A Review of Quantitative Modeling of International Tourism Demand

Muideen Adejare Isiaka

Department Of Economics, Accounting and Finance Bells University of Technology, Ota. Ogun State, NIGERIA

Abstract:

This study contains a review of various methodologies that have been used by researchers in measuring, modelling and estimating international tourism demand. It includes the measures of dependent and independent variables, econometric modelling of international tourism demand and its specification. The study identifies limited use of advanced quantitative methods like differential equation based system dynamics, multi-agent model based models, game theory application, artificial intelligent and machine learning models, network modeling and graph theory. The study concludes that international tourism organization should help build research capacity on the use of these modern methods.

Keywords: International Tourism, Demand model, Functional forms, Econometric model.

1. Introduction :

International Tourism Demand Can Be Defined As The Amount Of A Set Of Foreign Tourist Products That Consumers Are Willing To Acquire During A Specific Period Of Time, And Under Certain Conditions Controlled By The Explanatory Factors Used In Demand Theory (Song And Witt, 2000). In The Econometric Modelling Of International Tourism Demand, There Are No Standard Measures Of International Tourism Flows Universally Acceptable. A Number Of Studies Have Used Different Proxies For International Tourism Demand. These Include: International Tourist Expenditure/Receipts, International Tourist Arrivals/Departures, Travel Export/Import, The Number Of International Tourist-Nights Spent At Tourist Accommodation And Average Length Of Stay (Witt And Witt, 1995; Crouch And Louviére, 2000; Song And Witt, 2000). Notably, International Tourist Arrivals/Departures Have Been The Most Frequently Used Proxy For International Tourist Demand (Lim, 1997). According To Davies And Mangan (1992), An Increased Length Of Stay Allows Tourists To Undertake A Larger Number Of Activities, Which Affect Their Overall Spending, Sense Of Affiliation And Satisfaction. Therefore, Several

Authors Consider Length Of Stay An Important Market Segmentation Variable In Estimating The Determinants Of Tourist Spending (Davies And Mangan, 1992; Mok And Iverson, 2000). The Use Of Tourism Arrival As Dependent Variable Is Common In The Literature. In A Review Of Empirical Tourism Studies Between 1966 And 1992, Witt And Witt (1995) Observe That The Most Common Dependent Variables Are Number Of Tourists (Measured By Arrivals) And Tourists' Expenditure.

The Tourism Demand Literature Shows That There Are Several Measurements For International Tourism Demand Such As: The Number Of The Tourist Arrivals, The Number Of Nights Spent By Tourists Or The Receipts From Tourism. According To Song And Li (2008), The Number Of Tourist Arrivals Is Still The Most Popular Measurement In Tourism Demand Studies. The Main Reason For This Choice Has Been Easy Availability Of Tourist Arrivals Data. The Tourist Arrivals Include The Number Of Visits Or Trips; Tourist Or Visitor Flows, The Number Of Tourists Per Capita On Independent Travel, On Package Tours And By Surface Travel And Other Less Frequent Variables. Tourist Expenditures Are Also Frequently Used To Measure Demand For

International Tourism. It Is Expressed In Nominal Or Real Terms, Per Head Of Origin Population And Per Visitor Or Per Diem. One Of The Less Used Variables As A Dependent Variable Is The Number Of Nights Spent At Tourists' Accommodation. Lim (1997) Argues That Number Of Nights Spent By A Tourist Is Superior To Using Other Proxies Because It Accounts For The Length Of Stay With Friends And Relatives. Studies That Used Length Of Stay Show How It Varies With Nationality, Age, Occupation Status, Repeat Visit Behaviour, Stage In The Family Life Cycle And Physical Distance Between Place Of Origin And Destination, Among Other Variables. While These Studies Do Find Interesting Results, Their Descriptive Nature Hinders Formal Inference Tests On The Causal Relationships Between Individual Socio-Demographic Profiles And Actual Trip Experiences And Length Of Stay. Recently, Some Authors Have Employed Micro-Econometric Models To Estimate The Determinants Of Length Of Stay.

The Remaining Part Of This Study Is Divided Into Five Sections. Section 2 Contains The Review Of Types Of Equations Used In Tourism Demand Modeling While Section Threes Reviews The Major Dependent And Independent Variables Included In Tourism Demand Models. The Review Of The Explicit Specification Of The Quantitative Models Of International Tourism Demand Is The Focus Of Section 4 While Section 5 Identify The Future Direction Of Research In This Area. This Is Followed By A Brief Conclusion Section.

2. Types Of Equations In Tourism Demand :

The Main Methods Of Evaluating Tourism Demand Can Be Divided Into Single And System Equations Models. Tourism Demand Has Been Analysed For Groups Of Countries, Individual Countries Or States; It Has Also Been Disaggregated By Type Of Visits (Such As Holiday And Business Tourism); By Tourists' Characteristics (Such As Nationality, Age, Gender And Socio-Economic Groups); By Type Of Tourism Products (Sport Tourism, Ecotourism) And For Specific Components Of Tourism Products (Such As Accommodation And Transportation) (Stabler *Et Al.*, 2010).

The Single Equation Method Dominates The Tourism Demand Research During The First 30 Years Of Tourism Research (Since The 1960s). Most Of The Models Aimed At Estimating Aggregate Tourism Figures For A Given Destination, And Without Theoretical Justification For The Functional Form Adopted (Lim 1997, Durbarry And Sinclair 2003).

