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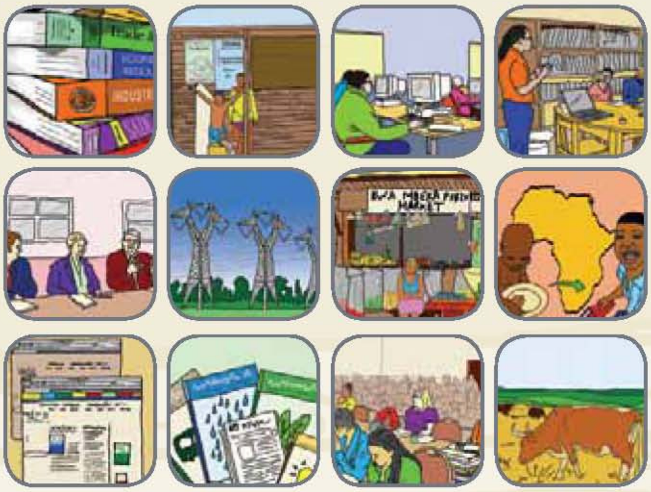

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Modelling Tourism Demand for South Africa using a system of equations approach: the Almost Ideal Demand System

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Abstract
This research aims to model tourism demand for South Africa from the UK and the USA by using an almost ideal demand system. An error correction almost ideal demand system (EC-AIDS) is used to quantify the responsiveness of UK and USA tourism demand to South Africa relative to changes in tourism prices and expenditure or income. Short-term own-price, cross-price and expenditure elasticities are derived from the EC-AIDS models. One of the key findings of the paper is that tourism from the UK and USA is not sensitive to price changes in South Africa in the short-term. Tourism to South Africa is found to be more income elastic than price elastic, indicating that the country is vulnerable to changing world economic conditions. Even though price competitiveness does not seem to be a key concern yet, significant substitution effects are present, with especially Spain and Malaysia benefitting from a decline in South Africa's price competitiveness.

Keywords: tourism demand; Almost Ideal Demand System (AIDS); error correction mechanism; South Africa Email: albert.tounamama@uct.ac.za - Email: fulbert.tchanatchana@finances.gouv.qc.ca

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1. INTRODUCTION

In recent times, tourism has become a very important sector in countries' economies – partly due to the impact of tourism on a country's gross domestic product (GDP) and the employment opportunities that tourism can offer. The worldwide figures over the past few years make for an interesting reading: for instance, from 2005 to 2007 international tourist arrivals grew by nine per cent, from 800 million to 900 million, according to the World Trade & Tourism Council (WTTC) Report of 2010. Since 2007 a lot has however changed in the economic environment, with North America experiencing a financial crisis that led to the global economic recession. The global tourism industry also suffered because of tourists' reluctance to travel due to tighter budgets and a lack of disposable income. Almost all destinations saw a decline in arrivals; South Africa was no exception to this trend.

According to the WTTC summary of the Tourism industry in 2010 (WTTC, 2010), the recession of 2009 effected a drop of 2.1 per cent in real World GDP. The recession mainly affected developed countries, the most important source for travel and tourism demand in the world. In terms of tourism, the global contribution of the tourism economy to the world economy fell by 4.8 per cent which, resulting in more than four and a half million jobs being lost. After the 2007 boom in international tourist arrivals, the recession caused a declined in tourist arrivals from 901 million in 2007 to 877 million in 2009. However, even with the effect of the recession, the global tourism industry still employs, directly and indirectly, 235 million people across the world; and tourism still accounts for 9.4 per cent of the World GDP, making it a sector to be reckoned with worldwide (WTTC, 2010). The WTTC (2010) also forecasts that Travel and Tourism will, in the long run, be a main role player in supporting and encouraging global growth and employment opportunities.

Many countries consider tourism as a means to increase income, generate foreign currency, create employment and increase revenues from taxes. With the benefits that tourism offers to a country, it is not surprising that developing countries are viewing tourism as a means of alleviating poverty. This necessitates a study of tourism demand, since any change in demand will cause a change in the magnitude of the benefits received. Of particularly interest is the competitiveness of a destination, of which price competiveness forms a central part. Most tourism demand models use a particular tourism price index, which often consists of a combination of inflation, expenditure and exchange rates. Li, Song and Witt (2004) state that this index is used in models to show how sensitive tourism demand really is to changes is.

The Almost Ideal Demand System (AIDS) proposed by Deaton and Muellbauer (1980) has become the most popular model for estimating price and income elasticities associated with tourism demand. Demand systems differ from the single equation methods due to their systems of equations approach with tourism expenditure shares as dependent variables. The AIDS system holds additional advantages over the use of single equation models, which normally has little theoretical justification and do not estimate the relationship between equations and variables. The inclusion of different destinations in the AIDS specification is useful for policymakers, since it shows the cross-price elasticities between alternative destinations.

The purpose of this research is to study tourism demand for South Africa from the United Kingdom (UK) and the United States of America (USA), compared to their demand for alternative destinations, namely Italy, Malaysia, New Zealand, Spain and the UK (USA). The reason for investigating the UK is that this country is the largest intercontinental source of tourist arrivals to South Africa. The USA was chosen as it is the largest market for tourist departures to foreign countries in the world and therefore has the potential to become South Africa's main intercontinental tourism market.

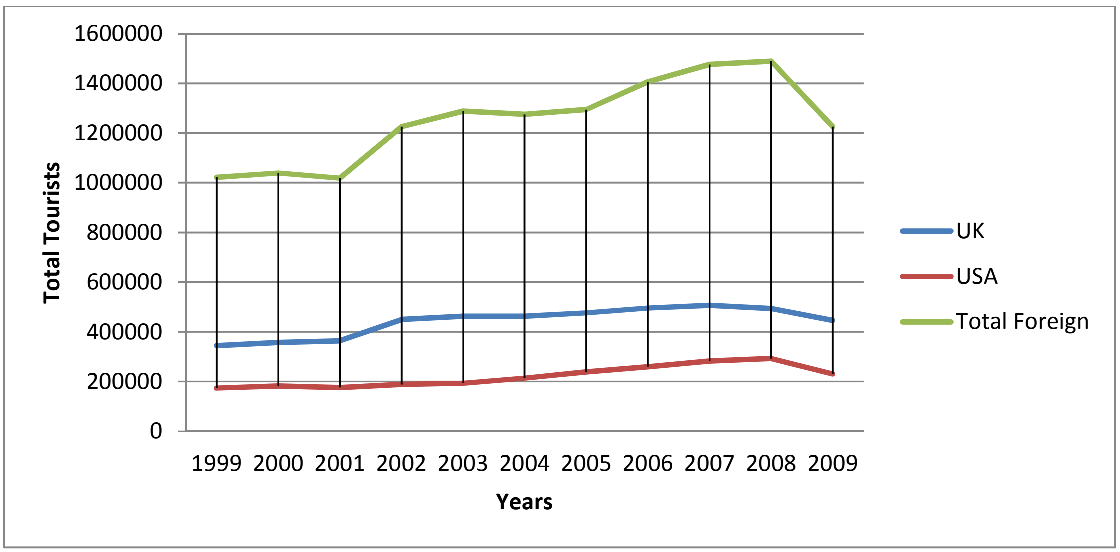
This research aims to determine whether the linear AIDS or error-correction AIDS model fits the South African tourism demand data best. In addition to estimating the correct model, the research will also calculate the elasticities associated with tourism demand for South Africa. These elasticities serve as the basis of policy recommendations and conclusions that can be drawn from the AIDS models.

