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THE DETERMINANTS OF DOMESTIC AIR PASSENGER DEMAND IN THE REPUBLIC OF SOUTH AFRICA

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CERTIFICATION

This dissertation entitled *The determinants of domestic air passenger demand in the Republic of South Africa*, by *Olebogeng Ambrocius Baikgaki*, under the supervision of *Dr. Olebogeng David Daw*, Department of Economics, Mafikeng Campus, North West University, South Africa, is hereby submitted for the fulfilment of the Masters of Commerce (M.Com) Degree in Economics. This degree has not been submitted in any other university or institution previously for the award of the degree.

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DECLARATION

I, *Olebogeng Ambrocius Baikgaki*, hereby declare that the work presented here is genuine work done originally by me and has not been published or submitted elsewhere for the requirement of a degree programme. Any literature, data or works done by others and cited within this dissertation has been given due acknowledgement and listed in the reference section.

Research was conducted in the Department of Economics at the North West University, Mafikeng Campus. The research was conducted between November 2012 and October 2013 under the supervision of Dr. David Daw. The opinions expressed and conclusions presented are those of the author alone.

Signature

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Olebogeng Ambrocius Baikgaki

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Date

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ABSTRACT

The purpose of this study was to establish the main socioeconomic factors that influence the demand for domestic air transport in South Africa. Based on the availability of data, the air transport demand presented as passenger enplanements was measured using an array of independent variables. The focus was only on domestic passenger movements in South African airports. This may assist airports to plan for their future developments.

This dissertation examined the air transport demand in the last three decades (1971 – 2012). In the literature, air transport demand is associated with income, population, airfares, the introduction of deregulations and many other variables. Based on the literature review, this study created a demand model for domestic air transport market in South Africa. The model uses income, population, crude oil prices, and household consumption, expenditure, gross domestic product, airfares, and dummies as determinants of air transport demand. The ultimate model indicated that the most appropriate domestic air transport demand model for South Africa consists of income, population, airfares and crude oil prices as explanatory variables.

The literature suggests that airports play a very essential role within the aviation industry and the economy at large. Thus, they contribute immensely to

the socio-economic development of most countries. They improve the accessibility of people to geographical areas that are not easily and efficiently accessible with other modes of travel. They allow for time critical in- and outbound freight. In most cases, airports have significant direct impact in terms of employment and expenditure at the airports as well as the multiplier effect from employees spending their salaries in the economic markets. Hence, studying the demand patterns found in the domestic airports as well as determinants of such demand is fundamental for proper airport planning and development.

Appropriate, effective and efficient airport planning is vital for the economic survival of the world economies. For airports to be economically sustainable, they also need to plan for the future. In most cases airports do their planning for the future based on the current and past experience.

This study used the simple regression model to study the relationship between domestic air transport passenger travels using the known independent variables. This was obtained by specifying an equation for the variable to be measured with the equation taking the form:

$$\hat{Y} = \hat{\beta}_0 + \hat{\beta}_1 X_{1t} + \hat{\beta}_2 X_{2t} + \hat{\beta}_3 X_{3t} + \hat{\beta}_4 X_{4t} + \hat{\beta}_5 X_{5t} \qquad (t = 1, 2, \ldots\ldots, T).$$

Knowing what determines passenger demand is necessary to define the facilities needed, the scale of such facilities, and the time at which they will be

required. The objectives of knowing the determinants of air transport demand is to a larger extent, to provide information that can be used to evaluate effects of uncertainties about the future. To ensure consistency in the master plans of South African airports, the factors influencing air transport travel should be fully integrated into the planning process.

From this study, the relationships between demand and the determinants of air transport was established. Subsequently, the socio-economic factors that normally influence the air transport demand were found to be the airport charges (landing fees, fuel prices), airfares, population, personnel disposable income, economic activity and status of the industry (e.g., GDP), geographic factors (e.g., distance), competition position, sociological factors (e.g. level of education, increased urbanisation) and political factors (e.g. open-skies/ Yamoussoukro Declaration, government policies). The study then focused on the relationship between the domestic air passenger enplanement and some independent variables mentioned above.

The ontological approach to this study followed the belief that the objectives of the thesis are of a deterministic nature, in that they can be predicted by the cause-and-effect laws. However, they need to be interpreted in terms of the contextual influences, understanding and interpretations of people in a specific setting and social reality attached to them. Hence the study was also guided by the literature on the determinants of air transport demand. The research

paradigm adopted for the analysis of data is that of constructivism, embracing a pragmatic approach. The epistemology is that of mixed-methods approach, that is, it in part qualitative and in part a quantitative.

An analysis of the contextual forces which have influenced airport demand was based on a quantitative approach. However, the qualitative approach was also followed, whereby literature reviews form part of research methodology. Research into the variables that influences the airport activity demand in South Africa was carried out by the mixed methods research approach, using the exploratory design procedure embracing a follow-up explanations model. The overall *modus operandi* of this design is the use of historical data to explain, or build on initial quantitative results.

A simple regression model was used as a modelling technique to study the determinants of domestic air transport passenger demand. The focus is on the relationship between the dependent (passenger enplanements) variable and the independent variables.

The model built was then calibrated to test its validity and ensure the accuracy of the model as well as ensuring that the explanatory variables included in the model are valid. STATA software was chosen for the analysis of data. The main categories examined using STATA are the coefficient of independent variables (magnitude), the probability (p) that socio-economic

variables selected influence the dependant variable (pax), the P- value (p), T-test (t), the model fitness (R^2) and the Degrees of Freedom (df).

The literature suggests that there is a correlation between the variables selected for this study. The theoretical assumptions about the air transport demand and its relationship to the socio-economic factors were then tested with the causal regression models.

The results obtained will add value to the development of the holistic approach to determine the determinants of domestic air transport passenger demand desired for South Africa.

The study suggests that income, airfares, crude oil prices and population are important estimators for measuring passenger movements in domestic air transport sector. Lastly, for further research this study suggests the exploration of South Africa's demand model by using time series approach and include the demand for international travel. In addition to this, O&D city pair investigation is another important study that should be carried out.

CHAPTER ONE

INTRODUCTION AND BACKGROUND OF THE STUDY

1.1. INTRODUCTION

The purpose of this study was to investigate factors that are likely to influence the demand for air passengers in South Africa. The study reviewed academic and professional literature on the determinants of domestic air passenger transport demand. The main focus of the study was on South Africa's domestic air passenger market.

Air transport is a very important mode of travel. It provides the only worldwide transportation network, which makes it essential for global business and tourism. It plays a vital role in facilitating economic growth, particularly in developing countries. Air transport handles approximately 2 billion passengers annually and 40 per cent of interregional exports of goods (ATAG, 2007:02).

Within the aviation industry, there are airports which constitute very important component of national resources. They serve a key role in the transportation of people and goods in regional, national, and international commerce. They are strategically placed in areas where they are linked to other modes of transport such as rail and roads as well as where national government's responsibility to manage and regulate the air traffic operations

intersects with the role of both national, provincial and local governments that own and operate most airports (ACRP, 2007).

Decisions are made by management of the air transport industry about future developments within the industry such as airport development plans. Plans for the future cannot be done without a proper prediction of the future. Attempts are made to quantify demand of air transport at the present moment. Similarly, the demand for air transport in future time period is estimated. However, quantification would not be possible without knowledge about what determines the demand (Wells, 2003).

Analysing air travel demand is a fundamental component of any airport's plan that replicates the capacity utilisation, which will be considered to make decisions. It is important to evaluate and to forecast the volumes of air passenger and cargo demand in future so that the infrastructure facility developments are appropriately carried out and airport risk is reduced (Suryani, Chou and Chen, 2009).

Air travel demand relates primarily to certain basic economic, demographic, behavioural, and market factors that provide people and business with the means to travel and connect with the outside world. It is simply the outcome of supply of people with motivation to travel, who have resources of time and money, utilising a transport infrastructure that fulfils their requirements to travel at the time, location, and cost they desire (Chin, 2002). During each phase of the

industry, the rationale and methodology to measure the demand for air travel would be unique and distinct.

In investigating what determines the demand for air passenger transport at any airport, the following factors were considered:

1. Availability of capacity; airports and airspace;
2. General economic situation; locally, nationally and internationally;
3. Socioeconomic and demographic variables of the airport region;
4. Economic factors directly related to airlines operating at the airport;
5. Competition between airlines serving the airport as well as competition between the air and other modes of transport;
6. Environmental and political constraints on the air transport system and airline industry;
7. Technological advancement in aeronautics, telecommunication, air navigation, and other related fields; and
8. Overall safety, security, and convenience of air travel (Chin, 2002).

This study therefore explored different factors that correlate to the air transport demand. The literature showed that the air transport demand represented by the revenue passenger kilometres is influenced by factors such as the Gross National Product (GNP), Personal Disposable Income (Y_d), distance from surrounding areas to the airport (D), Time travelled to the airport (T), the population size of area in which the airport is situated (Pop), Export (X),

Imports (Z), regional ties (R_t), quality of service provided by the airport (Q_a), fares at the airport (P_a), the price of the competing airport (P_c), the quality of service from the competing airports (Q_c) and market share of the airport (M).

1.2. BACKGROUND OF THE STUDY

Transport plays a significant role in the economy of any country because it works as a catalyst to economic development. It also gives a necessary supporting role to regional and local prosperity, economic growth and enhances the quality of life by improving access to jobs, education, health care, markets as well as social and leisure activities. An improved transport system may also reduce problems of congestion, pollution and accidents as well as improve safety (SAGCIS, 2013)

The transport sector, just like many economic activities that are intensified with infrastructure, is an important component of the economy impacting on the development and the welfare of populations. When transport systems are efficient, they provide economic and social opportunities as well as benefits that result in positive multiplier effects such as better accessibility to markets, employment and additional investments. When the transport is deficient in terms of capacity or reliability, they can have an economic cost such as reduced or missed opportunities. Efficient transport reduces cost, while inefficient transport increases costs. The impacts of transport are not always intended, and can have unforeseen or unintended consequences such as congestion, pollution

and even accidents. Transport carries an important social and environmental load which cannot be neglected (Rodrique and Notteboom, 2013).

In similar vein, air transport plays an important role in the social and economic development of the global system and the countries wanting to participate in it. All continents and its countries want to participate and gain a market share in the world air transport market. The increase in air transport demand in the last few decades has had the major effect of increasing air transport service. This has resulted in increasing congestion levels both in the airways and airports (Postorino and Russo, 2001).

Airports are also very important national resource. They serve a key role in transportation of people and goods in regional, national, and international commerce.

The air travel demand can be affected by two factors, i.e., external and internal factors. According to Lynies (2000) as quoted by Suryani et al (2009), assumption about future demand and performance are essential for business decision making. Accordingly, airfare and level of service may be considered as internal factors while Gross Domestic Product (GDP) and population are external factors (Suryani et al, 2009:2324).

There are many factors that may influence the demand for air travel. For instance, the growth in air traffic may be accelerated by the falling price of air

transport and an increase in economic activities (GDP). Falling airfares and rising personal incomes (GDP per capita) would lead to an increase in demand for air transport travel demand for leisure trips (Chin, 2002).

Demand for air travel is invariably affected by a variety of causal variables. The variables should be unambiguous and measurable and the available data should reasonably conform to mathematical formulation and statistical analysis. These causal variables are intrinsic to models that provide future estimates of demand. They reflect the different sectors of air transport demand represented in the respective demand models (ICAO, 2009). Causal variables typically used for demand forecasts, their influences on demand, and corresponding model type are indicated in Table 1.1 below:

Table 1.1: Demand Variables and Application

Type of influence	**Variable**	**Application**
Size and spending ability of market	Population or number of households Gross	Passenger forecasts
	Domestic or National Product for a country or region.	All types of forecasts
	Personal disposable income	Non-business passenger
	Exports	Outbound international

		Freight
	Imports	Inbound International Freight
Ethnic (or linguistic) ties between areas	Proportion of population of one area born in other area	Passenger forecasts for route or group of routes
Price of air service	Published Tariffs	Route forecasts
	Revenue Yield	All types of forecasts
Quality of air service	Departure frequency	Scheduled forecasts
	Number of stops or connections on a route	Scheduled route forecasts
	Travel time	Route forecasts
Access to air transport services	Number of destinations served	Regional forecasts
	Proportion of market within a certain distance or travel time from airport	Airport or route forecasts
	Tariff of a competing air service	Route forecasts
Price and quality of	Departure frequency on	

competing service	competing air service	Route forecasts
	Fare on competing surface transport surface	Route forecasts
	Travel time on competing surface transport	Route forecasts

Source: Ashford, Mumayiz, Wright, 2011

Air passenger demand is correlated to a region's population and the motivation of individuals to travel (i.e., their propensity to travel) as well as socioeconomic activities and measures that support travel and the availability of related services and infrastructure. The underlying assumption in all demand measurements is the strong correlation between demand and trip-generating factors that are derived from historical data (Kennon, 2002b).

The main focus of the study was on South Africa's domestic air passenger demand.

1.2. PROBLEM STATEMENT

1.2.1. Overview

In general, there is lack of national framework for measuring the demand for air transport in the South African Aviation Industry. Similarly, there is lack of understanding with regard to factors influencing the demand for air transport. This result in deficiencies in the planning processes of most airports in the

country. It is therefore very much important to investigate the factors that may possibly influence the demand for air passenger demand. This study was therefore a stepping stone towards studying the determinants of aviation demand. Hence, the study focused on the domestic air passenger demand for South Africa's airports. During the World Cup of 2010, there were problems associated with air transport demand. Poor planning at the major airports during the 2010 Soccer World Cup led to the unexpected congestion and delays in South African airports. If the determinants of air passenger demand were investigated and known, there would have not been such challenges during the world cup. Hence, this study intended to give a clear direction in terms of planning for these airports. Thus, the most crucial departure was to know the factors that influence the demand for air transport travel in South Africa.

The study reviewed the literature on the air transport demand. Data received from ACSA, StatsSA, IMF, Quantec, DBSA, Reserve Bank, WorldBank, Treasury and other important institutions were used to investigate the relationship between passenger demand and the selected independent variables of the study.

The outcome of the overall study was the contribution towards the development of the aviation demand forecasting framework in South Africa.

1.2.2. Research Question/Hypothesis

The main question for the study was whether the socioeconomic factors such as airfares, personal disposable income, population, consumption, expenditure and gross domestic product influence the air passenger enplanements.

1.3. AIMS AND OBJECTIVES

1.3.1. Overall aim

The overall purpose of this analysis was to investigate the factors influencing passenger demand at the South Africa's three major international airports.

1.3.2. Objectives of the study

Based on the preceding discussion in sub-section 1.1.1 to 1.2.2, the objectives of this thesis were:

- To investigate the relationships between air transport demand (dependent variable) and the potentially influential (independent) variables.
- To extract data sets from the known historical records of, *inter-alia*, Airports Company South Africa (ACSA), Airports Company International (ACI), International Monetary Fund (IMF), World Bank, Development Bank of Southern Africa (DBSA), Statistics South Africa (StatsSA), South African Reserve Bank (SARB), International Air Transport Association

(IATA), International Civil Aviation Organisation (ICAO), Worldbank and Quantec.

- To review the literature on the determinants of aviation demand and select the appropriate model for regressing domestic air transport demand in South Africa.

These objectives form an overall aim of investigating the possible factors influencing aviation.

1.4. RATIONALE FOR THE STUDY

Air travel demand relates primarily to certain basic economic, demographic, behavioural, and market factors that provide people and business with the means to travel and connect with the outside. It is simply the outcome of supply of people with motivation to travel, who have resources of time and money, utilising a transport infrastructure that fulfils their requirements to travel at the time, location, and cost they desire (Chin, 2002).

People normally travel to fulfil business obligations, for leisure, for other personal reasons, or for some combination thereof. Air travel is not significantly different from other modes of intercity travel, but it is inherently unique in many other ways. One principal difference between air and ground inter-city travel modes relates to the traveller's perception of time involved in travel and restrictions on the traveller's desire to select a route, a carrier, a transport mode

to reach final destination, in addition to safety, cost, convenience, and accessibility to the traveller.

The aviation industry operates in a fast changing environment. As the world air travel industry has matured after undergoing phases of growth, regulation, deregulation, consolidation, globalisation, and liberalisation, the industry has stabilised in terms of basic structure, operating characteristics, underlying economic forces driving the market, and the interrelationships with the socioeconomic environment within which it exists and functions (Chin, 2002).

It is therefore imperative that air transport authorities understand what determines the demand for domestic air travel and be able to plan for the future of air transport. Planning for the future require a robust demand modelling. Forecast of air transport demand has a great influence on the development of airport master plans with respect both to airside (runways, taxiways, aprons, technological devices) and landside (boarding/landing area, waiting rooms, etc.), given that it depends on the amount of passengers during the reference time period, usually the year or more years for such aim (Andreoni and Postorino, 2006).

The demand for air transport travel has increased notably from 1994, associated with the political stability following the first elections of the democratic government during that time as well as the integration of South Africa to the world economy. This happened despite some negative peaks due

to political and/or market driven events that reduce the user willingness to travel (DoT, 2009).

ACSA statistics have shown that 3.1 million passenger arrived by air in South Africa in 1993 (just before the elections), this figure increased by an estimated 7 million passenger in 2000 and 13.4 million in 2008. Furthermore, the offered services have quickly changed in the last years both in terms of trip organization and monetary costs, also because various alliances and mergers have occurred, together with the emergence of new air carriers on the market (DoT, 2009).

Airport managers and carriers have a great interest in the demand modelling and simulation, particularly when there is a competitive market and users can choose among different services. The task is not easy to accomplish, given the complexity of the situation where more air carriers can compete by offering different fares, different origin/destination airports serving the same areas, different on board services and so on. Hence it is vital to model the air transport demand in all airports. Thus, this study focuses on modelling the air passenger demand in South Africa's three major international airports. The major airports are very important because they have larger share in South Africa's aviation market.

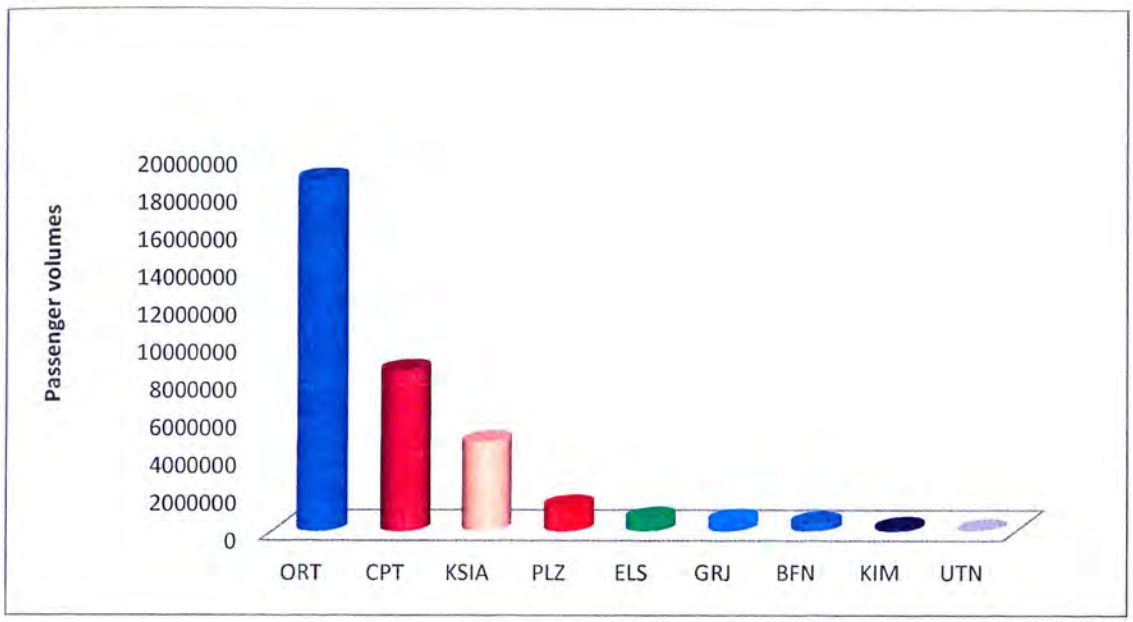
1.5. SCOPE OF THE STUDY

Passenger enplanements are divided into two distinct components which are domestic and international passenger enplanements. The domestic passenger enplanements are defined as the number of people who department from South African airports to any other airport(s) within the boundaries of South Africa. The international passenger enplanements on the other hand is defined as the number of people departing from South Africa's airports on any non-stop commercial international flight operated by South African or foreign carriers.