Starting From The 90s, An Advanced Class Of Neoclassical Models Made Its Appearance In Pursuit Of Strong Consistence Between Empirical Models And Neoclassical Theory And Shift Of Analytical Focus From Destinations To Origins. Tourism Figures For A Given Destination Could Be Consistently Estimated By Estimating, For Each Origin, The Number Of Individuals Who Choose That Destination As Their Preferred Country. Such Awareness Produced A Consequent Shift From Single Equation To System Of Equations Models. Empirical Models' Functional Form Was Often Justified By Various Theoretical Demand Systems Like The Linear Expenditure Demand System (LEDS) (Carraro And Manente 1994; Smeral And Witt 1996), And The Almost Ideal Demand System (AIDS) (Divisekera 2003; Durbarry And Sinclear 2003).

Quantitative Studies On Tourism Demand Analysis Can Be Divided Into Two Groups. The First Focuses On Time Series Modelling Approaches While The Second Concentrates On Causal Techniques. The Time Series Models Extrapolate Historic Trends Of Tourism Demand Into The Future Without Considering The Underlining Causes On The Trends. Another Limitation Of These Models Is That They Are Not Based On Any Theory That Underlines Tourist's Decision Making Process. On The Other Hand, Causal Models Are Carefully Constructed Based On Economic Theory And Pay A Particular Attention To The Factors That Influence Tourism Demand. Studies Published Between The 1960's And Early 1990 Mainly Followed The Traditional Regression Approach, Given That The Models Were Specified In Static Form With Limited Diagnostic Statistics Being Reported. In The Mid 1990's, Dynamic Specifications Such As The Autoregressive Distributed Lag Model (ADML) And Error Correction Model (ECM) Began To Appear In The Tourism Literature (Song And Witt, 2006).

Early Researches On Tourism Concentrate On Static Specifications Based On AIDS. In Purely

Static Specifications Such As The Orthodox AIDS Approach, Consumers Are Assumed To Adjust Perfectly And Instantaneously To Changes In Their Demand Determinants. Tourism Demand Has Traditionally Been Modelled Using Various Approaches, Including Structural Equations And Time Series Techniques. These Have Been Able To Forecast Changes In The Number Of Tourists Over Time (Papatheodorou, 1999; De Mello, Pack And Sinclair, 2002). In A Recent Review To Identify The Frontier Of Research Methodology In Relation To Modelling And Forecasting Of Tourism Demand, Song And Li (2008) Observe Increased Application Of Advanced Time Series And Econometric Methodologies In Recent Studies Than Earlier Studies After Comparing The Recent Research Trend With The Earlier Studies Conducted Between 1960 And 2000 As Reviewed In Li, Song And Witt (2005). The Earlier Studies Between 1960 And 2000 Lack The Use Of Modern Econometric Techniques And Test Like Error Correction Mechanism, Generalised Autoregressive Conditional Heteroskedastic Model, Exponential Smoothing, Fuzzy Time Series And Genetic Algorithm Which Are The Feature Of Recent Studies. Most Of These Studies Are Preoccupied With Forecasting Rather Than Modelling Tourism Demand.

Morley (1997) Uses Non Linear Diffusion Type Dynamic Model To Estimate Tourist Arrivals In Australia From Seven Major Countries Of Origin Based On Importance Of Information Flow. The Study Was Based On The Assumption That Current Level Of Tourism From Origin Country To Destination Country Depends On Available Information About Destination Country. Positive Information Leads To Higher Flow While Negative Information Leads To Lower Flow. This Is Irrespective Of Whether The Information Is Deliberately Sought For Or Randomly Encountered. Based On A Three-Stage Budgeting Process, Li, Song And Witt (2006) Compared Fixed Parameter Linear Almost Ideal Demand System (LAIDS) Model With Time Varying Parameter (TVP)-LAIDS. Given That LAIDS Is A System Demand Model, They Were Not Able To Obtain Kalman-Filter-Based Simultaneous Estimation Of The TVP-LAIDS As It Consumes Many Degrees Of Freedom. Nonetheless, They Were Able To Estimate Unrestricted Model Equation By Equation For The Long Run (TVP-LR-LAIDS) And The Short Run (TVP-EC-LAIDS) Versions.

3. Dependent And Independent Variables In International Tourism Demand Models :

For The Independent Variables, A Recent Survey By Song And Li (2008) Shows That Main Factors Affecting Tourism Demand In Recent Empirical Studies Include: Income Of Tourist, Relative Tourism Price Between Destination And Origin Country, Substitute Tourism Price In Competing Destinations And Exchange Rates. Notably, Prideaux (2004) Lists Factors That Affect Tourism Flow To Include Price, Exchange Rate, National Income, Cost Of Utilities (Communication, Energy, Water, Financial Services, Domestic Transport, And Tariff Protection), Destination Image, Personal Financial Capability To Travel, Personal Preferences, Government Regulations And Risk Factors (Political Tension, Health Epidemics, Concern For Personal Safety And Fear Of Crime). The Most Common Variables Are Income And Prices As Predicted By The Traditional Consumer Theory. Macroeconomic Variables Like Exchange Rate Volatility And Inflation Rate Has Become Important Factors In Tourism Demand Model (Saayman And Saayman, 2013; Chao Et Al., 2013; De Vita And Kyaw, 2013 And Chen Et Al., 2015).

Conceptually, The Larger The Real Per Capita Income Of A Country, The More Likely Its Citizens Can Afford To Purchase Travel Services Abroad, Ceteris Paribus. Growth In Real Incomes Provides Consumers With Increased Spending Power. In Examining The Relationship Between Income And Tourism Demand, It Seems Reasonable To Suggest, That Once One Achieves A Certain Level Of Income, The Income Elasticity Will Increase Initially But Then, It Will Remain Approximately Constant For A Range Of Per Capita Income. Ultimately, It Will Decrease As It Is Unlikely That Tourism's Share Of Expenditure Out Of GNP Would Grow Indefinitely. In Tandem With This, Barry And O'Hagan (1972) Have Addressed The Concept Of A Saturation Effect. They Based It On The Hypothesis That, After A Certain Point, The Amount Of Utility Accruing To An Individual From A Holiday May Decline As The Number Of Tourists Enjoying Utility From

The Same Holiday Increases. A Vast Majority Of Studies Have Included Income As An Explanatory Variable In Tourism Demand Models. Some Studies Have Used Total National Disposable Income (Bond And Ladman, 1972; Oliver, 1971; TRA, 2016; Kusni Et Al., 2013). Artus (1970) Derive An Index From Real Disposable Income Whereas, Uysal And Crompton (1985) Used GNP Per Capita Data.

