# An econometric approach to tourism demand: Arrivals from UK and Australia to Turkey

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**Abstract**

The main purpose of this study is to establish an econometric model in order to explain the factors affecting tourism demand in Turkey for the arrivals from the United Kingdom (UK) and Australia. The study generates forecasts for tourist arrivals from these countries to Turkey for the year 2005. In the estimation period, general-to-specific modeling approach is used and trend and seasonally adjusted moving average forecasting is used to forecast the demand. The demand modeling and forecasting indicate that the cost of tourism in Turkey does not have a significant effect over the arrivals from UK and Australia; however, *word of the mouth* effect is an important factor for these arrivals.

*Keywords: Tourism demand, Turkish tourism, econometric models, tourism forecasting, UK, Australia, word of mouth effect, autoregressive distributed lag model (ARDL)*

## 1. Introduction

Being the cradle of civilizations and offering a lot of opportunities for winter and summer tourism, Turkey is visited by millions of tourists each year. From all over the world, tourists come to visit this historical and amusing country.

According to "Distribution of Foreigners Arriving in Turkey "statistics published by Turkish Ministry of Tourism, international tourism arrivals in Turkey increased from 2,117,094 in 1984 to 17,517,610 in 2004. In addition to these figures, tourist receipts in 1984 recorded as US$840 million, has increased to US$15,888 million in 2004. Furthermore, in 2004, Germany was the biggest origin country of Turkish tourism by the rate of 22.74% of overall tourists. Russia, United Kingdom, Bulgaria, Netherlands and Iran are the following five countries by the rates of 9.16%, 7.92%, 7.48%, 6.80% and 3.59% respectively.

Although Turkey has tourism arrivals from almost every country, the study focuses on two origin countries UK and Australia. The reason for this choice is that the UK has been one of the biggest origin countries of Turkish tourism as mentioned above and Australia has a small portion in Turkish tourism. Thus, one origin country with high rates of tourists and another with low rates of tourists in Turkish tourism were chosen for a specific purpose. Income levels and preferences of these countries' citizens and geographical locations of the countries were also considered at the choice process.

In 2004, UK had a rate of 7.92% and Australia had a rate of 0.38% in total tourist arrivals according to the statistics.

By looking at the tourism statistics of Turkey, it can be thought that Turkey could have more tourist arrivals than these from past to the present. This idea can appear since there are not more alternative destinations around Turkey for tourists when her history, culture, natural affluence and variety of destinations are considered. According to De Stefano (2004), "a

WWF analysis points out that in 2005 Turkey will experience a massive surge of new tourism development and, by 2020, it will be a leading tourist destination in the Mediterranean together with Greece and Croatia".

Therefore, the purpose of this study is mainly to determine the factors affecting the demand for arrivals from UK and Australia and to generate the forecasts for the year 2005.
Section two presents a literature review; while section three explains the model and section four gives the analysis of data. Section five and six gives the estimation and forecast results respectively and section seven concludes.

## 2. Literature Review

In the tourism demand modeling studies, researchers have applied several approaches in the model selection and forecasting methods. Song and Witt (2000) used the general-to-specific approach in the estimation of Autoregressive Distributed Lag Model (ARDL). It is argued that since the causal (econometric) modeling contains the factors in tourism demand and forecasting for policy evaluation against the non-causal (mainly time series) modeling, ARDL is a preferable model (Song et al., 2003a). Particularly, studies that had been published from 1960s to early 1990s used traditional regression approach in tourism demand modeling. These were in the static form with very limited diagnostic statistics (Song and Turner).

Vector Autoregressive (VAR) models have been used heavily to forecast tourism demand by many researchers (see for example Song et al. (2003b), Witt et al. (2003, 2004) and Wong et al. (2005)). By specifying the ARDL, Error Correction Model (ECM) is also used for tourism demand and estimation of this model is discussed in Song and Witt (2000). As the last main model type, which was driven in the tourism demand modeling is the Almost Ideal Demand System (AIDS) model. For instance, Han et al. (2004) used AIDS model in the modeling of US tourism demand for European destinations.