In this study, the focus was only based on the domestic flight operations in the South African airports. In 2012, the combined operation of the three major international airports accounted for 91 per cent of the total passenger enplanement in all ACSA controlled airports. ACSA owns and control 10 airports, only three of these airports have an internationals status, i.e., OR Tambo, Cape Town and King Shaka international airports. OR Tambo have the largest market share of 53 per cent, followed by Cape Town with 14 per cent, King Shaka have 9 per cent share and the remaining 9 per cent is shared amongst other airports, that is Pilanesburg, Upington, George, Kimberly, Bloemfontein, East London and Port Elizabeth. Pilanesburg airport has ceased its operation since September 2011. The best source of information on passenger enplanements on these airports was the Airport Company South Africa (ACSA). The market share of all ACSA controlled airports are presented

in Figures 1.1 and 1.2 below. Figure 1.1 shows the total passenger enplanements in 2012.

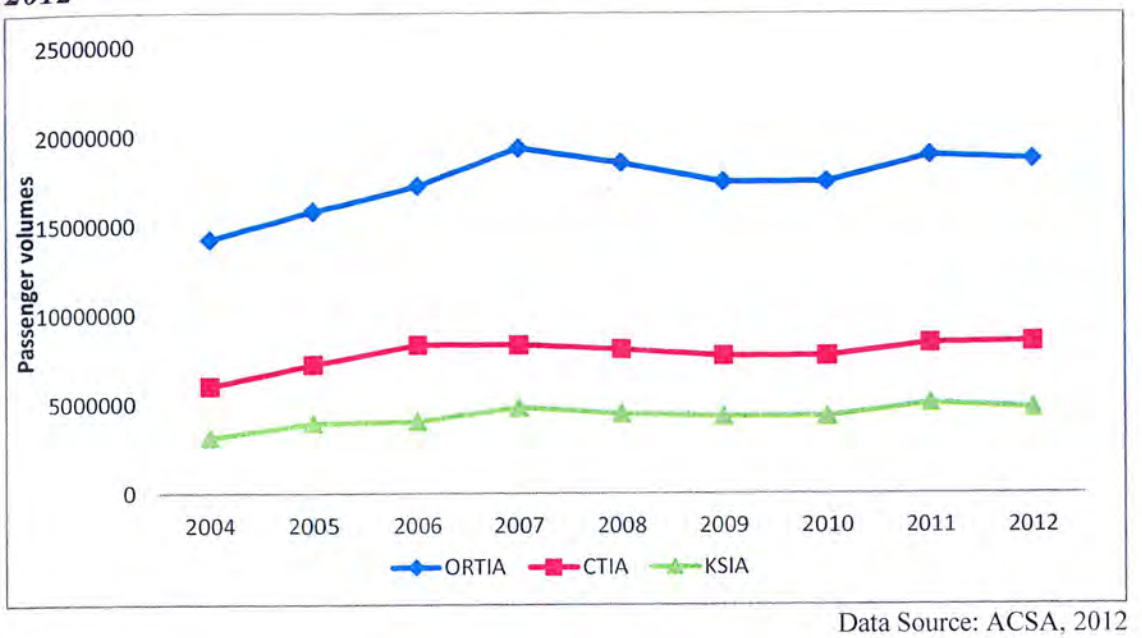
Figure 1.1: Total air passenger enplanements in all ACSA controlled airports in 2012



Data source: ACSA, 2012

Figure 1.1 shows that South Africa's major international airports are responsible for the larger share of passenger enplanements. The remaining airports account for only 9 per cent, with some even having too few flight services to be considered regular service. For example, some airports such as Upington, had less than 5000 passenger per annum for the past eight years (2004 – 2012). Then, it is economically significant to use the three international airports for this analysis since they have reliable air passengers. The passenger enplanements for the 2012 at the three major airports are presented in Figure 1.2 below:

Figure 1.2: Air passenger enplanements for the three international airports in 2012



Data Source: ACSA, 2012

Figure 1.2 also indicates that OR Tambo international airport handles more passenger, with a monthly estimates of approximately 17 million passengers per month followed by Cape Town with an average of 7 million passenger and King Shaka international airports with an average of 3.9 million passengers.

1.6. THE RESEARCH METHODOLOGY

As described more fully in chapter 3 of this study, the ontological approach to this study follows the belief that the objectives of the thesis are not only of a purely deterministic nature, in that they can be predicted by the cause-and-effect laws, but rather that they need to be interpreted in terms of the contextual influences, understanding and interpretations people in a specific setting and social reality attach to them. The research paradigm adopted for the analysis of

data is that of constructivism, embracing a pragmatic approach. The epistemology is that of mixed-methods approach, that is, it is in part qualitative and in part a quantitative.

Analysis of the contextual forces which have influenced airport demand has been based on a quantitative approach. However, the qualitative approach was also followed, whereby literature review form part of research methodology. Research into the variables that influences the airport activity demand in South Africa has been carried out by the mixed methods research approach, using the exploratory design procedure embracing a follow-up explanations model. The overall *modus operandi* of this design is the use of historical data to explain, or build on initial quantitative results (Mitchell, 2009:18-19).

The following sections highlight the research methodology followed and will be elaborated upon in more detail in chapter three.

1.6.1. Qualitative Techniques

Qualitative methods are used more appropriately when historical data concerning the events to be predicted are either scarce or unavailable, or when the events to be predicted are affected by non-quantifiable information or by technology changes. The benefit of the qualitative method is that both quantifiable and unquantifiable information can be used. However, it is impossible for the qualitative method to measure or improve the accuracy of the

prediction because no systematic model is used. Besides, the forecasts may contain built-in biases of the experts given the subjectivity involved with the qualitative methods.

In practice, qualitative techniques are used less frequently than quantitative methods discussed in the following section.

1.6.2. Quantitative Techniques

In contrast to qualitative methods, quantitative methods analyse historical data (or historical trend) statistically to identify a pattern, and then apply a mathematical model to emulate the pattern. The estimated equation of the model may be used to forecast the trend into the future. This quantitative approach relies on the assumption that the identified pattern will continue into the future. Quantitative models are further grouped into two types: time-series analysis and causal methods.

Both time-series and causal methods have gained widespread acceptance because they offer several advantages. First, the forecasts are objectively conducted once the explanatory variable(s) and the functional form of the model are determined. Second, the accuracy and statistical validity of the resulting model can be tested using statistical methods. Additionally, various types of computer packages are readily available for the modellers to apply quantitative methods efficiently (SAS, MiniTab, SPSS, STATA, E-views, and R). A range

of forecast values based on confidence intervals can be developed using quantitative methods.

Time-series analysis forecasts the future value of a dependent variable by applying statistical analysis only to history (or time series) data of the variable. It assumes that one may forecast the value of a variable by studying only the historical pattern of that variable over time. It is known to be very effective in predicting short-term forecasts such as monthly, weekly, daily or hourly variations in demand. The simple exponential smoothing technique is the most commonly used in time series analysis dealing with the fluctuation patterns. However, significant developments have also been made in techniques such as moving average, adaptive filtering, Box-Jenkins methods, and spectral analysis (Enders, 2011).

Causal models assume that the dependent variable to be forecasted can be explained by the behaviour of another or set of independent variables. The purpose of the causal model is to discover the form of the relationship between all the variables by statistical analysis, and to use it to forecast future values of the dependent variable. Time series models focus on when an event will happen, while causal model focus on why an event happened. The most commonly known causal model is the regression model. The advantage of using a regression model is that it is relatively easy to conduct the forecast when the projected explanatory variables are available (Shen, 2006).

For this study, a regression model is used as a technique to forecast the passenger enplanements in South Africa's three major international airports.

1.7. LIMITATION OF THE STUDY

The study focus was limited to the domestic air passenger demand. Hence, some explanatory variables were not studied in detail in this study, for as long as they did not relate to the domestic passenger market.

1.8. OUTLINE OF THE STUDY

1.8.1. Chapter One: Introduction and Background of the Study

This chapter covered the introductory part of the study and motivated an investigation into the determinants of South Africa's domestic air passenger demand.

1.8.2. Chapter Two: Literature Review

This chapter entailed a theoretical review of factors influencing the air transport demand in airports. The main focus was on South Africa's domestic air travel, with particular reference made to experiences in other parts of the world.

1.8.3. Chapter Three: Research Methodology

The research design and methodology of the study was outlined in this chapter. The chapter included sampling techniques, population, survey methods and the statistical analysis used in this study.

1.8.4. Chapter Four: Data Presentation, Interpretation and Analysis of Results

The chapter discussed the findings of the field study.

1.8.5. Chapter Five: Summary, Conclusions and Recommendation

Summary and conclusions reached from the research findings are presented. Recommendations for further exploration of this field of the study are provided in this chapter.

CHAPTER TWO

LITERATURE REVIEW

2.1. INTRODUCTION

This literature review studied determinants of air transport demand, in other words, the factors driving aviation demand. The study distinguished five main groups of determinants: economic factors, geographic and demographic factors, market structure and social factors. This approach clearly differentiated what is affecting air transport demand from different perspectives. Critical evaluation of carefully investigated literature holds considerable part of this chapter.

Analysing previous studies relating to this topic formed a significant part of the research and played a crucial role in the evaluation of the empirical part and conclusion. The aim of the literature review of this research was to create a comprehensive knowledge of air transport demand and its determinants (Domirsoy, 2012).

The transport sector is infrastructure intensive and a very essential component of the economy, impacting on the development and the welfare of communities. When transport systems are efficient, they provide economic and social opportunities as well as benefits that result in positive multiplier effects such as better accessibility to markets, employment and additional investments. When the transport is deficient in terms of capacity or reliability, they can have an

economic cost such reduced or missed opportunities. Efficient transport reduces cost of travel and doing business, while inefficient transport increases such costs. The impacts of transport are not always intended, and can have unforeseen or unintended consequences such as congestion, pollution and even accidents. Transport carries an important social and environmental load which cannot be neglected (Rodrique and Notteboom, 2013).

Air transport is a capital intensive mode and plays an important role in the social and economic development of the global system and the countries wanting to participate in it. All continents and its countries want to participate and gain a market share in the world air transport market. The increase in air transport demand in the last few decades has had the major effect of increasing air transport service. This has resulted in increasing congestion levels both in the airways and airports (Postorino and Rucco, 2001).

Congestion has been and continues to be a problem at many airports throughout the world. It imposes costs on both the users and providers of air transport services. A common response is to expand the capacity of airports in the most afflicted regions. Hence, it is vital to study the current demand for airport service and forecast the future air transport demand. More importantly, to study and establish the determinants of air passenger demand (Cohen, Cletus and Coughlin, 2003).

Airports are very imperative national resources. They serve a strategic role in transportation of people and goods in regional, national, and international commerce. They are strategically placed in areas where they are linked to other modes of transport such as rail and road as well as where national government's responsibility to manage and regulate the air traffic operations intersects with the role of both national, provincial and local governments that own and operate most airports (ACRP, 2007). It has become vital for the airports to estimate future demand of air transport service for planning and other related purposes as well manage the factors influencing air passenger demand (Alam and Karim, 1998).

Measuring and projecting air travel demand for an airport, city, or region is a critical and fundamental step in the airport planning process. Yet it is more of an art than science, or perhaps an inexact science. Predicting is at the heart of the planning and design process of many airports. Airport terminals, runways, freight storage facilities, parking lots and other networks are based on the forecasts for the airport (Ashfold, Mumayiz and Wright, 2011).

It is important to measure the volumes of air passenger and cargo demand in future so that the infrastructure facility developments are appropriately carried out and airport risk is reduced. Future peak demand in passenger flows at various airports should be estimated (Suryani, Chou and Chen, 2009).

Air traffic statistics forms a major part of fleet planning, route development and preparation of the annual operational plan. Analysing and forecasting air travel demand help reduce the airlines' risk by objectively evaluating the future demand side of the air transport business (Ba-Fail, Seraj and Jasimuddin, 2000).

Assumption about future demand and performance are essential for business decision making. The air travel demand can be affected by two factors, i.e., external and internal factors. Accordingly, airfares and level of service may be considered as internal factors while GDP and population are external factors (Suryani et al, 2009).

Aviation industry experiences constant changes as a result of changing economic, political and transportation security environments. Determining factors of air transport demand is essential for the constitution of the national transportation policy. In this regard, examining historical statistics such as GDP and population trends and passenger numbers plays a crucial role in reaching this aim and drawing up accurate forecast (Demirsoy, 2012).

In this study, the focus was on investigating the determinants of domestic air passenger demand in South Africa's airports. The major focus of this research was set on investigating the drivers of domestic air transport demand. This study began by focusing on the economic outlook of the World Economy, the United States, United Kingdom, European Markets, South African economy. Furthermore, the study provided a brief overview of the performance of the air

transport industry in different regions such as the United States, United Kingdom, European countries, Middle East and Africa.

2.2. WORLD ECONOMIC OUTLOOK

The world economy is still struggling to recover after four years of the epidemic of the global financial crisis. During 2012, global economic growth weakened further compared to the previous years. A growing number of developed economies fell into a double-dip recession. Those in severe sovereign debt distress moved even deeper into recession, caught in the downward spiralling dynamics from high unemployment, weak aggregate demand compounded by fiscal austerity, high public debt burdens, and financial sector fragility. Growth in the major developing countries and economies in transition has also decelerated remarkably, reflecting both external vulnerabilities and domestic challenges. Most low-income countries have held up relatively well in 2012, but faced adverse spill over effects from the slowdown in both developed and major middle-income countries. The prospects for the next two years continue to be challenging, troubled with major uncertainties and risks slanted towards the downside (UN, 2013).

World Gross Product (WGP) growth was expected to reach 2.2 per cent in 2012 and forecast to remain well below the potential of 2.4 per cent in 2013 and 3.2 per cent in 2014. At this restrained pace, many economies will continue to

operate below potential and will not recover the jobs lost during the Great Recession of the 1930's (UN, 2013).

For many developing countries, the global slowdown implies a much slower pace of poverty reduction and narrowing of fiscal space for investment in education, health, basic sanitation and other critical areas needed for accelerating the progress to achieve the Millennium Development Goals (MDG's). Weaknesses in the major developed economies are also at the roots of continued global economic miseries. Most of them, particularly those in Europe, are dragged into a downward spiral as high unemployment, continued rescuing of firms and households, continued banking instability, heightened sovereign risks, fiscal tightening, and slower growth viciously feed into one another (OECD, 2012).

Several European economies are already in recession. In Germany, output also slowed down significantly while France's economy is stagnating. In the baseline outlook for the euro area, Gross Domestic Product (GDP) is expected to grow by only 0.3 per cent in 2013 and 1.4 per cent in 2014, a feasible recovery from a decline of 0.5 per cent in 2012. Economic growth in the new European Union (EU) members also decelerated during 2012, with some countries such as Czech Republic, Hungary and Slovenia, falling back into recession. GDP growth n these economies is expected to remain subdued at 2

per cent in 2013 and 2.9 per cent in 2014, with high risks for a much worse performance if the situation in the euro area deteriorates further (OECD, 2012).

The United States economy weakened notably in 2012, and growth prospects for 2013 and 2014 remain sluggish. The external demand is also expected to remain weak. GDP growth of the U.S. is forecast to decelerate to 1.7 per cent in 2013 and already monotonous pace of 2.1 per cent in 2012 (OECD, 2012).

The economy of Japan in 2012 was up from 2011, mainly driven by reconstruction works and recovery from the earth-quake related disasters of 2011. The government also device measures to stimulate private consumption. Export faced strong complications from the slowdown in global demand and appreciation of the yen (Japanese currency). The Japan's economy is expected to slow down given the phasing out of consumption incentives combined with a new measure increasing taxes on consumption, anticipated reductions in pension benefits, and government spending cuts. These measures were made to respond to concerns about the extremely high level of public indebtness. The impact of the greater fiscal austerity was expected to be mitigated by the reconstruction investment, however the situation prevailed but at a slower pace. GDP is forecast to grow at 0.6 per cent in 2013 and 0.8 per cent in 2014, down from 1.5 per cent in 2012 (UN, 2013).

The economies of the developed countries are spilling over to developing countries and economies in transition through weaker demand for their exports

and heightened volatility in capital flows and commodity prices. Their problems are also home-grown; however, growth in investment spending has slowed significantly, sanctioning a continued deceleration of future output growth if not counteracted by additional policy measures (UN, 2013).

The economies of Asian countries have weakened considerably during 2012 as the region's growth engines, China and India, both shifted to a lower gear. China is forecast to grow at 8.5 per cent on 2013 and 8.9 per cent in 2014 (OECD, 2012). China has seen fast growth in recent decades but is starting to face structural bottlenecks and overinvestment leading to excess production capacity. While a significant deceleration in exports has been a key factor for the slowdown, the effects of policy tightening in the previous two years also remain. Domestic investment has softened prominently. Both China and India are faced with a number of structural challenges hampering growth. India's space for more policy stimulus seems limited. China and other countries in the region passes greater space for additional stimulus, but this far have refrained from using it. In the outlook, growth for East Asia is forecast to pick-up slightly to 6.2 per cent in 2013, from 5.8 per cent estimated in 2012 (UN, 2013).

In the Western Asia, most oil-exporting countries experienced robust growth supported by record-high oil revenues and government spending. In contrast, economic activity weakened in oil-importing countries, burdened by higher import bills, declining external demand and shrinking policy space. As a result,

oil-exporting and oil-importing economies are facing a dual track growth outlook. Meanwhile, social unrest and political instability, notably in Syrian Arab Republic, continue to elevate the risk assessment for the entire region. On average GDP growth in the region is expected to decelerate to 3.3 per cent in 2012 and 2013, from 6.7 per cent in 2011 (UN, 2013).

GDP growth in Latin America and the Caribbean decelerated notably during 2012, led by weaker export demand. In the outlook, it is projected that these economies will return to moderate economic growth rates, led by stronger economic performance in Brazil. GDP growth is forecast to average 3.9 per cent for the entire region in 2013, compared to 3.1 in 2012 (UN, 2013).

Economies of Africa, on average, are forecast to see a slight moderation in output growth in 2013 to 4.8 per cent, down from 5 per cent in 2012. Major factors underpinning this continued growth trajectory include the strong performance of oil-exporting countries, continued fiscal spending in infrastructure projects, and expanding economic ties with Asian economies. However, Africa remains plagued by numerous challenges including armed conflicts in various parts of the region. Growth in income per capita will continue, but at a pace considered insufficient to achieve substantial poverty reduction. Infrastructure shortfalls are among the major obstacles to more dynamic economic development in most economies of Africa (UN, 2013).

In South Africa, GDP growth is expected to average 5 per cent in 2013, up from 4.4 per cent of 2012 (UN, 2013).

2.3. SOUTH AFRICAN ECONOMY

The South African economy is estimated to have grown by 3.1 per cent in 2011, up from 2.9 per cent in 2010, but growth was expected to slow down to 2.9 per cent in 2012 due to the continued weakness in the global economy and domestic structural constraints (AEO, 2012). However the GDP growth went up to 4.4 per cent in 2012 with further expectation for growth of 5 per cent in 2013 (UN, 2013).

Growth of real value added in the mining sector slowed to 0.2 per cent in 2011 as a result of strikes, accidents, logistical problems, plant maintenance, increases in electricity tariffs and wage rises above the rate of inflation. Production of coal, gold and manganese ore declined while output of industrial commodities and platinum weakened because of waning global demand. Unclear prospects for the global economy, strong rand, and transport and energy constraints make for an uninspiring outlook for the mining sector (AEO, 2012).

In the agricultural sector, real value added contracted by 0.4 per cent in 2011 as yields failed to match the bumper harvest of 2010, in part as a result of flooding early in the year. The modest output gain was due to animal products and field crops. Maize production in particular was again substantial during the

2010/11 season and reached 10.6 million tonnes but that was down from the 12.8 million tonnes in the previous season (AEO, 2012).

By contrast, the manufacturing sector grew by 2.4 per cent in 2011, although this was significantly less than the 5.4 per cent growth rate recorded in 2010. The sector got off to a strong start in the first quarter with real value added growing by 12.8 per cent quarter-on-quarter (annualised rate). However, activities in the sector were consequently affected by weakening global demand and to a loss in competitiveness linked to the appreciation of the rand in the first half of 2011. Demand for residential and non-residential buildings declined but civil construction grew, driven by public investment on other related infrastructure development. Overall, the construction sector increased by a mere 0.8 per cent in 2011, a continuation of the sluggish growth of only 0.9 per cent in 2010 (ADB, 2012).

Tertiary sectors are consistently growing faster than overall GDP with the exception of personal services, led by trade, government and financial activities, in spite of soft conditions in the banking sub-sector. Motor trade activity also contributed to growth, thanks to strong demand of household sector and the car rental industry. The transport sub-sector slowed but the communication sector stayed on its steady growth path, leading to a combined 3.3 per cent growth for the sector. Finally, general government experienced an annual growth rate of 3.9 per cent in 2011 (ADB, 2012).

