attempted to provide reasonable (or average) price elasticities in international tourism by using meta-analytical methods. The meta-analytical methods use a statistical perspective to identify underlying patterns in the findings and to correct the distribution of findings for study artifacts, the most important being variance due to sampling error. His study integrated results from 80 studies, and traditional narrative review of literature has been employed. The empirical estimation indicated that, on average, the relative elasticity of demand with respect to the price of destination tourist services is of the order of -0.6 to -0.8. This implies that an increase in the price of tourist services by 1% would typically dampen demand by about 0.6 to 0.8%.

The idea that transport cost should be regarded as a demand determinant seems to be based on and justified by the previous research (e.g. Uysal & Crompton, 1984; Witt & Witt, 1992). An increase in transport cost is expected to have an adverse impact on tourism demand. This transport cost is associated with the distance from origin to destination since, theoretically, the cost of transport rises as the distance increases. Ideally, however, the cost of transport should be considered not only as the financial cost of the fare met by the consumer but the value which the tourist places on the duration (time factor) of the journey (Gronau, 1970).
A direct relationship is expected between per capita income and expenditure on transport, since the higher the real per capita income, the more likely the tourist will be able to afford to meet transport service costs for tourism abroad particularly to long-haul destinations. While the value of duration of the journey is supposed to be a positive function of income, the impact of transport cost on the length of stay at a destination cannot be clearly anticipated. This is so because, on the one hand, the higher the cost of transport to arrive at a destination, the higher the average expenditure in that destination, since the tourist may stay longer in order to justify the higher cost of transport undertaken (Blackwell, 1970; Bechdolt, 1973; Kliman, 1981); and on the other hand, high transport costs may place a severe constraint on the predetermined tourist budget, which then may affect adversely not only the length of stay in a destination but the choice of that destination for holidays in the first place.

The appropriate measure of transport cost is the weighted average price of all modes of transport, that is by air, sea and land, weighted, for instance, by the number of tourists that travelled using the respective mode of transport. In practice, deciding the transport cost can be complicated by there being many transport modes and a range of ticket prices. For example, the travelling costs of rail and that of airline are different, and even if tourists utilise the same mode of transport, the price will vary because of the companies' pricing policy. Syriopoulos (1995) emphasised that calculation of a transport cost variable was not possible due to the complexity of the fare structure and changes in route networks and departure frequencies. Nevertheless, it seems reasonable to use representative air fares from origin to destination as a proxy of relative prices variable (Gray, 1966; Witt, 1980a, 1980b; Witt & Martin, 1987c; Witt & Witt, 1992). However, Martin and Witt (1987, p.245) argued that "there does not seem to be an
obvious answer to the question 'Which is the best form of the tourist-prices variable, a specific-cost-of-tourism variable or the consumer price index, and/or relative exchange rates', and concluded that "the empirical results ... indicate that the consumer price index (either alone or together with the exchange rate) is a reasonable proxy for the cost of tourism".
3.5.2.3. Relative Exchange Rates

While some researchers incorporated variations in rates of exchange into their relative price variable, others tested the effects of such changes by including the foreign exchange rate as a separate independent variable. The latter group of researchers, for example, includes Gerakis (1965), Gray (1966), Artus (1972), Loeb, (1982), Uysal and Crompton (1984), Chadee and Mieczkowski (1987), Lim (1987), and Kim (1988).

Gerakis (1965), for example, hypothesised that the responsiveness of tourist receipts to changes in relative prices and, in particular, to devaluations and revaluations of exchange rates is becoming an increasingly important aspect of the international adjustment mechanism not only for seven countries he studied but also for many other countries. He further argued that the sensitivity is due to an extensive substitution, which takes place between the tourist's country of residence and the country undertaking exchange reform and, in particular, between the latter and other neighbouring countries competing with it for the tourist dollar. From his examination of seven devaluations and revaluations, it was shown that the experience of these reforms supports the hypothesis. It was demonstrated that relative movements in tourist receipts were in the direction that would have been expected on the basis of this hypothesis; that the devaluations were followed by appreciable gains in tourist earnings and the revaluations by smaller, but still marked, losses; and that the apparent elasticities of tourist receipts were in general quite high.

In general, if exchange rates of generating countries are lower than that of destination countries, the demand for tourism would be likely to increase. In the short-run, exchange rate differentials may be of particular importance for the tourist, who is likely to take into account of them,
when planning holidays. Furthermore, exchange rates may be considered as a more direct proxy (compared with relative prices) for the relative cost of living, in decision making concerning expenditure on tourism abroad. Tourists are more aware of exchange rates than relative prices, due to the wider publicity about the former (Witt & Witt, 1992).

On the other hand, the use of exchange rates as an indication of the cost of living in a tourist destination may be misleading due to the fact that, even though exchange rates in a destination may become more favourable to the tourist, this could still be counterbalanced by high inflation rates; in addition, exchange rates may fluctuate more rapidly than relative prices. It is plausible to suggest that, whereas in the short-run it may be important to study exchange rate effects separately from price effects, in the long-run it is the effective exchange rate impact (relative exchange rates adjusted for relative price changes) that is expected to be more important for tourism demand.

The role of changes in exchange rates in demand for tourism has been discussed in some of the previous work. Gray (1966, p.86), for example, noted that "prices are seldom completely known in advance by travellers 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 exchange can be expected to be a prime indicator of expected prices". Furthermore, Artus (1970, p.605) argued that "the effect of a change in exchange rate on foreign travel is not similar to the effect of differential rates of inflation. The consequences of a change in exchange rate are immediately perceived by potential foreign travellers. On the other hand, these persons are probably not well informed about recent prices developments in foreign countries".
It seems that Korea has been a popular tourist destination for Japanese tourists since 1960. One of the reasonable assumptions for the phenomena is that the relative prices of Korea could have played an important role for attracting Japanese tourists. The exchange rate differentials which explains the number of tourist arrivals or tourist receipts is likely to increase as the Japanese economy grows. Kim (1988) found that Japanese tourism demand to Korea is heavily dependent on consumer price level of Korea and the exchange rate.
3.5.2.4 Marketing Expenditure

It is likely that increases in marketing expenditure in a tourist market undertaken by a tourist destination would have a positive impact on tourism demand for that destination. Unfortunately, the very inadequate statistical data have not permitted a rigorous analysis of the effect of this variable on measuring international tourism demand.

Some researchers have included marketing expenditure as an explanatory variable. For example, Barry and O'Hagan (1972) examined the demand for tourism in Ireland by the British over the period 1956 to 1969 using marketing expenditure as an explanatory variable. The other explanatory variables were UK income and price variables representing the cost of living. They pointed out that relative marketing expenditure is a more appropriate variable than marketing expenditure itself since advertising tourism is a function best carried out by national agencies. In addition, more real product differentiation is expected in a tourist market than in other mass consumption markets.

Uysal and Crompton (1984) used 'promotional expenditure' as an explanatory variable for measuring the international tourist flows to Turkey. The research was analysed by an ordinary least squares multiple regression technique. The promotional expenditure is calculated by multiplying the promotional expenditure per tourist by the number of tourists received from the generating countries. In terms of data source, promotional expenditure data were obtained from the annual reports of the ministry of Tourism and Culture in Turkey. The figures obtained did not represent the total cost of promoting the country. Therefore, it is likely that estimated marketing elasticities are biased. Individual hotels, tour promoters, and travel agencies undertook independent promotional campaigns. Thus, the expenditure of the Ministry of Tourism and Culture constitutes only a part
of the total investment in promotion. The authors conclude that the coefficients of the promotional expenditure were inelastic in all cases, ranging from 0.022 to 0.596 and these findings suggest that investment in promoting Turkey as a tourist destination is likely to have a minimal impact on international tourist flows to Turkey.

For a further example, Papadopoulos and Witt (1985) made an attempt to measure the foreign tourist arrivals in Greece from its eight most important generating countries over the period 1972-82. Separate log-linear models were estimated for tourist visits from Austria, France, FR Germany, Italy, Sweden, Switzerland, UK and the USA. The data on promotional expenditure refer to actual expenditure by the Greek National Tourist Organisation in a given origin, and are split into advertising expenditure and public relations expenditure. As a result of the analysis, they found that total promotional expenditure variable and advertising expenditure variable explained the tourism demand better than public relations expenditure variable. Therefore, they concluded that the more effective form of promotional activity appears to be advertising.
3.5.2.5. Lagged Dependent Variable

A lagged dependent variable might be used to explain the dependent variable. Information regarding a tourist destination usually disseminates slowly. The reputation of a tourist destination is spread via word of mouth even though organised marketing and advertising also play a major role. Positive impressions of a tourist destination gained by people (friends, relatives, past experience of tourists themselves) who have already been there can exert a strong influence on others to visit it as well ("demonstration effect"). Furthermore, once people have visited a particular destination and have been satisfied, they show a tendency to return ("habit persistence") since, being familiar with the destination, they may prefer it to an unknown alternative, where tourist satisfaction may be doubtful.

Witt (1980a) hypothesised that a lagged dependent variable reflects 'habit persistence' of travellers. He explained that the use of a lagged dependent variable can be justified by two major assumptions. One is that if a traveller has visited a country and it becomes his favourite, then he is likely to choose the same destination for his next journey. The other is that a lagged dependent variable can explain the influence of marketing advertisement. For example, the stories experienced during the travel might stimulate the motivation of potential tourists by word of mouth.

In addition, lagged explanatory variables such as income, price, exchange rate, etc. also seems to be coherent. Edwards (1982) postulated that countries tend to get a reputation for being expensive after the event, not while it is happening and people determine their holiday plans according to how well-off they are at the time.

Thus, the number of tourists choosing a particular holiday destination in any year is related to the tourists who have
chosen it in previous year. The adjustment of tourism demand to long-run levels is likely to occur gradually, since past demand levels may exert a significant impact on current tourism demand levels. Therefore, consideration of the possible lags in the demand for tourism model is important.

However, one must be cautious when a lagged dependent variable is included among the regressors. It is very likely that the Durbin-Watson statistic would fail to detect the autocorrelation when lagged dependent variable is used. In this case, it is upward biased. The d-w statistic is to detect the autocorrelation of disturbance. Since the lagged dependent variable is not independent of past values of disturbance (i.e. it is endogenous variable), the OLS estimators are likely to be biased and lose the property of consistency (Thomas, 1997, p.305).
3.5.2.6. Dummy Variables

Special events related to political, social, economic and cultural factors, as well as other 'qualitative' factors, may affect tourism (in a favourable or adverse direction) and sometimes cause demand to fluctuate dramatically. Dummy variables, consequently, are included in the model in order to pick up the impact of such factors. The impact of political instability, in particular, that has been experienced in some of the destinations over the period of the study, is considered. The relevant dummy variables take a value of unity for the period of the occurrence of the political (or other) events and a value of zero for the remaining years.

For example, Witt and Witt (1992) used three dummy variables to pick up the effects of the oil crisis (1974-75 and 1979) and currency restrictions in UK (1967-69). The oil crisis dummy variables were intended to represent the psychological impacts of the crisis on foreign tourism demand. On the other hand, the UK government applied a £50 foreign currency limit to holidays abroad from late 1966 to late 1969 (fares excluded) in an effort to stem the outflow of foreign currency. Therefore, the currency restriction dummy variable was included to capture the resulting distortion in international tourism demand.

Although the dummy variables mentioned above are used to pick up negative impact on international tourism, Qiu and Zhang (1995) used two dummy variables in order to pick up the positive effect of special events. These events include 1976 Summer Olympics in Montreal and 1986 Winter Olympics in Calgary and World's Fair in Vancouver.
3.5.2.7. Other Explanatory Variables

The size of population was often used as an explanatory (or independent) variable by many researchers (Crampon, 1966; Armstrong, 1972; Bond & Ladman, 1972; Askari, 1973; Diamond, 1977; Kliman, 1981). In some cases, the dependent variable was adjusted to take population size into account (Artus, 1972; Askari, 1973; Bechdolt, 1973; Sunday, 1978; Kliman, 1981; Loeb, 1982; Witt & Martin, 1987a; Martin & Witt, 1988a).

Qiu and Zhang (1995) employed a crime rate variable to measure the international tourism demand for travel to Canada from the US, UK, France, West Germany and Japan. The crime rate in Canada can be regarded as a measure of safety for tourists. They used violent offences data, which include homicide, attempted murder, sexual assault, and robbery, since these data are good indicators of safety in a country. If tourists have reliable information on Canada's crime statistics, it would be expected that higher crime rates would have a negative effect on tourist arrivals. Safety concerns should mainly affect the decision of whether to visit Canada. Given the relatively small number of observations for expenditure, the crime variable is not included in most of the expenditure equations. They found that the coefficient of crime rate was negative and significant for US when they dropped a time trend variable. Interestingly, apart from France, all the coefficients of crime rate were found to be positive, which subsequently leads to the spurious relationship between dependent variable and crime rate variable.

Kim (1988) used a trade volume variable (total amount of import and export between a tourist generating country and Korea) for econometric analysis in order to identify the economic determinants of international tourism demand from major tourist generating countries (Japan, US and Taiwan) to
Korea. He attempted to use this variable to explain a considerable number of business related pleasure tourists. He found that seasonally adjusted trade volume variable was significant in explaining the Japanese and Taiwanese tourists demand to Korea. However, it turned out to be insignificant for the US demand model, and as a result it was dropped from the model.
3.6. Chapter Summary

A critical review of the framework for forecasting tourism demand was undertaken in order to provide a clear picture.

The rationale of forecasting was discussed in the light of planning and management in tourism. In general, policymakers need forecasting for tourism policy making and physical planning of infrastructure while managers in tourism-related business require forecasting in order to plan for financial viability. However, the characteristics of tourist products differ from that of other business commodities. The nature of the tourist products such as hotel rooms and airline seats are perishable, which means we cannot store them for future use. Therefore, forecasting the demand for tourism would be particularly important.

The forecasting process, divided into the design, specification and evaluation stages, was discussed in order to provide a formal structure of sequential steps leading to a defined objective. These three steps are equally important in that they affect the performance of forecasting. The restraining elements of forecasting were considered from seven points of view; time horizon, data, accuracy, resources, cost, simplicity of application, and forecaster. Each element can have significant effect on forecasting. Apart from these elements, in particular, international demand for tourism is likely to be influenced by a number of qualitative factors. This qualitative factors may be associated with personal preferences, politics, environment, ad hoc events, etc.

In order to identify the determinants of tourism, some popular dependent and independent (or explanatory) variables were critically reviewed, since they are significantly associated with developing and formulating forecasting
models. Previous studies have shown that price and income variables have played very important roles as determinants of international tourism demand. Exchange rate is either incorporated into relative price variable or used as a separate independent variable. Marketing variable is less likely to be employed for the demand analysis because of inadequate statistical data. Lagged dependent variable has the characteristics of both "demonstration effect" and "habit persistence". However, cautious analysis is required when lagged dependent variable is used as a regressor. Dummy variable can be used to pick up the impact of a special event. Other explanatory variables such as size of population, rate of crime, and trade volume are examined. These variables may be of interest when explaining the international demand for tourism to a particular destination.
CHAPTER IV

FORECASTING METHODS
4.1. Introduction

A number of comprehensive reviews of methods for forecasting tourism demand have been carried out. The alternative approaches to tourism demand forecasting of three cases (Uysal & Crompton, 1985; Calantine et al., 1987; Archer, 1994) are considered (see Figure 4.1, 4.2 and 4.3).

Figure 4.1 Alternative Approaches to Demand Forecasting in Tourism I

As shown in Figure 4.1, Uysal and Crompton (1985), in their overview of previous research, classified tourism forecasting methods into two approaches: qualitative and quantitative approaches. They include in qualitative methods; traditional approaches, the Delphi model and Judgement-Aided model (JAM), while the Gravity & Trip Generation model and multivariate regression models. By traditional approaches they refer to survey analysis which includes (1) national or regional vacation surveys and (2) potential visitor surveys in tourism-generating areas. They emphasised that vacation surveys are relatively less expensive than other surveys as a means of looking for changes over time of propensity to travel. However, this approach, like many other surveys methods, tends to mislead and misinform because of biases introduced by using non-probability samples, non-response of
selected respondents, and invalid or unreliable instruments. The other methods will be examined later in this chapter.

**Figure 4.2 Alternative Approaches to Demand Forecasting in Tourism II**

Exploratory Forecasting
- Regression
- Time Series
- Gravity & Trip Generation

Speculative Forecasting
- Delphi
- Scenario Writing

Normative Forecasting

Integrative Forecasting

Source: Adapted from Calantone; Di Benedetto and Bojanic, 1987.

Calantone et. al. (1987) used a different approach to categorising forecasting methods for tourism. They divided the forecasting methods available into four distinguishable forms, which have already been suggested by Van Doorn (1984b). Those categories are exploratory, speculative, normative, and integrative forecasting techniques as illustrated in Figure 4.2. Explorative forecasting attempts to make forecast through extrapolation of past trends and identification of relationships between independent and outcome variables. Speculative forecasting incorporates judgement and intuition into forecast. Normative forecasting involves identification of the methods required to attain certain desired situations in the future. Integrative forecasting seeks to determine the underlying relationships among independently obtained forecasts in order to achieve convergence of results. They pointed out that explorative and speculative methods are often encountered in tourism forecasting, but normative forecasting techniques are hardly used in predicting tourism demand because of the presumed difficulty for government assigning specific goals for tourism to accomplish (Calantone et. al., 1987).
Figure 4.3 Alternative Approaches to Demand Forecasting in Tourism

Univariate
- Time Series
  - Trend Projection
  - Moving Averages
  - Decomposition Analysis
  - Exponential Smoothing
  - Box-Jenkins I
  - Box-Jenkins II
  - Indicators
  - Market Analysis
  - Clawson Technique
  - Regression
  - Spatial Models
  - Growth Scenario
  - Almost Ideal Demand System

Causal
- System Models
  - System Dynamics
  - Input-output Analysis

Quantitative

Causal

Simplistic
- Executive Opinion
- Sales Force Estimates

Technological
- Delphi Models
- Morphological Analysis
- Scenarios
- Cross-impact Analysis
- Relevance Trees


Archer (1994) provided a more comprehensive and detailed review of forecasting methods applied to tourism (see Figure 4.3).
In Figure 4.3, the Box-Jenkins method is divided into Box-Jenkins I and II. The criteria for this classification lies in whether it employs univariate analysis or multivariate analysis. Box-Jenkins I is an univariate form while Box-Jenkins II is a more sophisticated version using a transfer function (see Appendix 4.1).

Simple indicators technique is a causal approach which studies an individual time series or a combination of time series data of other economic activities to forecast tourist arrivals, without using a modeling approach. It would be ideal if there existed a yardstick which gives correct indications of tourism demand. However, this is unlikely to be achievable since the factors governing tourism demand are various and complex.

Market analysis is not strictly quantitative analysis since it uses surveys (e.g., survey of tourists, survey of potential tourists etc.). Nevertheless, this technique provides useful data which can be manipulated to make forecasts. Although surveys aimed at discovering future intentions of tourists are rarely accurate, surveys can yield valuable information for very short-term forecasts. Because of the inherent weaknesses and limitations of survey techniques, however, market analysis is not suitable for medium-term or long-term forecasts. Furthermore, survey techniques are likely to be expensive and time-consuming if the unbiased and large data samples required for reliable forecasts are to be collected.

The Clawson technique was initially developed by Marion Clawson (1966) inspired by H. Hotelling. This technique depicts the relationship between the number of tourist arrivals and travel cost. The Clawson technique is normally described as a travel cost method (Cooke, 1994). The basic approach of the travel cost method is to estimate the relationship between the visit rate of particular zone and
the associated travel cost. The particular zone is characterised by a series of concentric circles around a certain tourist destination. The travel cost here is composed of the monetary cost of travel and the imposed cost of time. However, the approach is limited by the lack of practicability. Archer (1994) pointed out that the more sophisticated version of this model involve the use of regression and bears little resemblance to the original model.

Spatial models assume the underlying relationship between specified places in order to explain the movement of traffic. The simplest form of the model is also known as gravity and trip generation model. This model will be examined later in this chapter.

The growth scenario model is used by the Bureau of Management Consulting to provide long-term forecasts for the Canadian Government Office of Tourism (Bureau of Management Consulting, 1975). The technique focuses on the implications of growth trends rather than on identifying particular behaviour patterns between a dependent variable and explanatory variables. The model is aimed at determining, quantifying and predicting the most important socio-economic variables assumed to influence tourism demand. When the data is inadequate for regression analysis, the technique offers a relatively efficient and inexpensive alternative (Archer, 1994).

For the literature review of forecasting methods, some useful techniques are selected and illustrated in Figure 4.4. The justification for choosing them is their relative rigor and frequent use. Some strengths and weaknesses of both quantitative and qualitative forecasting methods will be critically examined.
Figure 4.4 Classification of Alternative Forecasting Techniques Chosen to Their Relative Rigor and Frequent Use

- Naive Model
- Moving Averages
- Exponential Smoothing
- Decomposition Analysis
- Box-Jenkins
- Gravity & Trip Generation Model
- Econometric Analysis
  - Classical Multivariable Regression
  - Almost Ideal Demand System
  - Cointegration & Error Correction Model
  - Vector Autoregression
- Neural Network Model
- Executive Opinion
- Sales Force Estimates
- Delphi Models
- Scenario Writing

- Univariate Time Series
- Causal Models
- Quantitative
- Simplistic
- Technological
- Qualitative
4.2. Quantitative Techniques

4.2.1. Univariate Time Series Models

4.2.1.1. Naive Models

The simplest time series model is the Naive model. Witt and Witt suggested two Naive models for tourism forecasting (Witt & Witt, 1992). The first Naive model indicates that the value in time t is assumed to be the same value in time t+1. The equation might be expressed as follows:

\[ \text{Naive I} : \quad \hat{Y}_{t+1} = Y_t \]  \hspace{1cm} (4-1)

where

- \( Y_t \) = Actual (or observed) value in the period of t
- \( \hat{Y}_{t+1} \) = Forecast value for the period of t+1 ahead

This model is simple and can easily be applied intuitively without calculation of equation in practical manner. Applying and relying upon this method in business industry seems to be risky, since it does not indicate any trend, seasonality and cycle. An alternative Naive model is a slight improvement on the earlier one, because it employs the growth rate over the previous period. The equation is as follows:

\[ \text{Naive II} : \quad \hat{Y}_{t+1} = Y_t \left( 1 + \frac{Y_t - Y_{t-1}}{Y_{t-1}} \right) \]  \hspace{1cm} (4-2)

where

- \( Y_t \) = Actual (or observed) value in the period of t
- \( \hat{Y}_{t+1} \) = Forecast value for the period of t+1 ahead

Martin & Witt (1989b) used both Naive I and Naive II in order to compare the performance (or accuracy) among seven forecasting techniques. Their criteria were MAPE (Mean Absolute Percentage Error) and RMSPE (Root Mean Square Error).
Percentage Error). Since both MAPE and RMSPE are subject to distortion caused by outlying observations, one or two poor forecasts are likely to affect the average error measures (Witt & Witt, 1989b). MAPE and RMSE are defined as follows:

\[
MAPE = \frac{1}{n} \sum_{t=1}^{n} \left| \frac{e_t}{Y_t} \right| \times 100
\]

\[
RMSPE = \sqrt{\frac{1}{n} \sum_{t=1}^{n} \left( \frac{e_t}{Y_t} \right)^2} \times 100
\]

where

\[n\] number of forecasts

\[e_t\] Forecast error

\[Y_t\] Actual value

Apart from Naive models, they used econometric analysis, exponential smoothing, Gompertz, trend curve analysis and autoregression. Forecasts from four major origin countries (France, Germany, UK, USA) to various destinations in Europe were made using yearly data ranging from 1965 to 1984. When one-year-ahead forecasts were considered, Naive I showed the lowest MAPE and RMSPE (the lower the values of MAPE and RMSPE the more accurate) for whole origin countries. In the case of UK, Naive II ranked second and third in terms of MAPE and RMSPE respectively for one-year-ahead forecast. In the case of France and Germany, however, Naive II was the least accurate technique among seven techniques in terms of MAPE and RMSPE when two-year-ahead forecasts were made.

Nevertheless, if the time series contain a seasonal pattern, Naive models are unlikely to produce reliable forecast results. Although the Naive II model might simulate the trend to a certain degree, it is still inadequate. Naive II might perform reasonably well for a short-term forecasting where no seasonality or cycle exists.
4.2.1.2. Moving Average

One of the simplest smoothing methods is the arithmetic moving average which yields the mean value of the past history data. The data for previous years, months or seasons are added together and divided by the number of observations to give an average figure. When the next observation become available, the oldest in the sequence is excluded from the calculation, and the new one is calculated to produce the new average. When forecasting time horizon becomes longer and longer, this method will produce only one specific constant value with a wide confidential limit because of a smoothing effect. The equation of simple moving average can be generalised and described notationally as follows:

\[
\hat{Y}_{t+1} = \frac{Y_t + Y_{t-1} + Y_{t-2} + \ldots + Y_{t-N+1}}{N} \\
= \frac{1}{N} \sum_{i=t-N+1}^{t} Y_i
\]

(4-3)

where

\( \hat{Y}_{t+1} \) = Forecast for the next period, \( t+1 \)

\( Y_t \) = The actual value of the variable at time \( t \)

\( N \) = The number of observations used in the average

The moving average for time period \( t \) equals the arithmetic mean of the \( N \) most recent observations. When \( N \) equals 1 (or moving average of order 1), the specification is reduced to Naive I model. However, the problem with the simple moving average method is the fact that determining \( N \) can only be done empirically. Even if a computer program is used in order to search for the most appropriate \( N \), it still requires an empirical searching process. Nevertheless, a computer can definitely speed up the process though its software is unlikely to be easily affordable in terms of cost.
Using different values of $N$ is likely to produce different forecast. In other words, the greater the number of periods in the moving average, the greater the smoothing effect. If the underlying trend of the past data is thought to be fairly constant with substantial randomness, then a greater number of periods should be chosen. Alternatively, if there is thought to be some change in the underlying state of the data, more responsiveness is needed, therefore fewer periods should be included in the moving average (Lucy, 1992). The moving average model works best with stationary data although it does not handle trend or seasonality very well (Makridakis, Wheelwright & McGee, 1983).
Linear Moving Average

Some other moving average methods have been developed in order to enhance the performance of simple moving average. For example, linear moving average can reduce the systematic error by adjusting the difference between the values of simple moving average and double moving average. The systematic error here particularly occurs when a series of data contains a linear trend. As illustrated in Table 4.1, the errors occurred systematically and they are unlikely to be corrected when a simple moving average is applied.

Table 4.1 Forecasting a Series with Trend Using a Moving Average of Order 3 and its Systematic Error

<table>
<thead>
<tr>
<th>Period</th>
<th>Observed Value</th>
<th>Forecast (N = 3)</th>
<th>Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>10</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>2</td>
<td>20</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>3</td>
<td>30</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>4</td>
<td>40</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>5</td>
<td>50</td>
<td>30</td>
<td>20</td>
</tr>
<tr>
<td>6</td>
<td>60</td>
<td>40</td>
<td>20</td>
</tr>
<tr>
<td>7</td>
<td>70</td>
<td>50</td>
<td>20</td>
</tr>
<tr>
<td>8</td>
<td>80</td>
<td>60</td>
<td>20</td>
</tr>
<tr>
<td>9</td>
<td>90</td>
<td>70</td>
<td>20</td>
</tr>
</tbody>
</table>

One of the way of solving this problem is using a double moving average. Double moving average is a moving average of a moving average (Makridakis, Wheelwright & McGee, 1983). For example, MA (3*3) is a 3-period moving average of a 3-period moving average. Table 4.2 demonstrates how forecasts can be obtained by linear moving average.
The values in column (6) which contain linear trend can be obtained by subtracting double moving average values from single moving average values. The forecasts can be produced by adding up the trend values $t+m$ period ahead and the values gained by summing up simple moving average values and the values in column (6). The equation can be give by:

$$
Y_t = a_t + b_t m
$$

where

$Y = $ Actual (or observed) values

$N = $ Number of order

$S' = $ Values obtained by simple moving average

$S'' = $ Values obtained by double moving average

$\hat{Y}_{t+m} = a_t + b_t m$
The equation (4-5) shows how to get forecasts for \( m \) periods ahead. The forecast for \( m \) periods ahead equals \( a_t \) plus \( m \) times the trend component \( b_t \). The \( a_t \) is an adjusted smoothed value for period \( t \). The factor \( 2/(N-1) \) involved with \( b_t \) is questionable. This arises because an \( N \) period moving average should really be centred at a time period \( (N+1)/2 \) and the moving average is computed at time period \( N \) (for the first moving average), making difference of \( N-(N+1)/2=(N-1)/2 \) periods. Although this technique tackled the problem inherent in simple moving average, its forecasts require more data than those by simple moving average, which will be more likely to happen as the number of order increases. Furthermore, if a series of data involve nonlinear behaviour, this technique may not perform well in terms of accuracy.
4.2.1.3. Exponential Smoothing

In order to overcome some of the limitations of moving averages, exponential smoothing is frequently used as an alternative technique. The major limitation of the moving average method is that equal weights are assigned to each observation. However, this might be inappropriate for forecasts where the higher degree of emphasis should be put on the latest data in order to reflect most recent trend.

In general, exponential smoothing is similar to moving average in that it has a smoothing effect. Nevertheless, the distinctive feature is that it involves the automatic weighting of past data with weights that decrease exponentially with time. The latest values receive the greatest weighting and the old observations receive a decreasing weighting. Therefore, the exponential smoothing technique is often called a weighted moving average and the underlying principle is as follows:

**New Forecast = Old Forecast + a proportion of the forecast error**

If this is expressed in notational form, then it will be as follows:

\[
\hat{Y}_{t+1} = \hat{Y}_t + \alpha(Y_t - \hat{Y}_t)
\]

where
- \( \hat{Y}_{t+1} \) = the forecast of the series for period \( t+1 \),
- \( Y_t \) = the actual value of the time series in period \( t \),
- \( Y_t - \hat{Y}_t \) = forecast error
- \( \alpha \) = the smoothing constant \((0 \leq \alpha \leq 1)\)

For the choice of the initial forecast, \( \hat{Y}_0 \) (\( t=0 \)), any reasonable value can be adopted by the forecaster, and the effect of the initial forecast is quickly discounted by the method and the corresponding error can be alleviated. Witt and Witt (1992) explained that the single exponential
smoothing model in effect attempts to reduce forecast error by correcting last period's forecast by a proportion of last period's error. In order to help understanding, the equation (4-6) can be rewritten as follows:

\[ \hat{Y}_{t+1} = \alpha Y_t + (1-\alpha)\hat{Y}_t \]  

(4-6)

It is obvious that the value of \( \alpha \) should lie between 0 and 1, since \((1-\alpha)\) in the equation (4-6) indicates the proportion which will be multiplied by the previous forecast. The higher the value of the smoothing constant (i.e. the nearer to 1), the more sensitive the forecast becomes to current conditions, whereas the lower the value, the more stable the forecast will be (i.e. it will react less sensitively to current conditions). In other words, when \( \alpha \) is close 1, the new forecast will include a substantial adjustment for any error that occurred in the preceding forecast. Conversely, when \( \alpha \) is close to 0, the new forecast will be very similar to the old one.

Simple exponential smoothing technique also has its own problem of determining the optimal value for \( \alpha \). Normally, the optimal value for \( \alpha \) can be found by minimising errors such as MSE (Mean Square Error), MAPE (Mean Absolute Percentage Error), etc. through trial and error (Makridakis, et al, 1983).

