Forecasting tourism demand for South Africa

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Foreword

The first article in this dissertation namely, *Forecasting tourism demand for South Africa using a single equation causal approach* was presented at the International Conference on Advances in Tourism Economics in Lisbon, Portugal on the 14th and 15th of April 2011.

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Abstract

Tourism is currently the third largest industry within South Africa. Many African countries, including South Africa, have the potential to achieve increased economic growth and development with the aid of the tourism sector. As tourism is a great earner of foreign exchange and also creates employment opportunities, especially low-skilled employment, it is identified as a sector that can aid developing countries to increase economic growth and development. Accurate forecasting of tourism demand is important due to the perishable nature of tourism products and services. Little research on forecasting tourism demand in South Africa can be found. The aim of this study is to forecast tourism demand (international tourist arrivals) to South Africa by making use of different causal models and to compare the forecasting accuracy of the causal models used. Accurate forecasts of tourism demand may assist policy-makers and business concerns with decisions regarding future investment and employment.

An overview of South African tourism trends indicates that although domestic arrivals surpass foreign arrivals in terms of volume, foreign arrivals spend more in South Africa than domestic tourists. It was also established that tourist arrivals from Africa (including the Middle East), form the largest market of international tourist arrivals to South Africa. Africa is, however, not included in the empirical analysis mainly due to data limitations. All the other markets namely Asia, Australasia, Europe, North America, South America and the United Kingdom are included as origin markets for the empirical analysis and this study therefore focuses on intercontinental tourism demand for South Africa.

A review of the literature identified several determinants of tourist arrivals, including income, relative prices, transport cost, climate, supply-side factors, health risks, political stability as well as terrorism and crime. Most researchers used tourist arrivals/departures or tourist spending/receipts as dependent variables in empirical tourism demand studies.

The first approach used to forecast tourism demand is a single equation approach, more specifically an Autoregressive Distributed Lag Model. This relationship between the explanatory variables and the dependent variable was then used to *ex post* forecast tourism demand for South Africa from the six markets identified earlier. Secondly, a system of equation approach, more specifically a Vector Autoregressive Model and Vector Error Correction Model were estimated for each of the identified six markets. An impulse response analysis was undertaken to determine the effect of shocks in the explanatory variables on tourism demand using the Vector Error Correction Model. It was established that it takes on average three years for the effect on tourism demand to disappear. A variance decomposition analysis was also done using the Vector Error Correction Model to determine how each variable affects the percentage forecast variance of a certain variable. It was found that income plays an important role in explaining the percentage forecast variance of almost every variable. The Vector Autoregressive Model was used to estimate the short-run relationship between the variables and to *ex post* forecast tourism demand to South Africa from the six identified markets.

The results showed that enhanced marketing can be done in origin markets with a growing GDP in order to attract more arrivals from those areas due to the high elasticity of the real GDP per capita in the long run and its positive impact on tourist arrivals. It is mainly up to the origin countries to increase their income per capita. Focussing on infrastructure development and maintenance could contribute to an increase in future tourist arrivals. It is evident that arrivals from Europe might have a negative relationship with the number of hotel rooms available since tourists from this region might prefer accommodation with a safari atmosphere such as bush lodges. Investment in such accommodation facilities and the marketing of such facilities to Europeans may contribute to an increase in arrivals from Europe. The real exchange rate also plays a role in the price competitiveness of the destination country. Therefore, in order for South Africa to be more price competitive, inflation rate control can be a way to increase price competitiveness rather than to have a fixed exchange rate.

Forecasting accuracy was tested by estimating the Mean Absolute Percentage Error, Root Mean Square Error and Theil's *U* of each model. A Seasonal Autoregressive Integrated Moving Average (SARIMA) model was estimated for each origin market as a benchmark model to determine forecasting accuracy against this univariate time series approach. The results showed that the Seasonal Autoregressive Integrated Moving Average model achieved more accurate predictions whereas the Vector Autoregressive model forecasts were more accurate than the Autoregressive Distributed Lag Model forecasts. Policy-makers can use both the SARIMA and VAR model, which may generate more accurate forecast results in order to provide better policy recommendations.

Key words:

ADLM, VAR, VECM, forecasting, tourist arrivals, South Africa

Opsomming

Die toerismebedryf is tans die derde grootste industrie in Suid-Afrika. Baie Afrika lande, insluitend Suid-Afrika, het die potensiaal om hoër ekonomiese groei en ontwikkeling te bereik deur die uitbreiding van die toerismesektor. Toerisme is ŉ belangrike bron van buitelandse valuta en verskaf werksgeleenthede, veral vir lae geskooldes, en kan daarom bydra tot ŉ land se ekonomiese groei en ontwikkeling. Akkurate vooruitskattings van toeriste-aankomste is belangrik weens die verganklike natuur van toerismeprodukte en -dienste. Min navorsing oor die vooruitskatting van toeriste-aankomste in Suid-Afrika kan gevind word. Die doel van hierdie studie is om die vraag na toerisme in Suid-Afrika (internasionale toeriste-aankomste) te voorspel deur gebruik te maak van verskillende oorsaaklikheidsmodelle en dan die akkuraatheid van die vooruitskattings te toets. Akkurate vooruitskattings van toerismevraag kan beleidmakers en besighede help in die besluitneming oor investering en indiensneming.

ŉ Oorsig van Suid-Afrika se toerismetendense dui aan dat alhoewel plaaslike toerisme-aankomste buitelandse toerisme-aankomste oorskry in terme van volume, bestee buitelandse toeriste steeds meer in Suid-Afrika as wat plaaslike toeriste doen. Daar is ook bevind dat Afrika (insluitende die Midde-Ooste) die grootste internasionale toeristemark vir Suid-Afrika is. Afrika is wel nie in die empiriese studie ingesluit nie weens databeperkings. Al die ander markte naamlik: Asië, Australasië, Europa, Noord-Amerika, Suid-Amerika en die Verenigde Koninkryk is ingesluit as markte van oorsprong vir die empiriese analise. Daarom fokus die studie op internasionale toerismevraag vir Suid-Afrika.

ŉ Oorsig van die literatuur identifiseer verskeie determinante wat toeriste-aankomste beïnvloed. Die determinante sluit in: inkome, relatiewe pryse, vervoerkoste, klimaat, aanbodsfaktore, gesondheidsrisiko's, politieke stabiliteit sowel as terrorisme en misdaad. Meeste navorsers gebruik toerisaankomste / -vertrekke of besteding deur / opbrengste uit toeriste as afhanklike veranderlike in empiriese studies oor toerismevraag.

Die eerste benadering wat gevolg is, is ŉ Enkelregressie-benadering. Die tipe enkelregressie wat geskat is, is ŉ *Autoregressive Distributed Lag Model*. Die verhouding tussen die onafhanklike en die afhanklike veranderlikes is gebruik om binne-steekproef vooruitskattings van toerismevraag te doen vir die ses markte wat vroeër geïdentifiseer is. Tweedens is ŉ Stelsel van vergelykings-benadering, meer spesifiek, ŉ *Vector Autoregressive* model en ŉ *Vector Error Correction* Model geskat vir elk van die

ses geïdentifiseerde markte. Daarna is ŉ impulsreaksieanalise gedoen deur gebruik te maak van die *Vector Error Correction* Model om te bepaal wat die effek van skokke in die onafhanklike veranderlikes is op die toerismevraag. Daar is bevind dat dit gemiddeld drie jaar duur vir die effek op toerismevraag om uit te faseer. ŉ Variansie-dekomposisie analise is gedoen deur gebruik te maak van die *Vector Error Correction* Model om te bepaal hoe elke veranderlike die persentasie vooruitskattingsvariansie van ŉ sekere veranderlike affekteer. Daar is bevind dat inkome ŉ belangrike rol speel in die verduideliking van amper al die veranderlikes se persentasie vooruitskattingsvariansie. Die *Vector Autoregressive* model is gebruik om die korttermynverhouding tussen die veranderlikes te bepaal asook om binne-steekproef vooruitskattings te maak van die toerismevraag na Suid-Afrika van die ses geïdentifiseerde markte.

Die resultate wys dat weens ŉ hoë elastisiteit wat die reële BBP per kapita oor die langtermyn het en ook ŉ positiewe impak, kan bemarking gedoen word in markte van oorsprong wat 'n groeiende BBP het om sodoende meer toeriste-aankomste vanaf daardie areas te trek. Dit is hoofsaaklik die markte van oorsprong wat in staat is om hul inkome per kapita te verhoog. Deur om op infrastruktuur ontwikkeling en handhawing te fokus, kan bydra tot verhoogde toekomstige toeriste-aankomste. Dit is moontlik dat toeriste-aankomste vanaf Europa ŉ negatiewe verhouding het met die hoeveelheid hotelkamer wat beskikbaar is. Toeriste vanaf Europa verkies dalk eerder ŉ safari atmosfeer soos *Bush lodges*. Investering in sulke tipe akkommodasie en bemarking van sulke fasiliteite aan inwoners in Europa kan daartoe lei dat toeriste-aankomste vanaf Europa toeneem. Die reële wisselkoers speel ook ŉ belangrike rol in prysmededinging van die bestemmingland. Daarom is inflasiebeheer eerder as ŉ vaste wisselkoers, belangrik om prysmededinging te verhoog.

Die vooruitskattingsakkuraatheid is getoets deur die *Mean Absolute Percentage Error*, *Root Mean Square Error* en *Theil's U* van elke model te bereken. ŉ Seisoenale *Autoregressive Integrated Moving Average* (SARIMA) model wat ŉ eenveranderlike-tydreeks-tegniek is, is geskat vir elke mark en die vooruitskattings van die SARIMA modelle is gebruik as maatstaf vir die vooruitskattingsakkuraatheid van die ander modelle. Dit is duidelik dat vooruitskattings gedoen deur die SARIMA modelle die akkuraatste is, terwyl vooruitskattings deur die *Vector Autoregressive* modelle meer akkuraat is as die van die *Autoregressive Distributed Lag Model*. Beleidmakers kan beide die SARIMA en die VAR model gebruik om sodoende akkurate vooruitskattingsresultate te kry om beter beleidsaanbevelings te gee.

Sleutelwoorde:

ADLM, VAR, VECM, vooruitskattings, toerisaankomste, Suid-Afrika

Chapter 1

South African tourism

1.1 Introduction

The tourism industry is the largest industry in the world according to Page (1999:4) and Naudé and Saayman (2005:2). The global financial crisis has had a severe impact on the global tourism industry, especially since September 2008 (UNWTO, 2009a:1). Global international tourist arrivals have declined with four per cent in 2009 when compared with global international arrivals of 2008 (UNWTO, 2010:3). Due to the decline in international arrivals around the world, receipts from tourism (in real terms) declined by 5.7 per cent in 2009 (UNWTO, 2010:3). The World Tourism and Travel Council (WTTC) indicates that tourism and travel generated 9.6 per cent of global gross domestic product (GDP) in 2008, but this contribution declined to 9.4 per cent in 2009 (WTTC, 2009b:6; WTTC, 2010a). It is also expected that the contribution of travel and tourism to global GDP will rise again to 9.6 per cent in 2020 (WTTC, 2010a). The WTTC predicts that global employment opportunities will increase from the expected 236 490 000 jobs in 2009 to 303 019 000 jobs by 2020 due to travel and tourism (WTTC, 2010a).

Despite the decline in tourism performance experienced by most countries since the global financial crisis, Africa managed to achieve positive tourism growth rates during the first eight months of 2009 whilst all other world regions experienced negative tourism growth rates (UNWTO, 2009b:3). Africa showed a four per cent growth rate in international tourism during the period January through August 2009 (UNWTO, 2009b:3). This emphasises the tourism potential that Africa has.

It is therefore not surprising that tourism has become an important aspect of economic development in developing countries. The tourism industry is a key sector for employment creation, since the tourism sector is relatively more labour-intensive than most industries (Chu, 2009:740). Tourism is also important for its contribution to foreign exchange earnings (Eilat & Einav, 2004:1315). Consumption of goods and services by tourists as well as taxes levied on business in the tourism industry contribute to a rise in income (Chu, 2009:740). Tourism demand is not always directly related to just the tourism sector. Often tourism demand increases lead to an increase in demand in other sectors of the economy (Roe *et al*., 2004:12). Infrastructure development on the other hand is often due to tourism-related activities, which in turn have spill-over effects on other related industries in the economy. Such activities include, for example, infrastructure investment for the 2010 Soccer World Cup in South Africa. Saayman (2003:3) states that South Africa can benefit from tourism, since it creates nation pride, attracts investment and has a noteworthy multiplier effect. Burger *et al*. (2001:403) asserts that tourism in South Africa can play a significant part in employment creation and an enhancement in the standard of living of South African citizens.

The focus on tourism in South Africa in the period before 1994 was largely on domestic tourism (Saayman, 2003:6). Saayman (2003:7) states that it was only in the post-1994 period that South Africa became officially known as an international tourism destination. South Africa experienced a long period of slow tourism arrival growth during the apartheid era and it is only since the early 1990's that arrivals to South Africa started to grow (Rogerson & Visser, 2006:201). International tourist arrivals grew significantly since the first democratic elections, as is evident from the following: international arrivals in 1994 amounted to 3 896 547 and rose to 7 001 865 in 2009 (Stats SA[1]). Despite the recession over the last year, tourism and travel contributed 7.9 per cent to South African GDP and 7.7 per cent to total employment in 2009 (WTTC, 2010a; SA Tourism, 2009c:5). This indicates the importance of the tourism industry to the South African economy. The Department of Environmental Affairs and Tourism (DEAT) has introduced high-scale plans over the last two decades to enhance tourist arrivals and have experienced significant successes (Rogerson & Visser, 2006:199), as will be illustrated in this chapter.

The aim of this chapter is to give an overview of the impact of tourism on the South African economy with the aim of establishing the importance of tourism to the economy, as well as providing a comparison between domestic tourism and international tourist arrivals in South Africa. This is followed by an in-depth assessment of international arrivals in South Africa, including seasonality, tourist spending and length of stay with the aim of identifying the arrival markets on which the empirical analysis will focus. The problem statement, objective, method and study outline follows after the market analysis.

1.2 The impact of tourism on the South African economy

Tourism can play a significant role in many developing countries including South Africa (Burger *et al*., 2001:403). As tourism is not a sector *per se*, it is therefore more difficult to determine the exact

[1] Stats SA Statistical releases: P0351 Tourism and Migration

impact that tourism has on the South African economy (Stats SA, 2009a:3). The aim of the Tourism Satellite Account (TSA) for South Africa is to determine what the probable impact of tourism is on the South African economy (Saayman, 2000:107). Knowing the contribution that tourism makes to the South African economy assists business planners and the government in terms of decision-making regarding product demand and investment demand (du Preez & Witt, 2003:436). It is therefore important that the number of tourist arrivals to South Africa, the nights spent in South Africa, the average spending per tourist per day as well as the amount of provinces visited per trip increase so as to enlarge the contribution that tourism makes to the South African economy (Saayman, 2000:114). This is in accordance with the strategy of the Department of Environmental Affairs and Tourism (DEAT) (Rogerson & Visser, 2006:199). A more in-depth study on these aspects follows later in this chapter. This section discusses the impact of tourism on GDP, investment, visitor exports and employment in South Africa in the past.

1.2.1 Tourism and the South African Gross Domestic Product (GDP)

The GDP of a country is the market value of all goods and services produced in that country within a year (Saayman, 2000:99). Tourism does not only affect the GDP of a country through consumer consumption (C) but also influences the GDP through investment (I), government expenditure (G), exports (X) and imports (Z). Tourist spending on goods e.g. food, is regarded as consumption spending while tourism-related investment made by companies and individuals, such as hotels, is regarded as investment. A portion of government expenditure is also tourism-related e.g. government spending on marketing South Africa as a tourist destination (Saayman, 2000:114-115). Visitor exports can take the form of services as well as gifts while imports can take the form of goods imported for the tourist or services such as the flight to the destination country which could be provided by the tourist's country of departure (any other country besides the destination country) (Page, 1999:55).

As mentioned earlier, travel and tourism do not only have a direct impact on GDP but also an indirect impact. The reason that tourism is not a sector on its own is because tourism is considered consumption-based and dependent on the preference of each tourist, rather than on goods and services produced (Stats SA, 2009a:3). According to the WTTC, travel and tourism contributed R189,402 billion (in nominal terms) to South Africa's GDP in 2009 (WTTC, 2010a).

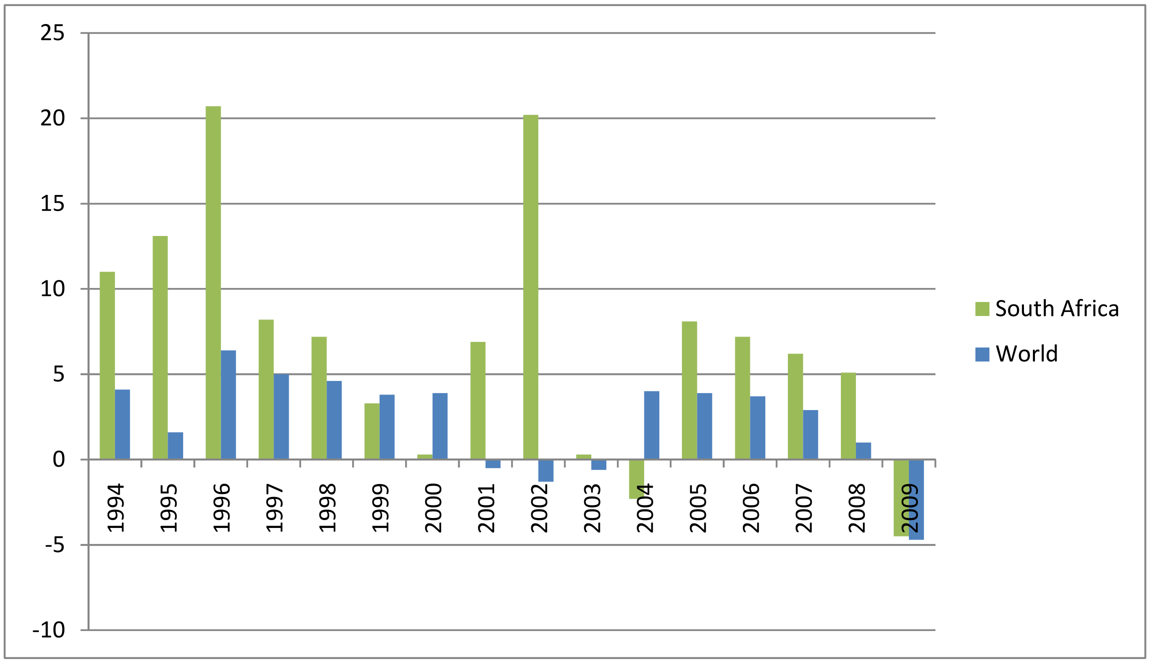

Figure 1.1: The percentage tourism and travel real GDP growth, 1994 - 2009[2]

Source: WTTC (2010a)

Figure 1.1 indicates the percentage real tourism and travel GDP growth between 1994 and 2009 for both the world and South Africa. Since the first democratic election in 1994, tourist arrivals grew significantly. The Rugby World Cup in 1995, the African Cup of Nations and World Cup of Golf in 1996 also led to tourist arrivals increasing significantly which increased the contribution of travel and tourism (directly and indirectly) to real GDP in 1995 to 1996. The terrorist attacks in the United States of America (USA) in 2001 did not have a negative impact on tourist arrivals in South Africa, as experienced by other countries such as the USA. Tourist arrivals grew 11.1 per cent in 2002 which increased tourism spending (DEAT, 2004:12). This effect is evident in the spike on the graph. Arrivals to South Africa increased slightly during 2003 despite the SARS[3] outbreak (SA Tourism, 2003:11). Though arrivals increased slightly, total foreign direct spending decreased by 6.2 per cent during 2003 (SA Tourism, 2003:18). Due to the global financial crisis, tourist spending decreased as well as length of stay which hindered real GDP growth during 2009. Despite negative events, real GDP growth in South Africa due to travel and tourism remains on average higher than the world travel and tourism real GDP growth rate. The WTTC expects that South Africa's tourism and travel will show annualised real GDP growth rates of 4.5 per cent over the next ten years (WTTC, 2010b:5).

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[2] According to the WTTC, it includes the direct and indirect effects of travel and tourism spending.
[3] South African Revenue Service

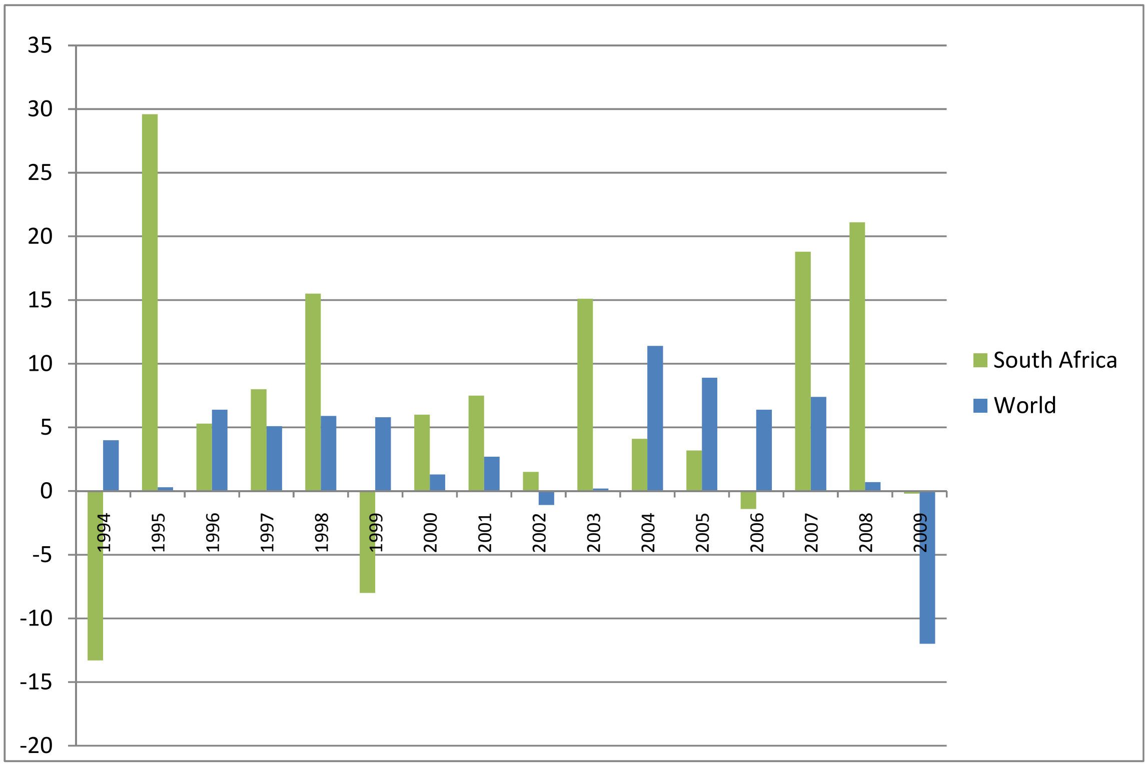


Figure 1.2: Percentage real growth in tourism capital investment, 1994 - 2009

Source: WTTC (2010a)

Figure 1.2 shows the percentage real growth in capital investment in the period between 1994 and 2009. The capital investment in Figure 1.2, according to the WTTC, includes fixed investments made by travel and tourism service providers and government agencies for tourism purposes (WTTC, 2010a). As seen from the figure above, real capital investment growth in South Africa was especially high in 1995, 1998, 2003, 2007 and 2008. Capital investment increased in 1995 due to South Africa being the host country for the 1995 Rugby World Cup; investment also increased significantly during 1998 and 2003. This might be due to South Africa being the host country for the 1998 World Cup of Athletics and the 2003 Cricket World Cup. Leading up to the 2010 Soccer World Cup, capital investment also increased significantly. Capital investment (direct and indirect) in tourism-related activities amounted to R71,405 billion (in nominal terms) in 2009 which represents 12.9 per cent of total investment in South Africa during 2009 (WTTC, 2010a). The WTTC forecasts that the South African annualised real tourism and travel capital investment growth rate between 2010 and 2020 will be around five per cent (WTTC, 2010b:5).

Tourism plays an important role as a foreign exchange earner. It is important for countries to have an adequate amount of foreign exchange available to pay for imported goods and services. The foreign reserve position of a country will have an effect on the exchange rate of the country since a shortage in foreign reserves of a particular country will lead to depreciation in the exchange rate of that country (Saayman, 2000:123). In South Africa, visitor exports showed a positive growth rate in the period 2004 to 2008 (R47.6 billion to R73.2 billion) but decreased to R64,609 billion during 2009; this can, according to the WTTC, again be attributed to the global financial crisis (WTTC, 2010a).

In developing countries, tourism is not just important for the contribution to foreign exchange but also for the creation of employment. In South Africa, employment due to tourism (direct and indirect) also showed a positive trend in the period 2004 to 2008 (780 800 to 993 400) but declined in 2009 to 919 800 (WTTC, 2010b:10; WTTC, 2010a), for the same reason indicated above. It is argued that tourism is more labour-intensive than any other sector in the economy, excluding the agricultural sector (Page, 1999:20). The tourism sector also consists of more low-skilled employees when compared to a sector such as the manufacturing sector (Christie & Crompton, 2001:15). In developing countries such as Africa, the proportion of unskilled labour in the labour force is large (Christie & Crompton, 2001:15). This indicates the importance of tourism in countries with a large proportion of low-skilled labourers such as South Africa. The South African government has noticed the importance of tourism to economic growth and development especially in terms of the contribution to national income, foreign exchange earnings and employment creation (DEAT, 1996). The next section will compare domestic tourism with international tourist arrivals in South Africa.

1.3 South African tourism: domestic tourism *versus* foreign arrivals

Domestic tourism plays a significant role in South Africa. Definitions of some of the main terms that are going to be used in this chapter are those defined by South African Tourism (2008b:29-30):

"*Domestic tourist is defined as a resident visitor who visits within the economic territory of the country of reference.*"

"*Foreign traveller is defined as a person who resides outside of South Africa and visits the country temporarily.*"

It should be noted that the terms “foreign” and “international” arrivals will be used interchangeably. Figure 1.3 illustrates the composition of tourism volume in South Africa. Domestic tourism still forms the largest share of total tourism volume. Domestic trips have been declining since 2006 from 82 per cent to 75 per cent of total tourism volume in 2009, while both foreign land and air markets have been increasing since 2006 (SA Tourism, 2009b:66; SA Tourism 2009c:66). This decline is illustrated in Figure 1.3. It should be distinguished that arrivals from “foreign land” markets are those arrivals entering South African borders, while foreign arrivals by air enter South Africa through airports.

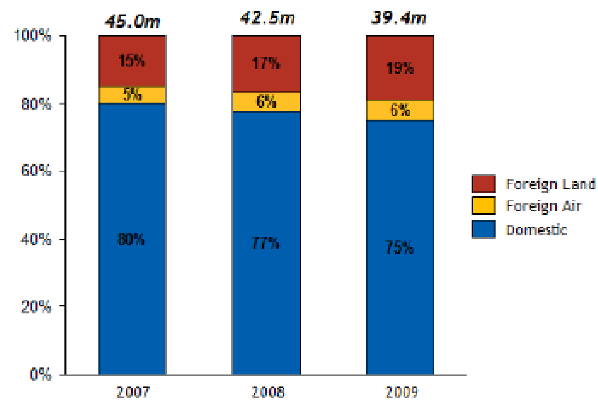


Figure 1.3: Domestic tourism volume *versus* foreign arrivals

Source: SA Tourism (2009c:66)

It is interesting that although domestic tourism dominates in terms of volume, it does not dominate in terms of tourism spending or receipts. Foreign land markets form the largest part of total tourism spending with 52 per cent of total tourism spending in 2009, showing a declining trend since 2006 (SA Tourism, 2009b:4; SA Tourism, 2009c:66). Foreign air markets’ total tourism spending has increased since 2006 totalling 31 per cent of total tourism spending in 2008 but declined slightly to 27 per cent in 2009, while domestic tourism spending contributed 22 percent in 2009 (SA Tourism, 2009b:4; SA Tourism, 2009c:66).

The South African population size in 2009 was 49 million (Stats SA, 2009b:4). During 2007, 43.7 per cent of the South African adult population took domestic trips (SA Tourism, 2009c:67). South Africa experienced a slight increase from 43.7 per cent in 2007 to 47.6 per cent in the proportion of South Africans taking a domestic trip in 2009 (SA Tourism, 2009c:67). Reasons for the increase in the proportion of South Africans taking domestic trips during 2009 include the depreciation of the Rand against all major currencies such as the euro, British pound and US dollar which made domestic trips more attractive (SA Tourism, 2009b:8). Though the proportion of South Africans that took domestic trips in 2009 have increased, the number of domestic trips taken in 2009 has decreased from 35.9 million domestic trips in 2007 to 30.3 million domestic trips in 2009 (SA Tourism, 2009c:67). This indicates that the average amount of domestic trips taken per domestic tourist in 2009 declined from 3.1 in 2006 to 2.1 in 2009 (SA Tourism, 2009b:5; SA Tourism, 2009c:67). The impact of the global financial crisis on the incomes of tourists could be a leading factor in lowering domestic trips as experienced during 2009.

A large proportion of the domestic trips taken during 2009 was with the aim of visiting friends and family (76.2 per cent) while 12 per cent of domestic trips were taken to enjoy a holiday and 5.3 per cent for business purposes (SA Tourism, 2009c:67). Domestic tourists may have found visiting friends and family financially more acceptable during the global financial crisis period. Domestic tourism still remains seasonal with seasonal spikes especially during school holiday periods as seen in Figure 1.4 (SA Tourism, 2009b:13). Domestic trips taken during 2009 were mostly taken during the summer holiday (January and December), the winter holiday (July, August and September) and the autumn holiday (April). The reason for a higher percentage of domestic trips taken during the summer and winter holidays, is that the length of these holidays are longer compared to the autumn and spring holidays. Domestic tourists may find it more convenient to travel during longer holidays since they can take a longer vacation than when school holidays are shorter. Tourists may also prefer to go to coastal areas to enjoy sun, sea and sand during the summer months. During the winter months, domestic tourists may want to go to warmer regions in the country to escape the cold winter temperature. Therefore, the percentage of domestic trips increases during these months.

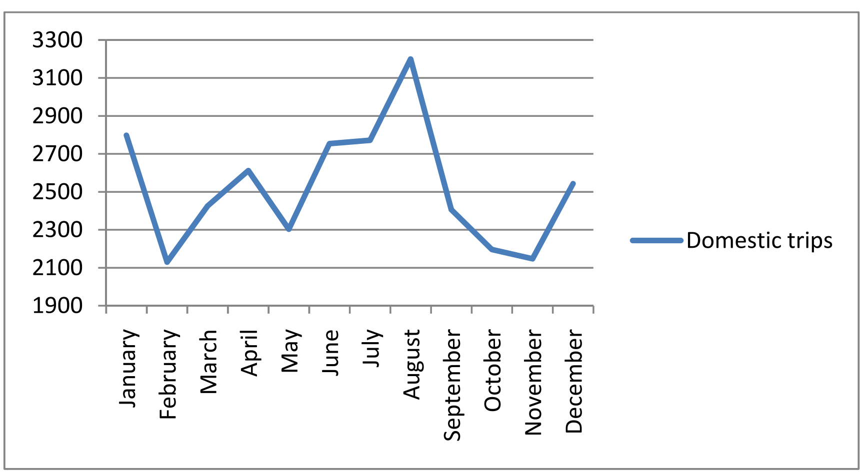


Figure 1.4: Seasonality of domestic tourism in 2009

Source: Adjusted from SA Tourism (2009c:68)

The average length of domestic trips in 2008 was 4.5 nights (a slight increase from 4.4 nights in 2007), but declined to 4.2 nights in 2009 (SA Tourism, 2009b:14), again probably due to the global financial crisis. Revenue obtained from domestic tourism decreased by 13 per cent from that obtained in 2008 (SA Tourism, 2009c:75). This decrease is due to a decrease in the average spending per tourist per day from R780 in 2008 to R730 in 2009 as well as the decline in the number of domestic trips taken during 2009 (SA Tourism, 2009c:76). It is evident from these statistics that the global financial crisis affected the financial ability of domestic tourists to engage in more domestic trips during 2009, and that international tourist arrivals' spending was higher than domestic spending although domestic tourism dominates in terms of volume. The next section focuses on international tourist arrivals to South Africa.

1.4 International tourism

Increasing international tourist arrivals is one of the key objectives in South Africa's marketing strategy. It is clear that international tourists tend to spend more when on holiday or business than domestic tourists. It is therefore important to increase the quantity of foreign tourist arrivals as it creates more income, job opportunities and investment (Lim, 1997b:835). International tourism is also an earner of foreign exchange earnings, which is very important for the balance of payment (Lim, 1997b:835), which is not the case in domestic tourism. This section will review trends in foreign arrivals to South Africa as well as the behaviour of foreign arrivals in terms of seasonality, spending and length of stay with the aim of identifying the contribution that different regions add to the South African tourism industry. The focus is therefore on the above-mentioned aspects in order to identify the tourist arrival markets for the empirical study in chapters three and four.

1.4.1 Foreign arrivals to South Africa

South Africa was ranked twenty-sixth in 2009 in terms of international tourist arrivals by country of destination (SA Tourism, 2009c:11). International travel rose from 6 000 538 in 2000 to 9 728 860 in 2008 and declined to 7 001 865 in 2009 due to the global financial crisis and recessions that followed (Stats SA). Figure 1.5 shows how international arrivals to South Africa increased over the years. Statistics South Africa defines foreign travellers to South Africa as non-South African residents who do not reside permanently in South Africa, and who enter South Africa for any purpose or length of time (Stats SA, 2009c:ii)

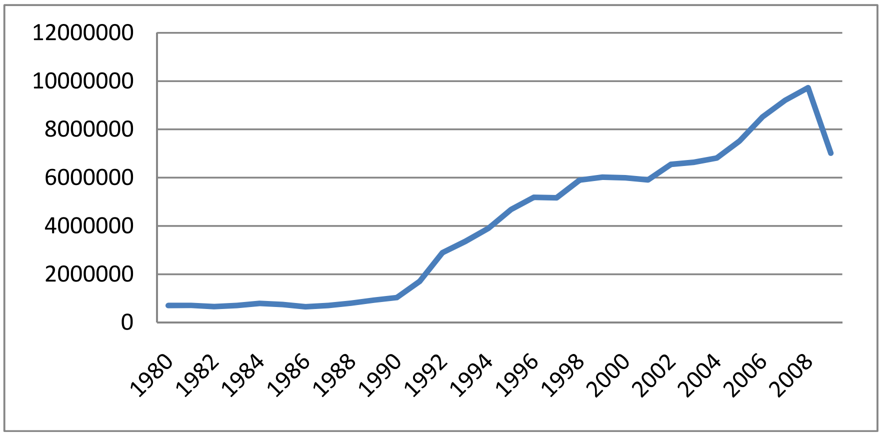


Figure 1.5: Arrivals of foreign travelers in South Africa, 1980 - 2009

Source: Data from Statistics South Africa

International tourist arrivals were stagnant during the 1980's, which was an era of sanctions against South Africa. International tourist arrivals only started to increase in the early 1990's. Events that had an effect on tourist arrivals in South Africa since the 1990's can be divided into two categories, namely past events and recent events.

1.4.1.1 Past events

During 1994 and 1995, foreign arrivals increased significantly due to South Africa's first democratic elections in 1994 and hosting the Rugby World Cup in 1995. In the years 1997 and 2001 there was a slight downward turn in international tourist arrivals and departures due to the 1997 Asian financial crisis, which reduced the ability of people to travel while people felt unsafe to travel just after the 9/11 terrorist attacks in 2001, which took place in the USA. Goodrich (2002:576) states that many organisations in the USA discouraged travelling to other countries that were considered to be unsafe. South Africa is in general classified as a "high crime" country which automatically discourages travelling to South Africa. While this event had a severe impact on tourist arrivals in other countries, the effect on South African tourism was not as severe as on tourist arrivals to other countries. This is evident from Figures 1.1 and 1.2. Goodrich (2002:576) argues that potential holiday-takers from the USA were encouraged to go to safer holiday destinations such as Europe, Africa and South America.

1.4.1.2 Recent events

The global financial crisis has also taken its toll on tourist arrivals. SA Tourism (2009a:10) states that the effect of the global financial crisis has especially been felt since August 2008. The reason for this lagging effect is because bookings are usually made between 3 to 18 months in advance (SA Tourism, 2009a:10).

Another recent event is South Africa hosting the 2010 FIFA Soccer World Cup. It was expected that tourist arrivals to South Africa will increase significantly. International arrivals grew 25 per cent when compared to international arrivals in the same period during 2009 (BuaNews, 2010). Another advantage is that 32 billion viewers watched the coverage of this occasion (SA Info, 2010). SA Tourism (2005:12) argued that it is possible that these foreign arrivals will have a longer holiday in South Africa than usual, especially since this event takes place over a month.

Hosting the FIFA Soccer World Cup can be beneficial especially for the South African tourism industry. This event is South Africa's chance to improve its image as a safe country to travel to and people can see what South Africa looks like. South African tourism can thus reach markets that were previously not really reached (SA Tourism, 2005:14). This can lead to further increases in international arrival. Bohlmann (2006:24) finds that by hosting the Soccer World Cup, R21 billion would be added to the economy and will lead to around 150 000 new jobs. Despite the positive contribution that such an event can bring to the country's economy, several challenges will also be anticipated such as displacement of tourists as well as demand risks. According to the DEAT (2005:31) displacement of tourists will be harmful for South Africa's tourism revenue if there is no careful planning to lower the effect of tourist displacement. Tourist displacement means the decline in tourist arrivals to a host country of an immense event such as the 2010 FIFA Soccer World Cup. The decline in tourist arrivals to the host country is usually before, during and after the big event (DEAT, 2005:31). This is due to tourists knowing who the host nation of such an event is and therefore choosing not to travel to that country during the time of the event. Tourist arrivals may also decline in the following year or two due to an exceptionally large number of visitors visiting South Africa during the event.

1.4.2 Foreign arrivals to South Africa by region

Figure 1.6 indicates that Africa (including the Middle East) is South Africa's largest international foreign arrivals market with 7 807 546 arrivals followed by Europe (1 348 502), the Americas (379 907), and then Asia and Australasia combined (322 290) (SA Tourism, 2009c:18). Arrivals from Africa (including the Middle East) increased by 5.59 per cent during 2009 (SA Tourism, 2009c:97).