South Africa's real gross domestic product at from 1971 to 2012 is presented in Figure 2.1 below:

Figure 2.1: Gross Domestic Product from 1971 to 2012

Data Source: StatsSA, 2012

GDP growth rate from the year 1993 till 2012 is presented on Figure 2.2. More importantly, Figure 2.2 presents the fluctuation of GDP growth; towards 1994, the growth rate increased drastically due to the first democratic elections in South Africa and further integration of the country to the world economic activities. The activities of the Rugby World Cup held in South Africa in 1995 resulted in the alarming growth rate in 1996 followed by a decline in 1997 to 1998. Preparation for hosting the United Nation World Summit on Sustainable Development in 2002 led to a steady increase in GDP growth rate in 2002. The spill-over of world economic crisis of 2008 had an impact on the GDP in South Africa, which recorded negative growth rate between 2008 and 2009 and started

peaking a momentum in 2010 due the FIFA Soccer World Cup spectacular held in the Country on that year. Another deep was seen in 2011 due to the financial crisis in Europe.

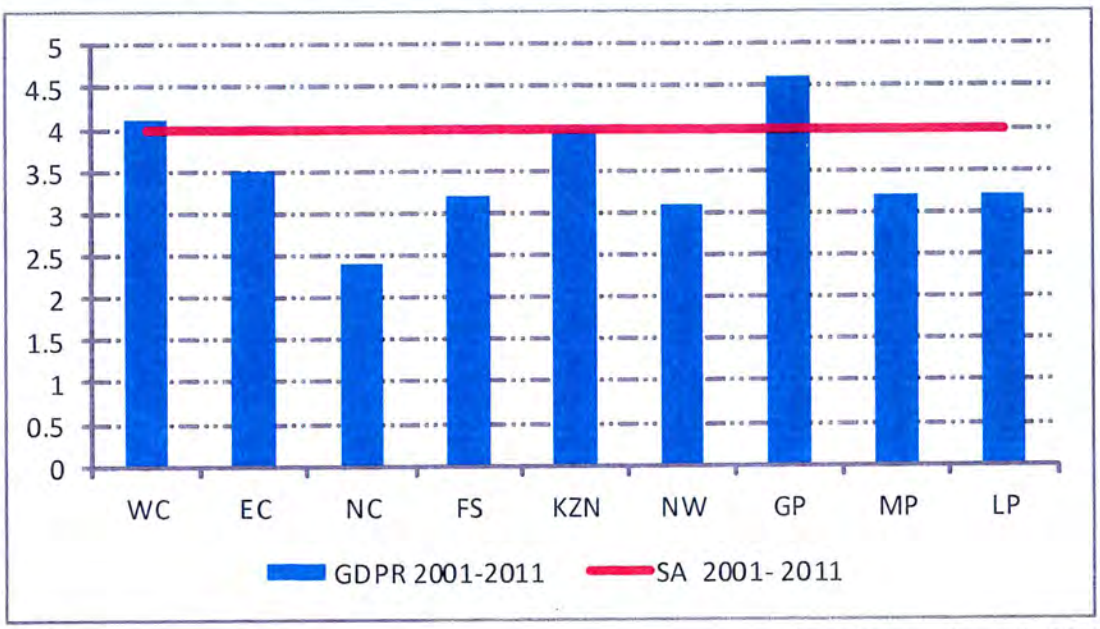
Figure 2.2: GDP growth rates from 1993 to 2012

Data Source: StatsSA, 2013

The seasonally adjusted GDP at current prices shows a steady increase in economic growth of South Africa from for a ten year period ranging from 2002 to 2012. The average real economic growth rates from 2001 to 2011 were recorded for provincial economies and the total economy as indicated in Figure 2.3. The South African economy recorded an average growth rate of 4 per cent. Gauteng and Western Cape were above the national average with average rates of 4.6 per cent and 4.1 per cent respectively. KwaZulu-Natal recorded the same average as that of the national economy. All other provincial economies

recorded lower growth rates, e.g. Northern Cape posted a lower average growth rate of 2.4 per cent over the period (StatsSA, 2012).

Figure 2.3: Average real annual economic growth rate per province: 2001 – 2011

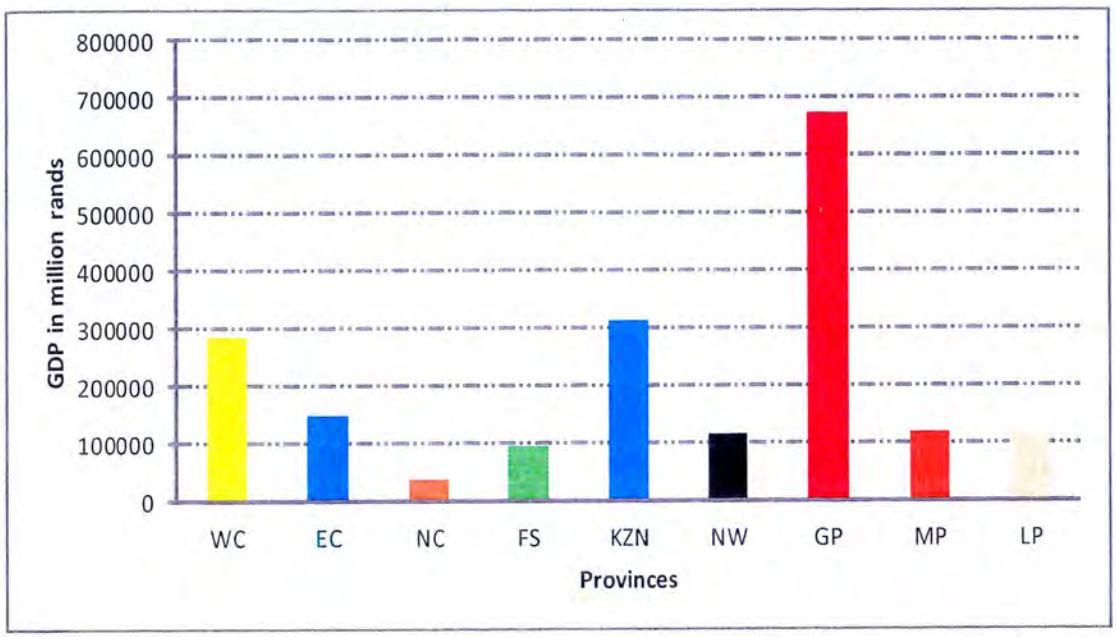


Data Source: StatsSA, 2012

From 1996 to 2012, the relative change of the contribution of the nine provinces to the South African economy did not change, with Gauteng remaining the largest contributor to the economy with 34.5 per cent, followed by KwaZulu-Natal with 15.7 per cent and Western Cape with 14.5 per cent. These dominant provinces collectively contribute nearly two-thirds to the South African economy. They have, however, shown a decline in their contribution over the period (StatsSA, 2012). Figure 2.4 presents the GDP value of the three provinces that contribute the largest share of South Africa's total GDP.

These provinces are Gauteng, Western Cape and KwaZulu-Natal provinces respectively.

Figure 2.4: Gross Domestic Product contribution by Provinces



Data Source: StatsSA, 2013

2.4. THE GLOBAL AIR TRANSPORT DEMAND OUTLOOK

2.4.1. Introduction

Air transportation has become the most important, reliable and fastest mode of transport between and within countries due to the globalisation process. Increased urbanisation and better distribution of income allowed air transport to spread across all regions and countries of the world (Airbus, 2011). While the World Economy is expected to grow at an average rate of 3.3 per cent annually for the next 20 years, global air passenger traffic growth is forecasted higher

than GDP growth according to Boeing Current Market Outlook (Demirsoy, 2012).

2.4.2. Worldwide Air Travel Demand

Worldwide air travel demand was 4.6 per cent higher in November 2012 compared to 2.9 per cent of November 2011. Air freight volumes edged up 1.6 per cent over the same period after declining 2.6 per cent in October, year on year. This shows a turning point for air cargo in terms of bouncing back and regaining lost ground. Passenger capacity rose 3.2 per cent and load factor improved 1 per cent point to 77.2 per cent in 2012 compared to 2011. This was also coupled by the positive economic developments in the U.S. and an improvement in business confidence, the conditions which are aligning to see a return on growth in 2013. In 2013, air cargo volumes are expected to grow by 1.4 per cent while air passenger traffic is projected to increase by 4.5 per cent worldwide. Majority of passenger growth came from domestic markets, particularly China (IATA, 2012).

Passenger markets have held up better than cargo in the face of adverse economic conditions. But the current level of air travel is just 2 per cent higher than at the start of 2012. This is considerably weaker than the long-term average growth rate (IATA, 2012).

2.4.2.1. International Passenger Markets

International passenger demand grew 5.6 per cent in November 2012 compared to November 2011. Emerging markets continued to perform well, and capacity increased 3.1 per cent compared to 2011. Load factor also rose 1.8 per cent points to 76.3 per cent. Amongst other regions, strongest passenger growth was experienced by Asia-Pacific Carriers. Demand for international air passengers grew up 6.2 per cent year-on-year. Some of this growth reflected depressed results in 2011 due to flooding in Thailand. Airlines in the region experienced increased competition on long-haul markets. Load factor surged 2.6 per cent points to 75.7 per cent (IATA, 2013).

In North America, passenger demand grew up 2.6 per cent compared to November 2011, an improvement on the weak 0.2 per cent growth in October, following the impact of Hurricane Sandy on the international flights across the North Atlantic. Airlines in the region have experienced some of the slower growth rates in international traffic throughout the year. Capacity went up by 0.4 per cent, pushing load factor up 1.6 per cent points to 79.6 per cent (IATA, 2013).

The passenger demand in Europe grew 4 per cent in November 2012 compared to the same month in 2011. Capacity climbed 0.8 per cent and load factor was 77.8 per cent (IATA, 2013).

Despite the low growth in air transport demand in maturing regions like North America and Western Europe, emerging economies like China and regions like Middle East will enhance air transport growth globally. For instance, airline traffic growth rates are expected to be 7 per cent in Asia-Pacific region and 6.8 per cent in Latin America, while it is projected to be only 23 per cent for North America. BRICS (Brazil, Russia, India, China and South Africa) economies and other emerging economies are anticipated to contribute 56 per cent of world economic growth in the coming 20 years (Airbus, 2011). Thus these regions and economies will be the main growth drivers of the air transport in the next decade (Demirsoy, 2012).

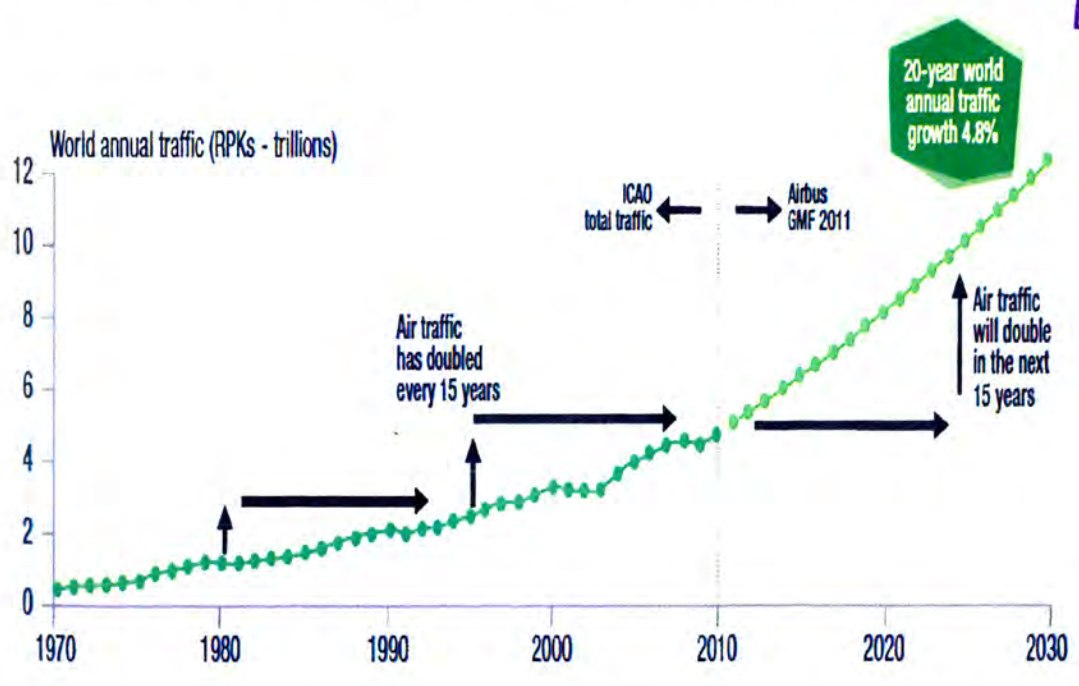
In the Middle East, air passenger demand expanded 10.5 per cent compared to November 2011, second best among the regions, continuing the exceptional growth throughout the year. However, this was outstripped by a capacity increase of 11.2 per cent which resulted in the load factors falling 0.5 percentage points to 73.5 per cent (IATA, 2013).

Latin American carriers posted demand growth of 11 per cent in November 2012 compared to the same month in 2011. This resembles a strongest regional growth. The effects of Eurozone crisis and China's lower growth in 2012 were offset by strong domestic demand in several major economies. Capacity increased by 9.8 per cent, leading to an improvement in load factor of 0.8 percentage points to 76.3 per cent (IATA, 2013).

African airlines saw demand expand 5 per cent year-on-year but capacity growth was held at 4.4 per cent. Load factor rose 0.4 percentage points to 64.7 per cent but remains the lowest of all regions (IATA, 2013).

The world air transport demand was forecasted by Airbus for a 20 year period (2010 to 2030) as predicted in Figure 2.5 below. It is anticipated that the demand for air transport will increase in the next fifteen year due to an increase in the world economic activities. Furthermore, liberalisation process has promoted the birth of new business models such as low-cost carriers (LCC) all over the world. Low cost carriers are expected to enable more and more people to fly by introducing considerably lower and more affordable airfares and thus target lower income population (Demirsoy, 2012).

Figure 2.5: World Air Transport Demand Forecasts *(Source: Airbus, 2011)*



2.4.2.2. Domestic Passenger Markets

In general, domestic markets rose 3 per cent in November 2012 compared to the same month of 2011. This reflects an improvement of over 2.4 per cent year-on-year growth reported in October 2012. Capacity grew 3.3 per cent leading to load factor dipping of 2.2 percentage point to 79.1 per cent (IATA, 2013).

The US domestic demand travel was up 1.1 per cent; however, capacity expanded 2.7 per cent leading to a 1.3 percentage point drop in load factors to 82.1 per cent (IATA, 2013).

Chinese demand grew by 7.7 per cent, lagging strong capacity expansion of 10.3 per cent. Load factor fell 1.9 percentage points to 79.1 per cent. Chinese Domestic travel increased by 1.9 per cent in November 2012 compared to October 2012 (IATA, 2013).

Indian demand fell by 6.5 per cent reflecting the slowing economy and sinking business confidence (IATA, 2013).

Japanese traffic grew 4.4 per cent year-on-year, eclipsing a 1.5 per cent increase in capacity and pushing load factor up 1.9 percentage points to 67.3 per cent (IATA, 2013).

Strong domestic demand growth of 10.2 per cent was experienced in Brazil. This country has been the fastest-growing domestic market for two consecutive

months. Capacity fell 2.1 per cent and load factor jumped 8.3 percentage points to 73.9 per cent (IATA, 2013).

2.5. AIR TRANSPORT MOVEMENTS IN THE SOUTH AFRICAN CONTEXT

2.5.1. Total Domestic Movements

2.5.1.1. Total domestic air transport passengers in South Africa

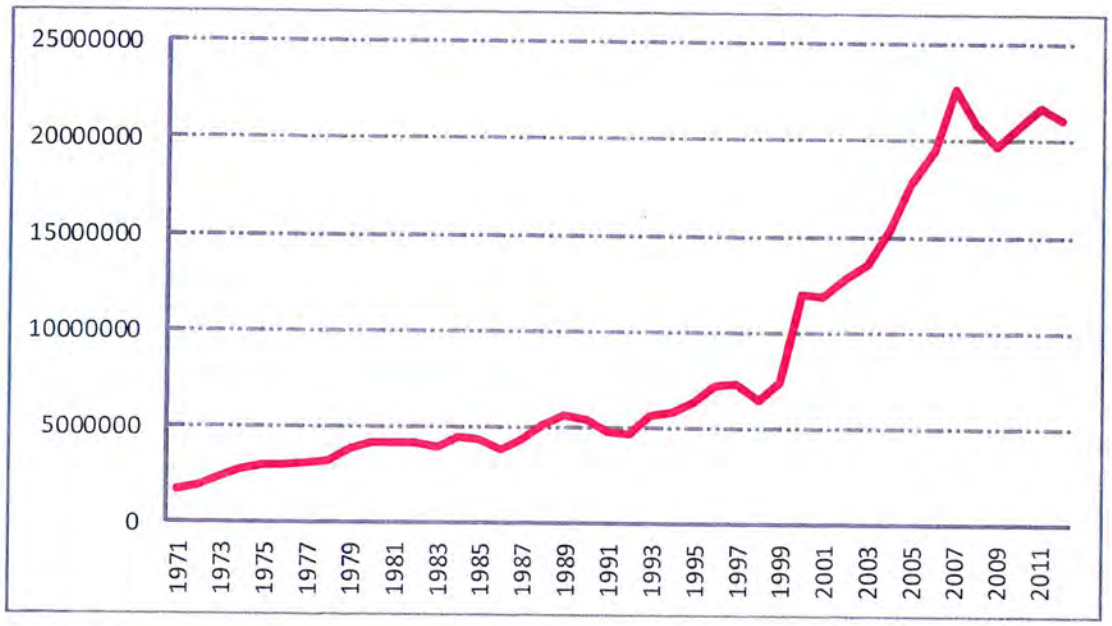
South Africa has a steadily increasing economy with approximately 50 million inhabitants. As one of the emerging markets that will contribute to the world economic growth, South Africa is promising high demand growth in air transport industry. Just a few years ago, air travel was considered as a luxury means of travel and only few people in the country could afford to fly or had a chance to experience flying over. However, things have changed drastically in the past decade, due to the introduction of low cost carriers like Mango, Kulula.com and Comair. These airlines targeted lower income population and offer them lucrative and affordable airfares (Demirsoy, 2012).

According to OECD classifications, South Africa is an upper-middle income country. There has been a substantial increase in the middle income class in the last decade, which is considered to be forming the backbone of air transport growth (Airbus, 2011). In addition to income increases, air transport growth accelerated due to the market deregulation, bilateral agreements with other

countries. This liberalisation led to the emergence of new private airlines, new business models (LCC) and rigorous infrastructure investments like new airports (King Shaka) and the expansion of the existing airports (OR Tambo) in order to provide a possibility for more people to fly. The hosting of FIFA Soccer World Cup event in South Africa has also led to rigorous infrastructure development in the period prior to kick-off of the event. This event has also resulted in the rise in transport demand of different modes of travel, including air transport demand (Demirsoy, 2012).

The total number of domestic passengers in South African borders increased from 1.5 million in 1970 to 16.8 million in 2010. This is reflected in Figure 2.6 below. The Figure shows a continuing rise in the demand for domestic air passengers in South Africa from 1970 to 2010. This trend is a testimony that air transport demand will continue to rise in future as more and more people are willing to fly given the increase in economic activities of the country and further increase in population, the income per capita of the citizens as well as other socio-economic factors (IATA, 2011).