Many developments to the basic model have been made to cope with various problems such as seasonal factors and sudden fluctuations. These approaches include adaptive smoothing, double and triple exponential smoothing and correction for trend and delay factors etc. Holt's two-parameter (double exponential smoothing) and Winter's three-parameter trend and seasonality technique are examined.

A forecasting software program such as Forecast Pro for Windows which will be used for this research provides some
sophisticated exponential smoothing methods. These are Holt (Linear) exponential smoothing and Winters (Linear and Seasonal) exponential smoothing. Holt exponential smoothing treats data as linearly trended but non-seasonal, while Winters exponential smoothing has the advantage of being capable of dealing with seasonal data in addition to data which exhibit a trend.
Holt's (Linear) Exponential Smoothing

The method of simple exponential smoothing examined in the previous section is theoretically appropriate when the time series does not have a trend. If simple exponential smoothing is used with a time series that contains a consistent trend, the forecasts will trail behind that trend. The Holt's linear exponential smoothing (HLES hereafter) method avoids this problem by explicitly recognising and taking into account the presence of a trend. The forecast for HLES is found using two smoothing parameters (with values between 0 and 1) and three equations:

\[
\begin{align*}
S_t &= \alpha Y_t + (1 - \alpha)(S_{t-1} + T_{t-1}) \\
T_t &= \beta(S_t - S_{t-1}) + (1 - \beta)T_{t-1} \\
\hat{Y}_{t+m} &= S_t + T_m
\end{align*}
\] (4-7)

where

- \(S_t\) = equivalent of simple exponential smoothed value
- \(\beta\) = smoothed coefficient analogous to \(\alpha\)
- \(T_t\) = smoothed trend in data series

The first equation in (4-7) adjusts \(S_t\) directly for the trend of the previous period, \(T_{t-1}\), 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 value. The second equation in (4-7) then updates the trend by differencing the last two smoothed values. This is appropriate particularly when there is a trend in the data. In the case of some randomness remaining, the \(T_t\) is modified by smoothing with \(\beta\) the trend in the last period \((S_t - S_{t-1})\), and adding that to the previous estimate of the trend multiplied by \((1-\beta)\). The equation for \(T_t\) in (4-7) is similar to the basic form of simple exponential smoothing given by equation (4-6) apart from the updating of the trend. It should be noted that the value of \(S\) is updated first, and then the trend \(T\) is updated. Therefore, the forecast can be produced by adding the smoothed series values, \(S_t\), to the
trend component, $T_i$, multiplied by the number of periods ahead to be forecasted, $m$.

At the initial stage of HLES, two estimates are required; to get the first smoothed value for $S$ and the other to obtain the trend $T_i$. The former is easier than the latter. $S_i$ can be simply exchanged with $Y_i$. However, estimating $T_i$ is unlikely to be solved in a simple way. Makridakis et. al. (1983) suggest some possibilities of calculating $T_i$ as follows:

$$T_i = Y_2 - Y_1$$

or

$$T_i = \frac{(Y_2 - Y_1) + (Y_3 - Y_2) + (Y_4 - Y_3)}{3}$$

(4-8)

or $T_i$ = an "eyeball" slope estimate after plotting the data

When the data has no dramatic ups and downs it would not matter too much. However, if there is dramatic change, for example negative change in an initial slope estimate, it might take the forecasting system a long time to overwhelm the influence of such a large downward shift while the overall trend is upwards. The HLES has some weakness dealing with seasonal data since this technique does not include a function for seasonal effect.
Winter's (Linear and Seasonal) Exponential Smoothing

Winter's exponential smoothing has the advantage of being capable of dealing with seasonal data in addition to data with a trend. Winters exponential smoothing is based on three equations, each of which smoothes a factor associated with one of the three components of the pattern - randomness, trend and seasonality. In the way it accomplishes smoothing for randomness and adjusting for trend, Winter's exponential smoothing is similar to Holt's exponential smoothing. However, Winter's approach includes an additional parameter to deal with seasonality. The main function of Winter's exponential smoothing and three basic smoothing equations involved are shown as follows:

\[
\begin{align*}
S_t &= \alpha \frac{Y_t}{I_{t-L}} + (1-\alpha)(S_{t-1} + T_{t-1}) \\
T_t &= \beta (S_t - S_{t-1}) + (1-\beta)T_{t-1} \\
I_t &= \gamma \frac{Y_t}{S_t} + (1-\gamma)I_{t-L} \\
\hat{Y}_{t+m} &= (S_t + T_t m)I_{t-L+m}
\end{align*}
\]  

(4-9)

where:
- \(S_t\) = Smoothed value of deseasonalised series
- \(T_t\) = Smoothed value of trend
- \(I_t\) = Smoothed value of seasonal factor
- \(L\) = Length of seasonality (e.g., number of months in a year)
- \(\hat{Y}_{t+m}\) = Forecast for \(m\) periods ahead of time \(t\).

In (4-9), \(Y_t\) is divided by \(I_{t-L}\), which adjusts \(Y_t\), for seasonality, thus removing the seasonal effects that might exist in the original data \(Y_t\). After trend and seasonality factors are estimated through the second and third equations in (4-9) respectively, a forecast is obtained with the last equation in (4-9). Winter's exponential smoothing techniques would be appropriate for forecasting demand where seasonal factors are involved. For example, the demand for airline seats and hotel rooms shows various types of seasonal pattern
depending on circumstances. Whatever the seasonal pattern is, Winter's exponential smoothing technique is likely to perform well if the pattern has been regular and is unlikely to change significantly in the future.
4.2.1.4. Decomposition Method

Decomposition methods have been applied in the tourism forecasting area, and are often associated with the work of BarOn (1975) in Israel. The observed values of time series are usually the result of several influences. Therefore, it is important to isolate and measure those parts of a time series that are attributable to each of the components. Customarily, time series variations are considered to be the result of three or four basic influences: secular trend, seasonal variations, irregular or random changes, and possibly cyclical fluctuations. Classical decomposition can be represented as:

\[ Y_t = T_t \times S_t \times I_t \]  \hfill (4-10)

where

- \( Y \) = the number of tourist arrivals
- \( T \) = the trend value
- \( S \) = the seasonal component
- \( I \) = the irregular (unpredictable) component
- \( t \) = the time period

The decomposition method could be expressed in the multiplicative form or additive form. For example, Wanhill (1980) applied the multiplicative decomposition method for forecasting tourist arrivals in Slovakia. The rationale for choosing the multiplicative decomposition method lies in its ease of computation. He used 48 observations of historical monthly data ranging from 1976 to 1979 and employed a 12 month centred moving average method in order to obtain seasonal index. With the seasonal index, he, then obtained seasonally adjusted values. These seasonally adjusted values are intended to gain a trend line (i.e. linear equation) through the least square method. Eventually, the forecast results are produced by multiplying trend values by seasonal index.
4.2.1.5. Box-Jenkins (ARIMA)

The time-series approach developed by George Box and Gwilym Jenkins (1970) is a highly sophisticated technique which is relatively inexpensive to use. In fact, this method has been shown to be a highly efficient technique for forecasting where the time series pattern is very complex and difficult to distinguish. This model combines an autoregressive component with a moving average component involving current and past error terms. However, the moving average process in this technique is completely different from the concept of moving average mentioned earlier. This will be explained later.

Basically, there are two stages of forecast with the Box-Jenkins Method. Firstly, the form of model which best expresses the relationships between the values of a series of data through time should be identified. Secondly, the model should be estimated to calculate numerical values for these relationships. Unlike other mathematical forecasting techniques, the model is purpose-built to fit the data. In addition, a systematic process is used to allow identification, estimation and diagnostic checking.

Identification Aspect

In this section, not only the autoregressive model and moving average component for ARMA model but also the procedure of identifying the appropriate ARMA model will be examined. The autoregression of order \( p \) (AR(\( p \)) equation can be expressed as follows:

\[
Y_t = \alpha_0 + \alpha_1 Y_{t-1} + \alpha_2 Y_{t-2} + \ldots + \alpha_p Y_{t-p} \tag{4-11}
\]

Where

\( Y_t = \) actual value of the time series
\( \alpha_i = \) parameters to be estimated \((i = 0, 1, \ldots, p)\)
\( p = \) order of autoregressive process

The 'computational iteration' indicates that from a set initial value of the constant or a coefficient, a computer program tries different values to improve the ability of the equation to simulate the time series, that is, reduce the squared error (or some other measure of error) of the forecast series compared to the actual time series (Frechtling, 1996). The number of past values included on the right side of the autoregressive equation (i.e. the value of \( n \)) identifies the model's order.

On the other hand, the term 'moving average' used for the ARMA \((p, q)\) model is different from the one used for smoothing effects on past actual values in section 4.2.1.2. The moving average here refers to a relationship between actual values in time series and successive error terms (the actual values less the forecast values). The general form of the moving average of order \( q \) (MA\((q)\)) is as follows:

\[
Y_t = \beta_0 - \beta_1 e_{t-1} - \beta_2 e_{t-2} - \ldots - \beta_q e_{t-q}
\]  

(4-12)

Where
\( Y_t = \) actual value of the time series
\( \beta_i = \) parameters to be estimated \((i = 1, 2, \ldots, q)\)
\( e_{t-i} = \) error term \((i = 1, 2, \ldots, q)\)
\( q = \) order of moving average

Compared to the autoregressive model, the order of the moving average model is indicated by the number of error terms included in the right side of the equation (4-12). Since the Box-Jenkins model combines these two models, the general form of ARMA \((p, q)\) model would be as follows:

\[
Y_t = c + \alpha_1 Y_{t-1} + \alpha_2 Y_{t-2} + \ldots + \alpha_p Y_{t-p} - \beta_1 e_{t-1} - \beta_2 e_{t-2} - \ldots - \beta_q e_{t-q}
\]

(4-13)

Where
\( Y_t = \) actual value of the time series
\( c, \alpha_i, \) and \( \beta_i = \) parameters to be estimated
One of the distinctive nature of the Box-Jenkins approach is that it examines the actual data in order to temporarily identify the appropriate ARMA \((p,q)\) model in advance for forecasting. The \(p\) and \(q\) are generally identified through examining the autocorrelation function (ACF) and partial autocorrelation function (PACF) of actual time series data. Computing ACF and PACF by hand or simple spreadsheet program is tedious and likely to make mistakes. It is recommended rather to use a relatively technical and statistical package such as Statistica\textsuperscript{TM} (Frechtling, 1996).

To put it simply, AR(\(p\)) is determined by the number of significant partial autocorrelations. Here, it is called 'significant' if the absolute value of partial autocorrelation lies beyond the absolute value of standard error multiplied by 1.96 and -1.96. Therefore, the exact value of dashed line in Figure 4.5 can be as follows:

\[
\text{Significance level} = \frac{1}{\sqrt{n}} \times \pm 1.96 \quad (if \ x = 95) \quad (4-14)
\]

where
\(n = \) the number of observations

The 1.96 and -1.96 are standard error thresholds for a 95 per cent confidence level. For example, there should be only one partial autocorrelation significant at the 95 per cent confidence level for an autoregressive model of order one (see Figure 4.5). For further example, Figure 4.6 is illustrated in order to demonstrate the case of AR(2).

The ARIMA process is often expressed as ARIMA\((p,d,q)\), where \(p\) denotes the number of autoregressive terms, \(d\) the number of times the series has to be differenced before it becomes stationary, and \(q\) the number of moving average terms. For example, ARIMA\((2,1,2)\) time series has to differenced once \((d = 1)\) before it becomes stationary and the (first-differenced)
stationary time series can be modelled as an ARMA(2,2) process, that is, it has two AR(Autoregressive) and two MA(Moving Average) terms.

Figure 4.5 Autoregressive Models of Order 1

Having mentioned the expression of ARIMA model, how to obtain \( p, d \) and \( q \) is questionable. If the underlying generating process for a time series is based on a constant mean and a constant variance, then the time series is stationary. More formally, a series is stationary if its statistical properties are independent of the particular time period during which it is observed. However, many econometric time series are nonstationary, that is, they are integrated.

According to Makridakis and Wheelwright (1989), the Box-Jenkins method is based on the schematic diagram shown in Figure 4.7. First, a general class of forecasting models is postulated; then three stages are proposed. In stage 1 a
specific model that can be tentatively entertained as the forecasting model best suited to that situation is identified. Stage 2 consists of fitting that model to the available historical data and running a check to determine whether it is adequate. If not, the approach returns to stage 1 and an alternative method from those available in the general class is identified. When an adequate model has been accepted, stage 3 - the development of a forecast for some future time period - is pursued.

Figure 4.6 Autoregressive Models of Order 2

This technique has a number of advantages over other methods of time series analysis. Firstly, it is more logical and statistically sound than other univariate time series models. Secondly, the method extracts a great deal of information from the historical time series data. Finally, the method results in an increase in forecast accuracy while keeping the number of parameters to a minimum in comparison with similar modelling processes. However, like other univariate time series models, it can predict when but not why demand may change and in consequence it cannot be used to assess the impact of changes in any of the factors which influence demand.

Figure 4.7 Process of Box-Jenkins Method

1. Postulate a general class of ARMA models
2. Identify the model which can be tentatively entertained
3. Estimate parameters in the tentatively entertained mode
4. Diagnostic check: is the model adequate?
5. Use models to generate forecasts

A general class of Box-Jenkins models for a stationary time series are ARIMA (Autoregressive Integrated Moving Average) models. ARIMA models are a specialised class of linear filtering techniques that completely ignore independent variables in making forecasts. ARIMA is a highly refined curve-fitting device that uses current and past values of the dependent variable to produce accurate short-term forecasts (Hanke & Reitsch, 1992).
4.2.2. Causal Models

Causal models are based on the cause-and-effect relationship between dependent variable and explanatory variables. For example, it is often assumed and examined that the tourist demand is affected by the level of income, travel cost, exchange rate, marketing expenditure and so forth. Since major explanatory variables have already been dealt with in Chapter Three, this section focuses specifically on the nature of each technique.

Some dominant causal models which have particularly been applied to tourism demand forecasting are examined in this section. These are gravity and trip generation models and econometric models. Econometric models are broken down into four sub-sections; classical multivariable regression models, Almost Ideal Demand System models, cointegration and error correction model, vector autoregression model. In addition, artificial neural network models are reviewed at the end of this section, although this technique is not used for the empirical study of this research.
4.2.2.1. Gravity and Trip Generation Models

Origin and Characteristics

Gravity models and trip generation models need to be explained respectively in terms of their origin and characteristics.

Gravity models look similar to regression models in that both use ordinary least squares for the demand function. However, they are different from the point that gravity models seem to always be involved with the distance variable. Archer (1976, p.54) pointed that:

> It is very difficult to differentiate at the margin between gravity models and what might be termed multi-variable regression demand models. Perhaps the principle differences lie in the derivation of the two basic models and in the degree of emphasis given in gravity modelling to the constraints imposed upon travel by the distance factor.

Some authors emphasised that there exist some conceptual and technical differences in their formulation. While the regression models are estimated statistically, the gravity model is usually calibrated by trial-and-error procedures (Cesario, 1969; Uysal & Crompton, 1985).

Others make some distinction by describing that regression models are usually implemented to determine the relative magnitude and direction of each independent variable on the specified outcome variable, while gravity models frequently specify quite rigidly the relationships which are hypothesised to exist (Van Doorn, 1984b).

The gravity models are derived from the principles of Newton's law of gravitation: two bodies attract each other in
proportion to the product of their masses and inversely proportional to the square of their distance apart (Uysal & Crompton, 1985).

The major form of equation is as follows:

\[ I_{ij} = \frac{GM_{ij}}{D_{ij}^2} \]  

(4-15)

where
\[ I_{ij} = \text{gravitation attraction between two bodies, } i \text{ and } j \]
\[ G = \text{gravitational constant} \]
\[ M_{ij} = \text{masses of } i \text{ and } j \]
\[ D_{ij} = \text{distance between the centres of } i \text{ and } j \]

If this model is transformed into gravity model for tourism, one simple gravity model can be formulated as follows:

\[ T_{ij} = \frac{P_i G_i A_j}{D_{ij}^\alpha} \]  

(4-16)

where
\[ T_{ij} = \text{number of holiday visitors from zone } i \text{ staying in zone } j \]
\[ P_i = \text{population size of zone } i \]
\[ D_{ij} = \text{distance from zone } i \text{ to zone } j \]
\[ G_i = \text{generation factor for zone } i \text{ (constant)} \]
\[ A_j = \text{attractiveness factor for zone } j \text{ (constant)} \]
\[ \alpha = \text{distance exponent (constant)} \]

This formulation is almost equivalent to Crampon's model. Initially, the equation (4-16) must be calibrated with historical data before it can be used for forecasting. Then, the values of \( G_i, A_j \) and \( \alpha \) must be calculated.

Although the \( G_i \) constant is fixed as a universal constant in Newton's model, \( G_i \) for tourism is a proportionality constant that adjusts the magnitude of the other variables so that they can explain as accurately as possible the observed level
of tourism demand. Smith (1989) pointed out that the relative values of $G$ in different modelling situations might contain some meaning of use to tourism research, but the subject has not yet been fully addressed. However, he emphasised that the most important reason for developing a gravity model is not to replicate observed travel patterns or to examine the magnitudes of $\alpha$ and $G$, of course, but rather to provide a forecasting methodology.

$A_j$ represents the relative attractiveness or capacity of a specific destination, and $A_j$ is a constant rather than a variable. It is likely that the larger the estimated value of $\alpha$, the greater the effect of distance on reducing the number of tourists. Gordon and Edwards (1973) showed a three-step approach in order to obtain three constants, or $G$, $A_j$, and $\alpha$. The objective of their research was to examine the pattern of holiday trips in Great Britain and to forecast the potential demand for holidays in the South West of England which might occur after the construction of two motorways by using a gravity and trip generation model.

Smith (1989) mentioned that the formulation has been the inspiration for a growing body of travel and interaction models in the social sciences. He then explained that interaction here could be any form of exchange between two social groups such as financial flows, telephone calls, mail volumes, marriages, trips, etc. The masses of the social groups may be expressed in terms of population, relative wealth, retail floor space, destination attractiveness, and many other variables. Distance is usually measured in terms of physical separation, but measures of travel time or social distance can also be used.

There can be some strengths and weaknesses of the gravity model. One weakness, in the basic model, is that there is no upper limit on the number of trips that may be forecasted. Gravitational attraction in Newton's law of gravitation is
always proportional to the masses of two bodies and applicable whatever the masses of two bodies changes. However, it is likely that the number of trips does not seem to increase proportionally to the population size of origin area and the capacity of destination. For example, if the capacity were to increase ten fold the forecast would increase ten fold, which is unrealistic. In addition, population size does not always explain the number of trips. Instead of population size, income variable might explain the dependent variable much better.

Smith (1989) suggested that a constrained gravity model in which a realistic upper limit is identified should be developed in order to solve the problem of the basic gravity model. It can be accomplished by developing a two-stage model. The first stage estimates the total number of trips that can be generated under specified conditions, and the second part allocates those trips to competing destinations.

One of the strengths of the gravity model lies in that it can measure the relative attractiveness of destinations from a particular origin. For example, it would be of interest to measure the relative attractiveness of Cheju Island in Korea perceived by Korean domestic tourists from various regions.

However, it is sometimes difficult to compare the relative attractiveness without considering socio-economic variables since the gravity model puts more emphasis on the non-socio-economic variables such as distance, size of population, time to travel by a certain type of travel mode and so on. For example, it is not sensible to measure and compare the relative attractiveness of Korea seen by Japanese and American merely by incorporating distance and population size factors when a gravity model is used. Population itself is unlikely to well explain international demand for tourism. For example, even though US outnumber Japanese in terms of population size, it does not necessarily mean that the number
of US tourists are higher than that of Japanese to Korea. For further example, Boniface & Cooper (1994) stated that the densely populated rural nations of South-east Asia have low travel propensities due to the level of economic development and the simple fact that the population is mainly dependent upon subsistence agriculture and has neither the time nor the income to devote to tourism.

In terms of distance factor, either travel cost or time cost is normally used as a proxy variable for distance factor rather than physical distance factor particularly when international demand is forecasted. Physical distance factor seems to be less significant than travel cost and time cost for the determinants of tourism demand. The development of transport technology made it possible and easier to access a tourist destination which used to be difficult to reach and affordable for more people to make more international trips than before. Moreover, pleasure tourists are more likely to prioritise the price of travel package program and the values (or attractions) of particular tourist destination rather than the physical distance.

Therefore, as a gravity model improves its performance by incorporating socio-economic variables, the distinction between a gravity model and a multiple regression is likely to become increasingly blurred until they become virtually identical.

Archer (1976) stated that a gravity model is expressed in a more rigid form with the nature of the relationship, particularly those concerning distance, more closely specified. Consequently, the gravity model is a demand function in which the variable of distance element exists.

Trip generation models are sometimes derived from gravity models, whilst in other cases they are merely refined forms of consumer demand equations (Gordon & Edwards 1973; Archer, 1976; Ewing, 1980; Uysal & Crompton, 1985).
Ewing (1980) defined "trip generation" as the volume of trips emitted by an origin, and defined "trip distribution" as the proportionate allocation of these trips to different destinations. He, then, explained the jargon, spatial interaction, which indicates synthesis or joint resultant of trip generation and trip distribution, namely trip flows between all pairs of origins and destinations in a system.

**Applications**

Noticeably, Crampon (1966) used a gravity model in order to measure the potential US market for tourism in Colorado. He was the first to demonstrate explicitly the usefulness of the gravity model to tourism research. He emphasised that (1) the magnitude of the population of the market area and (2) the distance between the destination and that market should be used as a series of independent variables.

He, then, suggested that other independent variables such as income of origin market, the average age of the origin market, and the general propensity of the residents to travel can be injected into his gravity model. He pointed out that the data which represents the magnitude of the population of the market area seem to be very straightforward and could be obtained easily, while the distance can be represented in various ways. He used substantial and shortest distance between origin and destination, or mileages, which were given by American Automobile Association, Rand McNally, and oil company maps. Nevertheless, he suggested that the cost of travel or the time consumed in movement from the origin to the destination could be used as a proxy of distance (Crampon, 1966).

As a further investigation, Crampon and Tan (1973) developed a gravity model in order to examine the factors which influenced the flow of tourists into the Pacific Basin area.
in 1970. The objective of the research was to provide a framework for quantitatively examining the major elements or factor-groups that influence travel in order to facilitate an identification and understanding of the various factors rather than analyse or even identify all such influencing factors. In an attempt to measure the total number of visits made to any travel destination, he described that four mutually exclusive factors exert an impact on travel between such origin-destination pairs (o-d pairs). Those elements include market element \((M_{oy})\), destination element \((A_{dy})\), location element \((L_{od})\), and tie element \((T_{ody})\). The mathematical function of their model can be expressed in a simple form as follows:

\[
V_{ody} = f(M_{oy}, A_{dy}, L_{od}, T_{ody})
\]  

(4-17)

They used two market variables represented by the magnitude of the population of origin o and the per capita income of residents of origin o respectively, one location variable represented by the distance in miles, and one tie variable represented by the per mile cost of travel between each o-d pair. Then, they converted these four independent variables into logarithms so that the standard least square technique can be possible. They explained that the relative attractiveness of certain destinations can be indicated by a ratio. The ratio is obtained from the actual or observed value divided by an estimated or computed value. If the resulting value is greater than 1.0, then the actual number of visits made was greater than what was expected by the model. Subsequently, they assumed that this ratio indicates or measures relative attractiveness of a destination. They concluded that the more highly developed countries had higher propensities to travel and attract visitors. Unsatisfactorily, the \(R^2\) value was low, which indicates some significant explanatory variables had been eliminated from the analysis.
Gordon and Edwards (1973) also used a gravity model based on a number of factors which were likely to influence the number of recreational trips. Then, they attempted to employ the model to forecast the potential increase in demand for holidays in the South West of England which might result from the completion of two new motorways.

The factors include population, generation factors (car ownership and/or income in the region of origin; the accessibility of other resorts or holiday areas from the region of origin), distance factors (money costs of travel between the two areas; journey time between the two areas), and attractiveness factor in order to explain the flow of holiday-makers from specific origins to various destinations. Obviously, all the factors showed the positive relationship with the number of trips except the distance factors. In order to support underlying model, various sub-models were developed to quantify the generation factor for each origin and the attractiveness factor for each destination.
4.2.2.2. Econometric Analysis

Before moving on to examine econometric models, an appropriate definition of econometrics is sought since it is sometimes confused and difficult to define.

Tintner defined econometrics as follows:

Econometrics, the result of a certain outlook on the role of economics, consists of the application of mathematical statistics to economic data to lend empirical support to the models constructed by mathematical economics and to obtain numerical results.

(Tintner, 1968, p.74)

Although there are a number of ways of defining econometrics, it is an amalgam of economic theory, mathematics and statistics. However, Gujarati (1995) argued that there is a difference between the economic statistician and econometrician. He emphasised that the true econometrician is the one who is not only involved with collecting, processing, and presenting economic data but also using the collected data to test economic theories.

On the other hand, Wanhill (1987) defined an 'econometric model' as a statistical 'caricature' of how the economy works. He pointed out that the model can be used to simulate the economy to ascertain the effects of changes in exogenous variables (instruments) under a government's control, or to predict the behaviour of the economy when conditions are kept stable.

No matter how the definition of econometrics is, it is concerned with

1. the measurement of relationships between a dependent variable and independent variable(s);
2. the estimation of the parameters (or coefficients) involved;

3. the validity of the theoretical ideas represented by such relationships;

4. quantitative predictions or forecasts by using the relationships.

In an econometric model, there exists a certain procedure similar to those in multiple regression. Makridakis et. al. (1983) summarised the procedure as follows:

1. determining which variables to include in each equation (specification) based on economic theory;
2. determining the functional form (i.e., linear, exponential, logarithmic, et.) of the each of the equations;
3. estimating the parameters of the equations;
4. testing the statistical significance of the results;
5. checking the validity of the assumptions involved.

(Makridakis et. al., 1983, p. 321)

Gujarati (1995) also put forward a general procedure of traditional econometric methodology. The procedure is as follows:

1. Statement of theory or hypothesis
2. Specification of the mathematical model of the theory
3. Specification of the econometric model of the theory
4. Obtaining the data
5. Estimation of the parameters of the econometric model
6. Hypothesis testing
7. Forecasting or prediction
8. Using the model for control or policy purposes
As shown in 7 and 8 from the procedure above, the ultimate purpose of using the econometric models is for forecast and policy making.

It should be noted that there is not much difference between an econometric model and multivariable regression in that both models use least square technique to obtain best fitting equation. Indeed, multivariable regression models can be regarded as one form of econometric modelling. Therefore, the following section deals with classical multivariable regression followed by AIDS (Almost Ideal Demand System) model and cointegration and error correction approach which are new developments of econometric modelling.

**Classical Multivariable Regression Models**

The classical multivariable regression analysis, the traditional approach, applies the ordinary least square technique for the estimation of parameters (or coefficients). As the name suggests, multivariable regression involves the use of two or more independent variables in order to predict a dependent variable. This technique allows a researcher to study the relationships between a dependent variable and a number of explanatory variables whilst taking into account the interrelationships among the explanatory variables (or independent variables) themselves. Therefore, the selection of dependent and independent variables is critically important in order to identify the degree of the influence between those variables.

The general form of multivariable regression (also called multiple regression) is as follows:

\[
Y_i = \hat{\beta}_0 + \hat{\beta}_1 X_{1i} + \hat{\beta}_2 X_{2i} + \cdots + \hat{\beta}_n X_{ni} + \epsilon_i
\]

(4-18)

where
where

- $Y_i$ = dependent variable
- $X_{ki}$ = independent variables
- $\hat{\beta}_k$ = fixed parameters (or coefficients)
- $\epsilon$ = error term

In equation (4-18), $\hat{\beta}_0$ is referred to as intercept and $\hat{\beta}_1$, $\hat{\beta}_2$, etc. as regression slopes. In particular, it should be noted that $\hat{\beta}_1$, for example, measures the effect on $Y$ of a unit change in $X$, when all the other explanatory variables are held constant. Likewise, $\hat{\beta}_2$ measures the effect on $Y$ of a unit change in $X_2$ when all other $X$ variables are held constant.

Since $Y$ and $X$ variables are already known, obtaining coefficients is the most important task minimising the error term in order to make full function. The coefficients are often calculated by ordinary least squares (OLS) which is the best-known method of estimation in multivariable regression. The OLS technique attempts to minimise the sum of squared residuals (SSR).

$$SSR = \sum e_i^2 = \sum(Y_i - \hat{Y}_i)^2$$

(4-19)

where

- $SSR$ = Sum of Squared Residuals
- $e_i$ = residuals
- $Y_i$ = dependent variable of the regression equation
- $\hat{Y}_i$ = estimated dependent variable of the regression equation

The population regression equation can be postulated as equation (4-20) while sample regression equation can be simply expressed as equation (4-21).

Population regression equation:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \ldots + \beta_k X_k$$

(4-20)
Sample regression equation:

\[ \hat{Y} = \hat{\beta}_0 + \hat{\beta}_1 X_1 + \hat{\beta}_2 X_2 + \ldots + \hat{\beta}_k X_k \]  \hspace{1cm} (4-21)

In equation (4-21) \( \hat{Y} \) is known as the estimated (or predicted) value of \( Y \) in equation (4-20). Obviously, the actual sample values of \( Y \) will not coincide with estimated value of \( Y \), and the difference between the two are referred to as residuals as shown in equation (4-22).

\[ Y_i = \hat{Y}_i + \epsilon_i \quad \text{for all } i \]  \hspace{1cm} (4-22)

The method of ordinary least squares is attributed to Carl Friedrich Gauss, a German mathematician. Under certain assumptions, the method of least squares has some very attractive statistical properties that have made it one of the most powerful and popular methods of regression analysis (D. J. Gujarati, 1995). In other words, the least square method seems to be the most reliable way of finding precise estimator(s) or coefficient(s) of regression analysis.

In multivariable regression analysis, assumptions are made concerning explanatory variables and concerning disturbances.

It is assumed that each of the explanatory variables

(IA) is non-stochastic (not trended);
(IB) has values that are fixed in repeated samples;
(IC) is such that, as \( n \to \infty \), the variance of its sample values \( \frac{\sum x_i^2}{n} \to Q_j \) \( (j=2,3,\ldots,k) \), where the \( Q_j \) are fixed finite constants.
(ID) There exist no exact linear relationships between the sample values of any two or more of the explanatory variables.
Assumptions concerning the disturbances are as follows:

(IIA) \( E(e_i) = 0 \) for all \( i \);

(IIB) \( \text{Var}(e_i) = E(e_i^2) = \sigma^2 \) constant for all \( i \);

(IIC) \( \text{Cov}(e_i, e_j) = E(e_i e_j) = 0 \) for all \( i \neq j \);

(IID) each \( e_i \) is normally distributed.

The assumption (IC) rules out explanatory variables that exhibit definite trends over time, which result in the problem of spurious correlation.

The assumption (ID) indicates that there should be no linear relationship between explanatory variables. For example, \( X_{1i} = 5 + 3X_{2i} \) is not allowed. If this assumption is ruled out, this would imply that a linear relationship may well exist between explanatory variables, which would subsequently lead to the 'multicollinearity' problem. In practice, it is unlikely to experience the perfect multicollinearity which means exact linear relationship between explanatory variables.

One of the significant barriers often encountered by researchers when using multivariable regression model is multicollinearity problem. Multicollinearity is the name given when two independent variables are perfectly or nearly perfectly correlated (i.e., the correlation between them is equal or very close to +1 or -1).

The problem with multicollinearity is that it can lead to large standard errors and small \( t \) ratios. Its possible consequences may be summarised as follows.