All other regions experienced declined tourist arrivals with the Americas being the region with the greatest decline in arrivals (-6.75 per cent) (SA Tourism, 2009c:97).

According to Stats SA (2009c:97), the largest number of tourist arrivals to South Africa are from the Southern African Development Community (SADC). Saayman and Saayman (2008:83) state that travellers from bordering countries travel for different reasons than other arrivals. Reasons might include looking for work, medical treatment or studying. The leading neighbouring countries with the largest number of total arrivals to South Africa during 2009, was Zimbabwe with 25 per cent of all SADC arrivals and Lesotho with 21.6 per cent (Stats SA, 2009a:6). It should be noted that neighbouring countries' tourist arrivals with the purpose of visit being a holiday, are sometimes miss-guiding since the purpose of visiting South Africa is often for shopping. In 2009, 23 per cent of the arrivals from Botswana and 18.1 per cent from Zimbabwe arrived with the objective to study, while 35.4 per cent from Namibia also travelled to South Africa for work (Stats SA, 2009a:7).

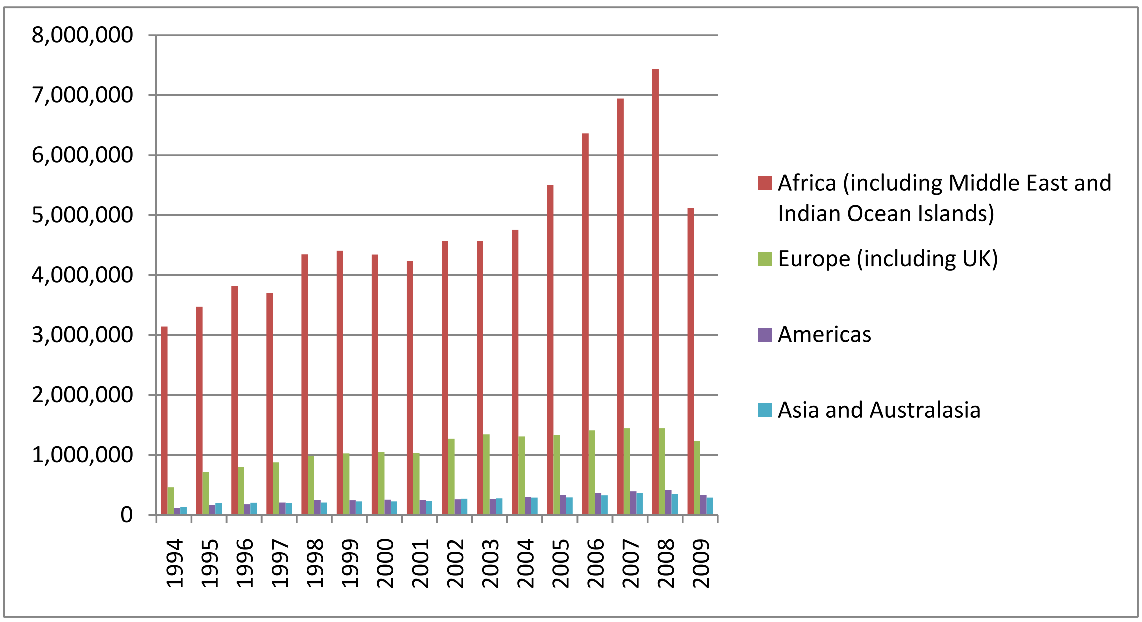


Figure 1.6: Arrivals to South Africa by region, 1994 - 2009

Source: Data from Statistics South Africa

Figure 1.7 shows that the top five markets that arrived by air during 2008 and 2009 were: in sequence, the United Kingdom (UK), the United States (USA), Germany, Netherlands and France. Most of the top 20 countries showed declining arrivals or consistency except the UK, India, Italy, China and Portugal. As mentioned earlier, this decline in arrivals from most markets might be due to the global financial crisis and the subsequent recession in many of the countries. Since tourism is classified as a luxury good, the global financial crisis led to lower disposable income available for spending which led to people cutting back on luxury goods such as tourism. The top five markets from 2008 are again the top markets in 2009 and for this reason the study will focus on forecasting tourist arrivals from these markets.

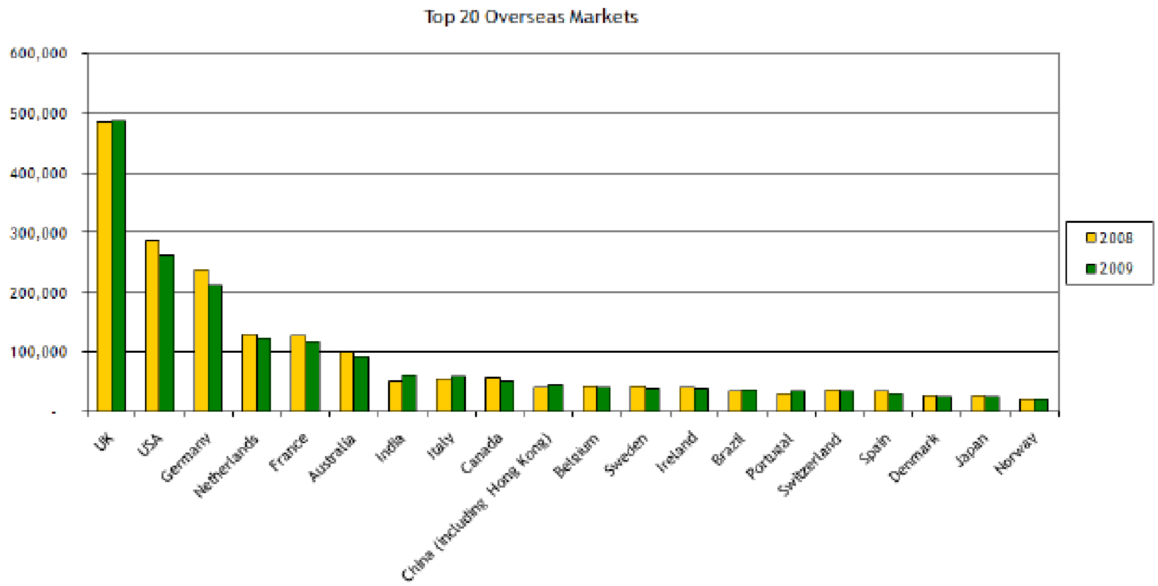


Figure 1.7: Top 20 markets for arrivals by air, 2008 - 2009

Source: SA Tourism (2009c:21)

1.4.3 Seasonality

Since seasonality leads to unused capacity, it is important to improve seasonality to maintain and increase tourism growth. Improving seasonality may hold several advantages, for example, it is possible that more equally distributed tourist arrivals may lead to seasonal employees obtaining permanent positions (William & Shaw, 1991). Less friction on infrastructure may be a result of more even arrival periods (Mitchell & Murphy, 1991). Tourists may also find that certain tourism-related activities are more accessible if seasonality is improved. The seasonality index (which measures variations in monthly arrival patterns for a certain time period) ranges around one, where values equal to one indicate no seasonality, which is ideal. Values lower than one indicate that the number of arrivals adjusted for seasonality is higher than the actual arrivals, therefore the seasonal pattern leads to lower actual arrivals. Index values higher than one indicate that the seasonally adjusted number of arrivals is lower than the actual arrivals, therefore the seasonal pattern leads to higher actual arrivals.

A moving average method was performed on the tourist arrival data for the period 1999 to 2009 in order to determine the extent of seasonality in the time series. Seasonal adjustment is useful when evaluating month-to-month changes (Makridakis *et al*., 1998:613). The centred moving average (x_t) of the arrivals (y_t) is calculated using the following equation:

$$x_t = \frac{(0.5y_{t+6}+\cdots+y_t+\cdots+0.5y_{t-6})}{12} \tag{1.1}$$

The ratio of period *t* is then determined with the next equation:

$$r_t = \frac{y_t}{x_t} \tag{1.2}$$

The seasonal indices are then computed, for example, the seasonal index i_m (where *m* is a certain month) is the average of the ratio in period *t* when the observations for only month *m* are used. The seasonal factors (s) are then determined as follows:

$$s = \frac{i_m}{12\sqrt{i_1,i_2,i_3\ldots i_{12}}} \tag{1.3}$$

in order for the seasonal indices to multiply to one. Therefore, the actual tourist arrivals (y) is s_t per cent higher in period *t* than the seasonally adjusted tourist arrival series. Figure 1.8 indicates that seasonality is higher in the summer months.

Air arrivals have always been, and still are, a challenge for improving seasonality, but since 2004, air arrival seasonality started to improve, while land arrival seasonality has worsened since 2006, although improving slightly between 2008 and 2009 (SA Tourism, 2008a:42; SA Tourism, 2009c:1).

It is evident from Figure 1.8 that the summer (January and December) and winter months (April to June) are the months with the highest seasonality. Tourists from the northern hemisphere have summer school holidays during South Africa's winter months and may decide to go on a family holiday during April to June. The summer months in South Africa are the perfect time to enjoy a holiday at a coastal area and for this reason tourists from abroad may choose to escape the cold winter holidays in the northern hemisphere for sun, sea and sand. It is for this reason that seasonality is often higher in these months. It is also in these months that domestic tourists tend to go on holiday, which adds pressure on the infrastructure.

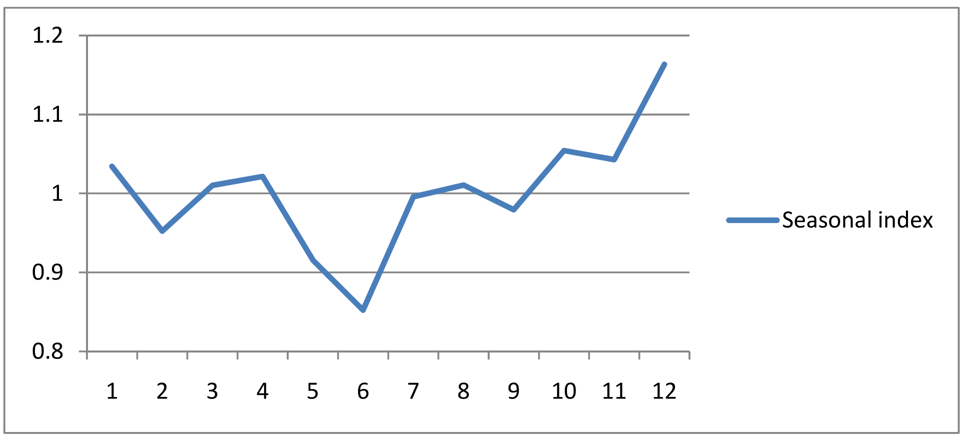


Figure 1.8: Seasonal index of international tourist arrivals to South Africa[4]

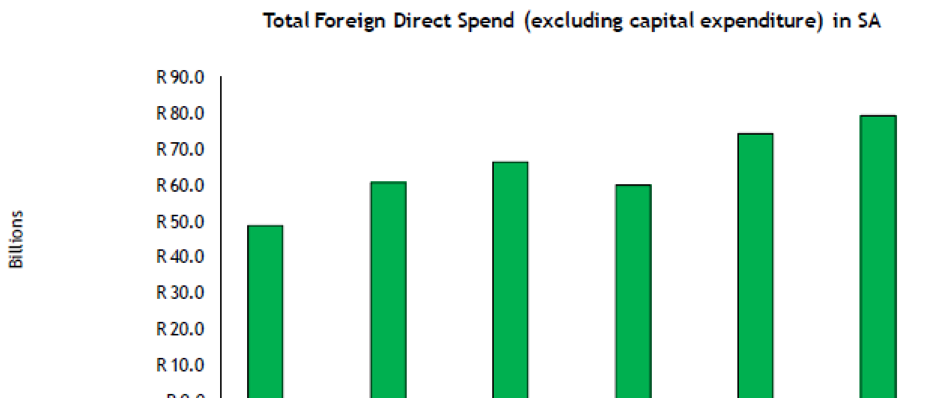
Source: Author calculations using arrival data from Stats SA

1.4.4 Tourist spending

Figure 1.9 shows that Total Foreign Direct Spending (TFDS) by tourists has generally increased since 2004, but declined during 2007. The increase between 2008 and 2009 was driven by three factors namely, an increase in average tourist spending per day (increasing TFDS by R6 billion), an increase in international arrivals (contributing to an increase in TFDS of R1.6 billion), as well as an increase in the duration of stay (increasing TFDS by R2.50 billion) (SA Tourism, 2009c:28). Note that Figure 1.9 indicates nominal spending, thus spending is not adjusted for price increases. Average spending per tourist from air markets remains higher in 2009 than that of per tourist from African land markets (SA

[4] International arrivals include land and air arrivals.

Tourism, 2009c:1; SA Tourism, 2008a:1). All the regions contributed to an increase in income during 2009 (except the Americas), but Africa-land tourists spent 17.2 per cent per day more in 2009 compared with 2008 (SA Tourism, 2009c:30). Asia and Australasia were the second largest contributors with a 5.2 per cent increase in TFDS per day followed by African-air tourists (5.1 per cent more) and European tourists (2.3 per cent more) (SA Tourism, 2009a:30; SA Tourism, 2009c:30). Tourists from the Americas spent 9.7 per cent less per day during 2009 (SA Tourism, 2009c:30). One should keep in mind that the South African inflation rate was kept in the inflation target bracket between 2004 and 2006, but inflation rose significantly from an average of 4.6 per cent in 2006 to an average of 7.2 per cent during 2007 (SARB, 2010). This led to prices being high which may have deterred spending during 2007.



	2004	2005	2006	2007	2008	2009
TFDS Excluding Capital	R 49.0	R 60.7	R 66.6	R 60.1	R 74.2	R 79.4
% Change		23.9%	9.7%	-9.8%	23.5%	7.0%

Figure 1.9: TFDS in South Africa (excluding capital expenditure), 2004 - 2009

Source: SA Tourism (2009c:28)

Spending (excluding spending on capital) by air markets increased in the period 2004 to 2008 but decreased slightly from R30.7 billion in 2008 to R27.2 billion in 2009 (SA Tourism, 2008a:31; SA Tourism, 2009c:29). Spending by land markets, also excluding spending on capital, increased from 2004 to 2006 but declined by 17.8 per cent (in nominal value) in 2007 and increased again during 2008 and 2009 to R52.2 billion (SA Tourism, 2008a:31; SA Tourism, 2009c:29). The increase in TFDS (excluding capital expenditure) during 2009 is mostly the outcome of inflated expenditure. The inflation rate increased significantly during 2008 to an average of 11.5 per cent compared to an average inflation rate of 7.2 per cent during 2007 (SARB, 2010). The appreciation in the rand against the euro and the British pound during 2008 and 2009 made prices less competitive and curbed spending for tourists from the European Union (SA Tourism, 2009c:30). Therefore, the increase in

TFDS (excluding capital expenditure) during 2009 was predominantly driven by the rise in inflation. This is evident since inflation-adjusted TFDS (excluding capital expenditure) decreased by 0.1 per cent when compared with the TFDS (excluding spending on capital) in 2008 (SA Tourism, 2009c:31).

When looking at the distribution of spending within South Africa, most foreign arrivals do not visit more than two provinces. In 2007, the mean number of provinces visited was 1.3, the same as in 2006 but declined to 1.2 in 2009 (SA Tourism, 2009c:58). An increase in the number of provinces visited can promote spending in South Africa, thereby increasing development and job creation equally in all the provinces visited.

1.4.5 Length of stay

Despite an increase in foreign arrivals since 2002, tourists' duration of stay has declined as shown in Figure 1.10. In 2009, the mean length of stay again decreased to the lowest level ever in South Africa. The mean length of stay in 2008 was 8.2 nights declining to 7.5 nights in 2009 (SA Tourism, 2009c:104).

One would prefer the mean length of stay in a country to increase. By increasing the duration of stay, tourists are expected to take part in tourist activities, thereby increasing tourist spending, contributing to tourism income and thus economic growth (SA Tourism, 2007:59).

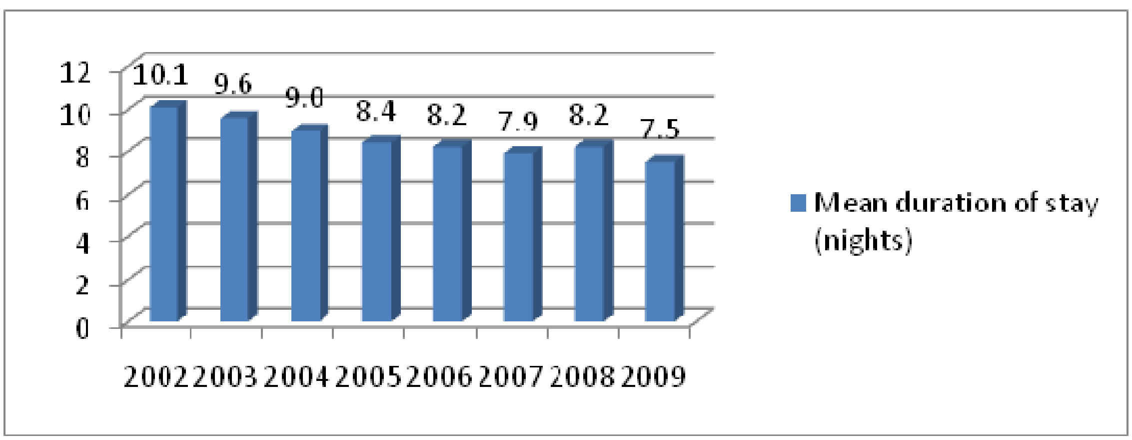


Figure 1.10: Mean duration of stay in South Africa by foreign arrivals, 2002 - 2009

Source: Adjusted from SA Tourism (2009a:33) and SA Tourism (2009c:104)

As Figure 1.6 indicates, tourists travelling from African countries by land rather than air, form the largest arrival market for South African tourism. Unfortunately, it is also the neighbouring countries (the largest portion of tourism land arrivals) that spend on average the least amount of days in South Africa. SADC arrivals generally spent three days in South Africa in 2009, while other African countries spent on average five days in South Africa during 2009 (Stats SA, 2009c:8). Other air arrivals generally spent six days in South Africa during 2009 (Stats SA, 2009c:8). This study will therefore focus on forecasting arrivals from Asia, Australasia, Europe, North America, South America and the United Kingdom rather than on African arrivals.

This section gave an indication of tourism trends in South Africa. It is evident from the historic trends that although arrivals from Africa are the greatest, arrivals from bordering countries (which form a large share of arrivals from Africa) often travel to South Africa for purposes other than to enjoy a holiday. Tourists from countries such as the UK, USA, Netherlands, France and Australia form the largest portion of international air arrivals and arrivals from regions other than Africa stay for longer periods in South Africa. It is for this reason that the markets selected for the empirical study are Asia, Australia, Europe, North America, South America and the United Kingdom. The following section will provide an overview of the source markets selected for the empirical study.

1.5 Source markets for South African tourism

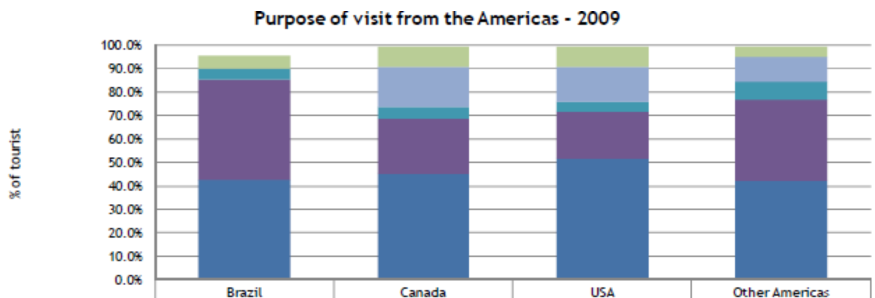
This division will include arrivals to South Africa, the purpose of visiting South Africa, TFDS (excluding capital expenditure) in South Africa, seasonality and the duration of stay in South Africa by the Americas, Europe and the United Kingdom as well as Asia and Australasia.

1.5.1 Americas

Despite the global financial crisis, which has begun to reveal secondary effects on tourism arrivals since late 2008, tourist arrivals from Brazil and Argentina still showed impressive growth rates in 2009. Arrivals from the USA declined by 8.5 per cent and arrivals from Canada decreased by 9.0 per cent (SA Tourism, 2009c:18). Contrary to that, arrivals from Argentina grew 23.5 per cent and arrivals from Brazil grew 3.7 per cent in 2009 (SA Tourism, 2009c:17).

Arrivals from the Americas mainly visit South Africa to enjoy a holiday as seen from Figure 1.11 (SA Tourism, 2009c:25). Most arrivals from the USA (51.8 per cent) visit South Africa for holiday purposes, while 45.3 per cent of Canadian arrivals to South Africa enjoy a holiday in South Africa, and 42.6 per cent of tourist arrivals from Brazil also enjoy a holiday in South Africa (SA Tourism, 2009c:25). Arrivals from African countries on the other hand, especially South African neighbouring country arrivals, visit South Africa mostly to do their shopping (SA Tourism, 2007:24).

The Americas had a decrease of nearly 6.8 per cent in TFDS (excluding capital expenditure) between 2008 and 2009 (SA Tourism, 2009c:32). The decrease in TFDS (excluding capital expenditure) by the Americas was mostly due to a decline in average expenditure per day (SA Tourism, 2009c:32).



	Brazil	Canada	USA	Other Americas
Other	5.5%	8.7%	8.9%	4.5%
Religion				
VFR		17.0%	14.7%	10.7%
Medical				
Business - Tourists	4.8%	5.1%	4.4%	7.4%
Business - Traveller	42.5%	23.2%	19.8%	34.6%
Shopping Business				
Shopping - Personal				
Holiday	42.6%	45.3%	51.8%	42.2%

Figure 1.11: Purpose of visiting South Africa from the Americas in 2009[5]

Source: SA Tourism (2009c:25)

Seasonality improved for the Americas region in 2009 compared with 2008 (SA Tourism, 2009c:47). USA's seasonality improved between 2008 and 2009 (SA Tourism, 2009c:52). This is also true for Canada and Brazil who both had lower seasonality (SA Tourism, 2009c:140). However, arrivals from other countries in the Americas experienced increased seasonality (SA Tourism, 2009c:140).

Length of stay during 2009 in South Africa of tourists coming from the Americas was on average 16.9 nights, while the median nights spent in South Africa by the Americas is seven (SA Tourism, 2008a:98; SA Tourism, 2009c:104). Tourists from Canada stayed on average the most amount of nights (19.6) in South Africa, while seven nights were again the median (SA Tourism, 2008a:98). Tourists from the USA stayed the second longest on average, 17.2 nights, and generally seven nights,

[5] Note that empty cells are due to the sample size being too small for a valid interpretation.

while tourists from other countries in the region stayed 14.3 nights on average and most commonly five nights (SA Tourism, 2008a:98). Brazil stayed the least number of nights in South Africa (11.6 nights on average and a median of seven nights) as stated in Table 1.1 (SA Tourism, 2009c:104).

Table 1.1: Nights spent in South Africa by tourists from the Americas in 2008 - 2009

	Average nights		**Most frequent number of nights**	
	2008	**2009**	**2008**	**2009**
Americas	17.9	16.9	7	7
USA	18.2	17.4	7	7
Canada	20.0	19.6	6	7
Brazil	13.4	11.6	7	7
Other Americas	15.1	14.3	5	5

Source: SA Tourism (2008a:98; 2009c:104)

1.5.2 Europe and the United Kingdom

Arrivals from Europe (including the United Kingdom) declined slightly (-4.1 per cent) during the period 2008 to 2009 (SA Tourism, 2009c:17). This decline in tourist arrivals was predominantly due to declining arrivals from Germany (-11.5 per cent), France (-8.9 per cent) and the Netherlands (-4.3 per cent) (SA Tourism, 2009c:17). Figure 1.12 indicates the reasons for arrivals from Europe and the UK visiting South Africa. Most arrivals from the UK and Europe visit South Africa to enjoy a holiday (SA Tourism, 2009c:26). Arrivals to South Africa with the main purpose of visiting family and friends are mostly from the UK (27.2 per cent), the Netherlands (13.8 per cent) and Germany (13.6 per cent) compared to all the other countries in this region (SA Tourism, 2009c:26). Business travellers constitute a larger proportion of total arrivals from France (25.8 per cent) and Italy (25.5per cent) compared to other countries in the region (SA Tourism, 2009c:26).

Seasonality for tourist arrivals from Europe (including the United Kingdom) improved significantly compared to 2007 and 2008 (SA Tourism, 2009c:47). This decline is driven by decreasing seasonality from France and the UK (SA Tourism, 2009c:54).

Table 1.2 indicates that the average number of nights spent in South Africa in 2009 by tourists from Europe (including the UK) are 17.3 and the most general number spent in South Africa is thirteen nights (SA Tourism, 2009c:104). SA Tourism (2009c:104) finds that tourists from Germany and the Netherlands spent the greatest number of nights in South Africa (19.8 and 21.1 respectively). This can be driven by colonial ties between South Africa and Germany and the Netherlands. It may be possible that the number of nights spent in South Africa is greater since tourists might have accommodation due to family ties in South Africa.

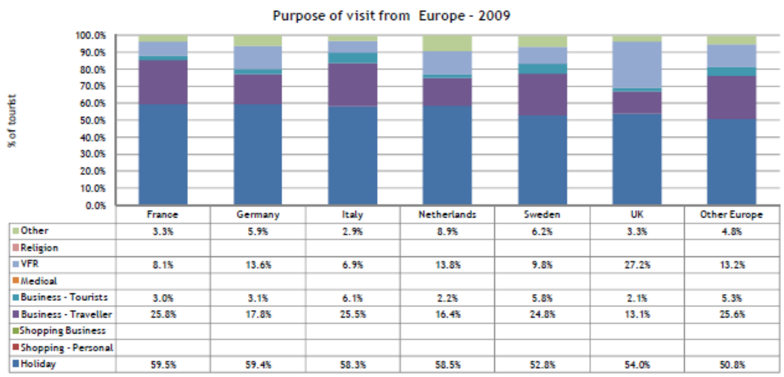


Figure 1.12: Purpose of European and UK tourists visiting South Africa in 2009[6]

Source: SA Tourism (2009c:26)

Table 1.2: Nights spent in South Africa by tourists from Europe and the UK in 2008 - 2009

	Average nights		**Most frequent number of nights**	
	2008	**2009**	**2008**	**2009**
Europe	18.8	17.3	13	13
France	13.9	14.00	10	10
Germany	20.9	19.8	13	13
Italy	13.4	12.5	6	6
Netherlands	26.1	21.1	7	13
Sweden	19.4	17.5	13	13
UK	18.6	17.3	13	13
Other Europe	17.8	16.4	6	6

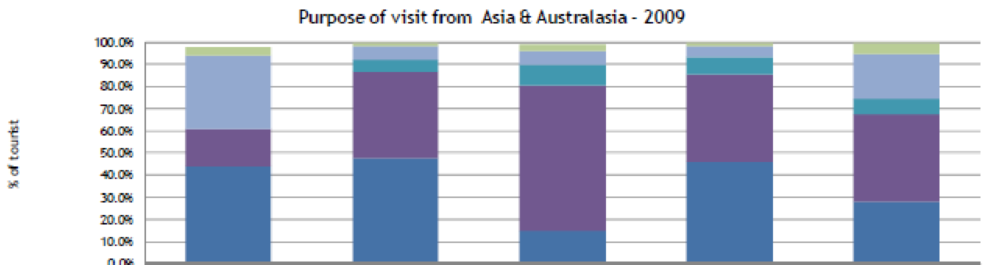
Source: SA Tourism (2008a:98; 2009c:104)

1.5.3 Asia and Australasia

Tourist arrivals from the Asia region increased significantly in the period 2008 to 2009 (3.7 per cent), while tourists from Australasia shared a decline in arrivals (-6.4 per cent) in the same period (SA

[6] Note that empty cells are due to the sample size being too small for a valid interpretation.

Tourism, 2009c:18). Figure 1.7 shows that arrivals from India experienced an increase of 12.4 per cent, while arrivals from China (including Hong Kong) experienced an increase of 19.6 per cent (SA Tourism, 2009c:17). This increase in Indian tourist arrivals may be a result of the 2009 Indian Premier League that took place in South Africa from 18 April until 24 May 2009 (Brown & Shankar, 2009).



	Australia	China (incl. Hong Kong)	India	Japan	Other Asia & Australasia
Other	4.0%	1.3%	3.3%	1.4%	4.5%
Religion					
VFR	33.1%	5.9%	5.9%	4.8%	20.5%
Medical					
Business - Tourists		5.4%	9.3%	7.7%	7.0%
Business - Traveller	16.9%	38.9%	65.8%	39.6%	39.7%
Shopping Business					
Shopping - Personal					
Holiday	43.9%	47.9%	14.9%	45.9%	27.9%

Figure 1.13: Purpose of Asian and Australasian tourists visiting South Africa in 2009

Source: SA Tourism (2009c:25)

Figure 1.13 shows why tourists from Australia, India, China (including Hong Kong) and Japan visited South Africa in 2009. Tourists from China, Japan and Australia visited South Africa mostly to enjoy a holiday (47.9 per cent, 45.9 per cent and 43.9 per cent respectively) (SA Tourism, 2009c:25). Most arrivals from India (65.8 per cent) and Japan (39.6 per cent) on the other hand came to South Africa to do business (SA Tourism, 2009c:25).

Seasonality for the Asia and Australasia region improved between 2007 and 2008, but worsened again in 2009 (SA Tourism, 2009c:48). This increase in seasonality was driven by increasing seasonality of tourists from India (SA Tourism, 2009c:140).

Table 1.3 shows that the arrivals from India (21.4) and Australia (15.4) spent on average the most number of nights in South Africa during 2009, while tourists from Japan spent on average the least number of nights (7.7) in South Africa (SA Tourism, 2008a:98; 2009c:104).

This section provided an overview of the performance of each region and the contribution they make to the South African tourism industry. It is apparent that arrivals from Europe (including the UK) stay the longest in South Africa on average, while arrivals from Asia and Australasia stay the least number of nights in South Africa on average. From Table 1.4 it is clear that arrivals from countries having colonial ties with South Africa stay longer in South Africa on average than arrivals from other countries. It is also evident that most tourist arrivals from almost all regions (excluding African arrivals) visit South Africa for vacationing purposes. The next section focuses on the problem statement, objective, method and study outline.

Table 1.3: Nights spent in South Africa by tourists from Asia and Australasia in 2008 - 2009

	Average nights		**Most frequent number of nights**	
	2008	**2009**	**2008**	**2009**
Asia and Australia	16.2	16.2	5	5
Australia	14.6	15.4	7	6
China (including Hong Kong)	16.8	13.2	5	5
India	25.4	21.4	6	4
Japan	7.3	7.7	4	3
Other Asia and Australasia	15.3	17.6	7	6

Source: SA Tourism (2009c:104)

1.6 Problem statement

The tourism industry is a very competitive industry and therefore relying on natural resources is not enough to obtain a competitive advantage. It is for this reason that it is very important to improve resource management which could contribute to economic growth. Many African countries, including South Africa, have the potential to achieve higher economic growth and development by focusing more on their tourism industry (Kester, 2003:203). According to Kareem (2008:1) most African countries do not fully utilise their tourism potential. The perishable nature of tourism products and services make it important to accurately forecast tourism arrivals.

Effective forecasting can prevent excessive capital investment and labour employment due to overestimating tourist demand or, if underestimated, it can prevent businesses from fully utilizing opportunities (du Preez & Witt, 2003:436). It is therefore essential to forecast future tourist arrivals. Forecasting tourist arrivals accurately will reduce uncertainty of the future and the impact that tourist arrivals will have on a country's available resources (Burger *et al*., 2001:404). Much research has been done comparing which method is best for forecasting tourism demand internationally (see for example du Preez & Witt, 2003 and Chu, 2004). Goh & Law (2002:510) state that more research should be done to determine the forecast results obtained from a Vector Autoregressive (VAR) model as well as a cointegration approach.

In South Africa and Africa, the determinants of tourism demand have been the focus (example Naudé & Saayman, 2005). Naudé and Saayman (2005) estimated a panel data regression to determine the relationship between explanatory variables and tourist arrivals to Africa. It is evident that political stability, tourism infrastructure and marketing have a strong relationship with tourist arrivals to Africa (Naudé & Saayman, 2005:365). Saayman and Saayman (2008) found that income, price, transport cost, local infrastructure and climate influence tourism demand for South Africa, while Seetanah *et al*. (2010) shows that substitute prices also has an influence on South African tourism arrivals. Little research on forecasting tourism demand for South Africa can, however, be found. This research aims to fill this void.

1.7 Objective

The objective of this research is to forecast tourism arrivals for South Africa using historical time series data. Since foreign tourist arrival spending is higher compared to domestic tourist spending the focus is on forecasting foreign arrivals. Tourism demand from Asia, Australasia, Europe, the United Kingdom, North America and South America will be forecast which could aid future planning and policy making. Africa has not been chosen due to the difficulty in obtaining data and for reasons identified in the market analysis. In order to reach this objective, this research sets the following goals. The first goal is to explore the determinants of tourism demand in order to identify the factors that influence tourists' decisions to travel abroad. There are a variety of factors that can potentially influence a tourist's demand for travelling to a particular destination. Some factors are specific to the destination country such as climate, political stability and infrastructure. Other factors are more origin-country specific, for example, the income of the tourist, which is sometimes measured as the gross national product (GNP) per capita of the origin country (Eilat & Einav, 2004:1321).

The second goal is to review the different methods used in forecasting tourism demand in order to determine the most appropriate methods for this study. The third goal is to assess the accuracy of the single equation econometric method of *ex post* forecasting tourism demand to South Africa from six of South Africa's main tourist markets (Asia, Australasia, Europe and the United Kingdom, North America and South America). The fourth goal is estimate a system of equation model and to perform an impulse response analysis and variance decomposition for each of the six markets in order to understand the relationship of the coefficients better, as well as to *ex post* forecast tourism demand to South Africa from the six identified markets. The single equation method and the system of equation methods will then be assessed against a time-series method which will form the fifth goal.

1.8 Method

The study will constitute a literature study followed by an empirical study. The literature study will comprise the determinants that influence tourist arrivals and an overview of the forecasting methods. Tourist demand will be *ex post* forecast with the use of historical tourist arrival time series data for Asia, Australasia, Europe and the United Kingdom, North America and South America. All data is available from secondary sources including Statistics South Africa, The South African Reserve Bank and the International Monetary Fund.

Generally, tourism demand modelling and forecasting is divided into two categories, namely quantitative methods and qualitative methods (Hilaly & El-Shishiny, 2008:1). Quantitative methods can in turn be divided into two sub-categories: causal models and non-causal models (Song & Li, 2008:204). Time-series models such as Integrated Autoregressive Moving Average (ARIMA) models (Box-Jenkins), Naïve one and Naïve two models and exponential smoothing models form part of the non-causal sub-category (Song & Li, 2008:210). Causal models which constitute econometric models include models such as the Error Correction Model (ECM), Autoregressive Distributed Lag Model (ADLM) and the Vector Autoregressive (VAR) model (Song & Li, 2008:211).

The difference between causal and non-causal models is that non-causal models do not use explanatory variables to explain the value of the dependent variable (Hilaly & El-Shishiny, 2008:1). Time-series models use the historic data of a variable to forecast itself. Therefore, the time-series model depends on historic trends and patterns of the variable concerned (Song & Li, 2008:210). This method is often used when data availability of explanatory variables is limited or too costly to obtain (Song & Li, 2008:210). In contrast, econometric models have the ability to assess the effectiveness of policies and can be valuable in the formulation of new policies or business strategies due to the cause-effect relationship captured by the econometric model (Song & Li, 2008:211).

According to Song and Li (2008:211), the models often estimated in tourism demand modelling and forecasting are the Vector Autoregressive (VAR) models, Autoregressive Distributed Lag Models (ADLM's), Error Correction Models (ECM's) and Time Varying Parameter (TVP) models. A study by Li *et al*. (2005:84-87) also indicates that most researchers have used an ADLM and VAR model in tourism demand modelling and forecasting studies. Therefore, the models that will be estimated in this study are an ADLM, VAR model and a Vector Error Correction Model (VECM). The ADLM and VAR models are chosen since no article could be found by the author of studies on tourism demand forecasting to South Africa using either ADLM or VAR modelling, and since it remains some of the most popular econometric modelling techniques used to forecast tourism demand. The VECM is estimated in addition to the VAR model in order to capture the long-run relationship between the variables and to perform an impulse response analysis and variance decomposition for each of the identified markets.

The independent variables which are often used in estimating tourism demand include: income, exchange rate, relative costs of goods and services, population size of origin countries, marketing expenditure and weather. Some researchers include dummies, lagged dependent variables or a trend variable in their studies to improve the forecasting performance. The forecasting will be performed using EViews version seven. A complete explanation of the methods used and the explanatory variables included in this study will be presented in chapter three (article one) and chapter four (article two).

1.9 Study outline

Chapter one gave a brief overview of global tourism and further examined the South African tourism sector and, specifically, tourism trends. International tourist arrivals, length of stay, expenditure and seasonality all form an important part of South Africa's tourism strategy. This chapter provided an overview of these developments over the years and identified South Africa's main tourism markets. Furthermore, this chapter stated the problem underlying this research, the objective and goals of this study and the method that will be used to reach these objectives and goals.

Chapter two is the literature chapter which will provide a comprehensive discussion of the determinants that influence tourism demand, as well as understanding what influences tourists to travel to a certain destination, which is helpful to researchers in order to better understand tourism arrivals, and can aid forecasters in their final findings.

Chapter three consists of a first article which will address the econometric models and more particularly the ADLM used for tourism demand forecasting. This chapter will also provide the forecasting results for South Africa from the six markets. The fourth chapter consists of the second article which will focus on the VAR model and the VECM used by several researchers and will provide the impulse response analysis and the variance decomposition results for South Africa from the six markets using the VECM. The VAR model will be used to *ex post* forecast tourism demand to South Africa from the six identified markets. Chapter five will conclude with the findings from this study, a comparison of the results of chapter three and four and that of a time-series technique and provide recommendations for further research.

1.10 Summary

The aim of this chapter was to provide an overview of the importance of tourism to the South African economy and to provide an in-depth study of international tourism trends. It is clear that tourism affects not only consumer spending (C) but also investment (I), government expenditure (G), exports (X) and imports (Z). The percentage real GDP growth due to travel and tourism in South Africa is on average higher than the world travel and tourism real GDP growth rate. The DEAT noticed the importance of tourism to economic growth and development and has introduced high scale plans. Domestic tourism still forms the majority of tourism in South Africa and foreign arrivals spend more than domestic tourists. It is also evident that South Africa has experienced significant foreign arrival growth since the early 1990's.