Figure 2.6: Total domestic air passenger movements from 1971 to 2012



Data Source: IATA, 2012

2.5.1.2. Total Value of Domestic Airfreight

The value of airfreight transported in South African borders increased from R 56.8 million in 1970 to R 1.1 billion in 2010. This is depicted in Figure 2.7 below:

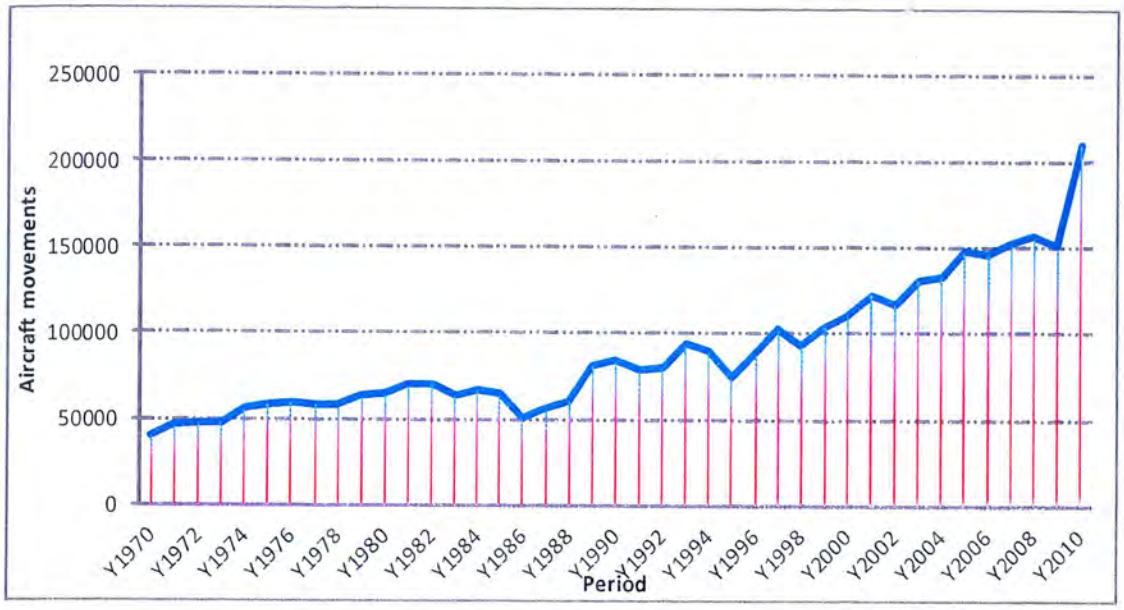
Figure 2.7: Domestic airfreight value in South Africa

Data Source: IATA, 2011

2.5.1.3. Total Domestic Air Traffic Movements

The total domestic air traffic movements also increased over the years, from in 38 900 carriers in 1970 to 210 296 carriers in 2010 as depicted in Figure 2.8 below (ACSA, 2011).

Figure 2.8: Total air traffic movements in South Africa



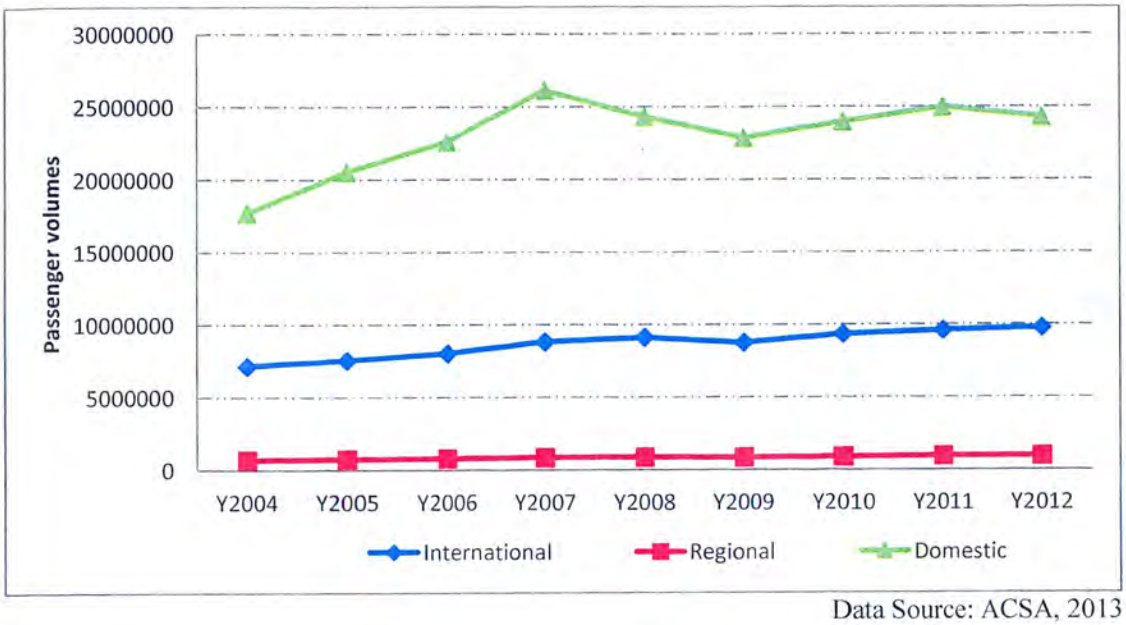
Data Source: IATA, 2011

2.5.4. Total movements in ACSA controlled airports

2.5.4.1. Total passengers in ACSA controlled airports

The total number of passengers using ACSA controlled airports for a nine year period spanning from 2004 to 2012 is depicted in Figure 2.9. The largest share of air passenger movements goes to international travel, followed by domestic and few regional trips. The number of air transport trips increased steadily since 1994, after the first democratic elections in South Africa, up until 2007. The total air transport demand travel dropped significantly between 2008 and 2009 due to global economic crisis. A peak was realised towards 2010. This may be attributed to the 2010 FIFA Soccer World Cup hosted by South Africa (ACSA, 2013).

Figure 2.9: Total passenger movements: International, Regional and Domestic



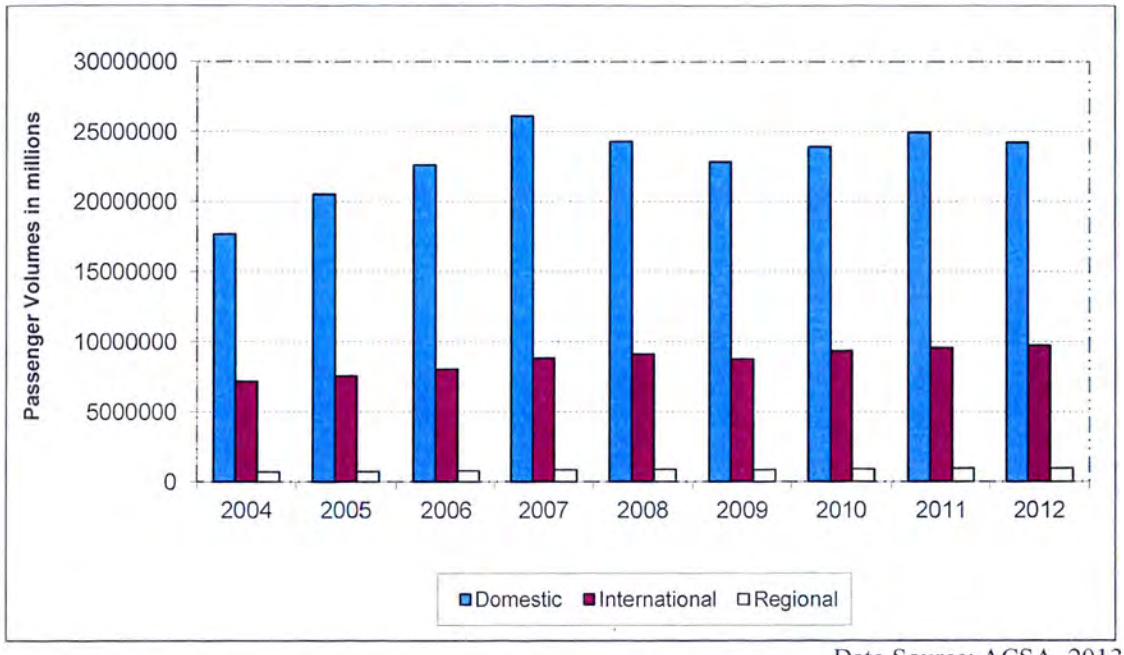
Data Source: ACSA, 2013

2.5.4.2. Aircraft movements in ACSA controlled airports

Aircraft movements comprising of international, regional and domestic arrangements are presented in Figure 2.10. The figure shows that unlike passenger volumes which are high in the international markets and lower in domestic markets; high number of aircraft movements is experienced in the domestic markets than in international markets. This may be attributed to the fact that larger aircraft are used more in the international markets than in the domestic markets and their ability to carry large number of passengers. Figure 2.10 also indicates that in aircraft movements went up drastically since 2004 until it reached a maximum peak in 2007 and then began to slow down due to

the global economic meltdown. However the movements gained a momentum towards 2010 due to the 2010 FIFA Soccer World Cup.

Figure 2.10: Aircraft movements in ACSA controlled airports: International, Regional and Domestic



Data Source: ACSA, 2013

2.5.4.3. Airfreight movements in ACSA controlled airports

Table 2.2 depicts the volume of freight moved at each of the airports managed by ACSA for the year ending September 2006.

Table 2.2: Airfreight tonnage movements by 2006

Airport	2006 (metric tons)
OR Tambo International	321 219
Cape Town International	Not available
Durban International	18 253

Port Elizabeth	8 562
East London	1 590
George	1 220
Bloemfontein	844
Kimberley	180
Upington	1 022
TOTAL	**352 890**

Source: University of Johannesburg, 2008

The above table indicates that a larger portion of air freight was transported by OR Tambo International Airport in 2006 followed by Durban International and Port Elizabeth airport respectively. Unfortunately, data was not available regarding the freight volumes transported by Cape Town International Airport.

2.6. ECONOMICS OF AIRPORTS

Airports play a significant role as enablers of economic and social activities. They play a greater role in economic growth and development of the region, globalisation, connecting cities and countries. Airports form a major part of a country's infrastructure and foster economic activities by encouraging international commerce and tourism as well as generating employment (University of Johannesburg, 2008).

Airports support employment generation. Direct employment opportunities include workers from the construction sector when the airport is being built. Once the airport is operational, personnel is required for a range of services, including airport operations and management, aircraft maintenance, storage facilities, charter services and leasing activities. They offer increased accessibility, which in turn catalyses the tourism sectors. An increase in the number of visitors and airport users in turn results in more money flowing to the local economy (Economywatch, 2010).

The increased economic activity and employment on the other hand, cause change in the consumer behaviour, raising the standard of living of people in the region. Thus, the availability of airports provides a thrust to the gross domestic product (GDP) of the local economy, having a positive impact on the national economy (University of Johannesburg, 2008).

Airports play a fundamental role in the tourism and business travel sectors of the economy. They provide a vital links to other modes of transport and they link cities and regions on a national and international basis. Hub airports such as OR Tambo International Airport (ORTIA) are fundamental to the effective functioning of passenger travel on national, regional and international basis (University of Johannesburg, 2008).

2.6.1. Contribution of ACSA controlled Airports to the South African Economy

In South Africa, Airports Company South Africa Limited (ACSA) was established in 1993, under the Companies Act of 1973 as amended and the Airports Act of 1993 as amended. ACSA was formed to take over the ownership and operation of nine principal airports, including the three major international airports of OR Tambo, Cape Town and Durban (now King Shaka). Since 1993, ACSA has transformed from a fragmented, capital intensive parastatal into a focused, profitable and commercial enterprise that is market-driven and customer service oriented. In 1998, Pilanesburg international airport was added into the list of ACSA controlled airport with the concession of 30 years. This move was made in order for ACSA to manage the influx of tourists through this airport (ACSA, 2006).

ACSA manages nine state airports on behalf of the Department of Transport and has an agreement to manage Pilanesburg airport in the North West Province. The following Table 2.3 depicts the airports that are managed by ACSA.

Table 2.3: ACSA managed Airports

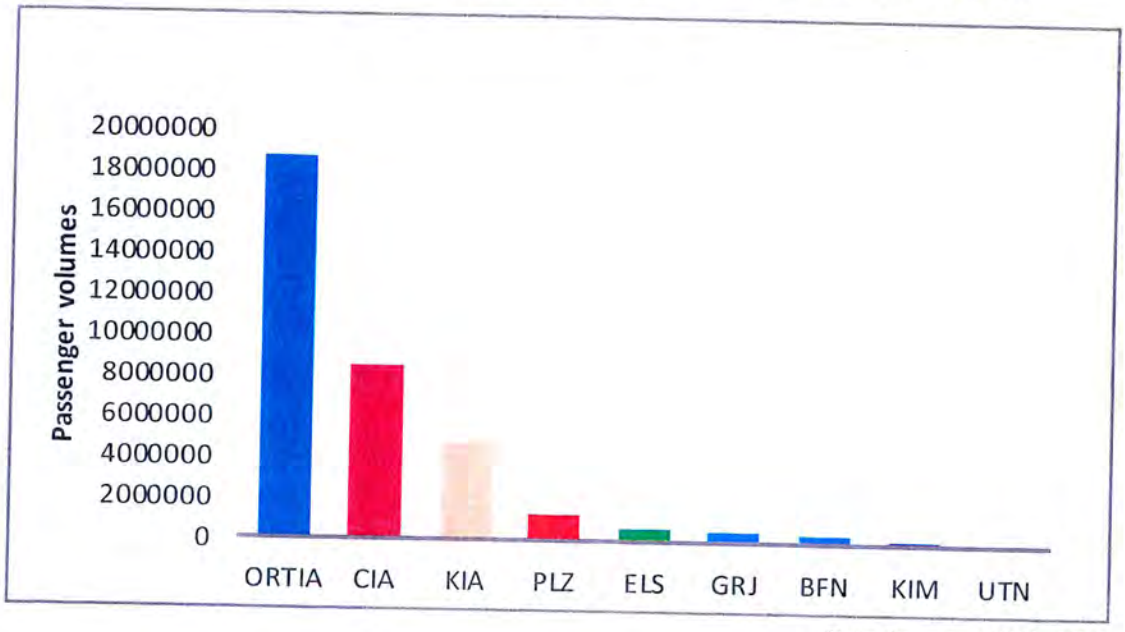
NATIONAL AIRPORTS	INTERNATIONAL AIRPORTS
Port Elizabeth	O.R. Tambo
East London	Cape Town
George	King Shaka
Bloemfontein	Pilanesburg (contractual agreement which
Kimberly	since lapsed)
Upington	

Source: University of Johannesburg, 2008

ACSA's network of 9 airports[1] continues to play a dominant role in the South African aviation industry, handling over 98 per cent of the country's commercial air traffic (University of Johannesburg, 2008). The passenger enplanement carried through these airports is shown in Figure 2.11 below:

[1] Pilanesburg International was not operational during the time of writing this document

Figure 2.11: Total Passenger Enplanement at ACSA controlled Airports



Data Source: ACSA, 2013

In 2012 calendar year, this airport network processed more than 35 million departures and arrivals as well as more than 500 aircraft landing from all destinations, connecting Africa with all other continents (ACSA, 2013). These is far below the estimated passenger and air traffic movements of 44.4 million and more 600 aircraft movements forecast for 2012 (University of Johannesburg, 2008). Figure 2.11 indicates that OR Tambo handles a larger share of passenger with almost 19 million passengers, followed by Cape Town and Durban with approximately 9 million and 4.8 million passengers, respectively (ACSA, 2013).

OR Tambo International airport is very important in South Africa in terms of passengers and freight handled as well as air traffic movements. The study conducted by the University of Johannesburg on the economic impact of the

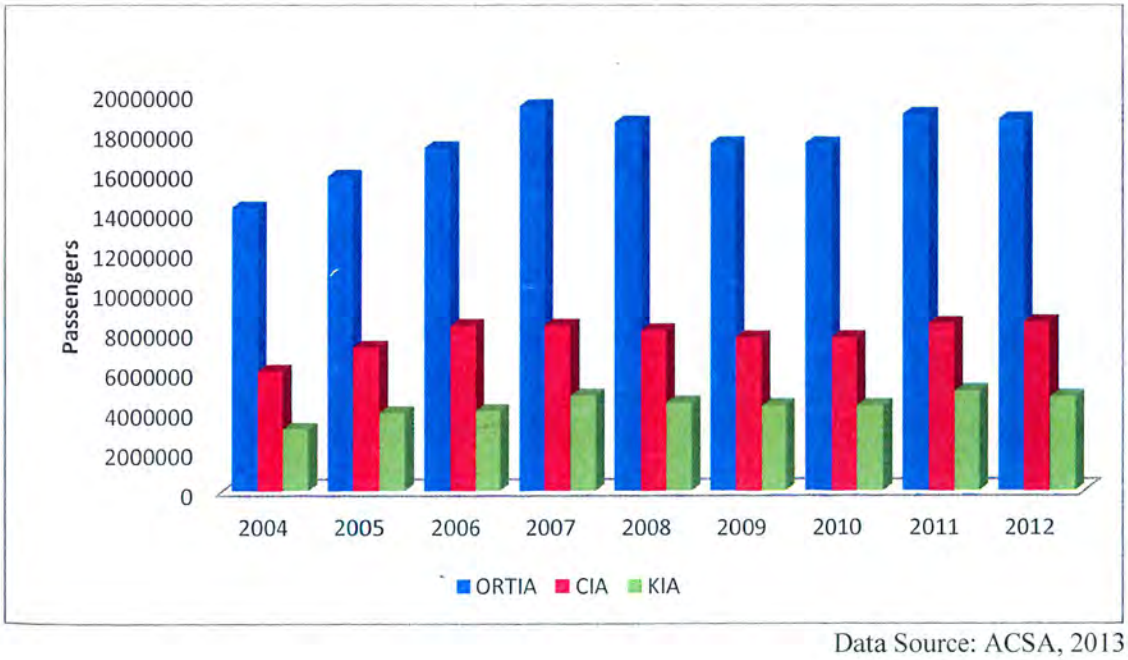
three major international airports indicates that OR Tambo International Airport ranks the second in terms of the international passenger movements in Africa (after Cairo). However, it ranks first in terms of total passenger movements (international, regional and domestic combined), international airfreight volumes and air traffic movements. ORTIA has the largest range of technical support which makes it the "hub" airport in South Africa and the SADC region. It is also the main airfreight hub in the country with more than 90 per cent of the value of international airfreight in and out of South Africa (University of Johannesburg, 2008).

Cape Town International Airport is the second largest airport in South Africa in terms of passengers and freight handles as well as air traffic movements. Cape Town and its surrounding areas have become a leading tourism area due to its desirable geographic location and good trade conditions. Passenger numbers in Cape Town International Airport have increase in the past decade and this growth is expected to continue in the future. Cape Town International Airport (CIA) in the other hand is growing in importance in the international, regional and domestic market. It plays a critical role in supporting the Western Cape region as a preferred international tourism destination (ACSA, 2013).

King Shaka is the third largest in South Africa and services major industrial and tourism hubs in KwaZulu-Natal province (ACSA, 2013).

Figure 2.12 shows the market share of air transport passengers amongst the three major international airports. This Figure confirms that OR Tambo International Airport has the largest passenger market share, followed by Cape Town International Airport and King Shaka International Airport, respectively (ACSA, 2013). This trend has been like that for the past nine years (2004 – 2012). It is envisaged that these three airports will continue to dominate the South African air travel demand market. Given the infrastructure investments in these airports, these trends might continue in the continent and ultimately compete for market shares in the global aviation markets (ACSA, 2006).

Figure 2.12: Passenger Enplanements in South Africa's Major International Airports



Data Source: ACSA, 2013

2.6.2. The economic impact of South Africa's three major international airports: ORTIA, CIA and KIA

The impact study conducted by the University of Johannesburg in 2008 found that the three airports collectively contributed an estimated R 189 billion to the South African GDP. ORTIA's share of contribution was equal to approximated 50 per cent, while CIA's share was 32 per cent and KIA had 13 per cent. The combined employment impact of the three airports was estimated at 429 662 employment opportunities, with ORTIA leading with a 57.9 per cent contribution. The combined direct and indirect employment effect of the three airports is approximately 33 726 direct, on-airport employment opportunities, 395 936 indirect employment opportunities, implying a multiplier effect of 11.7. This implies that, for every direct employment opportunity created at any of these airports, another 11.7 jobs are created in the economies of the associated provinces. The three airports also contribute an estimated R 14.1 billion towards the fiscus through taxation. This represents almost 4.5 per cent of the total tax revenue in South Africa (University of Johannesburg, 2008).

2.7. AIR TRANSPORT DEMAND

Demand is defined as the various units of a particular product or service that consumer are willing and able to purchase at specified time period under specific condition (Wensveen, 2012). The demand function is a statement of a

relationship between quantity demanded and the factors which affect this quantity. The function is usually expressed in the form (Aderamo, 2010):

$$D = a_0 + a_1 x_1 + a_2 x_2 + a_3 x_3 \ldots\ldots\ldots\ldots\ldots\ldots\ldots + a_n x_n$$

This is a multiple regression equation;

where

D = quantity demanded (dependent variable)

$x_1, x_2, x_3, \ldots\ldots\ldots\ldots x_n$ = independent variables influencing demand

$a_1, a_2, a_3, \ldots\ldots\ldots\ldots a_n$ = parameters

a_0 = Intercept

This is a linear function which depicts demand relationships and which can be easily solved by using a method of least squares (Aderamo, 2010).

Another commonly used model for demand relationship is the power function. This takes the form:

$$D = a_0 x_1^{a_1} x_2^{a_2} x_3^{a_2} \ldots\ldots\ldots\ldots\ldots\ldots x_n^{a_n}$$

This model assumes that the marginal effects of each variable on demand are not constant but depend on both the value of the variable and the values of all other variables in the demand function. The parameter of the power function

may also be estimated by the method of least squares by first transforming the equation into a linear relationship by using logarithms.