2. THE SOUTH AFRICAN CASE

According to the Minister of Tourism for South Africa, Marthinus van Schalkwyk, (Anon, 2011), South Africa's arrivals of international tourists grew from one million arrivals in 1990 to almost 10 million in 2010, which equates to a 13 per cent compound growth over the last 20 years. South Africa is currently the most popular destination on the African continent and the twenty-sixth most visited destination worldwide (UNWTO, 2009). However, the economic recession of 2009 influenced international arrivals to South Africa negatively, a pattern which necessitates an in-depth review of the demand for South Africa as a tourist destination.

From 2002 to 2008, the growth rate of South Africa's largest long-haul markets, the UK, France, Germany, the USA, the Netherlands and Australia (in that order) only grew by 2.5 per cent in six years, which, according to Mr. Van Schalkwyk (Anon, 2010), is worrisome. This would suggest that competition for long haul destinations is fierce and that tourists' demand are relatively elastic when it comes to choosing a destination.

Figure 1: Foreign Tourist Arrivals



(Source of data: Statistics South Africa)

The trends depicted in Figure 1 motivate the problem underlying this research. The figure illustrates that the growth of tourists from abroad to South Africa increased steady between 1999 and the end 2007 but declined sharply with the financial crisis starting at the end of 2008. Tourists to South Africa are thus susceptible to changes in price and/or income. The question is then: how sensitive are they to price and/or income changes?

The following questions can therefore be asked when it comes to tourism demand: How sensitive are tourists to price increases? Are tourists more prone to react to income changes than to price changes or *vice versa*? Or are tourists indifferent to both the aforementioned changes? How does the economic climate affect tourist demand? What can South Africa do to ensure a consistent flow of international tourists?

The focus of this research is on tourism demand and, specifically, on the demand for South Africa by tourists from the USA and the UK. The competitive nature of the tourism industry makes it imperative for a country to keep its foreign demand high and therefore requires demand that is inelastic to changes in prices and income for tourists coming to South African shores.

To ascertain the reasons for the declining growth in these markets, an investigation into the income and price elasticity of foreign tourist demand is warranted. The purpose of this research is to provide some answers to the questions above. More specifically, to investigate the income and price elasticities of tourist demand from South Africa's largest European market – the UK – and its largest North American market – the USA.

3. LITERATURE REVIEW

The theoretical justification enjoyed by the AIDS model includes that the properties of demand can be imposed on the model through the estimation of a restricted model. The properties of demand are, according to Snyder and Nicholson (2008):

- Adding up: According to microeconomic theory, the adding up restriction implies that the sum of all expenditures weighted by prices should equal unity. Simply put, it means that expenditure cannot exceed the budget constraint of an individual.
- Homogeneity: Microeconomic theory states that the homogeneity of demand assumes that all households face the same prices so that differences in household consumption are based on expenditure patterns and family composition.
- Symmetry: Symmetry applies to the consistency of consumer choice with regard to spending patterns because, without these restrictions, consumers make inconsistent choices. Negativity comes from the concave nature of cost functions due to costs being minimised and utility maximised.
- Negativity: This means that a rise in prices results in a fall in demand as required when the commodities under analysis are considered normal goods.

According to Cortés-Jiménez, Durbarry and Paulina (2009), the AIDS model is based on this microeconomic framework but it can be generalised to an aggregation level by supposing that normal consumers make multi-stage budgeting choices. Tourists' maximisation of their utility can be observed when choosing between a set of alternative destinations. In a demand system, such as the AIDS, there are a group of simultaneously estimated equations, one for each budget share.

One of the main advantages of the AIDS model compared to other demand system specifications is that it provides flexibility and is easy to calculate. In terms of demand theory, the AIDS model automatically satisfies the adding up restriction. By imposing parameter restrictions, the homogeneity and symmetry restrictions can be satisfied (Li, Song and Witt, 2004). According to Fujii, Khaled and Mak (1985), the negativity restriction cannot be satisfied by parameters alone but is likely to be satisfied by any data set created by utility maximising behaviour.

Due to this model's ease of use and its flexibility, the linear AIDS model is very popular for empirical studies. Apart from testing tourism demand, the AIDS model has been applied successfully in various other demand studies such as the demand for meat supply in South Africa (Taljaard, Alemu and van Schalkwyk, 2004), food demand systems (Kastens and Brester, 1996) and household expenditures (Blundell, Browning and Meghir, 1994).

After Deaton and Muellbauer introduced the AIDS model in 1980, the first pilot studies using the model for tourism demand were done by White (1982) who analysed USA's tourism expenditures in Europe from 1960-1981, with White (1985) furthering his study by grouping countries under seven regions and adding a transportation equation into the demand system.

Studies that used Deaton and Muellbauer's AIDS model without any alterations were:

Fujii, Khaled and Mak (1985) who assessed the demand for foreign tourists visiting Hawaii, paying special attention to the price of lodging, food and drink, recreation and entertainment, local transport, clothing and other. This was one of the first studies that used the AIDS model with the focus on how tourists react to policy changes.

Sinclair and Syriopoulos (1993) determined how tourists from the UK, Germany, France and Sweden allocate their expenditure among groups of Mediterranean countries. Papatheodorou (1999) focused on the demand for international tourism in the Mediterranean from three developed countries (the UK, West Germany and France) and their demand for six Mediterranean countries from 1957-1989. He also provided a detailed discussion on the various variables in the AIDS model:

- The dependent variable is the tourism expenditure from the origin country in the destination country as part of the aggregate tourism expenditure of the origin country.
- The set of explanatory variables included prices, total tourist expenditures and a time trend. A problem was encountered in finding data for advertising expenditure and dummy variables for seasonal trends proved to be insignificant. These were dropped from the specification.

De Mello, Pack and Sinclair (2002) constructed an AIDS model of the UK demand for neighbouring counties (France, Spain and Portugal). The focus of this study was to establish whether countries that were considered developing countries (in the case of Spain and Portugal, who only moved into the developed country category in the mid 1980s), had an increase in tourism demand since their ‘status’ changed and, alternatively, how they compared to a developed country like France. They found that, for the most part, poorer countries can catch up to their richer neighbours but, in the case of Portugal, the catch up was not as instantaneous as with Spain and this catch up effect holds valuable information for policy makers in attracting foreign tourists.

Han, Durbarry and Sinclair (2006) studied USA’s tourism demand for European destinations using a static AIDS model and showed that price competitiveness is important for the USA’s demand for France, Italy and Spain but not so important for the UK. There is also an argument for France and Italy being substitutes for one another and the same goes for Italy and Spain, the study found no relationship between Spain and France. In addition they found that an increase in the USA’s tourism expenditure caused the demand for Spain and the UK to decline while France and Italy benefit from this increase in expenditure.

According to Anderson and Blundell (1983), the basic AIDS model by Deaton and Muellbauer assumes that there is no difference in consumers’ short and long-run behaviour. This implies that the consumer is always in balance. However, there are a few factors that cause the consumer to be out of balance before full correction takes place. These include habit persistence, imperfect information and incorrect expectation.

According to Chambers and Nowman (1997), the assumptions of the static AIDS model are unrealistic. They cite the reasons for as the fact that no attention is paid to the data in terms of its statistical properties and the dynamic nature of time series analysis. Their critique is particularly relevant when the data series contains unit roots, since this may cause spurious results.

Since the few early studies using the AIDS model and the criticism levied against them, i.e. the lack of ability of the long-run specification to comprehend the dynamic adjustment of tourism demand, AIDS modelling has evolved with recent studies focusing on a more dynamic framework and the use of different approaches. Popular among these are co-integration and the use of an error correction mechanism (ECM).

Lyssiotou (2001) was the first to use a nonlinear AIDS model and introducing a lagged dependent variable. This was done to capture habit persistence while measuring UK demand for tourism to North America excluding Mexico and 16 other European destinations. One flaw in this study was that neighbouring destinations were aggregated and thus no substitution and complementary effects could be witnessed between these countries.