If the studies for modeling the tourism demand in Turkey are considered, almost the same methods as above have been used in previous research. Among them Halicioglu (2004) examined the aggregate tourism demand for Turkey with ARDL model. In this study, annual data from 1960 to 2002 is examined and the results suggested that the most significant factor in determining the level of tourist arrivals into Turkey is real world income level, which was followed by the relative prices and transportation cost. Another important econometric study about the tourism demand in Turkey was made by Akis (1998) who approached the subject with a compact econometric model. As a result of this study, positive relationship between tourist arrivals and national income of tourist generating countries and a negative relationship between tourist arrivals and relative prices were observed.

Each of the models used in tourism demand and forecasting has different advantages. In this study we preferred to use ARDL for modeling the demand since it is the most preferable model type in tourism demand modeling and easy to follow the general-to-specific approach steps. Moreover, forecasts will be made by trend and seasonally adjusted moving average forecast method, although most of the studies about tourism forecasting have been using exponential smoothing and Box-Jenkins procedures (Song et al., 2003a).

## 3. The Model

ARDL contains the factors of tourism demand and policy evaluation simultaneously. Model components are in the form of power functions since the tourism demand can be better modeled by power functions and it is easy to apply OLS in the estimation process (Song et al., 2003a).

The model is in the form of

$$Q_{it} = A \; P_t^{\beta} Y_{it}^{\alpha} e_{it} \qquad (1)$$

where $Q_{it}$ is the tourism demand variable measured by tourism arrivals from country i to Turkey at time t ; $P_t$ is the price of tourism in Turkey at time t ; $Y_{it}$ is the income level of the origin country i at time t and $e_{it}$ is the residual term and it is used to capture the influence of all other factors that are not included in the demand model. Substitute price variable measuring the cost of tourism in the alternative destinations around Turkey was not included in the model since there are not too many alternative destinations which look like Turkey with their cultural and geographical features.

The income variable, $Y_{it}$, is measured by the index of GDP (2000=100). The own price variable, $P_t$, is calculated by the following formula;

$$P_{it} = \frac{(CPI_{Tur} / EX_{Tur})}{(CPI_i / EX_i)}$$

where $CPI_{Tur}$ and $CPI_i$ are the consumer price indices for Turkey and origin country i respectively; $EX_{Tur}$ and $EX_i$ are the exchange rate indices (2000=100) for Turkey and origin country i, respectively. The exchange rate is calculated as the annual average market rate of local currency against the US dollar. Although the own price measure contains two elements namely cost of travel and cost of living for tourists, in most of the studies cost of the travel component is excluded since it can cause multicollinearity problems and lack of data availability (Song and Witt, 2000).

During the model specification, when the logarithm of equation (1) is taken, the following equation is obtained:

$$\ln Q_{it} = \lambda + \beta \ln P_{it} + \alpha \ln Y_{it} + u_{it} \qquad (2)$$

where $\lambda = \ln A$, $u_{it} = \ln e_{it}$, and $\alpha$, $\beta$ are income and price elasticities, respectively.

With the help of equation (2), we generate our final ARDL model by adding lags for each variable. This specification is made to convert the static model (2) to a dynamic one (see Hendry (1995)). By a dynamic model, in fact the ARDL, it is assumed to catch the previous year's effects on current year's tourism arrivals and to measure the "word of mouth effect" by the lag of dependent variable, $Q_{it}$. Word of mouth effect indicates how the early visits to one

country influence the next ones and removes uncertainty about a destination for the arrivals who wants to prefer that destination (Song et al., 2003a).