1. Estimation of parameters (or coefficients) may be imprecise because of the large standard error. As a result, confidence intervals will be wide, and even small changes to the data set may have a considerable effect on the estimates.
2. Small t ratios mean that significance tests concerning single variables may tell us little. However, the danger here is that a variable turned out to be insignificant due to a low t ratio may be forced to be eliminated from the equation while, in fact, this variable is important in the determination of the dependent variable. Its true importance may simply be obscured by the presence of multicollinearity.

3. It may be impossible to incorporate the variables involved with multicollinearity into the equation at the same time.

In statistics, the precision of an estimate is measured by its standard error mentioned above. This standard error is nothing but the standard deviation of the sampling distribution of the estimator, and the sampling distribution of an estimator is simply a probability or frequency distribution of the estimator, that is, a distribution of the set of values of the estimator obtained from all possible samples of the same size from a given population.

It should be noted that multicollinearity does not imply any violation of the classical assumptions of multivariable regression in which case estimation is impossible apart from perfect multicollinearity. Even with a high degree of multicollinearity, the OLS (Ordinary Least Squares) estimators retain all their desired properties of efficiency, consistency, etc.

Makridakis et al. (1983) pointed out two major issues involved with multicollinearity. One is related to calculation and the other is associated with the stability of regression coefficients.

If perfect multicollinearity exists in a regression analysis, it is simply not possible to carry out a least square solution. In the case of nearly perfect multicollinearity,
the least square solutions still can be affected by round-off error problems in some calculators (and some computers). However, round-off error problems are likely to be solved due to computational methods that are robust enough to take care of all but perfect multicollinearity problems (Makridakis et al., 1983).

In addition, the stability of the regression coefficients is affected by near multicollinearity. In fact, this seems to result from the computation problem mentioned above. The value of a specific coefficient in a regression model would be slightly different from one another depending on the technique chosen to obtain coefficients. Since some research using OLS in multiple regression has proved to be unsuitable for multicollinearity problem, some other way of regression techniques such as ridge regression is often recommended in order to handle the multicollinearity problem (Willis & Perlack, 1978).

For example, Fujii and Mak (1980) once discussed the problem of multicollinearity among explanatory variables commonly encountered in travel demand forecasting and attempted to solve it by using ridge regression. The authors demonstrated that when severe multicollinearity exists and the pattern of collinearity among regressors changes over time, ridge regression models yield forecasts with significantly lower forecast error than ordinary least squares models.

However, Thomas (1997) pointed out major drawbacks of using ridge regression technique. From his point of view, ridge regressions are an essentially mechanical and arbitrary technique, although they can lead to estimators with smaller mean square errors than the OLS estimators. The use of principal components has its advocates, but the results obtained by this technique are frequently very hard to interpret in a sensible economic manner.
In a number of forecasting analyses, the number of tourists or expenditure spent on tourism is commonly used as the dependent variable, while income level of origin countries, travel cost, exchange rates and marketing expenditure are generally accepted as independent variables. Some researchers used the number of tourists as a dependent variable (Blackwell, 1970; Bechdolt, 1973; Jud & Joseph, 1974; Summary, 1988) while others preferred to use visitor expenditure figures as a dependent variable (Guthrie, 1961; Gray, 1966; Artus, 1970, 1972; Stronge & Redman, 1982; Chadee & Mieczkowski, 1987).

For example, Blackwell (1970) made an attempt to derive projections of tourist numbers to Ireland for the period 1969 to 1978 and to use these projections to forecast the demand for accommodation. The travel to Ireland was first divided into its market, or origin countries. Several multi-variable regression analyses were undertaken in order to explain the numbers of tourists originating in Great Britain and USA. The dependent variable was the number of visitors per 1,000 population of Great Britain and USA respectively. He used four independent variables to explain the dependent variables. Those four explanatory variables are as follows: (1) disposable income per capita at constant prices; (2) a price factor, which in the case of UK visitors was expressed as the ratio of the average value of consumers' total expenditure in Ireland to that of the Great Britain, and for US visitors was taken to be the weighted average revenue per passenger-mile of certain major North Atlantic air carriers, and (3) a car ferry dummy variable (in the case of UK visitors only) to express the influence of the expansion of car ferry facilities. No time factor was included because of the possibility of high multicollinearity between time and the income variable. In his research, the most important explanatory variable was the disposable income for every permutation of the basic model. In his concluding remarks, the attention to some weaknesses and constraints of his
analysis and to the lack of an adequate data base was drawn. He emphasised that forecasts are likely to be influenced by unpredictable factors such as changes in economic and political policies.

For a further example, Bechdolt (1973) made an attempt to measure the demand for travel by the cross-sectional analysis. The mainland states of USA and the District of Columbia were selected for origin areas while Hawaii was chosen for destination. The data used for the demand function covers the period from 1961 to 1970. He used two forms of model. One was a total demand function which was attempted to measure the total number of visitors of each state to Hawaii using two major explanatory variables. The first one was the total personal income earned in a state. The second was the cost of travel as a proxy of distance factor. The first-class return fee of airline was adopted for the cost of travel. The other model was fairly similar to the previous one except the fact that the data were expressed in per capita terms. He specified that the number of visitors in proportion to the population of each state for a given year was a function of the per capita personal income and the airline fair for each state.

The method and application of classical multivariable regression have been examined. However, there are major weakness in the assumptions of the classical multivariable regression models. Interestingly, there is no appropriate way of confirming whether the relationship between dependent variable and independent variables is true or not even if high correlation exists between them. This problem is associated with non-stationary time series (or data contains trend).

For example, if the number of tourist arrivals in a particular destination country were turned out to be highly correlated with the number of dogs in the origin countries by
using multivariable regression, this does not necessarily mean that there is a causal relationship between them.

Thus, highly significant regression coefficients and high values for the coefficient of determination $R^2$ are likely to be obtained when both dependent variable and regressor(s) in an equation are trend-dominated even if the trending variables are completely unrelated. This is called spurious regression or spurious correlation problem.

**Almost Ideal Demand System (AIDS) Model**

The almost ideal demand system (AIDS) model is a functional model for the representation of consumer preferences using a system of demand equations, thereby linking economic theory to econometric application (White, 1982 & 1985; O'Hagan & Harrison, 1984; Fujii, Khaled & Mak, 1985; Syriopoulos, 1990).

Basically, this technique involves a three-stage process of making a forecast. Firstly, consumer expenditure by origin countries are allocated into the proportions presumed to be spent on each group of goods including tourism identified as one of the groups. Secondly, the tourism expenditure is categorised into domestic and international, with the latter divided into regions and subregions. Lastly, tourism expenditure to particular destination is identified and allocated.

The basic functional form of the AIDS model is as follows:

$$w_i = \alpha_i + \sum_{j=1}^{n} \gamma_j \ln p_j + \beta_i \ln \left( \frac{x}{p_j} \right) + u_i \quad i = 1, ..., n \quad (4-23)$$

where

- $w_i$ = Budget share of the $i$th good
- $\alpha, \beta$ and $\gamma$ = Parameters
\( p_i = \) Price of the \( i \)th good
\( x = \) Total expenditure on all goods of the group (in the system)
\( P = \) Aggregate price index
\( u_i = \) Normal disturbance term assumed to have zero mean and constant variance.

The aggregate price index, \( P \), is defined as:

\[
\ln P = a_0 + \sum_{i=1}^{n} \alpha_i \ln p_i + \frac{1}{2} \sum_{i=1}^{n} \sum_{j=1}^{n} \gamma_{ij} \ln p_i \ln p_j \quad (4-24)
\]

A linear approximation can be made by replacing \( P \) with the approximation \( P' \) (where prices are relatively collinear), so that

\[
\ln P' = \sum_{i=1}^{n} w_i \ln p_i \quad \text{(or, } P' = \prod_{i=1}^{n} p_i^{w_i}) \quad (4-25)
\]

where
\( w_i = \) the observed sample budget share
\( p_i = \) the price of \( i \)th good

Restrictions from consumer demand theory are easily imposed on the model. These restrictions are necessary if the model is to be consistent with the basic axioms of demand and utility theory (Deaton & Muellbauer, 1980). The adding up, homogeneity, and symmetry restrictions require that:

\[
\sum_{i=1}^{n} \alpha_i = 1, \quad \sum_{i=1}^{n} \gamma_{ij} = 0 \quad j = 1, \ldots, n
\]
\[
\sum_{i=1}^{n} \beta_i = 0, \quad \sum_{j=1}^{n} \gamma_{ij} = 0 \quad i = 1, \ldots, n \quad (4-26)
\]
\( \gamma_{ij} = \gamma_{ji} \) for all \( i \) and \( j \)

In fact, the values of \( \beta_i \) determine whether good \( i \) is a luxury or normal good. When \( \beta_i > 0 \), the budget share \( w_i \) increases
with $x$ so good $i$ is considered a luxury, similarly if $\beta_i < 0$ the good is usually called normal.

White (1982, 1985) applied AIDS model for the first time to examine international travel demand between the United States and Western Europe. The expenditure and price elasticities of the demand for tourism were obtained. In particular, dummy variable for the 1968 political disturbances in France were incorporated into each budget share equation. Sixteen European destinations were aggregated into seven groups based on geographical and socioeconomic grounds, in order to reduce the substantial number of parameters to be estimated. In summary, travel to most other countries was classified as complimentary with respect to travel to France and as substitutes with respect to the UK. The homogeneity condition (the demand function is homogeneous of degree zero in prices) was tested and accepted but symmetry (the matrix of price substitution effects is symmetric) was rejected.

The homogeneity and symmetry are properties that characterises the Hicksian (compensated) demand function and the Marshallian demand functions. The homogeneity that a proportional change in expenditure and all of the prices has no effect on the quantities purchased or, further, on the budget allocation. The symmetry (or Slutsky) condition means that the cross-price derivatives of the Hicksian demand functions are symmetric. By this is meant, the matrix of the compensated price derivatives, or substitution matrix, should be symmetric.

In addition, adding up and negativity properties need to be satisfied for the demand functions. The adding up indicates that the sum of the individual expenditures is equal to total expenditures. The total expenditure constraint ensures that the values of the expenditure on the different goods and services add up to the predetermined total under all
circumstances. It should be noted that expenditure here is not identical to income. Deaton (1975) mentioned that an income constraint would not necessarily satisfy the adding up property. The concept of negativity is that compensated own-price increases lead to lower demand levels for the commodity involved. These four conditions are necessary for the model to be consistent with the consumer demand theory.

O'Hagan and Harison (1984) refined the AIDS model applied by White and attempted to extend the empirical conclusions. The allocation of total US tourism expenditure in Western Europe was reexamined. However, the share of each European destination was taken individually and not in aggregate groups. Furthermore, transportation cost was not included in the system. Time trends and various dummy variables were used in each equation in order to take into account of political upheavals, international fairs, sporting events and changing tourist tastes (or propensities). The estimation of the original model could not proceed properly because of the multicollinearity problems and "degrees of freedom" inadequacies (usually resulted from a large number of parameters to be estimated compared to a relatively small number of observations). Therefore, they imposed certain non-zero restrictions on the coefficients of cross-price effects \( \gamma_{pj} \) and ended up estimating a transformation of the initial AIDS model using a single relative price variable for each destination country. The single price variable was of the following form:

\[
\ln p_i^* = \ln p_i - \frac{\sum w_j \ln p_j}{\sum w_j} 
\]

The final model can be formulated by replacing \( p_i \) in equation (4-23) with the \( p_i^* \) obtained from in equation (4-27). The overall values of the elasticities were reasonably accepted except the positive own-price elasticity for Spain.
On the other hand, Fujii, Khaled and Mak (1985) applied AIDS model to investigate tourism demand and to estimate total tourism expenditure and price elasticities for individual components of vacation travel to Hawaii. The expenditure by visitors to Hawaii during 1958 to 1980 was analysed for six different classes of goods and services: 1) food and drink, 2) lodging, 3) recreation and entertainment, 4) local transport, 5) clothing and 6) other items. The research was undertaken particularly for the evaluation of the effects of public policies on the pricing of goods and services at a tourist resort. More specifically, for example, the effects on local government revenue and on the travel industry of a tax on hotel occupancy were assessed by the model. The study concluded that a tax on hotel room occupancy, imposed in many resorts, probably damages the lodging and some non-lodging sectors of the tourism industry.

Finally, Syriopoulos (1990) applied AIDS model to examine the consumer behaviour of major tourist generating countries such as U.K., West Germany, France, Sweden and USA, by linking consumer preferences with tourism expenditure allocation to major Mediterranean destinations (i.e., Greece, Spain, Portugal, Italy and Turkey). For the formulation of a tourism demand system, further restrictions on consumer preferences were provided for his study apart from the four conventional restrictions on the demand system (i.e., adding-up, homogeneity, symmetry and negativity properties).

In order to estimate the share of tourism expenditure allocated to each tourist destination by each tourist origin country, total tourism receipts in each destination country were weighted by the relative share of tourist arrivals from the corresponding origin under study. Total tourist expenditure undertaken by each origin country was computed by adding up tourist expenditure allocated in each of the five Mediterranean destinations. Since tourism price indices were not available, the consumer price index was used as a proxy
for the tourism price index. Subsequently, the consumer price index was adjusted by the relevant exchange rates, producing an index of effective (or real) prices. However, dummy variables and time trends complicated the estimation without improving the estimation results and, as a result, these variables were eventually dropped from the final version of the model.

The empirical results showed that the overall estimates of the parameter coefficients were satisfactory. Durbin-Watson statistics was used to check the presence of autocorrelation (or serial correlation) in residuals (or disturbances). No clear-cut conclusions were drawn about the likely presence of first-order autocorrelation in the disturbances of most equations. Nevertheless, no attempt was made to correct for autocorrelation and modify the model into which some other explanatory variables are incorporated since any re-specification of the model should be directed towards a dynamic model. He concluded that the homogeneity and symmetry hypotheses were rejected because of the inappropriate asymptotic standard tests that are seriously biased. In addition, he pointed out that complications may arise due to endogeneity resulting from the inclusion of total expenditure as an explanatory variable.

Likewise, it is extremely difficult to acquire reliable data to estimate the model, and large number of parameters to be estimated may complicate the model severely despite sound foundation in demand theory.
Cointegration and Error Correction Model (ECM)

The spurious regression or spurious correlation problem in classical regression model was mentioned previously. Notably, Granger and Newbold (1974) warned spurious relationships between dependent and explanatory variables when an econometric equation has high $R^2$ but low d-w statistics. The low d-w statistics is due to the presence of autocorrelation in the OLS residuals.

Since most of the economic variables are upward/downward trended, i.e., they are non-stationary. The regression models based on these data are likely to produce high $R^2$s. However, the high $R^2$s do not necessarily mean that the variables in question are actually related and the seemingly high correlation judged by the $R^2$ may only be resulted from trend components in the time series. This subsequently leads to the question: how to find the true economic relationship or the long-run equilibrium relationship between economic variables? The cointegration technique is developed for this purpose.

Granger and Newbold (1986) pointed out that the true long-run equilibrium relationship can be detected by the pattern of disequilibrium error in the regression model with level variables. If the disequilibrium error is identically and independently distributed with zero mean and constant variance (i.e. stationary), then it is said that the variables in the regression model are cointegrated, or equivalently, there is a long-run equilibrium relationship exists between the variables.

The cointegration technique is explained in detail below. In order to simplify the explanation, a two variable regression model is used. However, the principle can be expanded easily to a more complicated system with many variables.
Suppose the long-run equilibrium relationship between two variables \( X \) and \( Y \) is defined as follows:

\[
Y_t = KX_t^{\beta_1} \quad (4-28)
\]

where \( K \) and \( \beta_1 \) are constant parameters. For example, \( Y \) might be the demand for tourism in a tourist destination country and \( X \) is income of tourism generating country under ceteris paribus conditions. \( \beta_1 \) can be regarded as the long-run elasticity of \( Y \) with respect to \( X \). The equation (4-28) can be transformed into logarithm function as follows using the lower-case letters to denote the natural logarithms of variables.

\[
y_t = \beta_0' + \beta_1 x_t \quad (4-29)
\]

where \( y_t = \ln Y \), \( x_t = \ln X \) and \( \beta_0' = \ln K \).

It should be noted that although economic systems are generally assumed to be in equilibrium in the long-run, economic variables may temporarily diverge from the equilibrium status in the short-run and this divergence may be measured by the disequilibrium error, that is,

\[
y_t - \beta_0' - \beta_1 x_t : \text{disequilibrium error} \quad (4-30)
\]

Obviously, if the disequilibrium error takes a zero value then \( x_t \) and \( y_t \) are in equilibrium. Equation (4-29) also could be written in a dynamic form (i.e., introducing lagged variables into equation (4-29)):

\[
y_t = b_0 + b_1 x_t + b_2 y_{t-1} + \mu y_{t-1} + \epsilon_t, \quad 0 < \mu < 1 \quad (4-31)
\]

The main problem in estimating the parameters of equation (4-31) is that the levels of variables may be non-stationary. Furthermore, the d-w statistics will be upward biased since the lagged dependent variable is used as an explanatory variable. When a lagged dependent variable is used, it is
very likely that d-w statistic would fail to detect the autocorrelation of disturbance. These problems are likely to cause spurious relationship between $x_t$ and $y_t$. However, subtracting $y_{t-1}$ from each side of equation (4-31), and then adding and subtracting $b_1x_{t-1}$ from right-hand side produces

$$\Delta y_t = b_0 + b_1\Delta x_t + (b_1 + b_2)x_{t-1} - \lambda y_{t-1} + \epsilon_t$$  \hspace{1cm} (4-32)

where $\lambda = 1 - \mu$. If equation (4-32) is reparameterized, then it becomes:

$$\Delta y_t = b_0 + b_1\Delta x_t - \lambda(y_{t-1} - \beta_1x_{t-1}) + \epsilon_t$$  \hspace{1cm} (4-33)

Equation (4-33) can then be further reparameterized as follows:

$$\Delta y_t = b_1\Delta x_t - \lambda(y_{t-1} - \beta_0 - \beta_1x_{t-1}) + \epsilon_t$$  \hspace{1cm} (4-34)

In fact, equation (4-34) is called the short-run error correction model (ECM) and it is just another way of writing (4-31). The term in parenthesis in equation (4-34) can be regarded as the disequilibrium error from period $t-1$. Consequently, the current change in $y$ depends upon the change in $x$ and upon the extent of disequilibrium in the previous period.

The reason for distinguishing $\beta^*_0$ from $\beta_0$ is that they are not identical. Rather, the relationship between them is given by equation (4-35).

$$\beta^*_0 = \frac{\lambda \beta_0 - \theta(b_1 - b_2)}{\lambda}$$  \hspace{1cm} (4-35)

The $\theta$ in equation (4-35) represents the long-run trend growth rate in $x$. Therefore, $\Delta x_t = \theta$, or $x_t = x_{t-1} + \theta$. Thus, the parameter $\beta^*_0$ in the equilibrium relationship equation (4-29) depends on $\theta$, the long-run growth rate in $x$. If the long-run
elasticity $\beta_1$ exceeds the short-run elasticity $\beta_0$, then the parameter $\beta_0'$ will vary inversely with the growth rate. Equation (4-35) only reduces to $\beta_0' = \beta_0$ either if the long-run growth rate in $x$, $\theta$ is zero, or if the short-run and long-run elasticities $\beta_1$ and $\beta_0$ are equal. However, it should be noted that the ECM in the form (4-34) could not be estimated without prior knowledge of the long-run parameters.

In order to identify whether $x_t$ and $y_t$ are cointegrated each other in equation (4-29), there are some preconditions to be satisfied. Firstly, $x_t$ and $y_t$ should be integrated of order one, that they are I(1) variables. In addition, the disequilibrium error which is expressed in some linear combination of $x_t$ and $y_t$ should form a stationary time series and have a zero mean. If these conditions are met, then it can be said that $x_t$ and $y_t$ are cointegrated.

The Engle-Granger methodology is prevalently applied to test for cointegration. Engle and Granger (1987) suggest a simple way of detecting cointegration between $x_t$ and $y_t$. The procedure is outlined below:

Firstly, the integration order or the number of unit roots in the two variables should be examined first before testing for cointegration since the variables under consideration should be integrated of the same order. In testing for unit roots of the time series, the Dickey-Fuller (DF) test and augmented Dickey-Fuller (ADF) test may be used although other test procedures, such as Phillips-Perron (Phillips & Perron, 1988) test and the Perron test (Perron, 1989), are also available (in this research, only DF and ADF tests are used).

The DF test is the simplest form of unit root testing procedure. The DF stationarity test is based on the following auxiliary equation:

$$X_t = \alpha + \phi X_{t-1} + u_t \quad (4-36)$$
where $X$ is a time series, $\alpha$ is the intercept, $\phi$ autocorrelation coefficient and $u_i$ disturbance term. If the value of the coefficient of $\phi$ in equation (4-36) is equal to 1, time series $X$ is said to be nonstationary (or $X$ contains unit roots). The above equation can be transformed into the following equation if $X_{t-1}$ is taken away from each side and $\phi$ is reparameterized.

$$\Delta X_t = \alpha + \phi' X_{t-1} + u_t, \quad \phi' = \phi - 1$$ \hspace{1cm} (4-37)

In practice, instead of testing the parameter $\phi=1$, $\phi'=0$ is actually tested by examining the t statistic of the estimated parameter, $\phi'$. However, Dickey and Fuller (1979) noticed that since the error term in equation (4-37) does not have a normal distribution, the standard t test is therefore invalid. The calculated t statistic of $\phi'$ is hence compared with the Dickey-Fuller critical values which were generated from Monte Carlo simulations. If the calculated t ratio of $\phi'$ is not more negative than the critical value of the DF statistic, the time series is said to be nonstationary. The test is then repeated based on the differenced series until the t statistic is less than the critical value of the DF statistics. The integration order or the number of the unit roots of the time series is therefore defined as the number of differences that are needed to achieve a stationary series. However, if the residuals in the auxiliary equation (4-36) suffer from serial correlation problem, the DF statistic will generate biased result. To solve the problem of serial correlation, the ADF test should be used. The ADF test is the modified procedure by augmenting equation (4-36) with lagged dependent variables. The rth-order ADF statistic is based on the following equation:

$$X_t = \alpha + \phi_1 X_{t-1} + \phi_2 X_{t-2} + \cdots + \phi_r X_{t-r} + u_t$$ \hspace{1cm} (4-38)
As reparameterized before, equation (4-38) may be transformed into:

\[ \Delta X_t = \alpha + \phi^* X_{t-1} + \phi_1^* \Delta X_{t-1} + \phi_2^* \Delta X_{t-2} + \cdots + \phi_r^* \Delta X_{t-r+1} + u_t \]  

(4-39)

where \( \phi^* = \phi_1 + \phi_2 + \cdots + \phi_r - 1 \) and the other \( \phi^*_i \)'s are also functions of the original \( \phi \)'s in equation (4-38). The purpose of the ADF test is the same as that of the DF test, that is to test the null hypothesis of non-stationarity \( H_0: \phi^*=0 \), against an alternative hypothesis \( H_a: \phi^*<0 \). If \( H_0 \) is rejected in favour of \( H_a \), then this implies that \( X \) is a stationary process.

Once the two variables are found to be integrated of same order, the second step is to test whether the two variables \( x_t \) and \( y_t \), are cointegrated, i.e., to see whether there exists a long-run equilibrium relationship between them. For example, if \( x_t \) and \( y_t \) are I(1), the next step is to estimate the long-run equilibrium relationship in the form:

\[ y_t = \beta_0 + \beta_1 x_t + u_t \]  

(4-40)

If the variables are cointegrated, an OLS regression produces a "super-consistent" estimator of the cointegrating parameters \( \beta_0 \) and \( \beta_1 \). Stock (1987) demonstrated that the OLS estimators \( \beta_0 \) and \( \beta_1 \) are still consistent provided \( x_t \) and \( y_t \) are cointegrated. Furthermore, he proved that these estimators converge in probability to their true values faster in the OLS models dealing with non-stationary variables than in OLS models using stationary variables.

In order to determine whether \( x_t \) and \( y_t \) are actually cointegrated, the estimated residuals (disequilibrium errors) of the long-run cointegration regression model (4-40) should be tested for stationarity. If the disequilibrium errors are found to be stationary, then \( x_t \) and \( y_t \) are cointegrated. For this stationary test of residuals, the same DF and ADF test procedures may be used.
The third step is associated with error correction model (ECM). As mentioned previously, the long-run cointegration regression can always be transformed into a short dynamic error correction model as demonstrated early. Therefore, the residuals from the estimated cointegration model (4-40) can be used to estimate the error correction model in the form of:

\[ \Delta y_t = b_0 + b_1 \Delta x_t - \lambda \hat{u}_{t-1} + \epsilon_t \]  \hspace{1cm} (4-41)

where \( \hat{u}_{t-1} \) is the estimated error term from the long-run cointegration regression (4-40), which is the equivalent error correction term in equation (4-34) since \( \hat{u}_{t-1} = (\hat{\gamma}_t - \hat{\beta}_0 - \hat{\beta}_1 x_{t-1}) \). In practice, when estimating equation (4-41) additional lagged dependent and independent variables may be included to form a general model and then the test down procedure is used to achieve a more specific specification based on the significance of the estimated parameters.

There can be several advantages of using ECM. Firstly, if dependent variable and explanatory variables are found to be cointegrated, the short-run disequilibrium relationship between them can always be represented as an ECM (Engle & Granger, 1987) while the long-run relationship is given by the cointegration regression. Secondly, it can avoid the spurious regression problems caused by incorporating non-stationary variables into classical regression models. Thirdly, the ECM is can be easily fitted into the general-to-specific methodology which is advocated by Hendry and Richard (1983). Thomas (1997) emphasised that the general-to-specific methodology could be regarded as a search for the most parsimonious ECM that best fits the given data set since this approach involves a far more systematic examination of various economic hypothesis, and avoids the worst excesses of data mining. Lastly, an ECM representation of a
disequilibrium relationship will always reduce problems of multicollinearity, since general-to-specific practitioners claim that the regressors in an ECM are often almost orthogonal. In other words, correlations between any two explanatory variables in an ECM are virtually zero. Therefore, it can be sure that high standard errors are not resulted from multicollinearity problem. Accordingly, an explanatory variable with low t ratio can be eliminated from the original equation one by one until ECM reaches suitably parsimonious final equation.

However, if the lagged explanatory variables in parenthesis in equation (4-34) are non-stationary, and not cointegrated, then the results of the ECM will be again spurious without following normal t and F distributions.

In addition, the Engle-Granger two-stage method has the problem of estimating the multivariate cointegrating regression in which more than one cointegrating vectors may exist. Engle-Granger two-stage method is valid when only one cointegrating vector exists. Cointegrating vector here indicates the family of coefficients which enable linear combination of variables to be stationary. Since this identification problem is similar to simultaneous equation bias, one could not have sensible idea of what has been estimated. Furthermore, it should be noted that in the multivariate case the $R^2$ for the cointegrating regression can no longer be relied on as an indicator particularly when small samples are used. This is because $R^2$ always increases when more regressors are added to an equation. For this reasons, Johansen (1988) suggests the Full-Information Maximum Likelihood (FIML) approach.

One good example is given below in order to provide intuitive insight into the Johansen method. For example, suppose that two I(1) variables $x$ and $y$ are determined by the following
ADL (Autoregressive Distributed Lag) equations with a maximum lag of two periods:

\[
y_t = b_{11} y_{t-1} + b_{12} x_{t-1} + b_{13} y_{t-2} + b_{14} x_{t-2} + \varepsilon_t \quad (4-42)
\]

\[
x_t = b_{21} y_{t-1} + b_{22} x_{t-1} + b_{23} y_{t-2} + b_{24} x_{t-2} + \varepsilon_t \quad (4-43)
\]

Equations (4-42) and (4-43) can be reparameterised in error correction for as follows:

\[
\Delta y_t = (b_{11} - 1) \Delta y_{t-1} + b_{12} \Delta x_{t-1} - (1 - b_{11} - b_{13}) y_{t-2} + (b_{12} + b_{14}) x_{t-2} + \varepsilon_{1t} \quad (4-44)
\]

\[
\Delta x_t = b_{21} \Delta y_{t-1} + (b_{22} - 1) \Delta x_{t-1} + (b_{21} + b_{23}) y_{t-2} - (1 - b_{22} - b_{24}) x_{t-2} + \varepsilon_{2t} \quad (4-45)
\]

Equations (4-44) and (4-45) can be expressed as below by using matrix form

\[
\Delta z_t = B_1 \Delta z_{t-1} + B_2 z_{t-2} + \varepsilon_t \quad (4-46)
\]

where

\[
\Delta z_t = \begin{pmatrix} \Delta y_t \\ \Delta x_t \end{pmatrix}, \quad B_1 = \begin{pmatrix} b_{11} - 1 & b_{12} \\ b_{21} & b_{22} - 1 \end{pmatrix}
\]

\[
B_2 = \begin{pmatrix} -b_{13} & b_{12} + b_{14} \\ b_{21} + b_{23} & -(1 - b_{22} - b_{24}) \end{pmatrix}, \quad \varepsilon_t = \begin{pmatrix} \varepsilon_{1t} \\ \varepsilon_{2t} \end{pmatrix}
\]

Among the four matrices above, matrix \( B_2 \) is a major concern since the rank of \( B_2 \) is associated with cointegration. The rank is defined as the maximum number of linearly independent rows in the matrix. There are three possibilities available concerning the rank of \( B_2 \):

Firstly, if all elements of \( B_2 \) are zero then it implies that the matrix has a rank of zero. As a result, \( \Delta z_t \) depends only on past values of itself. In other words, no error correction mechanisms are operating, and hence no long-run
relationship exists between $x$ and $y$. Therefore, it can be said that $x$ and $y$ are not cointegrated.

Secondly, if the rank of $B_2$ is two then it indicates that its rows are linearly independent. Accordingly, $x$ and $y$ are stationary variables based on Granger representation theorem. Since $x$ and $y$ are already stationary variable, the question of cointegration does not rise. In addition, this is the violation of the assumption that $x$ and $y$ are $I(1)$.

Lastly, if the rank of $B_2$ is unity then this implies that one of the rows in $B_2$ is not linearly independent. Consequently, $B_2$ can be written in the following form

$$B_2 = \alpha \beta'$$  (4-48)

where $\alpha$ is a $2 \times 1$ column vector and $\beta'$ is a $1 \times 2$ cointegrating row vector, whose elements consist of the parameters in a long-run equilibrium relationship between $x$ and $y$. Thus, if the rank of $B_2$ is unity then $x$ and $y$ are cointegrated.