The Effect Of Price Changes Is More Complex In Tourism Than The Effects Of Changes In Income. It Is Not Just Destination Holiday Prices That Are Important But Also, Relative Price Differences Between The Destination And The Generating Country. Basically, There Are Three Elements Constituting The Price Of Tourism: The Cost Of Travel To The Destination; The Exchange Rate Between The Tourist's Country Of Origin And That Of The Destination Country And The Cost Of Goods And Services Incurred After Arrival. Gerakis (1966) Posits That The Effects Of These Price Changes Are Short Term Whereas Barry And O'Hagan (1972) View The Effects To Be Long-Term, On The Basis That, Reputations For Expensiveness Or Cheapness Passed On By Word-Of-Mouth Are Developed Over A Number Of Years, For Example, The Reputed Cheapness Of Greece And Expensiveness Of Paris.

Defining Tourism Prices Is Very Difficult, Given That, The Cost Of Tourism Is A Function Of The Total Mix Of Goods And Services Consumed By Each Tourist. However, Price Indices For Tourists Simply Do Not Exist (Witt And Witt 1992). Edwards (1988) Emphasizes The Point That No Country Has An Adequate Price Series Representing Costs To Tourists. Most Authors Have Used The CPI Or The Retail Price Index As Proxy For The Cost Of Tourism (Little, 1980; Loeb, 1982; Witt And Martin, 1987). Nonetheless, These Authors Complain About The Fact That There Is No Better Measure. Notably, Most Authors Who Have Used The CPI As A Proxy Would Accept The Argument That The Mix Of Goods And Services Consumed By Tourists Is Not Very Different From The Mix Constituting The CPI And That, The Changes In The CPI Reasonably Reflect The Changes In The Prices Of Goods And Services Consumed.

Some Countries Have Attempted To Build A Price Series Of Hotel Charges. Observably, Such Price Series Are Limited Because They Relate To Nominal Rates And Not To The Discounted Rates Which Tour Operators Negotiate. Such Discounts Vary From Year To Year Usually In Accordance With The Expected Demand-Supply Balances. A Weighted Average One-Directional Airfare Has Been Used As A Proxy For Price By Bond And Ladman (1972) But The Authors Do Not Actually Give Their Reasoning As To Why The Cost Of Travel Would Be Appropriate To Reflect The Cost Of Tourism. Witt And Martin (1987) Have Shown That The CPI Is An Appropriate Proxy For The Cost Of Tourism Within The Context Of International Tourism Demand Models. A Number Of Studies Include A Price Variable In The Form Of Cost Of Tourism In The Destination Relative To The Cost Of Tourism In The Origin (Artus, 1970; Barry And O'Hagan, 1972; Kliman, 1981; Uysal & Crompton, 1985 And Witt, 1980). The Consequent Implication/Assumption From This Approach Is That The Substitute For A Particular Foreign Holiday Is Domestic Tourism.

Most Authors Make Reference To The Cost Of Transport As An Important Determinant Of Tourism Flows But Have Typically Excluded The Travel Cost Variable From The Model. Uysal And Crompton (1985) Summarized The Usual Explanations For Omitting Transportation Costs From Tourism Demand Models To Include: Insufficient Data; Anticipated Problems With Multicollinearity; Difficulty In Identifying The Appropriate Mode Of Transport Cost; Lack Of Statistically Significant Results In Studies Where It Is Included; And The Reluctance To Lose Another Degree Of Freedom In Estimation. Jud (1974) Used Distance As A Proxy For The Cost Of Travel. This Approach Is Questionable On The Basis That Only In Cross-Sectional Models Where Prices Are Held Constant At A Given Moment Can Distance Serve As An Index Of Cost And Even Then, Fares And Distance Do Not Move Exactly In Step. Therefore, The Coefficient Of The Distance Variable Cannot Sufficiently Represent A Measure Of Responsiveness To The Cost Of Transport. Bond And Ladman (1972) Used A Weighted Average One-Directional Air Fare Cost As A Proxy Of How The Cost Of A Whole Trip Might

Vary Through Time. Witt (1980) Included Travel Time In His Model.