Therefore, our final model, ARDL, becomes

$$\ln Q_{it} = \alpha_0 + \alpha_1 \ln Q_{it-1} + \alpha_2 \ln P_{it} + \alpha_3 \ln P_{it-1} + \alpha_4 \ln Y_{it} + \alpha_5 \ln Y_{it-1} + \varepsilon_{it} \qquad (3)$$

It is possible to get demand elasticities from equation (3). Since the equation (3) represents a long run demand function, if the long run equilibrium is assumed, the following equation is obtained:

$$\ln Q_{it} = \frac{\alpha_0}{(1-\alpha_1)} + \frac{(\alpha_2+\alpha_3)}{(1-\alpha_1)} \ln P_{it} + \frac{(\alpha_4+\alpha_5)}{(1-\alpha_1)} \ln Y_{it} \qquad (4)$$

where the coefficients of income and price variables in equation (4) are demand elasticities. Demand elasticities can be used to make interpretation about tourism policy. Furthermore, they are used to eliminate the incorrectly signed variables due to economy theory in estimation process.

## 4. Data Analysis

### 4.1. Data

Data and sources used are:

Tourist arrivals from UK and Australia: Tourist arrivals for the period 1980-2004 for UK and for the period 1984-2004 for Australia are obtained from the *Turkish Republic Ministry of Tourism Statistics*[1] (for Australia, data starts from 1984 due to unavailability)

Income for UK and Australia: GDP indices (2000=100) of each country is used and obtained from *International Financial Statistics (IFS)* by IMF[2].

Consumer Price Indices (CPI) and Exchange Rates Indices (EX): (2000=100) indices are used for UK and Australia and (1995=100) indices for Turkey are converted to (2000=100). All indices are obtained from *International Financial Statistics (IFS)* by IMF [2].

For the countries Turkey, UK and Australia, Table-1 indicates related data and statistics:

[1] www.turizm.gov.tr
[2] www.imfstatistics.org

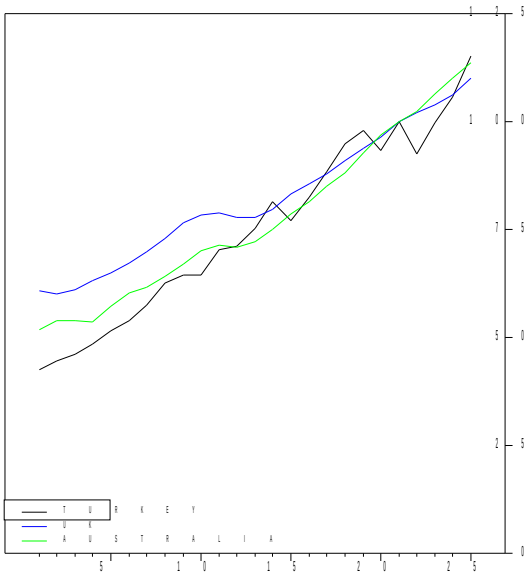
**Table-1 Data for Turkey, UK and Australia**