For the exposition of the third case, let's assume that the second row is a constant multiple $k$ of the first row in $B_2$. That is,

$$b_{21} + b_{23} = -k(1 - b_{11} - b_{13})$$  (4-49)

and

$$-(1 - b_{22} - b_{24}) = k(b_{12} + b_{14})$$  (4-50)

Equation (4-45) can be rewritten as

$$\Delta x_t = b_{21} \Delta y_{t-1} + (b_{22} - 1) \Delta x_{t-1} - k(1 - b_{11} - b_{13}) y_{t-2} + k(b_{12} + b_{14}) x_{t-2} + \epsilon_{2t}$$  (4-51)

Equations (4-44) and (4-51) can be reparameterised as follows:
\[
\Delta y_t = (b_{11} - 1)\Delta y_{t-1} + b_{12}\Delta x_{t-1} - (1 - b_{11} - b_{13})(y_{t-2} - \beta x_{t-2}) + \epsilon_t
\]

(4-52)

and

\[
\Delta x_t = b_{21}\Delta y_{t-1} + (b_{22} - 1)\Delta x_{t-1} - k(1 - b_{11} - b_{12})(y_{t-2} - \beta x_{t-2}) + \epsilon_{2t}
\]

(4-53)

where

\[
\beta = \frac{b_{12} + b_{14}}{1 - b_{11} - b_{13}}
\]

(4-54)

From equations (4-44) and (4-51), it can be seen that the vectors \( \alpha \) and \( \beta' \) in (4-48) are

\[
\alpha = \begin{bmatrix} 1 \\ k \end{bmatrix}, \quad \beta' = (-1 - b_{11} - b_{13}, b_{12} + b_{14})
\]

(4-55)

The cointegrating vector \( \beta' \) implies a long-run equilibrium relationship

\[-(1 - b_{11} - b_{13})y_t + (b_{12} + b_{14})x_t = 0 \]

(4-56)

or, normalising the coefficient on \( y_t \),

\[y_t = \beta x_t \]

(4-57)

where \( \beta \) is as defined above.

As shown in (4-55), only a single cointegrating vector \( \beta' \) exists when estimating the long-run equilibrium relationship of two variables. In the multivariate case, the similar approach can be applied. If there are \( m \) variables that are all I(1) then \( m \) equations will be available similar to (4-42) and (4-43) each containing lagged values of all \( m \) variables. These equations can be expressed in the form of (4-46), that is,
\[
\Delta z_t = B_1 \Delta z_{t-1} + B_2 z_{t-2} + \epsilon_t \quad (4-58)
\]

where \( B_1 \) and \( B_2 \) now represent both \( m \times m \) matrices and \( \epsilon_t \) now contains \( m \) disturbances. Therefore, the rank of \( B_2 \) must lie between 1 and \( m-1 \) so as to become cointegrated. If the rank of \( B_2 \) is either zero or \( m \) then the question of cointegration does not rise. If the rank of \( B_2 \) is denoted as \( r \), where \( 0 < r < m \), then the \( \alpha \) and \( \beta \) now both become \( m \times r \) matrices. The columns of the matrix \( \beta \) (that is the rows of \( \beta' \)) form cointegrating vectors. Thus, the Johansen approach not only determines the number of cointegrating vectors but also provides estimates of these vectors together with the adjustment parameters in the matrix \( \alpha \).

The details of the Johansen method are beyond the scope of this research. However, the method proceeds by first testing the null hypothesis \( r = 0 \). If this is not rejected then it implies that there are no cointegrating vector available. On the other hand, if \( r = 0 \) is rejected, this means that there is at least 1 cointegrating vector (\( r \leq 1 \)). Subsequently, testing hypothesis \( r = 1 \) is carried on and then \( r = 2, r = 3, \ldots \) in sequence until a hypothesis cannot be rejected. If, for example, \( r < r' - 1 \) is rejected but not \( r < r' \) then the implication is that there are \( r' \) cointegrating vectors.

Again, the advantage of Johansen procedure is that it verifies estimates of all possible cointegrating vectors in the multivariate case. Moreover, it provides a framework for testing restrictions on the parameters in the implied long-run relationships unlike the Engle-Granger two-stage approach.

Few research on forecasting tourism demand has been undertaken by using cointegration technique (Kulendran, 1996; Song, Romilly & Liu, 1997). Kulendran (1996) used cointegration regression to estimated the long- and short-run
relationship between quarterly tourist flows to Australia from the USA, Japan, UK and New Zealand. In order to estimate the cointegrating relations between tourist arrivals and the factors that influence the arrivals such as income, price and airfare, Johansen's Full-Information Maximum Likelihood (FIML) was used after confirming that the economic variables are non-stationary. The long-run and short-run relationships were identified by using cointegration and short-run dynamic ECM respectively. The result showed that income of tourist generating countries was a powerful variable in explaining tourist flows to Australia. Furthermore, ECM was used for forecasting 1995(1) to 1996(4), and the forecasted values were compared with the actual values. The forecast values of the explanatory variables were obtained from estimated ARIMA models. Since the actual values were available to 1995(2), only the half of the forecasts were comparable. However, the results gave fairly accurate forecasts.

Song, et. al. (1997) also applied cointegration and ECM for the empirical study of outbound tourism demand in the UK. They emphasised the importance of pre-modelling test and the general-to-specific methodology in using cointegration and the ECM techniques. In particular, they employed system demand theory to construct destination preference index. For the preference index, they include the number of visits to a particular destination, income level of the tourist, holiday price of all destinations including substitute and complementary destinations and a measure of unobservable non-economic variables. Thus, the distinction of this study is that not only economic variables but also social, cultural and psychological influences were taken into account for the estimation. Additionally, they compared the forecasting performance of the ECMs with some other quantitative models such as Naive I, AR(1), ARMA(p,q), VAR (Vector Autoregressive) models. The RMSE (Root Mean Squared Error), MAE (Mean Absolute Error) and Theil's U statistics were used
for measuring the forecasting performance. As a result, ECM turned out to be the best forecasting technique overall and produced considerably accurate forecasts.

**Vector Autoregression (VAR) Model**

Notably, Sims (1980) developed the VAR model on the ground that a set of variables which are difficult to make any distinction between endogenous and exogenous variables in advance should all be treated on an equal footing. The traditional econometric model assumes that the consistent estimation of any equation in a model is possible as long as the division between endogenous and exogenous variables are feasible. However, it is sometimes impossible or ambiguous to have such a clear division.

In effect VAR model treats all variables as endogenous. Furthermore, initially at least, no zero-restrictions are placed on the parameters of equations in the model (The omission of a variable from an equation can be regarded as the placing of a 'zero-restriction' on its parameters). Thus each equation has exactly the same set of regressors. The formulation of a general VAR model is as follows,

\[ z_t = \sum_{i=1}^{k} A_i z_{t-i} + \epsilon_t \]  

(4-59)

where \( z_t \) is a column vector of observations at time \( t \) on all the variables in the model. \( \epsilon_t \) is a column vector of random disturbance values, which may be contemporaneously correlated with one another but are assumed to be nonautocorrelated over time. The \( A_i \) are matrices of parameters, all of which are non-zero.

In VAR formulation, since all regressors are lagged variables, they can be assumed to be contemporaneously
uncorrelated with the disturbance. As a result, each equation can be consistently estimated by OLS. In addition, VAR model is also very easy to use for forecasting since the regressors are already available. A traditional multiple regression equation require priori forecast of regressors, and therefore the forecast of dependent variable will be heavily dependent upon how well one can forecast the regressors (or explanatory variables).

However, VAR models are sometimes termed 'atheoretical' since they are not based on any economic theory. Since initially no restrictions are placed on any of the parameters in any of the equations in the model, in effect 'everything causes everything' (Thomas, 1997). Furthermore, unrestricted VAR models are prone to overfitting the data as more variables are added to the models so a reduction in dimensionality is often necessary to improve their forecasting accuracy (Simkins, 1995).
4.2.2.3. Artificial Neural Network (ANN) Models

Definition

Neural network can be defined as software algorithms which can be trained to learn the relationships that exist between input and output data including nonlinear relationships.

These software algorithms have been studied for many years in the hope that the computer can achieve human-like performance, for example, in the fields of speech and image recognition. One of the special features of neural network models is that they can be composed of many nonlinear computational elements operating in parallel and arranged in patterns reminiscent of biological neural nets (Lippmann, 1987). In other words, a neural network is a biologically inspired computational structure composed of many simple, highly interconnected processing elements.

Neural net models are specified by the net topology, node characteristics, and training (or Learning) rules.
Net Topology

Net topology is the configuration formed by the connections between nodes on a neural network model. Although there are various types of net topologies, the typical type of net topology is shown in Figure 4.8. A certain type of net topology seems to be determined by the number of hidden layers, the number of nodes for each layer, and how they are connected each other.

Figure 4.8 An Illustrative Example of a Neural Network Model

Node Characteristics

The processing elements are normally referred to as neurons or node. They execute in parallel and exchange information much like the neurons and synapses within the brain. As shown in Figure 4.9, each neuron receives signals from several neurons, processes this information, and passes a signal on to several more neurons in a manner analogous to biological neurons.
Figure 4.9 Node (or Computational element)

Input data

\[ y = f \left( \sum_{i=0}^{N-1} w_i x_i - \theta \right) \]  

(4-60)

where
\( y \) = output
\( x \) = input
\( w \) = weight
\( N \) = number of inputs
\( \theta \) = threshold

In fact, this is one of the learning equations. In most of the learning methods, when a system is in learning mode, weights are changed gradually in an iterative process. The system is repeatedly presented with case data from a
training data set, and is allowed to change its weights after one (or predetermined number of) iteration(s).

Through this type of function, neural networks learn a desired input-output mapping, typically for pattern classification or function approximation. Learning can be achieved by adjusting the weights, or strengths between connections, of the network in order to minimise the performance error over a set of example inputs and outputs. It is this feature of "learning by example" that sets neural network techniques apart from conventional methods.

This function which we don't know yet can be any type of nonlinearities. Lippmann (1978) showed three representative types of nonlinearities in his renowned literature review on neural networks. Those nonlinearities which include hard limiters, threshold logic elements, and sigmoid are illustrated in Figure 4.10. More complex nodes may include temporal integration or other types of time dependencies and more complex mathematical operations than summation (Lippmann, 1987).

Figure 4.10 Three Types of Nonlinearities

![Figure 4.10 Three Types of Nonlinearities](Image)

Hard limiter    Threshold logic    Sigmoid

Taxonomy

In general, neural network models can be divided into two categories; binary and continuous valued inputs. This is usually determined by the type of input and output required. However, continuous-valued inputs encompass what binary inputs can do. This does not necessarily mean that binary inputs can be discarded. Binary inputs type has some advantages. For example, binary inputs might outperform continuous valued inputs in terms of speed when binary type of output, such as 1(true) or 0(false), is required. Furthermore, the algorithm of binary type can be easily constructed relative to continuous valued type, which subsequently leads to substantial saving of effort and time.

Each type of input can break down into *supervised* and *unsupervised* by types of learning. Learning here indicates the process by which the system arrives at the values of connecting weights. For the system to learn, it should be given a learning method to change the weights to the ideal values and a domain data set that represents the domain knowledge. Learning is the key factor in neural networks, and various neural networks are distinguished by learning rules.

In supervised learning, the system developer tells the system in advance what the correct answer is, and the system determines weights in such a way that once given the input, it would produce the desired output. While repeating this process, the system changes or adjusts the weights in order to produce outputs close to what are expected. A child learning new lessons with the help of a teacher, is analogous to supervised learning.

In unsupervised learning, the system receives only the input, and no prior information on the expected output. In
this type of learning, the system learns to produce the pattern of what it has been exposed to. This type of learning gives the image of an infant who learns by repeated exposure to its environment. The self-organising neural network (developed by Kohonen) is the network that created this category of learning.

Most of the neural networks seem to employ the supervised learning method, since this type is or more immediate use for problem solving. On the other hand, unsupervised learning has the potential for creating intelligent systems more powerful than what other methods could accomplish.

Figure 4.11 A Taxonomy of Six Neural Networks

A taxonomy of six neural networks that can be used as classifiers. Classical algorithms which are most similar to the neural net models are listed along the bottom.

Applications

Most of the available techniques used in time series analysis, such as Box-Jenkins, assume a linear relationship among variables. In practice, this drawback can make it difficult to analyse and predict accurately the real processes that are represented by these time series. One of the advantages in using a neural network model is that it can deal well with the time series data in which nonlinearity exists.

Again, neural networks originated with the mathematical modelling of how the human brain works, but have since been applied to a wide variety of topics. For example, they have been widely used in pattern recognition, where applications include automatic reading of hand-writing and the recognition of acoustic and visual facial features corresponding to speech sounds (Chafiefield, 1993). For further example, possible uses of the model include determining in which areas rainfall affects river levels the most, doing what-if analysis, and using the network as part of an early warning system.

However, this model is now being applied to prediction or forecasting which is unavoidable in making important decisions. It has been applied to predicting future levels of stock prices, traffic congestion, power loads etc. In particular, for example, Pattie and Snyder (1996) used the backpropagation model in order to forecast visitor behaviour toward national parks in US and compare its performance with six other time series models including simple regression, single exponential smoothing, Holt-Winters three-parameter exponential smoothing, Box-Jenkins (ARIMA), Census II decomposition and Naive model. Interestingly, the results showed that Census II decomposition and neural network model (backpropagation) were the best techniques in terms of accuracy when
forecasting 12 months ahead. They concluded that the neural network model is a valid alternative to classical forecasting techniques in tourism science (Pattie & Snyder, 1996).

According to Werbos (1994), the origin of the word "backpropagation" is not clear, however, some people speculate that someone reading a draft of the popularised version of backpropagation in Rumelhart and McClelland (1986) noticed a vague, qualitative similarity to an earlier algorithm developed by Rosenblatt (1959), which Rosenblatt had called "backpropagation". The essence of backpropagation is the idea of calculating derivatives efficiently, through calculations that work their way backward from the outcome variables of interest.

However, some limitations to the practical use of neural networks are, the long time consumed in the modelling process and the large amount of data required by the present neural network methodologies (Lachtermacher & Fuller, 1995).

It is a lengthy process to grasp the concept of neural network model and to find most appropriate technique. For example, it is critical to define the input and output pattern, the number of hidden layers and the pattern of connectivity among units etc. appropriately. Since it is complicated to identify the patterns of connectivity among units intuitively, they need be modified by experience. In addition, selecting proper propagation, activation and learning rules may lead to lengthy and tedious task because they need to be found by trial and error.

Another problem is associated with the amount of data. Even if there are a range of rigorous techniques available for adaptation (or learning), the reliable forecasts are subject to the number of data used for training. This is plausible in a sense that sound neural network model is determined by
how well trained the rules using huge amount of data. Therefore, the quantity of data available is a critical factor for modelling neural network model. Although neural network has been prevalently used to forecast stock market, considerable amount of data are unlikely to be obtained from the tourism industry.

Consequently, having mentioned the major limitations of neural network, it is sceptical whether the neural network model can outperform the existing quantitative forecasting techniques in terms of efficiency and accuracy when time is critical and the amount of data are insufficient. Because of these limitations, neural network approach can not be undertaken in this study.
4.3. Qualitative Techniques

Whereas quantitative forecasts depend upon establishing patterns or relationships in historical time series, qualitative forecasting relies largely on human judgement. This human judgement, which is common to all qualitative forecasting, is generally brought to bear by obtaining the views and opinions of many experts, both inside and outside the organisation.

Literally, qualitative approaches to forecasting consist of techniques which do not rely on numerical historical data. They are applicable in circumstances where numerical data does not exist or for very long-term forecasts where the historical data cannot be extrapolated sufficiently far into the future with any certainty, i.e. where the underlying relationships of a time series are likely to change substantially over the longer period.

However, The characteristics and the use of qualitative forecasting seem to be well described by Uysal and Crompton (1985).

Qualitative forecasting methods are generally characterised by the use of accumulated experience of individual experts, or groups of people assembled together, to predict the likely outcome of events. This approach is particularly appropriate where past data are insufficient or inappropriate for processing or where changes of a previously unexperienced dimension make numerical analysis of past data inappropriate (Uysal & Crompton, 1985, p.7).
Notably, Archer (1994) pointed out three major situations that qualitative forecasting are preferable to quantitative one. These three cases are described below.

- Data are insufficient or are known to be unreliable.
- It is not possible to construct a suitable numerical model.
- Time is insufficient to initiate and operate a quantitative analysis.

All the companies which are attempting to launch new business do not have historical numerical data. For example, a newly established tourist hotels would not have historical data concerning its business trend. Therefore, it is preferable to use qualitative analysis to quantitative ones. Although it may be possible to examine the secondary data of other competitive hotels for forecasting, experts' judgement is still required for sound decision-making.

When factors difficult to quantify need to be considered for forecasting, qualitative analysis is preferred to quantitative ones. For example, suppose one wants to incorporate an explanatory variable indicating the degree of political stability into quantitative forecasting model predicting international tourism demand. Although it might be idealistic model for forecasting, it is not possible to operate the model. This is because not only the data have not been collected in reality but also it is difficult to measure and quantify the degree of political stability. Therefore, where social and political unrest has affected the life of a particular nation or region, the data base may not be useful for quantitative forecasting. In addition, qualitative forecasting method is more appropriate than quantitative ones particularly when enough time is not given to whom forecast results is urgently required.

This section is divided into two sub-sections; simplistic approach and technological approach. The simplistic approach
indicate the subjective assessment method which include, for example, group composites, surveys, market research, and individual judgemental assessments. In general, it seems that less people are involved in the simplistic approach than those in technological approach. Therefore, owing to the subjective nature of simplistic approach, the reliability of its forecast results is questionable.

On the other hand, the term "technological" is generally used to denote forecasting techniques focused primarily on predicting the environment and technology over the longer term (Makridakis et al., 1983). Prehoda (1967) provides simple definition of technological forecasting as "the description or prediction of foreseeable invention, specific scientific refinement or likely scientific discoveries, that promise to serve some useful function. These are functions that meet the requirements of industry and military services, government agencies, and the general needs of society. However, one objection to this method is the fact that different expert using the same method do not always produce the same forecasts. Sometimes the divergence in opinion among experts is so extensive that it is hard to imagine that any substantial confidence could be placed in the results.

The ensuing section will deal with executive opinion and sales force estimate as representatives of simplistic approach, and Delphi and scenario writing will be examined on behalf of all technological approaches.
4.3.1. Simplistic Approach

4.3.1.1. Executive Opinion

'Seat of the pants' forecasting, based upon a lengthy practical experience of the tourism business, is still widely used in the private sector. Indeed at the micro level, e.g., in deciding whether or not to construct a new restaurant at a particular site, entrepreneurial flair can sometimes forecast demand as accurately as, or even more accurately than, the most rigorous econometric techniques (Archer, 1987).

An advantage of this technique is its simplicity. Very little skill or training is required to participate, and only knowledge about the variables to be forecast is required. It does not require much historical data, although describing the recent past may be helpful in establishing a common foundation for the discussion. In addition, subjectivity of the opinion can be reduced by considering the views of other members in an organisation.

Frechtling (1996) pointed out that often the most forceful or most senior executives' opinions carry the most weight in this group discussion since these may not have the best ability to describe the most likely future (Frechtling, 1996). Furthermore, Archer (1987) warned that the process can deteriorate into a guessing game unless such discussions are structured.

Therefore, structured meetings involving a facilitator who works for the group rather than a leader for whom the group works are often suggested in order to avoid this kind of drawback. Armstrong (1978) emphasised the importance of structured meetings since most organisations will continue to do their forecasting by improving structured meetings. He
then divided structured meetings into two techniques: developmental discussions and E-T-E (estimate-talk-estimate).

The developmental discussion was adapted from Maier and Maier (1957). With this technique, a facilitator is used rather than a leader.

The roles of a facilitator are as follows:

1. Prepares for the meeting by decomposing the problem.
2. Provides an opportunity in the meeting for all members of the group to participate, and especially encourages the expression of minority options.
3. Avoids evaluation and helps the group to suspend evaluation.
4. Avoids introducing her own ideas to the group.

(Armstrong, 1978, p.112)

Another method for structuring meetings is E-T-E. This technique is similar to Delphi except that a face-to-face meeting is used instead of a mail survey. Both estimates in E-T-E are made anonymously. During the talk period, participants are asked to avoid arguing for their own position or even revealing it. Unlike Delphi, however, the researcher does not generally control the discussion, and people will sometimes argue for their own positions. In comparison to Delphi, E-T-E offers advantages in terms of speed of response. In addition, E-T-E seems to provide greater accuracy than traditional meetings (Armstrong, 1978).
Figure 4.12 The Jury of Executive Opinion Process

1. Select judges: people familiar with the variables you are forecasting, their recent history, and what affects them.

2. Pose the questions to the judges in a group setting where discussion is encouraged.

3. Ask for answers: record the various forecasts of point estimates from the group where all can see them.

4. Obtain forecasts: discuss the various forecasts until a consensus on point forecasts of the variables is reached.

4.3.1.2. Sales Force Estimates

One of the most popular methods of demand forecasting in many industries is to analyse and then amalgamate the forecasts of salesmen and sales managers. In the tourism and travel industry the equivalent method is to bring together the predictions of travel agents, tour operators and others.

While such forecasts benefit from the specialised knowledge and experience of those involved in selling the service, they merely shift the onus for forecasting onto people with insufficient knowledge or understanding of the factors involved in demand forecasting. This technique is unlikely to be very accurate for more than a season ahead.
4.3.2. Technological Approach

4.3.2.1. Delphi Approach

The Delphi method of forecasting aims to obtain expert opinion about the future through questionnaire surveys of a group of experts in the field, and is particularly useful for long-term forecasting. The respondents provide their estimates of the probabilities of certain specified conditions or events occurring in the future, and estimate when the events would be likely to occur. Strict anonymity is maintained to prevent dominant personalities from swaying the opinions of others. In other words, pressures to conform are minimised since the participants do not meet face-to-face (Dalkey & Helmer, 1963).

A Delphi study involves several iterative rounds, and at each stage the derived group opinion is fed back to the participants in the form of the range and distribution of responses. The panel members are requested to re-evaluate their previous replies in the light of the summary group opinion and to justify any answers which would still differ greatly from the overall group opinion. The experts are thus able to try to convince one another about their views. Eventually a group consensus emerges and it is possible to draw up a forecast. This is usually stated in terms of the median group responses to the various scenarios. The steps involved in executing a Delphi forecast are summarised in Figure 4.13.

The assumptions underlying the Delphi approach are first that the range of responses will decrease and converge towards the mid-range of the distribution, and second that the median response will move towards the 'correct' answer with each succeeding round of questionnaires. The distinguishing characteristics of Delphi forecasting are the aim: to
generate expert opinion about the future; and the method used: iterative polling of participants with feedback of group opinion between polls (Witt & Martin, 1989a).

Kaynak and Macaulay (1984) once applied the Delphi technique in order to gather information and opinions on tourism industry on a more detailed scale than ever for the development of tourism in Nova Scotia. The efficiency of the technique was demonstrated by the fact it took only two
rounds of measurement and refinement until the range of responses converged toward the midrange of the distribution and until the total group responses, or median, reached a 'consensus'. Consequently, the cost of undertaking research became less than expected. Nevertheless, the time interval from start to finish for the mail survey was considerably long.

For a further example, Liu (1989) used the Delphi technique in order to forecast demand for tourism toward Hawaii, particularly Oahu, by the year 2000. The questions on the level of future demand such as tourist arrivals towards Hawaii, market share, maximum and desirable visitor accommodation etc. were given to local experts and travel agents. The results showed that few significant differences in responses among the groups, and confirmed expectations about convergence and consistency of managerial responses with statistical projections and existing trends. However, it was given as a concluding remark that the combination of quantitative and qualitative techniques and surveying the relevant groups need to be considered in order to be of value in the difficult and risky process of making long-term forecasts.

Approaches such as the Delphi technique offer the dual advantage of enabling a broader range of quantifiable and non-quantifiable variables to be taken into account while at the same time providing a framework for consultation. More specifically, these techniques provide a vehicle for integrating a range of approaches (Fraulkner & Valerio, 1995). The Delphi technique has the major advantage of allowing the respondents to have more time for deliberation of their responses since they can work individually without being pressured for an instant answer. Delphi provides the opportunity to bring the latest and best prevailing knowledge to bear on a problem. Delphi also overcomes geographical boundaries. However, the criteria for the selection of
experts can be questionable and arguable. The Delphi technique, a lengthy process requiring a lot of time investment by the respondents, usually leads to a high attrition rate. In addition, it can be costly especially if remuneration of experts is a factor. Duration of the study and size of the panel need to be considered prudently.
4.3.2.2. Scenario Writing

Scenario writing is an approach to forecasting which attempts to show how a particular future state (or set of alternative future states) could eventually occur, given the current situation as the starting point. The construction of scenarios is a method of assessing potential long-range economic, political, technical and societal developments. Scenarios describe alternative hypothetical futures, which are determined by our actions in the present (Jungermann & Thuring, 1987).

On the other hand, Archer (1980) noted that the attention of scenario writing is focused both on the variables affecting demand and on the decision points which occur in order to indicate what actions can be taken to influence the level of demand at each stage and what the repercussions of such actions might be.

Uysal and Crompton (1985) pointed out that scenario writing is not a forecasting technique per se but a method of clarifying the issues involved. This seems to be a very persuasive argument in a sense that the method is more focused on identifying variables which influence tourism demand and possible repercussions after taking a particular action rather than producing a certain forecasted figure.

Van Doorn (1986, p. 36) suggests the following definition: 'A scenario gives a description of the present situation, of one or more possible and/or desired situation(s) and of one or more sequence(s) of events, which can connect the present and future situation(s). ' It therefore follows that a thoroughly written scenario comprises at least three components (Van Doorn 1984b, 1986):

1. baseline analysis, i.e. a description of the current situation;
2. at least one future image, i.e. a description of a potential situation in the future;
3. for each future image, at least one future path which indicates how the current situation could develop into the eventual future image.

The application of scenario writing to the tourism or recreation demand forecasting area involves the description of a hypothetical sequence of events showing how demand would be likely to be influenced by particular casual processes. For example, Schwaninger (1984) made a scenario projection for the period between the years 2000 and 2010. This can be regarded as a long-term forecast since it attempted to predict 20 years ahead. A number of likely trends and concerns were considered in his research from the point of economic, socio-cultural, ecological, technological and political aspects.
4.4. Chapter Summary

In this chapter, the use and the nature of some popular quantitative and qualitative techniques were described in order to examine their strengths and weaknesses.

Although univariate time series models have no explanation of the reason why a forecast is what it is, they certainly are one of the most rigorous techniques for short-term forecasting. Archer (1976) noted that rigorous techniques are in general more suitable for short term forecasting and forecasts for few months ahead can be obtained by projecting past trends with the aid of statistical techniques such as exponential smoothing and other methods of time series analysis. Causal models are often used for mid-term forecast since they are based on the cause-and-effect relationships between dependent variable and explanatory variables.

In this Chapter, the cointegration and ECM approach is highlighted since they can avoid the spurious regression problem which may rise when variables are non-stationary. Moreover, ECM can be easily fitted into the general-to-specific methodology, and will always reduce the multicollinearity problem.

On the other hand, qualitative techniques are definitely required when statistical data is not available nor enough to run a quantitative model. Additionally, the combination of quantitative and qualitative forecasting is inevitable when long-term forecasts need to be made. For qualitative forecasting, the Delphi technique is frequently used since it has the advantage of eliciting and refining group judgement based on the rationale that a group of experts is better than one expert particularly when exact knowledge is not available. Therefore, an expert or panel of experts need to be appropriately selected and should have sound knowledge
because the forecast results will totally depend on their judgement.

However, the neural network model and qualitative approach will not be employed for this research. Only seven quantitative techniques including naive I, simple moving average, simple exponential smoothing, AR(1), ARMA(p,q), VAR and ECM will be used for the analysis.
CHAPTER V

RESEARCH METHODOLOGY
5.1. Introduction

This chapter outlines the methodology used in this study. The ensuing section examines the choice of dependent and explanatory variables used in the tourism demand models. The specification of the models are examined in section 5.3. Pre-modelling testing procedures are also described in this section. In addition, the technical features of two computer software programs are examined. In section 5.4, the nature of some measuring criteria is investigated because the rank of accuracy depends on the choice of measuring criteria. Three measuring criteria are chosen; MAE, RMSE and Theil's U statistic.

It should be emphasised that this study focuses on ECM (Error Correction Mechanism) rather than other techniques. Some previous tourism demand modelling and forecasting studies concluded that simple univariate time series models such as naive/autoregressive models often outperform causally specified models (see for example, Martin & Witt, 1989 and Witt and Witt, 1992). However, Song, Romilly and Liu (1997a) argued that the superior performance of the simple time series analysis over the econometric models in forecasting tourism demand is often caused either by model misspecification or by inappropriate use of modelling methodology. This study tries to examine whether the forecasting performance of the international tourism models could be improved by incorporating some of the recent developments in econometrics.

This study differs from that of Kulendran (1996) and Song et al. (1997a) in the following aspects. First, the cointegration and ECM approach is used to model and forecast international tourism demand to Korea. Second, the international tourism demand considered in this study relates to both leisure travel and business travel; thus, a trade volume variable and National Disposable Income (NDI) or Gross Domestic Product (GDP) instead of personal disposable income
are used in the specification of the demand models. Third, this model can be distinguished from others in that price variables of six competing tourist destinations are incorporated into the model in order to examine whether they have either a substitutional or a complementary effect on Korean inbound tourism demand. Finally, instead of evaluating the forecasting performance of the competing models based on only a single forecasting horizon, this study compares the models' forecasting performance over a number of forecasting periods. This allows us to see whether the models will have different forecasting power when the length of the forecasting period varies.

Again, the purpose of this study is to overcome the problem of spurious regression when non-stationary data are used and to identify correctly the determinants of the inbound tourism demand to Korea. In addition, both the long-run and short-run demand elasticities are estimated using the cointegration and error correction techniques in order to examine their economic implications. Lastly, the forecasting performance (or accuracy) of the ECMs and that of the alternative specifications are compared over different forecasting horizons.
5.2. Data

Although the tourism industry in Korea has been heavily and consistently dependent upon the Japanese and US markets in terms of tourist arrivals and receipts since 1960s, the demand for Korea as an international tourism destination by western European countries should not be underestimated either. Four tourist generating countries, Japan, Germany, the UK and the USA, are selected for the empirical analysis of inbound tourism demand to Korea. Figure 5.1 and 5.2 plot the number of tourist arrivals in Korea from these four countries. The diagrams show that the number of tourist arrivals from the four countries exhibits a similar pattern over the sample period. This section particularly deals with variables used for ECMs and other alternative techniques. The type of variable and its source is going to be explained.

5.2.1. Dependent Variable

The choice of the dependent variable in earlier studies has already been touched in Chapters Three and Four. For both univariate time series model and econometric analysis, an appropriate dependent variable for forecasting must be chosen. For the empirical analysis in this case, the number of annual tourist arrivals by country is used as a dependent variable. It might be more satisfactory to include other variables such as tourist receipts or quarterly data of tourist arrivals as a dependent variable. However, this study focuses on analysing the level of international demand for Korean tourism, and the number of tourist arrivals is considered to be the best dependent variable for the empirical analysis.
Figure 5.1 Japanese and USA Tourist Arrivals (1962-1994)


Figure 5.2 Germany and UK Tourist Arrivals (1962-1994)

Therefore, the number of annual tourist arrivals by country from 1962 to 1994 (33 observations) is used as a dependent variable in this study. These annual data encompass all types of tourists in terms of trip purpose, and they are obtained from the "Korean Annual Statistical Report on Tourism" jointly published by KNTO and Ministry of Culture and Sports.

As shown in Figure 5.1 and 5.2, tourist arrivals from the four tourist generating countries are upward trended and, therefore, are nonstationary. These nonstationary time series will be transformed into stationary ones through premodelling process which will be explained in detail in section 5.3.2.1. Figure 5.3 shows the corresponding variables in their first differences. They are mean stationary according to the unit root test statistics discussed later.
5.2.2. Explanatory Variables

This study uses either the national disposable income (NDI) or gross domestic product (GDP) as the income variable. The choice between the two for the final demand model is solely determined by experimentation.