Taking logarithms of the power function, we obtain:

$$Log\ D = log + a_1\ logx_1 + a_2\ logx_2 + a_3\ logx_3 \ldots\ldots\ldots\ldots\ldots\ldots\ldots + a_n logx_n$$

A multiplicative demand function such as this also has constant elasticities over the complete range of values and these elasticities are given by the parameters$a_1, a_2, a_3, \ldots\ldots\ldots\ldots a_n$, which are estimated by regression analysis (Aderamo, 2010).

2.7.1. Forecasting of Air Transport Demand

Demand is an economic principle that describes a consumer's desire, willingness and ability to pay a price for a specific good or service. Demand is therefore defined as the various amounts of a product or service that consumers are willing and able to purchase at various prices over a particular time period (Mohr, Fourie and Associates, 2009).

Forecast of air travel demand is an important input for a wide variety of economic decisions including but not limited to research and development, airplane design, airport planning and production planning. For a relatively mature product such as air transport demand where interest lies in aggregate demand, the typical empirical practice is to obtain a national level forecast using

aggregate level data when individual market data are not easily accessible (Carson, Cenesizoglou and Parker, 2010).

Air transport demand refers to the amount of air travel that people would choose under specific conditions. This report describes concepts related to transport demand, investigates the influence that factors such as prices, economic activities, population, income and service quality have on air travel activity, and how these impacts can be measured and used to forecast the future air transport demand (Vasigh, Fleming and Tacker, 2012).

People normally travel to fulfil business obligations, for leisure, for other personal reasons, or for some combination thereof. Air travel is not significantly different from other modes of intercity travel, but it is inherently unique in many other ways. One principal difference between air and ground inter-city travel modes relates to the traveller's perception of time involved in travel and restrictions on the traveller's desire to select a route, a carrier, a transport mode to reach final destination, in addition to safety, cost, convenience, and accessibility to the traveller (Kwakkel, Walker and Marchau, 2010).

Forecasting refers to estimation of the expected value of dependent variable for observations that are not part of the same data set (Aderamo, 2010). It is the attempt to quantify demand in future time period. Quantification can be in terms of Rands, such as revenue, or some physical volumes such as revenue passenger kilometres (RPKs) or passenger enplanements. Forecasting is predicting,

projecting, or estimating some future volumes or financial situation – aspects that are mostly outside the control of the management's control (Wensveen, 2012).

Forecasts of aviation demand are the key elements in all airport planning activities. They provide a basis for determining the type, size and timing of aviation facility development. As a result, forecasts influences almost all stages in the planning process (Johnson, 2008)

There is no way that a transport organisation or business can operate successfully unless there is a demand for its services. The estimation of expected future demands is a key element in planning transport operations. However, there is a need to understand the factors that influence aviation demand before forecasting can be carried to that effect (Aderamo, 2010).

Air transport demand forecasting in developing countries is needed for a variety of reasons, but also presents unique challenges. As in developed nations, most of the requirements for forecasting aviation demand are related to identifying infrastructure requirements such as airports, ground aids, and air traffic management (Bostrom, 2002).

The aviation industry operates in a fast changing environment. At the end of 1970's, the air transport industry was liberalised and privatised in the United States of America, with other countries following thereafter. As the world air

travel industry has matured after undergoing phases of growth, regulation, deregulation, consolidation, globalisation, and liberalisation, the industry has matured and stabilised in terms of basic structure, operating characteristics, underlying economic forces driving the market, and the interrelationships with the socioeconomic environment within which it exists and functions. Air travel industry has long become the backbone and vital link of interstate culture and commerce regionally, nationally and internationally (Chin, 2002).

Airport planning begins with a definition of the aviation demand that may reasonably be expected to occur during the useful life of its key components. The development of aviation demand forecasts proceeds through both analytical and judgemental process. A series of mathematical relationships is tested to establish statistical logic and rationale for projected air transport demand growth. However, the judgement of the forecast analyst, based on professional experience, knowledge of aviation industry, and assessment of the local situation, is important in the final determination of the preferred forecast (Kwakkel et al, 2010).

Air travel demand relates primarily to certain basic economic, demographic, behavioural, and market factors that provide people and business with the means to travel and connect with the outside. It is simply the outcome of supply of people with motivation to travel, who have resources of time and money, utilising a transport infrastructure that fulfils their requirements to travel at the

time, location, and cost they desire. During each phase of the industry, the rationale and methodology to forecast demand for air travel would be unique and distinct (Chin, 2002).

A number of organisations, aircraft manufactures and agencies such as Airports Company South Africa (ACSA), International Civil Aviation Organisation (ICAO), Air Traffic and Navigational Services, Airbus and Boeing have provided forecasts of how the see aviation growing in the future (Gillen, 2009).

Studies of aviation activities are established to assist airport operators and other bodies involved in the development of aviation facilities to properly plan for the distribution of limited financial resources to enable the highest return on investment. The forecasts provide the foundation to ascertain the required facilities to meet future demand (MassDOT, 2010).

Forecasting the future demand for air transportation and understanding factors that are determining it, is crucial in the aviation sector to form transport policies. With the help of in-depth analysis of the key determinants, airlines and airports can develop their market strategy in order to increase the demand for their enterprise. They can decide whether to expand their fleet and flight network according to the demand forecasts, while airports use forecasts to decide if further capacity increase is necessary and profitable. In case of

misleading forecast airlines and airports may suffer severe financial problems or even go bankruptcy (Aderamo, 2010).

The underlying assumption in all forecasts is the strong correlation between demand and determining factors that are derived from historical data, and this correlation is applicable for the forecasting horizon. Expected future demand environments expressed as forecasts of such factors as airfare levels, airline service, gross national product, and so on, are all inputs to the forecasting process (Kennon, 2002a).

Each type of forecast serves a unique purpose. For instance, an airline might make a short-term forecast of total passenger enplanements between particular pair cities to provide a basis for determining station personnel and ground equipment needed and expenses related to such items. *Short-term forecasts* normally span a period of 1 month to 1 year. *Medium-term forecasts* generally span for a period of 1 to 5 years. On the other hand, a *long-term forecast* spans a period of 5 to 10 years (Wensveen, 2012).

2.7.3. Determinants of Air Transport Demand

There are various factors affecting the air transport demand. These drivers of air transport demand may differ for each country. Each factor is composed of elements that stimulate or constrain air transport demand growth (Abed, Ba-Fail and Jasimuddin, 2001). It may depend not only on the country's economic and

social background or geographic location and size, but also on some important aspects like economic downturn or liberalisation that could decrease or increase the air transport demand (Demisroy, 2012).

The drivers (factors) of air transport demand may be conveniently classified into two broad groups, i.e., external and internal factors. Thus, internal factors are those factors within the air transport industry itself while external factors are outside the control of the air transport industry. Internal factors mainly comprise of airfares and quality of service provided. External factors basically include long-range factors economic, social, demographic and political trends such as age, income, population, ethnic and cultural ties to other national, and the international trade. There are also short ranges or short term conditions such as inflation, interest rates and currency exchange rates can have a strong effect on the growth potential of air transport demand (Vasigh et al, 2012).

Amongst factors influencing demand for air transport demand as mentioned in many studies, the following factors are very important to mention:

- Basic quantitative indicators such as population, gross domestic product (GDP), activity of certain sectors of the economy, personal consumption expenditures and or retail sales;
- Derived socioeconomic and psychological indexes such as propensity to travel, frequency of service, personal income, employment categories, educational levels, customer loyalty, availability of other transport modes,

in-flight amenities, safety, aircraft characteristics (size, speed, and operating costs), schedule frequency, or structure of air carrier industry, random effects such as SARS[2], terrorism attacks and recession (Bluestone, Glover, McGrath and Schauffler, 2010).

In the study by Domirsoy (2012), the definition of air transport demand determinants is stated as "*Determinants are factors which make it possible for people to travel and increase the number of travels taken by individual*". However, thus definition is not complete because determinants can also affect air transport demand in a negative way. Therefore the correct definition for this study would be "*Determinants are factors which it possible or unbearable for people to travel and boosts or knocks the number of travels taken by each individual*" (Demirsoy, 2012). The potential determinants of air transport demand are presented in Table 2.4:

[2] Severe Acute Respiratory Syndrome

Table 2.4: Determinants of Air Transport Demand

Economic	Geographic	Demographic	Market Structure	Social	Maturity
• GDP • Income • Expenditure • Airfares • Inflation • Jet-fuel prices	• Size of the country • Topographic structure	• Population • Urbanization	• Liberalization Level • Business model • Alternative Modes • International Trade	• Perception • Education • Immigration	• Income Elasticity • Price Elasticity • Cross Price Elasticity

Source: Demirsoy, 2012

Extensive literature review helps to form the determinants of the air transport demand under five main topics. These main factors of air travel demand may be grouped as follows (Demirsoy, 2012):

- Economic Factors
- Geographic and Demographic Factors
- Market Structure
- Social Factors
- Maturity

All the above-mentioned factors recapitulate different agents affecting air transport demand. Economic factors are one of the most influential drivers for air transport demand and factors such as income, expenditure, airfares and inflation can be listed in this category. Geographic and demographic factors stimulating air travel demand are population, size of the country, topographic structure of land, and urbanization level. Regulated or deregulated markets and the business models of airlines can be mentioned as components of market structure. Social factors include such factors as psychological perception of public –e.g. unfamiliarity to flying, education, and immigration. Lastly, maturity is a key notion that is determining the relation and magnitude of the relation between determinants and the air transport demand. In-depth analysis of these factors is conducted in the following sections.

2.7.3.1. Economic Factors

This part explains the main economic factors and their interaction with air transport demand. Economic activity (mainly GDP), income, and airfares are the components of the economic factors (Demirsoy, 2012).

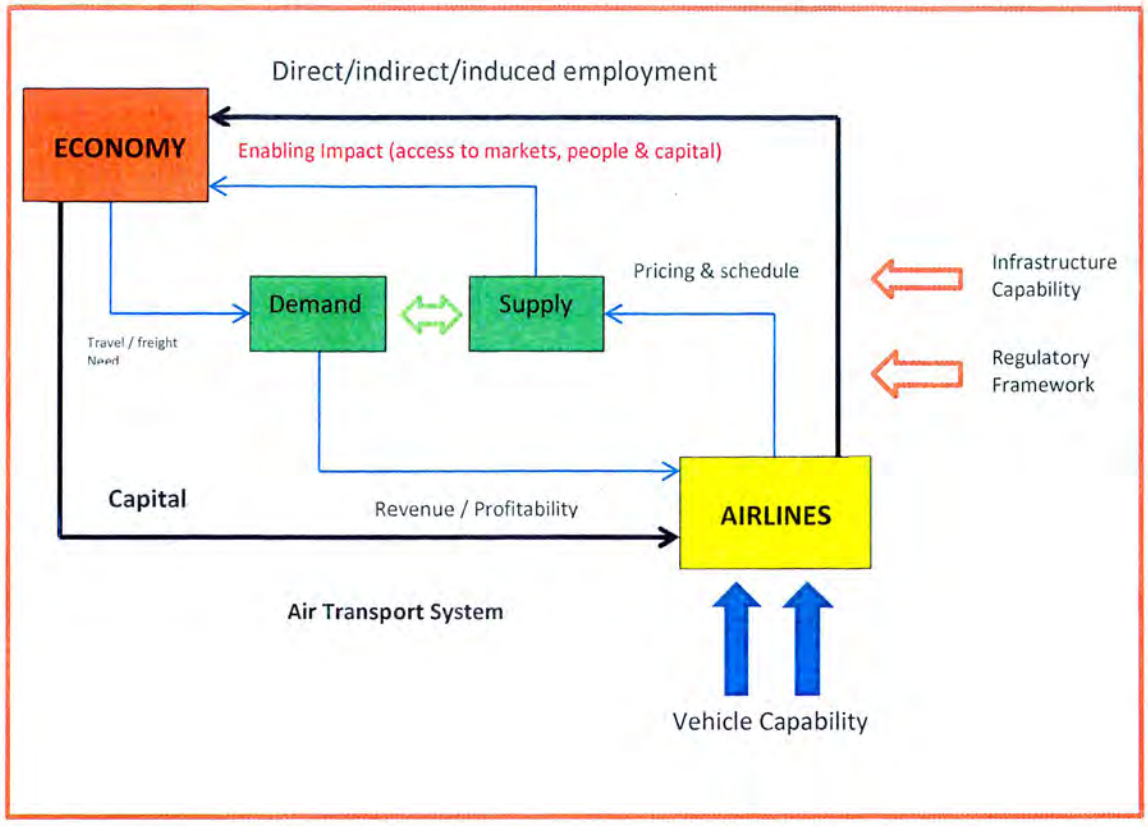
2.7.3.1.1. Economic Activity

The growth in air traffic is accelerated by the increase in economic activities (Chin, 2002). Air transportation generates an economic activity by creating employment and by its enabling effect. Enabling effect is defined by Ishutkina

and Hansman (2008) as quoted by Domirsoy (2012) as "*The total economic impact on employment and income generated by the economic activities which are dependent on the availability of air transportation services*". Air transportation enables access: to markets, to people, to capital, to ideas, to knowledge, to labour supply, to skills and to opportunity and resources (Domirsoy, 2012).

Air transport and economic activity are interconnected and have spontaneous effect on one another. Thus these economic activities are somewhat stimulated by air transport, and they, in turn, generate demand for air transport services. Air transport makes markets and people closer; it also secures significant part of country's GDP (Boeing, 2011). Consequently, there is a mutual relationship (correlation) between economic activities and air transportation. For example, Marazzo, Schere and Fernandes (2010) found interaction between GDP and passenger number although reaction times to the changes are different. The interaction between air transport and economic activity can be explained in Figure 2.13.

Figure 2.13: Interaction between Economy and Air Transportation



Source: Ishutkina & Hansman, 2008

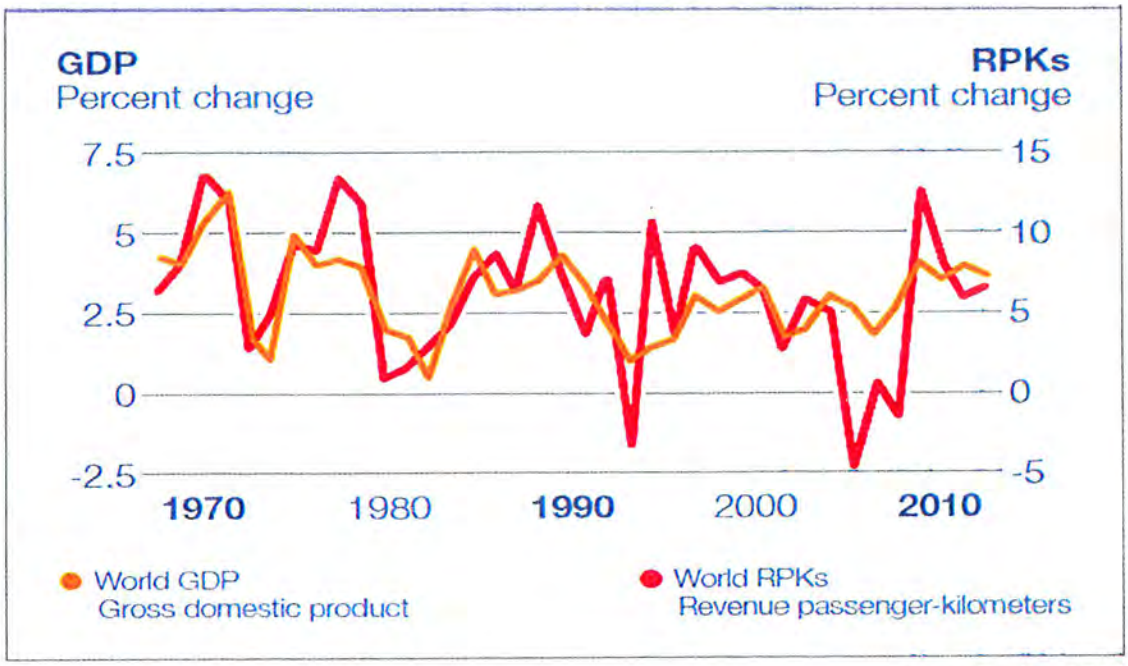
Figure 2.13 indicates that airlines, airports and related services create direct and indirect employment for economy. Moreover, the services that are supplied by air transport firms enable economic activities. In return the economy provides capital and demand for the air transport firms. Power of this relationship is determined by exogenous factors such as infrastructure capability, regulatory framework, aircraft sizes and reliability (Domirsoy, 2012).

Demirsoy (2012) agrees that growing regional economic activity increases the demand for air transportation in that region. For example, in the United

State O & D (Origin and destination) interstate market, they established that the increases in GSP (Gross State Product) by 1 % affected O & D demand by 0.75 % and 0.95 % positively in two different regressions. Therefore, the US is regarded as one of the most mature air transport markets (Bhadra and Wells, 2005).

Conversely, demand reaction to the GDP (or GSP) changes is expected to be higher in the developing or emerging countries (regions). In other words, in the developing regions economic growth (GDP) is playing a more influential role in increasing air transport demand (Domirsoy, 2012). According to Bhadra (2003), there is likelihood that GDP will positively influence the demand for air transport. In similar vein, the study conducted by Aderamo (2010) confirms that there is high positive correlation between air transport demand and gross domestic product (GDP). Figure 2.14 shows a close relationship between World GDP and air transport passenger demand presented as Revenue Passenger Kilometres (RPKs) between 1970 and 2010, as shown below:

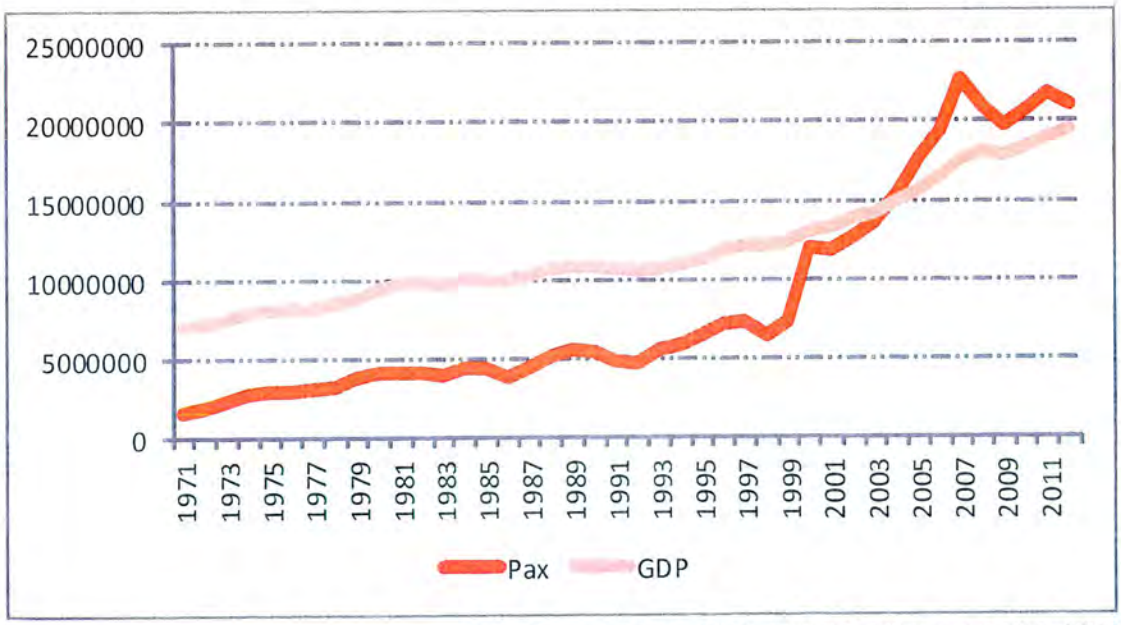
Figure 2.14: Relationship between GDP and air transport passenger demand



Source: Boeing, 2011

The relationship between GDP and air passenger demand in a South African context is also presented in Figure 2.15 below:

Figure 2.15: Relationship between GDP and air transport passenger demand



Data Source: SARB, 2013, StatsSA, 2013 and ACSA, 2012

Figure 2.15 shows that there is positive relationship between the world GDP and air transport passenger demand. The relationship is shown by a similar trends followed by the two variables. The figure also shows that the aviation sector is highly characterised by the dynamic growth.

In similar breath, interest rates and exchange rates may have a strong influence on growth of passenger demand but only in short-term. Exchange rates can be valid determinants of air transport demand but mainly in international routes. If one country's currency is valued stronger in comparison to another currency, then this country's citizens can buy more foreign currency than before with the same amount of money. This provides relatively cheaper prices for this country's citizens and may increase the desire to go to that country where the prices are cheaper than before. For example, if South African citizens can get more local currency of other country with the same amount of Rands (R) than their desire to travel to that country would increase (Domirsoy, 2012).