Coshall (2000) Identified Other Variables That Explain International Tourism Flows To Include Many Financial, Perceptual, Cultural, Social And Environmental Factors. Lim (1997) Summarized Some Of The Variables Used In The Analysis Of Tourism Demand Since The 1960s. Various Independent Variables Are Used And The Number Of Independent Variables Ranges From One To Nine. The Most Popular Variable Was Income Used By 84per Cent Of Those Studies. Income Influences The Ability To Pay For Overseas' Travel And Proxies Used For Income Include Nominal Or Real Per Capita Personal, Disposable Or National Income Or GDP And GNP. Other Important Variables Identified By Lim (1997) Were: The Relative Prices Of Goods And Services Purchased By Tourists In Chosen Destinations, Compared With The Origin And Competing Destinations As Measured By The CPI Ratio (73per Cent); Transportation Cost, Which Refers To The Cost Of Round-Trip Travel Between The Destination And The Origin Country (55per Cent); Dynamics Are Often Included To Account For Lagged Effects (26per Cent); Exchange Rate Between The Currencies Of The Destination And Origin Country (25per Cent); Trends, Which Capture Secular Changes In Tourist Taste (25per Cent); Competing Destinations/Goods, Which Lead To Substitution When Costs Associated With Travel And Tourism Increase (15per Cent); Seasonal Factors, Often Captured In Dummy Variables (14per Cent); Marketing Expenditures To Promote The Country As A Destination (7per Cent); Migration And Ethnic Factors, Which Captures Tourists Visiting Friends Or Relatives (5per Cent); Business Trade/Travel, As Measured By Proxies Such As Trade, Direct Foreign Investment And Capital Flows (5per Cent); Economic Activity Indicators, Such As Unemployment And Income Distribution (3per Cent); Some Authors Include Qualitative Factors, Such As Tourists' Attributed Household Size, Population In The Origin, Trip Motive Or Frequency, Destination Attractiveness, Events At The Destination (60per Cent); And Other Factors, Such As Supply/Capacity Constraints On Tourism Accommodation, Exchange Rate Reforms Or Foreign Currency Restrictions, Cross Price Elasticity Of Vacation Goods And The Average Propensity To Consume Tourism Goods (27per Cent). Kusni Et Al. (2013) Include Relative Price, Price Of Substitute Destination And Price Of Complementary Destination.

Some Studies Argued That The Extent Of Demand For Tourism Services From Any Origin Is Obviously Related To The Actual Size Of The Population, The Amount Of Potential Customers In A Market To Buy That Good. In General, Demand For Foreign Tourism From A Country With A Relatively Small Population Would Rarely Approximate To That Of A Country With A Large Population Even If The Propensity To Travel Abroad Is Higher In The Small Country. Bond And Ladman (1972) Allow For The Impact Of Population By Using It As A Separate Explanatory Variable. Their Study Confirmed That Population Proved To Be A Significant Variable In A Number Of Cases. Laber (1969) Estimated A Demand Model Using Three Variables And Then, Multiplies Each Of Them By The Population Figures. Thus, Population Does Not Actually Appear As A Separate Explanatory Variable In His Econometric Model.

One Would Expect Terrorist Attacks To Greatly Impact Choices Made By Consumers, As The Perceived Risk Of Travelling In A Relatively Dangerous Country Would Weigh Heavily On Considerations Of Utility. Hence, Consumers May Choose Alternative Destinations Less Vulnerable To Terrorism. Consequently, Some Researchers Have Tried To Estimate The Likelihood Of Tourists' attack On Tourism. To Proxy For Health Risk, Naudé And Saayman (2005) Use The Prevalence Of Malaria As An Explanatory Variable Claiming That It Has Been Identified As A Health Risk That Lowers Tourism By Gallup And Sachs (2000).

4. Quantitative Specification Of International Tourism Demand :

Naudé And Saayman (2005) Modelled Tourism Demand In Africa As A Two-Level Utility Function By The Following Optimization Problem:

Maximise

$$U_i(q_t \mid q_{t-1}) = \prod_{j=1}^{m}(q_{jt} - k_{jt})^{\delta_j}, \sum_{j=1}^{m}\delta_j = 1 \tag{1}$$

Subject to

$$\sum_j p_{jt}q_{jt} = e_t$$

In Equation 1, P_j Is The Price Of Tourism Produced In African Country J; $k_{jt} = y_{jt} + \gamma_j q_{jt-1}$; y_{jt} Is Positive And Represents The Minimum Consumption Requirement In Period T; $\gamma_j q_{jt-1}$ Is The Consumption Based On Past Consumption; Q_{ij} Is Demand For International Tourism By Origin I For African Destination J; E_t Is Past Tourism Consumption Expenditures Proxy By Incomes.

Tsounta (2008) Examined The Determinants Of Tourism Demand In The Eastern Caribbean Currency Union By Estimating The Demand Functions In A Panel Setting Using Annual Data Between 1979 And 2005. He Modeled Tourism Demand As Follows:

$$\ln \text{TD}_{it} = \beta_{0i} + \beta_1 \ln y_{it} + \beta_2 \ln p_{it} + \beta_3 \ln p_{it}^* + \beta_4 \ln \text{FDI}_{it} + \beta_5 \ln \text{OIL}_t +$$
$$\beta_6 \ln(\text{airline..s}_{it}) + \sum_{j=1}^{n}\beta_{6+j}d_{ijt} + \sum_{k=-m_i}^{M_i}\beta_k \Delta \ln(y_{it-k}) + \sum_{k=-m_2}^{M_2}\beta_k \Delta \ln(p_{it-k}) +$$
$$\sum_{k=-m_3}^{M_3}\beta_k \Delta \ln(p_{it-k}^*) + \sum_{k=-m_4}^{M_4}\beta_k \Delta \ln(FDI_{it-k}) + \sum_{k=-m_5}^{M_5}\beta_k \Delta \ln(OIL_{IT-K}) + v_{it} \tag{2}$$

In (2), T=1,..,27 (1979 To 2005) And I=1,...,6; Ms' Represent The Number Of Lead And Lags; Td_{it} Is The Number Of Tourist Arrivals In Island I At Time T; Y_{it} Is The Weighted Average Of The Real GDP Per Capita Of Source Countries Related To Country I At Time T, With Weight Being The Tourist Arrivals Shares From Each Country; p_{it}^* And p_{it} Are The Customer-Based And Competitor-Based Real Effective Exchange Rates, Respectively; Fdi_{it} Is The Foreign Direct Investment Inflow To Country I At Time T (Expressed In US Dollar Terms); Oil_{it} Is The Average Oil Price At Time T; $Airlines_{it}$ Is The Number Of Airlines Serving Destination I At Time T; D_{ijt} Is A Dummy Variable To Capture The Wars In Iraq In The Early 1990s And 2003, And Afghanistan In 2001; The September 11, 2001 Terrorist Attack In The United States; And Category 3 And Above, Hurricanes In Each Country; Δ Denotes The First-Difference Operator; β_{0i} Is Country Fixed Effect; V_{it} Is An Error Term.