| Year | CPI TUR | GDP TUR | EX TUR | CPI AUS | GDP AUS | EX AUS | CPI UK | GDP UK | EX UK | PRICE AUS | ARR AUS | INC AUS | PRICE UK | INC UK | ARR UK |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1980 | 0.0081 | 42.4223 | 106.81 | 36.84 | 51.82 | 195.68 | 39.2658 | 60.8223 | 153.438 | 0.0004 | na | 51.82 | 0.0003 | 60.8223 | 62,192 |
| 1981 | 0.0111 | 44.4829 | 105.93 | 40.41 | 53.93 | 197.36 | 43.9305 | 59.9463 | 133.758 | 0.0005 | na | 53.93 | 0.0003 | 59.9463 | 60,294 |
| 1982 | 0.0145 | 46.0678 | 97.21 | 44.92 | 53.89 | 174.71 | 47.7044 | 61.0927 | 115.462 | 0.0006 | na | 53.89 | 0.0004 | 61.0927 | 59,582 |
| 1983 | 0.0190 | 48.3577 | 93.73 | 49.46 | 53.67 | 154.96 | 49.9021 | 63.2556 | 100.059 | 0.0006 | na | 53.67 | 0.0004 | 63.2556 | 84,434 |
| 1984 | 0.0283 | 51.6033 | 88.76 | 51.41 | 57.11 | 151.04 | 52.374 | 64.8816 | 88.1426 | 0.0010 | 17,716 | 57.11 | 0.0005 | 64.8816 | 89,709 |
| 1985 | 0.0409 | 53.7921 | 89.53 | 54.88 | 60.28 | 120.34 | 55.5507 | 67.1935 | 85.5041 | 0.0010 | 22,602 | 60.28 | 0.0007 | 67.1935 | 124,677 |
| 1986 | 0.0551 | 57.564 | 73.87 | 59.86 | 61.51 | 115.20 | 57.4547 | 69.8495 | 96.7615 | 0.0014 | 20,760 | 61.51 | 0.0013 | 69.8495 | 154,231 |
| 1987 | 0.0766 | 62.7664 | 67.55 | 64.95 | 64.30 | 120.35 | 59.8385 | 73.0299 | 108.1 | 0.0021 | 21,491 | 64.30 | 0.0020 | 73.0299 | 266,900 |
| 1988 | 0.1330 | 64.3606 | 66.67 | 69.64 | 67.08 | 134.67 | 62.7753 | 76.6528 | 117.496 | 0.0039 | 28,989 | 67.08 | 0.0037 | 76.6528 | 465,142 |
| 1989 | 0.2171 | 64.5225 | 72.36 | 74.91 | 70.09 | 136.09 | 67.6701 | 78.3183 | 108.152 | 0.0055 | 33,628 | 70.09 | 0.0048 | 78.3183 | 405,943 |
| 1990 | 0.3480 | 70.495 | 81.94 | 80.35 | 71.33 | 134.16 | 74.0822 | 78.9132 | 117.717 | 0.0071 | 37,045 | 71.33 | 0.0067 | 78.9132 | 351,458 |
| 1991 | 0.5776 | 71.1487 | 83.83 | 82.94 | 70.91 | 133.79 | 78.419 | 77.8339 | 116.705 | 0.0111 | 20,707 | 70.91 | 0.0103 | 77.8339 | 200,813 |
| 1992 | 0.9823 | 75.4056 | 80.48 | 83.76 | 72.29 | 126.27 | 81.3461 | 77.9867 | 116.451 | 0.0184 | 30,907 | 72.29 | 0.0175 | 77.9867 | 314,608 |
| 1993 | 1.6316 | 81.47 | 90.02 | 85.28 | 75.07 | 116.79 | 82.6187 | 79.8035 | 99.0709 | 0.0248 | 30,585 | 75.07 | 0.0217 | 79.8035 | 441,817 |
| 1994 | 3.3654 | 77.025 | 67.75 | 86.90 | 7869 | 125.64 | 84.6647 | 83.3329 | 101.022 | 0.0718 | 32,354 | 78.69 | 0.0593 | 83.3329 | 568,284 |
| 1995 | 6.3306 | 82.5648 | 73.24 | 90.93 | 81.44 | 127.33 | 87.5526 | 85.7 | 104.113 | 0.1210 | 43,287 | 81.44 | 0.1028 | 85.7 | 734,721 |
| 1996 | 11.417 | 88.3484 | 75.19 | 93.30 | 84.96 | 134.45 | 89i6965 | 88.0047 | 103.01 | 0.2188 | 46,796 | 84.96 | 0.1744 | 88.0047 | 758,433 |
| 1997 | 21.2052 | 94.999 | 80.1 | 93.54 | 88.24 | 127.77 | 92.5061 | 90.9011 | 108.02 | 0.3616 | 52,986 | 88.24 | 0.3091 | 90.9011 | 915,337 |
| 1998 | 39.1535 | 97.9365 | 86.82 | 94.33 | 92.92 | 108.08 | 95.6681 | 93.7367 | 109.254 | 0.5167 | 60,657 | 92.92 | 0.5150 | 93.7367 | 996,512 |
| 1999 | 64.5514 | 93.3247 | 90.16 | 95.72 | 96.93 | 110.82 | 97.1561 | 96.36 | 106.736 | 0.8289 | 46,075 | 96.93 | 0.7866 | 96.36 | 814,889 |
| 2000 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 1 | 58,295 | 100 | 1 | 100 | 915,285 |
| 2001 | 154.4 | 92.6753 | 82.4 | 104.38 | 102.46 | 88.89 | 101.821 | 102.134 | 94.9779 | 1.5957 | 58,661 | 102.46 | 1.7479 | 102.134 | 845,536 |
| 2002 | 223.825 | 99.8982 | 91.78 | 107.52 | 106.55 | 93.40 | 103.485 | 103.897 | 99.0207 | 2.1185 | 58,678 | 106.55 | 2.3335 | 103.897 | 1,037,507 |
| 2003 | 280.444 | 15.841 | 99.95 | 110.50 | 110.13 | 111.94 | 106.5 | 106.109 | 107.801 | 2.8426 | 56,854 | 110.13 | 2.8401 | 106.109 | 1,091,404 |
| 2004 | 304.558 | 115.294 | 105.07 | 113.08 | 113.69 | 126.49 | 109.657 | 110 | 120.823 | 3.2421 | 67,413 | 113.69 | 3.1938 | 110 | 1,387,850 |