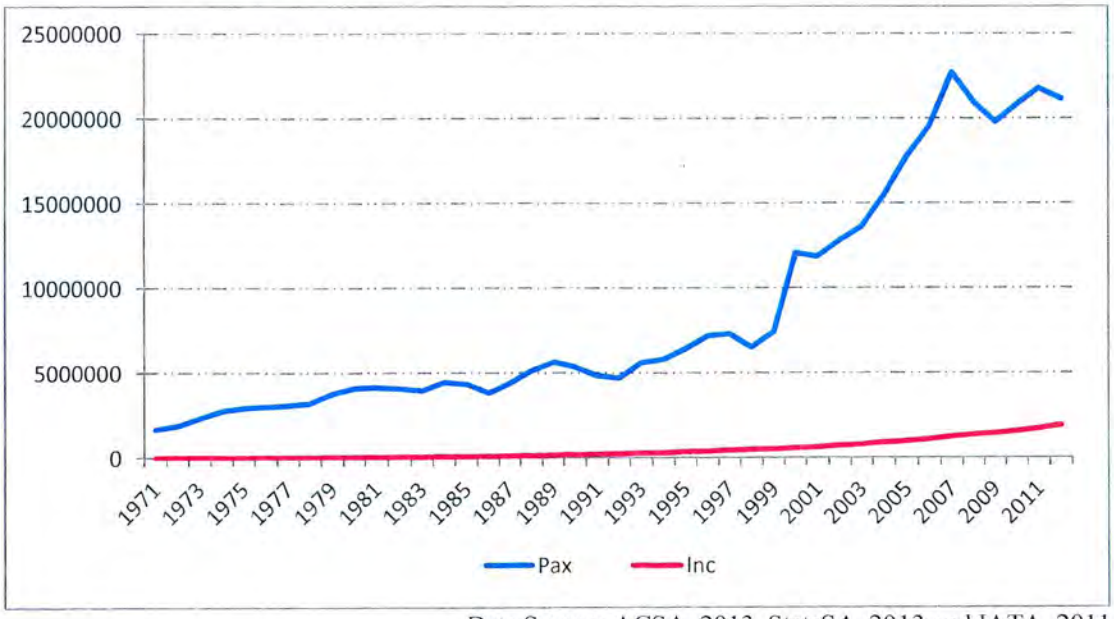
2.7.3.1.2. Income

Income refers to an amount of money or its equivalent received during a period of time in exchange for labour or services, from the sale of goods or property, or as profit from financial investments (Farlex, 2013). In economics, income is measured by using Gross National Income (GNI). GNI is obtained by subtracting all income earned by foreign-owned factors of production in South

Africa from the GDP. In addition, all income earned by South African factors of production in the rest of the world has to be taken into account (Mohr, 2013). However, in other cases, GDP is referred to as an alternative measure of income together with disposable income and consumer expenditure. For instance, UK CAA (Civil Aviation Authority) uses consumer expenditure as the main determinant of long-term air transport demand. Assuming that time and income shares allocated to travel are constant over time and space, when the individuals' incomes increase, they do not raise the proportion of expenditures for transportation, but along with the income increase their budget for the transportation expenses automatically grows (Ba-Fail et al, 2000). Thus, air transportation is becoming more desirable once higher income levels are achieved by individuals, prompting them to shift from slower and cheaper means of transport to the faster ones like air travel (Ishutkina & Hansman, 2008). Because of their direct relations, GDP and per capita income may not exist together as explanatory variables in the same model (Ba-Fail et al, 2000).

Air transportation demand changes moves together with income growth. The disaggregate approach shows that lower income groups would have low participation in air travel, while middle income groups represent high growth, but higher income groups reflect the maturity in the air transport (Domirsoy, 2012). In South Africa with lower incomes groups, the relationship between income and air transport demand is presented in Figure 2.16.

Figure 2.16: Income and air passenger growth relation in South Africa from 1971 to 2012



Data Source: ACSA, 2013, StatsSA, 2013 and IATA, 2011

Figure 2.16 above shows that there is a positive relationship between income and passenger demand. Rising incomes have led to an increase in demand for air transport travel demand for leisure trips (Chin, 2002). Thus, more people will be willing to travel as and when their income rises and the opposite also hold. Alternatively, wealth can be a determinant of air transport demand. The authors use financial and non-financial assets as determinants of wealth to understand air transport demand changes. However, wealth can be assumed as an accumulative sum of income of the individuals, which can lead to biased results (Domirsoy, 2012).

2.7.3.1.3. Airfares

Pricing remains a very complex issue in the demand of many products and services for various industries. It has been even more complex in the air transport industry since the transition of market regulation to a deregulated environment. A fundamental characteristic of demand is that when the price decreases, the corresponding quantity demanded increases and the vice-versa. Thus, there is an inverse or negative relationship between price and the demand for service or product. Hence, people will ordinarily fly more at lower air ticket prices and less at higher prices. For example, at higher prices, passenger will rather drive instead of flying and business people will choose telephone conference calls (Wensveen, 2012).

Airfares and prices of alternative modes of transportation are crucial determinants for air transport demand (Domirsoy, 2012). For example: an increase in the price of South African Airways (SAA)'s competitor, *ceteris paribus*[3], will normally drive some passengers to switch to SAA. This is referred to as a substitution effect (Wensveen, 2012).

Air fares are assumed to move in line with airline costs such as fuel and non-fuel costs (tax and environmental cost elements). Fuel costs are driven by fuel price and fuel efficiency. Thus, airfares may be raised by the cost of purchasing

[3] All other things being equal (Wensveen, 2012)

an aircraft by an airline, the increase in fuel costs and other non - fuel costs (DfT, 2011).

The growth in air traffic is accelerated by the falling price of air transport. Falling airfares have led to an increase in demand for air transport travel demand for leisure trips (Chin, 2002). However, leisure travellers are more sensitive to price changes, however, for business travellers - prices are considerably less significant aspect. Some alternative parameters may be mentioned instead of airfares because generally it is hard to come by average airfares for specific countries (Domirsoy, 2012).

Furthermore, previous research show that deregulation have generally positive effect on air transport demand by enabling lower cost carriers (Kulula.com, Comair and Mango) and stronger competition in the market. Thus, passenger demand for air transportation has a tendency to increase with the introduction of Low Cost Airlines (Domirsoy, 2012).

As Alperovich and Machnes (1994) suggest, aggregate CPI or CPI of transport, storage and communication sector can be used as an alternative variable to overcome problems arising from obtaining data about airfares. Economic theory suggests negative relationship between price and demand for the most of the goods and services (Alperovich et al, 1994). However, especially for the last decade overall inflation rates are more likely to have positive relation with demand rather than negative. Liberalization trend (or

deregulations) and consequent emergence of LCC made a declining impact on airfares, which affect significance and sign of the inflation coefficient conversely (Domirsoy, 2012). The consumer price index will be used to imitate the airfares in South African air transport industry (Alperovich et al, 1994).

Hence, the trend or change in consumer price index (airfaires) presented in Figure 2.17 below:

Figure 2.17: Consumer Price Index as representation of airfares

Data Source: StatsSA, 2013

The consumer price index above indicates an increasing trend over the years 1971 until 2012. Since there is a negative relationship between the airfares and passenger demand, we would expect this increase to decrease the level of air tickets purchase.

2.7.3.1.4. Geographic and Demographic Factors

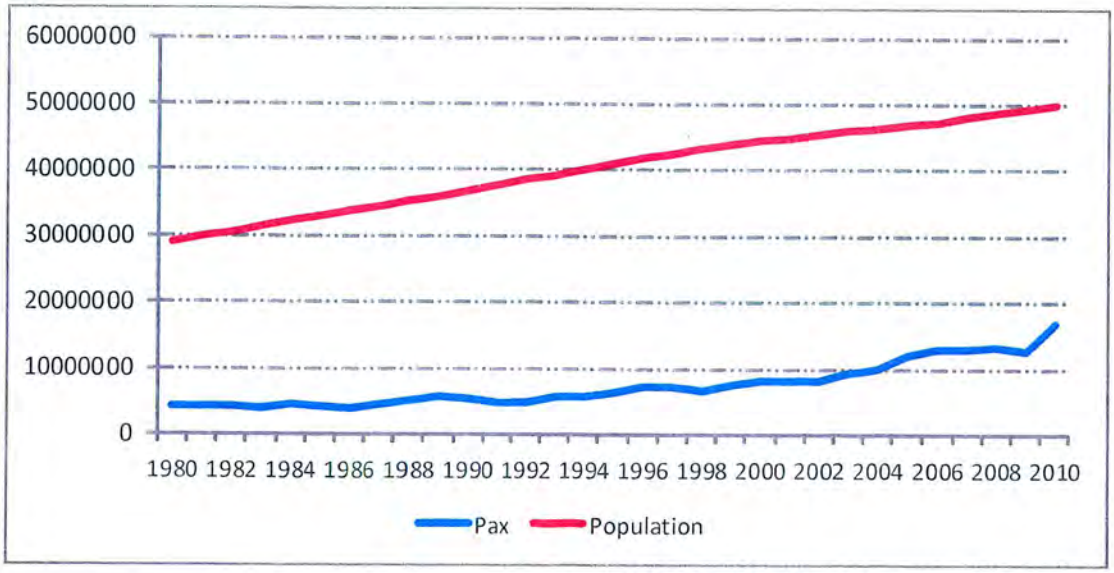
Demographic size and distribution, as well as geographic conditions of the land are amongst other factors effecting air transport demand. These factors are studied and their effects to the demand of air transport are explained in the following subsections.

2.7.3.1.4.1. Demographic Factors

Demographic factors are second most important features that are influencing air transport demand following the economic factors. These mainly comprise of population size and the rate of urbanisation (Demirsoy, 2012).

With the current world population growth, it is forecasted that 6 billion will double in around 70 years leading to 13 billion inhabitants on earth. This population growth will result in an increase growth for the air transport demand. Thus, air passenger demand is positively correlated to a region's population (Chin, 2002). The population trend presented in Figure 2.18 takes similar pattern of GDP growth presented in Figure 2.1 of this study to indicate a correlation between population's growth and GDP. These two variables are also positively correlated to the passenger demand as depicted in Figures 2.16 and 2.18 of this study.

Figure 2.18: The relationship between population and air passenger demand between 1980 and 2010



Data Source: StatsSA, 2011 & IATA, 2011

Figure 2.18 above indicates that air passenger demand depends on population size. As a result, air transportation demand concentrates on these highly populated and urbanized regions, which is also effecting the location selection of the airports (Bhadra and Wells, 2005).

Globalization has a significant effect on air transportation since it has triggered urbanisation process. Urban areas are accommodating most crucial factors of air transport demand: high and densely populated cities, economic magnitude and necessity of being mobile. There is a relationship between population density and proximity of airports to these densely populated areas. Moreover, due to globalization the urbanisation process has prompted immigration from rural to urban areas (Domirsoy, 2012).

2.7.3.1.4.2. Geographic Conditions

Decisions to provide air transport service depend on factors such as the airport's geographic location with respect to airline networks, and the availability of subsidies. Non-urban markets usually share several characteristics. Except for those satellite communities immediately adjacent to metropolitan areas, their economies are slow growing and they often have declining populations. Household incomes are usually lower than average, and people have a lower propensity to fly even after adjustment for the income differential. Businesses that are dependent on air travel do not locate in these communities and therefore there is little business-related air travel. Those residents who do fly often drive long distances to a larger airport (i.e., OR Tambo international) to take advantage of non-stop flights, higher frequencies, more reliable service, and larger aircraft (Kennon, 2002a).

Various studies relate air transport demand to geographic conditions of countries. Geographic factors such as location, size, and distances play a fundamental role in determining air transportation demand (Ishutkina & Hansman, 2008). Thus, the larger the country the more demands for air travel within that particular country. On the other hand, the countries, which have improved infrastructure of ground transportation, tend to have less than average air transportation per capita (e.g. France). In countries like France, high-speed trains have become an indispensable substitute for the air transportation. Again,

distances in a straight line between cities are not so long in some countries like Norway, for example, but it takes long time to commute by alternative modes like train or road or some regions are not connected to alternative modes (Bhadra and Wells, 2005).

There could be two explanations of this fact – either an inadequate infrastructure of alternative modes or the topographic conditions of the countries. This observation could also be applied to the South African case due to poor infrastructure of railways and poor public transport. These factors increase demand for air transportation. High elevated countries (e.g. mountains in Lesotho) are more likely to have higher per capita air transportation than flat countries (South Africa). Air transportation demand can increase as a result of above-mentioned geographic characteristics of countries (Domirsoy, 2012).

2.7.3.1.5. Market Structure

New business models like LCC, liberalization (Yamoussoukro Declaration), competition and bilateral agreements continue to stimulate air travel demand. All of these are results of deregulations in air transportation sector. Deregulations are the milestone of the aviation industry in many countries, and they trigger the increasing demand for air transport by letting new airlines enter the business (increasing competition) such as low-cost carriers, for example. Furthermore, prices decrease significantly as a result of deregulation and

emerging competition. Consequently, more people are able to afford flying because it is no longer a luxury good (Domirsoy, 2012).

2.7.3.1.6. Social Factors

Air passenger demand is correlated to the motivation of individuals to travel (i.e., their propensity to travel) as well as socioeconomic activities and measures that support travel and the availability of related services and infrastructure (Chin, 2002).

However, social factors are generally very difficult to quantify. Psychological, environmental (from a social perspective), immigration issues and changing lifestyles (habits) are part of social factors. People are taking longer and more holidays than before. Every extra holiday means additional journey where some proportion of it may be travelled by air. Travel patterns are rapidly changing as young people who have grown up in an environment of safe and reliable air travel regard flying as a normal means of extending their social and educational horizons. This shows that social factors can play a vital role in the demand for air transport by increasing desire to fly and quick arrival at their respective destinations. The new generation is living in the age of globalization, so the desire to be mobile is much stronger and the size of the world become smaller because of new technologies, possibilities and new way of thinking. Leisure air transport market is experiencing growth as a result of influence of social factors. For instance, growing desire to travel, increasing international

education and changing family are inducing increasing travel needs of individuals. Average education year of individuals may also affect air travel taken by individuals. Thus, the higher the educational level, the more air travel may be taken by these individuals. One can expect that highly educated societies have higher propensity to fly (Domirsoy, 2012).

Passengers' expectation with regard to future prices may influence the decision to fly; either you fly now or postpone for the next period. For instance, the passenger's expectations that prices will go up in future, will prompt them to buy now (raising demand currently) to beat the anticipated increase in prices. Conversely, expectations of falling future prices will tend decrease the current demand for tickets (Wensveen, 2012).

In similar breath, considerable part of the citizens of urban settlement comes from different locations. This means there is migration from rural to urban areas. In emerging countries there is a strong flow of migration from rural to urban areas; people try to find a better job, to move to areas with higher standard of living. These people usually leave a lot of relatives and friends behind. As a result of this, one can expect that migration plays a considerable role in determining air travel demand, because migrants tend to travel in order to see their hometown, friends and relatives few times a year. Often this type of travellers is called visiting friends and relatives (VFR) travellers. In South Africa, there is continuing influx of foreigner from countries with political

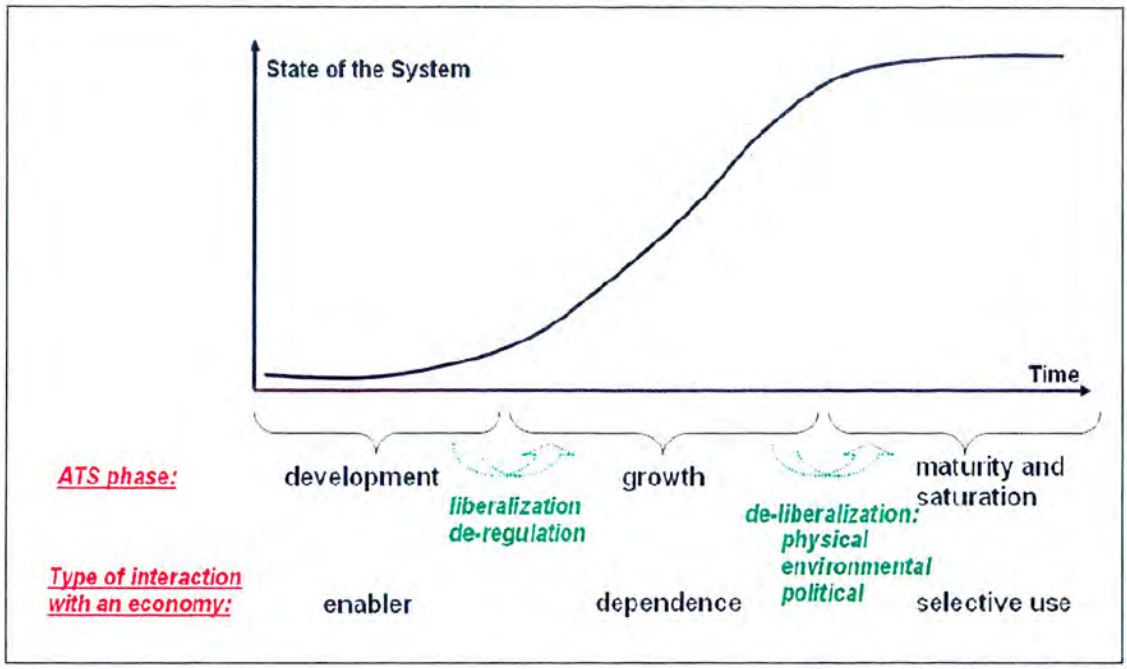
unrests and economic instability such as Nigeria, Zimbabwe, Mozambique, Bangladesh, Mali, Somalia and Egypt (Domirsoy, 2012).

2.7.3.1.7. Maturity in Air Transport Demand

Maturity is a very influential perception in the aviation industry that has been discussed for four decades already; moreover, it is directly related to changes in the air transport demand. Many researchers have noticed the close correlation between air transport growth and economic activity; as a result, air transport maturity is often related with economic growth (Graham, 2000). Maturity is described as a situation in a market whereby the growth of the air transportation sector is less than the GDP or income growth. Graham (2000:112) describes maturity and saturation concept as follows: "*Maturity will be considered to be setting in if there are declining changes in growth whilst saturation could be considered to exist if there is no growth anymore*".

Figure 2.19 shows the growth curve of air transportation. After the development phase in the industry -where in most of the cases there is only one carrier that is publicly owned- like in South Africa, liberalization or deregulations kick off the growth phase in the industry by allowing private companies to provide regular or charter flights within a country and also letting prices be determined by companies themselves without government intervention (Ishutkina et al, 2008).

Figure 2.19: Evolution of the air transportation and its interaction with economic activity



Source: Ishutkina et al, 2008

It is not possible to expect endless growth of air transportation demand, but it is very likely to see an S-shaped growth structure where growth is remarkably fast in the early phase, and then slows down gradually (Ishutkina et al, 2008). These phases could be named as development phase, growth phase and saturation phase. In many cases sudden changes in the S-shaped curve are influenced by changes in regulatory framework such as deregulations and liberalizations (Domirsoy, 2012).

In practice, falling growth rates of the U.S. domestic passenger air transport from 15% in the 1950s to 5% in the 1980's are considered as an indication of market maturity (Graham, 2000); however, in theory there are also other explanations of the decreasing growth rates. One of them is the income

elasticity. Such an approach is used by the United Kingdom Department for Transport to calculate maturity level of the UK air transport market. Income elasticity indicates the response of air transport demand to changes in the individual's incomes. For instance, if the air transportation demand starts to get less sensitive to income changes, in other words, if increases in the income do not cause proportionally higher increases in passenger numbers, then this market is considered as a mature. On the other hand, instead of using airline traffic or passenger numbers as a dependent variable in some cases, revenues are used to determine maturity (Graham, 2000). Essentially all these approaches are using the same fundamental to identify maturity levels by substituting different variables.

Different countries tend to have different air transport growth rates. For instance, some economies have experienced air passenger growth of more than 10 per cent; to mention as an example such countries as Vietnam, United Arab Emirates, China, Chile, and Turkey (Ishutkina & Hansman, 2008), while the growth in other countries has been considerably slower. This is explained with different income elasticity of air transportation demand, in other words these countries are experiencing different phase of S-shaped curve. It is necessary to mention that maturity level within a country also may differ with regard to different markets and different O&D routes (Domirsoy, 2012).

2.8. CONCLUSIONS

The world economy is still struggling to recover from the global economic crisis that hit worldwide economic markets in Europe and other developed economies. The developing countries were also hit hard by the spill-over effects from their developed counterparts. The consequent sovereign debt crisis moves deeper into recession. This further lead to job cuts in many economies. Higher unemployment rates then threatened the demand for many products and service, including the demand for air transport.