Habibi, Rahim And Chin (2008) Examined The Long Run Demand For Tourism In Malaysia From United Kingdom And United States Using Error Correction Model And Cointegration Model On Time Series Data From 1972 To 2006. They Modelled Tourism Demand Simply As Follows:

$$Tai = Ƒi (Yi , Tpi, Tci) \tag{3}$$

In (3), Tai Is The Measure Of Tourist Arrivals From Every Origin Country I; Y Is The Real Income Per Capita; TP Is The Tourism Prices Adjusted By Exchange Rate And TC Is The Travel Cost Between The Origin And Destination Countries. Another Simple Formulation Of Tourism Demand Is That Of Zhou, Bonham And Gangnes (2007) Who Estimated A Vector Error Correction Model (VECM) Of Tourism Supply And Demand In Hawaii Tourism. They Expressed The Marshallian Demand For Tourism Product As:

$$D_{ij} = F(Y_i, P_i, P_j, P_j^s, Z) \tag{4}$$

In (4), D_{ij} Is The Tourism Product Demanded In Destination J By Consumers From Origin Country I; Y_i Is The Income Of Origin Country I; P_i Is The Price Of Other Goods And Services In The Origin Country I; P_j Is The Price Of Tourism Product In Destination Country J; P_j^s Is The Price Of Tourism Product In Competing Destinations; And Z Is The Vector Of Other Factors Affecting Tourism Demand.

Onder, Candemir And Kumral (2009) Examined The Determinants Of International Tourism

Demand In Izmir, Turkey And Modelled The International Tourism Demand As Follows:

$$TOUR_t = \alpha + \beta_1 EXCH_t + \beta_2 GDPOPC_t + \beta_3 GDPPC_t + \beta_4 TRANSP_t + \varepsilon_t$$
(5)

In (5), $Tour_t$ Represents Tourist Arrivals; $Exch_t$ Is The Real Exchange Rate; $Gdpopc_t$ Is Per Capita GDP Of The OECD Countries; $Gdppc_t$ Represents GDP Per Capita Of The Izmir; $Transp_t$ Is The Transportation Public Capital Stock; E_t Is Error Term And T Is Time. GDP Per Capita Of The Region Is Used As Indicators Of The Level Of Economic Development.

Boopen (2006) Examined The Determinants Of International Tourists' Arrivals In Mauritius With Particular Emphasis On The Impacts Of Transports On Tourism Development. He Used Cointegration Analysis To Estimate The Following Tourism Demand Function:

TR = F (GDPH, GDPF, ROOM, XRAT, CPI, TRANS, NONTRANS)   (6)

In (6), TR Is The Total Number Of Tourist Arrivals Per Annum In Mauritius; GDPH Is The Urbanisation And Development Level Of A Destination Proxied By The Income Of The Destination Country; GDPF Is The Weighted Average Of Real Per Capita Gross Domestic Product In Countries Of Origin As Proxy For Total Expenditures On Tourism; ROOM Is The Rooms Available In The Country As A Measure For The Capacity Of The Tourism Sector; XRAT Is The Nominal Exchange; CPI Is The Relative Price Measured By The CPI Of A Destination Country Adjusted By The $ Exchange Rate; TRANS Is The Stock Of Transport Infrastructure (Inclusive Of Air, Land And Water Transport) Constructed Using The Perpetual Inventory Methodology; NONTRANS Is The Non Transport Capital And Encompasses Other Public Capital Such As Communication, Energy, Waste Water And Defense.

Kareem (2007) Examined Demand For Tourism In Africa Using Panel Regression Methods On Data From 20 African Countries Over The Period Between 1995 And 2003. He Modelled Tourism Demand As Follows:

$$Inta_{it} = A_{i0} + A_{i1}inwy_{it} + A_{i2}incpi_{it} + A_{i3}inexc_{it}$$
$$+ A_{i4}incr_{it} + A_{i5}pol_{it} + A_{i6}intel_{it} + A_{i7}inta_{it-1} + E_{it}$$
(7)

In (7), I = 1---20; TA Is The Total Tourist Arrivals In Africa; WY Is The Real World Income; CPI Is The Exchange Rate Adjusted To Relative Prices Between Africa And The Rest Of The World; CR Is The Crime Rate Measured By The Incidence Of Recorded Crime Rate On The Continent; POL Is The Measure Of Political Instability; And Tel Is The Number Of Fixed And Mobile Telecommunication Services.

Habibi, Rahim, Ramchandran And Chin (2009) Examined Main Determinants Of The International Tourism Flows To Malaysia Using Dynamic Panel Regression On Annual Data Set From The 15 Most Important Generating Countries Between 1995 And 2005. They Modelled Tourism Demand As Follows:

$$lnTA_{i,t} = \beta_0 + \beta_1 lnTA_{i,t-1} + \beta_2 lnGDP_{i,t} + \beta_3 lnTP_{i,t} +$$
$$\beta_4 lnTO_{i,t} + \beta_5 D_{1997} + \beta_6 D_{2003} + \lambda_t + \eta_t + \varepsilon_{it}$$