Africa forms the largest tourist arrival market to South Africa, but most of the arrivals from Africa are arrivals from the SADC region, and travel to South Africa by tourists from the SADC region is for different reasons than what is normally the motive for international travel. Since average spending per tourist from African land markets is lower than that of air markets, and there is a difference in purpose of travel by the African market, Africa is therefore excluded from the empirical analysis. The markets chosen for the empirical analysis are therefore the remaining regions namely, Asia, Australasia, Europe, North America, South America and the United Kingdom.

It is important to forecast tourism arrivals accurately so as to reduce uncertainty of the future. With accurate forecasts, businesses have the opportunity to invest correctly and improve their business decisions, e.g. when and if to hire an extra worker. Much research has been done on forecasting methods, but little research is available on forecasting tourism demand for South Africa. Therefore, the subsequent chapter will first focus on the determinants that influence the choice to travel abroad and which methods are generally used to forecast tourism demand before discussing the empirical articles.

Chapter 2

Determinants and model specification of tourism demand

2.1 Introduction

Most tourism demand studies focus on either the determinants that influence tourism demand or on effective forecasting of tourism demand (Kareem, 2008:6). Effective forecasting aids business managers and policy makers, for example, when choosing when to invest more in their business or when to employ more personnel, while studies focusing on the determinants of tourism demand help to understand the factors that influence the choices of tourists. Before proceeding to forecasting tourism demand for South Africa, a brief literature overview will be given of the factors that influence the demand for tourism. In the competitive world of today it is important to understand the behaviour of potential tourists when planning for a business or when planning is done by policy makers (Saayman & Saayman, 2008:82). However, Brakke (2005:3) states that little is still known about the factors that drive tourism demand. Focusing on improving these factors, a country can attract more tourists thereby expanding the contribution of a country's tourism sector to the country's economy as a whole. Kareem (2008:1) notes that Africa's tourism potential is not fully utilised, and that Africa has the potential to enhance the contribution of tourism to the gross domestic product (GDP) of countries within the continent.

The aim of this chapter is twofold. Firstly, the chapter will focus on the determinants that are incorporated in several empirical studies dealing with tourism demand. The explanatory variables are often included in econometric forecasting models to improve the forecasting performance of the forecasting models. It is therefore necessary to discuss these determinants that influence tourism demand. Secondly, the different forecasting methods used in forecasting tourism demand will be examined after an overview of the different determinants affecting tourism demand. This chapter therefore forms the background to chapters three and four.

2.2 The determinants of tourism demand

From microeconomic theory it is known that each individual wants to maximise his or her utility, and will therefore choose a travel destination that will do just that. According to economic theory, some of the factors that influence consumer demand include income, prices of goods or service, prices of substitutes, preferences and family and friends (Perloff, 2007:14). Tourists are often influenced by the same determinants when deciding which destination country to travel to. Popular explanatory variables used include income, prices, transport cost, exchange rates, marketing expenditure, weather conditions, history and culture, population size, trends, dummies, a lagged dependent variable and supply-side factors such as the infrastructure of the destination country and efficiency of tourist services (Saayman & Saayman, 2008:84). Factors which might have a negative effect on tourism demand include political instability, terrorism and crime as well as natural disasters and health risks. These will be reviewed in section 2.2.12.

The dependent variable used in most of the empirical studies dealing with tourism demand is tourist arrivals or departures, tourism receipts or expenditure or, in a few studies, the length of stay in a destination country (Lim, 1997b:839).

The explanatory variables previously mentioned will now be discussed focusing first on the independent variables to be included, and then on specification variables.

2.2.1 Income

Most empirical studies dealing with international tourism demand include income as an independent variable. Proença and Soukiazis (2005:6) argue that it is the most important determinant that influences individuals to travel. Examples of studies done which included income as an independent variable are those by Saayman and Saayman (2008:85), Divisekera and Kulendran (2006:190) as well as Brakke (2005:17).

According to economic theory, an increase (or a shift outwards) in *per capita* income causes the budget constraint to shift outwards and makes it possible for the individual to reach a higher utility function. Brakke (2005:15) states that, for the majority of destinations, tourism has a hypothesized income elasticity larger than one, therefore tourism is categorized as a luxury good. Brakke (2005:15) also argues that as income increases a smaller part of that income is allocated for necessities (for example food and clothes). Therefore, more income is available for expenditure on other goods and services such as tourism. However, not only the level of income, but also the distribution of income plays a role. In a country with high income inequality, a smaller proportion of the population will have the financial ability to travel abroad (Walsh, 1996:6). A country with a higher GDP and less income inequality should yield a much higher percentage of tourism demand to destination countries (Saayman, 2000:32).

Proença and Soukiazis (2005:6) point out that the demand for tourism and length of stay has a relationship to income. Lim (1997b:842) notes that it is important to remember that it is not only the income in period t that has an effect on tourism demand, but the income in period $t - 1$ is also important since income takes time to affect tourism demand, thus affecting tourism demand with a lag. This indicates that it will take time for a shock affecting income to affect tourism travel patterns. According to Walsh (1996:6), planning for vacations abroad is often done at the beginning of the year or more often in the previous year and thus explains why tourism lags after the business cycle.

In her study, Lim (1997b:841-842) points out that 84 out of 100 articles used income as an explanatory variable, making income the most commonly included explanatory variable. Though discretionary income is hard to measure, it is argued that it is the best suitable proxy for *per capita* wealth (see Kareem, 2008:7; Divisekera & Kulendran, 2006:192). Several studies have used proxies to measure the impact of an individual's income on tourism demand. These proxies took the form of real GDP *per capita* (Saayman & Saayman, 2008:85), nominal *per capita* income, gross national product (GNP) and GDP (Naudè & Saayman, 2005:369). Saayman and Saayman (2008:91) find that the tourism demand for South Africa from origin continents such as North America, Asia and Europe have a positive relationship with rising *per capita* income.

2.2.2 Relative prices

Prices of goods and services are another important variable to include when estimating tourism demand determinants since they affect consumer choices. Substituting travel destinations is possible if, for example, the costs of travelling to and staying in a certain destination escalate relative to that of other destinations abroad or a domestic holiday (Lim, 1997b:843). Price competitiveness is thus necessary in order to prevent tourists from choosing a different holiday destination. Price is, however, not the only factor which influences tourists' choice of holiday destinations. De Mello *et al*. (2002) indicate that countries which offer a variety of travel activities have higher price elasticity with regard to travelling abroad than countries with fewer travel activities to offer.

It is known from microeconomic theory that an increase in price will cause the quantity demanded to decline, *ceteris paribus* (Perloff, 2007:15). Many factors influence the prices under discussion; these include inflation, labour costs and productivity within the tourism industry. Inflation will have a negative effect on price competitiveness in the destination country when inflation is higher in that country compared to other countries. As mentioned above, this will entice tourists to rather travel to a destination with lower price levels. Forsyth and Dwyer (2009:85) state that the effect of an increase in the price level on tourism demand can be diminished by a depreciation in the exchange rate.

Low wages also have an impact on the price levels in a country. Countries that have lower labour wages often have lower price levels as well, e.g. Singapore (Forsyth & Dwyer, 2009:85). Forsyth and Dwyer (2009:85) find that as income *per capita* increases, the price competitiveness is altered. High productivity is also associated with lower prices of final goods and services, given the production costs (Melitz & Ottaviano, 2005:24). Therefore, developed countries often have an advantage in productivity and for this reason enhance price competitiveness due to improved productivity (Mohr & Fourie, 2004:149). Other factors that may hinder price competitiveness include fuel and airport taxes as well as environmental charges (Forsyth & Dwyer, 2009:85). Therefore, it is essential that a country would focus on being price competitive in order to prevent the substitution effect caused by being price uncompetitive.

Since it is very hard to obtain realistic and accurate representative tourist consumption baskets of goods and services, several studies have used the consumer price index (CPI) of the destination country relative to the origin country's CPI (Song & Witt, 2006:218). A disadvantage of using CPI as a proxy is that it takes into account the goods and services used by citizens within the destination country, and not spending by tourists visiting the destination country, which may differ from the spending patterns of citizens (Lim, 1997b:843). The reason for not constructing a tourism basket of goods and services ("Tourism Price Index") as a measure for country cost is because prices of accommodation, food, entertainment and other activities vary, depending on consumer willingness to spend on them (Divisekera & Kulendran, 2006:190). Brakke (2005:14) proposes the construction of a price competitiveness index (PCI) to compare prices between destinations. In order to do so, one must divide the purchasing power parity (PPP) by the exchange rate multiplied by 100 to get the PCI (Brakke, 2005:14). PPP is defined as the expenditure in competing destination countries on the same tourist basket of goods and services (Forsyth & Dwyer, 2009:80). The PCI is similar to the real exchange rate, where the real exchange rate, like the PCI, captures the effect of inflation and the exchange rate in one variable (Lim, 1997b:843).

2.2.3 Transport costs

Another price factor that influences the decision to travel is the cost of travelling to and in the destination country. It is necessary that a country should have a trustworthy transport system and competitive transport prices (DEAT, 1996:30), since transport costs are regarded as the most significant aspect of travelling cost, therefore greatly affecting tourists' travelling choices (Lim & McAleer, 2001:4). Although transport cost plays a significant role in tourism demand, it is not often included in empirical studies due to the difficulty in measuring transport cost. Lim (1997b:843) finds in her study that transport cost is included in only 55 of 100 published articles.

A change in the cost of transportation can cause substitution effects. Walsh (1996:13) argues that transport cost often causes substitution between domestic travelling and travelling abroad. For example, if it becomes less expensive to travel to South Africa compared with other destination countries, *ceteris paribus*, then tourism demand to South Africa can be expected to rise. Walsh (1996:13) states that transport cost has a more marked influence on tourist arrivals than on tourist spending in the destination country. For example, though travelling abroad is more affordable at present, those tourists who were initially not going to travel due to high transport cost might decide to travel due to the lower transport costs, but spending in the destination country would not increase since increased spending in the destination country would make the holiday abroad too expensive (Walsh, 1996:13). On the other hand, if the transport cost to several destinations is more or less the same, chances are that the tourist will go to the more convenient destination, for instance the destination with the shortest flight distance (Brakke, 2005:13). Saayman and Saayman (2008:93) find in their study of tourism demand for South Africa that transport cost plays a significant role. This is because South Africa is a long-haul destination for developed continents such as Europe, North America and Australia. As seen from chapter one, tourist arrivals from Europe, for example, are much higher than those from other continents (excluding Africa) farther away, such as Australasia.

Proxies for transport cost have been used in several studies because of the difficulty in collecting data on transport cost. This is due to price differences in, for example, business and economy class flights, the different modes of transport and air carriers available, as well as specials or tour packages available (Brakke, 2005:13). Air travel is considered to be the main transport mode when travelling to far places. Kareem (2008:7) finds that countries in which more tourists enter their borders via road transport often use oil or gasoline prices as a proxy for transport cost, as opposed to airline fares for destinations with most arrivals entering through airports.

In some studies, multicollinearity is also present between income variables and transport cost (Witt & Witt, 1995:454). Naudè and Saayman (2005:378) use distance between the capital of a destination country and the capital of the country of origin for the tourist as a proxy in their international demand function. Note that Naudè and Saayman (2005:378) completed a panel data analysis where distance remained constant, only varying in cross-section, not in the time dimension of the panel. Muñoz (2007:18) uses crude oil as a proxy for travel cost. Saayman and Saayman (2008:85) also use the price of crude oil as well as the price of jet fuel in their study to proxy for travel cost.

2.2.4 Exchange rate

Exchange rates play an important role in tourism because they influence the competitiveness of a country. The depreciation in the exchange rate of a country increases the country's tourism competitiveness (Forsyth & Dwyer, 2009:85). Forsyth and Dwyer (2009:85) argue that exchange rates are a good indication of the price level of a country relative to the price level in other countries. For example, if a country experiences an increase in relative prices compared to the origin country, the exchange rate of the potential destination country will depreciate. When the exchange rate appreciates it can harm the tourism sector of a country, if the appreciation of the exchange rate leads to a decline in foreign arrivals, and domestic tourists might choose to visit a country abroad due to increased buying power (NZIER, 2007:vii). An appreciation in the exchange rate of the destination country may also influence the expenditure ability of foreign tourists and can lead to a decline in tourism revenue (NZIER, 2007:ii).

There are many reasons for exchange rate fluctuations. Forsyth and Dwyer (2009:85) state that exchange rates are very volatile, not only in developing but also in developed countries. Exchange rate volatility is often the result of global economic conditions such as the global financial crisis and domestic economic performance. Dutch disease[7] in Australia, for example, led to a significant decrease in international tourism to Australia between 2003 and 2008 (Forsyth & Dwyer, 2009:85).

The nominal exchange rate alone is not a very good indicator of the competitiveness of a destination according to Walsh (1996:10). Some of the empirical studies have included exchange rates, apart from relative prices (Kareem, 2008:7). Lim (1997b:844) states that the reason for including both the exchange rate and relative prices is to determine the effect of nominal exchange rates on tourism

[7] Dutch disease is the result of an increase in the exports of one industry which lead to an increase in the exchange rate of that country which cause the exports of other industries in that country to become less competitive (Forsyth & Dwyer, 2009:85).

demand. However, multicollinearity is often present when including both these variables in international tourism demand studies (Lim, 1997b:844). Witt and Witt (1995:454) argue that the inclusion of just the exchange rate could be misleading since the relative inflation could also have a significant influence as mentioned in section 2.2.2. For example, if South Africa's currency has depreciated significantly, but inflation has increased, then both these changes could balance out. It is argued by a number of researchers that a tourist's decision to travel to a certain destination country is influenced to a great extent by exchange rate fluctuations more so than inflation rates (Artus, 1972). Therefore, it is more reliable to include the real exchange rate rather than just the nominal exchange rate (Walsh, 1996:10). Researchers who have used the real exchange rate to capture the substitution effect between holiday destinations are Saayman & Saayman (2008:85) and Kareem (2008:10).

2.2.5 Climate

Berrittella *et al*. (2004:3) mention that only a few studies have been done on how climate as an external factor influences the tourist's final decision when considering travel destinations. One of the reasons for this might be that climate is believed to be relatively constant and very difficult to control (see Hamilton & Tol, 2004:3 and Berrittella *et al*., 2004:3). Hamilton *et al*. (2005:253) state that it is not only the climate in competing destination countries abroad which influences tourism demand, but also the climate experienced in the country of origin. Agnew and Palutikof (2001:41) also indicate that tourists would prefer to take a domestic vacation rather than vacations abroad when summer months are warmer than usual. It should, however, be noted that this is more likely for less important vacations that are usually of shorter length (Agnew & Palutikof, 2001:41).

Certain activities depend on certain climates or weather conditions to be enjoyed or to supply the activity. Such activities are usually outdoors such as hiking, skiing and sunbathing. Agnew and Palutikof (2001:41) argue that, in general, most tourists prefer destinations with temperatures of around 21ºC.

Lise and Tol (2002:447) state that older people, especially when they are retired, are more flexible which makes it possible for them to travel to a particular country any time they want, when the weather suits them. Younger people, such as scholars or working people, who have time constraints might have to choose a different holiday destination to the climate category they prefer. Consequently, the desire to travel as well as the same expenditure ability remain, but where the final holiday destination will be might change (Berrittella *et al*., 2004:5). Hamilton and Lau (2004:2) conclude that a few researchers have included climate or climate change as independent variables when estimating the demand for destinations. Some of these are Maddison (2001:11), Lise and Tol (2002:434), Hamilton (2003:24) and Berrittella *et al*. (2004:9). Saayman and Saayman (2008:93) conclude that there is a positive link between sunny weather in South Africa and tourist arrivals confirming that South Africa is seen as a sun, sea and sand destination.

Due to data limitations, several researchers used proxies to capture the effect that climate has on tourist demand. Lise and Tol (2002:433) used several variables to capture the effect of climate, such as average day and night temperatures and average rainfall during the summer season. Hamilton *et al*. (2005:246) used annual average temperatures as a proxy for climate while Scott and McBoyle (2001:70) used a tourism climate index (TCI) as a proxy for climate. Scott and McBoyle (2001:70) included five different variables in the TCI and attributed a certain weight to each of the five subvariables in the TCI. Some of the subvariables include average wind speed, total hours of sunshine, total rainfall, and two subvariables to capture the minimum and maximum daily temperatures as well as the average daily temperatures and humidity (Scott & McBoyle, 2001:70).

2.2.6 Culture

Tourists choose their destination country in accordance with their preferences. Foo and Rossetto (1998:10) suggest that tourists who seek to learn new things could regard museums as the ideal place for learning more (for example, the Cradle of Humankind in South Africa), or to learn more about that particular country's culture, for example the Voortrekkers or San (Bushmen) in South Africa. The availability of cultural activities and sights varies between different countries and is regarded as a great advantage when tourists consider different countries to make their holiday destination choice (Brakke, 2005:15). The meaning of cultural tourism, according to Silberberg (1995:361), is individuals who travel to a community with a full or partial intention of visiting historical, heritage or artistic attractions. Cultural offerings may take various forms such as carnivals or festivals, museums and even architectural sites (Silberberg, 1995:362 and Getz, 2008:404).

Cultural tourists are classified into different groups. Silberberg (1995:363) states that tourists who originally had no intention of attending cultural activities might decide to attend a cultural event such as a festival or visit a gallery when, for example, they have free time available or if the attraction is close by (Silberberg, 1995:363). According to Yun *et al*. (2008:3) purposeful cultural tourists tend to plan a holiday mainly for cultural reasons. This type of tourist also spends more time on research before his/her visit.

Silberberg (1995:363) maintains that the expenditure of cultural tourists is generally higher and that they focus more on one particular area. They also tend to fall into the older age group. Silberberg (1995:363) also argues that tourists with higher incomes or levels of education will generally be more interested in cultural attractions. De Mello *et al*. (2002:514) and Eilat and Einav (2003:23) both include culture in their studies of tourism demand. Eilat and Einav (2003:23) include a dummy variable to capture the effect of culture while De Mello *et al*. (2002:514) use a trend variable. Countries that have colonial ties or that share a language or parent language (e.g. South Africa and the Netherlands) can also be accounted for in tourist demand models. Eilat and Einav (2004:1321) used a dummy variable to ascertain whether the origin and destination country share at least one language or none.

2.2.7 Population

The population size of an origin country is closely linked to the demand for tourists to travel abroad (Walsh, 1996:5). Walsh (1996:5) states that the demand of a more highly populated origin country would most likely trump the demand of a lower populated origin country to travel, even if the tendency to take a trip abroad of the smaller country is higher. Population size is therefore often included in tourism demand equations and can be used to examine economics of scale (Proença & Soukiazis, 2005:8). Therefore, strategic marketing in those countries with a relatively larger market can lead to the enhancement of economies of scale.

Some studies include population size as an independent variable with the main purpose of capturing the market size (Proença & Soukiazis, 2005:8). Bond and Ladman (1972) included the population size of the origin country as a separate independent variable. Muñoz (2007:18), Garín-Muñoz and Montero-Martin (2007:1229) as well as Proença and Soukiazis (2005:8) did not include population as an explanatory variable but included it in certain variables to turn it into *per capita* form.

Hamilton (2003:8) argues that the population density of countries can also influence tourism demand, for instance, high population density in a country may indicate that there are many cities in that country which can enhance that country's attractiveness. On the other hand, if there are not enough natural areas due to high population density in a country, tourists may choose a destination country with more natural areas (Hamilton, 2003:8).

2.2.8 Supply-side factors

The supply side of the tourism sector plays a decisive role in the decision-making process entered into by potential tourists. Supply-side factors include accommodation, transportation, restaurants, entertainment services, information infrastructure and general infrastructure. When the supply side of the tourism sector is well developed and fully functional it can make the destination more easily approachable. Proença and Soukiazis (2005:11) point out that supply-side conditions in the destination country play an important role in the attraction of tourists. It is for this reason that several researchers include supply-side variables when estimating tourism demand.

Kester (2003:204) indicates that one of the obstacles that impedes tourism development in several African countries is a lack of well-developed infrastructure. Many African countries have a shortage or a lack of efficient accommodation, airports and other tourism-related services and facilities such as water, electricity, telecommunication, public transport and general transportation infrastructure as well as restaurants (Kester, 2003:204 and Eugenio-Martin *et al*., 2004:2-4). Eugenio-Martin *et al*. (2004:2) emphasize the importance of well-developed infrastructure for tourism development. Insufficient infrastructure can increase the relative price of tourism-related goods and services which will lead to less tourism competitiveness in terms of price and quality (Naudé & Saayman, 2005:371).

Both Naudè and Saayman (2005:378) and Saayman and Saayman (2008:85) used the number of hotel rooms available in the destination country as a proxy to determine the tourism sector's capacity. Proença and Soukiazis (2005:11) also used accommodation as an explanatory variable as well as the public investment ratio to GDP in the destination country that is a proxy for the welfare generated due to infrastructure available. Dritsakis and Athanasiadis (2000:4) used fixed investment with a two-year lag to determine the impact of infrastructure development on the demand for tourism. It should be noted that Dritsakis and Athanasiadis (2000:4) did not use investments made in tourism infrastructure but rather investments made in infrastructure development in the economy as a whole.

2.2.9 Marketing expenditure

The marketing of a country may influence the destination choice of tourists (Saayman, 2000:40). There are different forms of marketing, including word-of-mouth, television, internet, press, public relations and radio. The competitiveness between destination countries has increased over the years (Buhalis, 2000:113), making marketing essential as it promotes a country and its activities and culture. Promotion creates awareness of a country and can influence the final choice of an individual when he or she is considering a country to travel to. Witt and Witt (1995:455) argue that national tourist organisations tend to be more effective in terms of tourism marketing since they promote a specific country, which is not the case when tour operators are considered who tend to promote several holiday destinations.

Marketing has an impact on tourism demand at present and in the future, though the impact of marketing done in the current period will diminish over time (Walsh, 1996:15). Several researchers have omitted marketing when estimating demand functions because of measurement difficulty. Lim (1997b:845) mentions that only seven per cent of the studies undertaken between the 1960's and late 1990's have included marketing as an independent variable. Researchers who have included proxies for marketing include Naudè and Saayman (2005:380), who have used internet users as a proxy for marketing. Divisekera & Kulendran (2006:192), on the other hand, have used advertising expenditure to estimate the impact of advertising on tourism demand.

2.2.10 Trend

A trend can be defined as an upward or downward movement of a variable over a certain period of time. A trend is usually included in the demand function to capture, for example, consumer preferences, such as the popularity of a certain holiday destination over a certain time period, and cyclical effects (Proença & Soukiazis, 2005:8). Walsh (1996:12) states that a trend variable also captures the changes in independent variables not included in the equation such as demographic changes in the source country. Lim (1997b:841) mentions that since the late 1960's a trend variable was included in 25 per cent of the publications. De Mello *et al*. (2002:514) argue that even though expenditure and prices have not changed, tourists might choose to visit a familiar destination country or a destination country that they are unfamiliar with. If a trend variable is absent, the coefficients for prices as well as expenditure may be spurious (De Mello *et al*., 2002:514).

Several researchers do not include a trend variable and treat preference as exogenous or fixed (Walsh, 1996:12). Song and Witt (2006:217) are of the opinion that the reason why some researchers don't include a trend variable might be because it can create multicollinearity problems, especially multicollinearity between income and the trend variable. Researchers who have used a trend variable include Song *et al*. (2003b:125), Walsh (1996:18), Dritsakis and Athanasiadis (2004:3) as well as De Mello *et al*. (2002:514).

2.2.11 Lagged dependent variable

An alternative to a trend variable is to include a lagged dependent variable. Witt and Witt (1995:455) state that it is likely that tourists who have visited a certain country might visit that country again. The reason why tourists would want to revisit a country is that tourists are familiar with the destination country and are generally risk adverse. Witt and Witt (1995:455) believe that tourists will tell their relatives and friends about their experiences (word-of-mouth), reducing uncertainty for others to travel to that country as well. Therefore there might be a link between a current year's tourist arrivals and the previous year's tourist arrivals in the same country. Song and Witt (2006:217) also state that the omission of a lagged dependent variable from a tourism demand forecasting model would most likely lead to spurious results.

Researchers who have used a lagged dependent variable in their models include Walsh (1996:18); Lim and McAleer (2002:199), Song *et al*. (2003a:440), Song *et al*. (2003b:131) and De Mello *et al*. (2002:514). The inclusion of a lagged independent variable captures tourism dynamics and the preferences and behaviour of the tourist (Muñoz, 2007:17). Proença and Soukiazis (2005:11) have included a lagged tourism expenditure ratio of the source country as an independent variable, while several other researchers such as Kareem (2008:10) have included tourist arrivals in the previous year as an independent variable.

2.2.12 Dummy variables

Dummy variables are also often included when estimating a demand function to determine the effect of qualitative factors such as gender, age, and sporting events (Lim, 1997b:845). Specific events can influence a person's decision to travel for a certain period. Dummy variables are usually used when structural breaks are present. The reasons for including a dummy variable may vary according to destination or origin country (Song & Witt, 2006:217). One of the reasons that researchers include a dummy variable is to estimate the effect on tourism demand when, for example, a war such as the

Gulf war has occurred (see Walsh, 1996:11; Song & Witt, 2006:217), or political changes come about, such as the end of apartheid in South Africa in 1994. Factors such as culture, climate and terrorism have also been the reason for including dummies.

There are determinants which solely have a negative impact preventing tourist arrivals in a certain country. Some of these factors might include political instability, terrorism/crime and natural disasters and health risks. Many of these factors are captured by dummy variables. Therefore, each of these factors is subsequently reviewed.

2.2.12.1 Political instability

One of the many reasons for a government's existence is the maintenance of basic security and public order. Instability within the government itself can lead to uncertainty and instability. In this regard Sihmez (1998:421) states that the effect of political instability usually lasts much longer than terrorist attacks. Therefore, political instability can impede tourism demand for a long time. Political instability is much more likely to occur in developing countries. One example of political instability is that experienced in Zimbabwe over the past couple of years, whereas other examples include racial, tribal and religious conflicts in Somalia and Burundi (Sihmez, 1998:420). The negative perception associated with political instability that is attached to a country is often hard to change and takes a long time to change. Sihmez (1998:420-421) points out that political instability in certain countries within a region often leads to a region being labelled as a politically unstable region, such as East Africa and the Middle East.

Instability in a particular country can cause tourists to travel to other destinations that provide the quality that they want to experience but can offer political stability, even if the politically unstable destination country offers better prices (Neumayer, 2004:2). In their tourism demand study, Naudè and Saayman (2005:380) focussed on political stability in Africa as a significant determinant for tourists from the Americas and Europe. It is therefore important for countries, especially developing countries, to create a stable political environment since tourism in these countries contributes much more to GDP compared to developed countries (Neumayer, 2004:4). Other studies that include political instability are Aresh *et al*. (2004:196), Eugenio- Martín *et al*. (2004:9) and Dritsakis and Athanasiadis (2000:9).

2.2.12.2 Terrorism and crime

Terrorism and crime can affect the final decision of a prospective tourist to travel to a certain country (Brunt *et al*., 2000:418). Sönmez and Graefe (1998:114) and Sihmez (1998:427) indicate that terrorism often emerges due to political unrest or for religious reasons and differs from ordinary daily crime. If people feel unsafe in travelling to a certain country, they will choose a different country to visit. George (2003:577) states that negative media publicity regarding criminal activities may influence a tourist's final decision to travel. Word-of-mouth information may also prevent a potential traveller from travelling to a high-crime destination. Certain areas are, in particular, hot spots for crime. Unfortunately it is also those areas that tourists tend to visit, for example riotous areas such as night clubs. The effects of crime and terrorism are that they lead to declining tourist arrival rates in the country where the crime or terrorist attack took place, sometimes resulting in the surrounding countries experiencing a decline in their tourist arrivals (Dean, 2002:1).

Sihmez (1998:427-428) argues that tourists' reactions to terrorism or crime may differ in accordance with their travel purpose. Business tourists are often required to travel to a country which has experienced a terrorist attack or that has a high crime rate, whereas tourists who wanted to holiday in the country concerned may choose a different destination country after such an attack (Sihmez, 1998:427-428). Some tourists may choose to proceed with their travelling plans due to the high cost implication, whereas other tourists might choose a different destination country. Therefore tourist arrivals often change due to terrorist attacks (Sihmez, 1998:430).

Neumayer (2004:4) maintains that violence is much more common in developing than developed countries. This might be the result of poverty in the destination country while tourists might be wealthier. According to George (2003:575), South Africa is also known as a "high crime" country. To find reliable and sufficient data to evaluate the effect of crime on tourism demand is quite complex and it might be for this reason that crime is not often included in tourism demand models. George (2003:676) notes that data are usually aggregated crime statistics that do not differentiate between tourists and residents of the destination country. Research that includes crime or terrorism in tourism demand models has been undertaken by Neumayer (2004:9), Naudé and Saayman (2005:378) as well as Eilat and Einav (2004:1321).

2.2.12.3 Natural disasters and health risks

Natural disasters and diseases also influence the decisions of tourists to travel to a particular country. A tourist may personally experience health problems while visiting a certain destination and therefore he or she might be more risk averse and choose not to visit higher health risk destinations, or the media may influence the tourist's decision to travel (Lee, 2010:486). Examples of the diseases in question include H1N1 (swine flu), H5N1 (bird flu), malaria, HIV/AIDS and SARS. Some regions pose more serious health risks than others, for example the presence of malaria in tropical and subtropical regions (WHO, 2010). Naudé and Saayman (2004:14) included the incidence of malaria as a proxy for health. The tsunami that occurred on 26 December 2004 likewise had a severe impact on international tourist arrivals in the countries directly affected by the 2004 Indian Ocean tsunami as well as in the surrounding countries. Phuket, for example experienced a decline of 85 per cent in international tourists during January 2005 (Henderson, 2007:233).

2.2.13 Summary of the determinants of tourism demand

This section described several determinants that are often included in empirical studies to explain tourism demand for a particular destination. Income is a very popular variable to include since tourism is a luxury good and directly affects the ability of potential tourists to travel abroad. Income is often proxied by using GDP, GNP, nominal per capita income or real per capita income. Price competitiveness can also affect consumer choices. It is for this reason that researchers often include the real exchange rate as a proxy for relative prices. Transport cost is considered to form the largest part of travelling cost and therefore affects the destination choice made by potential tourists. Due to the difficulty of measuring transport cost, it is not always included in empirical studies. Researchers who have included transport cost, often used jet oil prices or crude oil prices as a proxy. Other variables that are sometimes included, but are not as popular as the above mentioned determinants, are supply-side factors, marketing expenditure and climate variables.

A trend variable may also be included to capture, for example, the effect of changing consumer taste over time. Dummies may be introduced into the model to capture certain events or circumstances such as terrorism or crime, health risks, natural disasters or political instability. Tourists may also choose to revisit a certain country, and for this reason, researchers often include lagged tourist arrivals as an explanatory variable.

The next section provides a brief discussion on models often used in empirical tourism demand studies and, more specifically, in forecasting tourism demand.

2.3 Model specification

The previous section was devoted to the factors that influence tourism demand. This section will provide an overview of the different forecasting models used in tourism demand and forecasting studies. According to Archer (1980:5), the methods used to forecast tourism demand can be divided into two categories, those of a quantitative nature and those of a qualitative nature. Quantitative methods are methods that combine historical data and statistical models to determine the relationship between the dependent variable and the explanatory variables (Makridakis *et al*., 1998:8). Qualitative methods do not rely as much on historical data but more on joint specialist opinions (Makridakis *et al*., 1998:12). Qualitative methods can be used to supplement quantitative methods, which aid business planners and policy makers in their final decisions (Makridakis *et al*., 1998:12). According to Chu (2004:210), quantitative methods outperform those of a qualitative nature. For this reason, the focus will be on quantitative methods. Quantitative methods can be sub-divided into two groups, namely: causal methods and non-causal methods. Each is reviewed below.

2.3.1 Causal methods

Causal methods are regression models used to forecast tourism demand by estimating the relationship between tourism demand and the explanatory variables used (Chu, 2004:210). Historic data is used to estimate the regression. To forecast tourism demand, the future values of the explanatory variables are used and combined with the estimated relationship (Witt & Witt, 1995:448). Causal methods are especially valuable to determine the cause-effect relationship in tourism demand forecasting (Frechtling, 2001:20). However, disadvantages associated with econometric modelling include the complexity of finding appropriate data and the high cost of obtaining the necessary data (Frechtling, 2001:20). The next section will provide a summary of the different econometric models often used in forecasting tourism demand.

2.3.1.1 Econometric models

Researchers often use econometric models to determine the causal relationship of various determinants on tourism demand. Saayman and Saayman (2008:83) state that tourism demand studies generally include single equation estimations, more complete models (system of equation models) and panel data models.

2.3.1.1.1 Single equation models

Some examples of single equation models are the autoregressive distributed lag model (ADLM), the error correction model (ECM) and the time-varying parameter (TVP) model (Song & Li, 2008:211). These models treat all the independent variables as exogenous (Song & Li, 2008:211).

2.3.1.1.1.1 Error Correction Model

The ECM has attracted the attention of many researchers (Karimi, 2008:4). An ECM is used to explain the current values of the dependent variable regressed on the current values of the independent variables and the previous values of the dependent variable, as well as the independent variables and error (Kulendran & Witt, 2003:506).

Unlike other econometric methods, such as the VAR model, the ECM makes it possible to capture the long and the short-run dynamics when cointegration occurs (Karimi, 2008:4). Cointegration occurs when the dependent and independent variables are non-stationary, for example I(1), which leads to the error being stationary, that is I(0) (Asteriou & Hall, 2007:309). If the data are differenced in order to make data stationary, a long-run relationship can no longer be estimated (Asteriou & Hall, 2007:307). If this is not taken into account, the forecasting results may not be very good estimates.

Other advantages associated with the ECM are that if cointegration occurs, first differencing prevents the regression results from being spurious (Asteriou & Hall, 2007:310).The errors are I(0) due to cointegration. Therefore, in the long-run division of the model, the errors that adjust to equilibrium will not become larger as a steady state is approached (Asteriou & Hall, 2007:311).

Kulendran and Witt (2003:509) indicate in their study that the ECM outperformed the ARIMA model in the long-run (eight quarters ahead) while the ARIMA outperformed the ECM in the short-run (four quarters ahead).

2.3.1.1.1.2 Autoregressive Distributed Lag Model

The ADLM has the advantage that if cointegration is present, the long and short-run relationship between the explanatory variables and the dependent variable can be examined (Bahmani-Oskooee & Ng, 2002:150). By using the Bound test approach introduced by Pesaran *et al*. (1996), the presence of cointegration can be tested even though some of the variables concerned may be integrated of the order one, zero or mutually integrated (Salleh *et al*., 2007:353).

The ADLM is known as a dynamic model since it includes lagged and current explanatory variables which incorporate the time component with regard to the decision–making process of tourists (Song *et al*., 2003a:440). A lagged dependent variable is also included as an explanatory variable which represents word-of-mouth advertising (Song *et al*., 2003a:440). Word-of-mouth advertising may lead to an increase in future tourist arrivals due to less uncertainty about the destination country (Song *et al*., 2003a:440). Another advantage associated with the ADLM is that the chances of serial correlation being present in this model is lower than in other cointegration models (Aresh *et al*., 2004:193).

2.3.1.1.1.3 Time-varying Parameter Model

The TVP model is included in several tourism demand studies and researchers have obtained relatively accurate modelling and forecasting results (Song & Li, 2008). TVP models are often used when there are structural changes in data or when constant coefficients are too restricted (Athanasopoulos *et al*., 2009:14). The main advantage that the TVP has is that the coefficients change over a certain time period, whereas the coefficients in previous econometric models did not change over time (Li *et al*., 2006:176). When the coefficients are estimated with the TVP, the more recent data have a stronger influence than data further back into the past (Hilaly & El-Shishiny, 2008:4). Over the years, several researchers started to combine some of the single equation models to improve the modelling and forecasting results. Researchers have, for example, combined the TVP and ECM, and have estimated a TVP-ECM model and obtained relatively accurate results (see Li *et al*., 2006).

2.3.1.1.2 System of Equation Models

Systems of equation models include several multiple equations with co-dependent variables (Hilaly & El-Shishiny, 2008:5). For this reason, researchers often prefer system equation models over single equation models (Hilaly & El-Shishiny, 2008:5). However, according to Frechtling (2001:205), system of equation models have several disadvantages, which include:

- Higher risk of multicollinearity than in single equation models.
- Using ordinary least squares (OLS) will result in estimator bias.
- Risk of increasing random errors.
- More expensive to perform than single equation models.

Two examples of the system of equation models include the Vector Autoregressive (VAR) Model and the Almost Ideal Demand System (AIDS) Model.

2.3.1.1.2.1 Vector Autoregressive Model

In the VAR model, all the variables are endogenous, unlike the single equation models where the variables are exogenous; this model is suited for policy simulation (Li *et al*., 2005:89). The weakness of the VAR model is the great loss in degrees of freedom (Hilaly & El-Shishiny, 2008:5). When a VAR model is used, all variables are treated as endogenous variables (Song *et al*., 2003b:135) and the present values are then regressed against all the previous values of the variables used (Song & Witt, 2006:218). This is known as an unrestricted VAR model (Song & Witt, 2000:93).

The VAR model has several advantages but also a few disadvantages. One advantage is that using a VAR model makes it relatively easy to forecast since it is not necessary to forecast each variable (Hilaly & El-Shishiny, 2008:8). The VAR model also requires little theoretical knowledge. This, however may also be a disadvantage since this makes the interpretations of the results more complex (Asteriou & Hall, 2007:281). Another disadvantage is that the data need to be stationary before the model can be estimated. It is therefore often necessary to difference the data in order to obtain stationary data. By differencing the data, important information regarding the long-run relationship is lost. A drawback from inserting too many lags in the model may result in a significant loss in the degree of freedom which can prevent the model from providing accurate results (Asteriou & Hall, 2007:280). It is therefore necessary to specify the appropriate lag length. According to Song and Witt (2000:93), a large number of lags should be included at first and then the number of lags should be reduced to the appropriate lag length. Different criteria, such as the Akaike Information Criteria, Schwarz Information Criteria and the modified LR test can be used to determine the optimum lag length (Song & Witt, 2000:94).