Nevertheless, the increase in the world population, coupled with the increased educational level and globalisation have counteracted the decrease in the need to travel by air transport. Thus, there has been a continuing world-wide increase in air transport demand for the past decade. The worldwide air travel demand is expected to grow by 4.8 per cent in 2030.

The South African economy is not immune to the activities of the world economies, hence was also affected by the world economic recession. However, the effects were outweighed by the rigorous infrastructure investments during the period leading to the 2010 FIFA Soccer World Cup hosted by South Africa. This spectacular event has led to an increase in economic activities in South Africa and the world. It gave rise to a need to link South Africa with the outside world, and the general need to travel by air and thus increase demand for air transport in South Africa.

South Africa has also experienced a high population growth and migration, which gave rise to the demand for many products and service. The increase in economic activities gives rise to an increase in GDP. Gauteng, KwaZulu-Natal and Western Cape are the major contributing provinces towards the total South African GDP. As a result, the larger markets share of the total passenger movements (air transport demand) are found in the three major airports strategically positioned in these three provinces. These major international airports are OR Tambo International, Cape Town International and King Shaka International Airports.

The demand for air transport is influenced by many factors. These include airfares, gross domestic product (GDP), unemployment, income, population size, and availability of alternative mode, business model (low cost airlines), inflation rate, urbanisation (migration), and maturity. Most of these variables were studied in the literature and will be used to determine their relationship with the depended variable (passenger demand). The methodological approach used to determine the relationship between the above independent variables and the dependent variable were discussed in details in the succeeding chapter.

CHAPTER THREE

THE RESEARCH METHODOLOGY

3.1. INTRODUCTION

This chapter outlines the methodology used to collect data and the steps taken to ensure the validity and reliability of the accompanying research instruments. The purpose here was to establish the relationship between different factors (determinants) and South Africa's domestic air passenger demand (StatsSA, 2013).

3.2. RESEARCH DESIGN

Research design may be defined as a framework or plan for a study that is used as a guideline in the collection and analysis of data. It encompasses the methodology and procedure employed to conduct scientific research (Matlabe, 2006). Zikmund (2003) also explained research design as a master plan that specifies the methods and procedures for collecting and analysing data. It ensures that the study is relevant to the problem. The design will be categorised as follows (Zikmund, 2003):

3.2.1. Research Approach

This is a quantitative research study; whereby quantitative methods were employed. The quantitative method was used to document and analyse the

relationship between domestic air transport demand and different determinants (Matlabe, 2006). However, the following sections focused on the difference between qualitative and quantitative research methods in the study.

3.2.1.1. Quantitative research

Quantitative research refers to the systematic investigation of numeric properties and phenomena and their relationships. This method of research is widely used in both the natural and social sciences. The objective of quantitative research is to develop and employ mathematical models, theories and hypotheses pertaining to natural phenomena. It relies less on interviews, observations, and small numbers of questionnaires, focus groups, subjective reports and case studies but is much more focused on the collection and analysis of numerical data and statistics (Jordan and Cruz, 2011).

Quantitative research is perceived to be a scientific approach to research employing "experimental and quasi-experimental" strategies (Thanasegaran, 2005). Harvey (2002) describes quantitative data as data which can be sorted, classified and measured in a strictly "objective" way. They are capable of being accurately described by a set of rules or formulae or strict procedures which then make their definition unambiguous and independent of individual judgment (Handyman, 2009).

"In economics, as in any social science discipline, quantitative research is often contrasted with qualitative research, which is the examination, analysis and

interpretation of observations for the purpose of discovering underlying meanings and patterns of relationships, including classifications of types of phenomena and entities, in a manner that does not involve mathematical models" (Quantitative Research, 2007).

3.2.1.1.1. Advantages of quantitative research methods

The following serves as the advantages of following a quantitative approach in data collection and analysis of the study:

- The use of standardised methods in quantitative research allows for greater objectivity and accuracy of results (Jordan and Cruz, 2011);
- Quantitative research usually involves few variables and many cases, and employs prescribed procedures to ensure validity and reliability (Thanasegaran, 2005);
- Quantitative methods allow researchers to summarise vast sources of information and facilitate comparisons across categories and over time (Walliman, 2008); and
- Quantitative methods make allowance for a broader study involving a greater number of subjects, and enhancing the generalisation of results (Thanasegaran, 2005).

3.2.1.1.2. Disadvantages of quantitative research methods

The following disadvantages of using qualitative methods were found important to mention in this study:

- The development of standard questions by the researcher can lead to 'structural' bias and false representation, where the data actually reflects the view of the researcher instead of the participating subjects (Thanasegaran, 2005);
- They collect a much narrower and sometimes superficial dataset (Kruger, 2003);
- Results are limited as they provide numerical descriptions rather than detailed narrative and generally provide less elaborate accounts of human perception (Thanasegaran, 2005);
- The statistics provided can be somewhat insignificant, therefore yielding insignificant results (Kruger, 2003);
- Quantitative methods are ideally suited for finding out who, what, when and where, however they are inappropriate for the collection of behavioural data (Jordan and Cruz, 2011);
- Quantitative methods only deal with issues known at the beginning of the research project as this is when the questions are decided and documented (Kohlbacha, 2006); and

- Quantitative research can be quite complex and requires considerable investment for proper understanding and utilisation (Kruger, 2003).

To overcome the disadvantages of the quantitative research method mentioned above, the researcher collected all available data on determinants identified through literature review of this study on the preceding chapter. Data collected was verified for validity. Thus, the study incorporated an element of qualitative methods for more clarity and understanding of the relationship between air passenger demand and its determinants.

3.2.1.2. Qualitative Research

Qualitative research is one of the two major approaches (other than quantitative) of research methodology in the social sciences. Qualitative research involves an in-depth understanding of human behaviour and the reasons that govern human behaviour. It investigates the why and how of decision making. Qualitative methods make use of smaller, focused samples rather than large random samples. The data for qualitative research comes in various mediums, including text, sound, still images and moving images (Qualitative Research, 2007).

Thanasegaran (2005) described qualitative research as naturalistic, anthropological, and ethnographic. Qualitative research is *"inquiries of knowledge that are outside the framework prescribed by the scientific method,*

as well as assumptions of inferential" (Thanasegaran, 2005). Qualitative research methods include action research, case study research, Delphi Studies, grounded theory, life histories, hermeneutics, general narrative enquiry or participant observer research (Thanasegaran, 2005). Emphasis is placed on the importance of looking at the variables in the natural setting in which they are located. Detailed data is captured through open-ended questions using techniques such as historical analysis, focus groups, interviews, surveys, questionnaires and diaries (Jordan and Cruz, 2011).

3.2.1.2.1. Advantages of qualitative research

The following aspects were identified as advantages of using qualitative research approach:

- Qualitative research usually achieves a greater level of depth and details than quantitative techniques (Jordan and Cruz, 2011);
- Qualitative methods are preferred when researching sensitive subjects. Rather than being constrained by pre-set answers, they allow sensitive subjects to be approached in a sensitive way by allowing the researcher to employ personal skills to help lessen the difficulties of the subject matter (Thanasegaran, 2005);
- The use of qualitative methods creates openness between all parties and can help generate new theories. Participating subjects can discuss issues that are

important to them, rather than responding to closed questions, and they can also clarify ambiguities or confusion over concepts (Thanasegaran, 2005); and

- According to Kruger (2003), it certainly seems reasonable to suggest that one may have a better understanding of community members' situations than just by looking at demographic statistics.

3.2.1.2.2. Disadvantages of qualitative research

The following disadvantages of using qualitative analysis need to be taken into consideration before deciding on the approach:

- Fewer subjects tend to be studied resulting in a study being more difficult to generalise (Qualitative Research, 2007);
- The openness and greater interaction with the researcher can, in some cases, be counter-productive; some subjects can feel uncomfortable in the presence of an interviewer and give answers under duress (Frankel & Devers, 2000);
- Influences like gender and ethnicity of researchers can impact on some of the answers given by the participating subjects (Frankel *et al*, 2000); and
- Qualitative results are more difficult to replicate in research due to the lack of structured design or standardised procedures (Woods, 2011).

3.3.1. Qualitative estimation techniques in air transport industry

Qualitative methods are used more appropriately when historical data concerning the events to be predicted are either scarce or unavailable, or when the events to be forecasted are affected by non-quantifiable information or by technology changes. Judgment, Delphi and technological forecasting are qualitative methods typically applied in research (Ashfold et al, 2011).

In expert judgement, a total lack of data on the airport and airline industry would prevent making any reasonable estimate of future demand. Under certain conditions, a crude but effective method of forecasting is the judgment estimate by an expert close to the problem and environment who would be able to integrate and balance the factors involved in the specific situation. However, the chances of success diminish as the complexity of the particular situation increases, number of factors increase, and the need for long-term forecasts becomes necessary (Hyndman, 2009).

Survey of expectation method is one step above previous one-essentially providing an aggregate judgement of several experts in the airport and air transport industries who are in a position to cast their opinions and judgement to estimate future trends. By assembling an expert panel with broad range of interests and specialities, the forecaster would hope for a balanced view and a reasonable estimate (Ashfold et al, 2011).

A refined and improved version of this approach is the *Delphi technique*. It is essentially the informed consolidation of the responses of all experts through an iterative procedure. The experts cast their opinion regarding the forecasts. This is administered with a questionnaire in which they are requested to indicate a most probable course of development in the activity being forecast. The initial returns and feedback on the opinions of the entire panel are consolidated in the first iteration of the procedure as a composite return by the entire panel (Hyndman, Koehler, Ord, and Snyder, 2008).

This compose figure is returned to the panel in the second iteration questionnaire, giving them an opportunity to revise their original assessment in light of the prevailing opinions among the entire panel. In this procedure, the range of expert responses after each iteration tends to narrow and consensus is ultimately reached. This technique is a practical means of bringing experts from a wide range of specialities and based on the information each provides moves toward consensus with aggregate composite values. In general, however, this method is more appropriate and suitable to aggregate forecasts at the national level than to disaggregate forecasts at the airport or regional levels (Ashfold et al, 2011).

The benefit of the qualitative method is that both quantifiable and unquantifiable information can be used in the forecasting process. However, it is impossible for the qualitative method to measure or improve the forecast

accuracy because no systematic model is used. Besides, the forecasts may contain built-in biases of the experts given the subjectivity involved with the qualitative methods (Hyndman et al, 2008)

In practice, qualitative techniques are used less frequently in the forecasting process than quantitative methods discussed in the following section.

3.3.2. Quantitative estimation techniques in air transport industry

In contrast to qualitative methods, quantitative estimation methods analyse historical data (or historical trend) statistically to identify a pattern, and then apply a mathematical model to emulate the pattern. The estimated equation of the model is used to forecast the trend into the future (Handyman et al, 2008). This quantitative approach relies on the assumption that the identified pattern will continue into the future. Quantitative models are further grouped into two types: time-series analysis and causal methods. Both time-series and causal methods have gained widespread acceptance because they offer several advantages.

First, the forecasts are objectively conducted once the explanatory variable(s) and the functional form of the model are determined.

Second, the accuracy and statistical validity of the resulting model can be tested using statistical methods (De Livera et al, 2009).

Furthermore, various types of computer packages are readily available for the modellers to apply quantitative methods efficiently (SAS, MiniTab, SPSS, STATA, E-views, and R). A range of forecast values based on confidence intervals can be developed using quantitative methods (Demirsoy, 2012).

Time-series analysis forecasts the future value of dependent variable applying statistical analysis only to history (or time series) data of the variable. It assumes that one may forecast the value of a variable by studying only the historical pattern of that variable over time. It is known to be very effective in predicting short-term forecasts such as monthly, weekly, daily or hourly variations in demand. The simple exponential smoothing technique is the most commonly used in time series analysis dealing with the fluctuation patterns. However, significant developments have also been made in techniques such as moving average, adaptive filtering, Box-Jenkins methods, and spectral analysis (Enders, 2011).

Causal models assume that the dependent variable to be forecasted can be explained by the behaviour of another or set of independent variables. The purpose of the causal model is to discover the form of the relationship between all the variables by statistical analysis, and to use it to forecast future values of the dependent variable. Time series models focus on when an event will happen, while causal model focus on why an event happened. The most commonly known causal model is the regression model. The advantage of using a

regression model is that it is relatively easy to conduct the forecast when the projected explanatory variables are available (Shen, 2006).

3.4. RESEARCH APPROACH FOR THIS STUDY

The ontological approach to this study followed the assumption that the objectives of this thesis are of a purely deterministic nature, in that they can only be predicted by the cause-and-effect laws. The research paradigm adopted for the analysis of data was that of constructivism, embracing a pragmatic approach. The epistemology was that of a quantitative research method approach (Mitchell, 2009).

Analysis of the contextual factors which have influence on air passenger demand has been based on a quantitative approach. Research into the variables that influences the domestic air passenger demand in South Africa has been carried out by the quantitative research approach. The overall *modus operandi* of this design is the use of historical data to explain, or build on initial quantitative results (Mitchell, 2009).

In many cases, mathematical methods are used in order to explain the relationship between different factors that are mentioned in the literature review with domestic air passenger demand (dependent factor). Majority of these researches consist of two different approaches: demand forecast (determinants) and demand elasticity (maturity) analysis (Demirsoy, 2012).

Nevertheless, the main focus of this research and the variables used in these studies vary significantly. Thus, there is a need for a brief summary of these researches and their outcomes. Investigation of pragmatic approaches and the literature review formed the cornerstone for this study's research methods and they provide guidance in choosing variables used and explaining outcomes of the econometric model (De Livera and Hyndman, 2009).

For this study, a multiple regression model was used as a technique to measure the relationship between domestic air passenger enplanements in South Africa's airports and the independent variables selected for this study. The econometric demand method incorporates various causal economic, social, and operational variables in determining variables in determining, on the basis of historical data, a quantitative relationship between domestic air passenger demand and the variables influencing this level of demand. These models have been widely used over the years to predict urban passenger demand. When applied to air transport, an econometric model is established (and statistically tested to validate the model) between number of passenger air trips and a number of predictive causal variables. Model development is usually carried out by evaluating air trip generation rates from survey data and record against socioeconomic data of the area and the physical characteristics of the overall air transport demand. The evaluation uses a correlation analysis to define suitable

predictive variables selected as the independent variables of the model (Ashfold et al, 2011).

Future demand levels are developed based on the assumption that the relationship developed through econometric analysis is applicable in the future and valid in the future as it was in the past. However, it is possible to adjust the econometric models if the causal variables change in the intervening years after the models are developed. The causal variables of econometric models are monitored and any changes observed could be verified and necessary adjustments are made on the model parameters. This would ensure the continuing adequacy and verification of continuing applicability of econometric model (Ashfold et al, 2011).

3.5. SAMPLING METHODS

Sampling refers to an act of taking any portion of a population as representative of that population and the portion taken is considered to be representative of reality. The basic idea in sampling is that, by selecting part of the elements in a population, conclusions may be obtained about the entire population. The following decisions need to be met in securing a sample:

What is the relevant population, what are the parameters of interest? What is the sample frame, what is the type of sample, what sample size is needed (Kerlinger, 1986).

3.5.1. Population

The population refers to the total collection of elements about which the researcher wishes to make inferences (Burt, Barber & Rigby, 2009). The population is the set of units that the sample is meant to represent. The units that make up the population will depend on the units of analysis. For a national survey, for example, the population is usually defined as all adults (18+ years) who are non-institutionalised (i.e., they live in households). For another study, the population might be all employed people or families with children under five years old (De Vaus, 2006).

For the purpose of this study, the target population was South Africa's domestic air transport demand. Data was collected about the domestic air passenger movements in South Africa. The main sources of information were Airports Company South Africa (ACSA), Statistics South Africa (StatsSA), South African Reserve Bank (SARB), Airports Company International (ACI) and the World Bank.

3.5.2. Sample Frame

The sample frame refers to the list of elements from which the sample is actually drawn. For this research, the sample will be drawn from a frame comprising of all airports in South Africa (Babbie, 2010).

3.5.3. Sample Type

Sampling may be grouped into probability sample techniques and non-probability sampling techniques. The probability random sampling may be divided into simple random sampling, stratified sampling, cluster sampling, and the systematic sampling. On the other hand, the non-probability samples may be divided into the convenience sampling, quota sampling, purposive sampling, and snowball sampling.

3.5.4. Sampling Method for this study

The purposive sampling technique was employed for this study where only domestic air passenger market was selected as sample of the study. The reason for taking a purposive sample was to have a more efficient sample that could be taken on the basis of preference. The domestic market is growing at a very high rate in South Africa. Hence, the focus was chosen having this high growth rate in mind, the purpose of which was to study the domestic air passenger movements in South African airports (ACSA, 2013 and World Bank, 2013). This sampling method was also very useful for situation where the researcher wants to quickly reach the target sample and where a sampling for proportionality was not a primary concern (Trochim, 2007).

3.5.6. Sample size

The study focused on only domestic air passenger demand. Data on passenger enplanements was collected from ACSA, ACI and the WorldBank. Similarly, data on exogenous variables was implored from other institutions mentioned on 3.3.1 above and data analysis was undertaken in conjunction with the North West University Statistics and Economics Departments.

3.5.7. Data Analysis

Data collected for the period 1971 to 2012 was captured and a statistical package (STATA) employed for the analysis of the data. A regression analysis was performed on the data and a relationship between different variables used was identified. Multicollinearity analysis was also conducted to establish the possible multiple linear relationships amongst different variables employed for the study.

3.6. DATA COLLECTION FOR THIS STUDY

A quantitative method was employed for this study where the secondary data was sourced from different institutions such as Airports Company South Africa (ACSA), Airports Company International (ACI), International Monetary Fund (IMF) and World Bank and Statistics South Africa (StatsSA). The advantage of using this method lies with its ability to get faster, clearer and more comprehensive and accurate data.

3.7. SUMMARY AND CONCLUSIONS

The study followed a quantitative method approach where quantitative methods were employed. The quantitative method provides insight into the reality about the relationship between the dependent (domestic air passenger movements) and the independent variables (such as GDP, income, population).

A purpose sampling technique was applied in the study. Thus, the study focused only on the domestic air passenger enplanement in South Africa. In this study, secondary data was made available from array of institutions such as ACSA, StatsSA, ACI, IMF and World Bank.

The following chapter presents the results, its interpretation and analysis of data collected.

CHAPTER FOUR

DATA PRESENTATION, INTERPRETATION AND ANALYSIS

4.1. INTRODUCTION

The methodology described in chapter three of this study provides the baseline for data collection. The main purpose of this study was to identify the determinants of domestic air transport passenger demand of South Africa's airports. The objective of this chapter was to present, analyse, interpret and draw conclusions from the data collected for this study in respect of the determinants of the domestic air transport demand in these airports.

The purpose of interpreting data is to reduce it to an understandable and interpretable arrangement so that the relation of the research problems can be studies and tested, as well as reaching the comprehensive conclusion. On the other hand, when the researcher interprets the research results, the researcher studies them for the meaning and implications.

4.2. THE OBJECTIVES OF THE STUDY

The main objective of this study was to respond to question regarding possible influence of different variables on the demand for domestic air travel. In order to respond to this main question, it may be divided into a set of sub-questions. The questions may then be summarised in the hypothetical form as follow:

H_1: Consumer expenditure has a significant impact on the demand for air transport demand

H_2: Population plays as major role in influencing the need to travel

H_3: Unemployment triggers a serious impact on the demand for domestic air travel

H_4: Gross Domestic Product has a significant effect to the changes in domestic air transport demand.

H_5: Oil prices have a significant impact on air transport demand

H_6: Total Government Expenditure triggers a serious impact in the air transport demand

H_7: Airfares have a significant effect on domestic air passenger demand

H_8: Income triggers a significant impact on the demand for domestic air travel

A regression model was utilised to answer the above hypothesis and the main research question.

4.3. RESEARCH SAMPLE

The secondary data was used in this study and was collected from a number of sources. The mains source of data was the Airports Company South Africa (ACSA), Statistics South Africa (StatsSA), the World Bank, International Monetary Fund and the Department of Transport (DoT). Data collection was

restricted to the period 1971 to 2012. This period was taken because data on air passenger demand was only available from 1971. ACSA and World Bank provided data on passenger movements (demand variable), unemployment data was received from Quantec, while the price for crude oil was received from inflation data.com. Airfares was replaced by consumer price index (CPI) received from StatsSA. The study further collected data on population, consumption, expenditure and GDP per capita from Statistics South Africa.