In (8), $Ta_{i,T}$ Is The Number Of Tourists Arrivals In Malaysia From Country I During Year T; $Ta_{i,T-1}$ Is The Number Of Tourist Arrivals In Malaysia From Country I During The Previous Period; $Gdp_{i,T}$ Is The Gross Domestic Product In Each Of The Origin Country; $Tp_{i,T}$ Is The Relative Cost Of Living Of Tourists In Malaysia And $To_{i,T}$ Is The Trade Volume Between Malaysia And Each Of The Origin Countries. The Dependent Variable, As Well As The Lagged Dependent And The GDP Variables Are Expressed In Per Capita Terms. The Two Dummy Variables (D_{1997} And D_{2003}) Were Included To Capture The Effect Of The Asian Financial Crisis In The Year 1997 And The SARS Crisis In The Year 2003 On Tourism. D_{1997} Takes The Value Of 1 In Malaysia For The Year 1997 And 0 Otherwise. D_{2003} Takes The Value Of 1 In Malaysia For The Year 2003 And 0 Otherwise. The Fixed Effects Of Decomposition Of The Error Term Are λ_t , η_t And ε_{it} In Which λ_t And η_t Are The Time And Destination-Specific Effects. The Error Component ε_{it} Was Assumed To Be Serially Uncorrelated With Zero Mean And Independently Distributed Across Destinations But Heteroskedasticity Across Time And Destinations Were Allowed For. Moreover, ε_{it} Is Assumed To Be Uncorrelated With The Initial Condition $Lnta_{i,T}$, For T = 2,…,T, And With The Individual Effects Of η_t For Any T.

Walle (2010) Examined The Determinants Of Tourist Flows In Ethiopia Using Panel Data

$$TA_{it} = \beta_1 TA_{it-1} + \beta_2 PCI_{it} + \beta_3 EXR_{it} + \beta_4 DIST_i + \beta_5 CPI_{it} + \beta_6 Kenya_t + \beta_7 POP_{it} +$$
$$\beta_8 Urban_t + \beta_9 Road_t + \beta_{10} Internet_t + \beta_{11} Africa + \beta_{12} Year1 + \beta_{13} Year2 + \beta_{14} Year3 \quad (9)$$
$$\beta_{15} Year4 + \beta_{16} Year5 + \beta_{16} Year6 + \varepsilon_{it}$$

In (9), Ta_{it} Is The Number Of Tourist Arrivals From Country I In Year T; Ta_{it-1} Is The Number Of Tourist Arrivals From Country I In Year T-1; Pci_{it} Is The Per Capita Income Of The Sending Country I In Year T; Exr_{it} Is The Exchange Rate Between The Currencies Of Ethiopia And Origin Country I In Year T; $Dist_i$ Represents Air Distance From The Capital Of The Origin Country I To Addis Ababa; Cpi_{it} Stands For The Ratio Of Consumers' Price Indices (Cpis) Of Ethiopia And The Origin Country I In Year T; $Kenya_t$ Represents The Ratio Of Cpis Of Ethiopia And Kenya In Year T; Pop_{it} Stands For The Total Population Of The Sending Country I In Year T; $Urban_t$, $Road_t$ And $Internet_t$ Represent The Urbanisation Rate, The Length Of Road Network In Kilometres And Number Of Internet Users In Ethiopia At Time T Respectively; Africa And Year Denote Dummy Variables For The Sending Countries Being African And Six Years Respectively And E_{it} Is The Error Term.

Habibi And Rahim (2009) Examined International Tourism Demand In Malaysia From Ten Source Countries Using The ARDL Bound Test Approach To Cointegration For Quarterly Time Series Data From 1998:Q1 To 2007: Q3. They Modelled Tourism Demand As Follows:

$Lnta_t = B_0 + B_1 lnta_{t-1} + B_2 lny_{i,T} + B_3 lntp_{i,T} + B_4 lntc_{i,T} + B_5 lntps_{j,T} + B_6 lntv_{j,T} + B_7 d03 + E_{it}$ (10)

In (10), $Lnta_t$ And $Lnta_{t-1}$ Are Logarithm Of Tourists' Arrivals From Australia To Malaysia At Time T And Time T-1 Respectively; $Lny_{i,T}$ Is The Logarithm Of GDP In Country I At Time T; $Lntp_{i,T}$ Is The Logarithm Of Tourism Prices Between Malaysia And Country I (Relative Prices) At Time T; $Lntc_{i,T}$ Is The Logarithm Of Travel Cost Between Malaysia And Country I At Time T; $Lntps_{j,T}$ Is The Logarithm Of Tourism Price In Substitute Destination J At Time T; $Lntv_{j,T}$ Is The Value Of Trade Between Malaysia And Origin Country I At Time T; D03 Is The Dummy Variable With A Value Of 1 For The SARS Crisis In 2003: Q2 And Is 0 Otherwise.

Analysis. He Specified The Tourism Demand Model As Follows:

Garcia-Ferrer And Queralt (1997) Estimated International Tourism Demand For Spain. They Modelled The International Tourism Demand In Spain As Follows:

$X_{ij} = F (U_j (X, Y), Px_{ij}, Py_{ij}, R_j)$ (11)

In (11), Xij Is The Quantity Of The Tourism Products Demanded In Destination I By Tourists From Country J; $Uj (X, Y)$ Is The Utility Or The Attractiveness Of The Tourism Products Demanded In Country I From The Other Substitute Countries By Tourists From Country J; Px_{ij} Is The Price Of Travel Services For Tourists From Country J In Destination I; Py_{ij} Is The Price Of Travel Services For Tourists From Country J In Substitute Destination To I; R_j Is The Discretionary Income For Tourists From Country J. According To The Authors, If The Absolute Value Of The Price Elasticity Exceeds Unity, The Demand For Tourism Is Price Elastic And An Increase In Tourism Price Will Result In A More Than Proportionate Decrease In Quantity Demanded, And As A Result, Total Tourism Revenue Will Fall.