Durbarry and Sinclair (2003) studied tourism demand from France for three markets, Italy, Spain and the UK for 1968-1999, using an error correction AIDS model (EC-AIDS model). The authors showed that time-trends and lagged endogenous variables can be omitted from the model as they violate the restriction of homogeneity. This can be rectified by having a constant term and first-order differencing. Using the long-run model, it was found that the homogeneity and symmetry restrictions were valid. The elasticities that were derived showed that tourism demand to these destinations was very sensitive to price changes which, again, indicate a level of price competiveness between the three countries.

With regards to long-run implementation of the EC- AIDS model, there have been studies that incorporated the Error Correction Model specification into the linear AIDS model which allows the analysis of both the long and short-run dynamics.

Li, Song and Witt (2004) used a dynamic linear AIDS model to estimate the UK tourism demand to 22 Western European Countries. While comparing the static AIDS model with the dynamic AIDS model they found that the EC-AIDS model was superior to the other models with regards to the properties of a demand function (homogeneity and symmetry) and better in terms of forecasting accuracy. They also found that tourism to Western Europe from the

UK can be deemed as a luxury good in the long run, hence a larger numerical price elasticity is found in the long run than in the short run.

Cortés-Jiménez, Durbarry and Paulina (2009) used monthly data from 1996-2005 to evaluate Italian tourism demand in four main European destinations. These were France, Germany, the UK and Spain. They investigated both the short and the long run, as well as cross-price and expenditure elasticities derived from the dynamic model. They found that the dynamic model outperformed the long-run model in forecasting accuracy. Their study is unique because they measure monthly Linear AIDS (LAIDS) and EC-AIDS models and thus get more accurate results than previous studies which used yearly data.

Other extensions of the AIDS model can be found in research by Li, Song and Witt (2004). Their study introduced a time varying parameter (henceforth, TVP) to the Linear AIDS model (LAIDS) in both the long-run and short-run error correction (EC) forms. They were particularly interested in the structural instabilities in data brought about by high rates of inflation and changing consumer expectations. They conclude that an EC-LAIDS equation is the most appropriate form but, in terms of forecasting, the TVP models for both the short and long run outperform any of the other AIDS models. They further state that their model has superior forecasting abilities to the normal fixed parameter EC-LAIDS, but that the predictive ability of the TVP needs further investigation.

As is evident from the above, studies of international tourism demand that use a systems of equation approach, and more specifically an AIDS-specification, have thus far not been done for South Africa. As previous literature has suggested, modelling and AIDS for tourism demand is appropriate in studying the elasticities and competiveness of a tourism destination.

4. METHOD

As noted in the introduction, the AIDS model with its system of equations has an advantage over single equation models because it can analyse the interaction of budget allocations for different groups or services. The AIDS is also unique in that it has its basis in microeconomic consumer expenditure theory. Therefore it shows how demand is quantified as a function of consumers' expenditure budget and the relative prices of a set of goods and services that they can purchase. In the case of tourism, it shows how tourists choose between alternative destinations based on their budget and the relative prices of destinations.

According to Chang, Khamkaew and McAleer (2010), the AIDS model is preferred to most demand models because the AIDS model includes a group of consumer goods. Estimating all the consumer goods at once allows this model to interpret tourists' allocation of expenditure on alternative destinations. This allows the AIDS model to potentially provide useful information about the sensitivity of tourism demand to changes in comparative prices and expenditure as well as interaction for competing destinations.

The AIDS model with its system of equations approach focuses on clarifying the changes in tourism expenditure, rather than changes in the levels of tourism demand. Han *et al.* (2006) state that the model assumes that consumption and labour supply are not linked. This is done to ensure that consumers' tourism budget shares do not fluctuate in accordance with their work time and effort. The literature review in the previous section set out the various applications of the AIDS model and how it evolved over time.

As indicated, the purpose of this research is to model tourism demand for South Africa for the UK and the USA using the AIDS approach, and to calculate the relevant elasticities from the model. The elasticities derived from this model are the key to understanding how UK and USA tourists decide upon the destinations they are going to visit based on their expenditure/income, exchange rate and tourism prices. Noting this, this paper will proceed as follows: Firstly, the AIDS model will be reviewed outlining the variables that will be used as well as the specification of the LA/AIDS model itself. Secondly, the pre-modelling analyses are explained, which include unit root tests. If the data has unit roots present, a Johansen co-integration test will be performed to identify the presence of co-integration. If co-integration is present the LA/AIDS is not the correct model and the EC-AIDS model will have to be estimated. Thirdly, the unrestricted model will be estimated, after which a Wald-test will be performed to test the homogeneity and symmetry restrictions. If the restrictions hold, it will be unnecessary to estimate the restricted model. Finally, after the final model has been estimated, the elasticities will be calculated and a detailed description of them given before a conclusion is reached.

4.1 Model Specification

This model was estimated using quarterly data covering the period 1999 first quarter to 2008 fourth quarter. Tourism expenditure and arrivals for the countries in the model was obtained through tourism New Zealand for New Zealand, the Office of Travel & Tourism Industries for USA arrivals, Tourism Malaysia Corporation for Malaysia, Statistics UK for the UK, Eurostat for Spain and Italy tourist arrivals and the World Bank for their expenditure data and Stats SA for the South African data.

Price data was obtained from the International Monetary Fund's (IMF) *Yearbook of International Financial Statistics*. The base year was 2000. The same source was used to obtain the various real exchange rate data for the countries.

One assumption that is made is that tourists from the UK and the USA allocate their budget expenditure between six main destinations. According to Cortés-Jiménez *et al.* (2009) this is done because it is assumed that preferences in each group are not influenced by the demand in other groups. The empirical analysis will examine the interrelationships in the budgeting processes of UK and USA's tourists and the demand for j destinations. These destinations are for the UK: South Africa, Italy, Spain, New Zealand, Malaysia and the USA and for the USA the destinations are: South Africa, Italy, Spain, New Zealand, Malaysia and the UK. These destinations were chosen because of their geographical importance. South Africa is the destination that is focused on, and New Zealand was chosen as another long haul destination in the Southern Hemisphere. The choice of Italy and Spain is based on the fact that these are the two key destinations in Europe for both, the UK and the USA. Malaysia was chosen as a representative destination in the East and because, like South Africa, has been experiencing growth in tourism. The other two countries, the UK and the USA, were chosen as they are popular destinations for USA and UK tourists respectively.

The AIDS model, in particular the Linearized Almost Ideal Demand System (LA/AIDS), is the most popular system used in tourism demand and takes the following functional form:

$$w_{it} = \sum_j c_{ij} \ln p_{jt} + b_i \ln RexP + \theta_{1i} Db + \theta_{2i} Dst + \theta_{3i} Dsd + \theta_{4i} Dsf + c_{it} \qquad (1)$$

where i represents the country destination, j denotes all the country destinations, t signifies time with the time being from 1999Q1 to 2008Q4 (Q meaning quarter). ln implies that the variable is transformed in natural logarithms. Natural logarithms were taken to eliminate measurement problems.

As for the description of the variables, w_{it} shows share of tourism expenditure assigned in destination i to total tourism expenditure in j destinations. The effective relative price of tourism in each destination is denoted by $\ln p_{jt}$. The ratio between the UK and USA tourist expenditure and the Stone price index is given by (x/P^*) , and D refers to dummy variables. In this research, four dummy variables are used; the first dummy variable is Db that attempts to capture the lead up to the recession of 2008, which is defined as 1 for the four quarters of 2007, which had abnormally high tourist figures, and 0 for all the other periods. The other three dummies, Dst, Dsd, Dsf, are seasonal dummies to observe whether there are any noticeable trends that can be observed, by tourists from the UK and the USA.