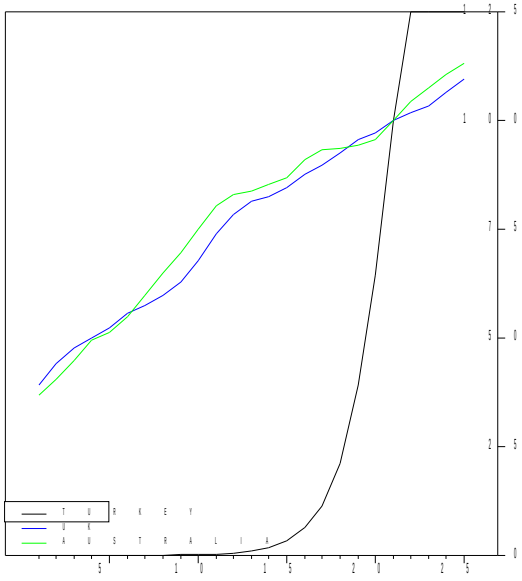
CPI: Consumer Price Index (2000=100)
GDP: Gross Domestic Product Index (2000=100)
EX: Exchange Rate Index (2000=100)
ARR: Tourism arrivals from the UK and Australia to Turkey (in numbers)
PRICE and INC: Indices calculated to be a model variable