Bashagi And Muchapondwa (2009) Examined The Actions That Boost International Tourism Demand In Tanzania And Modelled Tourism Demand As:

$Visits = F (RP_1, RP_2, T, Y, EXR, QF)$ (12)

In (12), Visits Is The Tourist Demand For The Destination Country; RP_1 Is A Relative Price Index Between The Origin And Destination Country; RP_2 Is A Relative Price Index Between The Origin And Alternative Destination Countries; T Is The Transport Costs; Y Is Income Per Capita Of The Origin Country; EXR Is The Currency Exchange Rate, Measured As Units Of Destination Currency Per Unit Of Origin Currency; QF Are Qualitative Factors In The Destination Country. They Used Monthly Data Between 1996 And 2006 And Used The ARDL Approach To Estimate The

International Tourism Demand Model. They Specified The ARDL Function As:

$$\ln \text{VISITS}_t = f(\ln \text{VISITS}_{t-1}, \ln \text{TRP}_t, \ln \text{KRP}_t, \ln \text{OILPRICE}_t, \ln \text{INCOME}_t, \quad (13)$$
$$\ln \text{EXR}_t, \text{DUMMY}_{1998}, \text{DUMMY}_{2001})$$

And The Estimated Equations As:

$$\ln \text{VISITS}_t = \beta_0 + \beta_1 \ln \text{VISITS}_{t-1} + \sum_{t=0}^{t=q} \beta_2 \ln \text{TRP}_{t-t} + \sum_{t=0}^{t=q} \beta_3 \ln \text{KRP}_{t-t} +$$
$$\sum_{t=0}^{t=q} \beta_4 \ln \text{OILPRICE}_{t-t} + \sum_{t=0}^{t=q} \beta_5 \ln \text{INCOME}_{t-t} + \sum_{t=0}^{t=q} \beta_6 \ln \text{EXR}_{t-t} \quad (14)$$
$$+ \delta_1 \text{DUMMY}_{1998} + \delta_2 \text{DUMMY}_{2001} + \varepsilon_t$$

In (13) And (14), Visits$_t$ And Visit$_{t-1}$ Are The Number Of International Tourist Arrivals In Tanzania In Period T And Period T-1 Respectively; TRP Is The Domestic Tourism Price Proxy By The Ratio Of The Tanzanian CPI To The United States CPI (US CPI Was Used To Represent The World's Cost Of Living); KRP Is The Price Of Tourist Goods In Alternative Destinations (Proxy By The Ratio Of The Kenyan CPI To The United States CPI); OILPRICE Is The Monthly Average Of World Oil Prices (Used To Proxy Transport Costs); INCOME Is The Negative Value Of The United States Monthly Unemployment Rate (A Proxy For International Tourist Income); EXR Is The Exchange Rate Between The Tanzanian Shilling And The United States Dollar (A Proxy For The Exchange Rate Between Tanzania And The World); DUMMY$_{1998}$ Is A Dummy Variable Used For The 1998 United States Embassy Bombing In Tanzania; DUMMY$_{2001}$ Is A Dummy Variable Used For The 2001 Terror Attack In The United States. The Two Different Treatments Of The Two Dummy Variables Are Used To Capture Their Plausible Temporary And Permanent Effects On International Tourism Demand. In The Treatment That Captures Permanent Effects, The Dummy Variables Take The Value Of 1 From The Period That The Associated Event Occurs Onwards While In The Treatment That Captures Temporary Effects, The Dummy Variables Take A Value Of 1 For Only A Few Months Following The Associated Event.

Gormus And Gocer (2010) Examined The Socio-Economic Determinants Of Tourism Demand In Turkey Using Gravity-Based Two Ways Random Effect Panel Models For Annual Time Series From 2000 To 2006 For 32 Countries. They Specified The International Tourism Demand As Follows:

$$\ln TA_{it} = \alpha_i + \beta_1 \ln Y_{it} + \beta_2 \ln TV_{it} + \beta_3 \ln Dis_{it} + \beta_4 \ln AC_{it} + \beta_5 \ln RP_{it} + \beta_6 D01_{it} + \varepsilon_{it} \rightarrow \text{Model 1}$$
$$\ln TA_{it} = \alpha_i + \beta_1 \ln Y_{it} + \beta_2 \ln TV_{it} + \beta_3 \ln Dis_{it} + \beta_4 \ln AC_{it} + \beta_5 \ln RP_{it} + \beta_6 \ln Pop_{it} + \varepsilon_{it} \rightarrow \text{Model 2}$$
$$\ln TA_{it} = \alpha_i + \beta_1 \ln Y_{it} + \beta_2 \ln TV_{it} + \beta_3 \ln Dis_{it} + \beta_4 \ln AC_{it} + \beta_5 \ln RP_{it} + \beta_6 \ln ME_{it} + \varepsilon_{it} \rightarrow \text{Model 3}$$
$$\ln TA_{it} = \alpha_i + \beta_1 \ln Y_{it} + \beta_2 \ln TV_{it} + \beta_3 \ln Dis_{it} + \beta_4 \ln AC_{it} + \beta_5 \ln RP_{it} + \beta_6 \ln CPGRE_{it} + \varepsilon_{it} \rightarrow \text{Model 4}$$
$$\ln TA_{it} = \alpha_i + \beta_1 \ln Y_{it} + \beta_2 \ln TV_{it} + \beta_3 \ln Dis_{it} + \beta_4 \ln AC_{it} + \beta_5 \ln RP_{it} + \beta_6 \ln CPEGP_{it} + \varepsilon_{it} \rightarrow \text{Model 5}$$
$$\ln TA_{it} = \alpha_i + \beta_1 \ln Y_{it} + \beta_2 \ln TV_{it} + \beta_3 \ln Dis_{it} + \beta_4 \ln AC_{it} + \beta_5 \ln RP_{it} + \beta_6 \ln CPSPA_{it} + \varepsilon_{it} \rightarrow \text{Model 6} \quad (15)$$
$$\ln TA_{it} = \alpha_i + \beta_1 \ln Y_{it} + \beta_2 \ln TV_{it} + \beta_3 \ln Dis_{it} + \beta_4 \ln AC_{it} + \beta_5 \ln RP_{it} + \beta_6 \ln REER_{it} + \varepsilon_{it} \rightarrow \text{Model 7}$$
$$\ln TA_{it} = \alpha_i + \beta_1 \ln Y_{it} + \beta_2 \ln TV_{it} + \beta_3 \ln Dis_{it} + \beta_4 \ln AC_{it} + \beta_5 \ln RP_{it} + \beta_6 D02_{it} + \varepsilon_{it} \rightarrow \text{Model 8}$$
$$\ln TA_{it} = \alpha_i + \beta_1 \ln Y_{it} + \beta_2 \ln TV_{it} + \beta_3 \ln Dis_{it} + \beta_4 \ln AC_{it} + \beta_5 \ln RP_{it} + \beta_6 D03_{it} + \varepsilon_{it} \rightarrow \text{Model 9}$$
$$\ln TA_{it} = \alpha_i + \beta_1 \ln Y_{it} + \beta_2 \ln TV_{it} + \beta_3 \ln Dis_{it} + \beta_4 \ln AC_{it} + \beta_5 \ln RP_{it} + \beta_6 D04_{it} + \varepsilon_{it} \rightarrow \text{Model 10}$$
$$\ln TA_{it} = \alpha_i + \beta_1 \ln Y_{it} + \beta_2 \ln TV_{it} + \beta_3 \ln Dis_{it} + \beta_4 \ln AC_{it} + \beta_5 \ln RP_{it} + \beta_6 D05_{it} + \varepsilon_{it} \rightarrow \text{Model 11}$$