In this study, the real exchange rate is used as the tourism price index because the exchange rates are adjusted for inflation and this gives a better indication of how tourism is affected by the exchange rate than the nominal exchange rate (Chang *et al.*, 2010).The Stone price index formula is given in the Appendix[1]. This Stone price index is calculated by the sum of the weight of country i at time t, multiplied by the logarithm of the price.

One challenge foreseen by Eilat and Einav (2004) in the determination of tourism demand is the necessity for variables that represent tourism prices. The problem, according to them, is that indices for tourism prices are not always readily available. The common cure for researchers facing this problem was to use exchange rate variables to substitute for tourism prices. One popular measure used was the use of nominal exchange rates, measured as an index relative to a base year. This was done on the assumption that tourists are aware of changes in exchange rates but do not have the information regarding nominal price changes in the destination country. They dismiss the argument if some of the costs of tourism are paid in advance, which is normally true in the case of hotels rentals and car hire. Eilat and Einav (2004) indicated that using real exchange rates instead of nominal exchange rates provides an improved account of the actual cost of living in both countries and both indices have a common denominator in being measured relative to a base year. This adjustment can track the changes in costs over time, but cannot capture the real differences of cost of living between the two destinations in terms of actual cost of living.

Table 1. Variables, description of the data and source

Variable	Description	Data Used	Source

w_{it} [$wita, wmal, wsa, wspa, wuk, wusa$]	shows share of tourism expenditure assigned in destination i to total tourism expenditure in j destinations	Quarterly Arrival data from countries	Tourism New Zealand Stats SA the Office of Travel & Tourism Industries for USA Tourism Malaysia Corporation Statistics UK
$\Delta \ln p_{jt}$	Tourism Prices calculated by equation (3.1) and (3.2)	Inflation of the all the countries. Base year: 2005. Exchange rate of all the countries: Base year 2005.	IMF: *Yearbook of International Financial Statistics*
$\ln\ RexP$	The natural logarithm f ratio between UK and USA tourist expenditure and the Stone price index is given by $(x/P*)$. The tourist expenditure is given by $\ln(\frac{\frac{\sum EXP_{it}}{POP_t}}{P_t^*})$. where the $\sum EXP$ is the sum of total expenditure by USA (UK) tourists in the six destinations, *POP* is total number of tourists from the USA (UK) and *P** is the Stone price index.	Sum of Expenditure by USA (UK) tourists. Total departures USA (UK) and the Stone Price index given by (4.1)	Tourism New Zealand Stats SA the Office of Travel & Tourism Industries for USA Tourism Malaysia Corporation Statistics UK

The AIDS model shares a multi-stage budgeting approach, and consists of explaining variations in the shares of budget expenditure. Papatheodorou (1999) states that the AIDS model assumes the presence of a representative consumer, which implies that aggregate data should be expressed in terms of a typical consumer. In this research, the budget shares were constructed as suggested by Papatheodorou (2002): total tourist expenditure of the two countries, the UK and the USA, divided by the total number of tourists from the respective countries, multiplied by the number of tourists that went to each destination.

4.2 Pre-Modelling Analysis

The first part of the pre-modelling analysis is to test the data for possible unit roots. From theory, it is know that a series might be non-stationary in the level form. The Augmented Dickey Fuller test is used, where the null hypothesis states that a series has a unit root. If the null hypothesis is rejected then the series does not contain a unit root and is stationary. In this research, a five per cent significance level is used, which means that the null hypothesis of a unit root cannot be rejected if the probability (p) > 0.05, but it can be rejected if p < 0.05. The variables and their resulting probabilities from the Augmented Dickey Fuller test are shown in Tables 2 and 3 below.

Table 2. ADF results for USA model

Weight	ADF(level) No Intercept	ADF(level) Intercept	ADF(First difference) No Intercept	ADF(First difference) Intercept
	Probability	Probability	Probability	Probability
Wita	0.8026	0.0957	0.0005**	0.0085**
Lnpita	0.7072	0.9308	<0.0001**	0.0016**
Wmal	0.8787	0.9232	<0.0001**	0.0005**
Lnpmal	0.2301	0.7079	<0.0001**	<0.0001**
Wnz	0.8234	0.3506	0.0001**	0.0001**
Lnpnz	0.2879	0.5276	0.0001**	0.0026**
Wsa	0.9939	0.5268	0.0104**	0.0015**
Lnpsa	0.8838	0.0406**	<0.0001**	-
Wspa	0.6815	0.2461	<0.0001**	<0.0001**
Lnpspa	0.7623	0.9060	<0.0001**	<0.0001**
Wuk	0.3294	0.1056	0.0018**	0.0206**
Lnpuk	0.6187	0.5379	<0.0001**	0.0001**
lnrexpUSA	0.0859	0.2394	<0.0001**	<0.0001**

** = indicates significant at a 5% level

Table 3. ADF results for UK model

Weight	ADF(level) No Intercept	ADF(level) Intercept	ADF(1st difference) No Intercept	ADF(1st difference) Intercept
	Probability	Probability	Probability	Probability
Wita	0.9107	0.2076	0.0004**	0.0052**
Lnpita	0.3245	0.9979	0.0000**	0.0004**
Wmal	0.8946	0.9736	0.0098**	0.0752
Lnpmal	0.5661	0.5163	0.0061**	0.0694
Wnz	0.9627	0.7361	0.2374	0.0180**
Lnpnz	0.3326	0.8911	<0.0001**	0.0006**
Wsa	0.8841	0.6120	<0.0001**	0.0003**
Lnpsa	0.9447	0.2851	<0.0001**	0.0005**
Wspa	0.6210	0.0214**	0.0018**	-
Lnpspa	0.4133	0.9884	<0.0001**	0.0004**
Wusa	0.3125	0.0091**	<0.0001**	-
Lnpusa	0.6182	0.6382	<0.0001**	0.0002**
lnrexpUK	0.7504	0.0345**	0.0346**	-

** = indicates significant at a 5% level

Table 2 and Table 3 show the probabilities that the weights, logarithm of price and logarithm of expenditure data is non-stationary. The ADF test shows that all of the weights in Table 2 and Table 3 are non-stationary in level form. All the logarithm of price data in Table 2 and Table 3 are also non-stationary in level form when assuming there are no intercepts.

Table 2 and Table 3 also show that the data is stationary after first differencing the non-stationary time series - therefore all variables are integrated of order one (i.e. I(1)). Since all the variables have the same order of integration, a co-integration test can be performed to test for a possible long-run relationship between the variables. Given the unit root test results, the following step is therefore to conduct a co-integration analysis. This is done to test whether there exists a consistent long-run relationship between the variables or, in other words, if they are jointly co-integrated. Asteriou and Hall (2007:319) indicate that the Johansen co-integration analysis must be used when there are more than two variables, since more than one cointegrating relationship is then a possibility.

The statistics that are generated by the Johansen test are the trace statistic and the maximum eigenvalue statistic respectively. The aim of these statistics is to determine the number of co-integrating vectors. To interpret the model, the use of 'r' is important because it determines the number of co-integrating vectors. For example, if r = 0 then there are no co-integrating vectors. It is important to note that the two test statistics sometimes have conflicting results and do not always indicate the same number of co-integrating vectors.

Table 4 and Table 5 show the co-integration results for both USA tourists and UK tourists where r = 0 means no integrating vectors, r≤1 means at least one co-integrating vector. To select the appropriate number of lengths to ensure white noise residuals, the Schwartz criterion was used and the appropriate lag length is 1 for all models.