2.3.1.1.2.2 Almost Ideal Demand System

A method which is becoming increasingly more popular is the AIDS model. Hilaly and El-Shishiny (2008:6) point out that the AIDS model is based on consumer utility maximizing theory and is therefore more appropriate for estimating the AIDS model with tourism expenditure shares as the regressand (Hilaly & El-Shishiny, 2008:6; Song & Li, 2008:211). The AIDS model has many advantages, namely the ability to estimate price and expenditure elasticities, which is very helpful when comparing the interdependencies between travel destinations (Saayman & Saayman, 2008:83). Hilaly and El-Shishiny (2008:6) argue that the coefficients would be biased if too few substituting destination countries were included in the model.

The AIDS model, according to Song and Li (2008:211), provides good coefficients because of the incorporation of several destinations into the AIDS model. Unfortunately, including a large number of destinations may lead to a high number of degrees of freedom lost (De Mello *et al*., 2002:510). Failure to include enough destinations into the model may, on the other hand, result in bias parameters (Hilaly & El-Shishiny, 2008:6).

De Mello et al. (2002:515-516) find in their study that the AIDS model provides accurate forecasting results. Li et al, (2006:67-68) have estimated and forecast different combinations of Linear AIDS models, for example TVP-LR-LAIDS, TVP-EC-LAIDS and find that they forecast relatively well.

2.3.1.1.3 Panel data models

Finally, panel data studies are also used more often, since panel data enhance the quantity and quality of the data (Yaffee, 2003:1). Saayman and Saayman (2008:84) state that the advantages associated with the use of panel data include less multicollinearity and improved estimates. Panel data is a combination of cross-section data over a certain time period. Panel data can thus be divided into a variable, a time period and the cross-section (Brakke, 2005:19). There are three ways to estimate a panel data model, namely a common constant model, a fixed effects model or a random effects model.

If a common constant panel data model is estimated, the constant is the same for all the cross-sections in the model (Song & Witt, 2000:140). This method is easy to estimate but may not provide efficient estimates and may be too restrictive (Song & Witt, 2000:140). When the fixed effects model is estimated, each cross-section has its own constant (Asteriou & Hall, 2007:346). This is achieved by inserting a dummy variable for the cross-sections (Song & Witt, 2000:140). Including too many dummy variables may result in the loss of a number of degrees of freedom (Song & Witt, 2000:140). A standard F-test can be performed to determine if a common constant or a fixed effects model is more appropriate to estimate (Asteriou & Hall, 2007:346). The R-square from the fixed effects model is the R-square of the unrestricted model and the R-square of the common constant model is the R-square of the restricted model. The null hypothesis is that all the constants are the same (Asteriou & Hall, 2007:346).

The random effects method also has a constant for each cross-section but is a random parameter (Asteriou & Hall, 2007:347). A Hausman test is usually performed to determine whether a fixed effects model or a random effects model should be estimated (Asteriou & Hall, 2007:348). If the null hypothesis is rejected, a random effects model can be estimated (Asteriou & Hall, 2007:349).

The panel regression approach in empirical studies of tourism demand has not been used to a great extent (Song & Li, 2008:212). Naudé and Saayman (2005:384) have performed a random effects panel data model but have not done any forecasting. Garin-Muñoz and Montero-Martin (2007:1230) as well as Muñoz (2007:18) estimated a fixed effects panel model. Other studies include those of Eilat and Einav (2004:1315) as well as Proença and Soukiazis (2005:2).

2.3.2 Non-causal methods

The characteristic that distinguishes causal methods from non-causal methods is that non-causal methods identify stochastic components (such as lagged dependent variables as regressors as well as past errors) in each time-series (Chu, 2004:210).

2.3.2.1 Time-series methods

Unlike causal models that estimate the relationship between a dependent variable and explanatory variables, time-series models use the dependent variable (in this case tourism arrivals) to forecast itself. Du Preez and Witt (2003:449) find that Autoregressive Integrated Moving Average (ARIMA) models perform relatively well in terms of forecasting accuracy.

The ARIMA time-series analysis contains two components, a non-seasonal Autoregressive (AR) component as well as a non-seasonal Moving Average (MA) component. The AR component can have a parameter of order *p,* since the AR component indicates that the current value of Y_t i.e. the current value of tourist arrivals, will depend on the previous value of tourist arrivals, i.e. Y_{t-p}, the parameter *p* indicates the number of lagged dependent variables included in the model (Lim & McAleer, 1999:575). The MA component can have a parameter of order *q*, since the MA component indicates that tourist arrivals in the current period, i.e. Y_t depend on the previous errors or *q* lagged error terms (Lim & McAleer, 1999:575). Often, integration is necessary to transform the data from non-stationary to stationary. The time-series analysis therefore takes the general ARIMA(*p*,*d*,*q*) form, where *d* indicates the non-seasonal order of integration.

It might be necessary to include a seasonal component into the general ARIMA(*p*,*d*,*q*) model since tourist activities, and therefore tourist arrivals as mentioned in chapter one, are largely influenced by the different seasons. Business planners have to accommodate for the seasonal trends in their planning and might find such forecasting very useful. A SARIMA$(p,d,q)(P,D,Q)_s$ model captures both the non-seasonal and seasonal component (Lim & McAleer, 1999:576). The parameters *P* indicate the seasonal AR component, *D*, the seasonal order of integration and *Q* specifies the seasonal MA component.

ARIMA models hold several advantages. Du Preez and Witt (2003:449) find that ARIMA models generally have good fits and are easier to interpret than some of the other models. Chu (1998:613) states that ARIMA models are drawn from the firm groundwork of classical probability theory and mathematical statistics. Chu (1998:613) finds that ARIMA models give smaller forecast-error variances than other standard single-series models.

Researchers found conflicting results when comparing the forecasting accuracy of the ARIMA and SARIMA models (Song & Li, 2008:210). Goh and Law (2002:503) used a multivariate SARIMA to forecast tourism demand in order to improve forecast accuracy by including an explanatory variable.

Goh and Law (2002:509) found that their multivariate SARIMA had outperformed the univariate SARIMA and other univariate time-series models.

2.4 Forecasting accuracy

Most tourism demand forecasting researchers use the size of the forecasting errors to examine the performance of their tourism demand forecasting models (Li *et al*., 2005:92). According to Li *et al*. (2005:92), the majority of tourism demand forecasting studies in the past have used the Mean Absolute Percentage Error (MAPE), Root Mean Square Error (RMSE) or Root Mean Square Percentage Error (RMSPE) and Theil's *U* as a means to examine the forecasting performance of their tourism demand forecasting models. Therefore, the focus will fall on the above-mentioned methods of testing forecasting accuracy.

Song and Witt (2000:160) state that forecasting error values are often turned into absolute or quadratic error values in order to prevent positive and negative forecasting errors from cancelling out. The MAPE represents a linear loss function, whereas the RMSE is a quadratic function (Li *et al*., 2005:92). The MAPE measures the mean absolute percentage difference between actual tourist arrival values and forecast tourist arrival values (see equation 2.1) (Yorucu, 2003:182), while the RMSE evaluates the extent to which forecast errors deviate from the mean actual tourist arrival value (see equation 2.2) (Chu, 2009:744). The RMSPE measures the exact same deviation as the RMSE but is expressed as a percentage.

$$MAPE = \left[\frac{\sum\left(\frac{e_t}{a_t}\right)}{q}\right] * 100 \tag{2.1}$$

where e = actual tourist arrival value in period t minus forecast tourist arrival value in period t, a = actual tourist arrival value, q = number of quarters.

Hyndman (2006:45) indicates that the MAPE has the advantage that it is not dependent on scale and is therefore very suitable when the forecasting results between different data series are compared, for example comparing the forecasting results between different origin countries to that of the destination country (Song & Witt, 2000:161). The MAPE also has a disadvantage since this method is more sensitive to positive forecast errors than negative forecast errors (Hyndman, 2006:45), whereas the

RMSE is very sensitive to one bad forecast value (Li *et al*., 2005:92) See equation 2.2 (Yorucu, 2003:182).

$$RMSPE = \sqrt{\frac{\sum pe_t^2}{q}} \tag{2.2}$$

where *pe* is the percentage deviation between the actual and forecast value and *q* is as above.

The Theil's *U* method (see equation 2.3) of testing forecasting accuracy focuses more on the forecasting turning points (Yorucu, 2003:184). The Theil's *U* value usually falls within the bracket of zero and one (Yorucu, 2003:183). When the Theil's *U* value is closer to zero, it means that the forecast values are very good (Yorucu, 2003:183).

$$Theil's\ U = \frac{\sqrt{\frac{\sum e_t^2}{q}}}{\sqrt{\frac{\sum a_t^2}{q}} + \sqrt{\frac{\sum f_t^2}{q}}} \tag{2.3}$$

where: *e, a* and *q* are as above, and *f* = forecast tourist arrival value in period *t*.

According to Lewis and DeLurgio (as quoted by Hsu, 2010:4320), a forecasting result with a forecasting error of 10 per cent and less is an indication of highly accurate forecasting results, whereas a percentage number between 10 and 20 indicates good forecasting accuracy, and a percentage number between 20 and 50 reasonable forecasting accuracy. Researchers have also found forecasting accuracy to vary between forecasting horizons, for example, a longer forecasting horizon often leads to less accurate forecasting results due to the possibility of several unforeseen events taking place (Li *et al*., 2005:92). The type of data used in the empirical analysis may also have an influence on forecasting accuracy. Li *et al*. (2005:97) note that advanced causal models often outperform time-series techniques when annual data is used, whereas time-series techniques using monthly or quarterly data often lead to better forecasting accuracy results than causal methods using monthly or quarterly data.

2.5 Summary

The focus of this chapter was on providing a thorough overview of the determinants that influence tourism demand. Understanding the influence of these determinants and the impact they have on tourism demand can aid policy makers and business planners. The determinants described in this chapter have also been described by several authors. Popular explanatory variables included in studies relating to this topic are income, relative prices, transport cost and exchange rate. Other explanatory variables differ and are subject to the destination country and origin countries chosen. It has been ascertained that certain factors have negative effects on tourism arrivals such as political instability, terrorism and crime as well as natural disasters and health risks. Limiting the presence of these negative factors can aid the tourism sector of a country and increase the contribution of tourism to the GDP of the country concerned.

Researchers find it difficult to acquire the necessary data to calculate the effect of independent variables on tourism demand and for this reason use dummies or trend variables. Data limitations prevent a full understanding of the effect of these determinants on tourism demand. Some empirical studies exclude certain variables because they are closely linked with other explanatory variables that are of greater importance.

The modelling methodology has developed considerably over the years, enabling researchers to obtain more accurate modelling and forecasting results. Explanatory variables are often included in some of the tourism forecasting models in order to obtain more accurate forecasting results. From the discussion it became evident that the various models used by researchers to obtain causal effects can be categorised as single equations, system equation as well as panel data models, while time series models (which do not capture causal effects) are argued to perform almost as well as causal models, in some cases even outperforming causal models. Popular methods for examining the forecasting accuracy of tourism demand forecasting models are the MAPE, RMSE and Theil's *U*.

In the following chapter, the focus is placed on choosing suitable explanatory variables for inclusion in the econometric model. A single equation approach will be taken in chapter three followed by a system of equation approach in chapter four. The empirical analysis of the first model in chapter 3, namely the Autoregressive Distributed Lag Model, will also be discussed in the first article and the forecasting results of six origin markets (Asia, Australia, Europe, North America, South America and United Kingdom) will be compared.

Chapter 3

Article 1

Forecasting tourism demand for South Africa using a single equation causal approach

Abstract:

South Africa has become a very popular tourist destination over the years. Tourists from around the world travel to South Africa to indulge themselves in the warm weather; to enjoy the beautiful coastline, wildlife and historical attractions such as Robben Island. International tourist arrivals have increased significantly over the past 15 years and the country is now (2009) ranked twenty-sixth in terms of international arrivals. It is therefore surprising that little research is available on forecasting tourism demand in South Africa. Three tourism demand studies have been completed that identified the determinants of tourism demand for Africa and South Africa (see Saayman & Saayman, 2008; Naudé & Saayman, 2005 and Seetanah *et al*., 2010). However, none of these studies attempted to forecast tourist arrivals. The only study that forecast tourism arrivals to South Africa as a whole used pure time series techniques (see Saayman & Saayman, 2009), which has the disadvantage of not providing any policy recommendations. Therefore, this paper aims to expand on forecasting intercontinental tourism demand for South Africa by using a single equation causal approach with the aim of not only exploring the relationships between arrivals and their determinants, but also to provide forecasts of arrivals based on these determinants. Autoregressive Distributed Lag models, supplemented with an error correction term, are estimated for tourist arrivals from Asia, Australasia, Europe, North America, South America, and the United Kingdom. In-sample (*ex post*) forecasts were performed and forecasting accuracy was evaluated by determining the Mean Absolute Percentage Error (MAPE), Root Mean Percentage Square Error (RMPSE) and Theil's *U* of each model.

Key words: South Africa, tourism forecasting, autoregressive distributed lag model, error correction mechanism

3.1 Introduction

Tourism is the largest industry in the world (Page, 1999:4) and is therefore also a very competitive industry. Since the tourism sector is considered a low-skilled labour-intensive employer (Lim, 1997b:835), it is particularly helpful for developing countries which have a large proportion of unschooled workers, as it could increase employment opportunities. In addition, increasing the number of tourist arrivals enhance foreign exchange earnings (Lim, 1997b:835) and may improve investment as well as the development of infrastructure (De Mello *et al*., 2002:509).

South Africa has become a very popular tourist destination over the past twenty years. Tourists from around the world travel to South Africa to indulge themselves in the warm weather; to enjoy the beautiful coastline, wildlife and historical attractions such as Robben Island. International tourist arrivals have increased significantly over the past 15 years (Stats SA, 2009c:1) and the country is now (2009) ranked twenty-sixth in terms of international arrivals (SA Tourism, 2009c:11). South Africa experienced a period of stagnation in international arrivals during the 1980's as seen in Figure 3.1. This was primarily as a result of sanctions against South Africa due to its political policies. The sanctions were lifted in the early 1990's which led to an increase in international arrivals (Saayman & Saayman, 2008:82).

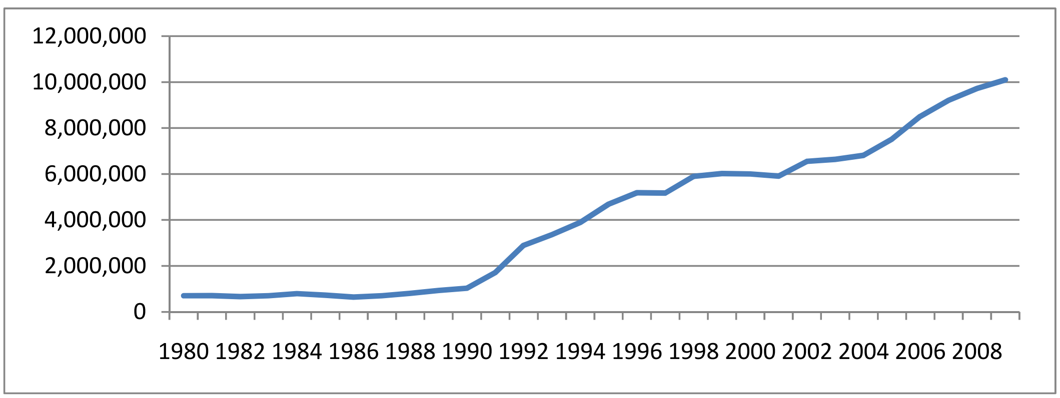


Figure 3.1: Arrival of foreign travelers in South Africa, 1980 - 2009

Source: Statistics South Africa (2009c:86-97; 2008:82-91)

Although arrivals from Africa are South Africa's largest market, they visit South Africa for different reasons than arrivals from other markets. Tourists from neighbouring African countries form the largest portion of arrivals from Africa and they visit South Africa regularly for purposes of shopping, study or employment (Saayman & Saayman, 2008:83). Arrivals in South Africa can therefore be divided into two groups, namely, arrivals from Africa and intercontinental arrivals (Saayman & Saayman, 2008:82).

Du Preez and Witt (2003:436) state that a lack of knowledge of future tourist arrivals may lead to missed opportunities or an overestimation of tourism demand. Overestimating tourism demand may, for example, lead to excessive investment. Therefore, in order to improve resource management, it is important to accurately forecast tourist arrivals.

Although there are a number of studies on forecasting tourist arrivals to other countries, little research is available on forecasting tourism demand in South Africa. Three tourism demand studies have been completed that identified the determinants of tourism demand for Africa and South Africa (see Saayman & Saayman, 2008; Naudé & Saayman, 2005 and Seetanah *et al*., 2010). However, none of these studies attempted to forecast tourist arrivals. The only study that forecast tourism arrivals to South Africa as a whole used pure time series techniques (see Saayman & Saayman, 2009), which has the disadvantage that it does not provide any policy recommendations. Therefore, the current research aims to expand on forecasting tourism demand for South Africa by using a single equation causal approach with the aim of not only exploring the relationships between arrivals and their determinants, but also of providing forecasts of arrivals based on these determinants. In-sample (*ex post*) forecasts will be performed and forecasting accuracy will be evaluated by determining the Mean Absolute Percentage Error (MAPE), Root Mean Square Percentage Error (RMSPE) and Theil's *U* of each model.

The remainder of this article is structured as follows: A brief overview of the determinants of tourism demand will be given in the following section. This is followed by a review of the data and the methods followed. Section 3.4 focuses on the results obtained as well as assessing forecasting accuracy. This article concludes by providing recommendations.

3.2 Determinants of tourism demand

Tourist utility maximisation needs to be considered when determining the factors that may influence a potential tourist's choice of country of destination (Divisekera, 2003:33). The choices of potential tourists will be limited by budget constraints as well as time available. Lim (1997b:841) notes that out of 100 empirical studies on tourism the explanatory variables which are the most popular to be included are income (85 out of 100), relative prices (73 out of 100), qualitative factor (60 out of 100) and transport cost (55 out of 100). Naudé and Saayman (2005:369) state that the determinants will not have the same effect on tourism demand of all international tourists, but will differ in accordance with the origin and destination countries involved. Due to measurement difficulties and the occasional unavailability of data, researchers use proxies to determine the effect of certain determinants.

Since tourism is regarded as a luxury (Brakke, 2005:15), income (budget constraints) will, to a great extent, influence the choice of the country of destination. In addition, transport cost is considered by Lim and McAleer (2001:4) to have a substantial impact on total travelling cost. Therefore, transport cost may result in substitution between countries nearest to the country of origin and those countries farther away from the origin country of potential tourists.

Price competitiveness also plays a role in the choice of destination. Tourists who visit a destination country for shopping as the main activity may regard price competitiveness important when choosing the country of destination. Tourists may consider the exchange rate of the potential destination country a good indication of the price level in that country (Forsyth & Dwyer, 2009:85).

Other variables often included in tourism demand studies are market expenditure and climate. Promotion of the country of destination leads to a greater awareness, which contributes to the competitiveness of that country. Tourists often favour certain holiday activities. Some of these activities may be dependent on a certain climate or weather conditions, especially activities such as skiing, sunbathing and hiking. However, researchers are hard pressed to find an appropriate proxy to capture the effect of marketing expenditure and climate and, for this reason, they often exclude these factors from their models (see Lim, 1997b:845 and Berrittella *et al*., 2004:3).

The general infrastructure of a country of destination contributes to the tourism product offered by that country. In this regard Naudé and Saayman (2005:371) states that infrastructure such as well-developed roads, good accommodation and entertainment may improve the competitiveness of the country of destination. In some cases, dummy variables can capture the effects of determinants that cannot be numerically expressed such as health risks, natural disasters, political instability and cultural ties. Witt and Witt (1995:455) add that lagged dependent variables are also included in research to capture the effect of word-of-mouth information which leads to declining uncertainty with regard to the country of destination.

In terms of the various determinants used in previous research on tourism demand for South Africa, Saayman and Saayman (2008) included the real GDP per capita of the origin country as a proxy for income, the real exchange rate as a proxy for relative prices, the price of crude oil as a proxy for travel cost, the number of hotel rooms available as a proxy for infrastructure in South Africa as well as the number of sunshine days in Cape Town as a qualitative factor in their time series analysis of tourism demand. Seetanah *et al*. (2010) included the following determinants in their panel data analysis of tourism demand for South Africa: relative prices, defined as the CPI adjusted by the exchange rate, the real price of competing destinations, GDP per capita of both South Africa and the origin country (development and income proxies), the distance between South Africa and the origin country as a proxy for transport cost, and the number of rooms available in South Africa.

3.3. Method

The method will be described in two-sections, namely, (i) a description of the data, and (ii) the econometric method used.

3.3.1 Data description

The dependent variable included in most of the tourism demand models is tourist arrivals or departures, tourism receipt or expenditure or length of stay in the country of destination (Lim, 1997b:839). This research uses tourist arrivals in South Africa as a dependent variable, since tourist spending and length of stay in South Africa are not available in quarterly or monthly time periods for a sufficient period of time to conduct proper analysis.

According to Witt and Witt (1995), it is better to use quarterly or monthly data rather than annual data because tourism demand is seasonal and annual data may not contain seasonal trends. Therefore, quarterly data for the period 1994 to 2004 is used to develop the models, except for the European model, where the data extend from 1999 to 2006. The time period differs from that of the other models because the euro has only been in effect since 1999. Forecasting is then done for 3 years, i.e. 2005 to 2007 in all cases, except for Europe where forecasting spans from 2008 to 2010, and these forecasts are compared to actual arrivals for accuracy. Since it was expected that the financial crisis would influence arrivals abnormally, the above timeframes were chosen to forecast pre-2008, where possible. The explanatory variables used in this study are income, relative prices, transport cost and accommodation as supply-side or infrastructure determinants (see Table 3.1 for a description of each variable). This is in line with previous research on tourism demand for South Africa. Table A1 in the Appendix provides descriptive statistics on the variables used in the models, while Figures A1 and A2 in the Appendix provide line graphs of the variables.

Table 3.1: Variable description

Variable	Proxy	Description	Source
Arrivals	Asia, Australasia, Europe, North America, South America, United Kingdom	Quarterly arrivals from each continent	StatsSA
Income	Gross domestic product (GDP)	Real GDP per capita in each country of origin expressed in national currency terms	IFS
Relative prices	Real exchange rate	South African rand versus currency of origin country	IFS and SARB[8]
Transport cost	Crude oil	The price of crude oil	SARB
Supply-side determinant	Hotel	The number of hotel rooms available	StatsSA

Data for quarters 2 and 3 of 2004 were missing in terms of the number of hotel rooms available. A ratio to moving average estimate of the data was carried out in order to obtain a seasonal index. The quarterly average of 2004 was then multiplied by the respective quarterly index ratio to intrapolate the missing data. The income variable was determined as follows:

$$Income = \left(\frac{\left(\frac{GDP}{Deflator}\right)*100}{Population}\right) * Constant\ US\$ \tag{3.1}$$

Where *GDP* is the GDP of the origin country nominal in US$, *Deflator* is the deflator with 2005 as the base year, *Population* is the population size of the origin country and *Constant US$* is the 2005 constant US$ exchange rate (Saayman & Saayman, 2008:85).

Real exchange rate is used as a proxy for relative prices. The real exchange rate is calculated using the following equation (Saayman & Saayman, 2008:86) and denominated in local currency for one unit of foreign currency:

$$Real\ exchange\ rate = \left(\frac{CPI_{origin}}{CPI_{destination}}\right) *\ Nominal\ exchange\ rate \tag{3.2}$$

Africa is not included in the empirical analysis due to lower average spending patterns by arrivals from Africa (SA Tourism, 2009c:32), data limitations and the fact that several African countries use

[8] South African Reserve Bank

the South African rand exchange rate (Saayman & Saayman, 2008:85). The United Kingdom, the United States of America, Germany, the Netherlands and France remain the top five markets for intercontinental arrivals to South Africa. Germany, the Netherlands, the United Kingdom and France have colonial ties with South Africa and this contributes towards higher arrival numbers recorded from these countries (see Naudé & Saayman, 2005). For the European model, the euro area is therefore used as a proxy and the United Kingdom is modelled separately due to its importance as the main source market.

Arrivals from the United States of America account for 84 per cent of all arrivals from North America. Therefore, for the North American model, the United States of America is used as a proxy. For South America, tourist arrivals from Brazil form the largest market (56 per cent), but due to data limitations, Argentina is used as a proxy for South America. Arrivals from Argentina account for 17 per cent of all arrivals from South America. Australia is used as a proxy for the Australasian model. Tourist arrivals from Australia amount to 82 per cent of total tourist arrivals from this region. India (30 per cent) and China (18 per cent) are the top source markets for Asia followed by Japan (11 per cent). Japan is chosen as the proxy for Asia due to data limitations on China and India.

3.3.2 Estimation method

Quantitative methods used in forecasting tourist arrivals can be sub-divided into two groups, namely causal methods and non-causal methods. Causal methods are regression models which are used to forecast tourism demand by estimating the relationship between tourism demand and the explanatory variables used (Chu, 2004:210). Historic data is used to estimate the regression. Unlike causal models that estimate the relationship between a dependent variable and explanatory variables, non-causal methods (or time series models) use the dependent variable to forecast itself. Causal methods can further be divided into single equation methods, systems of equation methods and panel data methods. This article focuses on a single equation causal approach to forecasting tourist arrivals in South Africa. Some examples of single equation models often used in tourism forecasting empirical studies are Autoregressive Distributed Lag Models (ADLM), Error Correction Models (ECM), Time Varying Parameter (TVP) models and various combinations of these models (Song & Li, 2008:211).

According to Hilaly and El-Shishiny (2008:3) the ECM has the ability to capture the short-run and the long-run dynamics when cointegration occurs. Cointegration occurs when the dependent and independent variables are non-stationary but integrated of the same order, for example I(1), which leads to the error being stationary, that is I(0) (Asteriou & Hall, 2007:309). TVP models are often used when there are structural changes in data or when constant coefficients are too restricted (Li *et al*., 2006:176). The TVP model accommodates the changing behaviour of tourists, for example, due to economic circumstances whereas fixed-parameter models do not have this ability (Song & Witt, 2000:132). When the coefficients are estimated with the TVP, the more recent data have a stronger influence than data further back into the past (Hilaly & El-Shishiny, 2008:4).

Salleh *et al*. (2007:353) state that the ADLM can be used when data is available for a limited period of time. This model is therefore suitable in the current research, since the data that will be used in the empirical analysis only extends from 1994 quarter 1 to 2004 quarter 4 (40 observations) and, in the case of the European data, from 1999 quarter 1 to 2006 quarter 4 (32 observations). The ADLM includes a lagged dependent variable, lagged independent variables and current independent variables as regressors (Song & Witt, 2000:74). The inclusion of too many explanatory variables may result in multicollinearity and as a result, high standard errors which may lead to invalid test statistics (Song & Witt, 2000:75). The ADLM benefits from the inclusion of lagged values of the explanatory variables and independent variable because it takes time for certain changes to take effect, and this is taken into consideration with this specification. It is also possible to estimate both long-run relationships as well as short-run relationships if cointegration is present (Divisekera & Kulendran, 2006:193). In such a case the ARDL model is expanded to include an error correction model specification. The general ADLM is shown in equation 3.3.

$$y_t = \alpha + \sum_{j=1}^{k}\sum_{i=0}^{p} \beta_{ji} x_{jt-i} + \sum_{i=1}^{p} \emptyset_i y_{t-i} + \varepsilon_t \tag{3.3}$$

Where *p is* the lag length, k is the number of explanatory variables, *x* is a vector of independent variables and ε_t is the white noise error term. Equation 3.3 can then be changed into and ECM (see Song & Witt, 2000:73-74) as indicated in equation 3.4.

$$\Delta y_t = \left(current\ and\ lagged\ \Delta x_{jt} s, lagged \Delta y_t s\right) - (1-\emptyset)[y_{t-1} - \sum_{j=1}^{k} \beta_j x_{jt-1}] + \varepsilon_t \tag{3.4}$$

According to Lim (1997a:541), 35 out of 100 tourism empirical studies used 1 proxy as an explanatory variable followed by 2 proxies (25 out of 100) and 3 proxies (19 out of 100). Therefore, the explanatory variables are examined to determine which variables to include in the ARDL models. This research follows the same approach as that by Aresh *et al*. (2004:201) for Fiji and of Song *et al*. (2003a:443) for Hong Kong.

Table 3.2: Augmented Dickey-Fuller and Phillips-Perron Unit root test results (p-values)

	Augmented Dickey-Fuller		**Phillips-Perron**	
Asia				
Variable	*Level*	*First difference*	*Level*	*First difference*
Larrivals	0.2340	<0.0001	0.0820	<0.0001
LGDP	0.6219	<0.0001	0.7270	<0.0001
Lhotel	0.1959	0.0187	0.4491	0.0003
Lreal exchange rate	0.5177	<0.0001	0.6238	<0.0001
Europe				
Variable	*Level*	*First difference*	*Level*	*First difference*
Larrivals	0.9087	0.0006	0.0014	
Lhotel	0.9533	0.0169	0.9757	0.0012
Lreal exchange rate	0.0857	0.0028	0.3812	0.0032
South America				
Variable	*Level*	*First difference*	*Level*	*First difference*
Larrivals	0.5727	<0.0001	0.0008	
Lcrude oil	0.7734	0.0002	0.7292	0.0002
LGDP	0.2550	0.0017	0.2548	0.0016
Lhotel	0.1959	0.0187	0.4491	0.0003
Australasia				
Variable	*Level*	*First difference*	*Level*	*First difference*
Larrivals	0.1621	<0.0001	0.1075	<0.0001
Lcrude oil	0.7734	0.0002	0.7292	0.0002
Lhotel	0.1959	0.0187	0.4491	0.0003
Lreal exchange rate	0.3071	<0.0001	0.3433	<0.0001
North America				
Variable	*Level*	*First difference*	*Level*	*First difference*
Larrivals	0.3680	0.0199	0.1559	<0.0001
Lcrude oil	0.7734	0.0002	0.7292	0.0002
Lhotel	0.1959	0.0187	0.4491	0.0003
Lreal exchange rate	0.6048	0.0006	0.5469	0.0004
United Kingdom				
Variable	*Level*	*First difference*	*Level*	*First difference*
Larrivals	0.1409	<0.0001	0.0060	
LGDP	0.2130	<0.0001	0.2374	<0.0001
Lreal exchange rate	0.4544	<0.0001	0.4444	<0.0001

To recognise and eliminate multicollinearity, the correlation between the variables was first examined (see Table A2 in the Appendix). The Asian correlation shows that crude oil correlates highly with GDP and arrivals. Therefore, crude oil is not included in the Asian model. GDP was excluded from the Australasian model due to a high correlation with arrivals and the real exchange rate. Though only crude oil and hotel rooms are correlated with each other in the European correlation table, the only variables included in the European model are arrivals, real exchange rate and hotel, since these variables also shows a long-run relationship (see Table 3.2 below). In the North American section of the correlation table, one can see that GDP correlates highly with almost all of the variables, thus GDP is excluded from the North American model. All correlations were low between the South American variables, but the exchange rate was excluded in the model to allow for a long-run relationship to be estimated (see Table 3.2 below). Hotel rooms and crude oil are also not included in the United Kingdom model due to high correlations with other independent variables.

The Augmented Dickey-Fuller test, assuming an intercept but no trend, with lag lengths based on the Akaike information criteria (AIC) is performed on each variable to determine the order of integration. The null hypothesis of both the Augmented Dickey-Fuller test and the Phillips-Perron test are that there is a unit root present in the data. According to Wang (2009:77), the AIC should be used for small samples while the Schwarz information criteria should be used for larger samples. As seen from the Augmented Dickey-Fuller unit root probability results set out in Table 3.2, all variables are non-stationary at levels and stationary at first difference. This test was supplemented by the non-parametric test of Phillips and Perron, which confirms the results of the Augmented Dickey-Fuller test, except for some of the arrival series. Therefore the stationarity results are treated with caution in the subsequent cointegration tests.

According to Pesaran *et al*. (2001:315), using the Johansen cointegration test or the Engel and Granger test to determine the level of cointegration will provide biased results if there is a combination of variables integrated of order one and variables integrated of order zero in the model (see also Wang, 2009:77). Therefore, the bound test approach is followed to determine the existence of cointegration. The bound test results are shown in Table 3.3. Pesaran *et al*. (2001:300) state that different F-critical values should be used to test the null hypothesis of no cointegration. The null hypothesis put differently is H_0: $\beta_5 = \beta_6 = \beta_7 = \beta_8 = 0$ (this is based on equation three). Thus, the Wald statistic of the long-run relationship is determined in order to test the null hypothesis and a rejection thereof indicates towards cointegration. In Table 3.3, the F-statistic values are compared to the Case III F-critical value (see Pesaran *et al*., 2001:300). It is evident from the table that there is only one cointegrating relationship present in all the regions, and that this relationship is present when arrivals from the regions are the dependent variable.

Table 3.3: Bound test results (F-statistic)

Region	Arrivals	GDP	Hotel	Exchange rate	Crude oil
Asia	8.1648***	0.1077	0.0580	0.1395	n/a
Australasia	7.0610***	n/a	1.5818	1.4655	1.3471
Europe	4.1532*	n/a	0.7606	1.3407	n/a
North America	3.6764*	n/a	0.0199	0.0918	0.3996
South America	8.0103***	0.4946	0.0400	n/a	0.2813
United Kingdom	11.4010***	0.7026	n/a	0.1795	n/a

Notes: *** Indicates 1% significance; ** Indicates 5% significance; * Indicates 10% significance.

Since the Bound test requires the error term to be a white noise residual, each of the models was tested for residual normality (Jarque-Bera normality test with null hypothesis of normality), serial correlation (Serial Correlation LM test with null hypothesis of no serial correlation), heteroscedasticity (ARCH Heteroscedasticity test with null hypothesis of no heteroscedasticity), omitted variable test (Ramsey Reset test) and structural breaks (Cusum and Cusum Square test). In addition, centred seasonal dummies were included in the specification to control for seasonality. Table 3.4 and Figure A3 in the Appendix, show the results of the above-mentioned test of each model – in none of the cases can the null hypotheses be rejected, indicating white noise residuals.

Table 3.4: Diagnostic tests

Test type	Asia	Australasia	Europe	North America	South America	United Kingdom
Jarque Bera normality test	0.565788 [0.753600]	3.641352 [0.161916]	1.270067 [0.529918]	3.142065 [0.207831]	0.872217 [0.646547]	0.837632 [0.657825]
Serial correlation LM test	0.837068 [0.5129]	1.705708 [0.1757]	1.579037 [0.2279]	1.437573 [0.2509]	1.454764 [0.2445]	0.544991 [0.7041]
ARCH Heteroscedasticity test	0.012618 [0.9111]	0.000515 [0.9820]	0.753783 [0.3929]	1.144352 [0.2917]	0.005296 [0.9424]	0.277791 [0.6013]
Ramsey Reset test	0.356236 [0.7240]	0.068708 [0.9456]	0.458703 [0.6517]	1.235670 [0.2268]	1.925219 [0.1647]	1.679394 [0.1035]

Note: values in brackets denote probability

3.4 Results

The results will be described in four-sections: firstly the estimated results, which will be followed by the short-run elasticties and then the long-run elasticities. The last section will describe the forecasting results.

3.4.1 Estimation results

Based on the results of the tests conducted above, the estimation equation for Asia (equation 3.5), Australasia (equation 3.6), Europe (equation 3.7), North America (equation 3.8), South America (equation 3.9) and the United Kingdom (equation 3.10) are:

$$\begin{aligned}\Delta larrivals = {} & \beta_0 + \beta_1 \Delta larrivals_{t-1} + \beta_2 \Delta lgdp + \beta_3 \Delta lhotel + \beta_4 \Delta lreal\ exchange\ rate + \beta_5 larrivals_{t-1} \\ & + \beta_6 lgdp_{t-1} + \beta_7 lhotel_{t-1} + \beta_8 lreal\ exchange\ rate_{t-1}\end{aligned} \tag{3.5}$$

$$\begin{aligned}\Delta larrivals = {} & \beta_0 + \beta_1 \Delta larrivals_{t-1} + \beta_2 \Delta lreal\ exchange\ rate + \beta_3 \Delta lhotel_{t-1} + \beta_4 \Delta lcrude\ oil_{t-1} \\ & + \beta_5 larrivals_{t-1} + \beta_6 lreal\ exchange\ rate_{t-1} + \beta_7 lhotel_{t-1} + \beta_8 lcrude\ oil_{t-1}\end{aligned} \tag{3.6}$$

$$\begin{aligned}\Delta larrivals = {} & \beta_0 + \beta_1 \Delta larrivals_{t-1} + \beta_3 \Delta lreal\ exchange\ rate + \beta_4 \Delta lhotel + \beta_5 larrivals_{t-1} \\ & + \beta_6 lreal\ exchange\ rate_{t-1} + \beta_7 lhotel_{t-1} + \beta_8 S_1 + \beta_9 S_2 + \beta_{10} S_3\end{aligned} \tag{3.7}$$

$$\begin{aligned}\Delta larrivals = {} & \beta_0 + \beta_1 \Delta larrivals_{t-1} + \beta_2 \Delta larrivals_{t-2} + \beta_3 \Delta larrivals_{t-3} + \beta_4 \Delta lhotel_{t-1} \\ & + \beta_5 \Delta lreal\ exchange\ rate + \beta_6 lcrude\ oil_{t-1} + \beta_7 larrivals_{t-1} \\ & + \beta_8 lreal\ exchange\ rate_{t-1} + \beta_9 lhotel_{t-1} + \beta_{10} lcrude\ oil_{t-1}\end{aligned} \tag{3.8}$$

$$\begin{aligned}\Delta larrivals = {} & \beta_0 + \beta_1 \Delta larrivals_{t-1} + \beta_2 \Delta lcrude\ oil_{t-1} + \beta_3 \Delta lgdp + \beta_4 \Delta lhotel + \beta_5 larrivals_{t-1} \\ & + \beta_6 lcrude\ oil_{t-1} + \beta_7 lgdp_{t-1} + \beta_8 lhotel_{t-1} + S_1 + S_2 + S_3\end{aligned} \tag{3.9}$$

$$\begin{aligned}\Delta larrivals = {} & \beta_0 + \beta_1 \Delta larrivals_{t-1} + \beta_2 \Delta larrivals_{t-2} + \beta_3 \Delta larrivals_{t-3} + \beta_4 \Delta lreal\ exchange\ rate \\ & + \beta_5 \Delta lgdp_{t-1} + \beta_6 larrivals_{t-1} + \beta_7 lreal\ exchange\ rate_{t-1} + \beta_8 lgdp_{t-1}\end{aligned} \tag{3.10}$$

Table 3.5: ADLM Estimation results

Variable	Asia	Australasia	Europe	North America	South America	United Kingdom
Constant	-33.7723**	-4.7877	7.787925**	-3.207213	-22.59985**	-12.62966*
$\Delta larrivals_{t-1}$	0.177999	0.2138	-0.284548	-0.513232**	0.143636	0.225291
$\Delta larrivals_{t-2}$	-	-	-	-0.489635***	-	-0.312793**
$\Delta larrivals_{t-3}$	-	-	-	-0.553866***	-	-0.34992***
$\Delta lgdp$	2.817158	-	-	-	1.545140*	-
$\Delta lgdp_{t-1}$	-	-	-	-	-	1.881329
$\Delta lhotel$	-0.40548	-	-0.499149	-	1.193489	-
$\Delta lhotel_{t-1}$	-	1.6330	-	-0.680983	-	-
Δlcrude oil	-	-	-	-	-	-
Δlcrude oil_{t-1}	-	-0.0505	-	-0.043644	-0.011631	-
Δlreal exchange rate	-0.14271	-0.1213	-0.212382	-0.569261**	-	-0.700141**
Δlreal exchange $rate_{t-1}$	-	-	-	-	-	-
$larrivals_{t-1}$	-0.94426***	-0.8194***	-0.340148**	-0.409029*	-0.85914***	-1.29987***
$lgdp_{t-1}$	4.899448***	-	-	-	1.114224***	2.982656***
$lhotel_{t-1}$	0.002245	0.8867*	-0.391782**	0.638305	1.793006**	-
lcrude oil_{t-1}	-	0.2978**	-	0.081175	0.320810**	-
lreal exchange $rate_{t-1}$	0.352646**	0.3836	0.319852***	-0.092316	-	0.133269
S_1	-	-	0.046654	-	0.218151***	-
S_2	-	-	-0.476565***	-	-0.27310***	-
S_3	-	-	0.010575	-	0.119937*	-
R^2	0.529486	0.511418	0.982497	0.693210	0.878074	0.899404
Adjusted-R^2	0.415422	0.392974	0.974621	0.587420	0.833368	0.873444
F-probability	0.000722	0.001226	0.000000	0.000032	0.000000	0.000000
AIC	-1.23243	-0.893145	-2.697749	-1.637104	-0.881657	-1.201385
SIC	-0.86007	-0.520787	-2.230684	-1.172662	-0.385180	-0.821387

Notes: *** Indicates 1% significance; ** Indicates 5% significance; * Indicates 10% significance.