Martin and Witt (1987) mentioned that the consumer price index is a reasonable proxy for the 'cost of living' for tourists within the context of international tourism demand models. In this study, the 'cost of living' is expressed in relative price form. For example, the 'cost of living' in Korea perceived by German tourists can be denoted as follows:

\[
\frac{CPIX_{KG}}{CPIX_G} = \frac{CPIX_K}{EX_{K/US}} \quad \frac{CPIX_K}{EX_{K/US(1990)}} = \frac{CPIX_G}{EX_{G/US}} \quad \frac{CPIX_G}{EX_{G/US(1990)}}
\]

where

- \(CPIX_{KG}\) = The 'cost of living' variable in Korea for the German tourists
- \(CPIX_K\) = Korean CPI (1990=100) divided by real exchange rate (Korean/US) index
- \(EX_{K/US}\) = Real exchange rate for Korean currency against US dollar
- \(EX_{K/US(1990)}\) = Real exchange rate (Korean/US) in 1990
- \(CPIX_G\) = German CPI (1990=100) divided by German exchange rate index
- \(EX_{G/US}\) = Real exchange rate for German currency against US dollar
- \(EX_{G/US(1990)}\) = Real exchange rate (German/US) in 1990.

The return air fare is employed as a travel cost variable and is tested for significance as a tourism determinant. The return economy airfare was obtained from ABC World Airways Guide priced in the origin countries' currency (from Frankfurt to Seoul, Tokyo to Seoul, New York to Seoul, and London to Seoul). This variable was also adjusted by the exchange rate to use the real cost of transport.
Trade volume, obtained by adding the annual import and export between origin country and Korea, is also included as an explanatory variable, testing whether the number of tourist arrivals might be explained by this variable. The sources of income, price and trade volume variables are from the OECD and IMF statistics.


5.3. Forecasting Model Specification

The performance of seven different type of quantitative forecasting models are compared when specific requirements are given. The univariate time series models, including naive I model, simple moving average, simple exponential smoothing, AR(1) and ARMA(p,q) models are employed as benchmarks. The VAR (Vector Autoregression) and ECM (Error Correction Model) then enter the forecasting performance competition. These models are estimated by the 'Forecast Pro' and 'Eviews' software programs which were accessible in the author's department.

5.3.1. Univariate Time Series Models

The specific model specifications of all five time series models are omitted since they were described in section 4.2.1.

The number of order in moving average and the alpha value in exponential smoothing are automatically chosen by Forecast Pro. In particular, the orders of the ARMA(p,q) models for each origin country are determined by the autocorrelation function (ACF) and the partial autocorrelation function (PACF) respectively. A testing-down procedure is used to find the best fitting model.
5.3.2. Causal Models

5.3.2.1. Cointegration & ECM

Syriopoulos (1995) stated that most of the previous tourism demand analyses (reviewed by Archer, 1976; Johnson and Ashworth, 1990; Sheldon, 1990) have been based on single equation models and have applied an econometric methodology dominated by what is traditionally known as the 'simple to general' approach. The idea of simple to general approach is that the final and optimal model can be obtained by manipulating a simple model, by, for example, adding and subtracting variables or changing the definition of variables (Gilbert, 1986). However, Syriopoulos (1995) argued that this methodology may not be able to provide a satisfactory explanation of the 'data generating process'. It is also constrained by theoretical limitations and empirical inadequacies. Consequently, this casts doubts upon the reliability of the estimation results. The 'general to specific' approach discussed in section 4.2.2.2. was developed to overcome these problems.

Prior to the use of 'general to specific' methodology, the integration orders (or the number of unit roots) of the variables should be examined, because the variables in a cointegration regression should be integrated of the same order, that is the variables should be I(1)s. In testing for unit roots of the time series, the augmented Dickey-Fuller (hereafter ADF) test (Dickey & Fuller, 1979) is used in this research although the Phillips-Perron test (Phillips & Perron, 1988) and the Perron test (Perron, 1989) can also be used as alternatives. The ADF test is based on the following equation:

\[ \Delta y_t = \alpha + \rho y_{t-1} + \beta T + \sum_{i=1}^{p} \gamma_i \Delta y_{t-i} + v_t \]  

(5-2)

where \( y_t \) is the relevant time series variable, \( T \) is a linear deterministic trend and \( v_t \) is the disturbance term which is
assumed to have a zero mean and constant variance. The ADF statistic is a t-test of significance of the estimated \( \rho \), and the critical values are given in Fuller (1976, Table 8.5.2). If the calculated t ratio of \( \rho \) is not more negative than the critical value of the ADF statistic, the time series is said to be nonstationary. The test is then repeated based on the differenced series until the t statistic is less than the critical value of the ADF statistic. The integration order or the number of the unit roots of the time series is therefore defined as the number of differences that are needed to achieve a stationary series. For example, if the time series becomes stationary after the first difference, the series is said to be integrated of order one, or I(1).

However, Phillips and Perron (1988) argue that if the estimated error term in equation (5-2) has the problems of serial correlation or heteroskedasticity, the ADF statistic is invalid, and the Phillips-Perron unit root test (1988) should be used. In this study, only the ADF test is employed since the residuals of the ADF equations for all variables are all well behaved. The lag length of the dependent variable in equation (5-2) is determined by the Akaike Information Criterion (AIC) and the Schwartz Criterion (SC). The results of ADF test are reported in the next chapter and the statistics show that all the variables can be characterised as I(1) series.

The long-run inbound tourism model for tourist generating country \( i \) may be expressed as:

\[
\ln T_{Ai} = \alpha_0 + \alpha_1 \ln NDI_{Ai} (or GDP_{Ai}) + \alpha_2 \ln FX_{Ai} + \alpha_3 \ln TV_{Ai} + \sum_{j=1}^{m} \eta_j \ln CPIX_{ij} + dum67 + dum74 + dum80 + dum88 + u_i
\]

(5-3)

where \( T_{Ai} \) is the total arrivals in Korea at year \( t \) by residents in country \( i \), \( NDI_{Ai} \) or \( GDP_{Ai} \) represents National Disposable Income and Gross Domestic Product of origin \( i \) in year \( t \) respectively. \( FX_{Ai} \) is the average return air fare to Seoul from the major city of country \( i \) in year \( t \) adjusted by
the corresponding exchange rate, \( TV_{it} \) is the trade volume variable which encompasses both imports and exports between Korea and country \( i \) in year \( t \) and it is also adjusted by appropriate exchange rate, and \( CPI_{ixt} \) is a proxy for tourism price or cost in destination \( j \) perceived by tourists from country \( i \) in year \( t \). In addition, dummy variables are also included in order to capture the influences of the first 'oil crisis' in 1974, the political upheaval in 1980, and the 1988 Seoul Olympics.

As mentioned earlier, if a set of variables are found to be cointegrated, the cointegration regression can always be transformed into an ECM of the form:

\[
\Delta \ln TA_u = \beta_0 + \beta_1 \Delta \ln TA_{u,-1} + \beta_2 \Delta \ln NDI_u \text{(or GDP}_u) + \beta_3 \Delta \ln FX_u + \beta_4 \Delta \ln TV_u \\
+ \sum_{j=1}^{m} \phi_j \Delta \ln CPI_{ij,u} + dum67 + dum74 + dum80 + dum88 + \delta u_{t-1} + \epsilon_t \tag{5-4}
\]

where \( u_{t-1} \) is the estimated error term obtained from the cointegration regression equation (5-3) and \( \Delta \) is the first difference operator. In particular, the coefficient of \( u_{t-1} \) is expected to be negative and significant. If a coefficient of \( \ln CPI \) in a competing tourist destination turns out to be negative and significant, then the destination has a complementary effect on international demand for tourism to Korea while the reverse case has a substitutional effect on it. Although equation (5-4) is a simple form of ECM, the lagged explanatory variables are also included and a "test-down" procedure is employed repeatedly until the most parsimonious specification is achieved. In order to obtain the parameters or coefficients, both the Engle-Granger two-stage and the Full-Information Maximum Likelihood (FIML) approaches are used for cointegration and ECM analyses.

A number of diagnostic tests are carried out to examine whether the ECMs are correctly specified. The presence of autocorrelation or heteroskedasticity in the ECM residuals implies that the estimates of the ECM are biased. The Jarque-
Bera (1980) normality test is a Lagrange Multiplier (LM) test for normal distribution of the residuals in a regression model. The statistic of normality test is distributed as $\chi^2(2)$. The Breusch-Godfrey (Godfrey, 1978) statistic is used to test for residual serial correlation (ACML) when the model includes lagged dependent variables, the ACML is an LM test with the statistic distributed as $\chi^2(p)$, where $p$ is the order of serial correlation tested. The Engle (1982) autoregressive conditional heteroskedasticity (ARCH) test is applied to test for the problem of heteroskedasticity under serially correlated residuals. The calculated ARCH statistics are compared with the critical values of the $\chi^2(p)$, where $p$ is the order of autocorrelation. Another statistic used in this study for the detection of non-constant variance in the residuals is the White (1980) heteroskedasticity test.

In testing for model mis-specification, the Ramsey (1969) RESET (Regression Error Specification Tests) LM test of functional form is utilised. In addition, the Chow (1960) $F$-statistic is employed to test for predictive failure. In implementing the Chow test, the year 1989 is chosen as the starting period for forecasting.

5.3.2.2. VAR

The unrestricted vector autoregressive (VAR) model can be simply specified by including all the variables selected from cointegration regression. However, these variables need to be differenced to achieve stationarity, and the lagged variables in first difference are also included. Since the VAR model treats all the variables as endogenous, no zero-restrictions are placed on the parameters of equations in the model. The model specification of VAR with one lag can be expressed in a matrix form as follows (the constant terms are omitted for simplicity):

$$z_t = A z_{t-1} + \varepsilon_t \quad (5-5)$$
where \( z_t \) is a column vector of all observations at time \( t \) of all the variables in the model while \( \epsilon_t \) is a column vector of random disturbance values. \( A \) is a 5x5 matrix representing the coefficients or parameters of regressors. If the variables used in ECM are replaced as follows:

\[
\Delta \ln TA = p, \Delta \ln NDI(\text{or GDP}) = q, \Delta \ln FX = w, \Delta \ln TV = x, \text{and} \Delta \ln CPIX = y
\]

then the simple form of VAR model can be expressed as follows:

\[
\begin{align*}
p_t &= a_{11} p_{t-1} + a_{12} q_{t-1} + a_{13} w_{t-1} + a_{14} x_{t-1} + a_{15} y_{t-1} + \epsilon_{1t} \\
q_t &= a_{21} p_{t-1} + a_{22} q_{t-1} + a_{23} w_{t-1} + a_{24} x_{t-1} + a_{25} y_{t-1} + \epsilon_{2t} \\
w_t &= a_{31} p_{t-1} + a_{32} q_{t-1} + a_{33} w_{t-1} + a_{34} x_{t-1} + a_{35} y_{t-1} + \epsilon_{3t} \\
x_t &= a_{41} p_{t-1} + a_{42} q_{t-1} + a_{43} w_{t-1} + a_{44} x_{t-1} + a_{45} y_{t-1} + \epsilon_{4t} \\
y_t &= a_{51} p_{t-1} + a_{52} q_{t-1} + a_{53} w_{t-1} + a_{54} x_{t-1} + a_{55} y_{t-1} + \epsilon_{5t}
\end{align*}
\]

(5-7)

Although five equations with one lag are estimated, only the first equation in (5-7) is used for the forecasting comparison. The 5x5 matrix \( A \) can be expressed as follows:

\[
A = \begin{pmatrix}
a_{11} & a_{12} & a_{13} & a_{14} & a_{15} \\
a_{21} & a_{22} & a_{23} & a_{24} & a_{25} \\
a_{31} & a_{32} & a_{33} & a_{34} & a_{35} \\
a_{41} & a_{42} & a_{43} & a_{44} & a_{45} \\
a_{51} & a_{52} & a_{53} & a_{54} & a_{55}
\end{pmatrix}
\]

(5-8)

From the matrix \( A \), only the first row is relevant since our concern is the tourism arrivals equation.
5.3.3. Forecasting Tools

Computer software programs normally provide a number of automatic features for model selection, estimation and evaluation, which helps to relieve forecasting practitioners of the burden of technical knowledge. However, there might be a danger when practitioners use these tools without fully understanding how they work. Some technical information about the forecasting tools used for this research is provided below. For the empirical analysis, two software programs are used: 'Forecast Pro' and 'Econometric Views 2.0' (hereafter Eviews).

Table 5.1 Forecasting Techniques Available in Forecast Pro and Eviews

<table>
<thead>
<tr>
<th>Techniques Available</th>
<th>Forecast Pro</th>
<th>Eviews</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>* Naive I</td>
<td>* Traditional</td>
</tr>
<tr>
<td></td>
<td>* Simple Moving Average</td>
<td>* Regression Analysis</td>
</tr>
<tr>
<td></td>
<td>* Simple Exponential Smoothing</td>
<td>* Cointegration &amp; ECM</td>
</tr>
<tr>
<td></td>
<td>* Bolt's Exponential Smoothing</td>
<td>* AR(p)</td>
</tr>
<tr>
<td></td>
<td>* Winter's Exponential Smoothing</td>
<td>* ARMA(p,q)</td>
</tr>
<tr>
<td></td>
<td>* Univariate ARIMA</td>
<td>* VAR</td>
</tr>
<tr>
<td></td>
<td>* Dynamic Regression</td>
<td>* Probit and Logit Estimation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>* Seasonal</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Autoregressive and Moving Average Error Processes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>* Simulations</td>
</tr>
<tr>
<td></td>
<td></td>
<td>* Nonlinear System Estimation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>* Recursive Estimation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>* Johansen</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Cointegration</td>
</tr>
</tbody>
</table>

These two programs have some advantages as forecasting tools. For example, Forecast Pro provides the automatic function of finding the order of moving average in simple moving average and the smoothing constant in simple exponential smoothing respectively. Eviews, on the other hand, enables us to find the optimal p and q in ARMA(p,q) model since it graphically illustrates the pattern of autocorrelation and partial autocorrelation function. Therefore, time and effort can be saved by eliminating unnecessary trial and error procedures.
Forecast Pro provides an 'expert' function which automatically detects the pattern of data and finds the best one among techniques available. The 'expert' in Forecast Pro uses a few basic rules to select a method from among exponential smoothing, univariate ARIMA, and dynamic regression. The 'expert', in arriving at recommendation, looks at the 'autocorrelation structure' as well as the stability of variance between the first and second half of the series. The program fits a state space model of autoregressive terms after differencing the series as necessary to achieve stationarity. If low-order terms, such as AR(1) or less, are significant, the autocorrelation structure is deemed to be 'low or weak'. On the other hand, if higher-order terms are also significant, the autocorrelation structure is termed 'strong'.

The 'expert' normally recommends ARIMA if it finds the order of the autocorrelation structure to be 'strong or moderately strong'. The 'expert' will still recommend ARIMA in the case of weak autocorrelation structure, if a variance stability (Chow) test reveals that the series is 'stable'. The combination of a weak autocorrelation structure and an unstable variance leads the expert system to recommend exponential smoothing. The 'expert' will also recommend smoothing when the sample size is very small.

When there is at least one other time series with which the variable to be forecasted is 'significantly' correlated, the Forecast Pro recommendation will always be dynamic regression. Forecast Pro uses 'dynamic regression' in a very general sense, to refer to a regression specification which includes dynamic terms, by which it means lagged values of the dependent variables and/or lagged error terms. In the spirit of ARIMA, it drops the assumption of standard OLS regression that the error term represents a random (white noise) process, and instead permits explicit modelling of autocorrelation in the errors.
As shown in Table 5.1, Eviews has a number of model estimation routines available. It ranges from OLS, 2SLS, 3SLS, polynomial distributed lag models to the estimation and analysis of ARIMA, VAR models and Johansen cointegration technique. The use of mouse point and click to choose available options makes navigating through its variety of econometric tools very easy. In addition, user can design a forecasting model by using given programming language and functions though this requires further knowledge on how to program.

Eviews has options to report basic statistics such as means, standard deviations, and tests of skewness and kurtosis, as well as the Jarque-Bera tests for normality. Other diagnostic tests available include ADF tests for unit roots, Chow breakpoint tests, Chow forecasting tests, the Ramsey RESET test, and recursive estimation (but this is only available for OLS estimation). For residual diagnostics, Eviews provides the user with options for the White test and the ARCH test for heteroskedasticity. In addition, the Q-statistic (including partial autocorrelations and autocorrelations functions) can be obtained as well as an LM test for serial correlation. In addition to the standard ADF tests for unit roots, the Phillips-Perron unit root test is also included in the program.

However, there is one drawback in Eviews. Although Eviews examines the number of cointegrating vector in the multivariate case (Johansen test), it does not provide an estimation function which incorporates the disturbances generated from Johansen test.
5.4. Evaluation Criteria of Forecasting Performance: Accuracy

In order to present objective evidence on the comparison of forecasting performance, four different time horizons (10, 7, 5 and 3 year ahead forecasts) are considered in this study. Therefore, the latest actual data up to 10 years are held to make ex post forecast. It should be noted that the change of the total number of tourist arrivals by country is used as a dependent variable for all forecasting models.

The most frequently used measures for testing accuracy are mean absolute forecasting error (MAE), mean square error (MSE), root mean square error (RMSE), mean absolute percentage error (MAPE), and Theil's (1966) $U$ statistic. For all the measures, the smaller the value of a measure the better the performance of a method.

Carbone and Armstrong (1982) undertook a survey at the general meeting of the First International Symposium on Forecasting in 1981. They attempted to identify the most frequently used criteria or the most important dimensions when choosing a forecasting method. Seventy academics and Seventy five practitioners were asked to fill out the questionnaire. As shown in Table 5.2, MSE, MAPE and MAE appeared to be the most popular criteria as accuracy measure. However, Witt and Witt (1992) criticised that it is not easy to see the relative position of accuracy compared with other criteria, as more than one accuracy measure may have been given per respondent.

The MSE, however, can create some problems. The major problem is that it does not facilitate comparison across different time series and for different time intervals, since the MSE is an absolute measure. Furthermore, its interpretation is not intuitive even for the specialist because it involves the squaring of a range of values (Makridakis, Wheelwright, and McGee, 1989). Nevertheless,
MSE measure attempts to formalise the trade-off between the desire for a small bias and the desire for a small variance.

Table 5.2 Evaluative Criteria and their Relative Importance as determined by Forecasting Practitioners and Academics.

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Academics (n=70)</th>
<th>Practitioners (n=75)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accuracy</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$R^2$</td>
<td>-</td>
<td>2</td>
</tr>
<tr>
<td>Mean Square Error (MSE)</td>
<td>30</td>
<td>20</td>
</tr>
<tr>
<td>Geometric MSE</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>Minimum variance</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Theil's U test</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Mean Percentage Error (MPE)</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Mean Absolute Error (MAE)</td>
<td>12</td>
<td>14</td>
</tr>
<tr>
<td>Mean Absolute Percentage Error (MAPE)</td>
<td>15</td>
<td>7</td>
</tr>
<tr>
<td>Minimax Absolute Error (MMAE)</td>
<td>2</td>
<td>-</td>
</tr>
<tr>
<td>Random Forecast Errors</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>No Specific Measure</td>
<td>8</td>
<td>14</td>
</tr>
<tr>
<td>Ease of Interpretation</td>
<td>26</td>
<td>29</td>
</tr>
<tr>
<td>Cost / Time</td>
<td>24</td>
<td>25</td>
</tr>
<tr>
<td>Ease of Use / Implementation</td>
<td>26</td>
<td>18</td>
</tr>
<tr>
<td>Adaptive to New Conditions</td>
<td>10</td>
<td>13</td>
</tr>
<tr>
<td>Universality</td>
<td>3</td>
<td>10</td>
</tr>
<tr>
<td>Capture Turning Points</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>Robustness</td>
<td>10</td>
<td>3</td>
</tr>
<tr>
<td>Incorporates Judgemental Input</td>
<td>4</td>
<td>2</td>
</tr>
</tbody>
</table>


The MAPE can be obtained by summing up the absolute errors, dividing them by the number of actual values used, and multiplying by 100 percent. The MAPE is often preferred to MAE since it is a relative one. However, Makridakis et al. (1989) noted that even MAPE itself does not give a good basis of comparison as to gains in accuracy made by applying a specific forecasting method. In order to get around this problem, they suggested that modified MAPE should be used. The modified MAPE firstly defines simple naive method as a
yardstick so that it can be compared with more sophisticated methods.

In this paper, the criteria used in comparing forecasting performance include the mean absolute forecasting error (MAE), root mean square error (RMSE) and the Theil's inequality coefficient, $U$. MAE measures the sum of absolute difference between actual values and fitted values. RMSE is obtained by squaring each of the errors, evaluating the mean and taking the square root. Thus, MAE and RMSE can be expressed respectively as follows:

$$MAE = \frac{1}{n} \sum_{i=1}^{n} |e_i|$$

$$RMSE = \sqrt{\frac{1}{n} \sum_{i=1}^{n} e_i^2}$$

where $e$ is forecast error and $n$ is the number of error term.

Although there can be a number of definitions of the Theil inequality coefficients, the coefficient $U$ in this study is defined as:

$$U = \frac{\sqrt{\frac{1}{T} \sum_{t=1}^{T} (Y_t^F - Y_t^A)^2}}{\sqrt{\frac{1}{T} \sum_{t=1}^{T} (Y_t^F)^2} + \sqrt{\frac{1}{T} \sum_{t=1}^{T} (Y_t^A)^2}}$$

where $Y_t^F$ and $Y_t^A$ represent forecast and actual values respectively, and $T$ is the length of the forecasting period.

Theil inequality coefficients measures the relative goodness compared with Naive I model. If a coefficient $U$ is less than unity then it indicates that a certain forecasting technique being used is better than the Naive and if a $U$ is greater than unity then it is worse than the Naive. If a $U$ takes the zero value, it means that the forecast is perfect.
5.5 Chapter Summary

To some extent, the underlying idea of the research methodology as a preparation stage for forecasting is based on Chapter Three. In the choice of variables, the number of tourist arrivals is used as a dependent variable while lagged dependent variable, NDI (or GDP), trade volume, return air fare and CPI are used as explanatory variables. Particularly, the stationary dependent variable is used for all forecasting techniques so that the forecast can be made under the same condition.

For model specification, only causal models were specified in detail since the univariate time series models have already been explained in Chapter Four. If the long-run cointegration relationship exists between variables, then this can always be transformed into short-run dynamic ECM. The ECM is free from spurious relationship and proved to be very powerful as a forecasting technique. The unrestricted VAR model treats all the variables as endogenous and has an advantage over ECM, since it uses regressors already available. The 'Forecast Pro' expert system provides automatic function to choose the most optimal univariate time series technique available, while Eviews pays great attention to model specification and testing by using some of the new advances in modelling such as ECM, Johansen FIML, VAR etc. In order to compare the forecasting performance (or accuracy) of different forecasting techniques, three different criteria are used; MAE, RMSE and Theil's U statistics.
CHAPTER VI

EMPIRICAL ANALYSIS AND IMPLICATIONS
6.1. Introduction

This chapter examines the empirical estimation and evaluation of econometric analysis based on Chapter 5. Some policy implications for tourism demand, and comparison of forecasting performance are also investigated.

In the following section, the premodelling tests are carried out to identify the properties of the data. The demand elasticities are obtained from the estimation of cointegration regression and short-run dynamic regression. The model evaluation is based on diagnostic statistics and Johansen test. A number of diagnostic tests are carried out to examine whether the ECMs are correctly specified.

The demand elasticities by country are analysed to show how they affect international demand for Korean tourism. Furthermore, not only the economic implications but also other implications, for example, from the socio-cultural perspective are discussed.

In section 6.3, the forecasting performance of the six chosen models are compared. The criteria used for comparison are MAE, RMSE and Theil's U statistic, and the latest data up to 10 years are held to make ex post forecasts. Moreover, five different time horizons (10, 7, 5, 3 and 1 year(s) horizons) are considered in order to provide objective evidence.
6.2. Empirical Estimation of Tourism Demand Models

6.2.1. Analysis of Cointegration and ECM

6.2.1.1. Premodelling Process

As mentioned earlier, premodelling process is to examine if non-stationary variables are able to be changed into stationary variables by using such as ADF unit root test. The long-run inbound tourism model for tourist generating country \( i \) is as follows:

\[
\ln TA_i = \alpha_0 + \alpha_1 \ln NDI_i (\text{or GDP}_i) + \alpha_2 \ln FX_i + \alpha_3 \ln TV_i + \sum_{j=1}^{m} \eta_j \ln CPIX_{ij} + \text{dum67} + \text{dum74} + \text{dum80} + \text{dum88} + u_i \tag{6-1}
\]

The variables employed for long-run model should be integrated with the same order. The ADF unit root test is undertaken for 12 variables of each origin country, and the results are provided in Table 6.1. After the first difference, the ADF tests show that in every case the null hypothesis of non-stationarity is rejected at least at the 5% significance level. As mentioned previously, the ADF statistics should be negative enough so as to reject the hypothesis of non-stationarity. As shown in Table 6.1, the ADF statistics of all the differenced data become more negative than the critical values, showing that all variables become stationary after the first difference, i.e., they are I(1)s.
Table 6.1 Results of ADF Test for Unit Roots

<table>
<thead>
<tr>
<th>Variable:</th>
<th>Germany</th>
<th>Japan</th>
<th>UK</th>
<th>USA</th>
</tr>
</thead>
<tbody>
<tr>
<td>ln TA</td>
<td>-0.757(2)</td>
<td>-2.930(2)</td>
<td>-0.874(2)</td>
<td>-3.268(2)</td>
</tr>
<tr>
<td>Δ ln TA</td>
<td>-4.632(2)*</td>
<td>-4.879(1)*</td>
<td>-4.555(2)*</td>
<td>-3.941(1)*</td>
</tr>
<tr>
<td>ln NDI</td>
<td>-0.703(2)</td>
<td>-0.075(2)</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Δ ln NDI</td>
<td>-3.629(1)*</td>
<td>-3.552(1)*</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>ln GDP</td>
<td>-</td>
<td>-</td>
<td>-2.949(1)</td>
<td>-3.003(0)</td>
</tr>
<tr>
<td>Δ ln GDP</td>
<td>-4.985(1)*</td>
<td>-4.364(1)*</td>
<td>-4.364(1)*</td>
<td>-4.364(1)*</td>
</tr>
<tr>
<td>ln FX</td>
<td>-2.046(2)</td>
<td>-1.872(2)</td>
<td>-1.526(2)</td>
<td>-2.327(2)</td>
</tr>
<tr>
<td>Δ ln FX</td>
<td>-4.882(0)*</td>
<td>-4.489(0)*</td>
<td>-5.375(0)*</td>
<td>-7.279(0)*</td>
</tr>
<tr>
<td>ln TV</td>
<td>-2.029(2)</td>
<td>-3.021(2)</td>
<td>-0.833(2)</td>
<td>-1.342(2)</td>
</tr>
<tr>
<td>Δ ln TV</td>
<td>-4.657(2)*</td>
<td>-4.634(1)*</td>
<td>-5.848(2)*</td>
<td>-4.569(2)*</td>
</tr>
<tr>
<td>ln KCPIX</td>
<td>-2.818(2)</td>
<td>-3.109(2)</td>
<td>-2.243(2)</td>
<td>-2.956(2)</td>
</tr>
<tr>
<td>Δ ln KCPIX</td>
<td>-4.306(1)*</td>
<td>-4.355(1)*</td>
<td>-3.857(1)*</td>
<td>-5.203(0)*</td>
</tr>
<tr>
<td>ln CCPIX</td>
<td>-3.370(2)</td>
<td>-2.793(2)</td>
<td>-2.520(2)</td>
<td>-3.068(2)</td>
</tr>
<tr>
<td>Δ ln CCPIX</td>
<td>-7.475(1)*</td>
<td>-8.017(1)*</td>
<td>-7.106(1)*</td>
<td>-7.905(1)*</td>
</tr>
<tr>
<td>ln JCPIX</td>
<td>-2.135(2)</td>
<td>-</td>
<td>-2.745(2)</td>
<td>-2.615(2)</td>
</tr>
<tr>
<td>Δ ln JCPIX</td>
<td>-5.198(0)*</td>
<td>-</td>
<td>-5.073(0)*</td>
<td>-4.459(1)*</td>
</tr>
<tr>
<td>ln MCPIX</td>
<td>-2.617(2)</td>
<td>-3.133(2)</td>
<td>-3.136(2)</td>
<td>-1.998(2)</td>
</tr>
<tr>
<td>Δ ln MCPIX</td>
<td>-3.779(0)*</td>
<td>-5.108(0)*</td>
<td>-4.247(0)*</td>
<td>-3.806(0)*</td>
</tr>
<tr>
<td>ln PCPIX</td>
<td>-1.855(2)</td>
<td>-2.127(2)</td>
<td>-1.885(2)</td>
<td>-1.980(2)</td>
</tr>
<tr>
<td>Δ ln PCPIX</td>
<td>-5.145(1)*</td>
<td>-5.150(1)*</td>
<td>-4.845(0)*</td>
<td>-5.127(1)*</td>
</tr>
<tr>
<td>ln SCPIX</td>
<td>-2.754(2)</td>
<td>-2.887(4)</td>
<td>-1.956(2)</td>
<td>-2.389(2)</td>
</tr>
<tr>
<td>Δ ln SCPIX</td>
<td>-4.042(1)*</td>
<td>-4.242(0)*</td>
<td>-4.419(1)*</td>
<td>-4.533(1)*</td>
</tr>
<tr>
<td>ln TCPIX</td>
<td>-2.799(2)</td>
<td>-3.810(2)</td>
<td>-2.770(2)</td>
<td>-2.858(2)</td>
</tr>
<tr>
<td>Δ ln TCPIX</td>
<td>-3.520(0)*</td>
<td>-4.359(0)*</td>
<td>-4.229(0)*</td>
<td>-3.964(0)*</td>
</tr>
</tbody>
</table>

Note: * = the ADF statistic is significant at 5% level.

TA = Total Arrivals
NDI = National Disposable Income, GDP = Gross Domestic Product
FX = Return Air Fare, TV = Trade Volume
KCPIX = Consumer Price Indexes adjusted by Korean exchange rate
CCPIX = Consumer Price Indexes adjusted by Chinese exchange rate
JCPIX = Consumer Price Indexes adjusted by Japanese exchange rate
MCPIX = Consumer Price Indexes adjusted by Malaysia exchange rate
PCPIX = Consumer Price Indexes adjusted by Philippine exchange rate
SCPIX = Consumer Price Indexes adjusted by Singapore exchange rate
TCPIX = Consumer Price Indexes adjusted by Thailand exchange rate
6.2.1.2. Coefficients, Standard Errors and Diagnostics

In the estimation of the cointegration regression for each tourist generating country, NDI is found to be significant in the equations of German and Japan while the GDP is accepted in the UK and USA models. Tourism prices (measured by CPI adjusted by the exchange rate) of the six potential substitute destinations are selected for the initial specifications of the long-run models, they are Thailand, Singapore, Malaysia, Philippines, China and Japan.

The initial cointegration regression for each tourist generating country, which contains the income variable of the tourism generating country, the price/costs of Korean tourism and prices of all six substitute destinations (five in the case of Japanese equation) is first estimated using the OLS and insignificant variables are dropped. The model is then re-estimated until a satisfactory long-run regression is achieved. The coefficients of the four final cointegration regressions (or cointegrating vectors) are shown in Table 6.2. As can be seen from the estimation results, all regressions achieve high $R^2$s. Since the $R^2$ indicates the goodness of fit, high $R^2$ implies that the variables considered are important in explaining the data on the demand for tourism. In addition, the results of Cointegration Regression Durbin-Watson (CRDW) statistics show that the residuals from the cointegration regressions are likely to be I(0)s and this is confirmed again by the ADF statistics. These results suggest that the variables in each of the four long-run regressions are cointegrated.