Table 4. Johansen co-integration test results for the USA

Model 1: Italy = wita = $\boldsymbol{f(\ln pita, \ln pmal, \ln pnz, \ln psa, \ln pspa, \ln puk, \ln rexp)}$ – **1 lag**

Hypothesis	r = 0	0.05 c.v.	r ≤ 1	0.05 c.v.
Trace	353.3254**	169.5991	230.8436**	134.6780
π max test	122.4818**	53.18784	70.07863**	47.07897

ECTi = WITA - (1.88)*LNPITA + (0.09)*LNPMAL + (0.09)*LNPNZ – (0.08)*LNPSA + (1.98)*LNPSPA – (0.12)*LNPUK – (0.001)*LNREPUSA + 0.3452

(-1.57) (0.19) (0.38) (-1.08) (1.57) (-0.50) (-0.62) (0.45)

Model 2: Malaysia = wmal = $f(\ln pita, \ln pmal, \ln pnz, \ln psa, \ln pspa, \ln puk, \ln rexp)$ – 1 lag

Hypothesis	r = 0	0.05 c.v.	r ≤ 1	0.05 c.v.
Trace	298.7817**	169.5991	214.7541**	134 6780
π max test	84.02755**	53.187 4	68.3 217**	47.07897

ECTmal = WMAL - (0.02)*LNPITA –(0.02)*LNPMAL – (0.003)*LNPNZ + (0.004)*LNPSA + (0.01)*LNPSPA +(0.02)*LNPUK + (2.17e-06)*LNREPUSA + 0.0508

(-0.22) (-0.63) (-0.14) (0.61) (0.11) (1.03) (0.48) (0.80)

Model 3: South Africa = wsa = $f(\ln pita, \ln pmal, \ln pnz, \ln psa, \ln pspa, \ln puk, \ln rexp)$ – 1 lag

Hypothesis	r = 0	0.05 c.v.	r ≤ 1	0.05 c.v.
Trace	304.7966**	169.5991	83.74930**	53.18784
π max test	221.0473**	134.6780	70.7 892**	7.07897

ECTsa = WSA + (0.02)*LNPITA + (0.003)*LNPMAL – (0.007)*LNPNZ + (0.007)*LNPSA – (0.03)*LNPSPA – (0.0004)*LNPUK + (1.1e-06)*LNREPUSA + 0.0028

(0.43) (0.17) (-0.56) (1.95) (-0.57) (-0.03) (0.42) (0.07)

Model 4: Spain = wspa = $f(\ln pita, \ln pmal, \ln pnz, \ln psa, \ln pspa, \ln puk, \ln rexp)$ – 1 lag

Hypothesis	r = 0	0.05 c.v.	r ≤ 1	0.05 c.v.
Trace	330.2352**	169.5991	219.8799**	134.6780
π max test	110.3552**	53.18784	63.78611**	47.07897

ECTspa = WSPA + (0.26)*LNPITA – (0.18)*LNPMAL – (0.005)*LNPNZ + (0.001)*LNPSA – (0.24)*LNPSPA + (0.05)*LNPUK – (2.31e-07)*LNREPUSA + 0.4198

(1.13) (-2.04) (-0.10) (0.07) (-0.99) (1.17) (-0.02) (2.81)

Model 5: UK = wuk = $f(\ln pita, \ln pmal, \ln pnz, \ln psa, \ln pspa, \ln puk, \ln rexp)$ – 1 lag

Hypothesis	r = 0	0.05 c.v.	r ≤ 1	0.05 c.v.
Trace	358.2321**	169.5991	231.6262**	134.6780
π max test	126.6059**	53.18784	68.52285**	47.07897

ECTu = WUK + (1.4138)* LNPITA + (0.0931)*LNPMAL – (0.0583)*LNPNZ + (0.0560)*LNPSA – (1.5226)*LNPSPA (0.04)*LNPUK +(2.1e-05)*LNREPUSA + 0.20

(1.34) (0.23) (-0.25) (0.78) (-1.37) (0.20) (0.45) (0.31)

** signifies that a test statistic is statistically significant at the 5% level. Co-integrating vector lags were chosen on the basis of SC, criteria by employing EViews 7. Tests are run employing Eviews 7, 2010. c.v. indicates critical value.

Table 5. Johansen co-integration test results for the UK

Model 1: Italy = wita = $f(\ln pita, \ln pmal, \ln pnz, \ln psa, \ln pspa, \ln pusa, \ln rexp)$ – 1 la

Hypothesis	r = 0	0.05 c.v.	r ≤ 1	0.05 c.v.
Trace	398.6884**	169.5991	208.2042**	134.6780
π max test	190.4841**	53.18784	73.86753**	47.07897

ECTi = WITA +(0.17)*LNPITALUK + (0.07)*LNPMALUK + (0.0004)*LNPNZUK +(0.01)*LNPSAUK -(0.06)*LNPSPAUK + (0.06)*LNPUSA + (0.007)*LNREPUK - 0.21

(0.70) (0.79) (0.008) (1.03) (-0.25) (5.63) (0.81) (-1.26)

Model 2: Malaysia = wmal = $f(\ln pita, \ln pmal, \ln pnz, \ln psa, \ln pspa, \ln pusa, \ln rexp)$ – 1 lag

Hypothesis	r = 0	0.05 c.v.	r ≤ 1	0.05 c.v.
Trace	375.5843**	169.5991	227.5308**	134 6780
π max test	148.0535**	53.18784	91.59444**	47.07897

ECTmal = WMAL - (0.14)*LNPITALUK+(0.0005)*LNPNZUK– (0.03)*LNPMALUK – (0.003)*LNPSAUK + (0.04)*LNPSPAUK – (0.01)*LNPUSA - (0.002)*LNREPUK + 0.17

(-1.83) (0.029) (-1.13) (-0.72) (0.56) (-0.40) (-6.74) (3.14)

Model 3: South Africa = wsa = $f(\ln pita, \ln pmal, \ln pnz, \ln psa, \ln pspa, \ln pusa, \ln rexp)$ – 1 lag

Hypothesis	r = 0	0.05 c.v.	r ≤ 1	0.05 c.v.
Trace	473.3056**	169.5991	284.7124**	134.6780
π max test	188.5932**	53.18784	117.0271**	47.07897

ECTsa = WSA–(0.01)*LNPITALUK+0.04)*LNPMALUK–(0.01)*LNPNZUK+(0.008)*LNPSAUK(-0.17)*LNPSPAUK–(0.07)*LNPUSA– (0.007)*LNREPUK + 0.15

(-0.16) (1.07) (-0.45) (1.12) (-1.58) (-2.01) (-12.60) (2.09)

Model 4: Spain = wspa = $\boldsymbol{f(\ln pita, \ln pmal, \ln pnz, \ln psa, \ln pspa, \ln pusa, \ln rexp)}$ **– 1 lag**

Hypothesis	r = 0	0.05 c.v.	r ≤ 1	0.05 c.v.
Trace	375.8566**	169.5991	205.5345**	134.6780
π max test	170.3221**	53.18784	73.73402**	47.07897

ECTspa = WSPA+(-0.79)*LNPITALUK+(0.07)*LNPMALUK-(0.15)*LNPNZUK+(1.54)*LNPSPAUK+(0.10)*LNPSAUK–(0.18)*LNPUSA+(0.01)*LNREPUK - 0.1163

(-1.68) (0.42) (-1.45) (3.11) (3.20) (-1.14) (6.34) (-0.35)

Model 5: USA = wusa = $\boldsymbol{f(\ln pita, \ln pmal, \ln pnz, \ln psa, \ln pspa, \ln puusa, \ln rexp)}$ **– 1 lag**

Hypothesis	r = 0	0.05 c.v.	r ≤ 1	0.05 c.v.
Trace	372.8839	169.5991	206.4663	134.6780
π max test	166.4177	53.18784	64.96202	47.07897

ECusa = WUSA +(0.79)*LNPITALUK–(0.18)*LNPMALUK (0.1762)*LNPNZUK+(0.13)*LNPSAUK – (1.201)*LNPSPAUK + (0.25)*LNPUSA – (0.007)*LNREPUK + 0.87

(2.05) (-1.29) (2.06) (-5.06) (-2.97) (1.92) (-3.64) (3.27)

** signifies that a test statistic is statistically significant at the 5% level. (2) Co-integrating vector lags were chosen on the basis of SC criteria by employing EViews 7. (3) Tests are run employing EViews 7, 2010. c.v. indicates critical value.