## 4.2. Visual Inspection of Data and Descriptive Statistics

**Plot Of GDP indices**

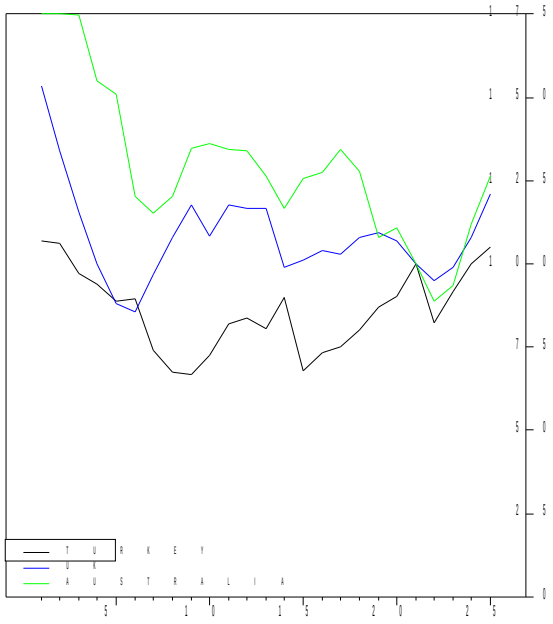


**Plot Of CPIs**

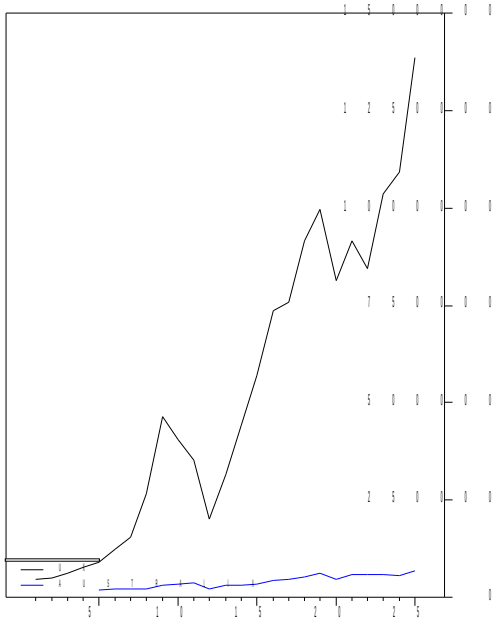


It can be said that three countries have almost close values about the GDP indices. Thus, their income levels seem to be similar to each other. However, for the consumer price indices (CPI), we cannot say the same thing. Turkey has very low CPI until 1990s against UK and Australia. But, it is obvious from the graph that, after 1990s a significant increase in Turkey's CPIs is observed.

**Plot Of Exchange Rate Indices**

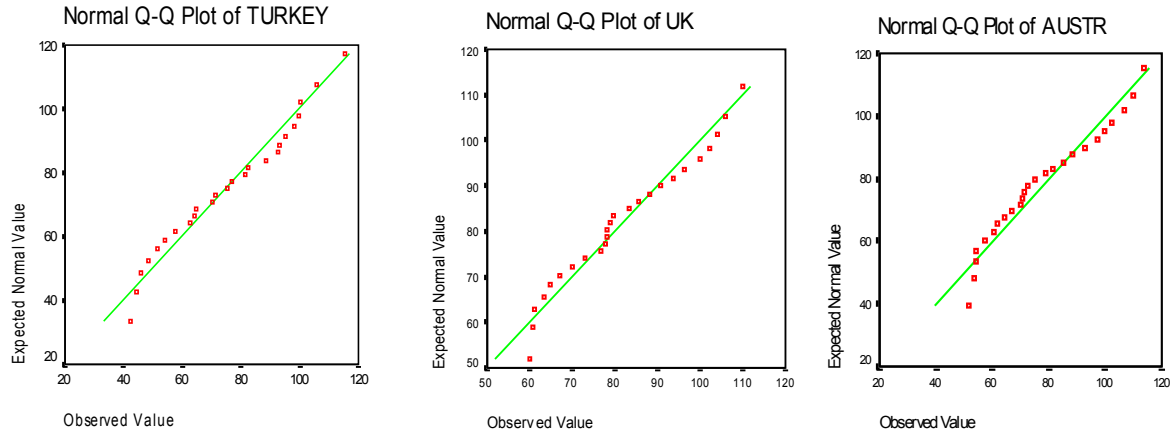


**Tourist Arrivals to Turkey**



Exchange rate indices show that the least valuable currency against US dollar is Turkish currency. Moreover, UK's currency has been gradually depreciating against US dollar. When we look at the tourist arrivals from UK and Australia to Turkey, the big difference between two countries is quite obvious. Furthermore, tourist arrivals from UK have been increasing with large numbers, while tourist arrivals from Australia have been fluctuating within a small interval.