The long-run estimates are the lagged logged explanatory variables, for example, β_5 to β_8 in the Asian model equation, while S_1, S_2 and S_3 represent the seasonal dummies. Seasonal dummies (such as in the case of Australasia and South America) are only included in the final models if they were found to be significant. The short-run estimates are the remaining differenced explanatory variables coefficients. A general to specific approach is taken for the short-run relationships and the number of lags tested for inclusion based on the lag length from the AIC criteria. Therefore, variables that are significant or variables that are close to significant are included in the model (Song & Witt, 2003). Table 3.5 provides the estimated ADLM results.

3.4.2 Short-run elasticities

In the short-run, tourist arrivals in the past have had a significant effect on arrivals from Europe, North America and the United Kingdom. This is a negative effect, which might be an indication that word-of-mouth information expressed by tourists who previously visited South Africa does not have the desired effect. This may be improved if more national tourist organisations focusing specifically on marketing South Africa as a tourist destination are established in these continents.

According to Witt and Witt (1995:455) tour operators tend to promote more than one tourist destination, unlike national tourist organisations. However, the interpretation should be treated with caution as it may only be as a result of seasonality effects that is picked by lagged arrival coefficients. An increase in tourist arrivals in the past is not significant in the Asian, Australasian and South American models.

An increase in real income per capita in the present as well as in the past leads to an increase in tourist arrivals in Asia, South America and the United Kingdom, though only the current real income per capita in the South American model is significant. As seen from Table 3.5, all the short-run real income per capita coefficients are elastic which emphasises the fact that tourism is considered a luxury good.

Hotel rooms available is not a significant variable in any model in the short-run and does not have the expected sign in the Asian, Australasian and North American models. This is because many tourists make their travel bookings a long time in advance and the number of hotel rooms available therefore does not have the expected relationship with tourist arrivals.

The price of crude oil in the past does has a negative effect on tourist arrivals in South Africa in the short run. Crude oil and lagged crude oil are not significant variables in any of the models in the short run. An increase in the buying power of the country of origin does not lead to an increase in tourist arrivals in the short run. This is again due to the fact that tourists book their holidays a long time in advance. The current real exchange rate is significant in the case of North America and the United Kingdom.

3.4.3 Long-run elasticities

The long-run elasticities are shown in Table 3.6. These elasticities are calculated by multiplying the lagged independent variables by a negative sign and dividing each lagged independent variable coefficient by the lagged dependent variable coefficient in the model. Most of the variables in Table 8 show the correct sign except the log of crude oil. The reason for this unexpected result may be that arrivals from Australasia, North America and South America have stronger buying power due to a better exchange rate and are not offset by changes in the price of crude oil. As seen from Table 3.6. log arrivals in the long run specification have a negative sign, which indicates the error correction component showing that the change in arrivals increase towards the long-run steady state equilibrium (Asteriou & Hall, 2007:312).

The size of the elasticities is also in line with studies carried out by other researchers such as Salleh *et al*. (2007:356) and Aresh *et al*. (2004:201). The size of the coefficients in the tourism demand to South Africa study done by Saayman and Saayman (2008:90) are comparable to the long-run results in this study. Saayman and Saayman (2008:90) also find a negative relationship between the number of hotel rooms available and European tourist arrivals in South Africa as well as travel cost and tourist arrivals from Australasia.

A one per cent increase in real income per capita may lead to a 5.19 per cent increase in tourist arrivals from Asia to South Africa. An increase of 1.30 and 2.29 per cent in tourist arrivals from South America and the United Kingdom may result because of a one per cent increase in real income per capita. The demand for South Africa as a destination is therefore again confirmed to be elastic.

The number of hotel rooms available also has the expected effect on tourist arrivals, except in the case of Europe which might be due in part to the colonial ties with accommodation. An increase of one per cent in the number of hotel rooms available leads to an increase of 2.38 per cent of tourist arrivals from Asia, 1.08 per cent of arrivals from Australasia, 1.56 per cent of tourist arrivals from North America and 2.09 per cent of tourist arrivals from South America.

The real exchange rate had the most significant effect on tourist arrivals from Europe. Arrivals from Europe increase by 0.94 per cent if the real exchange rate increases by one per cent. Arrivals from Asia, Australasia, North America and the United Kingdom might increase by 0.37, 0.47, 0,20 and

0.10 per cent respectively. The sizes of the elasticities are less than one, indicating a relative price inelastic demand.

Table 3.6: Long-run elasticities

Variable	*Asia*	*Australasia*	*Europe*	*North America*	*South America*	*United Kingdom*
gdp	5.1887	-	-	-	1.2969	2.2946
crude oil	-	0.3634	-	0.2256	0.3734	-
hotel	2.377	1.0821	-1.1518	1.5605	2.0870	-
real exchange rate	0.3735	0.4681	0.9403	0.1985	-	0.1025

3.4.4 Forecasting results

Following research by Song *et al*. (2003a) and Aresh *et al*. (2004), the forecasts are based on the long-run relationship shown in Table 3.5. *Ex post* forecasting is used to estimate the ADLM forecasting accuracy. The result from equation nine, taking Asia as an example, illustrate that the estimated value of Δlarrivals for each time period is determined. In order to get the forecast values, the Δlarrivals for each time period is then added to the last value of log arrivals. The result is anti-logged to obtain actual forecast tourist arrival values.

$$forecast\ \Delta larrivals = -33.7723 - 0.94426 larrivals_{1994} + 4.899448 lgdp_{1994} + 0.002245 lhotel_{1994} + 0.352646 lreal\ exchange\ rate_{1994} \quad (3.11)$$

↓ ↓ ↓ ↓ ↓ ↓ ↓

$$forecast\ \Delta larrivals = -33.7723 - 0.94426 larrivals_{2007} + 4.899448 lgdp_{2007} + 0.002245 lhotel_{2007} + 0.352646 lreal\ exchange\ rate_{2007} \quad (3.12)$$

The forecasting accuracy was tested by using the MAPE, RMSPE and Theil's *U*. The MAPE measures the mean absolute percentage difference between the actual tourist arrival values and the forecast tourist arrival values (Chu, 2009:744). The closer the MAPE value is to zero, the more accurate the forecasting result is. Equation 3.13 shows how the MAPE values were generated (Yorucu, 2003:182).

$$MAPE = \left[\frac{\Sigma\left(\frac{e_t}{a_t}\right)}{q}\right] * 100 \ , \tag{3.13}$$

where e = actual tourist arrival value in period t minus forecast tourist arrival value in period t, a = actual tourist arrival value, q = number of quarters.

The RMSE is the sample standard deviation of the forecast errors (Chu, 2009:744). The RMSE evaluates the extent to which the forecast errors deviate from the mean actual tourist arrival value, whereas the RMSPE indicates the percentage value of the deviation between the forecast value and the mean actual tourist arrivals value. If the RMSPE is closer to zero, the forecasting result is more accurate. Equation 3.14 shows how the RMSPE is generated (Yorucu, 2003:182).

$$RMSPE = \sqrt{\frac{\Sigma\, pe_t^2}{q}} \ , \tag{3.14}$$

where pe is the percentage deviation between the actual and forecast value and q is as above.

The Theil's U value indicates how accurately the turning points are forecast. If the Theil's U value is close to zero, then the forecast results are accurate. Equation 3.15 shows how the Theil's U was calculated (Yorucu, 2003:184).

$$Theil's\ U = \frac{\sqrt{\frac{\Sigma\, e_t^2}{q}}}{\sqrt{\frac{\Sigma\, a_t^2}{q}} + \sqrt{\frac{\Sigma\, f_t^2}{q}}} \ , \tag{3.15}$$

where: e, a and q are as above, and f = forecast tourist arrival value in period t.

Table 3.7 provides the forecasting accuracy results. A MAPE value with a negative sign indicates that the forecast value is larger than the actual arrival value, and a positive sign means the exact opposite. Forecasting accuracy is highly accurate for Asia and the United Kingdom, and relatively good for

Table 3.7: Forecasting accuracy results

Asia			**Europe**		
Forecast length	***Test type***	***Accuracy***	***Forecast length***	***Test type***	***Accuracy***
3 years ahead	*MAPE:*	9.661	*3 years ahead*	*MAPE:*	-18.406
2 years ahead	*MAPE:*	6.653	*2 years ahead*	*MAPE:*	-18.626
1 year ahead	*MAPE:*	3.917	*1 year ahead*	*MAPE:*	-26.488
3 years ahead	*RMSPE:*	12.043	*3 years ahead*	*RMSPE:*	31.456
2 years ahead	*RMSPE:*	8.419	*2 years ahead*	*RMSPE:*	32.957
1 year ahead	*RMSPE:*	4.823	*1 year ahead*	*RMSPE:*	39.096
3 years ahead	*Theil:*	0.073	*3 years ahead*	*Theil:*	0.115
2 years ahead	*Theil:*	0.050	*2 years ahead*	*Theil:*	0.120
1 year ahead	*Theil:*	0.026	*1 year ahead*	*Theil:*	0.133
Australasia			**North America**		
3 years ahead	*MAPE:*	35.538	*3 years ahead*	*MAPE:*	32.017
2 years ahead	*MAPE:*	26.034	*2 years ahead*	*MAPE:*	22.773
1 year ahead	*MAPE:*	11.031	*1 year ahead*	*MAPE:*	11.772
3 years ahead	*RMSPE:*	40.933	*3 years ahead*	*RMSPE:*	36.652
2 years ahead	*RMSPE:*	32.014	*2 years ahead*	*RMSPE:*	26.933
1 year ahead	*RMSPE:*	15.047	*1 year ahead*	*RMSPE:*	14.801
3 years ahead	*Theil:*	0.269	*3 years ahead*	*Theil:*	0.237
2 years ahead	*Theil:*	0.207	*2 years ahead*	*Theil:*	0.164
1 year ahead	*Theil:*	0.088	*1 year ahead*	*Theil:*	0.084
South America			**United Kingdom**		
3 years ahead	*MAPE:*	18.514	*3 years ahead*	*MAPE:*	1.828
2 years ahead	*MAPE:*	26.028	*2 years ahead*	*MAPE:*	7.516
1 year ahead	*MAPE:*	16.398	*1 year ahead*	*MAPE:*	9.215
3 years ahead	*RMSPE:*	30.976	*3 years ahead*	*RMSPE:*	21.239
2 years ahead	*RMSPE:*	28.192	*2 years ahead*	*RMSPE:*	18.571
1 year ahead	*RMSPE:*	16.948	*1 year ahead*	*RMSPE:*	19.483
3 years ahead	*Theil:*	0.174	*3 years ahead*	*Theil:*	0.115
2 years ahead	*Theil:*	0.174	*2 years ahead*	*Theil:*	0.109
1 year ahead	*Theil:*	0.095	*1 year ahead*	*Theil:*	0.119

North America. European forecasting accuracy is relatively inaccurate. The European forecasting accuracy may be inaccurate due to the data range that differs from that of the other continents. The European forecasts therefore range from 2007 quarter 1 to 2009 quarter 4. Since the global financial crisis had a negative impact on global tourist arrivals during 2008 and 2009, the poor results for Europe were expected to some extent. National statistics confirms the decline in arrivals from Europe in this period (SA Tourism, 2009c:17). The forecasting accuracy for the Australasian model is relatively good for the first two years but relatively inaccurate in the third year. In general, the forecasting accuracy worsens as the timeframe increase, with one-year forecasts more accurate than three-year forecasts.

3.5 Conclusion

This article focused on forecasting tourism demand in South Africa by using an Autoregressive Distributed Lag Model – an ideal method for smaller sample sizes with the inclusion of explanatory variables to determine future arrivals provides for policy recommendations. Intercontinental arrivals from Asia, Australasia, Europe, North America, South America and the United Kingdom were modelled and forecasted. Africa is not included in this study since arrivals from Africa often visit South Africa for reasons other than vacationing in South Africa, while data limitations and other barriers also contributed to the decision to exclude Africa from this study.

Based on the most popular variables included in analyses elsewhere in the world and in previous South African studies, the variables selected for inclusion in the models were chosen and specification tests based on lowering correlation between independent variables influenced the choice of the final specification. The inclusion of an error correction specification made it possible to determine both the short and long run elasticities. The empirical results show that real GDP per capita, real exchange rate and the number of hotel rooms available have an influence on tourism demand in the long run in most of the models.

Three important policy implications stem from the results of this research. Firstly, the demand for South Africa as a tourist destination is income elastic over both the short and long run. This implies that any shocks to world GDP or origin country recessions will have an immediate and long run effect on tourist arrivals in South Africa. Even though this is an aspect that is beyond the control of policy-makers, it still signals important measures that can be taken, such as stimulating domestic tourism in the case of world recessions.

Secondly, infrastructure for tourism in South Africa, as explained by hotel rooms, do not create a significant benefit over the short run, but do add to tourist arrivals in the long run. Policy makers can therefore increase the number of hotel rooms (or general infrastructure) in order to sustain the increase in the number of tourist arrivals in South Africa over the long run.

Thirdly, while price competitiveness remains important, the demand for South Africa as a destination is relatively price inelastic over both the short and the long run. This implies that the significance of exchange rate movements may be over-estimated when analysing international tourism numbers.

However, it might still have a spending implication, which could be ascertained by future research. It is also interesting to note that transport cost (as measured by the price of crude oil) has a small effect on arrival numbers.

In terms of the forecasting accuracy, the results are relatively accurate with low percentage errors, especially for the one-year forecasts. Keeping in mind that the models do not have the exact same explanatory set, the best of these results are the forecast arrivals from the United Kingdom and Asia. Future research can focus on improving the forecasting accuracy by using longer data sets which may improve the estimates or by including other destination country-specific factors.

Chapter 4

Article 2

Forecasting tourism demand for South Africa using a system of equation approach

Abstract

The need for accurately forecasting tourism demand is highlighted by the effect that the financial crisis and subsequent recession had on tourist arrivals worldwide. In recent years, several African countries have realised the potential to use their tourism sector as a means to aid economic growth. However, while sufficient international empirical research is available for modelling and forecasting tourism demand, the evidence for and application to African countries, including South Africa, are limited. Given the growing importance of tourism to the South African economy it is surprising that research on forecasting tourism demand for the country is limited. This article therefore aims to estimate an econometric model using a system of equation approach for tourism demand and to use these models to *ex post* forecast tourism demand to South Africa. This is supplemented with an impulse response analysis as well as variance decomposition analysis for tourism demand to South Africa from six regions namely, Asia, Australasia, Europe, North America, South America and the United Kingdom.

Key words: South Africa, vector error correction model, vector autoregressive model, impulse response analysis, variance decomposition

4.1 Introduction

Business decisions in the tourism industry are based on the businesses' view of the demand for their product (Song & Witt, 2006:214). Since many of the tourism products on offer are service-based and cannot be stockpiled, the need for effective forecasting of tourism demand cannot be overstated. Given the importance of forecasting tourism demand, it is not surprising that researchers over the years have focused their efforts on producing the most accurate tourism forecasts and a rich literature base and empirical evidence are available. However, while sufficient international empirical research is available, the evidence for and application to African countries, including South Africa, is limited.

In this regard, Kester (2003:203) states that several African countries have the potential to use their tourism sector as a means to aid economic growth. Tourism can contribute to an economy in more than one way, i.e. foreign exchange earnings can be increased through expanding international arrivals (Kester, 2003:203), the number of low-skilled job opportunities increases due to the nature of the tourism product, and tourism-related investment contributes to economic growth and development (De Mello *et al*., 2002:509).

In further support of tourism development in Africa, it is important to note that the recession experienced by several countries during 2009 due to the global financial crisis has not affected Africa to the same extent as other countries worldwide. The recession had a severe impact on tourist arrivals all over the globe (UNWTO, 2009a:1); nonetheless Africa remained the only continent to retain a positive tourism growth rate (UNWTO, 2009b:3). Ever since the early 1990s, the number of international tourist arrivals in South Africa has shown an upward trend. In 2009 South Africa was the twenty-sixth most frequently visited tourist destination in the world (SA Tourism, 2009c:6). However, the recession has had an impact on tourist arrivals in South Africa, and therefore also on the contribution of tourism to the South African gross domestic product (GDP), which decreased slightly from 8,5 per cent in 2008 to 7,9 per cent in 2009 (SA Tourism, 2009c:5; SA Tourism, 2008a:5).

Given the growing importance of tourism to the South African economy, it is surprising that research on forecasting tourism demand for the country is limited. This article therefore aims to estimate an econometric model using a system of equation approach for tourism demand and to *ex post* forecast tourism demand. In addition, this article sets out to perform an impulse response analysis and variance decomposition with the aim to determine the length and intensity of the effect that a shock will have on tourist arrivals (Song & Witt, 2006:219). Analysing a variance decomposition provides a better understanding of the coefficients from the VECM model (Maroney *et al*., 2004:141). The results, therefore, provide a better understanding of the out-of-sample causal relationship between the endogenous variables (Wickremasinghe & Ihalanayake, 2006:12).

The remainder of this article is structured as follows: Section 4.2 will give an overview of tourism forecasting literature and methods. This will be followed by the data and method used in this article. In sections 4.4 to 4.6, the results of the estimations will be presented and discussed. Section 4.7 will present the conclusion.

4.2 Literature review

It is important to accurately forecast tourist arrivals due to the competitiveness within the tourism industry and the perishable nature of tourism products and services, in order to improve resource management which could contribute to economic growth. With the aid of accurate forecasting results, the right business decisions can be made and the right policy actions can be formulated by government (Song & Witt, 2006:214). Effective forecasting can prevent excessive capital investment and labour employment due to the overestimating of tourist demand or, if underestimated, it can prevent businesses from fully utilising opportunities (du Preez & Witt, 2003:436). It is therefore essential to forecast future tourist arrivals. Forecasting tourist arrivals accurately will reduce the uncertainty of the future and the impact that tourist arrivals will have on a country's available resources (Burger *et al*., 2001:404).

Methods used in tourism demand forecasting studies can be either quantitative or qualitative methods (Archer, 1980:5). Chu (2004:210) indicates that quantitative methods generally outperform qualitative models; the focus in this article is therefore on quantitative methods. Quantitative methods are divided into two groups namely, causal and non-causal methods. Non-causal methods have only one variable, namely a dependent variable, which is used to forecast itself. Causal methods, on the other hand, include the dependent variable together with explanatory variables. Since causal methods show the relationship between tourism demand and explanatory variables and therefore lead to clear policy implications, it is also used in this research to forecast tourist arrivals.

Several causal methods exist that can be used to model and forecast tourism demand. Saayman and Saayman (2008:83) found that causal methods can be divided into three groups, namely single equation models, system of equation models as well as panel data models. A panel data model is typically estimated when time series data for a number of cross-sections are available and is useful when limited data are available in the time dimension. Researchers who have estimated a panel data model for tourism demand include Eilat and Einav (2004:1315), Proença and Soukiazis (2005:2) as well as Naudé and Saayman (2005:366). Song and Li (2008:212) note that multicollinearity is less likely to occur in panel data models and omitted variables are also seldom a problem when estimating a panel data model.

According to Wong *et al*. (2007:1068) most researchers focused on traditional regression methods to model and forecast tourism demand in the early 1990s. Witt and Witt (1995:448) found that most tourism demand modelling and forecasting studies used time-series approaches to modelling tourism demand but just a few studies were conducted on forecasting tourism demand using econometric methods. The focus shifted toward more advanced econometric methods such as cointegration methods in the early 2000s (Wong *et al*., 2007:1068). According to Song and Li (2008:204), out of 121 tourism demand modelling and forecasting studies conducted in the early 2000s, most researchers used a time series approach to forecast tourism demand (68 studies), whereas only 41 out of the 121 studies have focused on forecasting tourism demand using an econometric approach. According to Song and Li (2008:204,211), the models most often used in tourism demand studies were Error Correction Model (ECM), Autoregressive Distributed Lag Model (ADLM), Vector Autoregressive (VAR) models, Almost Ideal Demand Systems (AIDS) as well as the Time Varying Parameter (TVP) models.

Popular single equation approaches used in tourism demand studies are the ADLM, the ECM and the Time Varying Parameter (TVP) model (Song & Li, 2008:205-209). The TVP approach has become more popular because of the ability of the coefficients of this model to vary over time (Song *et al*., 2003b:131). Researchers who have estimated the above-mentioned models include Kulendran and Witt (2003) (ECM), Aresh *et al*. (2004) (ADLM), and Song *et al*. (2003a) (ADLM and the TVP model).

The system of equation approach includes multiple equations with co-dependent variables and is therefore preferred to the single equation approach by researchers (Hilaly & El-Shishiny, 2008:5). The VAR model and the AIDS model are frameworks often used by researchers when estimating tourism demand using the system of equation approach. The AIDS model has the advantage that it is able to estimate price and expenditure elasticities which aid in determining the interdependencies between destination countries (Saayman & Saayman, 2008:83). Researchers who have used VAR models in tourism demand research include Song *et al*. (2003b) and Song & Witt (2006), while De Mello *et al*. (2002) used an AIDS model. The Vector Error Correction Model (VECM) has also become a popular model in tourism demand research. Only the short-run relationship can be estimated with the VAR model whereas with VECM, cointegration relationships in the data that present make it possible to estimate both the long-run and short-run relationships. Researchers who have estimated VECMs for tourism demand include Saayman and Saayman (2008), Chaitip *et al*. (2006) and Bonham *et al*. (2009).

According to Lim (1997b:839), who reviewed 100 tourism demand articles, most researchers estimated log-linear models followed by linear models during the 1980s. Most of these studies involved the use of annual data. This trend did not change much since Song and Li (2008:214) found in their study that out of 121 articles published since 2000 most involved annual data (58 articles) followed by quarterly and monthly data (30 articles both). This may be due to explanatory variables that may not be available in monthly and quarterly frequencies (Song & Li, 2008:215).

This article will make use of the system of equation approach to forecast tourism demand. The popularity of VAR and VECM in modelling tourism demand has increased and they are therefore applied in the current research.

4.3 Method

The method will be described in two sections, namely (i) the data handling and description, and (ii) the estimation method used.

4.3.1 Data handling and description

Arrivals from Africa (including the Middle East) form South Africa's largest tourism market from abroad (7 807 546) during 2009, followed by tourist arrivals from Europe (1 348 502), the Americas (379 907) and Asia and Australasia (322 290). Arrivals from Africa are mostly from the South African Development Community (SADC) and they often visit South Africa for different reasons than those from other regions (Saayman & Saayman, 2008:83). Shopping, employment, studying and medical treatment are some of the main reasons for arrivals from the SADC countries (Stats SA, 2009a:7).

On average, in 2009 air markets were found to spend the most (R13 000) compared to land markets (R7 100) (SA Tourism, 2009c:29). Arrivals from Europe on average stay over in South Africa for the longest period of time followed by those from the Americas and Asia and Australasia (SA Tourism, 2009c:104). Therefore, due to the fact that the purpose of Africans visiting South Africa differs substantially from other regions such as Europe, the Americas and Asia and Australasia, as well as the fact that air markets spend on average more than land markets, Africa is excluded from this study. Data limitations also led to the decision to exclude Africa from the empirical analysis.

The dependent variable used in most empirical tourism demand studies is tourist arrivals or tourist expenditure (Walsh, 1996:5) and, in a few cases, length of stay by tourists (Lim, 1997b:839). International tourist arrivals data are chosen as the dependent variable since data on tourist arrivals are more readily available than tourist expenditure and length of stay by tourists from different origin countries.

Six models are estimated, namely one each for Asia, Australasia, Europe, North America, South America and the United Kingdom. EViews 7 is used to estimate the models. The data range for the tourism demand models is from 1994 quarter 1 to 2004 quarter 4 for the Asian, Australasian, North American, South American and the United Kingdom models. The data for the European model extend from 1999 quarter 1 to 2006 quarter 4. This is due to the euro which has only been in effect since 1999. Forecasts will be made for the period 2005 quarter 1 to 2007 quarter 4 for all the above-mentioned markets except for Europe, since it is expected that the global crisis of 2008 will cause a structural break in the data and therefore influence the accuracy of forecasts. The European forecasts will, however, be for the period 2007 quarter 1 to 2009 quarter 4, due to limited data available for the model development.

One country from each of the above-mentioned markets, excluding the United Kingdom, is used as a proxy for that market. The country selected to represent each market is the country which has the largest share in arrivals from that specific market. One exception is Japan, which is chosen as the proxy for Asia although only 15 per cent of arrivals from Asia are from Japan. Although India and China form the largest share of arrivals from Asia, and Japan is only the third largest tourism market in South Africa in terms of arrivals from Asia, data limitations exist with respect to China and India and therefore Japan was chosen as a proxy for Asia. Australia is chosen as a proxy for Australasia since 81 per cent of arrivals from Australasia are from Australia. The euro area is used as a proxy for arrivals from Europe. The USA has the largest number of arrivals from North America, namely 85 per cent, and is therefore chosen as proxy for North America. The second largest market of tourist arrivals from South America, namely Argentina (18 per cent), is selected as a proxy for South America. This is due to data limitations with regard to Brazil, the largest market for South American arrivals.

Income and relative prices are the most popular explanatory variables to be included in tourism demand models by researchers (Lim, 1997b:841). These variables are therefore included in the models estimated. Table 4.1 describes each of the variables used in this study. Note that the natural logs of all the variables were taken (denoted with an *"l"* as prefix) to standardise the variables and aid in the interpretation of the coefficients.

Table 4.1: Variable description

Variable	**Proxy**	**Description**	**Source**
Arrivals	Asia, Australasia, Europe, North America, South America, United Kingdom	Quarterly arrivals from each continent	Stats SA
Income	Gross Domestic Product (GDP) per capita	Real GDP per capita in each country of origin expressed in national currency terms	IFS
Relative prices	Real exchange rate	South African rand versus currency of origin country	IFS and the South African Reserve Bank

Since tourism is regarded as a luxury, especially if the purpose of travel is vacationing (Brakke, 2005:15), higher income *per capita* gives rise to a greater possibility to travel abroad. Therefore, income is expected to have a positive effect on tourist arrivals when included in tourism demand models. The real income per capita of each market is estimated using equation 4.1.

$$Income = \left(\frac{\left(\frac{GDP}{Deflator} \right) * 100}{Population} \right) * Constant\ US\$ \tag{4.1}$$

GDP is the GDP of the origin country; *Deflator* is the deflator with 2005 as base year; *Population* is the population size of the origin country; *Constant US$* is the 2005 constant US dollar.

Tourists may consider price competitiveness before deciding on a country of destination and many researchers use proxies such as the Consumer Price Index (CPI) of the country of destination relative to the CPI of the country of origin to measure price competitiveness (Song & Witt, 2006:218). Other researchers include the real exchange rate which incorporates the effect of inflation as well as the exchange rate (Lim, 1997b:843). Forsyth and Dwyer (2009:85) state that tourists may find the exchange rate of a potential destination country to be a relatively good indication of the price level of that country, while Witt and Witt (1995:454) indicate that the real exchange rate should rather be included as a relative price proxy than the nominal exchange rate. This article follows the latter approach and the equation used to determine the real exchange rate of each market is indicated in equation 4.2. Table B1 in the Appendix provides the descriptive statistics of all the variables of each market.

$$Real\ exchange\ rate = \left(\frac{CPI_{Origin}}{CPI_{Destination}}\right) * Exchange\ rate_{Origin}$$

(4.2)

The effect of some determinants on tourism demand is measured by including dummy variables. For example, cultural ties, terrorist and political activities, natural disasters and health risks may for instance be included with the use of dummy variables. Lagged dependent variables, for example the lag of tourist arrivals, may be included in the tourism demand model to determine the effect of word-of-mouth advertising on future tourist arrivals. Word-of-mouth can reduce uncertainty about a destination country and may lead to an increase in tourist arrivals (Witt & Witt, 1995:455).

4.3.2 Estimation method

While VECMs have been used in modelling tourism demand it is not a popular method in forecasting tourism demand and the research found to date indicates that the VAR model is more suitable for forecasting purposes. Therefore, this research follows a two-pronged approach by firstly modelling and forecasting tourism demand using a VAR framework and, secondly, by expanding the VAR to a VECM and analysing the impulse responses and the variance decompositions. For the forecasting and assessment of forecasting accuracy, this paper follows the work of Song *et al.* (2003b). For the second part of this paper, it follows the work by Chaitip *et al*. (2006). When a VAR model is used all variables are treated as endogenous variables (Song *et al*., 2003b:135) and the present values are then regressed against all previous values of the variables used (Song & Witt, 2006:218). This is known as an unrestricted VAR model (Song & Witt, 2000:93), which is represented by the following equation which represents an unrestricted VAR model of 1 lag length:

$$X_t = \Pi_1 X_{t-1} + \varepsilon_t$$

(4.3)

Where x_t is a vector of all the variables used within the system, ε_t is a vector of all the errors.

Note that an intercept vector may also be included (Song & Witt, 2000:93).

Table 4.2: Augmented Dickey-Fuller and Phillips-Perron unit root test

	Augmented Dickey-Fuller		**Phillips-Perron**	
Asia				
Variable	*Level*	*First difference*	*Level*	*First difference*
Larrivals	0.2340	<0.0001	0.0820	<0.0001
LGDP	0.6219	<0.0001	0.7270	<0.0001
Lreal exchange rate	0.5177	<0.0001	0.6238	<0.0001
Europe				
Variable	*Level*	*First difference*	*Level*	*First difference*
Larrivals	0.9087	0.0006	0.0014	<0.0001
LGDP	1.0000	0.0945	0.0184	<0.0001
Lreal exchange rate	0.0857	0.0028	0.3812	0.0032
South America				
Variable	*Level*	*First difference*	*Level*	*First difference*
Larrivals	0.5727	<0.0001	0.0008	<0.0001
LGDP	0.2550	0.0017	0.2548	0.0016
Lreal exchange rate	0.8077	0.0004	0.8942	0.0004
Australasia				
Variable	*Level*	*First difference*	*Level*	*First difference*
Larrivals	0.1621	<0.0001	0.1075	<0.0001
LGDP	0.5977	<0.0001	0.3336	<0.0001
Lreal exchange rate	0.3071	<0.0001	0.3433	<0.0001
North America				
Variable	*Level*	*First difference*	*Level*	*First difference*
Larrivals	0.3680	0.0199	0.1559	<0.0001
LGDP	0.7514	0.3847	0.3381	<0.0001
Lreal exchange rate	0.6048	0.0006	0.5469	0.0004
United Kingdom				
Variable	*Level*	*First difference*	*Level*	*First difference*
Larrivals	0.1409	<0.0001	0.0060	<0.0001
LGDP	0.2130	<0.0001	0.2374	<0.0001
Lreal exchange rate	0.4544	<0.0001	0.4444	<0.0001

VAR models are estimated using stationary data and therefore the data often need to be differenced in order to obtain stationary data to prevent spurious regression results (Song *et al*., 2003b:136). Due to differentiation, the long-run information concerning the relationship between the dependent and independent variables are then lost (Asteriou & Hall, 2007:309). Cointegration occurs when a linear combination of non-stationary variables are stationary (Dritsakis, 2004:114). If cointegration is present, an Error Correction component is added in order to capture the long-run relationship between the variables (Asteriou & Hall, 2007:310). Enders (2010:321) notes that if cointegration is present, the impulse response analysis would be incorrect if only a VAR is estimated in first differences, since the long-run is removed from the data. In addition, Granger causality cannot be assessed in such an instance, and therefore this paper expands on only estimating a VAR. The VECM can be presented as follows:

$$\Delta x_t = d + \sum_{i-1}^{p-1} \emptyset \Delta x_{t-i} + \alpha\beta x_{t-i} + \epsilon_t \tag{4.4}$$

where Δ is the difference operator and x_t is the vector, d is the vector of deterministic components, p is the lag lenth and ϵ_t indicates the white noise disturbances, α is the speed of adjustment to equilibrium and β is the long-run coefficient matrix.

The Augmented Dickey-Fuller and Phillips-Perron unit root tests are performed to determine the order of integration of the variables which will be included in each model. The Augmented Dickey-Fuller test, assuming an intercept but no trend, with lag lengths based on the Akaike information criteria (AIC) is performed on each variable to determine the order of integration. The null hypothesis of both the Augmented Dickey-Fuller test and the Phillips-Perron test are that there is a unit root present in the data. It is evident that all the variables are non-stationary at levels and stationary after first differencing, therefore it is clear that the variables are integrated of order one. Table 4.2 shows the results of the Augmented Dickey-Fuller and Phillips-Perron unit root test.

Table 4.3 indicates the lag length test results for each model. The lag length was selected using the Akaike Information Criteria (AIC) and the Schwarz Information Criteria (SC). The AIC and SC are chosen as selection criteria since the AIC and SC are the most popular selection criteria used, and the AIC is considered more appropriate for the selection of the ideal lag length when the data range is short (Wang, 2009:77). A lag length of two is chosen for the Asian model. For the Australasian model, a lag length of four is estimated, while the lag length chosen for the European, North American, South America and United Kingdom models are four, two, three and three respectively. Models were estimated for South America with a lag length of between 1 and 4. A lag length of three was chosen as it led to more accurate forecasting results.

An inverted autoregressive (AR) root graph is inspected for each model. All points should lie within the unit circle for the VAR model to be stable as seen in Figure B1and B2 (Appendix B).

Table 4.3: Lag length

	LR	FPE	AIC	SC	HQ
Asia	2	2	2	0	0
Australasia	2	4	4	0	2
Europe	4	4	5	4	5
North America	2	2	2	0	2
South America	4	4	4	1	4
United Kingdom	3	3	3	3	3

Note: LR = Sequential modified LR test statistic
FPE = Final prediction error
AIC = Akaike information criterion
SC = Schwarz information criterion
HQ = Hannan-Quinn information criterion

4.4 Results

After the before-mentioned tests were performed, the VAR models for Asia, Australasia, Europe, North America, South America and the United Kingdom respectively were estimated. This is done to obtain the coefficients which will be used to forecast tourism demand in South Africa. Centred seasonal dummies (S_1, S_2 and S_3) were included in the equation if found to improve the estimation results. The centred seasonal dummies affect the mean but not the trend.

Table 4.4 shows the VAR results for each of the markets. It was expected that Δ*larrivals*, Δ*lgdp and* Δ*lreal exchange rate* would have a positive relationship with the dependent variable. Most of the explanatory variables have the expected signs except for Δ*larrivals*. The negative relationship between past arrivals and the dependent variable indicates that word-of-mouth marketing is not effective in the short run. Other forms of marketing should therefore be enhanced since it may be more effective, for example, to market through national tourist organisations that are more focused on advertising one destination country. Positive experiences in a destination country lead to positive word-of-mouth and, in turn, more future tourist arrivals. Therefore, a safer tourist destination may reduce uncertainty and increase future tourist arrivals. The coefficients of the lags of the Δ*larrivals* can also be an indication of the seasonality effect.

The differences in log arrivals and GDP are found to be the most significant variables. The coefficients of $\Delta lgdp$ in almost all the cases are relatively elastic, with values greater than 1, emphasising that tourism is a luxury good. In some instances, the influence of the difference of log GDP on arrivals indicates a negative relationship. However, none of these variables are significant except for North America. This is not unique to this study, since Naudé and Saayman (2005:383) found in their study that income in Europe and the Americas also have a negative relationship with tourist arrivals in African countries.