The Johansen co-integration shows multiple co-integrating relationships for each country. According to the maximum eigenvalue and trace statistics, four co-integrating vectors are detected in each model of Table 4 and the same number of co-integrating vectors for Table 5. This is an indication of the long-term relationships between the various countries when it comes to tourism. Although there may be multiple co-integrating vectors, for the purpose of this study only the first co-integrating vector is used, as suggested by the research of Cortés-Jiménez *et al.* (2009). The individual equations to determine the error correction term of individual countries are found underneath the country models in Table 4 and Table 5. The t-statistics are in parentheses.

Since all the variables are integrated of order one (I(1)), and the Johansen test indicates there exists a long-run relationship between the variables, the EC-AIDS model has to be estimated. As was stated in the literature review, when the variables are non-stationary and co-integrated the LA/AIDS can be expanded into the EC-AIDS model. This equation takes into account the errors that occur from consumers and corrects them until they are in equilibrium. According to Khamkaew and Leerattanakorn (2010), the short-run AIDS model includes an error correction term, because it implies that the present change in budget shares does not exclusively depend on the current change in the relative price of tourism and real total expenditure per tourist, but also on the degree of disequilibrium in the previous period.

The remainder of this research therefore follows the EC-AIDS specification of Han *et al.* (2006) and Cortés-Jiménez *et al.* (2009), since the model that will be estimated will be an error correction model of tourism demand for South Africa by the UK and the USA. Using the basis of the model that was used by Cortés-Jiménez *et al.* (2009), the linear AIDs model, as defined in equation (1), is expanded to include an error correction term. Therefore, the following econometric model for both UK and USA tourist demand is estimated:

$$\Delta sdw_{it} = \sum_j c_{ij} \Delta \ln p_{jt} + b_i \Delta \ln(x/P^*) - \gamma[ECT_{t-1}] + \delta \Delta sdw_{it-1} + \theta_{1i} Db + \theta_{2i} Dst + \theta_{3i} Dsd + \theta_{4i} Dsf + c_{it} \quad (2)$$

Where i represents the country destination, j denotes all the country destinations, t signifies time with the time being from 1999Q1 to 2008Q4 (Q meaning quarter). For the variables that have been first-differenced the delta (Δ) is used and *ln* implies that the variable is transformed in natural logarithms. Natural logarithms were taken to eliminate measurement problems.

As for the description of the variables, sdw shows the seasonal differenced share of tourism expenditure assigned in destination i to total tourism expenditure in j destinations. The effective relative price of tourism in each destination is denoted by $\Delta \ln p_{jt}$. The ratio between the UK and USA tourist expenditures and the Stone price index is given by $\Delta \ln(RexP)$. The error correction term, also called the lagged co-integrating vector, is represented by ECT_{t-1}. sdw_{it-1} is the lagged dependent variable and indicates whether the previous year had an effect on the tourists' arrivals the following year and D shows the dummy variables. As indicated in the method, there are four dummy variables. The first dummy variable, Db, attempts to capture the lead up to the recession of 2008, which is defined as 1 for the four quarters of 2007, which had abnormally high tourist figures, and 0 for all the other periods. The other three dummies, Dst, Dsd, Dsf, are seasonal dummies to observe whether there are any noticeable trends that can be observed.

By establishing that the correct specification of the AIDS model to estimate is the EC-AIDS model, the second objective of the research is reached. The results of the EC-AIDS estimations and the resulting elasticities are explained in the next section.

5. RESULTS

5.1 Unrestricted AIDS Models

In this research, the EC-AIDS is estimated and, according to Cortés-Jimenez *et al.* (2009), the three most common estimation methods for AIDS models are: ordinary least squares (OLS), maximum likelihood (ML) and seemingly unrelated regression (SUR) estimations. This study will use the iterative SUR estimation method as Cortés-Jimenez *et al.* (2009) explain that the SUR method is more competent when using a system of equations model.

According to Moon and Perron (2006), the SUR can be used when a system of equations contains several individual relationships because their disturbance term is correlated. According to the authors, there are two main advantages in using the SUR method. The first is to gain efficiency in estimation by combining information in different equations and, secondly, the equation can impose/test restrictions that involve parameters in different equations. The estimated results are obtained using EViews 7 econometric software and are shown in Table 6 and in Table 7 for UK and for USA tourists respectively.

Table 6. Unrestricted AIDS model for UK tourists

	Italy	Malaysia	South Africa	Spain	USA
C	0.004660 (1.477051)	-0.000699 (-0.448560)	0.000384 (0.376761)	-0.005343 (-0.625428)	-1.89E-05 (-0.002252)
Δ ln P Italy	-0.019291 (-0.081057)	0.075158 (0.668927)	-0.005088 (-0.062404)	0.443094 (0.670309)	-0.511288 (-0.783768)
Δ ln P Mal	0.211254*** (2.974755)	-0.004818 (-0.136326)	0.013271 (0.541246)	-0.148140 (-0.749241)	-0.086879 (-0.449598)
Δ ln P SA	-0.005153 (-0.296537)	-0.002562 (-0.315333)	0.010242* (1.751246)	0.056272 (1.164765)	-0.062059 (-1.306522)
Δ ln P SPA	0.001676 (0.006971)	-0.081833 (-0.721865)	-0.005528 (-0.067053)	-0.341659 (-0.511164)	0.434720 (0.658078)
Δ ln P USA	-0.191509*** (-3.095871)	-0.002356 (-0.079408)	-0.012111 (-0.571012)	0.085922 (0.500543)	0.141765 (0.842976)
Δ ln P NZ	-0.034161 (-1.116962)	0.015508 (1.094561)	-0.023544** (-2.193069)	0.105670 (1.266825)	-0.049120 (-0.599188)
Δ ln RPEX	-0.001591 (-1.196831)	-5.46E-05 (-0.081319)	-0.000495 (0.935542)	0.008709** (2.555663)	-0.006255* (-1.860722)
EC(-1)	-0.094300 (-1.150446)	0.029039 (0.170167)	-0.181271** (-2.083346)	-0.077328 (-1.096035)	-0.066034 (-0.87910)
SDW(-1)	0.611222*** (8.392196)	0.543724*** (4.616016)	0.428014*** (4.054982)	0.552550*** (8.694622)	0.549488*** (7.942800)

Db	0.009117** (2.502268)	0.000974 (0.565409)	0.001172 (0.942796)	0.000831 (0.081406)	-0.012562 (-1.252020)
Dst	0.001120 (0.6887)	0.001896 (0.512787)	0.002110 (0.820925)	-0.012291 (-0.652937)	0.006736 (0.367888)
Dsd	-0.005495 (-1.610322)	0.001106 (0.640999)	-0.001026 (-0.893034)	0.001440 (0.152600)	0.004856 (0.526956)
Dsf	-0.009624 (-1.631442)	0.002971 (1.199976)	-0.002479 (-1.227602)	0.035701** (2.484901)	-0.024813* (-1.749509)
R^2	0.685495	0.498722	0.408452	0.668346	0.576643
R^2-adjusted	0.521952	0.238057	0.100847	0.495885	0.356498
DW-Stat	1.908108	1.972335	2.173765	1.746857	1.645919