Based on the results of the cointegration regressions, the corresponding ECMs can be estimated by incorporating the lagged error terms from the cointegration models. The estimated coefficients of the cointegration regressions and the corresponding ECMs in Table 6.2 and Table 6.3 are the long-run and short-run demand elasticities.
Table 6.2 Coefficients, Standard Error and Diagnostics of Long-run Models

<table>
<thead>
<tr>
<th>Parameters:</th>
<th>Germany</th>
<th>Japan</th>
<th>UK</th>
<th>USA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Origin:</td>
<td>Coefficient (Std. Error)</td>
<td>Coefficient (Std. Error)</td>
<td>Coefficient (Std. Error)</td>
<td>Coefficient (Std. Error)</td>
</tr>
<tr>
<td>$\alpha_0$</td>
<td>-15.335 (2.310)</td>
<td>-15.527 (2.961)</td>
<td>-3.069 (1.123)</td>
<td>-6.872 (2.703)</td>
</tr>
<tr>
<td>In $N_DI_t$</td>
<td>1.525 (0.209)</td>
<td>2.536 (0.688)</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>In $GDP_t$</td>
<td>1.525 (0.209)</td>
<td>2.536 (0.688)</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>In $FX_t$</td>
<td>-</td>
<td>-1.749 (0.524)</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>In $TV_t$</td>
<td>0.398 (0.091)</td>
<td>0.548 (0.396)</td>
<td>0.487 (0.034)</td>
<td>0.549 (0.161)</td>
</tr>
<tr>
<td>In $KCPIX_t$</td>
<td>-</td>
<td>-</td>
<td>-0.298 (0.094)</td>
<td>-0.544 (0.319)</td>
</tr>
<tr>
<td>In $CCPIX_t$</td>
<td>-</td>
<td>0.231 (0.113)</td>
<td>0.063 (0.037)</td>
<td>-</td>
</tr>
<tr>
<td>In $JCPIX_t$</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-0.664 (0.366)</td>
</tr>
<tr>
<td>In $MCPIX_t$</td>
<td>0.869 (0.241)</td>
<td>1.953 (0.670)</td>
<td>-</td>
<td>1.342 (0.385)</td>
</tr>
<tr>
<td>In $PCPIX_t$</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>In $SCPIX_t$</td>
<td>-0.687 (0.289)</td>
<td>-</td>
<td>-</td>
<td>-1.375 (0.461)</td>
</tr>
<tr>
<td>In $TCPIX_t$</td>
<td>-</td>
<td>-1.931 (0.895)</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>$DUM67$</td>
<td>-</td>
<td>-</td>
<td>0.187 (0.106)</td>
<td>0.362 (0.173)</td>
</tr>
<tr>
<td>$DUM74$</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>$DUM80$</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>$DUM88$</td>
<td>0.213 (0.115)</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Diagnostics:

<table>
<thead>
<tr>
<th>$R^2$</th>
<th>0.995</th>
<th>0.986</th>
<th>0.995</th>
<th>0.984</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adjusted $R^2$</td>
<td>0.994</td>
<td>0.983</td>
<td>0.995</td>
<td>0.980</td>
</tr>
<tr>
<td>Standard Error of regression</td>
<td>0.110</td>
<td>0.273</td>
<td>0.099</td>
<td>0.157</td>
</tr>
<tr>
<td>CRDW statistics</td>
<td>1.600</td>
<td>1.424</td>
<td>1.504</td>
<td>1.136</td>
</tr>
</tbody>
</table>

Note: CRDW = Cointegration Regression Durbin Watson.
The cells left blank in Table 6.2 and Table 6.3 are due to the elimination of the variables during the testing down procedure according to their statistical insignificance.
Table 6.4 Diagnostics of Short-run Dynamic Models

<table>
<thead>
<tr>
<th>Origin</th>
<th>Germany</th>
<th>Japan</th>
<th>UK</th>
<th>USA</th>
</tr>
</thead>
<tbody>
<tr>
<td>$R^2$</td>
<td>0.578</td>
<td>0.734</td>
<td>0.724</td>
<td>0.508</td>
</tr>
<tr>
<td>Adjusted $R^2$</td>
<td>0.477</td>
<td>0.653</td>
<td>0.655</td>
<td>0.385</td>
</tr>
<tr>
<td>Standard error of regression</td>
<td>0.102</td>
<td>0.198</td>
<td>0.066</td>
<td>0.114</td>
</tr>
<tr>
<td>Normality test (Jarque-Bera)</td>
<td>1.667</td>
<td>1.468</td>
<td>0.614</td>
<td>17.405</td>
</tr>
<tr>
<td>Serial Correlation</td>
<td>6.825</td>
<td>1.492</td>
<td>0.216</td>
<td>1.427</td>
</tr>
<tr>
<td>(Breusch-Godfrey)</td>
<td>0.002</td>
<td>0.184</td>
<td>0.102</td>
<td>0.052</td>
</tr>
<tr>
<td>White Heteroskedasticity</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chow Forecast F statistic (1989-1994)</td>
<td>1.288</td>
<td>0.314</td>
<td>0.506</td>
<td>0.258</td>
</tr>
<tr>
<td>Ramsey RESET Log likelihood ratio</td>
<td>7.027</td>
<td>6.169</td>
<td>2.871</td>
<td>2.5032</td>
</tr>
</tbody>
</table>

As shown in Table 6.4, a number of diagnostic tests are carried out to examine whether the ECMs are correctly specified since the presence of autocorrelation or heteroskedasticity in the ECM residuals implies that the estimates of the ECM are biased. The Jarque-Bera (1980) normality test is a Lagrange Multiplier (LM) test for normal distribution of the residuals in a regression model. The statistic of normality test is distributed as $\chi^2(2)$. In a normality test, the skewness and kurtosis of a distribution are measured as well. The skewness of a symmetrical distribution in the normal distribution is zero. If the upper tail of the distribution is thicker than the lower tail, skewness will be positive. The kurtosis is a yardstick to examine whether the tails of a particular distribution is thicker than that of the normal distribution or not. The kurtosis of a normal distribution is 3. For example, if the distribution has thicker tails than does the normal distribution, its kurtosis will exceed three. The results of skewness and kurtosis is shown in Table 6.5.
Table 6.5 Diagnostics of Normality Test

<table>
<thead>
<tr>
<th></th>
<th>Germany</th>
<th>Japan</th>
<th>UK</th>
<th>USA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Observations</td>
<td>32</td>
<td>31</td>
<td>31</td>
<td>31</td>
</tr>
<tr>
<td>Mean</td>
<td>-6.72E-18</td>
<td>8.06E-18</td>
<td>-4.70E-18</td>
<td>-4.48E-18</td>
</tr>
<tr>
<td>Median</td>
<td>-0.009037</td>
<td>-0.009028</td>
<td>-1.51E-17</td>
<td>0.002843</td>
</tr>
<tr>
<td>Maximum</td>
<td>0.260153</td>
<td>0.399512</td>
<td>0.128741</td>
<td>0.330408</td>
</tr>
<tr>
<td>Minimum</td>
<td>-0.146645</td>
<td>-0.264180</td>
<td>-0.119647</td>
<td>-0.213356</td>
</tr>
<tr>
<td>Std. Dev.</td>
<td>0.091652</td>
<td>0.173675</td>
<td>0.058861</td>
<td>0.101827</td>
</tr>
<tr>
<td>Skewness</td>
<td>0.544427</td>
<td>0.530224</td>
<td>0.129248</td>
<td>1.225459</td>
</tr>
<tr>
<td>Kurtosis</td>
<td>3.254148</td>
<td>2.890248</td>
<td>2.361066</td>
<td>5.932674</td>
</tr>
<tr>
<td>Jarque-Bera</td>
<td>1.666926</td>
<td>1.468802</td>
<td>0.613615</td>
<td>17.40457</td>
</tr>
<tr>
<td>Probability</td>
<td>0.434542</td>
<td>0.479961</td>
<td>0.735792</td>
<td>0.000166</td>
</tr>
</tbody>
</table>

All the skewness in Table 6.5 are positive, which implies that upper tail is thicker than lower tail. However, all the skewness apart from USA are close to zero, and it indicates that they are normally distributed (see Figure 6.1).

The Breusch-Godfrey (Godfrey, 1978) statistic is used to test for residual serial correlation (ACML) when the model includes lagged dependent variables, the ACML is an LM test with the statistic distributed as \( \chi^2(p) \), where \( p \) is the order of serial correlation tested. If a model contain a lagged dependent variable and the error terms of it exhibit serial correlation, OLS will produce inconsistent estimates (Otto, 1994). All the Breusch-Godfrey statistic are smaller than their critical values, which implies that the OLS residuals are not serially correlated.

The Engle (1982) autoregressive conditional heteroskedasticity (ARCH) test is applied to test for the problem of heteroskedasticity under serially correlated residuals. The calculated ARCH statistic are compared with the critical values of the \( \chi^2(p) \), where \( p \) is the order of autocorrelation. Another statistic used in this study for
the detection of non-constant variance in the residuals is the White (1980) heteroskedasticity test.

Figure 6.1 Probability Histogram of Normality Test

In testing for model mis-specification, the Ramsey (1969) RESET (Regression Error Specification Tests) LM test of functional form is utilised. In addition, the Chow (1960) F-statistic is employed to test for predictive failure. In implementing the Chow test, the year 1989 is chosen as the starting period for forecasting.
6.2.1.3. Demand Equations

The long-run cointegration and short-run dynamic ECM equations by origin country can be specified as follows:

**Japanese Demand Equation**

Long-run:

\[
\ln T_A = -15.527 + 2.536 \ln NDI_t - 1.749 \ln FX_t + 0.548 \ln TV_t + 0.231 \ln CCPIX_t + 1.953 \ln MCPIX_t - 1.931 \ln TCPIX_t
\]

ECM:

\[
\Delta \ln T_A = -0.034 + 0.4 \Delta \ln T_A_{t-1} + 2.251 \Delta \ln NDI_t - 0.519 \Delta \ln FX_t + 0.938 \Delta \ln TV_t - 0.94 \Delta \ln TV_{t-1} + 0.411 \Delta \ln MCPIX_t - 0.7941 u_{t-1}
\]

**US Demand Equation**

Long-run:

\[
\ln T_A = -6.872 + 2.998 \ln GDP_t + 0.549 \ln TV_t - 0.544 \ln KCPJX_t + 0.664 \ln JCPIX_t + 1.342 \ln MCPIX_t - 1.375 \ln SCPIX_t + 0.362 DUM67
\]

ECM:

\[
\Delta \ln T_A = 0.011 + 2.253 \Delta \ln GDP_{t-1} + 0.564 \Delta \ln TV_t - 0.372 \Delta \ln KCPJX_t + 1.411 \Delta \ln MCPIX_t - 1.456 \Delta \ln SCPIX_t - 0.406 u_{t-1}
\]

**German Demand Equation**

Long-run:

\[
\ln T_A = -15.335 + 1.525 \ln NDI_t + 0.398 \ln TV_t + 0.869 \ln MCPIX_t - 0.687 \ln SCPIX_t + 0.213 DUM88
\]
ECM:

\[ \Delta \ln T_A_t = 0.026 + 0.881 \Delta \ln ND_{t-1} + 0.452 \Delta \ln TV_t + 1.383 \Delta \ln MCPIX_t - 1.321 \Delta \ln SCPIX_t + 0.274 DUM88 - 0.953 \mu_{t-1} \]

\[ \text{UK Demand Equation} \]

Long-run:

\[ \ln T_A_t = -3.069 + 2.082 \ln GDP_t + 0.487 \ln TV_t - 0.298 \ln KCPIX_t + 0.063 \ln CCPIX_t + 0.187 DUM67 \]

ECM:

\[ \Delta \ln T_A_t = -0.053 + 0.761 \Delta \ln GDP_t + 0.315 \Delta \ln TV_t - 0.218 \Delta \ln KCPIX_{t-1} + 0.044 \Delta \ln CCPIX_t + 0.196 DUM67 - 0.502 \mu_{t-1} \]

6.2.1.4. Johansen Test

Based on the four demand models, Johansen test is carried out in an attempt to investigate whether more than one cointegrating vector exists in the cointegration regression models or not. For a cointegration regression involved with a single cointegrating vector, no problem arises in the use of Engle-Granger procedure. In the case of multivariate cointegrating vectors, however, the Engle-Granger procedure is no longer valid. If the Engle-Granger procedure is applied to the cointegration regression where multivariate cointegrating vectors exist, then the Engle-Granger procedure produces the mean value of the cointegrating vectors. Tables from 6.6 to 6.9 are the results of Johansen test. In order to reject the null hypothesis of \( r=m \) (\( m \) = the number of long-run relationships) in favour of the alternative that \( r=m+1 \), the likelihood ratio should be greater than the 5(1)% critical value.
### Table 6.6 Johansen Test of Germany Model

<table>
<thead>
<tr>
<th>Eigenvalue</th>
<th>Likelihood Ratio</th>
<th>5 Percent Critical Value</th>
<th>1 Percent Critical Value</th>
<th>Hypothesised No. of Cointegrating Equations</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.633341</td>
<td>60.03</td>
<td>47.21</td>
<td>54.46</td>
<td>None**</td>
</tr>
<tr>
<td>0.462101</td>
<td>29.93</td>
<td>29.68</td>
<td>35.65</td>
<td>At most 1*</td>
</tr>
<tr>
<td>0.259293</td>
<td>11.33</td>
<td>15.41</td>
<td>20.04</td>
<td>At most 2</td>
</tr>
<tr>
<td>0.074556</td>
<td>2.32</td>
<td>3.76</td>
<td>6.65</td>
<td>At most 3</td>
</tr>
</tbody>
</table>

Note: "(*)" denotes rejection of the hypothesis at 5%(1%) significance level.

While the German and UK models seem to be well specified, Japanese and US models may not be properly specified since the evidence shown in Table 6.7 and 6.8 implies that more than four cointegrating vectors exist at the 5% significant level. In the case of German model, only one cointegrating vector exists at 1% significant level whilst two cointegrating vectors are involved at 5% significant level.

### Table 6.7 Johansen Test of Japanese Model

<table>
<thead>
<tr>
<th>Eigenvalue</th>
<th>Likelihood Ratio</th>
<th>5 Percent Critical Value</th>
<th>1 Percent Critical Value</th>
<th>Hypothesised No. of Cointegrating Equations</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.945189</td>
<td>213.93</td>
<td>124.24</td>
<td>133.57</td>
<td>None**</td>
</tr>
<tr>
<td>0.738605</td>
<td>123.91</td>
<td>94.15</td>
<td>103.18</td>
<td>At most 1**</td>
</tr>
<tr>
<td>0.574517</td>
<td>82.32</td>
<td>68.52</td>
<td>76.07</td>
<td>At most 2**</td>
</tr>
<tr>
<td>0.569592</td>
<td>55.83</td>
<td>47.21</td>
<td>54.46</td>
<td>At most 3**</td>
</tr>
<tr>
<td>0.385318</td>
<td>29.69</td>
<td>29.68</td>
<td>35.65</td>
<td>At most 4*</td>
</tr>
<tr>
<td>0.279891</td>
<td>14.61</td>
<td>15.41</td>
<td>20.04</td>
<td>At most 5</td>
</tr>
<tr>
<td>0.133147</td>
<td>4.43</td>
<td>3.76</td>
<td>6.65</td>
<td>At most 6*</td>
</tr>
</tbody>
</table>

Note: "(*)" denotes rejection of the hypothesis at 5%(1%) significance level.

If more than two cointegrating vectors exist in a model, such as Japanese and US model, the disturbance terms should be re-incorporated into the short dynamic model and re-estimated. However, the software program to estimate coefficients based on Johansen FIML is not available in the Eviews. This is another limitation of the research and there is a room for
Eviews to be further developed. The final ECM model is obtained by Engle-Granger OLS estimation. The Engle-Granger approach estimates the mean value of coefficients where multivariate cointegrating vectors exist.

Table 6.8 Johansen Test of UK Model

<table>
<thead>
<tr>
<th>Eigenvalue</th>
<th>Likelihood Ratio</th>
<th>5 Percent Critical Value</th>
<th>1 Percent Critical Value</th>
<th>Hypothesised No. of Cointegrating Equations</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.787063</td>
<td>104.05</td>
<td>68.52</td>
<td>76.07</td>
<td>None**</td>
</tr>
<tr>
<td>0.615041</td>
<td>57.65</td>
<td>47.21</td>
<td>54.46</td>
<td>At most 1**</td>
</tr>
<tr>
<td>0.479886</td>
<td>29.01</td>
<td>29.68</td>
<td>35.65</td>
<td>At most 2</td>
</tr>
<tr>
<td>0.197711</td>
<td>9.40</td>
<td>15.41</td>
<td>20.04</td>
<td>At most 3</td>
</tr>
<tr>
<td>0.088773</td>
<td>2.79</td>
<td>3.76</td>
<td>6.65</td>
<td>At most 4</td>
</tr>
</tbody>
</table>

Note: "(**) denotes rejection of the hypothesis at 5%(1%) significance level.

Table 6.9 Johansen Test of US Model

<table>
<thead>
<tr>
<th>Eigenvalue</th>
<th>Likelihood Ratio</th>
<th>5 Percent Critical Value</th>
<th>1 Percent Critical Value</th>
<th>Hypothesised No. of Cointegrating Equations</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.944862</td>
<td>257.17</td>
<td>124.24</td>
<td>133.57</td>
<td>None**</td>
</tr>
<tr>
<td>0.930472</td>
<td>167.33</td>
<td>94.15</td>
<td>103.18</td>
<td>At most 1**</td>
</tr>
<tr>
<td>0.654543</td>
<td>84.68</td>
<td>68.52</td>
<td>76.07</td>
<td>At most 2**</td>
</tr>
<tr>
<td>0.601467</td>
<td>51.73</td>
<td>47.21</td>
<td>54.46</td>
<td>At most 3*</td>
</tr>
<tr>
<td>0.313596</td>
<td>23.21</td>
<td>29.68</td>
<td>35.65</td>
<td>At most 4</td>
</tr>
<tr>
<td>0.208489</td>
<td>11.55</td>
<td>15.41</td>
<td>20.04</td>
<td>At most 5</td>
</tr>
<tr>
<td>0.129565</td>
<td>4.30</td>
<td>3.76</td>
<td>6.65</td>
<td>At most 6*</td>
</tr>
</tbody>
</table>

Note: "(**) denotes rejection of the hypothesis at 5%(1%) significance level.
6.2.2. Economic Implications

From the estimated results, we could see that income and trade elasticities are positive as expected while price or cost elasticities are negative. As shown in Table 6.10, the estimated income elasticities ranging from 1.525 to 2.998 in the long-run models imply that travelling to Korea is a luxurious tourist good for tourists from the four tourist generating countries in question. However, all the income elasticities of each country in the short-run models are less than those in long-run models. In particular, Germany and UK are less than 1 in the short-run model indicating that they are income inelastic. On the other hand, Japan and USA appear to be fairly income elastic origin countries, which implies that travelling to Korea is a luxurious tourist good for Japanese and Americans.

Table 6.10 Income Elasticities

<table>
<thead>
<tr>
<th>Country</th>
<th>Long-run</th>
<th>Short-run</th>
</tr>
</thead>
<tbody>
<tr>
<td>Germany</td>
<td>1.525</td>
<td>0.881</td>
</tr>
<tr>
<td>Japan</td>
<td>2.536</td>
<td>2.251</td>
</tr>
<tr>
<td>UK</td>
<td>2.082</td>
<td>0.761</td>
</tr>
<tr>
<td>USA</td>
<td>2.998</td>
<td>2.253*</td>
</tr>
</tbody>
</table>

Note: * indicates the coefficient of 1 lagged variable

The return air fare variable is significant for Japan but not for the other three countries. This implies that air fare is not the right proxy for tourist price variable in explaining tourism demand to Korea.

Table 6.11 Travel Cost Elasticities

<table>
<thead>
<tr>
<th>Country</th>
<th>Long-run</th>
<th>Short-run</th>
</tr>
</thead>
<tbody>
<tr>
<td>Germany</td>
<td></td>
<td>–</td>
</tr>
<tr>
<td>Japan</td>
<td>–1.749</td>
<td>–0.519</td>
</tr>
<tr>
<td>UK</td>
<td></td>
<td>–</td>
</tr>
<tr>
<td>USA</td>
<td></td>
<td>–</td>
</tr>
</tbody>
</table>

The own price elasticity is found to be statistically significant with expected sign only in the UK and USA long-run models and the magnitude is significantly less than 1.
This indicates that the price/costs of the tourism in Korea has some marginal effects on the UK and USA residents when they make their travel decisions to Korea. On the other hand, it has no role to play in the decision making processes of the Japanese and German travellers. This implies that consumer price index is not an acceptable measure of the cost of living for Japanese and German travellers.

Table 6.12 Living Cost Elasticities

<table>
<thead>
<tr>
<th></th>
<th>Germany</th>
<th>Japan</th>
<th>UK</th>
<th>USA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Long-run</td>
<td>-</td>
<td>-</td>
<td>-0.298</td>
<td>-0.544</td>
</tr>
<tr>
<td>Short-run</td>
<td>-</td>
<td>-</td>
<td>-0.218</td>
<td>-0.372</td>
</tr>
</tbody>
</table>

Note: * indicates the coefficient of 1 lagged variable

As mentioned earlier, the relative price variables of the six substitute destinations are included in the initial specifications of the long-run tourism demand models. This allows us to see whether these proposed substitute destinations have any effect on the inbound tourism demand in Korea. The positive price elasticity of a particular destination indicates a substitution effect. For example, Malaysia is the substitute destination for German, Japanese and USA tourists. On the other hand, the negative price elasticity implies a complementary effect.

As shown in Table 6.13, Singapore has complementary effect on German overseas tourists to Korea. Overall, Malaysia and China are the two main competitive destinations while Singapore and Thailand are revealed as complementary destinations. Japan and Philippines are found to be neither substitute nor complementary destination for all four tourist generating countries.
The trade volume variable is found to be correctly signed and significant in all the long-run and short-run models. This result is not surprising since a relatively large proportion (about 16-20% during 1980s) of the tourist arrivals in Korea is related to business travel. According to Lee et al. (1996), business travellers dominated the Korean international tourism in the 1960s and they paved the way for the surge of pleasure tourists to Korea since earlier 1970s.

In terms of the dummy variables, surprisingly the 1988 Seoul Olympic Games is only significant in the German model while the 1974 'oil crisis' and the 1980 political upheaval did not affect the international tourism arrivals in Korea. The 1967 dummy is significant in the UK and USA in long-run models and this might be due to the economic situations in the two countries during that year, however, the exact reason why the 1967 dummy is significant remains unknown.
Table 6.15 Dummy Variable Elasticities

<table>
<thead>
<tr>
<th></th>
<th>Long-run</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Germany</td>
<td>Japan</td>
<td>UK</td>
<td>USA</td>
</tr>
<tr>
<td>Dum67</td>
<td>-</td>
<td>-</td>
<td>0.187</td>
<td>0.362</td>
</tr>
<tr>
<td>Dum88</td>
<td>0.213</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Short-run</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Germany</td>
<td>Japan</td>
<td>UK</td>
<td>USA</td>
</tr>
<tr>
<td>Dum67</td>
<td>-</td>
<td>-</td>
<td>0.196</td>
<td>-</td>
</tr>
<tr>
<td>Dum88</td>
<td>0.274</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>
6.2.3. Other Policy Implications

It is felt that well-conceived tourism policies will benefit the consumer, government, the private sector, and the world community at large and will be a major factor in improving every aspect of the tourism product. In this perspective, accurate forecasting international demand for tourism is critical. It is strongly suggested that the forecast should be made by country since they are likely to be influenced by different factors. This has already been justified by the econometric analysis. However, international tourism demand is affected by not only economic factors but also many other factors such as socio-cultural factors, political factors, environmental factors, natural disasters etc.

The tourism industry in Korea may face with some problems caused by the lack of market diversification. One of the problems lies in the fact that Korea's tourism has been heavily dependent upon Japanese and US markets for the last three decades. There are a couple of reasons for adopting market diversification.

In socio-cultural aspect, for example, Koreans have negative impression or perception on Japanese tourists since the demonstration triggered by Yi-hwa Women's University students during the 1970s. The demonstration was held against Japanese tourists because the sex tourism made by Japanese was prevalent at that time. Since then, Koreans still possess the negative image on Japanese tourists. As a result, international tourists from the other countries are more or less perceived negatively. Therefore, Japanese tourists exert negative socio-cultural impact on Koreans, even though they provide a considerable economic benefits to Korea. On the other hand, the western people may affect their positive culture such as good public moral and manner to Koreans regardless of their economic contribution.
In addition, international tourism demand is not only influenced by a range of economic and socio-cultural factors but also highly sensitive to diplomatic relationships between tourist generating country and receiving country. As shown in Table 6.16, for example, a number of Japanese tourists visit the Kyung-ju area which is one of the famous historic sites in Korea, and hence, the hotel room occupancy in Kyung-ju has been noticeably affected by the political conflicts between Korea and Japan (Kim, 1994).

Therefore, negative changes of political relationships between Japan and Korea may cause severe damage to Korea's tourism industry when the Japanese market share is relatively higher than other markets.

Table 6.16 Political Issues between Korea and Japan, and Percentage of Cancellation out of total Hotel Room Reservation in Kyung-ju

<table>
<thead>
<tr>
<th>Date</th>
<th>Political Issues</th>
<th>Percentage of Cancellation out of total Room Reservation</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 Jul. 1982</td>
<td>The distorted historical facts about the Japanese invasion to Korea was illustrated in the Japanese highschool text book on history.</td>
<td>15 - 20%</td>
</tr>
<tr>
<td>11 Feb. 1984</td>
<td>The Japanese Prime Minister's unreasonable insistence that Dokdo island belongs to Japan.</td>
<td>10 - 15%</td>
</tr>
<tr>
<td>17 Jun. 1986</td>
<td>The distorted historical facts about the Japanese invasion to Korea in Japanese highschool text book was unsettled.</td>
<td>5 - 10%</td>
</tr>
<tr>
<td>March 1992</td>
<td>Groups of Korean people protest against the compulsory service provided by Korean women for the entertainment of Japanese soldiers during their invasion.</td>
<td>5 - 10%</td>
</tr>
</tbody>
</table>

Source: Adapted from KNTC (1993).
6.3. Forecasting Performance

In order to present objective evidence on the comparison of forecasting performance, five different time horizons (10, 7, 5, 3 and 1 years horizons) are considered in this paper. Therefore, the latest actual data up to 10 years are held to make ex post forecasts. It should be noted that the first difference of the total tourist arrivals is used as a dependent variable for all forecasting models. The stationarity of all the time series used in the forecasting has been already achieved by first difference of the original data during the pre-modelling process.

A simple naive model which sometimes is called "no change" model is used as a benchmark for the evaluation of the forecasting performance of different competing models. The changes of tourism arrivals (in logarithm) from each tourist generating country over a number of forecasting periods are generated from the ECM, a simple moving average (SMA) process, a single exponential smoothing (SES) model, a simple autoregressive (AR(1)) model, an autoregressive moving average (ARMA(p,q)) model and an unrestricted vector autoregressive (VAR) model.

The orders of the ARMA(p,q) models for each origin country are determined by the autocorrelation function (ACF) and the partial autocorrelation function (PACF) respectively. The VAR models are simply specified by including all the variables selected from cointegration regression.