**GDP Indices:**




It can be seen from the Q-Q Plots of GDP values that, none of three countries' data seem to be normally distributed.

## 5. Estimates of the demand models[3]

In the estimates of the demand models, a general-to-specific procedure (Song and Witt, 2000) is followed to eliminate the insignificant or economically unacceptable variables from the general ARDL model, equation (3). Firstly we attempt to whether the variables are significant or not by using OLS to estimate equation (3). Then we eliminate insignificant variables by looking at their significance levels. In the equation (4) for demand elasticities, the coefficient of price variable is expected to be negative and the coefficient of income variable is expected to be positive by economic theory (Song et al., 2003a). Thus, the variables with wrong signs are also going to be eliminated. After this process, the diagnostic checking including White's heteroscedasticity test, Godfrey's autocorrelation test, Jarque-Bera's normality test, ARCH test, Ramsey's Reset test for mis-specification and Chow's predictive failure tests are applied and the models are checked for consistency. Then, the models that pass all of these tests are going to be employed for forecasting.

For UK, data from 1980 to 2004 was used to estimate and the above procedure was followed step by step. Then, the result is that price of tourism in Turkey does not effect the UK arrivals since the price variable is insignificant in UK's OLS results.

Therefore, the equation for UK demand becomes after estimation as

$$\ln Q_{it} = \alpha_0 + \alpha_1 \ln Q_{it-1} + \alpha_2 \ln Y_{it} + \alpha_3 \ln Y_{it-1} + \varepsilon_{it} \qquad (5)$$

[3] RATS 5.0 Codes for estimation and forecast procedures are available upon request from authors.

Note that constant term is not eliminated although it is insignificant (Song et al., 2003a).
For equation (5) new OLS results were obtained. Also, the coefficients were correctly signed. Diagnostic checking (with respect to $\alpha = 0.05$) test results are below.

**Table-2 Diagnostic checking tests for the UK model**

| Test | Ho Hypothesis | Test Result | Significance Level | Choice |
|---|---|---|---|---|
| White Test | no heteroscedasticity | Chi-Squared (9) 15.597018 | 0.07578891 | $H_o$ is accepted |
| Godfrey-Breusch Test | no autocorrelation | Chi-Squared (2) 0.606298 | 0.73848891 | $H_o$ is accepted |
| Jarque-Bera Test | residuals are normally distributed | Chi-Squared (2) 1.769887 | 0.41273753 | $H_o$ is accepted |
| ARCH Test | no autoregressive conditional heteroscedasticity effect | Chi-Squared (1) 1.721925 | 0.18944547 | $H_o$ is accepted |
| Reset Test | model is correctly specified | F(1,19) 2.13550 | 0.16026582 | $H_o$ is accepted |
| Chow Test | there exists structural stability between two sub-samples | F(10,1) 2.52777 | 0.45653285 | $H_o$ is accepted |

As can be seen from Table-2, UK demand model have passed all of the tests and now can be used for forecasting.

For Australia, data from 1984 to 2004 was used to estimate and the procedure employed in the UK model was followed step by step. But, the results obtained somewhat different from UK's. All of the variables in ARDL were insignificant. According to the general-to-specific approach, the possible model was found as autoregressive model (Hendry, 1995) in which the tourism arrivals are only related with the previous year's arrivals.

Furthermore, the model for Australia failed in the Jarque-Bera test in diagnostic checking. To remove this failure a dummy variable was included into the demand model of Australia (Brooks, 2002). Therefore, the equation for Australia demand becomes after estimation as

$$\ln Q_{it} = \alpha_0 + \alpha_1 \ln Q_{it-1} + d + \varepsilon_{it} \qquad (6)$$

For equation (6) new OLS results are obtained. Also, the coefficients were correctly signed. Diagnostic checking (with respect to $\alpha = 0.05$) test results are below.