In (15), Ta$_{it}$ Is Tourist Arrivals (Or Demand) From Country I To Turkey At Time T; Y$_{it}$ Is Real Income Of Sending Country At Time T; Tv$_{it}$ Is Trade Value Between Sending Country And Turkey At Time T; Dis$_{it}$ Is Distance Between Sending Country And Turkey; Ac$_{it}$ Is Accommodation Capacity Of Turkey At Time T; Rp$_{it}$ Is Relative Price Between Sending Country

And Turkey At Time T; Pop_{it} Is Population Of Sending Country At Time T; Me_{it} Is Marketing Expenditure Of Turkish Minister Of Culture At Time T; $Cpgre_{it}$ Is Competitive Price Between Turkey And Greece At Time T; $Cpegp_{it}$ Is Competitive Price Between Turkey And Egypt At Time T; $Cpspa_{it}$ Is Competitive Price Between Turkey And Spain At Time T; $Reer_{it}$ Is Real Effective Exchange Rate At Time T; $D01_{it}$ Is Dummy Variable To Capture Official Visit Of Turkish President And Prime Minister To Sending Country; $D02_{it}$ Is Dummy Variable To Capture February 2001 Economic Crisis; $D03_{it}$ Is Dummy Variable To Capture March 2003 Gulf War; $D04_{it}$ Is Dummy Variable To Capture EU Member Countries; $D05_{it}$ Is Dummy Variable To Capture 2001 September 11 Events; E_{it} Is The Error Term.

5. Future Direction :

Tourism Demand Is A Complex Phenomenon That Offers Opportunities For Applying Recent Advanced Modeling Technique Like Differential Equation Based System Dynamics, Cellular Automata Based On Game Theory Application, Multi-Agent Model Based On Artificial Intelligent Application, Learning Models Based On Psychology Of Tourist And Network Modeling Based On Graph Theory. Jere-Jakulin (2017) For Example Examined Complex System Methodology Of Modeling Tourism. This Type Of Model Need To Be Empirically Implemented In A Way That Parameter Estimates Of The Complex Structure Can Be Estimated Using Network And Graph Theory. Lopez And Bustos (2006) Demonstrated The Possible Application Of Multi-Agent Modeling System To Tourism During A Workshop On Industrial Applications Of Distributed Intelligent Systems. The Described System Can Be Adapted To Tourism Demand Modeling With Numerical Estimates Or Simulated Results That Can Guide Decision Making (Dvornik, Mitrovic, And Marusic, 2017).

According To Karakitsiou And Mavrommati(2017), The Two Most Applied Machine Learning Methods In Tourism Demand Forecasting Are Artificial Neural Network (ANN) And Support Vector Machine (SVM). The Authors Also Applied These Methods To Forecast Tourism Demand Model For Greece. Nicholls, Amelung, And Student (2017) Examine Agent-Based Modeling As A Powerful Tool For Tourism

Researchers And Specifically Noted That The Methodology Has Received Little Attention In Tourism Application Despite Its Potential In Modeling Complex System. The Authors Did Not Carry Out Any Empirical Application Of The Models. Example Of Practical Application Of Such Model In Tourism Can Be Found In Corniglion And Turnois (2011) Where The Authors Simulating Tourists' Behaviour Using Multi-Agent Modelling.

6. Conclusion:

This Review Work Indicates The Extent Of Exploration Of Factors Affecting Demand For Tourism In Different Part Of The World. It Also Reveals That Panel Specification Has Become Popular In Recent Studies. While Some Application Of Advance Quantitative Modeling Methods Can Be Found In Recent Studies There Is Opportunity For Significant Improvement As Stated In This Section. To Encourage The Use Of The Identified Models, Relevant Organisations Like The United Nations' World Tourism Organization (UNWTO) And The *World Travel* And *Tourism Council* (WTTC) Need To Build Research Capacity In These Areas.

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