Table 4.4: VAR estimation results

Variable	**Asia**	**Australasia**	**Europe**	**North America**	**South America**	**United Kingdom**
Δlarrivals$_{t-1}$	-0.2699*	-0.3754**	-0.2668	-0.3758**	-0.4448***	-0.2536
Δlarrivals$_{t-2}$	-0.2253	-0.1543	-0.2906	-0.3436**	-0.0313	-0.0801
Δlarrivals$_{t-3}$	-	-0.2736*	-0.2631	-	-0.0336	0.0976
Δlarrivals$_{t-4}$	-	-0.5163***	0.7084***	-	-	-
Δlgdp$_{t-1}$	1.0935	5.4881	2.0872***	6.6258***	2.2862**	-4.7575
Δlgdp$_{t-2}$	4.6446*	-3.8669	-0.1613	-6.0374**	1.5318*	7.3060
Δlgdp$_{t-3}$	-	-2.6635	1.6269**	-	-2.3893	-0.3518
Δlgdp$_{t-4}$	-	1.5049	-0.5296	-	-	-
Δlreal exchange rate$_{t-1}$	0.5083*	0.2244	0.4569*	-0.4375	-0.4965**	0.1429
Δlreal exchange rate$_{t-2}$	0.3480	-0.1020	-0.0926	0.2940	0.5271	0.1377
Δlreal exchange rate$_{t-3}$	-	-0.2349	0.4386*	-	0.1907**	0.1701
Δlreal exchange rate$_{t-4}$	-	0.5867	0.1902	-	-	-
Constant	0.0155	0.0413	0.0178		0.0278	0.0082
S_1	-0.0226	-0.1751**	-	-	0.2080**	0.1948*
S_2	-0.1019***	0.0664	-	-	-0.3577***	-0.4994***
S_3	0.1106***	0.1957***	-	-	0.0647	-0.0421
R^2	0.5475	0.7218	0.9844	0.4942	0.8619	0.9167
S.E.	0.1109	0.1190	0.0600	0.1145	0.1476	0.1174
AIC	-1.3522	-1.1272	-2.4813	-1.3420	-0.7317	-1.1901
SC	-0.9343	-0.4447	-1.8574	-1.0494	-0.1828	-0.6412
F(df)	4.1679	3.9779	73.5553	5.5367	14.0394	24.7627

Notes: *** Indicates 1% significance; ** Indicates 5% significance; * Indicates 10% significance.

Although Δ*lreal exchange rate* has a positive effect on tourist arrivals in almost all the markets, its impact is not significant in the short run, indicating that tourists are not likely to change their travel plans in the short run. The positive relationship between Δ*lreal exchange rate* and tourist arrivals indicates the importance of price competitiveness for tourists. Focusing on enhancing the price competitiveness of a country may lead to increased spending by tourists and may also lead to an increase in future tourist arrivals. Therefore, policy-makers can improve price competitiveness by keeping the inflation rate in the set target, lowering labour cost and increasing productivity.

4.5 Forecasting accuracy

Ex post forecasting is performed by using the estimated equation for each market, for example equations 4.5 and 4.6 taking Asia as an example. The estimated value of Δ*larrivals* for each time period is then added to the last value of log arrivals. The Mean Absolute Percentage Error (MAPE), Root Mean Square Percentage Error (RMSPE) and Theil's *U* value for each market are then estimated in order to determine the forecasting accuracy of each market.

$$\begin{aligned}\Delta larrivals = 0.0155 &- 0.2699\Delta larrivals_{1994q3} - 0.2253\Delta larrivals_{1994q4}\\ &+ 0.5083\Delta lreal\ exchange\ rate_{1994q3} + 0.3480\Delta lreal\ exchange\ rate_{1994q4}\\ &+ 1.0935\Delta lgdp_{1994q3} + 4.6446\Delta lgdp_{1994q4} - 0.0226S_1 - 0.1019S_2 + 0.1106S_3\end{aligned} \quad (4.5)$$

↓ ↓ ↓ ↓ ↓ ↓ ↓

$$\begin{aligned}\Delta larrivals = 0.0155 &- 0.2699\Delta larrivals_{2007q3} - 0.22553\Delta larrivals_{2007q4}\\ &+ 0.5083\Delta lreal\ exchange\ rate_{2007q3} + 0.3480\Delta lreal\ exchange\ rate_{2007q4}\\ &+ 1.0935\Delta lgdp_{2007q3} + 4.6446\Delta lgdp_{2007q4} - 0.0226S_1 - 0.1019S_2 + 0.1106S_3\end{aligned} \quad (4.6)$$

The MAPE measures the mean absolute percentage difference between the actual tourist arrival values and the forecast tourist arrival values (Chu, 2009:744). The closer the MAPE value is to zero, the more accurate the forecasting result is. Equation 4.7 shows how the MAPE values were calculated (Yorucu, 2003:182).

$$MAPE = \left[\frac{\Sigma\left(\frac{e_t}{a_t}\right)}{q}\right] * 100 \quad (4.7)$$

where e = actual tourist arrival value in period t minus forecast tourist arrival value in period t; a = actual tourist arrival value; q = number of quarters.

The RMSE is the sample standard deviation of the forecast errors (Chu, 2009:744), whereas the Root Mean Square Percentage Error (RMSPE) is the percentage sample standard deviation of the forecast errors. The RMSPE evaluates the extent to which the forecast errors deviate from the mean actual tourist arrival value. If the RMSPE is close to zero, the forecasting result is extremely accurate. Equation 4.8 shows how the RMSPE is calculated (Yorucu, 2003:182).

$$RMSPE = \sqrt{\frac{\sum pe_t^2}{q}} \tag{4.8}$$

where pe is the percentage deviation between the actual value and the forecast value and q is as above.

The Theil's U value indicates how accurately the turning points are forecast. If the Theil's U value is close to zero, then the forecasting results are accurate. Equation 4.9 shows how the Theil's U was calculated (Yorucu, 2003:184).

$$Theil's\ U = \frac{\sqrt{\frac{\sum e_t^2}{q}}}{\sqrt{\frac{\sum a_t^2}{q}} + \sqrt{\frac{\sum f_t^2}{q}}} \tag{4.9}$$

where e, a and q are as above, and f = forecast tourist arrival value in period t.

Table 4.5 shows the forecasting accuracy results for each market. According to Lewis and DeLurgio (quoted by Hsu, 2010:4320), a MAPE and RMSPE value of ten per cent and lower indicates that the forecasts are extremely accurate, a value between ten and twenty per cent indicates good forecasting results, and a value between twenty and fifty per cent shows reasonable forecasting results. The Theil's U value should be between 0 and 1 (Chu, 1998:607). The closer the Theil's U value is to zero, the more accurate the forecasting results. The North American forecasting results are extremely accurate, whereas the forecasting results for the United Kingdom and Australasian models are the least accurate. On the other hand, almost all of the variables in the North American model are significant. The European model has the second highest accurate forecasting and the European model has a very good fit. The forecasting results are, on average, relatively good.

Table 4.5: Forecasting accuracy

Asia			**Europe**		
Forecast length	***Test type***	***Accuracy***	***Forecast length***	***Test type***	***Accuracy***
3 years ahead	*MAPE:*	-15.531	*3 years ahead*	*MAPE:*	-14.114
2 years ahead	*MAPE:*	-14.369	*2 years ahead*	*MAPE:*	-9.284
1 year ahead	*MAPE:*	-13.918	*1 year ahead*	*MAPE:*	-7.091
3 years ahead	*RMSPE:*	16.691	*3 years ahead*	*RMSPE:*	25.293
2 years ahead	*RMSPE:*	14.855	*2 years ahead*	*RMSPE:*	14.691
1 year ahead	*RMSPE:*	14.002	*1 year ahead*	*RMSPE:*	8.985
3 years ahead	*Theil:*	0.075	*3 years ahead*	*Theil:*	0.113
2 years ahead	*Theil:*	0.067	*2 years ahead*	*Theil:*	0.076
1 year ahead	*Theil:*	0.066	*1 year ahead*	*Theil:*	0.051
Australasia			**North America**		
3 years ahead	*MAPE:*	-24.490	*3 years ahead*	*MAPE:*	-0.383
2 years ahead	*MAPE:*	-23.942	*2 years ahead*	*MAPE:*	0.818
1 year ahead	*MAPE:*	-25.840	*1 year ahead*	*MAPE:*	0.370
3 years ahead	*RMSPE:*	27.901	*3 years ahead*	*RMSPE:*	7.345
2 years ahead	*RMSPE:*	27.441	*2 years ahead*	*RMSPE:*	7.195
1 year ahead	*RMSPE:*	29.213	*1 year ahead*	*RMSPE:*	7.208
3 years ahead	*Theil:*	0.113	*3 years ahead*	*Theil:*	0.036
2 years ahead	*Theil:*	0.111	*2 years ahead*	*Theil:*	0.037
1 year ahead	*Theil:*	0.119	*1 year ahead*	*Theil:*	0.038
South America			**United Kingdom**		
3 years ahead	*MAPE:*	-22.257	*3 years ahead*	*MAPE:*	-26.879
2 years ahead	*MAPE:*	-16.731	*2 years ahead*	*MAPE:*	-21.234
1 year ahead	*MAPE:*	-13.861	*1 year ahead*	*MAPE:*	-20.713
3 years ahead	*RMSPE:*	25.306	*3 years ahead*	*RMSPE:*	42.387
2 years ahead	*RMSPE:*	19.394	*2 years ahead*	*RMSPE:*	36.987
1 year ahead	*RMSPE:*	16.151	*1 year ahead*	*RMSPE:*	38.300
3 years ahead	*Theil:*	0.114	*3 years ahead*	*Theil:*	0.153
2 years ahead	*Theil:*	0.085	*2 years ahead*	*Theil:*	0.138
1 year ahead	*Theil:*	0.072	*1 year ahead*	*Theil:*	0.144

4.6 VECM and variance decomposition

The Johansen cointegration test within the VAR space showed that there is cointegration present and therefore a VECM can be estimated. Table 4.6 indicates the level of cointegration for each model. The trace statistic and the maximum eigen value are used to determine the number of cointegration vectors under each assumption. The maximum eigen value is indicated in brackets.

Table 4.6: Johansen cointegration test results

Data trend	Asia	Australasia	Europe	North America	South America	United Kindgom
None **No intercept No trend**	0 (0)	2 (2)	1* (1)	1 (0)	0 (0)	1 (1)
None **Intercept No trend**	0 (0)	2 (1)	2 (2)	1 (1)	0 (0)	1 (1)
Linear **Intercept No trend**	1 (0)	1 (1)	1 (1)	1 (1)	0 (0)	1 (1)
Linear **Intercept Trend**	1* (2)	1* (1)	1 (1)	2 (1)	1* (1)	1* (1)
Quadratic **Intercept Trend**	2 (2)	1 (1)	3 (3)	1* (1)	1 (1)	1 (1)

Note: The * indicates the assumption used for each model

Table 4.7 indicates the long-run estimation results of each of the markets. It is evident that in all cases, the real exchange rate is significant and has the expected sign. Saayman and Saayman (2008:90) also find similar results except for that of Asia where there is a negative correlation between tourist arrivals and the real exchange rate. The results show that the positive relationship between tourist arrivals and the real exchange rate is in most cases, except for Europe, inelastic. Real GDP per capita, in all but one case (South America), has a negative relationship with tourist arrivals. The negative correlation between real GDP per capita and tourist arrivals is not significant for Asia as well as North America. Saayman and Saayman (2006:90) also state in their findings that tourist arrivals from Australia had a negative relationship with real GDP per capita. The results for South America show that a one per cent increase in real GDP per capita leads to a 1,62 per cent increase in tourist arrivals to South Africa.

Table 4.7: VECM long-run estimation results

Variable	Asia	Australasia	Europe	North America	South America	United Kingdom
$Larrivals_{t-1}$	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Lreal exchange $rate_{t-1}$	0.0693	0.1348	3.6279**	0.3664*	0.3151***	0.3285***
$Lgdp_{t-1}$	-0.7236	-2.7660***	-0.8863	-0.4206	1.6201***	-2.5659**
Trend	0.0111***	0.0298***	-	0.0139	0.0183***	0.0321***
Constant	16.9285	33.5751	-	13.155	-3.3465	32.5589

Note: *** indicates 1% significance; ** indicates 5% significance; * indicates 10% significance.

Table 4.8: Cholesky Normality Test

Cholesky Normality	Asia	Australasia	Europe	North America	South America	United Kingdom
Skewness	7.0643 (0.0699)	0.5759 (0.9019)	6.1568 (0.1040)	3.574 (0.3113)	4.3186 (0.2291)	1.0866 (0.7803)
Kurtosis	1.7001 (0.6368)	9.2831 (0.0258)	0.7548 (0.8602)	9.0551 (0.0286)	9.5930 (0.0224)	1.5930 (0.6610)
Jarque-Bera	8.7648 (0.1872)	9.8590 (0.1307)	6.9117 (0.3291)	12.6293 (0.0493)	13.9116 (0.0306)	2.6796 (0.8479)

Note: the value in brackets indicates the probability.

Table 4.9 White Heteroskedasticity Test

White Heteroskedasticity	Asia	Australasia	Europe	North America	South America	United Kingdom
Joint test	131.5792 (0.2214)	145.2189 (0.7214)	57.4560 (0.7641)	194.6994 (0.3161)	132.0340 (0.6271)	179.7258 (0.3672)

The diagnostic test (see Tables 4.9) shows that there is no heteroskedasticity. The LM Autocorrelation test results are included in Appendix B (Figure B14 – B15) which indicate that no serial correlation are present in the models. The Cholseky Normality tests show that the residuals are normally distributed (see Table 4.8). The Jarque-Bera probability for North and South America is less than 0,05 and therefore the null hypothesis, that the residuals are normally distributed, is rejected. Though the null hypothesis is rejected, it is rejected due to kurtosis rather than skewness. According to Paruolo (1996), the rejection of the normality assumption due to excess kurtosis will not affect the Johansen test results.

An impulse response analysis is often undertaken when estimating a VECM model. This will determine the length and intensity of the effect that a shock will have on, for example, tourist arrivals

(Song & Witt, 2006:219). An impulse response is therefore very useful, especially for policy formulation purposes. A vector moving average process needs to be performed in order to shock the error terms which make it possible to determine the effect on the dependent variable (Song & Witt, 2000:95). The shocks of the explanatory variables on the dependent variable are illustrated in Figure 4.1 and are measured by the Generalized Decomposition Method.

The impulse response results for Australasia, Europe, North America, South America and the United Kingdom are indicated in Figures B5 – B7 in Appendix B. It is evident from Figure 4.1 that in the case of Asia, tourism demand is positively affected by a shock in the real exchange rate and real GDP per capita. The effect of both the real exchange rate and real GDP per capita on tourism demand will fade away after approximately three years (12 quarters). The effect of a shock in tourism demand, on the other hand, has a negative impact on tourism demand from Asia and fades away after approximately two and a half years (10 quarters). Comparing the Asian impulse response results with the Asian long-run estimation results from Table 4.7 it is evident that there is a positive relationship between tourist arrivals and the real exchange rate. The initial positive shock of tourist arrivals to real GDP per capita turns into a downward trend till the response fades away. This again is similar with the finding from the Asian long-run estimation results from Table 4.7. The impulse response results for the other markets have more or less the same impact as the above-mentioned results. In the case of South America, the effect of shock in the real exchange rate and real GDP per capita initially leads to a negative impact on tourism demand where after this turns into a slight increase in tourism demand. The impulse response results show that, on average, any shock that affects tourism demand will decline after approximately three years.

A variance decomposition is performed for each of the markets. The reason for analysing a variance decomposition is to come to a better understanding of the coefficients from the VECM model (Maroney *et al*., 2004:141). The variance decomposition results therefore provide a better understanding of the out-of-sample causal relationship between the endogenous variables (Wickremasinghe & Ihalanayake, 2006:12). The results of the variance decomposition are summarised in Table 4.10 and 4.11 below (for a full inspection of the decompositions, see Appendix B (Tables B16 – B21). The first column indicates the time horizon whereas the second column, named S.E., indicates the variation between the current and future values of the endogenous variables due to the shocks. The columns labelled larrivals, lgdp and lexchange rate indicate the variance of each endogenous variable from its mean due to their own shock but also the shock in the other endogenous variables. This is done for each variable in the system to indicate how the shock influences each variable in the system. The Exogeneity test results (see Tables B8 – B13 in Appendix

B) were used to determine the Choleski ordering of the variables included in the variance decomposition. The variables most exogenous were included first and ending with the most endogenous variables (Duasa, 2007:32-33).

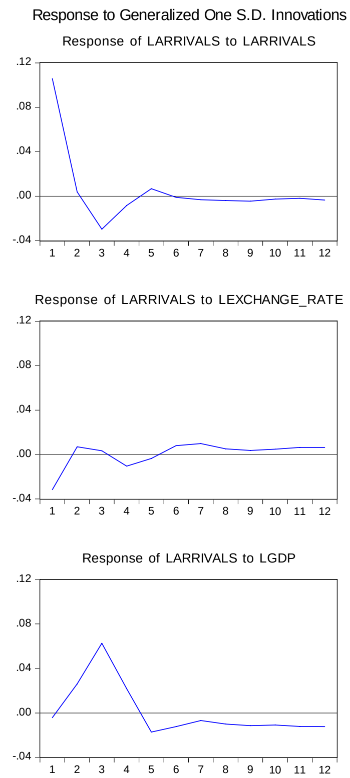


Figure 4.1: Impulse response of the Asian model

It is evident that in the case of Asia, the percentage forecast variance for tourist arrivals to South Africa from Asia is for the most part explained by tourist arrivals at time horizon 1. However, as the time horizon increases, the percentage forecast variance that is explained by tourist arrivals decreases and the percentage forecasted variance explained by GDP increases. This bears out the notion that tourists often make travel plans in advance and that at the time of planning a vacation abroad, income greatly affects travel decisions.

The variance decomposition results for Australasia follow the same trend as those of Asia. At first the percentage forecast variance of tourist arrivals to South Africa from Australasia is to a great extent explained by itself but as the time horizon increases, GDP plays an increasingly more important role. Europe's variance decomposition shows that at first the percentage forecast variance of tourist arrivals is explained by tourist arrivals as such but as the time horizon increases, the real exchange rate plays a more important role. This emphasises the strong relationship between the real exchange rate and tourist arrivals from Europe as seen in Table 4.7.

Table 4.10: Variance decompositions of arrivals

Asia				
Period	S.E.	Larrivals	Lexchange rate	LGDP
1	0.105685	90.46436	9.374561	0.161074
2	0.109671	84.61126	9.572922	5.815816
3	0.129216	64.67539	7.665071	27.65953
4	0.131677	62.90662	7.731513	29.36186
5	0.132989	61.78669	7.760011	30.45330
6	0.133720	61.11410	7.913549	30.97235
7	0.134200	60.68039	8.311585	31.00802
8	0.134681	60.30797	8.338407	31.35363
Australasia				
Period	S.E.	Larrivals	Lexchange rate	LGDP
1	0.080490	95.81167	2.835223	1.353103
2	0.083165	93.16241	2.954305	3.883290
3	0.102068	70.33199	2.180452	27.48755
4	0.107230	66.94975	2.109106	30.94114
5	0.117254	63.90586	6.303572	29.79056
6	0.120325	62.79267	8.917526	28.28980
7	0.126582	61.45351	8.613937	29.93256
8	0.132997	56.26045	7.824549	35.91500
Europe:				
Period	S.E.	Larrivals	Lexchange rate	LGDP
1	0.047472	91.69125	6.530839	1.777914
2	0.065761	63.12384	5.447705	31.42845
3	0.073875	58.92421	11.17325	29.90254
4	0.085034	53.19029	20.08767	26.72204
5	0.098633	43.98775	32.41244	23.59981
6	0.113876	35.77453	44.66963	19.55584
7	0.131292	28.73642	55.30833	15.95525
8	0.150618	22.92561	64.12229	12.95210
North America				
Period	S.E.	Larrivals	Lexchange rate	LGDP
1	0.086615	100.0000	0.000000	0.000000
2	0.088944	95.51927	0.060622	4.420107
3	0.092304	91.91614	0.115994	7.967864
4	0.096437	84.70640	0.655872	14.63773
5	0.105965	80.07851	1.808938	18.11255
6	0.106679	79.06562	1.961954	18.97243
7	0.106688	79.06727	1.962678	18.97005
8	0.107132	78.88521	1.978714	19.13608
South America				
Period	S.E.	Larrivals	Lexchange rate	LGDP
1	0.124958	97.97393	2.026070	0.000000
2	0.158969	71.56431	14.29681	14.13887
3	0.177784	67.18417	11.88304	20.93279
4	0.185050	69.05347	11.33577	19.61076
5	0.198233	70.57060	10.02976	19.39963
6	0.220087	71.56287	11.26108	17.17605
7	0.239289	71.02172	12.06656	16.91173
8	0.250927	69.95019	12.52903	17.52079

Table 4.11: Variance decompositions of arrivals from the United Kingdom

United Kingdom				
Period	S.E.	Larrivals	Lexchange rate	LGDP
1	0.065221	98.18986	0.462767	1.347375
2	0.068368	93.90971	3.807700	2.282592
3	0.076240	82.04298	13.23706	4.719960
4	0.084565	67.20469	20.59668	12.19862
5	0.089584	60.51519	19.25258	20.23223
6	0.100699	48.07650	16.46840	35.45509
7	0.107156	42.56639	16.44485	40.98876
8	0.111119	39.63361	15.60682	44.75957

The percentage forecast variance of North American tourist arrivals follows the same trend as that of Asia. The South American variance decomposition results indicate that the percentage forecast variance of tourist arrivals is more affected by tourist arrivals. The United Kingdom variance decomposition indicates that the percentage forecast variance of tourist arrivals is at first considerably affected by tourist arrivals. This, however, changes as the time horizon increases. During time horizon 8 it is evident that the real GDP per capita now plays a more important role in the percentage forecast variance of tourist arrivals.

4.7 Conclusion

This paper focused on estimating tourism demand to South Africa by using a system of equations approach, and more specifically a VAR approach to forecasting tourism arrivals and a VECM approach to perform an impulse response analysis and variance decomposition. As such, this paper follows the work of Song *et al*. (2003b) for the forecasting using the VAR model, and Chaitip *et al*. (2006) for the VECM.

Six models were estimated and arrivals from those markets, namely Asia, Australasia, Europe, North America, South America and the United Kingdom were then forecast. Africa has been excluded from this study since the majority of arrivals from Africa originate from SADC countries for other purposes than holidaying and since these countries are subject to data limitations. Literature studies indicate that the most popular variables to be included are income, relative prices and arrivals and therefore they are chosen as variables in this paper as well. Seasonal dummies are also included in the models if found to improve the estimation results.

Most of the explanatory variables have the expected relationships with the dependent variable except for the real exchange rate, in most cases. Of all the explanatory variables (excluding the seasonal dummies and trend), income (real GDP *per capita*) and past arrivals are the most significant variables. The models also fit well, as indicated by the R^2 values.

Forecasting accuracy was tested by making use of the MAPE, RMSPE and Theil's *U* and was found to be good. Forecasts for arrivals from the United Kingdom and Australasia are found to be the least accurate while forecasting results for North America are the most accurate, followed by Europe. In general the one-year forecasts are very good to good, while the three-year forecasts are reasonably good.

The impulse response analysis of all the markets shows that it takes on average three years for shocks in the explanatory variables affecting tourism demand to disappear. Policy-makers should bear that in mind when formulating policies.

It is evident from the variance decomposition results that real GDP per capita definitely plays an important role in future tourist arrivals, especially those from Asia, Australasia, North America and the United Kingdom. The real exchange rate greatly affects future tourist arrivals from Europe. The percentage forecast variance in the case of South America also seems to be affected to a great extent by the real exchange rate. The South African government should therefore try to increase price competitiveness which can contribute towards increasing future arrivals from these regions.

Chapter 5
Conclusion and recommendations

5.1 Introduction

The tourism industry is very competitive since tourism is considered to be a luxury good. Tourists are very fickle and can change their choice of destination when they chance upon a more attractive destination. Tourism has several advantages for a country: it is considered a large contributor of foreign exchange earnings to a country; is especially suitable for increasing low-skilled job opportunities within large cities or rural areas; it leads to infrastructure development which benefit other sectors of the economy; it also has a considerable multiplier effect and can therefore lead to growth and development in other sectors within the country. International tourist arrivals in South Africa have increased significantly since the early 1990s after the sanctions against South Africa were lifted. Many African countries, including South Africa, have the potential to achieve a higher level of economic growth and development and it is therefore not surprising that tourism is one of the industries identified to promote growth and development in South Africa.

Why is tourism forecasting necessary? Forecasting tourist arrivals in South Africa may assist business concerns and policy-makers to use the available resources effectively. Since tourism is more service-based, it is not always possible to stockpile. Therefore, in order to maximise business profits, it is necessary to have accurate figures of future tourist arrivals. Knowing what future tourist arrivals entail, business owners can commission a suitable number of employees and can determine whether it will be profitable to expand their businesses, for example, to build another hotel or guesthouse. Policy-makers may find it easier to plan for future infrastructure investment or to make other finance-related decisions.

Although previous research has been conducted to determine the determinants of tourism demand for Africa and South Africa (for example, Naudé & Saayman, 2005; Saayman & Saayman, 2008 and Seetanah *et al*., 2010), little research is available on forecasting tourism demand for South Africa. Therefore, this research was undertaken with the aim to forecast tourism demand to South Africa using two popular causal methods, namely a single equation and system of equation approach, and to compare that with the forecasting results of a time series technique.

The following questions may then be asked: Will causal forecasting methods outperform those of time-series methods such as the popular Seasonal Autoregressive Integrated Moving Average (SARIMA) model? Which causal approach is the most suitable for forecasting tourism demand?

In order to answer these questions the objective of this research was to *ex post* forecast tourism demand for South Africa using causal methods, more specifically a single equation method (ADLM) and a Vector Autoregressive (VAR) model, and to compare that with the results obtained from a time series technique, namely SARIMA models. The results from these methods can be used to provide policy recommendations.

As a point of departure, the South African tourism trends were examined. It was found that tourism affects the GDP of a country in many ways and that, though domestic tourism exceeds foreign arrivals in terms of volume, spending by foreign arrivals remains higher than that of domestic tourists. The different origin markets which would be used to forecast tourism demand from those origin markets were identified. The six chosen origin markets are Asia, Australasia, Europe, North America, South America and the United Kingdom.

Tourist arrivals from Africa (including the Middle East) are South Africa's largest tourist arrival market followed by arrivals from Europe, the Americas, Asia and Australasia. Most arrivals from Africa are arrivals from SADC countries, who often visit South Africa for reasons other than to spend a vacation in South Africa. These may include travelling for study purposes, employment or medical treatment. It has also been established that tourist arrivals from air markets spends more per tourist on average than arrivals from land markets. Therefore, due to the difference in purpose of travelling to South Africa, the lower average spending per tourist from land markets and data limitations, Africa has been excluded from this study.

A number of goals were set in order to reach the main objective of this study. The first goal was to explore the determinants that influence tourism demand with the aim of identifying the factors that influence a tourist's decision to travel. The second goal was to examine the different empirical methods used by other researchers to forecast tourism demand. Sections 5.2 and 5.3 provide a summary of the findings of the literature review of the tourism demand determinants and forecasting methods respectively. The third goal of this research was to assess the accuracy of the single equation econometric method and the fourth goal to estimate a system of equation model and *ex post* forecast tourism demand to South Africa from six of South Africa's main tourist markets (Asia, Australasia, Europe and the United Kingdom, North America and South America). Sections 5.4.1 and 5.4.2 summarise the findings of the single and system of equations methods. The fifth goal of this research was to assess the results of the single equation method and the system of equation methods against a time-series method. Section 5.4.3 provides this comparison of the forecast results, while sections 5.4.4 and 5.5 provide policy recommendations and recommended future research.

5.2 Findings of the tourism demand determinants

The first goal of the study, namely to explore the determinants of tourism demand in order to identify the factors that influence tourists' decisions to travel abroad was addressed in a literature review in Chapter 2. From microeconomic theory it is known that individuals like tourists would like to maximise their utility and will therefore choose a destination country that best satisfies their needs and that maximises their utility. Factors that affect individuals', and therefore also tourists' decisions, according to economic theory, include income, prices of goods and services and substitute prices. It is evident from tourism literature that this also applies to tourists and their decisions. However, additional factors also influence the tourism consumption decision.

From the literature review in Chapter 2, it is evident that there are several determinants which affect tourism demand. Some determinants are country-specific such as supply-side factors, climate, culture, political stability, crime and health risks. Other determinants are more origin country-specific such as income of the tourist. The review indicated that popular explanatory variables included in tourism demand models are income, relative prices, transport cost, lagged dependent variables, other supply-side determinants and dummy variables.

Brakke (2005:15) states that for most countries, the income elasticity with regards to tourist arrivals is greater than one. Therefore, it is expected that as income increases, tourist arrivals will increase and that tourists may choose a destination country where they will have relatively strong buying power since tourism is considered a luxury good. According to Saayman (2000:32), a country with a higher GDP level and less income inequality should form a bigger tourist arrival market for a destination country than a country with a lower GDP level and higher income inequality. Destination country-specific factors, as mentioned above, can to a large extent influence a tourist when choosing a destination country. A destination country with relatively low inflation can, with the aid of a competitive exchange rate, create an environment where the tourist may have a strong buying power which can make the destination country a more favourable country to visit. A destination country with competitive transport cost and a well developed transport infrastructure can also influence the destination choice of a tourist. Cultural ties between countries can lead to higher tourist arrivals from certain countries while factors such as politics, crime and natural disasters on the other hand, prevent tourists from travelling to a destination country with political instability or high crime levels.

From the review it also became evident that each origin market may respond differently to each determinant, and that there is no one set of determinants that affect tourists from all origin markets in the same way. Past research indicates that researchers mostly include only one, two or three explanatory variables in tourism demand models. Therefore, the focus fell on choosing the most important variables as identified through the literature study as well as previous research on tourism demand models for South Africa to include in the empirical analysis.

5.3 Findings of the tourism forecasting methods often used

The second goal was to review the different methods in forecasting tourism demand and this was addressed in the literature review in Chapter 2. This Chapter indicated that there are various ways to forecast tourism demand, and that these can be broadly divided into quantitative and qualitative methods. Researchers often find that quantitative methods outperform qualitative methods and many researchers therefore focus on quantitative methods. Quantitative methods are methods which are a combination of historical data and statistical models which help to determine the relationship between the dependent variable and the explanatory variables. Qualitative methods, on the other hand, do not rely on historical data but much more on specialist opinions. Quantitative methods can, in turn, be divided into two groups: causal and non-causal methods.

Causal methods are methods where explanatory variables are used to explain the dependent variable, whereas with non-causal methods, the dependent variable is used to explain itself. Causal methods can be divided into single equation models, system of equation models and panel models. Since the objective of this study is to determine whether causal forecasting methods forecast future tourism demand more accurately than non-causal methods (time series methods), causal methods were chosen for this study.

Researchers in the 1990s mainly estimated basic regression models and often used time series methods to model and forecast tourism demand. From 2000, more advanced econometric methods have been used by researchers to improve forecasting accuracy. Popular causal models include an Autoregressive Distributed Lag Model (ADLM), Error Correction Model (ECM), Time Varying Parameter (TVP) model, Vector Autoregressive (VAR) model, Almost Ideal Demand System (AIDS) model and panel data models.

The ADLM offers the advantage that if cointegration is present, long-run and short-run relationships between the variables can be estimated. Another advantage is that the chance for serial correlation to occur is smaller in comparison with other cointegration methods. The ECM is also a dynamic model as is the ADLM. The ECM also has the ability to provide long-run and short-run relationship information if cointegration is present. The TVP is often used when there are structural changes in the data or when the constant coefficients are too restricted. Therefore, the coefficients provided by such a model change over time.

The VAR model is a system of equation method and the variables are treated as endogenous variables. Researchers often use this method when they want to forecast each variable separately. The AIDS model is based on consumer utility theory. Therefore, in tourism research, tourism expenditure is often used as dependent variable. A panel model are used when panel data is available. Panel data are a combination of cross-section data over a certain period of time. The advantage of using such a model is that multicollinearity is less and improved estimates are often the result. Forecasting accuracy is often measured by calculating the Mean Absolute Percentage Error (MAPE), Root Mean Square Error (RMSE) and Theil's *U*.

5.4 Findings from the empirical analysis

A single equation causal model, namely an ADLM and a two system of equation models, namely a VAR model and VECM, were estimated for the six identified markets using EViews 7. Data were obtained from secondary sources, including Statistics South Africa, International Financial Statistics and the South African Reserve Bank. Article 1, which represents the single equation approach follows the same approach as a study conducted by Aresh *et al*. (2004:201), Song *et al*. (2003a:443) and Song *et al.* (2003b). Article 2, which represents the system of equation approach, follows the same procedure as Song *et al*. (2003b), Song and Witt (2006) and Chaitip *et al.* (2006). The findings of articles 1 and 2 will be summarised in sections 5.4.1 and 5.4.2 followed by a discussion of the forecasting accuracy results in section 5.4.3. Policy recommendations will be provided in section 5.4.4. Article 1 addressed the third goal of this study, namely to assess the *ex post* forecasting accuracy of the single equation econometric method used to *ex post* forecast tourism demand to South Africa from six of South Africa's main tourist markets (Asia, Australia, Europe and the United Kingdom, North America and South America). Article 2 addressed the fourth objective of this study namely, to estimate a system of equation model and to undertake an impulse response analysis and variance decomposition for each of the six markets in order to understand the relationship of the coefficients better as well as to *ex post* forecast tourism demand to South Africa from the six identified markets. The single equation and system of equation method will then be assessed against a time-series method which will form the fifth goal and is indicated in section 5.4.3.

5.4.1 Findings of Chapter 3 article 1

In order to reach the third goal of this study, an ADLM was estimated for each of the six origin markets. The preference for this model to all the other single equation models is that it is considered by Salleh *et al*. (2007:353) to be a more suitable model when the data range is smaller, as is the case in this study. Another advantage of the ADLM is that when cointegration is present, the long-run relationship between the explanatory variables and the dependent variable can be estimated. A Bound test approach was followed to determine whether cointegration was present in each of the six ADLMs. Each explanatory variable was used as a dependent variable to determine whether there is in fact only one cointegrated relationship, which should be the case. Centred seasonal dummies were included in the models if found to be significant in order to address seasonality in the tourist arrivals.

The short-run results indicated that real GDP per capita and lagged real GDP per capita are elastic, which emphasises the fact that tourism is considered a luxury good. Real GDP per capita is only significant in the South American model but current and lagged real GDP per capita have the correct sign in all the models which contain the variable (Asia, South America and the United Kingdom). Hotel (the number of hotel rooms available), which is a proxy for accommodation, and the lag of hotel are not significant and these variables have a negative relationship with arrivals in the Asian, Australasian and North American models. This may be due to the fact that tourists tend to make bookings well in advance and are not really affected by a change in the number of hotel rooms available in the short run. The same applies to the non-significance of crude oil and the real exchange rate as well as the negative relationship between the real exchange rate and arrivals in the short run.

Most of the long-run estimates have the correct signs and the size of the elasticities is also in line with that of Salleh *et al*. (2007:356) and Aresh *et al*. (2004:201). In most cases, an increase in income led to an increase in tourism demand as well. The proxy for supply-side factors, the number of hotel rooms available, also has a positive impact on tourist arrivals except in the European model. If the real exchange rate increases by one per cent, tourist arrivals increase as well. This indicates that, as the buying power of tourists increases, the number of tourist arrivals increases as well. Crude oil, the proxy for transport cost, did not have the expected effect on tourism demand. This may be an indication that crude oil is not a suitable proxy for travel cost.

The forecasting results of the United Kingdom were the most accurate, followed by Asia. Australasia had the least accurate forecasting results. The United Kingdom and Asian forecast accuracy results are considered very high while all the other market results are considered good to reasonably good forecasting results. It is interesting to note that most of the variables in the Asian and United Kingdom models were significant and did not include centred seasonal dummies.

5.4.2 Findings of Chapter 4 article 2

In order to reach the fourth goal of the study, the VAR model and the VECM were chosen as system of equation models since the long-run relationship between the variables can be estimated using the VECM. For the short-run estimates and tourism demand forecasting are done using the VAR model since it is the method most often chosen to forecast tourism demand by other researchers, and not the VECM. The VAR approach treats all variables as endogenous variables and includes several multiple equations with co-dependent variables. The VAR model is estimated with stationary data and all the variables had to be differenced in order to obtain stationarity. To include the long-run relationship and therefore be able to perform variance decompositions and impulse response analyses, a VECM was also estimated.

The results of the VAR model for the six markets indicate that past arrivals do not have a positive relationship with current tourist arrivals. This indicates that word-of-mouth marketing may not be effective in the short run. Again, this may be ineffective due to bookings being made well in advance. Tourist arrivals respond positively to a one per cent increase in real GDP per capita in almost every model and are also elastic estimates. In addition, the real exchange rate mostly has a positive relationship with arrivals though it is not very significant. Again this may be a result of bookings being made well in advance.

The long-run relationships obtained from the VECM indicate that there is a positive relationship between the real exchange rate and tourist arrivals. In most cases, except for Europe, this relationship is relatively inelastic. Real GDP per capita, on the other hand, is relatively elastic and real GDP per capita has a negative relationship with tourist arrivals in all but one case. Tourist arrivals from South America have a positive relationship with real GDP per capita. The size of the coefficients in this study is in line with that of studies done by Saayman and Saayman (2009:90) and Chaitip *et al*. (2006:1196).

The forecasting accuracy results of North America are the most accurate followed by Europe and Asia. The above-mentioned forecasting results vary between highly accurate forecasting results (North America) and good forecasting results (Europe and Asia). While the forecasting results for arrivals from South America, Australasia and the United Kingdom were the least accurate, they are still considered reasonably good.

An impulse response analysis that was undertaken indicates that a shock in the real exchange rate and real GDP *per capita* have a positive effect on tourism demand and that the effect on tourism demand will fade away in approximately three years. A shock to tourism demand in itself has a negative impact on tourism demand and takes more or less three years to gradually fade away.

The variance decomposition results indicate that, on average, as the time horizon increases, the importance of real GDP per capita in explaining the percentage forecast variance of tourist arrivals increases. This indicates that income plays an important role since travel plans are made well in advance. These results clearly identify that as income increases, tourist arrivals increase as well and vice versa. This shows that countries with lower real GDP per capita levels may have lower future tourist arrivals as stated in the literature review in Chapter 2. The percentage forecast variance of tourist arrivals is mostly explained by itself at the beginning of the time horizon. The real exchange rate plays a small role in the percentage forecast variance of tourist arrivals in almost all the models (excluding the European model).

5.4.3 Forecasting results

The fifth goal of this study is to compare the forecasting accuracy results of the single equation method and system of equation method with that of the time-series technique as indicated in Tables 5.1 to 5.3. These tables show the forecasting results of the different markets for the three time periods using the MAPE, RMSPE and Theil's *U*. A SARIMA model for each market has been estimated to serve as a benchmark in order to compare the forecasting accuracy. The SARIMA is recognized by researchers to obtain good forecasting results. Saayman and Saayman (2010) have conducted a study on forecasting tourism demand in South Africa making use of several univariate time series techniques including the SARIMA model. They found that the forecasting results obtained by using the SARIMA model outperformed three different univariate time series techniques (Naïve model, ARIMA, Holt-Winters exponential smoothing). Therefore, the SARIMA model was chosen as the benchmark model and these results basically mimic their results.