**Table-3 Diagnostic checking tests for the Australia model**

| Test | $H_o$ Hypothesis | Test Result | Significance Level | Choice |
|---|---|---|---|---|
| White Test | no heteroscedasticity | Chi-Squared (5) 2.360099 | 0.79740096 | $H_o$ is accepted |
| Godfrey-Breusch Test | no autocorrelation | Chi-Squared (2) 3.987232 | 0.13620201 | $H_o$ is accepted |
| Jarque-Bera Test | residuals are normally distributed | Chi-Squared (2) 0.458545 | 0.79511177 | $H_o$ is accepted |
| ARCH Test | No ARCH | Chi-Squared (1) 0.056388 | 0.81229811 | $H_o$ is accepted |
| Reset Test | model is correctly specified | F(1,16) 1.28877 | 0.27299544 | $H_o$ is accepted |
| Chow Test | there exists structural stability between two sub-samples | F(2,12) 0.79847 | 0.47254308 | $H_o$ is accepted |

As can be seen from Table-3, Australian demand model have passed all of the tests and now can be used for forecasting.

## 6. Forecasts

Although exponential smoothing and Box-Jenkins procedures have been mostly employed for forecasting the explanatory variables by researchers, trend and seasonally adjusted moving average forecasting method is used in this study due to its convenience and success in short-term forecasts.

In the forecasting process, explanatory variables whose values are unknown in the estimated model are forecasted separately. Then, the derived values are substituted in demand equation and expected tourism arrivals are calculated from country i to Turkey.

The estimated demand models presented in the previous section are used to forecast tourism arrivals for the year 2005 due to the trend and seasonally adjusted moving average method as introduced in Holt et al. (1960). For both UK and Australia tourism arrival forecasts for 2005, the data from 2000 to 2004 is used.

The forecast for UK with the coefficients are going to be in the form of

$$\ln \widehat{Q}_{2005} = -2.04747298 + 0.68687208 \ln Q_{2004} + 10.52108336 \ln \widehat{Y}_{2005} - 9.17254670 \ln Y_{2004}. \qquad (7)$$

In this equation, only the income value for the year 2005 is unknown. Thus, by following the procedure of Holt et al. (1960) for 2000-2004, we get the following:

$$\ln \widehat{Y}_{2005} = 4.7246$$

Then, by substituting this value into the equation (7), we find that

$$\ln \widehat{Q}_{2005} = 14.25134168$$

Only remaining thing is taking the exponential of this value and to find the forecast of UK tourist arrivals to Turkey for the year 2005.

Therefore, $\widehat{Q}_{2005} = 1{,}546{,}248$

The forecast for Australia with the coefficients is going to be in the form of

$$\ln \widehat{Q}_{2005} = 1.088919900 + 0.905119249 \ln Q_{2004} - 0 \qquad (8)$$

By substituting the 2004 tourism arrivals value into the equation (8), we get that

$$\ln \widehat{Q}_{2005} = 11.15257259$$

Then, again it remains to take anti-log of this value to find the tourism arrivals from Australia to Turkey for the year 2005. So,

$$\widehat{Q}_{2005} = 69{,}743$$

**7. Conclusion**

We measured the demand for Turkey tourism by established models employing the data for tourist arrivals from UK and Australia. Based on the estimations, forecasts for the following year are made. In the estimation process, the general-to-specific approach was used while forecasting procedure includes trend and seasonally adjusted moving average method.

The estimates of the demand models show that the previous year's arrivals influence the current year's tourism arrivals for both of the countries UK and Australia. It means that *word of mouth* effect is a very important factor for the tourists from these countries. Another implication of the estimates is that price of the tourism in Turkey does not influence the tourism arrivals from UK and Australia.

For the year 2005, 1,546,248 tourists are expected from the UK and 69,743 tourists are expected from Australia to Turkey. Therefore, it is predicted that UK tourism arrivals will have an annual growth rate of 11.42% and Australia tourism arrivals will have an annual growth rate of 3.46% in 2005.

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