*** = 1 % significance level ; ** = 5 % significance level; * = 10 % significance level

Table 7. Unrestricted AIDS model for USA tourists

	Italy	Malaysia	South Africa	Spain	UK
C	-0.001334 (-0.150263)	0.001195 (1.123775)	-0.000199 (-0.298227)	-0.003242 (-0.839009)	0.004387 (0.405726)
Δ ln P Italy	-0.556621 (-0.838777)	0.070097 (0.768719)	-0.018477 (-0.336000)	0.070794 (0.275369)	0.484150 (0.740535)
Δ ln P Mal	0.028855 (0.156733)	-0.054256** (-2.142971)	-0.006482 (-0.418105)	-0.161836** (-2.192329)	0.194356 (1.068826)
Δ ln P SA	-0.010479 (-0.227347)	-0.022097*** (-3.654828)	0.010487*** (2.857075)	-0.043275** (-2.570638)	0.055332 (1.174841)
Δ ln P SPA	0.565440 (0.828773)	-0.026420 (-0.283423)	0.02276 (0.405260)	-0.004719 (-0.017861)	-0.612940 (-0.916398)
Δ ln P USA	0.117894 (1.328178)	-0.007872 (-0.658163)	-0.006113 (-0.859416)	-0.018830 (-0.574138)	-0.087840 (-0.994961)
Δ ln P NZ	0.033041 (0.452139)	0.015999 (1.622968)	-0.007948 (-1.279610)	0.010838 (0.402059)	-0.040225 (-0.549873)
Δ ln RPEX	7.59E-06 (0.896089)	-2.07E-06* (-1.765002)	-4.35E-09 (-0.006425)	-2.50E-06 (-0.766360)	-6.00E-06 (-0.707243)
EC(-1)	-0.285292** (-2.238776)	0.076351 (0.472632)	-0.447335** (-2.154648)	-0.343145** (-2.473922)	-0.334758** (-2.134341)
SDW(-1)	0.578774*** (5.966587)	0.371585*** (3.495458)	0.814197*** (5.947657)	0.734039*** (7.384007)	0.642555*** (5.753802)
Db	-0.036930*** (-3.234293)	0.003681** (2.365027)	0.001714* (1.908678)	0.003531 (0.829981)	0.025711** (2.217986)
Dst	-0.019681 (-1.249818)	-0.002146 (-0.951184)	0.001636 (1.037393)	-0.002659 (-0.466938)	0.019375 (1.381996)
Dsd	0.028225* (1.819569)	0.000138 (0.109344)	-0.001339 (-1.417824)	0.011974** (2.209738)	-0.038731* (-1.923137)
Dsf	0.015027 (0.937761)	0.001050 (0.578730)	-0.000626 (-0.613705)	0.005745 (1.000947)	-0.018654 (-1.032049)
R^2	0.497246	0.625207	0.562218	0.626087	.493998
R^2-adjusted	0.235814	0.430315	0.334571	0.431652	0.230877
DW-Stat	2.437307	1.382026	1.967177	1.573946	2.452673

*** = 1 % significance level ; ** = 5 % significance level; * = 10 % significance level

In both, Table 6 and Table 7, it can be observed that there are a number of insignificant variables but they are kept in the estimation for the requirements of the AIDS. In the two tables, the lagged dependent variable (SDW(-1)) is significant for all the countries. This is expected as it shows that tourist expenditure is affected by that of previous years. Furthermore, the results in Table 6 and Table 7 are mixed, with the own-price variable and error correction terms only significant for some countries. The dummy that was inserted for the recession is significant for most countries as can be seen in Table 6 and Table 7, which indicates that 2007 was an abnormal year in terms of tourism. There are also some seasonal dummies that are significant and this captures the seasonal effect tourism from the UK and the USA. The R-squared statistics are low, which is not surprising since a number of variables are insignificant.

The two unrestricted models have some similarities with similar models that were estimated by Cortés-Jiménez *et al.* (2009) in that the expenditure variable is not very significant for most countries. The lagged dependent variable is significant for all the countries, in contrast to results found by Cortés-Jiménez *et al.* (2009).

5.2 Model Restrictions

As explained in the literature review, the properties of demand can be imposed in the form of restrictions for the AIDS model, the restrictions being homogeneity and symmetry. The Wald test is used to establish whether the restrictions satisfied the null hypothesis of homogeneity and symmetry. The results are presented in Table 6 and Table 7 with a five per cent level of significance being used in the null hypothesis ($p< 0.05$ can reject the null hypothesis that the variables are homogenous and symmetric).

Table 8. Wald test for homogeneity, symmetry and combined for UK tourists – AIDS model

	Homogeneity	**Symmetry**	**Combined**
Chi-Squared (probability)	6.3236 (0.276)	4.9690 (0.893)	13.5533 (0.560)

Table 9. Wald test for homogeneity, symmetry and combined for USA tourists – AIDS model

	Homogeneity	**Symmetry**	**Combined**
Chi-Squared (probability)	4.1342 (0.530)	7.3643 (0.691)	12.3701 (0.651)

For the UK model (indicated in Table 8) one cannot reject the null hypothesis of homogeneity and symmetry. Table 9 shows that the null hypothesis for homogeneity and symmetry cannot, also, be rejected for the USA model. The models therefore satisfy the restrictions of homogeneity and symmetry and the unrestricted EC-AIDS model will suffice when calculating the elasticities.

5.3 Elasticities

Han, Durbarry & Sinclair (2006) explain the formulas for calculating the elasticities from an AIDS model. The relevant formulas are shown below and correspond to the parameters estimated according to equation (2):

- Expenditure elasticity:

$$\eta_i = \frac{1}{w_i}\frac{dw_i}{d\ln x} + 1 = \frac{b_i}{w_i} + 1$$

- Uncompensated own-price elasticities:

$$\varepsilon_{ij} = \frac{1}{w_i}\frac{dw_i}{d\ln p_i} - 1 = \frac{\delta_{ii}}{w_i} - b_i\frac{w_i^{\beta}}{w_i} - 1$$

- Uncompensated cross-price elasticities:

$$\varepsilon_{ij} = \frac{1}{w_i}\frac{dw_i}{d\ln p_i} = \frac{\delta_{ii}}{w_i} - b_i\frac{w_i^{\beta}}{w_i}$$

Firstly, the expenditure elasticity is calculated using the results of the estimation that was provided by the unrestricted AIDS model. Both the expenditure elasticities for UK and USA tourists are shown by Tables 10 and 11 respectively.

Table 10. Expenditure elasticities for UK tourists – AIDS model

Country	Italy	Malaysia	South Africa	Spain	USA
η	0.989667**	0.996556**	0.982888**	0.999995**	0.752415**

** = indicates significant at the 5% level

Table 11. Expenditure elasticities for USA tourists – AIDS model

Country	Italy	Malaysia	South Africa	Spain	UK
η	1.00002**	0.999874**	1.0000000**	0.999983**	0.999986**

** = indicates significant at the 5% level

From the above tables, it is evident that the expenditure elasticities are all positive which means that, for UK and USA tourism, none of the destinations is 'inferior' because the shares increase with the real expenditure per capita.

In Table 10, it is evident that all of the elasticities are close to unity. This, in part, may be due to the dynamic nature of the model and the preferences of tourists such that no discernable difference can be made between the countries in terms of their expenditure elasticities. The USA's expenditure elasticity is the only one that is not close to unity and shows that UK tourists have a preference for the USA.

In Table 11, it is evident that all of the elasticities are again close to unity but, as was seen in Table 10, the dynamic nature of the model could possibly have an influence on the elasticities being so close to unity.

Demand theory dictates that own-price elasticities should be negative. Theoretically, if the price of a product/destination increases, demand should decrease (ceteris paribus). In this study, only the uncompensated own-price and cross-price elasticities are calculated, since De Mello *et al.* (2002) state that uncompensated elasticities focus on the real reaction of the dependent variable to changes in prices. This is useful, because it supplies more clear and direct information about the behaviour of demand. This feature of the uncompensated elasticities makes it more suitable for policy purposes.