Table 5.1: Forecasting accuracy for one year ahead

		ADLM	**VAR**	**SARIMA**
Asia	*MAPE*	3.917 (1)	-13.918 (3)	4.341 (2)
	RMSPE	4.823 (1)	14.002 (3)	9.105 (2)
	Theil's U	0.026 (1)	0.066 (3)	0.049 (2)
Australasia	*MAPE*	11.031 (2)	-25.840 (3)	-6.144 (1)
	RMSPE	15.047 (2)	29.213 (3)	7.368 (1)
	Theil's U	0.088 (2)	0.119 (3)	0.032 (1)
Europe	*MAPE*	-26.488 (3)	-7.091 (2)	-2.933 (1)
	RMSPE	39.096 (3)	8.985 (2)	3.313 (1)
	Theil's U	0.133 (3)	0.051 (2)	0.016 (1)
North America	*MAPE*	11.772 (3)	0.370 (1)	4.729 (2)
	RMSPE	14.801 (3)	7.208 (2)	5.205 (1)
	Theil's U	0.084 (3)	0.038 (2)	0.028 (1)
South America	*MAPE*	16.398 (3)	-13.861 (2)	5.759 (1)
	RMSPE	16.948 (3)	16.151 (2)	6.217 (1)
	Theil's U	0.095 (3)	0.072 (2)	0.033 (1)
United Kingdom	*MAPE*	9.215 (1)	-20.713 (3)	-11.359 (2)
	RMSPE	19.483 (2)	38.300 (3)	13.082 (1)
	Theil's U	0.119 (2)	0.144 (3)	0.050 (1)

Note: the numbers in brackets indicate rank

It is evident from Tables 5.1 to 5.3 that ADLM performed best in terms of forecasting accuracy for Asia for all three time periods. The SARIMA forecasting results for all three time horizons, on the other hand, are more accurate for the Australasian, European, South American and the United Kingdom regions and one-year ahead forecasts for North America. The VAR model provides more accurate two - and three-year forecasts for North American arrivals. When estimating the aggregate MAPE, RMSPE and Theil's *U* as seen in Table 5.4, it is clear that the SARIMA model provides the most accurate forecasting results for all three time horizons. The aggregate MAPE, RMSPE and Theil's *U* were calculated by adding the absolute values of the various MAPE, RMSPE and Theil's *U* of each model for each market and dividing each by six. The VAR model outperformed the ADLM in the two - and three-year time horizons but was outperformed by the ADLM model in the first year time horizon. This shows that, on average, the system of equation approach outperforms the forecasting accuracy results of the single equation approach, especially over longer time horizons, and that the SARIMA model provides more accurate forecasting results. However, it has to be kept in mind that the drawback of SARIMA estimates is that they provide very little policy implications. The policy implications that can be derived from the causal methods are therefore discussed in the next section.

5.4.4 Policy recommendations

Based on this research, a number of recommendations can be made. Marketing activities should be intensified in origin markets with a growing GDP to attract more arrivals from those areas since real GDP per capita in the long run is found to be elastic and has a positive impact on tourist arrivals. It is mainly up to the origin countries to increase income per capita.

The number of hotel rooms available in the long run has a positive relationship with tourist arrivals and is also elastic. Policies that are aimed toward infrastructure development and maintenance could contribute to an increase in future tourist arrivals. Arrivals from Europe might have a negative relationship with the number of hotel rooms available since tourists from this region might choose accommodation with a safari atmosphere such as bush lodges. Investment in such accommodation facilities and the marketing of such facilities to Europeans may lead to an increase in arrivals from this region.

The economic environment needs to be stable and the real exchange rate (and thus the inflation rate) need to be under control which may contribute to price competitiveness resulting in South Africa becoming a more desirable country to visit by tourists with an increased buying power. It is not recommended that the exchange rate should be fixed, but rather that the real exchange rate should remain competitive through inflation control.

Table 5.2: Forecasting accuracy for two years ahead

		ADLM	VAR	SARIMA
Asia	*MAPE*	6.653 (1)	-14.369 (2)	13.641 (3)
	RMSPE	8.419 (1)	14.855 (2)	18.717 (3)
	Theil's U	0.050 (1)	0.067 (2)	0.113 (3)
Australasia	*MAPE*	26.034 (3)	-23.942 (2)	-1.993 (1)
	RMSPE	32.014 (3)	27.441 (2)	6.851 (1)
	Theil's U	0.207 (3)	0.111 (2)	0.033 (1)
Europe	*MAPE*	-18.626 (3)	-9.284 (2)	-8.934 (1)
	RMSPE	32.957 (3)	14.691 (2)	13.398 (1)
	Theil's U	0.120 (3)	0.076 (2)	0.063 (1)
North America	*MAPE*	22.773 (3)	0.818 (1)	6.604 (2)
	RMSPE	26.933 (3)	7.195 (2)	7.169 (2)
	Theil's U	0.164 (3)	0.037 (1)	0.039 (2)
South America	*MAPE*	26.028 (3)	-16.731 (2)	12.028 (1)
	RMSPE	28.192 (3)	19.394 (2)	13.963 (1)
	Theil's U	0.174 (3)	0.085 (2)	0.080 (1)
United Kingdom	*MAPE*	7.516 (1)	-21.234 (3)	-12.968 (2)
	RMSPE	18.571 (2)	36.987 (3)	11.400 (1)
	Theil's U	0.109 (2)	0.138 (3)	0.058 (1)

Note: the numbers in brackets indicate rank

The impulse response analysis indicates that any shocks to the real exchange rate, real GDP per capita and tourism demand as such take on average three years to fade away. Policy-makers should keep this in mind when formulating policies.

The variance decomposition results indicate the importance of income in terms of the percentage forecast variance in each of the variables. This shows that if a negative shock would occur in real GDP per capita, this would significantly affect tourist arrivals in the future and this may take approximately three years to fade away. The real exchange rate on the other hand has a smaller impact on the percentage forecast variance of tourist arrivals than the real GDP per capita (excluding the European model).

Table 5.3: Forecasting accuracy for three years ahead

		ADLM	VAR	SARIMA
Asia	*MAPE*	9.661 (1)	-15.531 (2)	21.266 (3)
	RMSPE	12.043 (1)	16.691 (2)	26.362 (3)
	Theil's U	0.073 (1)	0.075 (2)	0.167 (3)
Australasia	*MAPE*	35.538 (3)	-24.490 (2)	-0.146 (1)
	RMSPE	40.933 (3)	27.901 (2)	6.896 (1)
	Theil's U	0.269 (3)	0.113 (2)	0.035 (1)
Europe	*MAPE*	-18.406 (3)	-14.114 (2)	-23.070 (1)
	RMSPE	31.456 (3)	25.293 (2)	31.777 (1)
	Theil's U	0.115 (3)	0.113 (2)	0.125 (1)
North America	*MAPE*	32.017(3)	-0.383 (1)	7.941(2)
	RMSPE	36.652 (3)	7.345 (1)	8.956 (2)
	Theil's U	0.237 (3)	0.036 (1)	0.052 (2)
South America	*MAPE*	18.514 (2)	-22.257 (3)	15.657 (1)
	RMSPE	30.976 (2)	25.306 (3)	17.706 (1)
	Theil's U	0.174 (2)	0.114 (3)	0.104 (1)
United Kingdom	*MAPE*	1.828 (1)	-26.879 (3)	-15.644 (2)
	RMSPE	21.239 (2)	42.387 (3)	16.748 (1)
	Theil's U	0.115 (2)	0.153 (3)	0.072 (1)

Note: the numbers in brackets indicate rank

Table 5.4: Forecasting accuracy for all markets

One year ahead			
	ADLM	**VAR**	**SARIMA**
MAPE	13.137 (2)	13.632 (3)	5.878 (1)
RMSPE	18.366 (2)	18.977 (3)	7.382 (1)
Theil's U	0.091 (3)	0.082 (2)	0.035 (1)
Two years ahead			
MAPE	17.938 (3)	14.396 (2)	9.361 (1)
RMSPE	24.514 (3)	20.094 (2)	11.916 (1)
Theil's U	0.137 (3)	0.086 (2)	0.064 (1)
Three years ahead			
MAPE	19.327 (3)	17.276 (2)	13.954 (1)
RMSPE	28.883 (3)	24.154 (2)	18.074 (1)
Theil's U	0.164 (3)	0.101 (2)	0.092 (1)

Note: the numbers in brackets indicate rank

From the forecasting accuracy it is evident that SARIMA models on average performed better than the causal methods. The SARIMA models will provide accurate forecasting results if researchers do not have time and money to estimate causal forecasting models. The system of equation approach is more accurate than the single equation approach. This may be an indication that some of the variables are endogenous rather than exogenous. Policy-makers may also find it useful to use both the SARIMA and VAR models, which may generate more accurate forecasting results and consequently provide better policy recommendations.

5.5 Recommendations for future research

Future researchers may use a longer sample period in order to improve the estimates of the models. The proxies used for some of the markets due to data limitations can also be improved as these data become more readily available. For example, India or China should rather be used as a proxy for Asia instead of Japan. Brazil should also rather be used as a proxy for South America than Argentina. This research did not include arrivals from African markets, which could be a field for future research. Other data quality restrictions include accommodation, where the number of hotel rooms available was used as a proxy. It also became evident from the findings that the proxy used for transport cost, namely the price of crude oil was not a very good proxy for transport cost. More research into a more appropriate proxy is therefore warranted.

In addition, more supply-side factors can be included in the models which may provide policy-makers with valuable information regarding determinants that can be changed or improved within the destination country. Other determinants that may also be considered include politics and crime as well as cultural ties. Including more or less the same explanatory variables will aid the decision-making regarding the model that forecasts the most accurately within certain time horizons.

In addition, this research only explored two popular causal methods for forecasting tourism demand. Future research could expand this research by using, for example, time-varying parameter models and almost ideal demand systems.

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Appendix A

Table A1: Descriptive statistics of the variables

	Mean	Median	Maximum	Minimum	Std. Dev.	Skewness	Kurtosis
Arrivals							
Asia	37834.44	37495	53050	18063	8113.889	-0.063347	2.741303
Australasia	17678.83	17992.50	27038.00	6614.000	4557.176	-0.20876	2.826987
Europe	199060.4	192763.5	307948.0	116054.0	54392.11	0.386873	2.149260
North America	46369.96	48423.50	67089.00	17311.00	12265.05	-0.43500	2.523639
South America	9833.641	10030.50	15305.00	2975.000	2743.454	-0.34457	2.935337
UK	84265.92	77593.50	148342.0	23422.00	30951.25	0.520327	2.768518
GDP							
Asia	8344.800	8368.067	8793.737	7959.894	214.8706	0.195857	2.633764
Australasia	7905.974	7989.137	8947.470	6806.534	648.9666	-0.13508	1.773367
Europe	7167.107	7168.122	7438.291	6896.795	142.1352	-0.01246	2.295268
N.America	9301.107	9447.147	10348.09	8161.887	656.3493	-0.25158	1.677432
S.America	1099.994	1110.036	1243.009	926.4601	84.06190	-0.41895	2.382477
UK	8242.164	8263.880	9390.345	7005.554	716.0073	-0.07320	1.702175
RER							
Asia	0.216381	0.205916	0.304534	0.171315	0.035417	0.861319	2.876015
Australasia	13.45005	13.29961	19.07407	10.76855	1.924245	0.970334	3.772645
Europe	25.03875	24.12681	32.72971	21.55934	2.936997	1.180104	3.504567
N.America	21.03870	20.04475	36.60849	14.96840	5.416430	1.078342	3.585553
S.America	12.65092	13.14229	22.20211	5.891512	3.910586	-0.11414	2.512618
UK	33.27489	34.49480	51.90087	22.59875	7.510647	0.487009	2.801877
Crude oil							
Asia	67.82727	62.64000	132.8800	34.46000	22.42125	0.822758	3.469612
Australasia	67.82727	62.64000	132.8800	34.46000	22.42125	0.822758	3.469612
Europe	105.8094	86.77000	208.6000	34.46000	47.95684	0.865235	2.575803
N.America	67.82727	62.64000	132.8800	34.46000	22.42125	0.822758	3.469612
S.America	67.82727	62.64000	132.8800	34.46000	22.42125	0.822758	3.469612
UK	67.82727	62.64000	132.8800	34.46000	22.42125	0.822758	3.469612
Hotel							
Asia	149413.6	154432.5	161873.0	127277.0	10085.91	-0.72904	2.275656
Australasia	149413.6	154432.5	161873.0	127277.0	10085.91	-0.72904	2.275656
Europe	148874.5	155806.0	161135.0	127300.0	12262.44	-0.83018	1.947455
N.America	149413.6	154432.5	161873.0	127277.0	10085.91	-0.72904	2.275656
S.America	149413.6	154432.5	161873.0	127277.0	10085.91	-0.72904	2.275656
UK	149413.6	154432.5	161873.0	127277.0	10085.91	-0.72904	2.275656

Notes: RER = Real exchange rate, N.America = North America, S.America = South America, UK = United Kingdom

Table A2: Variable correlation

Asia					
	Larrivals	*Lcrude oil*	*LGDP*	*Lhotel*	*Lreal exchange rate*
Larrivals	1.000000	0.752405	0.769859	0.465177	0.257139
Lcrude oil	0.752405	1.000000	0.838488	0.183496	0.212675
LGDP	0.769859	0.838488	1.000000	0.397074	0.022327
Lhotel	0.465177	0.183496	0.397074	1.000000	0.436506
Lreal exchange rate	0.257139	0.212675	0.022327	0.436506	1.000000
Australasia					
	Larrivals	*Lcrude oil*	*LGDP*	*Lhotel*	*Lreal exchange rate*
Larrivals	1.000000	0.667935	0.810098	0.577303	0.626758
Lcrude oil	0.667935	1.000000	0.719239	0.183496	0.551180
LGDP	0.810098	0.719239	1.000000	0.693463	0.745084
Lhotel	0.577303	0.183496	0.693463	1.000000	0.541226
Lreal exchange rate	0.626758	0.551180	0.745084	0.541226	1.000000
Europe					
	Larrivals	*Lcrude oil*	*LGDP*	*Lhotel*	*Lreal exchange rate*
Larrivals	1.000000	0.313158	-0.170090	-0.319528	0.175282
Lcrude oil	0.313158	1.000000	-0.501635	-0.910649	-0.167474
LGDP	-0.170090	-0.501635	1.000000	0.551893	-0.116943
Lhotel	-0.319528	-0.910649	0.551893	1.000000	0.137789
Lreal exchange rate	0.175282	-0.167474	-0.116943	0.137789	1.000000
North America					
	Larrivals	*Lcrude oil*	*LGDP*	*Lhotel*	*Lreal exchange rate*
Larrivals	1.000000	0.621416	0.894489	0.729631	0.606442
Lcrude oil	0.621416	1.000000	0.729666	0.183496	0.388698
LGDP	0.894489	0.729666	1.000000	0.707277	0.733491
Lhotel	0.729631	0.183496	0.707277	1.000000	0.726966
Lreal exchange rate	0.606442	0.388698	0.733491	0.726966	1.000000
South America					
	Larrivals	*Lcrude oil*	*LGDP*	*Lhotel*	*Lreal exchange rate*
Larrivals	1.000000	0.405508	-0.106364	0.594525	-0.058328
Lcrude oil	0.405508	1.000000	-0.443918	0.183496	-0.529290
LGDP	-0.106364	-0.443918	1.000000	-0.315772	0.390434
Lhotel	0.594525	0.183496	-0.315772	1.000000	0.149089
Lreal exchange rate	-0.058328	-0.529290	0.390434	0.149089	1.000000
United Kingdom					
	Larrivals	*Lcrude oil*	*LGDP*	*Lhotel*	*Lreal exchange rate*
Larrivals	1.000000	0.519558	0.741475	0.563218	0.646232
Lcrude oil	0.519558	1.000000	0.752574	0.183496	0.474331
LGDP	0.741475	0.752574	1.000000	0.670355	0.856715
Lhotel	0.563218	0.183496	0.670355	1.000000	0.783170
Lreal exchange rate	0.646232	0.474331	0.856715	0.783170	1.000000

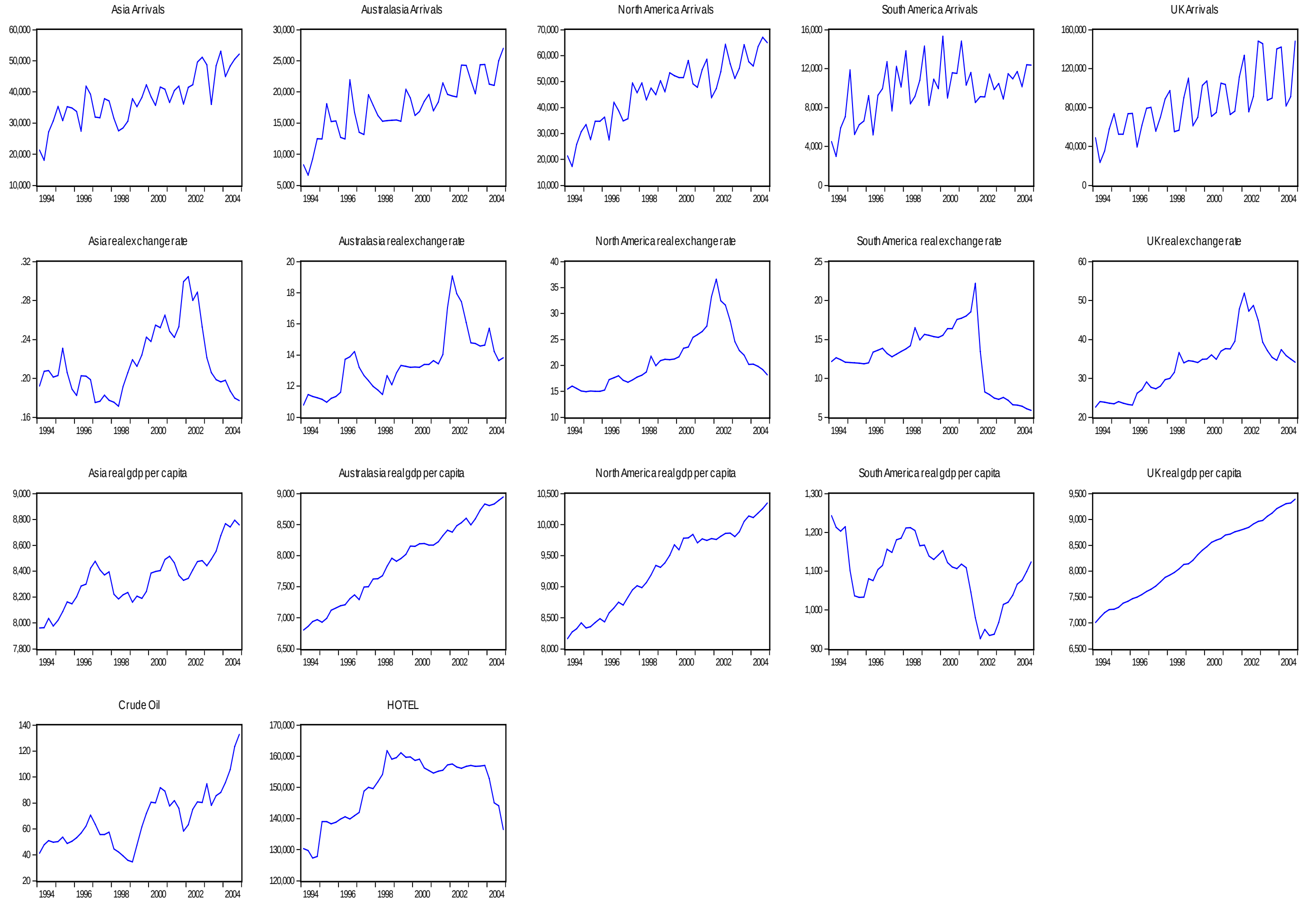


Figure A1: Line graphs of the Asian, Australasian, North American, South American and United Kingdom variables

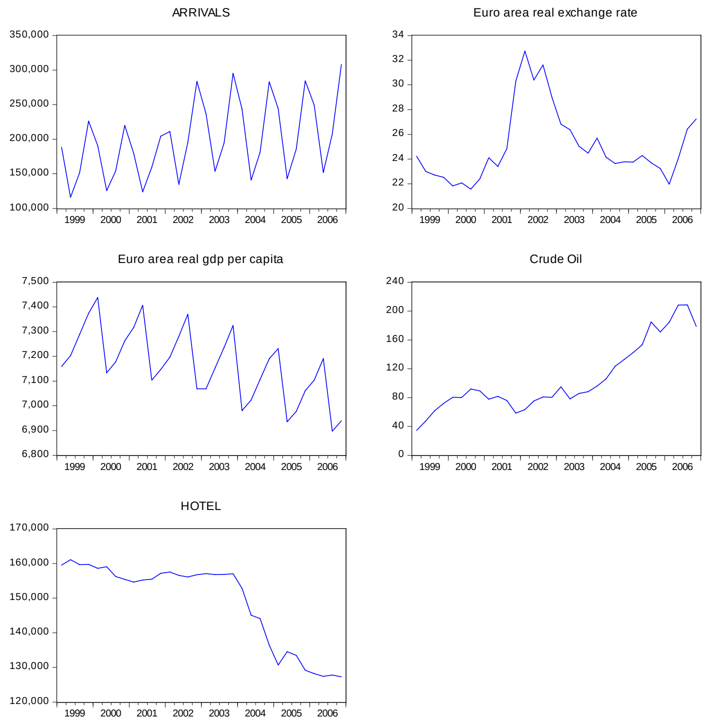
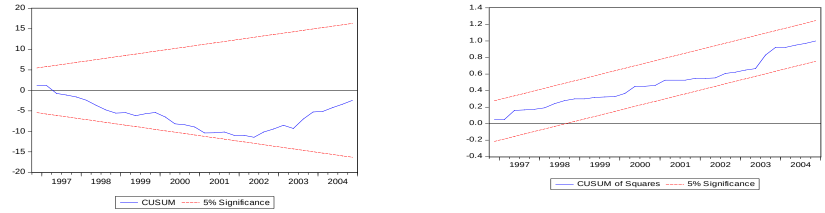
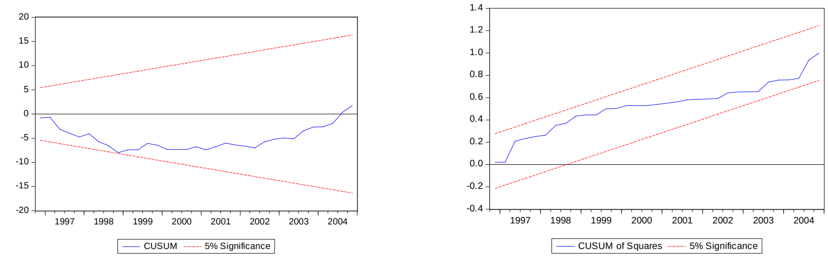


Figure A2: Line graphs of the European variables

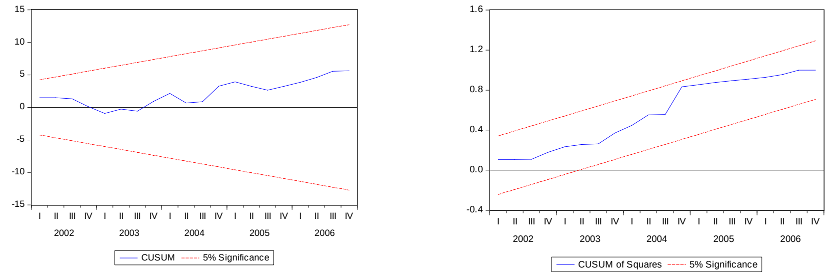
Asian model:



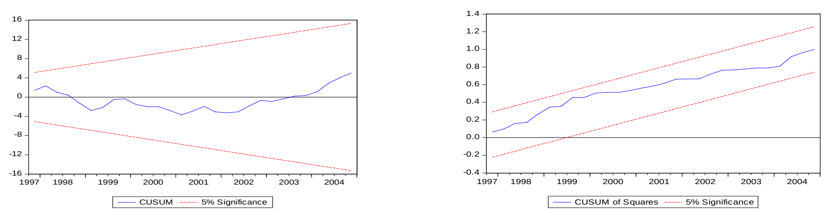
Australasian model:



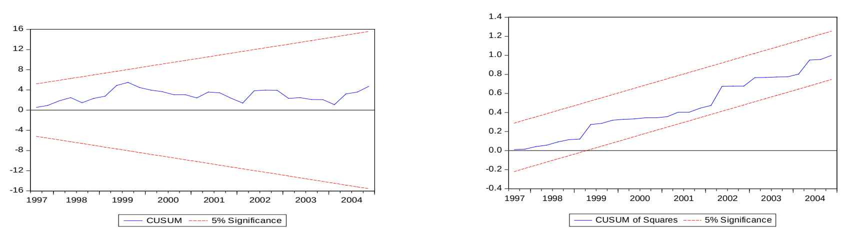
European model:



North American model:



South American model:



United Kingdom model

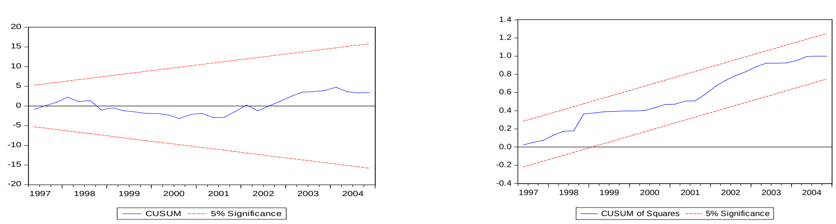


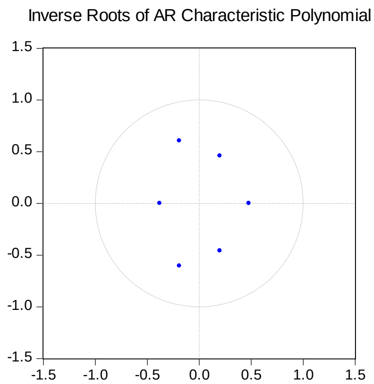
Figure A3: Cusum and Cusum Square test results from each model

Appendix B

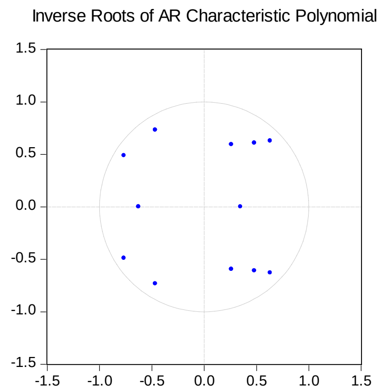
Table B1: Descriptive statistics of the variables

	Mean	Median	Maximum	Minimum
Arrivals				
Asia	37834.44	37495	53050	18063
Australasia	17678.83	17992.50	27038.00	6614.000
Europe	199060.4	192763.5	307948.0	116054.0
North America	46369.96	48423.50	67089.00	17311.00
South America	9833.641	10030.50	15305.00	2975.000
United Kingdom	84265.92	77593.50	148342.0	23422.00
GDP				
Asia	8344.800	8368.067	8793.737	7959.894
Australasia	7905.974	7989.137	8947.470	6806.534
Europe	7167.107	7168.122	7438.291	6896.795
North America	9301.107	9447.147	10348.09	8161.887
South America	1099.994	1110.036	1243.009	926.4601
United Kingdom	8242.164	8263.880	9390.345	7005.554
Real exchange rate				
Asia	0.216381	0.205916	0.304534	0.171315
Australasia	13.45005	13.29961	19.07407	10.76855
Europe	25.03875	24.12681	32.72971	21.55934
North America	21.03870	20.04475	36.60849	14.96840
South America	12.65092	13.14229	22.20211	5.891512
United Kingdom	33.27489	34.49480	51.90087	22.59875

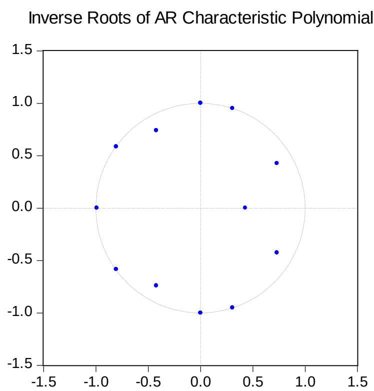
Asia



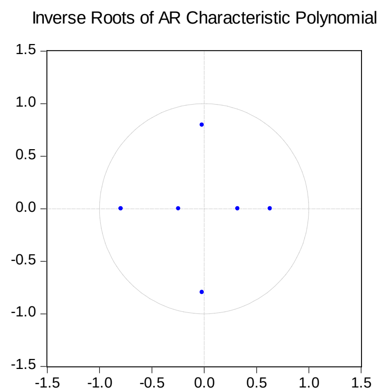
Australasia



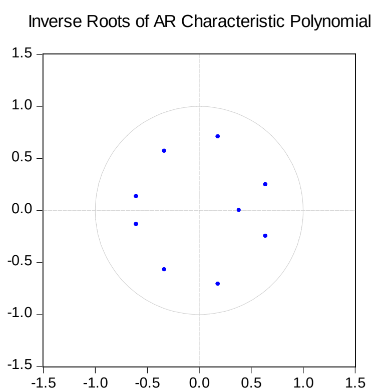
Europe



North America



South America



United Kingdom

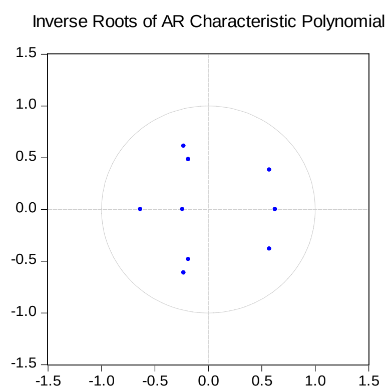


Figure B1: VAR Inverse AR root

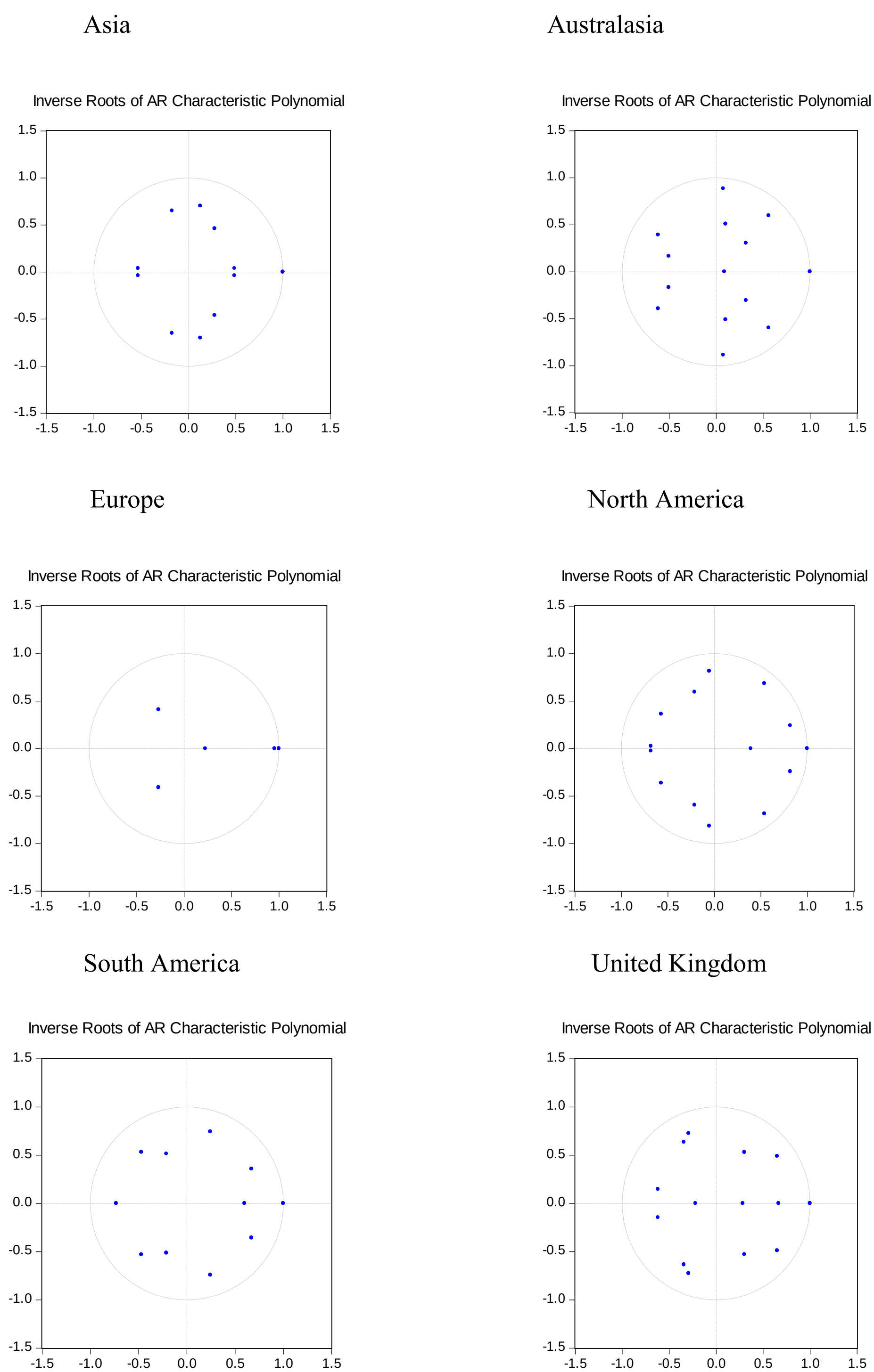


Figure B2: VECM Inverse AR root

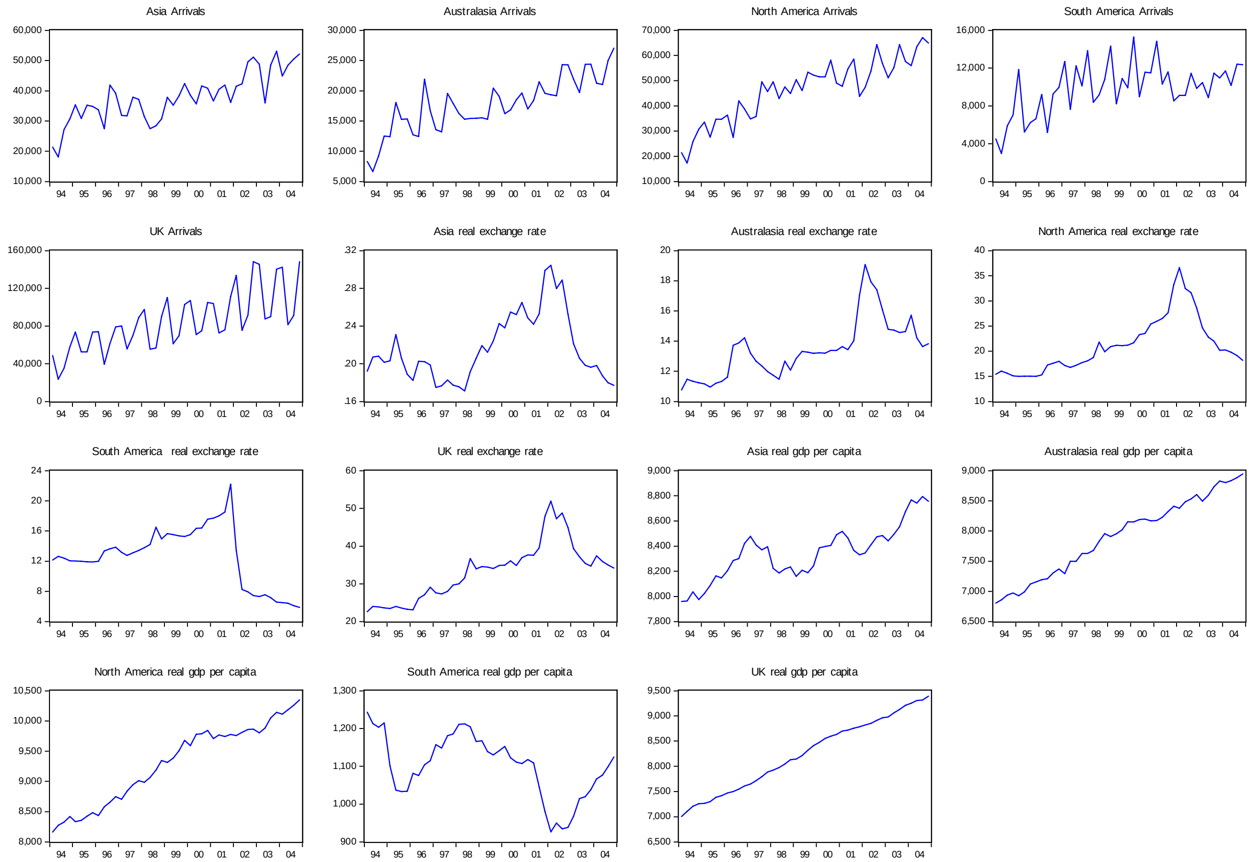


Figure B3: Line graphs of the Asian, Australasian, North American, South American and United Kingdom variables

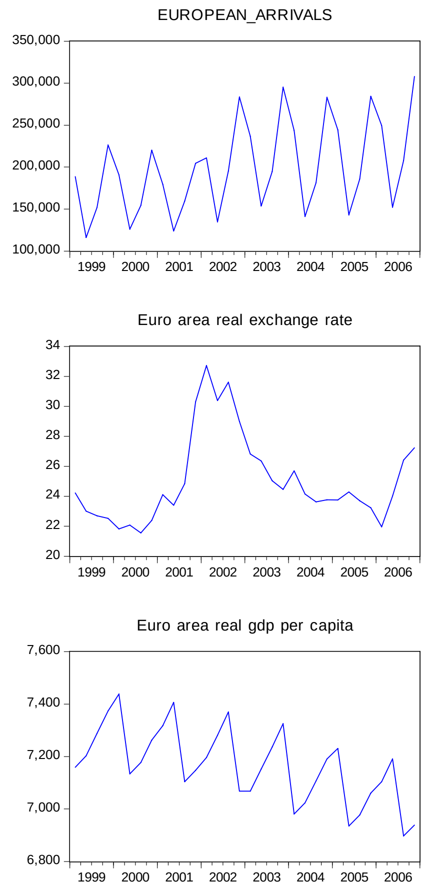


Figure B4: Line graphs of the European variables

Table B2: Asian model VAR Block Exogeneity Wald Test

VAR Granger Causality/Block Exogeneity Wald Tests
Date: 11/30/10 Time: 08:58
Sample: 1994Q1 2004Q4
Included observations: 41

Dependent variable: DLARRIVALS

Excluded	Chi-sq	df	Prob.
DLEXCHANGE_RATE	6.412332	2	0.0405
DLGDP	4.515972	2	0.1046
All	9.451480	4	0.0508