The criteria used in this paper for the evaluation of forecasting performance are the root mean square error (RMSE), mean absolute forecasting error (MAE) and the Theil (1966) inequality coefficient, U.
Table 6.17 Comparison of Forecasting Performance
(10 & 7 years' horizons)

<table>
<thead>
<tr>
<th>Method</th>
<th>MAE</th>
<th>RMSE</th>
<th>Theil's U</th>
<th>MAE</th>
<th>RMSE</th>
<th>Theil's U</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>10 years' horizon</td>
<td></td>
<td></td>
<td>7 years' horizon</td>
<td></td>
<td></td>
</tr>
<tr>
<td>G Naive</td>
<td>0.174</td>
<td>0.223</td>
<td>0.395</td>
<td>0.154</td>
<td>0.209</td>
<td>0.462</td>
</tr>
<tr>
<td>E SMA</td>
<td>0.123</td>
<td>0.170</td>
<td>0.422</td>
<td>0.110</td>
<td>0.159</td>
<td>0.489</td>
</tr>
<tr>
<td>R SES</td>
<td>0.119</td>
<td>0.155</td>
<td>0.386</td>
<td>0.108</td>
<td>0.146</td>
<td>0.439</td>
</tr>
<tr>
<td>M AR(1)</td>
<td>0.098</td>
<td>0.115</td>
<td>0.398</td>
<td>0.112</td>
<td>0.128</td>
<td>0.442</td>
</tr>
<tr>
<td>A ARMA(p,q)</td>
<td>0.073</td>
<td>0.095</td>
<td>0.384</td>
<td>0.102</td>
<td>0.118</td>
<td>0.454</td>
</tr>
<tr>
<td>N VAR</td>
<td>0.088</td>
<td>0.118</td>
<td>0.418</td>
<td>0.107</td>
<td>0.137</td>
<td>0.460</td>
</tr>
<tr>
<td>Y ECM</td>
<td>0.085</td>
<td>0.118</td>
<td>0.407</td>
<td>0.109</td>
<td>0.140</td>
<td>0.450</td>
</tr>
<tr>
<td></td>
<td>0.301</td>
<td>0.452</td>
<td>0.394</td>
<td>0.273</td>
<td>0.424</td>
<td>0.397</td>
</tr>
<tr>
<td>J SMA</td>
<td>0.283</td>
<td>0.380</td>
<td>0.892</td>
<td>0.265</td>
<td>0.359</td>
<td>0.444</td>
</tr>
<tr>
<td>A SES</td>
<td>0.281</td>
<td>0.375</td>
<td>0.432</td>
<td>0.255</td>
<td>0.353</td>
<td>0.401</td>
</tr>
<tr>
<td>P AR(1)</td>
<td>0.151</td>
<td>0.176</td>
<td>0.449</td>
<td>0.160</td>
<td>0.186</td>
<td>0.504</td>
</tr>
<tr>
<td>A ARIMA</td>
<td>0.125</td>
<td>0.152</td>
<td>0.780</td>
<td>0.094</td>
<td>0.120</td>
<td>0.555</td>
</tr>
<tr>
<td>N VAR</td>
<td>0.398</td>
<td>0.486</td>
<td>0.834</td>
<td>0.261</td>
<td>0.308</td>
<td>0.814</td>
</tr>
<tr>
<td>Y ECM</td>
<td>0.199</td>
<td>0.276</td>
<td>0.537</td>
<td>0.154</td>
<td>0.184</td>
<td>0.652</td>
</tr>
<tr>
<td></td>
<td>0.132</td>
<td>0.144</td>
<td>0.659</td>
<td>0.121</td>
<td>0.136</td>
<td>0.615</td>
</tr>
<tr>
<td>U SES</td>
<td>0.094</td>
<td>0.114</td>
<td>0.415</td>
<td>0.086</td>
<td>0.107</td>
<td>0.490</td>
</tr>
<tr>
<td>K AR(1)</td>
<td>0.108</td>
<td>0.119</td>
<td>0.438</td>
<td>0.120</td>
<td>0.130</td>
<td>0.479</td>
</tr>
<tr>
<td>ARIMA</td>
<td>0.078</td>
<td>0.091</td>
<td>0.374</td>
<td>0.092</td>
<td>0.100</td>
<td>0.417</td>
</tr>
<tr>
<td>VAR</td>
<td>0.121</td>
<td>0.138</td>
<td>0.487</td>
<td>0.073</td>
<td>0.092</td>
<td>0.402</td>
</tr>
<tr>
<td>ECM</td>
<td>0.070</td>
<td>0.081</td>
<td>0.321</td>
<td>0.066</td>
<td>0.080</td>
<td>0.356</td>
</tr>
<tr>
<td></td>
<td>0.138</td>
<td>0.194</td>
<td>0.588</td>
<td>0.128</td>
<td>0.182</td>
<td>0.765</td>
</tr>
<tr>
<td>U SES</td>
<td>0.112</td>
<td>0.165</td>
<td>0.556</td>
<td>0.106</td>
<td>0.155</td>
<td>0.772</td>
</tr>
<tr>
<td>S AR(1)</td>
<td>0.105</td>
<td>0.125</td>
<td>0.537</td>
<td>0.139</td>
<td>0.148</td>
<td>0.770</td>
</tr>
<tr>
<td>A ARIMA</td>
<td>0.080</td>
<td>0.092</td>
<td>0.536</td>
<td>0.115</td>
<td>0.125</td>
<td>0.743</td>
</tr>
<tr>
<td>VAR</td>
<td>0.139</td>
<td>0.183</td>
<td>0.561</td>
<td>0.093</td>
<td>0.122</td>
<td>0.796</td>
</tr>
<tr>
<td>ECM</td>
<td>0.074</td>
<td>0.088</td>
<td>0.368</td>
<td>0.060</td>
<td>0.069</td>
<td>0.673</td>
</tr>
</tbody>
</table>
Table 6.18 Comparison of Forecasting Performance
(5 & 3 years' horizons)

<table>
<thead>
<tr>
<th>Method</th>
<th>5 years' horizon</th>
<th>3 years' horizon</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>MAE</td>
<td>RMSE</td>
</tr>
<tr>
<td>G Naive</td>
<td>0.159</td>
<td>0.210</td>
</tr>
<tr>
<td>E SMA</td>
<td>0.110</td>
<td>0.158</td>
</tr>
<tr>
<td>R SES</td>
<td>0.110</td>
<td>0.146</td>
</tr>
<tr>
<td>M AR(1)</td>
<td>0.109</td>
<td>0.132</td>
</tr>
<tr>
<td>A ARMA(p,q)</td>
<td><strong>0.058</strong></td>
<td><strong>0.072</strong></td>
</tr>
<tr>
<td>N VAR</td>
<td>0.141</td>
<td>0.163</td>
</tr>
<tr>
<td>Y ECM</td>
<td>0.149</td>
<td>0.165</td>
</tr>
<tr>
<td>J SMA</td>
<td>0.257</td>
<td>0.407</td>
</tr>
<tr>
<td>A SES</td>
<td>0.244</td>
<td>0.341</td>
</tr>
<tr>
<td>P AR(1)</td>
<td>0.210</td>
<td>0.215</td>
</tr>
<tr>
<td>A ARIMA</td>
<td>0.075</td>
<td><strong>0.098</strong></td>
</tr>
<tr>
<td>N VAR</td>
<td>0.233</td>
<td>0.282</td>
</tr>
<tr>
<td>ECM</td>
<td>0.073</td>
<td>0.099</td>
</tr>
<tr>
<td>U SES</td>
<td>0.090</td>
<td>0.112</td>
</tr>
<tr>
<td>K AR(1)</td>
<td>0.114</td>
<td>0.125</td>
</tr>
<tr>
<td>ARIMA</td>
<td>0.083</td>
<td>0.092</td>
</tr>
<tr>
<td>VAR</td>
<td>0.067</td>
<td>0.088</td>
</tr>
<tr>
<td>ECM</td>
<td><strong>0.049</strong></td>
<td><strong>0.055</strong></td>
</tr>
<tr>
<td>U Naive</td>
<td>0.126</td>
<td>0.178</td>
</tr>
<tr>
<td>U SMA</td>
<td>0.110</td>
<td>0.156</td>
</tr>
<tr>
<td>S SES</td>
<td>0.104</td>
<td>0.147</td>
</tr>
<tr>
<td>A ARIMA</td>
<td>0.072</td>
<td>0.085</td>
</tr>
<tr>
<td>VAR</td>
<td>0.068</td>
<td>0.081</td>
</tr>
<tr>
<td>ECM</td>
<td><strong>0.040</strong></td>
<td><strong>0.045</strong></td>
</tr>
</tbody>
</table>
Table 6.19 Comparison of Forecasting Performance
(1 year horizon)

<table>
<thead>
<tr>
<th>Method</th>
<th>MAE</th>
<th>RMSE</th>
<th>Theil's U</th>
</tr>
</thead>
<tbody>
<tr>
<td>Naive</td>
<td>0.152</td>
<td>0.200</td>
<td>0.625</td>
</tr>
<tr>
<td>SMA</td>
<td>0.106</td>
<td>0.151</td>
<td>0.357</td>
</tr>
<tr>
<td>SES</td>
<td>0.110</td>
<td>0.143</td>
<td>0.212</td>
</tr>
<tr>
<td>AR(1)</td>
<td>0.111</td>
<td>0.141</td>
<td>0.411</td>
</tr>
<tr>
<td>ARMA(p,q)</td>
<td>0.092</td>
<td>0.093</td>
<td>0.372</td>
</tr>
<tr>
<td>VAR</td>
<td>0.053</td>
<td>0.075</td>
<td>0.408</td>
</tr>
<tr>
<td>ECM</td>
<td>0.074</td>
<td>0.092</td>
<td>0.252</td>
</tr>
<tr>
<td>Naive</td>
<td>0.234</td>
<td>0.381</td>
<td>0.200</td>
</tr>
<tr>
<td>SMA</td>
<td>0.235</td>
<td>0.326</td>
<td>0.034</td>
</tr>
<tr>
<td>SES</td>
<td>0.224</td>
<td>0.320</td>
<td>0.122</td>
</tr>
<tr>
<td>AR(1)</td>
<td>0.243</td>
<td>0.337</td>
<td>0.535</td>
</tr>
<tr>
<td>ARIMA</td>
<td>0.050</td>
<td>0.051</td>
<td>0.409</td>
</tr>
<tr>
<td>VAR</td>
<td>0.128</td>
<td>0.141</td>
<td>0.476</td>
</tr>
<tr>
<td>ECM</td>
<td>0.141</td>
<td>0.179</td>
<td>0.236</td>
</tr>
<tr>
<td>Naive</td>
<td>0.118</td>
<td>0.140</td>
<td>1</td>
</tr>
<tr>
<td>SMA</td>
<td>0.089</td>
<td>0.109</td>
<td>0.335</td>
</tr>
<tr>
<td>SES</td>
<td>0.088</td>
<td>0.107</td>
<td>0.371</td>
</tr>
<tr>
<td>AR(1)</td>
<td>0.061</td>
<td>0.082</td>
<td>0.390</td>
</tr>
<tr>
<td>ARIMA</td>
<td>0.090</td>
<td>0.091</td>
<td>0.528</td>
</tr>
<tr>
<td>VAR</td>
<td>0.061</td>
<td>0.078</td>
<td>0.361</td>
</tr>
<tr>
<td>ECM</td>
<td>0.047</td>
<td>0.058</td>
<td>0.175</td>
</tr>
<tr>
<td>Naive</td>
<td>0.121</td>
<td>0.169</td>
<td>1</td>
</tr>
<tr>
<td>SMA</td>
<td>0.102</td>
<td>0.146</td>
<td>0.540</td>
</tr>
<tr>
<td>SES</td>
<td>0.098</td>
<td>0.139</td>
<td>0.063</td>
</tr>
<tr>
<td>AR(1)</td>
<td>0.089</td>
<td>0.143</td>
<td>0.469</td>
</tr>
<tr>
<td>ARIMA</td>
<td>0.082</td>
<td>0.082</td>
<td>0.762</td>
</tr>
<tr>
<td>VAR</td>
<td>0.070</td>
<td>0.077</td>
<td>0.691</td>
</tr>
<tr>
<td>ECM</td>
<td>0.070</td>
<td>0.101</td>
<td>0.299</td>
</tr>
</tbody>
</table>

The results of three criteria are presented in Table 6.17, Table 6.18 and Table 6.19. The bold letter indicates the first rank in terms of accuracy. The forecasting results
indicates that the ECM is the most accurate specification in the case of UK and USA giving the smallest MAEs and RMSEs through whole range of forecasting time horizons. For UK and US models, the difference between ECM error and other models's error is much clearer when the forecast horizon increases. The forecast results generated by ECM are compared with actual values (see Table A6.1 in Appendix). For time series models, as the forecast horizon increases, so does the uncertainty attached to forecasts and the prediction interval consequently become wider. In terms of model's running time, ARMA(p,q) takes the most lengthy time among selected models.

However, the ECM does not outperform the ARMA(p,q) model in the case of Germany and Japan. This is probably due to the fact that the ECMs for these two countries may have suffered from the problem of functional form as judged from the RESET statistics (see Table 6.4). The problem of possible misspecification for these two countries may be caused by either the omission of important explanatory variables or by the inappropriate use of the proxy variables. Therefore, further research is needed to fine-tune the German and Japanese ECMs. It is expected that the performance of the ECMs could be enhanced by the improvement of the model respecification.

Contradictory to other studies, such as Martin and Witt (1989) and Witt and Witt (1992), this study finds that the naive model is the worst contender among the competing models. This suggests that correctly specified econometric models should outperform the simple time series alternatives. The same conclusion is also reached in Song, Romilly and Liu (1997a), Song, Romilly and Liu (1997b) and Brown, Song and McGillivray (1997) in forecasting the outbound tourism demand, aggregate consumption and housing prices in the UK.
6.4. Chapter Summary

In this chapter, the cointegration and ECM techniques are highlighted and used to analyse the inbound tourism demand in Korea by four major tourist generating countries. The pre-modelling data analysis, namely the ADF test for unit roots, indicates that all variables used in the study are I(1) variables. The Engle-Granger procedure suggests that the long-run equilibrium (or cointegration) relationship exist between the tourism demand variables for all the four tourist generating countries under investigation and the corresponding ECMs are estimated using the OLS. However, it is known that the Engle-Granger approach is likely to suffer from small sample bias in estimating the cointegration relationship and the ECMs. Further research on the use of the Johansen (Johansen and Juselius, 1990) maximum likelihood method and the Wickens and Breusch (1988) approach to analyse the long-run and short-run inbound tourism demand in Korea may therefore prove to be valuable.

The estimated income elasticities ranging from 1.525 to 2.998 in the long-run models imply that travelling to Korea is a luxurious tourist good for tourists from the four tourist generating countries in question. The trade volume is found to be significant in all models while return air fare is not except for Japan. Another interesting point needs to be made from the findings is that the relative price of the Korean tourism is significant in the UK and USA demand equations but not in the German and Japanese models. This may suggest that the Japanese and German tourists are less concerned with the costs of tourism when they make their decisions on travelling to Korea than the British and Americans. In terms of the significance of substitution prices, Malaysia and China turn out to be the most favourite substitute destinations while Singapore and Thailand are found to be complementary destinations.
The *ex post* forecasts generated from different models over five different time horizons show that ECM is superior to the other models for the UK and USA but not for Japan and Germany. This may be due to the problem of inappropriate functional form in the Japanese and German equations and further research is intended to improve the model specification for these two countries. Nevertheless, ECM outperform other alternative time series approaches, which is contradict to other studies, such as Martin and Witt (1989) and Witt and Witt (1992). This study finds that the naive model is the worst contender among the competing models.
CHAPTER VII

CONCLUSION

AND

RECOMMENDATIONS
This chapter concludes the thesis with a summary of the main issues put forward and investigated, the empirical findings obtained and the related policy implications and provides suggestions for future research on forecasting international demand for tourism.

7.1. Overall Summary of Research Findings

This section attempts to summarise the findings from the research. This thesis has examined the international demand for Korean Tourism and has contributed to the rigorous study of variables that affect the international demand for Korean tourism. Tourism in Korea played a significant role as a valuable means of alleviating balance of payments constraints and of income, employment and tax revenue generation. Nevertheless, the number of tourist arrivals may be characterised by fluctuations, since tourism is particularly sensitive to changes in the international economic and political environment, and this can induce undesirable repercussion for the economy as a whole.

In Chapter Two, the outline of international demand for Korean tourism focusing on four origin countries has been reviewed in order to identify their trends and travel propensity. Examining the historical background of generating countries based on statistical data seems critically important for forecast in that quantitative predictions are unlikely to be made without relevant past data or information. Therefore, the collection of statistical data or information are essential for the analysis of tourism demand.

For international demand for Korean tourism, the number of total arrivals are steadily increasing year by year, and the Japanese and US markets occupied over 50% out of the total in
1994. It is obvious that Korea has been heavily depend upon Japanese and US markets. It has been suggested that market diversification should be developed by accelerating overseas marketing promotion in order to redress the imbalance of international market share (Kim, 1989, p.44). There was some change in rank among markets showing the staggeringly increased number of tourists from socialist and former communist countries. In terms of tourism by purpose, pleasure tourists accounted for 57% followed by business tourists (11%) and VFR (10%) in 1994. The seasonal pattern of tourist arrivals indicates that August and October are regarded as peak month while December through February are still showing low volume, and this seasonal fluctuation should be tackled by developing new tourist products and marketing strategies. The consuming pattern of the four countries was broken down into six categories and was reviewed in order to compare the consuming behaviour in 1985 with that in 1995.

Chapter Three and Four reviewed the past literature on tourism demand and provided a background for the approach that has been followed in this thesis.

In Chapter Three, the framework for forecasting tourism demand was critically evaluated. The rationale of forecasting was discussed in the light of planning and management in tourism. In general, policymakers need forecasting for tourism policy making and physical planning of infrastructure while managers in tourism-related business require forecasting in order to plan for financial viability. However, the characteristics of tourist products differ from that of other business commodities. The nature of the tourist products are perishable, which means we can not store them for future use. Therefore, forecasting the demand for airline seats and hotel rooms is significantly important. The forecasting process which can be divided into the design, specification and evaluation stages was discussed in order to
provide a formal structure of sequential steps leading to a defined objective. These three steps are equally important in that they affect the performance of forecasting. The restraining elements of forecasting were considered from the six points of view; time horizon, data, accuracy, resources, cost and simplicity of application. Each element can have significant effect on forecasting. Apart from these elements, in particular, international demand for tourism is likely to be influenced by a number of qualitative factors. This qualitative factors may be associated with personal preferences, politics, environment, ad hoc events, etc. In order to identify the determinants of tourism, some popular dependent and independent (or explanatory) variables were critically reviewed, since they are significantly associated with developing and formulating forecasting models. Previous studies have shown that price and income variables have played very important roles as determinants of international tourism demand.

Chapter Four discusses various quantitative and qualitative approaches, but emphasis was placed on relevant past studies referring to econometric approaches to the modelling of tourism demand. In particular, the cointegration and ECM analysis are highlighted because they can solve the spurious regression problem. Moreover, ECM can be easily fitted into the general-to-specific methodology, and will always reduce the multicollinearity problem. On the other hand, although neural network model has been explained, it can not be applied for this research due to some limitations described at the end of section 4.2.2.3.

In Chapter Five, the detailed methodology is explained. In the choice of variables, the number of tourist arrivals is used as a dependent variable while lagged dependent variable, NDI (or GDP), trade volume, return air fare and CPI are used as explanatory variables. Particularly, the stationary
dependent variable is used for all forecasting techniques so that the forecast can be made under the same condition.

For model specification, only causal models were specified in detail since the univariate time series models have already been explained in Chapter Four. If the long-run cointegration relationship exists between variables, then this can always be transformed into short-run dynamic ECM. The ECM is free from spurious relationship and proved to be very powerful as a forecasting technique. The unrestricted VAR model treats all the variables as an endogenous variable and has an advantage over ECM, since it uses regressors already available. The 'Forecast Pro' expert system provides automatic function to choose the most optimal univariate time series technique available, while Eviews pays great attention to model specification and testing by using some of the new advances in modelling such as ECM, Johansen FIML, VAR etc. In order to compare the forecasting performance (or accuracy) of different forecasting techniques, three different criteria are used; MAE, RMSE and Theil's U statistics.

In Chapter Six, the cointegration and ECM techniques are presented and used to analyse the inbound tourism demand to Korea by four major tourist generating countries. The pre-modelling data analysis, namely the ADF test for unit roots, indicates that all variables used in the study are I(1) variables. The Engle-Granger procedure suggests that the long-run equilibrium (or cointegration) relationship exist between the tourism demand variables for all the four tourist generating countries under investigation and the corresponding ECMs are estimated using the OLS.

The estimated income elasticities ranging from 1.525 to 2.998 in the long-run models imply that travelling to Korea is a luxurious tourist good for tourists from the four tourist generating countries in question. The trade volume is found to be significant in all models while return air fare is not
except for Japan. Another interesting point needs to be made from the findings is that the relative price of the Korean tourism is significant in the UK and USA demand equations but not in the German and Japanese models. This may suggest that the Japanese and German tourists are less concerned with the costs of tourism when they make their decisions on travelling to Korea than the British and Americans. In terms of the significance of substitution prices, Malaysia and China turn out to be the most favourite substitute destinations while Singapore and Thailand are found to be complementary destinations.

The ex post forecasts generated from different models over five different time horizons show that ECM is superior to the other models for the UK and USA but not for Japan and German. This may be due to the problem of inappropriate functional form in the Japanese and German equations and further research is intended to improve the model specification for these two countries. Nevertheless, ECM outperform other alternative time series approaches, which is contradictory to other studies, such as Martin and Witt (1989) and Witt and Witt (1992). This study finds that the naive model is the worst contender among the competing models.
7.2. Recommendations for Future Research

To conclude, both long-run cointegration and short-run dynamic ECM approaches contribute important insights about the determinants of international demand for Korean tourism, as well as related policy implications. Nevertheless, it would be interesting to extend this work in alternative directions. In this final section, some suggestions for future research are made.

The Engle-Granger procedure suggests that the long-run equilibrium (or cointegration) relationship exist between the tourism demand variables for all the four tourist generating countries under investigation and the corresponding ECMs are estimated using the OLS. However, it is known that the Engle-Granger approach is likely to suffer from small sample bias in estimating the cointegration relationship and the ECMs. As tested in section 6.2.1.4, Japanese and US model are involved with multivariate cointegrating vectors. Therefore, further research on the use of the Johansen (Johansen & Juselius, 1990) maximum likelihood method and the Wickens and Breusch (1988) approach to analyse the long-run and short-run inbound tourism demand to Korea may therefore prove to be valuable.

An alternative approach to analysing international tourism demand could be put forward by neural network model. In general, the limitations to the practical use of neural networks are the long time consumed in the modelling process and the large amount of data required by the present neural network methodologies (Lachtermacher & Fuller, 1995).

It is a lengthy process to grasp the concept of neural network model and to find most appropriate technique. For example, it is critical to define the input and output pattern, the number of hidden layers and the pattern of
connectivity among units etc. appropriately. Since it is complicated to identify the patterns of connectivity among units intuitively, they need to be modified by experience. In addition, selecting proper propagation, activation and learning rules may lead to lengthy and tedious task because they need to be found by trial and error.

Another problem is associated with the amount of data. Even if there are a range of rigorous techniques available for adaptation (or learning), the reliable forecasts are subject to the number of data used for training. This is plausible in a sense that sound neural network model is determined by how well trained the rules using huge amount of data. Therefore, the quantity of data available is a critical factor for using the neural network model. Although the neural network has been prevalently used to forecast stock market, considerable amount of data are unlikely to be obtained from the tourism industry. However, if sufficient time and data are available, the forecasting performance of the neural network model could be explored.

Lastly, the availability of disaggregated data would contribute to the expansion of research on international tourism demand at the micro-level, since the studies up to now have used mostly macro-models, based on aggregate data including all tourism purposes. Disaggregate data would permit examination of the motives underlying international tourism demand and the divergent spending patterns of tourists, and, hence, would have more important policy implications for the tourism sectors of the destination countries concerned. It has been a major problem for all studies in the field of tourism demand that they have been severely constrained by the lack of adequate, reliable and consistent data and relevant national as well as international bodies should be seriously concerned with this issue.
1.1. Interview with the Director of Office of Research & Development

Date: 5 December 1995

* The availability of forecasting method

Does the KNTC undertake forecast?

- No. We don't do it by ourselves, but we ask forecasting experts in other academic institutes such as universities or KOTI (Korea Transportation Institute) to undertake a project on mid-term forecast (see A1.4).

* Why only produce mid-term forecast? Do you ask those experts to produce short-term and long-term forecast as well?

- Since short-term forecast is already made in the process of mid-term forecast project, we don't ask short-term forecast. Furthermore, it is very difficult to expect reliable forecast results when long-term forecast is made because there are likely to be various factors which might affect tourism demand unexpectedly. As you know, political factors and technological factors could influence international tourism demand seriously.

* How often does the KNTC ask forecasting experts to produce mid-term forecast?

- Normally, every four or five years. The president of KNTC has to report KNTC's plan to the Mr. president in the first year of his duty. Since the period of charge as a president of KNTC is four years, mid-term forecast is appropriate time horizon in order to cover his designated year. Sometimes, however, a new mid-term forecast is inquired whenever special
events or changes which seem to influence tourism demand seriously are anticipated. Those anticipated events include the Asian Games, the Olympic Games, the World Cup and so on. A new construction of infrastructure such as international airport could also affect tourism demand.

* What is the purpose of doing forecast?

- Before answering the question, I would like to mention that we are not much dependent on forecasting. We strongly believe there are always some unexpected variables in the case of Korea. As you know, tourism demand is likely to be affected by a number of factors, and it is virtually impossible to consider all those variables when forecasting. Therefore, it is really hard to accept the forecast results no matter how rigorous forecasting method was applied.

* Then, what could be the base material for future plan?

- In fact, we set the goal roughly on the basis of simple trend projection. We consider annual growth rate especially reflecting the trend of annual growth rate.

* Whom do you normally inquire about demand forecasting for tourism? I wonder if you can introduce me to one of forecasting experts or consultants so that I can see and interview him.

- Well, Professor Sah-Hun Kim at Kyung-gi University is one of the forecasting experts to whom we inquire about forecasting. For further recommendation, Dr. Seung-Dam Choi in KOTI(Korea Transport Institute) is regarded as a forecasting expert.
1.2. Interview with Professor Kim at the Department of Tourism Planning and Development in Kyung-gi University

Date: 11 December 1995

* What kind of forecasting methods have you used for measuring international tourism demand?

- Most of my work is rather quantitative approach. I have been using a range of time series models in order to find the most rigorous model out of them and most appropriate technique for measuring international demand for Korean tourism. The applied models include simple moving average, simple exponential smoothing, Brown’s quadratic exponential smoothing, Holt’s linear exponential smoothing, Winter’s linear and seasonal exponential smoothing, and additive or multiplicative decomposition method. These kinds of forecasting methods are available in some computer software programs such as TSP (Time Series Processor), RATS (Regression Analysis for Time Series), STATGRAPHIC, Forecast Pro etc. I found that there is no single model which is the most accurate and suitable for measuring international demand for Korean tourism when specific requirements were given. Therefore the research on accuracy of forecasting method should be carried out empirically.

* What was the requirements of KNTC?

- Frankly speaking, they don’t have specific requirements for forecast. As far as I am concerned, KNTC do not seem to understand the need for forecast. What they really want is setting a proper goal which is achievable so that they can be approved by the Korean government as a national tourist
organisation. This goal oriented-mind could give us serious disadvantages in terms of tourist receipts.

* What kind of dependent variable and independent variables are used for forecasting?

- The number of tourists was utilised as a dependent and independent variables for time series models, and those figures could be found in Korea Statistical Monthly Report published by Korea National Tourist Corporation. The monthly data were then manipulated into quarterly based data, and this was easily achieved by using spreadsheet software.

* What are the source of data and type of data (monthly, quarterly or early base) employed for their quantitative forecasting method?

- In fact, those statistical data appeared in Korea Statistical Monthly (or Annual) Report are normally based on the data compiled by Immigration Office.

* What do you think are the strengths and weaknesses of their method?

- As you might know, the strengths of time series models is easy to use and inexpensive to perform. The weakest point of time series models could be the fact that there is no reasonable explanation for the forecast results.
1.3. Interview with Dr. Choi in KOTI (Korea Transportation Institute)

Date: 13 December 1995

* Have you used forecasting method?

- I have used some univariate time series models for the report on "Supply and Demand Forecasting and Development Policy for Tourism Human Resources" in 1994. The short-term (1996), mid-term (2001), and long-term (2006) projections were made on yearly base using some past statistical data. The brief information of data is shown one of tables in the report.

<table>
<thead>
<tr>
<th>Data relevant to tourism human resource employment</th>
<th>Data</th>
<th>Range of historical data</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>The employment of qualified (or licensed) human resources by type of business, by region</td>
<td>Oct. 1989</td>
<td>MOT</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Oct. 1990</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Oct. 1991</td>
<td></td>
<td></td>
</tr>
<tr>
<td>The state of qualified human resources related to tourism by region</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Dec. 1989</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Dec. 1990</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Dec. 1991</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Dec. 1992</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Data associated with qualification of tourism human resources</th>
<th>General Manager</th>
<th>1986-1993</th>
<th>KNTC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manager in first class</td>
<td>1970-1993</td>
<td>KNTC</td>
<td></td>
</tr>
<tr>
<td>Manager in second class</td>
<td>1970-1993</td>
<td>KNTC</td>
<td></td>
</tr>
<tr>
<td>Hoteliers in bottom line</td>
<td>1965-1993</td>
<td>KTA</td>
<td></td>
</tr>
<tr>
<td>International tourist guide</td>
<td>1962-1993</td>
<td>KNTC</td>
<td></td>
</tr>
<tr>
<td>Domestic tourist guide</td>
<td>1976-1993</td>
<td>KTA</td>
<td></td>
</tr>
</tbody>
</table>


MOT = Ministry of Transportation, KNTC = Korea National Tourism Corporation, KTA = Korea Tourist Association
* What kind of time series models have you used?

- Simple trend projection, Brown's exponential smoothing and Holt's linear exponential smoothing were employed for forecasting. Although ARIMA (Autoregressive Integrated Moving Average) showed a bit higher accuracy it was excluded from the research. The forecast results obtained from ARIMA model was overfitting because the exceptionally high observations ranging from 1987 to 1989 due to the 1988 Seoul Olympic Games.

* What was the criteria of measuring accuracy?

- MSE (Mean Squared Error), MAPE (Mean Absolute Percentage Error), and Theil's U (the inequality coefficient) was the yardstick for choosing best fit results.

* What does the KNTC actually want to forecast?

- KNTC does not have specific requirements. In general, we formulate the problems on tourism demand and supply, and set the requirements to be predicted.

* The limitations or restrictions of performing forecast
  (e.g. No experts in forecasting area, lack of statistical data, lack of finance etc.)

Most of the statistical data on human resources or employment status in tourism industry in Korea are suspected in terms of reliability since the data on employee whose license has been already expired were included and those data were not properly updated. Therefore, the data used for the analysis were incomplete and inconsistent. In addition, some data were missing because they were not properly kept.
1.4. Forecasting Methods of KNTO (Korean National Tourism Organisation)

1.4.1. Mid- & Long-term Forecast

KNTC forecast the level of international demand for Korean tourism for mid- and long-term planning purposes by combined use of linear and non-linear regression models based on the preliminary assumptions below (Kim, 1991).

Assumptions made by KNTC

1. International economic growth would be stable by 1990 expecting 2.8% of annual growth. For Asia and Pacific area, annual average growth is expected to be 4%.

2. There would be no economic recession and no Oil shock until the end of 1980's.

3. Political relationships between Korea and Japan would change positively. To a great extent, Political stabilisation of Korea was expected around 1988 Seoul Olympic Games.

4. The extension of airlines between long-haul destinations such as European countries would increase the number of tourists visiting long-range destinations.

5. W.T.O. extrapolated 5% annual growth of international tourists in the later 1980's.

6. In particular, countries within Asia and Pacific region, as tourism destinations, would show 7% annual growth of the number of international inbound tourists in the 1980's.
7. The supply side of tourism industries within Korea has been improved greatly. Therefore, it would contribute to the increased number of international tourists.

Figure A1.1 Tourist Arrivals in Korea (1979-1983)


The fundamental form of linear regression equation is "\( Y = a + bX \)". In order to get the value of "\( a \)" and "\( b \)". some formula is required. Those formulae are as follows:

\[
\begin{align*}
\sum Y &= na + b\sum t \quad (1) \\
\sum tY &= a\sum t + b\sum t^2 \\
\end{align*}
\]

\[
b = \frac{-a\sum t + \sum tY}{\sum t^2} \quad (2)
\]

where
\( Y \) = the number of international tourists
\( n \) = the number of actual data
\( a \) = the \( Y \) intercept
\( b \) = the slope
\( t = X - \bar{X} \), Deviation
In order to facilitate the calculation of equation (1) and (2), the specific values of variables can be illustrated on the Table 1.

Table A1.2 Variables and their values of linear regression model (Least Square Method)

<table>
<thead>
<tr>
<th>Year</th>
<th>t</th>
<th>t²</th>
<th>Y (No. of Tourists)</th>
<th>tY</th>
</tr>
</thead>
<tbody>
<tr>
<td>1979</td>
<td>-5</td>
<td>25</td>
<td>1,126</td>
<td>-5,630</td>
</tr>
<tr>
<td>1980</td>
<td>-3</td>
<td>9</td>
<td>976</td>
<td>-2,928</td>
</tr>
<tr>
<td>1981</td>
<td>-1</td>
<td>1</td>
<td>1,093</td>
<td>-1,093</td>
</tr>
<tr>
<td>1982</td>
<td>1</td>
<td>1</td>
<td>1,145</td>
<td>1,145</td>
</tr>
<tr>
<td>1983</td>
<td>3</td>
<td>9</td>
<td>1,194</td>
<td>3,582</td>
</tr>
<tr>
<td>1984</td>
<td>5</td>
<td>25</td>
<td>1,297</td>
<td>6,485</td>
</tr>
</tbody>
</table>

\[ \Sigma t = 0 \quad \Sigma t^2 = 70 \quad \Sigma Y = 6,831 \quad \Sigma tY = 1,561 \]


The value "a" can be obtained from the equation (1), and the value "b" can be attained from the equation (2) using the value "a". These processes of calculation is as follows:

From equation (1)

\[ 6831 = 6a + b \times 0 \quad \Rightarrow \quad a = \frac{6831}{6} = 1138.5 \]

From equation (2)

\[ b = \frac{-1138.5 \times 0 + 1561}{70} = 22.3 \]

\[ \therefore Y = 1138.5 + 22.3X \]

Forecast values from 1985 to 1989 can be produced by applying the linear regression equation above, and this is shown in Table A1.3.
Table A1.3 Forecast values of linear regression model (1985-1989)

(Unit(Y): Thousands of people)

<table>
<thead>
<tr>
<th>Year(X)</th>
<th>t</th>
<th>trend values(Y)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1985</td>
<td>7</td>
<td>1,295</td>
</tr>
<tr>
<td>1986</td>
<td>9</td>
<td>1,339</td>
</tr>
<tr>
<td>1987</td>
<td>11</td>
<td>1,384</td>
</tr>
<tr>
<td>1988</td>
<td>13</td>
<td>1,428</td>
</tr>
<tr>
<td>1989</td>
<td>15</td>
<td>1,473</td>
</tr>
</tbody>
</table>


Then, the maximum values need to be yielded by using non-linear regression equation. Some formulae can be established as follows:

\[ Y = a + bX + cX^2 \]
\[ \Sigma Y = na + b\Sigma t + c\Sigma t^2 \] (1)
\[ \Sigma tY = a\Sigma t + b\Sigma t^2 + c\Sigma t^3 \] (2)
\[ \Sigma t^2Y = a\Sigma t^2 + b\Sigma t^3 + c\Sigma t^4 \] (3)

The values for each variable are tabulated in Table A1.4 in order to produce the values of a, b and c.