Positive and negative signs for cross-price elasticities indicate whether countries are substitute or complementary destinations. In the AIDS context, De Mello *et al.* (2002) state that concise deductions about the substitute and complementary effects are not always possible because, in previous studies, the models have not produced distinct cross-price effects. They also add that the results of the substitute and complementary effects should not distract from their importance as far as the relative magnitudes and the direction of change in demand goes. (The equations for the own-price and cross-price elasticities equations are shown above.)

Table 12. Uncompensated own-price and cross-price elasticities for UK tourists

	Italy	Malaysia	South Africa	Spain	USA
Italy	**-2.48839****	1.372973**	-0.03317	0.016394	-1.24137**
Malaysia	4.742454**	**-4.30649****	-0.16153	-5.16129**	0.14778**
South Africa	-0.17341**	0.459414**	**-0.51455****	-0.18213**	-0.41472**
Spain	0.831246	-0.27791	0.105567**	**-1.03159****	0.161192
USA	-0.51129**	-0.08688	-0.24043**	1.866288**	**-1.21087****

** = indicates significant at a 5% level

Table 12 shows, in terms of UK tourists' own-price elasticities (the diagonal in Table 12), that they are in some cases sensitive to price change and in other cases not as sensitive. For example, the figures show that a one per cent increase in prices in Italy will lead to a decrease of 2.49 per cent in UK tourism demand for Italy. A one per cent price increase in South Africa will lead to a 0.51 per cent decrease in tourism demand from the UK. One of the possible reasons why the elasticity for South Africa is quite low can be put down to the Pound Sterling/SA Rand exchange rate, where UK tourists do not see an increase in prices as a deterrent to travel to South Africa. This shows that UK tourists are price-*insensitive* when travelling to South Africa.

In terms of cross-price elasticities, it can be seen that most of the countries compete on prices. Positive signs mean that a country is a substitute for another country. For example, if South Africa's tourism price increases by one per cent, Malaysia gains 0.45 per cent in demand. On the other hand, it seems that South Africa and Italy are complements with an increase of one per cent in the tourism price of South Africa leading to a 0.41 per cent decrease in tourist demand to the USA. It is also interesting to note that a one per cent increase in the tourism price in Italy would lead to a 1.24 per cent decrease in tourism demand for the USA by UK tourists and, the same increase in prices by the USA would lead to a 1.87 per cent increase in demand for Spain as a tourism demand from UK tourists.

Table 13. Uncompensated own-price and cross-price elasticities for USA tourists

	Italy	Malaysia	South Africa	Spain	UK
Italy	**-1.12525****	0.077156	-0.02802**	1.511959**	0.315235**
Malaysia	4.271947**	**-1.30349****	-1.34666**	-1.6101**	-0.47969**
South Africa	-0.85534**	-0.30004**	**-0.64567****	1.053899**	-0.28297**
Spain	0.473969	-1.08348**	-0.28972**	**-0.94679****	0.12606**
UK	1.162318	0.466597	0.132838	-1.4715	**-0.43443****

** = indicates significant at the 5% level

Table 13 shows, in terms of USA tourists' own-price elasticities (the diagonal in Table 13), that they are not as sensitive to price change as UK tourists. For example, the figures show that a one per cent increase in prices in Italy will lead to a decrease of 1.12 per cent USA tourism demand for Italy. In terms of South Africa, a one per cent increase will lead to a 0.64 per cent decrease in tourism demand from the USA. Again, as in the previous model of UK tourists, the US Dollar-SA Rand exchange rate is favourable for USA tourists and a 1% price change would not lead to a demand change greater than 1%. It can be said that USA tourists are also price *insensitive* when it comes to South African prices and that the tourists do not seem to be discouraged by a stronger Rand.

In terms of cross-price elasticities, it can again be seen that most of the countries compete on prices. Positive signs mean that a country is a substitute for another country. For example, if South Africa's tourism price has a one per cent increase, it will lead to a 1.05 per cent increase in demand in Spain. This substitute effect can possibly be put down to the two countries having the same climate. Furthermore, it shows that a one per cent increase in the tourism price in South Africa would lead to a 0.85 per cent decrease in tourism to Italy from the USA and a decrease of 0.3 per cent in demand for Malaysia. Quite significant is that a one per cent increase in the tourism price in Italy would lead to a 1.51 per cent increase in demand for Spain from USA tourists. It is interesting to note that none of the UK cross-price elasticities with the other countries is significant even though they show large elasticity values.

6. CONCLUSION

This study joins a few studies that have dealt with tourism demand for South Africa, and is therefore important in understanding how tourism demand is affected, especially in a developing country that places so much emphasis on tourism. This research investigated tourism demand for South Africa from the United Kingdom (UK) and the United States of America (USA). Using quarterly data from 1999 to 2008, the demand for South Africa as a tourist destination by UK and USA tourists was modelled in a demand system, taking into account these countries' demand for other destinations as well – most notably their demand for Italy, Malaysia, New Zealand, Spain and UK (in the case of the USA) and the USA (in the case of UK tourist demand).

Secondly, this research aimed to determine whether the linear AIDS or error-correction AIDS model fits the South African data best. Within the microeconomic framework provided by the AIDS model, the data enabled the adoption of a dynamic error-correction AIDS (EC-AIDS) model which incorporates the dynamic nature of consumer behaviour. The unrestricted version of the model was found to be sufficient.

In addition to estimating the correct model, the research also calculated the elasticities associated with tourism demand for South Africa, which serves as the basis on which policy recommendations and conclusions that can be drawn from the AIDS models. The expenditure, own-price and cross-price elasticities were derived from the unrestricted EC-AIDS model.

Within this framework, own-price elasticities show the degree to which increases in tourism prices will reduce a destination's competiveness for UK and USA tourists. All destinations show a reduction in competiveness, but it is found, particularly in the South African case, that UK and USA tourists are not sensitive to price change and thus other factors must be the cause of less rapid growth in tourism.

Cross-price elasticities show the degree to which tourism demand for competing destinations will change in response to a price increase in one of them. All the South African cross-price elasticities are significant for both UK and USA tourists. For the UK, if there is an increase in the tourism price for South Africa, Malaysia will gain in price competiveness. The USA cross-price elasticity shows that, if South Africa has a rise in tourism prices, Spain will 'gain' in price competiveness.

Expenditure elasticities show the degree to which tourism demand will change in response to changes in the expenditure of UK and USA tourists. All the destinations are close to unity, which shows that, regardless of expenditure, people are still willing to visit the destinations. The results therefore imply that tourism from the USA and UK to South Africa is still more sensitive to changes in income than to changes in price. The slowdown in demand for South Africa from these destinations is therefore more likely to be linked to a slowdown in income than to a change in price competitiveness. However, the results also show that substitution effects are present and that Malaysia and Spain stands to gain from excessive price increases in South Africa.

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APPENDIX:

Stone price index:

$$\ln p^* = \sum_i w_{it} \ln p_{it}$$

$$\ln p_{it} = \ln[\frac{CPI_{it} * E_{it}}{CPI_{iUK} * E_{ibase}}]$$

$$\ln p_{it} = \ln[\frac{CPI_{it} * E_{it}}{CPI_{iUSA} * E_{ibase}}]$$

Where:

- $\ln p_{it}$ = effective tourism price
- CPI_{it} = Inflation of the destination country at time t
- E_{it} = Exchange rate of destination country at time t
- CPI_{iUK} and CPI_{iUSA} = Inflation of countries the tourists come from
- E_{ibase} = Base exchange rate of Pounds Sterling for the UK and US Dollars for the USA in 2005