Dependent variable: DLEXCHANGE_RATE

Excluded	Chi-sq	df	Prob.
DLARRIVALS	0.041582	2	0.9794
DLGDP	5.931705	2	0.0515
All	5.937145	4	0.2039

Dependent variable: DLGDP

Excluded	Chi-sq	df	Prob.
DLARRIVALS	4.059354	2	0.1314
DLEXCHANGE_RATE	2.841187	2	0.2416
All	5.322950	4	0.2557

Table B3: Australian model VAR Block Exogeneity Wald Test

VAR Granger Causality/Block Exogeneity Wald Tests
Date: 11/30/10 Time: 09:01
Sample: 1994Q1 2004Q4
Included observations: 39

Dependent variable: DLARRIVALS

Excluded	Chi-sq	df	Prob.
DLEXCHANGE _RATE	2.715384	4	0.6065
DLGDP	4.169278	4	0.3836
All	6.614908	8	0.5787

Dependent variable: DLEXCHANGE_RATE

Excluded	Chi-sq	df	Prob.
DLARRIVALS	4.318694	4	0.3646
DLGDP	4.702990	4	0.3192
All	10.26470	8	0.2469

Dependent variable: DLGDP

Excluded	Chi-sq	df	Prob.
DLARRIVALS	13.76268	4	0.0081
DLEXCHANGE _RATE	0.923795	4	0.9211
All	16.08088	8	0.0412

Table B4: European model VAR Block Exogeneity Wald Test

VAR Granger Causality/Block Exogeneity Wald Tests
Date: 12/12/10 Time: 19:07
Sample: 1999Q1 2006Q4
Included observations: 27

Dependent variable: DLARRIVALS

Excluded	Chi-sq	df	Prob.
DLEXCHANGE_RATE	11.97711	4	0.0175
DLGDP	15.12564	4	0.0044
All	28.36582	8	0.0004

Dependent variable: DLEXCHANGE_RATE

Excluded	Chi-sq	df	Prob.
DLARRIVALS	3.009058	4	0.5563
DLGDP	2.765134	4	0.5979
All	5.312551	8	0.7237

Dependent variable: DLGDP

Excluded	Chi-sq	df	Prob.
DLARRIVALS	28.70889	4	0.0000
DLEXCHANGE_RATE	1.625620	4	0.8042
All	34.92923	8	0.0000

Table B5: North American VAR Block Exogeneity Wald Test

VAR Granger Causality/Block Exogeneity Wald Tests
Date: 11/30/10 Time: 09:05
Sample: 1994Q1 2004Q4
Included observations: 41

Dependent variable: DLARRIVALS

Excluded	Chi-sq	df	Prob.
DLEXCHANGE_RATE	2.628173	2	0.2687
DLGDP	19.17725	2	0.0001
All	20.47736	4	0.0004

Dependent variable: DLEXCHANGE_RATE

Excluded	Chi-sq	df	Prob.
DLARRIVALS	1.289397	2	0.5248
DLGDP	0.996666	2	0.6075
All	1.925040	4	0.7495

Dependent variable: DLGDP

Excluded	Chi-sq	df	Prob.
DLARRIVALS	22.07407	2	0.0000
DLEXCHANGE_RATE	1.827867	2	0.4009
All	22.40335	4	0.0002

Table B6: South American model VAR Block Exogeneity Wald Test

VAR Granger Causality/Block Exogeneity Wald Tests
Date: 12/12/10 Time: 19:24
Sample: 1994Q1 2004Q4
Included observations: 40

Dependent variable: DLARRIVALS

Excluded	Chi-sq	df	Prob.
DLEXCHANGE_RATE	9.043966	3	0.0287
DLGDP	11.53318	3	0.0092
All	15.16217	6	0.0190

Dependent variable: DLEXCHANGE_RATE

Excluded	Chi-sq	df	Prob.
DLARRIVALS	3.500512	3	0.3207
DLGDP	3.659806	3	0.3006
All	8.310497	6	0.2162

Dependent variable: DLGDP

Excluded	Chi-sq	df	Prob.
DLARRIVALS	8.405401	3	0.0383
DLEXCHANGE_RATE	7.277840	3	0.0636
All	17.00429	6	0.0093

Table B7: United Kingdom model VAR Block Exogeneity Wald Test

VAR Granger Causality/Block Exogeneity Wald Tests
Date: 11/30/10 Time: 09:11
Sample: 1994Q1 2004Q4
Included observations: 40

Dependent variable: DLARRIVALS

Excluded	Chi-sq	df	Prob.
DLEXCHANGE_RATE	0.862165	3	0.8345
DLGDP	1.189483	3	0.7555
All	2.243939	6	0.8960

Dependent variable: DLEXCHANGE_RATE

Excluded	Chi-sq	df	Prob.
DLARRIVALS	2.406760	3	0.4924
DLGDP	7.543562	3	0.0564
All	8.630567	6	0.1954

Dependent variable: DLGDP

Excluded	Chi-sq	df	Prob.
DLARRIVALS	1.480668	3	0.6867
DLEXCHANGE_RATE	3.722559	3	0.2930
All	5.191823	6	0.5195

Table B8: Asian model VEC Block Exogeneity Wald Test

VEC Granger Causality/Block Exogeneity Wald Tests
Date: 03/17/11 Time: 20:23
Sample: 1994Q1 2004Q4
Included observations: 40

Dependent variable: D(LARRIVALS)

Excluded	Chi-sq	df	Prob.
D(LEXCHANGE_RATE)	1.523497	3	0.6769
D(LGDP)	14.49378	3	0.0023
All	15.00470	6	0.0202

Dependent variable: D(LEXCHANGE_RATE)

Excluded	Chi-sq	df	Prob.
D(LARRIVALS)	5.921424	3	0.1155
D(LGDP)	5.090523	3	0.1653
All	11.22861	6	0.0816

Dependent variable: D(LGDP)

Excluded	Chi-sq	df	Prob.
D(LARRIVALS)	3.335446	3	0.3427
D(LEXCHANGE_RATE)	2.248572	3	0.5224
All	5.733886	6	0.4537

Table B9: Australian model VEC Block Exogeneity Wald Test

VEC Granger Causality/Block Exogeneity Wald Tests
Date: 02/24/11 Time: 10:11
Sample: 1994Q1 2004Q4
Included observations: 39

Dependent variable: D(LARRIVALS)

Excluded	Chi-sq	df	Prob.
D(LEXCHANGE_RATE)	5.318197	4	0.2562
D(LGDP)	15.24368	4	0.0042
All	20.36492	8	0.0090

Dependent variable: D(LEXCHANGE_RATE)

Excluded	Chi-sq	df	Prob.
D(LARRIVALS)	8.427486	4	0.0771
D(LGDP)	8.935345	4	0.0627
All	13.38774	8	0.0992

Dependent variable: D(LGDP)

Excluded	Chi-sq	df	Prob.
D(LARRIVALS)	13.54653	4	0.0089
D(LEXCHANGE_RATE)	0.961725	4	0.9155
All	15.33592	8	0.0529

Table B10: European model VEC Block Exogeneity Wald Test

VEC Granger Causality/Block Exogeneity Wald Tests
Date: 03/12/11 Time: 09:08
Sample: 1999Q1 2006Q4
Included observations: 30

Dependent variable: D(LARRIVALS)

Excluded	Chi-sq	df	Prob.
D(LEXCHANGE_RATE)	1.308553	1	0.2527
D(LGDP)	13.22547	1	0.0003
All	13.49593	2	0.0012

Dependent variable: D(LEXCHANGE_RATE)

Excluded	Chi-sq	df	Prob.
D(LARRIVALS)	0.902593	1	0.3421
D(LGDP)	0.156825	1	0.6921
All	0.984601	2	0.6112

Dependent variable: D(LGDP)

Excluded	Chi-sq	df	Prob.
D(LARRIVALS)	1.694135	1	0.1931
D(LEXCHANGE_RATE)	0.598651	1	0.4391
All	2.051782	2	0.3585

Table B11: North American VEC Block Exogeneity Wald Test

VEC Granger Causality/Block Exogeneity Wald Tests
Date: 02/24/11 Time: 10:28
Sample: 1994Q1 2004Q4
Included observations: 39

Dependent variable: D(LARRIVALS)

Excluded	Chi-sq	df	Prob.
D(LEXCHANGE_RATE)	2.139576	4	0.7101
D(LGDP)	7.902811	4	0.0952
All	9.687041	8	0.2877

Dependent variable: D(LEXCHANGE_RATE)

Excluded	Chi-sq	df	Prob.
D(LARRIVALS)	9.220663	4	0.0558
D(LGDP)	13.91561	4	0.0076
All	18.15733	8	0.0201

Dependent variable: D(LGDP)

Excluded	Chi-sq	df	Prob.
D(LARRIVALS)	9.102800	4	0.0586
D(LEXCHANGE_RATE)	3.268999	4	0.5139
All	13.89757	8	0.0845

Table B12: South American model VEC Block Exogeneity Wald Test

VEC Granger Causality/Block Exogeneity Wald Tests
Date: 02/24/11 Time: 10:33
Sample: 1994Q1 2004Q4
Included observations: 40

Dependent variable: D(LARRIVALS)

Excluded	Chi-sq	df	Prob.
D(LEXCHANGE_RATE)	12.24927	3	0.0066
D(LGDP)	14.05085	3	0.0028
All	22.83060	6	0.0009

Dependent variable: D(LEXCHANGE_RATE)

Excluded	Chi-sq	df	Prob.
D(LARRIVALS)	1.335094	3	0.7208
D(LGDP)	3.849585	3	0.2782
All	4.212423	6	0.6480

Dependent variable: D(LGDP)

Excluded	Chi-sq	df	Prob.
D(LARRIVALS)	33.40176	3	0.0000
D(LEXCHANGE_RATE)	8.360545	3	0.0391
All	47.67336	6	0.0000

Table B13: United Kingdom model VEC Block Exogeneity Wald Test

VEC Granger Causality/Block Exogeneity Wald Tests
Date: 02/24/11 Time: 10:24
Sample: 1994Q1 2004Q4
Included observations: 39

Dependent variable: D(LARRIVALS)

Excluded	Chi-sq	df	Prob.
D(LGDP)	15.17053	4	0.0044
D(LEXCHANGE_RATE)	12.60748	4	0.0134
All	21.26164	8	0.0065

Dependent variable: D(LGDP)

Excluded	Chi-sq	df	Prob.
D(LARRIVALS)	0.450521	4	0.9781
D(LEXCHANGE_RATE)	2.982233	4	0.5608
All	3.630930	8	0.8888

Dependent variable: D(LEXCHANGE_RATE)

Excluded	Chi-sq	df	Prob.
D(LARRIVALS)	0.267183	4	0.9918
D(LGDP)	7.618184	4	0.1066
All	9.459975	8	0.3050

Table B14: LM Autocorrelation test results for Asia, Australasia, Europe and North America

Australasia

VEC Residual Serial Correlation LM Tests
Null Hypothesis: no serial correlation at lag order h
Date: 02/24/11 Time: 10:06
Sample: 1994Q1 2004Q4
Included observations: 40

Lags	LM-Stat	Prob
1	10.56643	0.3066
2	3.000096	0.9643
3	12.34355	0.1946
4	5.971231	0.7428
5	10.94282	0.2796
6	7.424061	0.5931
7	4.977380	0.8363
8	11.58909	0.2375
9	15.03338	0.0900
10	8.096545	0.5244
11	9.528627	0.3900
12	7.412119	0.5943

Probs from chi-square with 9 df.

Asia

VEC Residual Serial Correlation LM Tests
Null Hypothesis: no serial correlation at lag order h
Date: 02/24/11 Time: 10:12
Sample: 1994Q1 2004Q4
Included observations: 39

Lags	LM-Stat	Prob
1	6.104864	0.7294
2	6.073837	0.7325
3	9.864567	0.3616
4	12.86268	0.1689
5	5.317127	0.8058
6	6.410183	0.6983
7	3.521601	0.9400
8	15.58385	0.0761
9	3.124810	0.9591
10	13.15214	0.1558
11	7.825257	0.5518
12	3.604002	0.9355

Probs from chi-square with 9 df.

Europe

VEC Residual Serial Correlation LM Tests
Null Hypothesis: no serial correlation at lag order h
Date: 03/12/11 Time: 09:09
Sample: 1999Q1 2006Q4
Included observations: 30

Lags	LM-Stat	Prob
1	8.475860	0.4870
2	9.100428	0.4281
3	10.46677	0.3140
4	5.952556	0.7447
5	28.56969	0.0008
6	12.10361	0.2075
7	9.897400	0.3589
8	12.99309	0.1629
9	10.45179	0.3152
10	23.99791	0.0043
11	11.24285	0.2594
12	7.811581	0.5532

Probs from chi-square with 9 df.

North America

VEC Residual Serial Correlation LM Tests
Null Hypothesis: no serial correlation at lag order h
Date: 02/24/11 Time: 10:29
Sample: 1994Q1 2004Q4
Included observations: 39

Lags	LM-Stat	Prob
1	8.148642	0.5192
2	6.059276	0.7340
3	8.849119	0.4513
4	15.08816	0.0885
5	17.07763	0.0475
6	6.810902	0.6568
7	9.099707	0.4281
8	7.277896	0.6082
9	18.47793	0.0300
10	5.379381	0.8001
11	12.43711	0.1898
12	12.88964	0.1677

Probs from chi-square with 9 df.

Table B15: LM Autocorrelation test results for South America and the United Kingdom

United Kingdom

VEC Residual Serial Correlation LM Tests
Null Hypothesis: no serial correlation at lag order h
Date: 02/24/11 Time: 10:34
Sample: 1994Q1 2004Q4
Included observations: 40

Lags	LM-Stat	Prob
1	12.71197	0.1761
2	7.951437	0.5390
3	7.766188	0.5579
4	4.761388	0.8546
5	4.374509	0.8851
6	3.707519	0.9296
7	7.311711	0.6047
8	14.19105	0.1157
9	6.698343	0.6685
10	15.01844	0.0904
11	3.850392	0.9210
12	7.881310	0.5462

Probs from chi-square with 9 df.

South America

VEC Residual Serial Correlation LM Tests
Null Hypothesis: no serial correlation at lag order h
Date: 02/24/11 Time: 10:24
Sample: 1994Q1 2004Q4
Included observations: 39

Lags	LM-Stat	Prob
1	5.563403	0.7827
2	4.331144	0.8883
3	6.457201	0.6934
4	6.231781	0.7165
5	9.792382	0.3676
6	1.954432	0.9922
7	12.55334	0.1839
8	16.24114	0.0620
9	9.524112	0.3904
10	6.779982	0.6600
11	4.506182	0.8751
12	13.25536	0.1514

Probs from chi-square with 9 df.

Australasia **Europe**

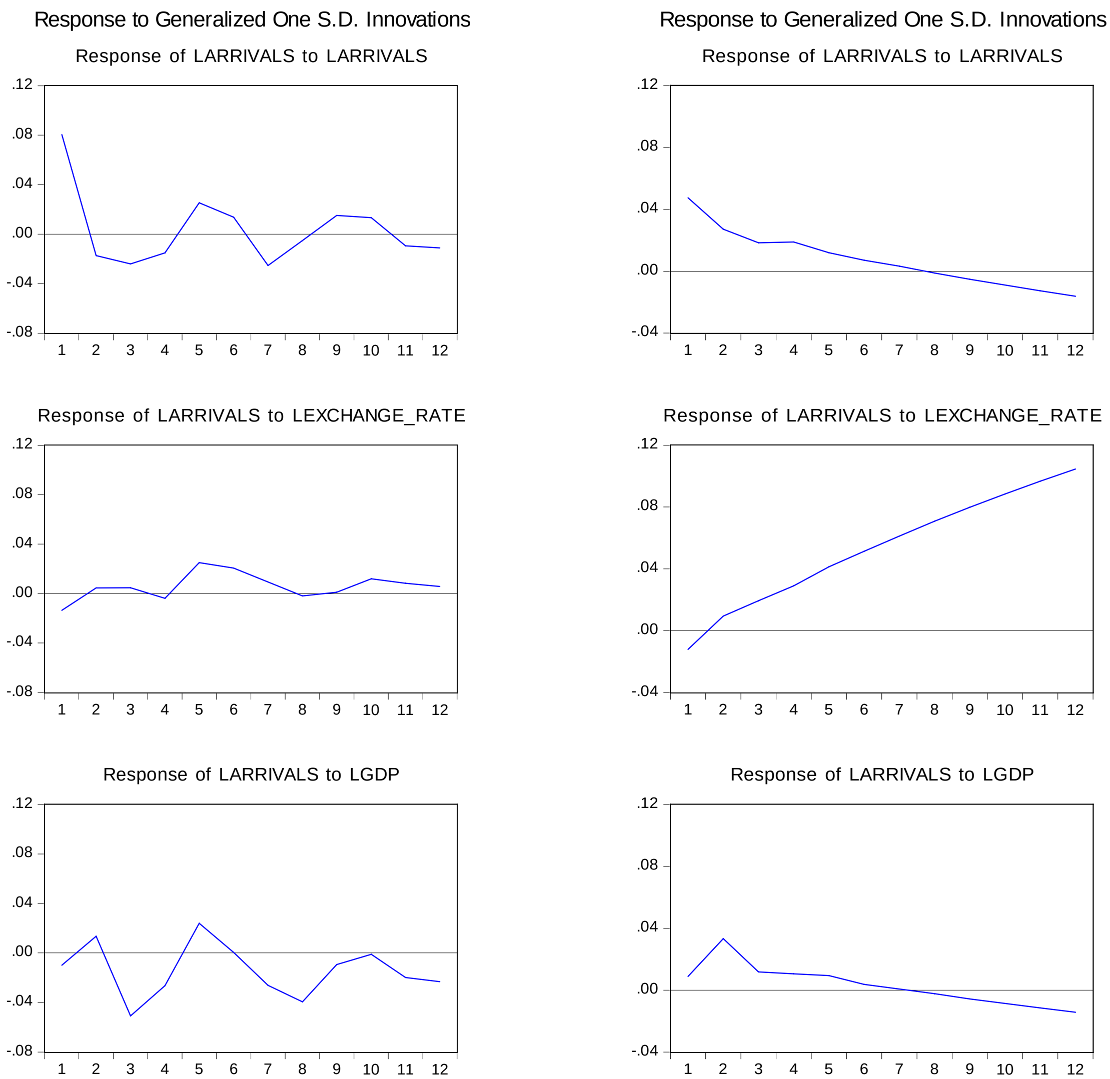


Figure B5: Impulse response analysis for Australasia and Europe

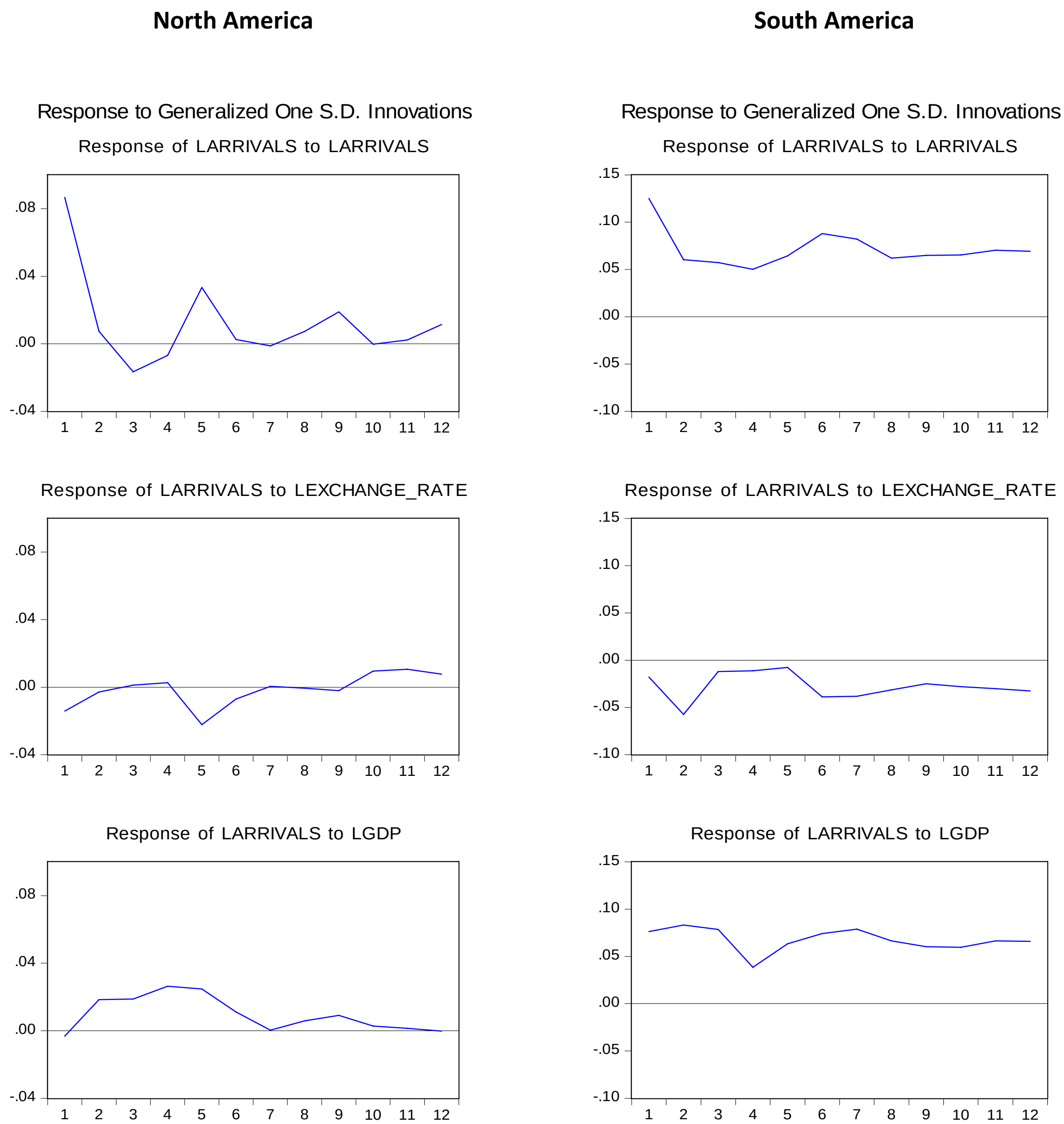


Figure B6: Impulse response analysis for North America and South America

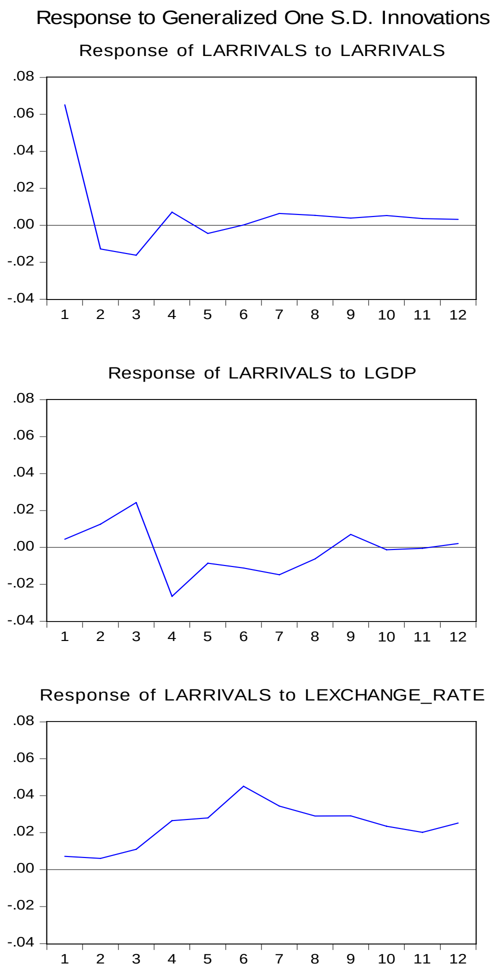


Figure B7: Impulse response analysis for United Kingdom

Table B16: Variance decomposition results for Asia

Asia

Variance Decomposition of LARRIVALS: Period	S.E.	LARRIVALS	LEXCHANGE_RATE	LGDP
1	0.105685	90.46436	9.374561	0.161074
2	0.109671	84.61126	9.572922	5.815816
3	0.129216	64.67539	7.665071	27.65953
4	0.131677	62.90662	7.731513	29.36186
5	0.132989	61.78669	7.760011	30.45330
6	0.133720	61.11410	7.913549	30.97235
7	0.134200	60.68039	8.311585	31.00802
8	0.134681	60.30797	8.338407	31.35363
9	0.135265	59.89735	8.295371	31.80728
10	0.135762	59.48339	8.302581	32.21402
11	0.136400	58.93257	8.357142	32.71029
12	0.137065	58.39789	8.403711	33.19840

Variance Decomposition of LEXCHANGE_RATE: Period	S.E.	LARRIVALS	LEXCHANGE_RATE	LGDP
1	0.064923	0.000000	98.43379	1.566210
2	0.097025	3.811553	95.31169	0.876756
3	0.126883	13.38543	80.64321	5.971356
4	0.149698	18.15904	71.02628	10.81468
5	0.173092	16.95390	65.72074	17.32536
6	0.197560	15.46082	62.11326	22.42592
7	0.220920	15.36801	59.25722	25.37477
8	0.241060	15.59718	56.99460	27.40823
9	0.259685	15.40197	55.20777	29.39026
10	0.277609	15.11408	53.92230	30.96362
11	0.294665	14.97549	52.98639	32.03812
12	0.310649	14.92216	52.18713	32.89070

Variance Decomposition of LGDP: Period	S.E.	LARRIVALS	LEXCHANGE_RATE	LGDP
1	0.007723	0.000000	0.000000	100.0000
2	0.012739	2.830816	0.307124	96.86206
3	0.016614	1.682566	0.306071	98.01136
4	0.020210	1.490177	0.237618	98.27220
5	0.023137	1.167512	0.183285	98.64920
6	0.025312	0.991607	0.159293	98.84910
7	0.027364	0.848737	0.172043	98.97922
8	0.029397	0.747543	0.175073	99.07738
9	0.031268	0.665459	0.161611	99.17293
10	0.032984	0.599560	0.151977	99.24846
11	0.034632	0.545581	0.148949	99.30547
12	0.036213	0.501021	0.147304	99.35168

Cholesky Ordering:
LGDP
LEXCHANGE_RATE
LARRIVALS

Table B17: Variance decomposition results for Australasia

Australasia

Variance Decomposition of LARRIVALS: Period	S.E.	LARRIVALS	LEXCHANGE_RATE	LGDP
1	0.080490	95.81167	2.835223	1.353103
2	0.083165	93.16241	2.954305	3.883290
3	0.102068	70.33199	2.180452	27.48755
4	0.107230	66.94975	2.109106	30.94114
5	0.117254	63.90586	6.303572	29.79056
6	0.120325	62.79267	8.917526	28.28980
7	0.126582	61.45351	8.613937	29.93256
8	0.132997	56.26045	7.824549	35.91500
9	0.134125	56.48565	7.700465	35.81388
10	0.135546	56.60833	8.314583	35.07709
11	0.137684	55.45297	8.423197	36.12383
12	0.140400	54.21922	8.265261	37.51552
Variance Decomposition of LEXCHANGE_RATE: Period	**S.E.**	**LARRIVALS**	**LEXCHANGE_RATE**	**LGDP**
1	0.057010	0.000000	100.0000	0.000000
2	0.094638	0.073450	98.37969	1.546864
3	0.123262	1.082684	97.81884	1.098473
4	0.147286	1.790272	97.24555	0.964175
5	0.162834	1.475838	94.60655	3.917609
6	0.173917	1.373411	92.91377	5.712823
7	0.184403	1.230271	90.39205	8.377674
8	0.193676	1.441024	88.70298	9.855995
9	0.203334	1.439815	88.58025	9.979932
10	0.213278	1.345592	89.03467	9.619742
11	0.223608	1.286644	89.56333	9.150024
12	0.233418	1.276143	89.50626	9.217595
Variance Decomposition of LGDP: Period	**S.E.**	**LARRIVALS**	**LEXCHANGE_RATE**	**LGDP**
1	0.007130	0.000000	0.082727	99.91727
2	0.009408	0.234850	1.002709	98.76244
3	0.011011	5.531639	1.259146	93.20921
4	0.011388	5.311418	1.179790	93.50879
5	0.012421	4.465957	1.036959	94.49708
6	0.013133	4.027617	0.935785	95.03660
7	0.013693	4.922024	0.966349	94.11163
8	0.014353	4.740252	0.879646	94.38010
9	0.015158	4.290846	0.809363	94.89979
10	0.015995	3.864027	0.821074	95.31490
11	0.016522	3.856909	0.787454	95.35564
12	0.016998	3.878071	0.748833	95.37310
Cholesky Ordering: LEXCHANGE_RATE LGDP LARRIVALS				

Table B18: Variance decomposition results for Europe

Europe

Variance Decomposition of LARRIVALS: Period	S.E.	LARRIVALS	LEXCHANGE_RATE	LGDP
1	0.047472	91.69125	6.530839	1.777914
2	0.065761	63.12384	5.447705	31.42845
3	0.073875	58.92421	11.17325	29.90254
4	0.085034	53.19029	20.08767	26.72204
5	0.098633	43.98775	32.41244	23.59981
6	0.113876	35.77453	44.66963	19.55584
7	0.131292	28.73642	55.30833	15.95525
8	0.150618	22.92561	64.12229	12.95210
9	0.171479	18.36636	71.12867	10.50497
10	0.193672	14.82433	76.60423	8.571435
11	0.216980	12.07350	80.87722	7.049275
12	0.241205	9.932694	84.21928	5.848027
Variance Decomposition of LEXCHANGE_RATE: Period	S.E.	LARRIVALS	LEXCHANGE_RATE	LGDP
1	0.065216	0.000000	100.0000	0.000000
2	0.106263	0.737743	99.14343	0.118830
3	0.136423	0.861523	99.03031	0.108171
4	0.160886	0.844454	99.07409	0.081461
5	0.182080	0.869921	99.06595	0.064130
6	0.200744	0.878401	99.06632	0.055282
7	0.217580	0.879036	99.07287	0.048097
8	0.233020	0.880796	99.07662	0.042588
9	0.247312	0.880428	99.08117	0.038399
10	0.260659	0.878955	99.08610	0.034942
11	0.273211	0.877143	99.09079	0.032066
12	0.285077	0.874855	99.09551	0.029639
Variance Decomposition of LGDP: Period	S.E.	LARRIVALS	LEXCHANGE_RATE	LGDP
1	0.022361	0.000000	4.935540	95.06446
2	0.029143	2.192805	6.600027	91.20717
3	0.033640	1.833615	9.779545	88.38684
4	0.038580	1.617526	10.76953	87.61294
5	0.042684	1.606659	11.47731	86.91603
6	0.046369	1.536399	12.10635	86.35725
7	0.049869	1.490345	12.49594	86.01371
8	0.053111	1.462865	12.80893	85.72821
9	0.056164	1.435963	13.06780	85.49623
10	0.059069	1.414854	13.27309	85.31205
11	0.061835	1.397790	13.44641	85.15580
12	0.064483	1.382856	13.59455	85.02259
Cholesky Ordering: LEXCHANGE_RATE LGDP LARRIVALS				

Table B19: Variance decomposition results for North America

North America

Variance Decomposition of LARRIVALS: Period	S.E.	LARRIVALS	LEXCHANGE_RATE	LGDP
1	0.086615	100.0000	0.000000	0.000000
2	0.088944	95.51927	0.060622	4.420107
3	0.092304	91.91614	0.115994	7.967864
4	0.096437	84.70640	0.655872	14.63773
5	0.105965	80.07851	1.808938	18.11255
6	0.106679	79.06562	1.961954	18.97243
7	0.106688	79.06727	1.962678	18.97005
8	0.107132	78.88521	1.978714	19.13608
9	0.109266	78.82767	1.988310	19.18402
10	0.109793	78.07391	2.866193	19.05990
11	0.110449	77.18841	3.959273	18.85232
12	0.111478	76.80335	4.690468	18.50618
Variance Decomposition of LEXCHANGE_RATE: Period	S.E.	LARRIVALS	LEXCHANGE_RATE	LGDP
1	0.058681	2.694883	93.15106	4.154059
2	0.089898	1.148731	82.84654	16.00473
3	0.115932	8.715355	76.79278	14.49186
4	0.146750	14.71390	64.58763	20.69846
5	0.172384	17.36373	57.94563	24.69064
6	0.194175	22.62119	53.29692	24.08189
7	0.208627	25.40912	51.90863	22.68224
8	0.218720	27.33215	51.72782	20.94003
9	0.225239	28.37978	51.86874	19.75149
10	0.230686	29.99260	51.10306	18.90434
11	0.235144	31.59121	50.09395	18.31484
12	0.238778	32.95606	49.11795	17.92598
Variance Decomposition of LGDP: Period	S.E.	LARRIVALS	LEXCHANGE_RATE	LGDP
1	0.004928	0.133449	0.000000	99.86655
2	0.007232	7.021464	2.081586	90.89695
3	0.010121	6.489576	3.367649	90.14278
4	0.012539	4.419050	9.563203	86.01775
5	0.015057	3.623688	14.55731	81.81900
6	0.017398	3.247342	17.85989	78.89277
7	0.019968	3.832689	19.25422	76.91309
8	0.022657	4.017820	19.61311	76.36907
9	0.025227	4.918265	19.57593	75.50581
10	0.027567	5.413069	19.80775	74.77918
11	0.029606	5.748759	20.27603	73.97521
12	0.031385	5.858580	20.85313	73.28830
Cholesky Ordering: LARRIVALS LGDP LEXCHANGE_RATE				

Table B20: Variance decomposition results for South America

South America

Variance Decomposition of LARRIVALS: Period	S.E.	LARRIVALS	LEXCHANGE_RATE	LGDP
1	0.124958	97.97393	2.026070	0.000000
2	0.158969	71.56431	14.29681	14.13887
3	0.177784	67.18417	11.88304	20.93279
4	0.185050	69.05347	11.33577	19.61076
5	0.198233	70.57060	10.02976	19.39963
6	0.220087	71.56287	11.26108	17.17605
7	0.239289	71.02172	12.06656	16.91173
8	0.250927	69.95019	12.52903	17.52079
9	0.260980	70.27270	12.50170	17.22560
10	0.270890	70.46854	12.67621	16.85525
11	0.282206	70.50788	12.82252	16.66959
12	0.293046	70.34108	13.12202	16.53690
Variance Decomposition of LEXCHANGE_RATE: Period	S.E.	LARRIVALS	LEXCHANGE_RATE	LGDP
1	0.118823	0.000000	100.0000	0.000000
2	0.188550	6.986819	92.57170	0.441477
3	0.241856	19.70518	78.04115	2.253669
4	0.294609	29.57059	66.92965	3.499754
5	0.340794	35.48574	60.29179	4.222470
6	0.380704	40.36877	55.14061	4.490616
7	0.415499	44.62470	50.88707	4.488229
8	0.445476	47.68737	47.74266	4.569967
9	0.471414	49.76932	45.57284	4.657848
10	0.494614	51.09698	44.21906	4.683961
11	0.516296	51.93497	43.38416	4.680864
12	0.537288	52.59738	42.73744	4.665182
Variance Decomposition of LGDP: Period	S.E.	LARRIVALS	LEXCHANGE_RATE	LGDP
1	0.020777	36.94790	0.427753	62.62435
2	0.035770	37.33645	17.25718	45.40637
3	0.049149	44.12980	19.67230	36.19790
4	0.062416	44.23361	27.52571	28.24067
5	0.077746	43.28694	34.84280	21.87026
6	0.091812	39.40829	42.53964	18.05207
7	0.102945	35.96314	47.81494	16.22192
8	0.111907	32.97703	52.19787	14.82509
9	0.119433	30.77203	55.37305	13.85492
10	0.126307	28.96662	57.91031	13.12306
11	0.132663	27.56922	59.79697	12.63381
12	0.138526	26.42203	61.28162	12.29635
Cholesky Ordering: LEXCHANGE_RATE LARRIVALS LGDP				

Table B21: Variance decomposition results for the United Kingdom

United Kingdom

Variance Decomposition of LARRIVALS: Period	S.E.	LARRIVALS	LGDP	LEXCHANGE_RATE
1	0.065221	98.18986	0.462767	1.347375
2	0.068368	93.90971	3.807700	2.282592
3	0.076240	82.04298	13.23706	4.719960
4	0.084565	67.20469	20.59668	12.19862
5	0.089584	60.51519	19.25258	20.23223
6	0.100699	48.07650	16.46840	35.45509
7	0.107156	42.56639	16.44485	40.98876
8	0.111119	39.63361	15.60682	44.75957
9	0.115258	36.83822	14.88671	48.27508
10	0.117643	35.41029	14.30183	50.28788
11	0.119368	34.40586	13.89298	51.70116
12	0.122060	32.90507	13.31709	53.77784
Variance Decomposition of LGDP: Period	S.E.	LARRIVALS	LGDP	LEXCHANGE_RATE
1	0.003195	0.000000	100.0000	0.000000
2	0.004923	0.655463	98.59162	0.752920
3	0.006597	0.896629	98.31740	0.785971
4	0.008233	1.172291	98.17009	0.657622
5	0.009873	1.020270	98.47910	0.500630
6	0.011107	0.932239	98.60650	0.461258
7	0.012247	0.848045	98.75579	0.396165
8	0.013299	0.788348	98.86256	0.349091
9	0.014224	0.744188	98.93319	0.322621
10	0.015111	0.724669	98.97189	0.303444
11	0.016001	0.712052	98.99188	0.296064
12	0.016853	0.701669	99.01937	0.278961
Variance Decomposition of LEXCHANGE_RATE: Period	S.E.	LARRIVALS	LGDP	LEXCHANGE_RATE
1	0.068510	0.000000	0.610759	99.38924
2	0.107657	0.163435	1.459802	98.37676
3	0.141429	0.130354	2.943721	96.92592
4	0.173935	0.087908	2.746728	97.16536
5	0.199716	0.131394	2.818762	97.04984
6	0.217040	0.195966	3.856939	95.94709
7	0.234566	0.302234	6.081020	93.61675
8	0.250129	0.327901	7.980527	91.69157
9	0.262917	0.327984	8.990367	90.68165
10	0.276224	0.316330	9.743698	89.93997
11	0.289801	0.297683	10.06711	89.63521
12	0.302651	0.280804	10.09480	89.62439
Cholesky Ordering: LGDP LEXCHANGE_RATE LARRIVALS				