Table A1.4 Variables and their values of non-linear regression model.

(Unit(Y): Thousands of people)

<table>
<thead>
<tr>
<th>Year</th>
<th>t</th>
<th>Y</th>
<th>tY</th>
<th>t²</th>
<th>t²Y</th>
<th>t³</th>
<th>t⁴</th>
</tr>
</thead>
<tbody>
<tr>
<td>1979</td>
<td>-5</td>
<td>1,126</td>
<td>-5,630</td>
<td>25</td>
<td>28,150</td>
<td>-125</td>
<td>625</td>
</tr>
<tr>
<td>1980</td>
<td>-3</td>
<td>976</td>
<td>-2,928</td>
<td>9</td>
<td>8,784</td>
<td>-27</td>
<td>81</td>
</tr>
<tr>
<td>1981</td>
<td>-1</td>
<td>1,093</td>
<td>-1,093</td>
<td>1</td>
<td>1,093</td>
<td>-1</td>
<td>1</td>
</tr>
<tr>
<td>1982</td>
<td>1</td>
<td>1,145</td>
<td>1,145</td>
<td>1</td>
<td>1,145</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>1983</td>
<td>3</td>
<td>1,194</td>
<td>3,582</td>
<td>9</td>
<td>10,746</td>
<td>27</td>
<td>81</td>
</tr>
<tr>
<td>1984</td>
<td>5</td>
<td>1,297</td>
<td>6,485</td>
<td>25</td>
<td>32,425</td>
<td>125</td>
<td>625</td>
</tr>
<tr>
<td>Total</td>
<td>( \Sigma t = 0 )</td>
<td>( \Sigma Y = 6,831 )</td>
<td>( \Sigma tY = 1,561 )</td>
<td>( \Sigma t² = 70 )</td>
<td>( \Sigma t²Y = 82,343 )</td>
<td>( \Sigma t³ = 0 )</td>
<td>( \Sigma t⁴ = 1,414 )</td>
</tr>
</tbody>
</table>

Although mean values of minimum and maximum values can be calculated in order to fit the trend, it is likely to enhance the accuracy of the forecast if some international events are considered. An assumed value, or effective value, can be given to the specific event. For example, '86 Asian Games and '88 Seoul Olympic Games are more likely to attract international tourists. Therefore, an effective value of the event needs be added to the forecasted value. This is shown on the Table A1.6.

Table A1.6 Final forecast value of KNTC (1985-1989)

<table>
<thead>
<tr>
<th>Year</th>
<th>Minimum Value</th>
<th>Maximum Value</th>
<th>Mean Value</th>
<th>Effective Value</th>
<th>Adjusted Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1985</td>
<td>1,295</td>
<td>1,459</td>
<td>1,377</td>
<td></td>
<td>1,380</td>
</tr>
<tr>
<td>1986</td>
<td>1,339</td>
<td>1,644</td>
<td>1,492</td>
<td>50</td>
<td>1,540</td>
</tr>
<tr>
<td>1987</td>
<td>1,384</td>
<td>1,865</td>
<td>1,625</td>
<td></td>
<td>1,630</td>
</tr>
<tr>
<td>1988</td>
<td>1,428</td>
<td>2,121</td>
<td>1,775</td>
<td>100</td>
<td>1,880</td>
</tr>
<tr>
<td>1989</td>
<td>1,473</td>
<td>2,412</td>
<td>1,943</td>
<td></td>
<td>1,940</td>
</tr>
</tbody>
</table>


For the purpose of the forecast, KNTC suggested that 50,000 international tourists for 1986 Asian Games and 100,000 international tourists for 1988 Seoul Olympic Games were assumed to visit Korea. In reality, 1.66 million international tourists visited Korea for the Asian Games and
2.34 million came for the Olympic Games. As shown in Table A1.7, the forecast error in a particular year is almost double over the previous year.

Table A1.7 Accuracy of Forecasting performed by KNTC

(Unit: Thousands of people)

<table>
<thead>
<tr>
<th>Year</th>
<th>Minimum Value</th>
<th>Adjusted Value</th>
<th>Maximum Value</th>
<th>Actual Data</th>
<th>Forecast Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>1985</td>
<td>1,295</td>
<td>1,380</td>
<td>1,459</td>
<td>1,426</td>
<td>46</td>
</tr>
<tr>
<td>1986</td>
<td>1,339</td>
<td>1,540</td>
<td>1,644</td>
<td>1,660</td>
<td>120</td>
</tr>
<tr>
<td>1987</td>
<td>1,384</td>
<td>1,630</td>
<td>1,865</td>
<td>1,875</td>
<td>245</td>
</tr>
<tr>
<td>1988</td>
<td>1,428</td>
<td>1,880</td>
<td>2,121</td>
<td>2,340</td>
<td>460</td>
</tr>
<tr>
<td>1989</td>
<td>1,473</td>
<td>1,940</td>
<td>2,412</td>
<td>2,720</td>
<td>780</td>
</tr>
<tr>
<td>Mean Value</td>
<td>1,384</td>
<td>1,674</td>
<td>1,900</td>
<td>2,004</td>
<td>330</td>
</tr>
</tbody>
</table>

Source: KNTC (1985),
*Note: Y= Number of international Tourists*
1.4.2. Short-term (1 year ahead) Forecast

1. Method
- Forecast the total number of international tourists every year
- Simple linear regression model
  \[ Y = a + bX \]
  a & b are obtained by ordinary least square method
- Yearly base
- From the last 7 years

2. Requirement
- Forecast year 2002 for Asian Games in Pusan

*Note
- If a historical data is out of trend because of remarkable event, then it needs to be omitted from calculation.
- Panels of expert (normally composed of lecturers or professors in university) assume and evaluate the future marketing activity of KNTC in order to quantify these efforts and add to the forecast results. The quantified value of marketing efforts made by KNTC is called 'effective value'.

*Note for longer-term forecast by KNTC

If there is a major change which might affect their plan, they forecast again for mid-term and long-term planning. For example, over 90% of the KNTC's financial resource is provided from tax free shop. It is very difficult to be supported or encouraged by government in terms of finance. If the plan that they are supposed to take over the tax free shop in newly built airport is frustrated by the government, it has to reschedule their plan in order to keep their balance of payments. This will result in restriction of its
marketing activity. In other words, the forecast results need to be adjusted because the effective value has been affected by the change.
1.4.3. Constraints of Performing Forecast

1. Forecasting experts are absent in KNTO. KNTO normally request the forecast to the panel of experts who are working in the academic field paying certain remuneration. However, since the payment is not sufficient for carrying out big project and what KNTO want is only the results of forecast, the designated forecasters tend to produce the forecast results year in and year out without substantial improvement.

2. It seems that various forecasting methods are not examined comparatively or empirically. This is critically important in terms of accuracy, since the applying various forecasting methods will confirm their performance. It seems that the lack of using various methods mainly results from the lack of knowledge about forecasting methods. To some extent, some forecasting methods are apt to be used without consideration of their characteristics. For example, KNTO do not seem to recognise that different forecasting techniques should be applied for specific forecast depending on the time horizon. Obviously, the abuse of forecasting methods might lead to the huge loss of money and other resources.

3. Few series of actual data was used for linear regression model, which might result in the difficulty of understanding the pattern of it. If they use monthly base data available, then the actual data might show various patterns such as seasonality, cycle etc. It is regarded that the historical data has not enough consistency among themselves, since forecasters believe that Korean tourism is still infant industry.
2.1. The Foreign Visitor Survey

I. Objective of Survey

KNTPC has been undertaking field survey almost every year since 1981 except 1986 and 1992. The purpose of survey lies in examining the propensity of international tourists, the degree of their satisfaction, their expenditure etc. in order to improve service quality and provide useful information to tourism policy makers.

II. Contents

1. General Information on Overseas tourists in Korea

* Number of Visits
* Purpose of Visit
* Type of Travel (Individual, Group, etc.)
* Determinants or motivation of travel
* Travel Route
* Nights of Stay
* Type of Accommodation
* Tourist Destination visited

2. Expenditure of International Tourists by Categories
   (Fill out each category)

* Accommodation
* Food & Beverage
* Transportation
* Entertainment
* Shopping
* etc.
3. Individual Estimation on Travel Experience (Scaling Method)

* The degree of Satisfaction
* The level of living cost in Korea
* Positive Impressions
* Complaints
* Intention of revisiting Korea
* Comments for the development of Korean tourism

III. Structure of Survey

1. The Object of Survey
   Overseas tourists staying Korea less than 60 days.

2. Sample Size
   Roughly 2,000

3. Survey Point
   Departure Room of International Airport(95%):
   Kimpo(80%), Kimhae(10%), Cheju(5%)
   Seaport(5%): Pusan, Incheon

4. Period of Field Survey
   Consecutive 5 days during the October
   (Monday to Saturday)

5. Survey Method
   - Selection of qualified person who is living in Seoul, Pusan, or Kyungju and is capable of speaking one of foreign languages among English, Japanese, Russian, or Chinese.
   - Orientation and education on survey questionnaire to selected interviewers.
- Supervision of interviewers

- Survey questionnaire was designed into 5 different languages: Korean, English, Japanese, Russian, Chinese.

Table A2.1 Tourist Average Expenditure per Person by Year and Major Country.

<table>
<thead>
<tr>
<th>Year</th>
<th>Germany</th>
<th>Japan</th>
<th>UK</th>
<th>USA</th>
</tr>
</thead>
<tbody>
<tr>
<td>1981</td>
<td>475.0</td>
<td>847.0</td>
<td>623.7</td>
<td>839.5</td>
</tr>
<tr>
<td>1982</td>
<td>1,145.2</td>
<td>906.6</td>
<td>899.2</td>
<td>1,046.5</td>
</tr>
<tr>
<td>1983</td>
<td>761.0</td>
<td>788.0</td>
<td>995.0</td>
<td>1,726.0</td>
</tr>
<tr>
<td>1984</td>
<td>724.0</td>
<td>717.0</td>
<td>603.0</td>
<td>791.0</td>
</tr>
<tr>
<td>1985</td>
<td>565.0</td>
<td>765.0</td>
<td>531.0</td>
<td>989.0</td>
</tr>
<tr>
<td>1986</td>
<td>N.A.</td>
<td>N.A.</td>
<td>N.A.</td>
<td>N.A.</td>
</tr>
<tr>
<td>1987</td>
<td>695.0</td>
<td>1,067.0</td>
<td>847.0</td>
<td>927.0</td>
</tr>
<tr>
<td>1988</td>
<td>1,018.0</td>
<td>1,423.0</td>
<td>1,067.0</td>
<td>1,280.0</td>
</tr>
<tr>
<td>1989</td>
<td>1,137.0</td>
<td>1,361.0</td>
<td>1,098.0</td>
<td>1,319.0</td>
</tr>
<tr>
<td>1990</td>
<td>796.0</td>
<td>1,461.0</td>
<td>1,089.0</td>
<td>998.0</td>
</tr>
<tr>
<td>1991</td>
<td>1,126.0</td>
<td>1,273.0</td>
<td>1,017.0</td>
<td>1,275.0</td>
</tr>
<tr>
<td>1992</td>
<td>N.A.</td>
<td>N.A.</td>
<td>N.A.</td>
<td>N.A.</td>
</tr>
<tr>
<td>1993</td>
<td>1,359.0</td>
<td>1,346.0</td>
<td>1,364.0</td>
<td>1,310.0</td>
</tr>
<tr>
<td>1994</td>
<td>1,585.68</td>
<td>1,398.18</td>
<td>1,074.0</td>
<td>1,482.3</td>
</tr>
<tr>
<td>1995</td>
<td>1,386.8</td>
<td>2,107.0</td>
<td>1,386.1</td>
<td>1,585.4</td>
</tr>
</tbody>
</table>

(Unit: US$)

Table A3.1 Average Rankings of Attributes of Forecasting Methods

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Tourist Office / Government Department</th>
<th>Academic Institution</th>
<th>Consultancy</th>
<th>Other Practitioners</th>
<th>Overall</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Users</td>
<td>Non-Users</td>
<td>Total</td>
<td>Users</td>
<td>Non-Users</td>
</tr>
<tr>
<td><strong>Short term</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Accuracy</td>
<td>2.5</td>
<td>1.0</td>
<td>2.3</td>
<td>1.7</td>
<td>1.6</td>
</tr>
<tr>
<td>Ease of Use</td>
<td>2.5</td>
<td>1.0</td>
<td>2.3</td>
<td>2.3</td>
<td>2.4</td>
</tr>
<tr>
<td>Cost</td>
<td>3.5</td>
<td>4.0</td>
<td>3.6</td>
<td>4.0</td>
<td>3.0</td>
</tr>
<tr>
<td>Speed</td>
<td>1.8</td>
<td>1.0</td>
<td>1.4</td>
<td>2.0</td>
<td>1.8</td>
</tr>
<tr>
<td><strong>Medium term</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Accuracy</td>
<td>1.7</td>
<td>-</td>
<td>1.7</td>
<td>1.4</td>
<td>1.3</td>
</tr>
<tr>
<td>Ease of Use</td>
<td>2.7</td>
<td>-</td>
<td>2.7</td>
<td>2.2</td>
<td>2.3</td>
</tr>
<tr>
<td>Cost</td>
<td>3.0</td>
<td>-</td>
<td>3.0</td>
<td>3.0</td>
<td>2.7</td>
</tr>
<tr>
<td>Speed</td>
<td>2.4</td>
<td>-</td>
<td>2.4</td>
<td>3.2</td>
<td>2.7</td>
</tr>
<tr>
<td><strong>Long term</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Accuracy</td>
<td>1.4</td>
<td>-</td>
<td>1.4</td>
<td>1.8</td>
<td>1.7</td>
</tr>
<tr>
<td>Ease of Use</td>
<td>2.6</td>
<td>-</td>
<td>2.6</td>
<td>2.0</td>
<td>1.3</td>
</tr>
<tr>
<td>Cost</td>
<td>2.7</td>
<td>-</td>
<td>2.7</td>
<td>2.5</td>
<td>2.7</td>
</tr>
<tr>
<td>Speed</td>
<td>3.6</td>
<td>-</td>
<td>3.6</td>
<td>3.4</td>
<td>3.7</td>
</tr>
</tbody>
</table>


Note: Rank of attributes are measured by scale of 1-4 with the most important attribute being ranked 1, and the least important ranked 4.
3.1. Calculation of Travel Propensity and Travel Frequency

Out of a population of 10 million inhabitants:

3.0 million inhabitants take one trip of one night or more  
  i.e. $3 \times 1 = 3.0$ m trips

1.5 million inhabitants take two trips of one night or more  
  i.e. $1.5 \times 2 = 3.0$ m trips

0.4 million inhabitants take three trips of one night or more  
  i.e. $0.4 \times 3 = 1.2$ m trips

0.2 million inhabitants take four trips of one night or more  
  i.e. $0.2 \times 4 = 0.8$ m trips

5.1 million inhabitants take at least one trip  
  8m trips

Therefore:

Net travel propensity =

$$\frac{\text{Number of population taking at least one trip}}{\text{Total population}} \times 100 = \frac{5.1}{10} \times 100 = 51\%$$

Gross Travel Propensity =

$$\frac{\text{Number of total trips}}{\text{Total population}} \times 100 = \frac{8}{10} \times 100 = 80\%$$

Travel frequency =

$$\frac{\text{Gross travel propensity}}{\text{Net travel propensity}} = \frac{80\%}{51\%} = 1.57$$

Source: Boniface and Cooper (1987), adapted from Burkart and Medlik (1975), pp. 53-60.
4.1. Transfer Function

Transfer function is often called multivariate ARIMA. The key to understanding transfer function methodology is to have an intuitive feel for what a transfer function is. Consider the following example. On each of 15 successive days, you deliver to the post office a bundle of letters to be mailed. The post office system delivers these letters over the days ahead. Let the number of letters mailed on day \( t \) be \( X_t \) and the number of letters delivered on day \( t \) be \( Y_t \). Table A4.1 gives illustrative data. In this case simple regression of \( Y_t \) on \( X_t \) would not help.

The reason for this situation is that the \( X_t \) values are dynamically distributed over future time periods, according to what is known as a transfer function. Thus, the 50 letters mailed on day 1 were delivered as follows:

- 0 (0%) were delivered on the same day (day 1)
- 5 (10%) were delivered one day later (day 2)
- 25 (50%) were delivered two days later (day 3)
- 10 (20%) were delivered three days later (day 4)
- 5 (10%) were delivered four days later (day 5)
- 5 (10%) were delivered five days later (day 6)

These deliveries are indicated in column 1 of Table A4.1. Similarly, if the transfer function remained the same, the other mailings, \( X_t \), would be distributed according to the same percentages (called \( v_0, v_1, v_2, v_3, v_4, \) and \( v_5 \) in Table A4.1), and the details in each of the column in Table A4.1 were so obtained. The values of \( v_0 \) through \( v_5 \) are called the impulse response weights (or transfer function weights). The transfer function itself can be written as follows:
\[ Y_t = v_0 X_t + v_1 X_{t-1} + v_2 X_{t-2} + \ldots + v_5 X_{t-5} \]
\[ = (v_0 + v_1 B + v_2 B^2 + \ldots + v_5 B^5) X_t \]  
\[ = v(B)X_t \]  \hspace{1cm} (A4-1)

Although equation (A4-1) can be written in various ways, the last in equation (A4-1) is the most shorthand notation, where \( v(B) \) is the transfer function.

Table A4.1 A Simple Illustration of a Transfer Function

<table>
<thead>
<tr>
<th>Letters Mailed (Column i shows how letters mailed on day i were delivered over time)</th>
<th>Letters Delivered</th>
</tr>
</thead>
<tbody>
<tr>
<td>Day</td>
<td>( X_t )</td>
</tr>
<tr>
<td>-----</td>
<td>--------</td>
</tr>
<tr>
<td>1</td>
<td>50</td>
</tr>
<tr>
<td>2</td>
<td>30</td>
</tr>
<tr>
<td>3</td>
<td>90</td>
</tr>
<tr>
<td>4</td>
<td>60</td>
</tr>
<tr>
<td>5</td>
<td>50</td>
</tr>
<tr>
<td>6</td>
<td>70</td>
</tr>
<tr>
<td>7</td>
<td>30</td>
</tr>
<tr>
<td>8</td>
<td>40</td>
</tr>
<tr>
<td>9</td>
<td>80</td>
</tr>
<tr>
<td>10</td>
<td>70</td>
</tr>
<tr>
<td>11</td>
<td>80</td>
</tr>
<tr>
<td>12</td>
<td>10</td>
</tr>
<tr>
<td>13</td>
<td>30</td>
</tr>
<tr>
<td>14</td>
<td>30</td>
</tr>
<tr>
<td>15</td>
<td>70</td>
</tr>
<tr>
<td>Author</td>
<td>Applied Field</td>
</tr>
<tr>
<td>--------</td>
<td>---------------</td>
</tr>
<tr>
<td>Artus, J. R. (1970)</td>
<td>Travel</td>
</tr>
<tr>
<td>Blackwell, J. (1970)</td>
<td>Accommodation in Ireland</td>
</tr>
<tr>
<td>Barry, K. O. (1972)</td>
<td>British tourist expenditure in Ireland</td>
</tr>
<tr>
<td>Bond, M. E. (1971)</td>
<td>International tourism demand to Latin America</td>
</tr>
<tr>
<td>Ladman, J. R. (1972)</td>
<td>Disposable income</td>
</tr>
<tr>
<td>Bond, M. E. (1971)</td>
<td>Disposable income</td>
</tr>
<tr>
<td>Ladman, J. R. (1972)</td>
<td>Disposable income</td>
</tr>
<tr>
<td>Bond, M. E. (1971)</td>
<td>Disposable income</td>
</tr>
<tr>
<td>Ladman, J. R. (1972)</td>
<td>Disposable income</td>
</tr>
</tbody>
</table>

Note: The table summarizes the results of past research on quantitative forecasting approaches in tourism, with emphasis on the application of econometric methods and the analysis of tourism-related economic indicators.
<table>
<thead>
<tr>
<th>Reference</th>
<th>Subject</th>
<th>Methodology</th>
<th>Data Period</th>
<th>Dependent Variable</th>
<th>Econometric Model</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kwack, S. Y. (1972)</td>
<td>US travel expenditure spent abroad</td>
<td>No extrapolation Econometric analysis</td>
<td>Quarterly (30) 3rd quarter 1960 - 4th quarter 1967</td>
<td>Tourist expenditure</td>
<td>Real income, price of foreign goods and services, transportation cost</td>
<td>Adjusted R squared, standard error of estimate, Durbin-Watson statistic</td>
</tr>
<tr>
<td>Witt, S. F. (1980)</td>
<td>International tourism demand by UK and German residents</td>
<td>No extrapolation Econometric Analysis</td>
<td>Monthly data UK data: 1964-1971 German data: 1969-1971</td>
<td>No. of Trips divided by population</td>
<td>Real personal disposable income, transportation cost, cost of tourism, dummy variables</td>
<td>R squared, Adjusted R squared, F statistics</td>
</tr>
<tr>
<td>Fujii, E. T. Mak, J. (1980)</td>
<td>US demand to Hawaii</td>
<td>Short-term, mid-term, 1974 to 1978 were projected Ridge Regression Yearly (13) 1961-73</td>
<td>No. of US tourist arrivals</td>
<td>Real airfare, disposable income</td>
<td>RMSE(Root Mean Square Error), Theil's U statistic</td>
<td>When multicollinearity exists, ridge regression model can produce lower forecast error than OLS(ordinary Least Square) models.</td>
</tr>
<tr>
<td>Loeb, P. D. (1982)</td>
<td>International travel demand to US</td>
<td>No extrapolation Econometric analysis</td>
<td>Yearly (19) 1961-79 or (12) 1968-79</td>
<td>Tourist expenditure</td>
<td>Real income, relative exchange rate, relative prices, dummy variable</td>
<td>R squared, F statistic, Durbin-Watson statistic</td>
</tr>
<tr>
<td>Author(s)</td>
<td>Title</td>
<td>Methodology</td>
<td>Data Source</td>
<td>Dependent Variable</td>
<td>Model</td>
<td>Notes</td>
</tr>
<tr>
<td>------------------</td>
<td>----------------------------------------------------------------------</td>
<td>-------------------------------</td>
<td>----------------------------------</td>
<td>--------------------------------------------------------------------------------------</td>
<td>-------</td>
<td>----------------------------------------------------------------------</td>
</tr>
<tr>
<td>Johnson, R. Suits, D. (1983)</td>
<td>Demand for visits to U.S. national parks</td>
<td>No extrapolation</td>
<td>Econometric analysis</td>
<td>Monthly (198) Jan. 1965 - Jun. 1981</td>
<td>No. of visits</td>
<td>Real disposable income, travel cost (retail gasoline price &amp; CPI)</td>
</tr>
<tr>
<td>Choy, D. (1984)</td>
<td>International tourism demand to Asian and Pacific region</td>
<td>Short-term</td>
<td>Naive, Simple linear regression</td>
<td>Yearly (10) 1973-82</td>
<td>No. of tourist arrivals</td>
<td>N.A.</td>
</tr>
<tr>
<td>Uysal, M. Crompton, J. L. (1984)</td>
<td>International tourism demand to Turkey</td>
<td>No extrapolation</td>
<td>Econometric analysis</td>
<td>Yearly (17) 1964-80</td>
<td>No. of tourist arrivals, tourist expenditure</td>
<td>Income, relative price, exchange rate, promotional expenditure</td>
</tr>
<tr>
<td>Wang, T. Ge, L. (1985)</td>
<td>Domestic tourism demand to city of Hangzhou in China</td>
<td>Short-term (one and two year ahead), long-term (7 years ahead)</td>
<td>Simple linear regression</td>
<td>Yearly (6) 1978-83</td>
<td>No. of tourist arrivals</td>
<td>Per capita national income</td>
</tr>
<tr>
<td>Source</td>
<td>Methodology</td>
<td>Data</td>
<td>Measures</td>
<td>Adjusted R squared</td>
<td>Notes</td>
<td></td>
</tr>
<tr>
<td>-------------------------------</td>
<td>------------------------------------------------------------------------------</td>
<td>---------------------------</td>
<td>--------------------------------------------------------------------------</td>
<td>--------------------</td>
<td>-----------------------------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>Summary, R. (1987)</td>
<td>International tourism demand to Kenya: No extrapolation; Multivariable regression</td>
<td>Yearly (15) 1968-82</td>
<td>Per capita real disposable income, air fare, amount of Kenyan shillings per unit of the origin country's currency, relative price</td>
<td></td>
<td>Some multicollinearity problems make the values of the resulting regression coefficients questionable. Therefore, the author suggested some type of qualitative analysis as an alternative to the multivariable regression.</td>
<td></td>
</tr>
<tr>
<td>Martin, C. A Witt, S. F. (1989)</td>
<td>International tourism flows from four major tourist-generating countries to various European destinations: Short-term forecast ex post forecast 9one or two years ahead</td>
<td>Naive I, Naive II, Exponential Smoothing, Gompertz, Trend curve analysis, Autoregression, Econometric Analysis</td>
<td>No. of tourist visits divided by population</td>
<td></td>
<td>In general, the Naive I and autoregression models appear to generate relatively accurate forecasts, whereas the Naive II, Gompertz and Trend curve analysis produce relatively inaccurate forecasts.</td>
<td></td>
</tr>
<tr>
<td>Witt, C. A. Witt, S. F. (1990)</td>
<td>International tourism flows from four major tourist-generating countries to six destinations: Short-term 1981 &amp; 1982</td>
<td>Econometric Analysis (Combination of OLS and Cochrane-Orcutt estimation)</td>
<td>personal disposable income, cost of living, rate of exchange, cost of travel, dummy variables</td>
<td></td>
<td>Conditions such as high goodness of fit and a large proportion of statistically significant coefficients do not appear to be sufficient to ensure a high level of forecast accuracy.</td>
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<td>Andrew W. P. Cranage, D. Lee, C. K. (1991)</td>
<td>Major centre-city Hotel: Short-term (six months ahead)</td>
<td>Box-Jenkins, Exponential Smoothing</td>
<td>Monthly (69) Jan 1984 - Sep 1989 Hotel Occupancy Rate</td>
<td>N.A.</td>
<td>Sum of Squared Residuals, Mean Sum of Squared Residuals</td>
<td>Box-Jenkins outperform exponential smoothing model</td>
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5.1. The Data used of Econometric Analysis

Table A5.1 Number of Arrivals by year and selected country (1962-1994)

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<th>Total</th>
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### Table A5.2 The stationary dependent variable (1962-1994)

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Table A5.3 NDI (National Disposable Income) 1985 Prices

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Table 5.4 GDP (Gross Domestic Product) 1990 Prices

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Note: Real exchange rate of country $i$ = Nominal exchange rate of country $i$ * (CPI of country $i$ / US CPI)
Table A5.8 Return Air Fare from the City of Major Tourist Generating Countries to Seoul

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Note: The return air fare data are adjusted by real exchange rate.
Table A5.9 Trade Volume

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Note: The trade volume here indicates the sum of both import amount from origin country and export amount to origin country.
### Table A5.10 The Adjusted Value of Trade Volume

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(Unit: Millions of US$)

Note: WPI* = Wholesale Price Index (1990=100).
Table A6.1 Comparison of Actual and Forecast Value by ECM
(10 Year Horizon, 1985-1994)

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</tr>
<tr>
<td>1987</td>
<td>0.099</td>
<td>N.A.</td>
<td>0.122</td>
<td>0.614</td>
</tr>
<tr>
<td>1988</td>
<td>0.279</td>
<td>N.A.</td>
<td>0.230</td>
<td>0.405</td>
</tr>
<tr>
<td>1989</td>
<td>0.025</td>
<td>0.109</td>
<td>0.205</td>
<td>0.060</td>
</tr>
<tr>
<td>1990</td>
<td>0.002</td>
<td>-0.210</td>
<td>0.057</td>
<td>0.056</td>
</tr>
<tr>
<td>1991</td>
<td>0.121</td>
<td>-0.258</td>
<td>-0.004</td>
<td>0.069</td>
</tr>
<tr>
<td>1992</td>
<td>-0.056</td>
<td>-0.074</td>
<td>-0.040</td>
<td>-0.193</td>
</tr>
<tr>
<td>1993</td>
<td>0.040</td>
<td>0.115</td>
<td>0.065</td>
<td>0.106</td>
</tr>
<tr>
<td>1994</td>
<td>0.175</td>
<td>0.228</td>
<td>0.097</td>
<td>0.280</td>
</tr>
</tbody>
</table>

Note: A = Actual Value, F = Forecast Value, N. A. = Not Available

Forecast for German tourism demand from 1985 to 1988 were unable to be generated due to the singularity problem.

Figure A6.1 Forecast with German ECM (6 Year Horizon)
Figure A6.2 Forecast with Japan ECM (10 Year Horizon)

Figure A6.3 Forecast with UK ECM (10 Year Horizon)
Figure A6.4 Forecast with US ECM (10 Year Horizon)
**REFERENCES AND BIBLIOGRAPHY**

**TEXTS**


**Archer, B. H. & Fletcher, J.** (1990), "Tourism: its Economic Importance" in Horwath Book of Tourism edited by Miles Quest, Horwath & Horwath, Chapter 2, pp. 10-25.

**Armstrong, J. S.** (1978), *Long-range Forecasting: From crystal ball to computer*, John Wiley & Sons.


Deaton, A. S. (1975), Models and Projections of Demand in Post-War Britain, Chapman and Hall.


REFERENCES AND BIBLIOGRAPHY


Firth, M. (1977), Forecasting Methods in Business and Management, Edward Arnold.


Martin, B. & Mason, S. (1992), British Tourism in the early 1990s, Insight, English Tourist Board.


Rumelhart, D. & McClelland, J. eds. (1986), Parallel Distributed Processing, MIT Press.


ARTICLES


Lim, E. S. (1990), A Study on the Demand Forecasting model of American, Japanese and Taiwanese Visitors to South Korea, Study on Tourism, Korea Academic Society of Tourism, pp. 141-156.


THESES

Kim, S. C. (1994), Forecasting Demand for Hotel Rooms in Seoul by The Analysis of Time Series Models, MSc, University of Surrey.

Kim, S. H. (1988), The Demand for International Travel and Tourism to South Korea: An Econometric Evaluation of Major Economic Factors, PhD, University of Santo Tomas.

Kim, S. M. (1989), A Comparative Study of Pulguk-Sa And Haein-Sa Temples As Tourist Destination in Korea, PhD, University of Surrey.

Lim, E. S. (1986), Estimates of demand function for Korea-bound Japanese and American tourists (Korean Version), PhD, Sejong University, Seoul.

Syriopoulos, T. C. (1990), Modelling Tourism Demand for Mediterranean Destinations, PhD, University of Kent at Canterbury.

Wanhill, S. R. C. (1978), An Econometric Model of Wales, PhD, University College of North Wales, Bangor.
STATISTICAL SOURCES


International Monetary Fund (1983-96), Direction of Trade Statistics Yearlybook.


JTB (Japan Travel Bureau), JTB Report 1995; All About Japanese Overseas Travelers, p.12.


OECD (1962-1994), Main Economic Indicators.


MANUALS