4.4. SELECTIONS OF VARIABLES AND DESCRIPTION OF DATASET

The selection of different independent variable was based on the literature review presented in chapter 2 of the study. Different studies used boarded passenger, passenger kilometres, passenger population ratio, terminal passenger numbers, income of the residents, level of trade in the country, level of exporting and importing goods and services, level of economic activities, liberalisation, prices of crude oil, consumption, expenditure, level of education and many other variables as determinants of air passenger demand. In this study, domestic terminal passenger numbers are preferred to indicate air travel passenger movements. Domestic terminal passenger data describes the number of arrived and departed passengers in the airports. In this method, one passenger is counted twice (one time in departure airport and once in arrival destination) only if the passenger travels between two airports within the same country (domestic routes).

There are several independent (exogenous) variables that influence the demand for air transport. However, this study will select few variables which are applicable to South African situation. Factors considered vital to influence the domestic air transport in South Africa were GDP, income (GDP per capita), population, expenditure, crude oil price, unemployment and airfares (or consumption). Amongst these variables, population and GDP are the most commonly used determinants of aviation demand. However, GDP has effects of income and population. Hence, using GDP gave duplication of determinants, leading to biased results. The study therefore used GDP per capita for the regression analysis. In case where data on airfares was unavailable or inaccurate as was the case in South Africa, the use of consumer expenditure was used for the regression analysis study. Therefore, the relationship between passenger demand and its determinants was expressed as follows:

$$Pax = f\ (GDP, Inc, Pop, Con, Exp, Oil, Une, Pr, dummies) \quad (1)$$

where:

Pax = Passenger demand

Inc = Income

Pop = Population

Exp = Final Total Government Expenditure

Con = Final Consumption Expenditure

Une = Unemployment

Oil = Crude Oil Prices

Pr = Airfares

Pax represents passenger movements, data on passenger numbers (Pax) on the left hand side of the equation was collected from Airports Company South Africa (ACSA) and WorldBank. On the right hand side of the equation, Pop expresses population and data was collected from Statistics South Africa. In this study, population refers to all people covered by the census calculated by statistics South Africa. The demand for air transport tends to be higher in the high densely populated areas, mostly urban areas. It is therefore anticipated that the demand of air transport would be higher in areas such as Gauteng, Western Cape and Kwazulu-Natal where the population is high. The variable Inc display income, presented as GDP per capita. GDP per capita which refers to the total income of all people in the country. GDP per capita refers to the total gross domestic product (GDP) at current prices shared by the entire population, i.e. Inc = GDP/Pop. Gross Domestic Product may be defined as the total value of all final goods and services produced within the boundaries of a country during a particular period (usually one (1) year) (Mohr, Fourie and associates, 2008). It shows the level of economic activities in the countries and refers to all final economic production within a country. Studies show that there is positive relationship between air travel demand and the level of economic activities.

Thus the rise in economic activities within the country measured by GDP, will give rise to the demand for air transport travel. In similar vein, the high levels of income (GDP per capita) in any economy will increase the demand for air transport. Data on GDP was collected from Statistics South Africa (StatsSA, 2012 and WorldBank, 2010).

The South African GDP per capita is the total value of the incomes earned by South African factors of production, irrespective of where the production actually occurs (SARB, 2013). GDP per capita is gross domestic product divided by midyear population (WorldBank, 2013). Data on GDP per capita was also received from both StatsSA and Worldbank).

In addition the variable Une represent the unemployment. Data on unemployment was received from Quantec. Unemployment refers to the number of people aged between 15 and 64 that are willing and able to work but do not have jobs (Mohr et al, 2008). Studies indicates that unemployed individuals are unlikely to fly, hence there is a negative relationship between air transport demand (Pax) and the unemployment level (Une). Thus, unemployed people do not have the purchase power to have air travel tickets. Hence it affects the overall demand for air transport. On the other hand, the variable Oil expresses the prices of crude oil. Crude oil refers to a mixture of hydrocarbons that exists in liquid phase in natural underground reservoirs and remains liquid at atmospheric pressure after passing through surface separating facilities. It is

refined to produce a wide array of petroleum products, including heating oils such as gasoline, diesel and jet fuels' lubricants, and asphalt such as ethane, propane, and butane as well as many other products used for energy or chemical content (World Bank, 2012). Data may be extracted from World Bank Statistical Support.

The variable (Pr) represents the price of air ticket. Due to non-availability of data on airfares, consumer price index (CPI) was used as a replacement. The consumer price index (CPI) is the official measure of inflation in South Africa. It is a measure that examines the weighted average of prices of a basket of consumer goods and services, such as transportation, food and medical care. The CPI is calculated by taking price changes for each item in the predetermined basket of goods and averaging them; the goods are weighted according to their importance. Changes in CPI are used to assess price changes associated with the cost of living (StatsSA, 2012).

The STATA statistical software was utilised by the researcher to analyse the data collected for this study.

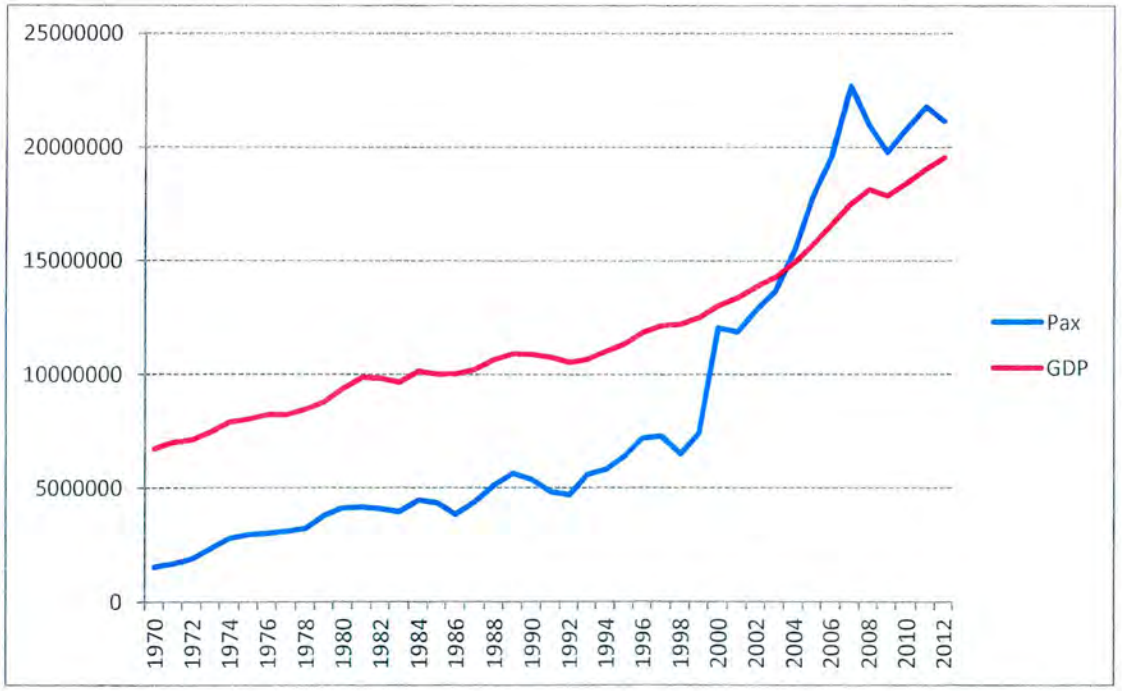
4.5. DATA PRESENTATION FROM 1971 TO 2012

Data was collected for all variables considered relevant for this study. The limitation was brought by the fact data on South Africa's passenger enplanement was only available from 1971; hence the study only used annual

data from 1971 to 2012. Data was sought on the following variables: air passenger enplanement, unemployment, gross domestic product, income, population, and consumption, expenditure, and crude oil prices. The information on these variables is presented in the following graphs (Figure 4.1., 4.2., 4.3., 4.4., 4.5., 4.6 and 4.7.) are used to explain the behaviour of different variables between the periods ranging from 2004 to 2012. Most of these variables follow the increasing patterns.

The domestic passenger movements in South Africa's airports are presented together the Gross Domestic Product in Figure 4.1. It shows that the demand for domestic air passenger service has increased throughout between 1970 and 2012.

Figure 4.1: Gross domestic product and domestic air passenger demand

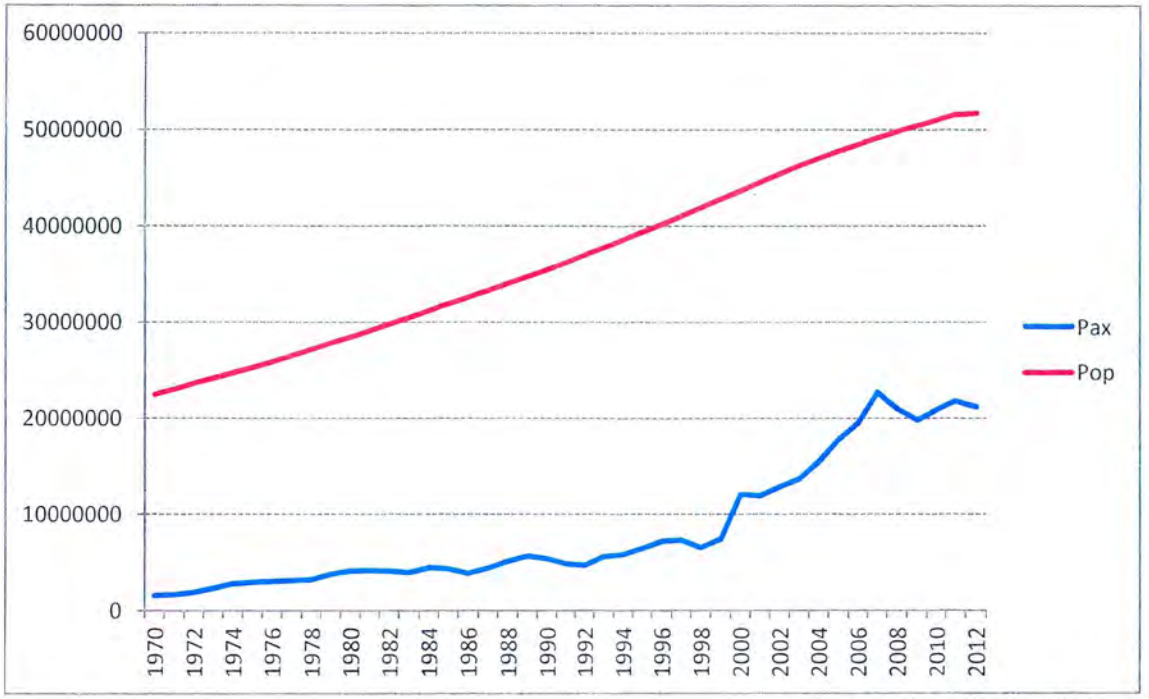


Data Source: StatsSA, 2012

The Gross Domestic Product also takes a similar trend as the passenger movements from 1970 to 2002 as presented in Figure 4.1. From 2003 onwards, the passenger demand increased at an alarming rate while GDP maintained constant trend throughout. However, there was a decline in economic activities between 2008 and 2009 due to the global economic turmoil. This also led to a decline in demand for domestic air passenger travel. An upward swing was experienced towards 2010 due to the preparations of the 2010 FIFA Soccer World Cup that took place in South Africa. Therefore, it is anticipated in this study that the increase in the level of economic activities will lead to an increase in the passenger demand of air transport.

Most studies indicated that the urban population is more likely to use air transport than their rural counterparts. However, the urban population takes similar trend as the total population. It is anticipated that the increase in population will increase the demand for many products including air transport. These incremental trends on population are presented in Figure 4.2 below, which also shows how population relates to the air transport demand.

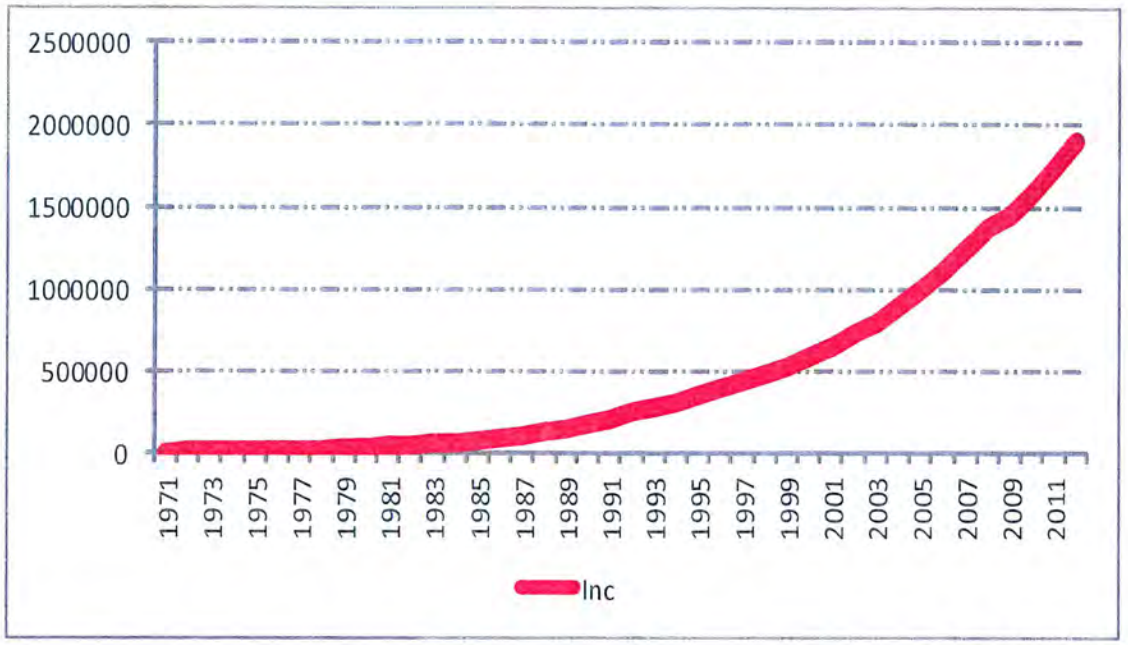
Figure 4.2: Population and domestic air passenger demand



Source: WorldBank, 2012

Figure 4.2 shows that there is likely to be a positive correlation between the passenger demand and the total population. Thus, an increase in population will somehow lead to an increase in air travel. Hence, there is a similar trend as indicated above. Although passenger demand shows a lot of fluctuation due to other factors influencing, the trend is similar to that of population. Population on the other shows a continued increase. The following figure depicts the trend followed by the household income.

Figure 4.3: Household Income



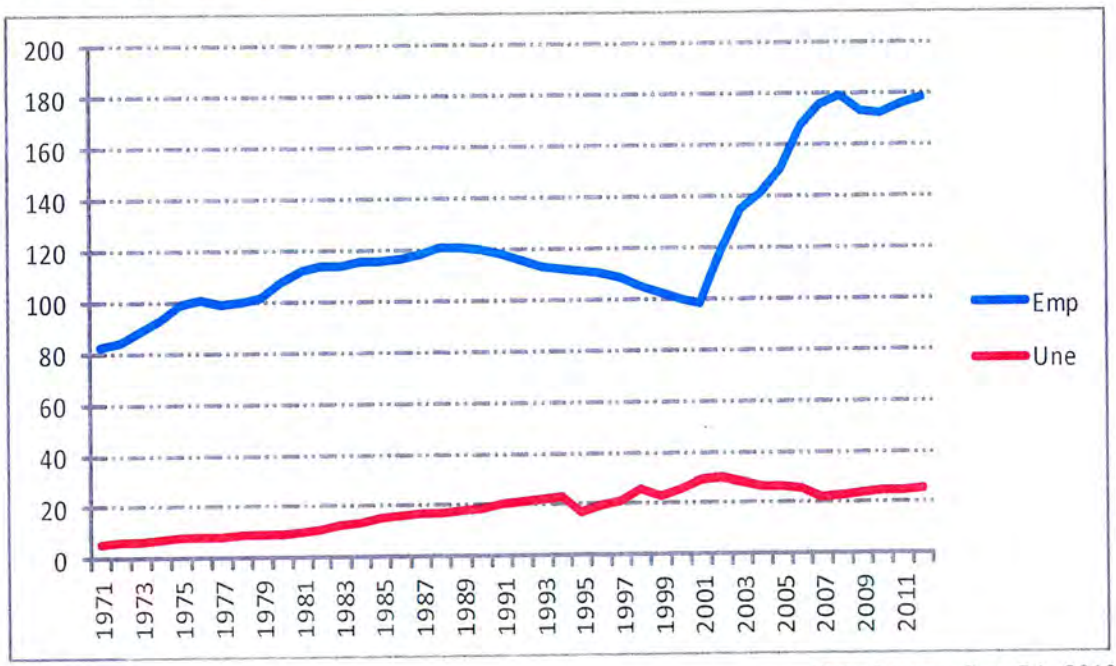
Data Source: Worldbank, 2013

Figure 4.3 shows the income which takes the increasing trends because it tallies with the population size and the gross national product. Income shows a fluctuating but increasing trend from 1971 to 2012. There was a slight decline in the level of income between 1991 and 1992 due to the political instability in the country at the time before the first democratic election of 1994 This may also be attributed to the disinvestment of white people leaving the country in fear of the unknown. Thus, closing business resulted in loss of jobs, loss of production and income. This was a period leading to the release of Dr Nelson Mandela[4] from Roben Island. The income started increasing between 1995 and 2007, then decline towards 2008 due to global economic crisis of that time. The income

[4] The first South African black and democratically elected president. He served as a president of the country from 1994 to 1998. This world icon, spent 27 years in prison in a battle for the freedom of black people in South Africa.

started picking a momentum towards 2010, due to the 2010 FIFA Soccer World Cup. It is anticipated in this study that an increase in income will increase the purchasing power of participants and hence, there will be an increase in demand for air transport travel. The following figure shows the level of unemployment and how it relates to the domestic air passenger demand.

Figure 4.4: Employment and unemployment in South Africa



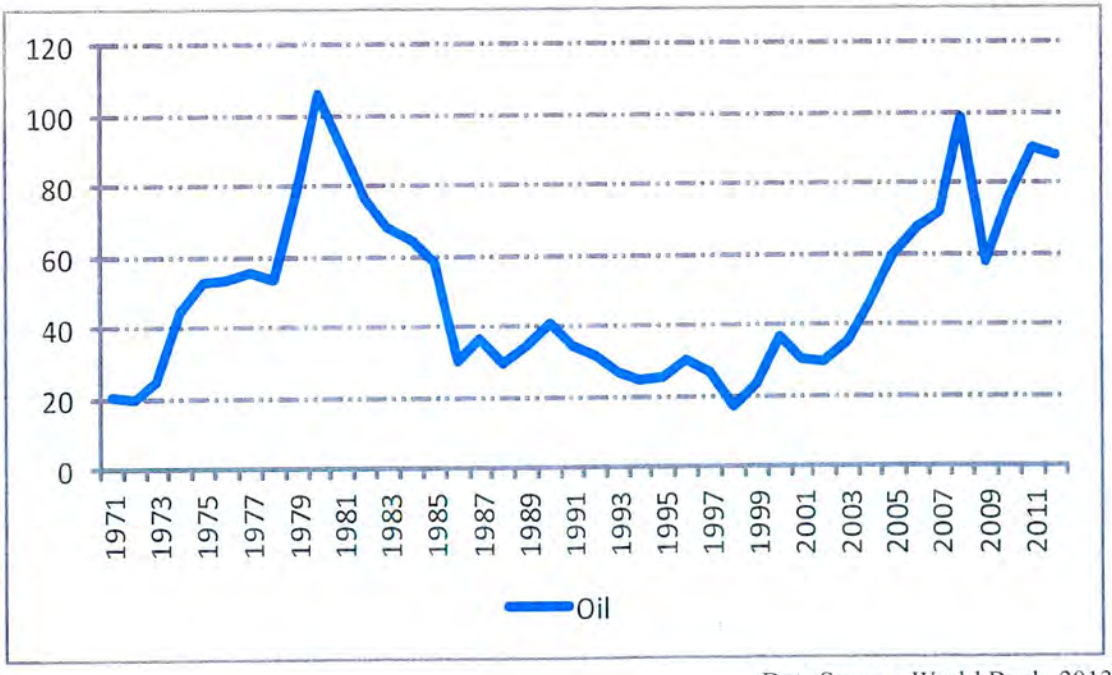
Data Source: StatsSA, 2013

The level of unemployment or employment was also selected as one of the variables that may influence decision of the consumer. Thus, when people are not working, their wish to use air transport will be limited. This reflects a negative relationship between unemployment and the demand for air transport travel. The levels of employment and unemployment are presented in Figure 4.4 above, whereby the rate of employment in South African took an increasing

trend while unemployment was also sky rocketing between 1971 and 1994 (during the apartheid era). The unemployment, on the hand, dropped significantly after the first democratic election in the country due to rigorous programmes to alleviate unemployment. Hence we saw an increasing employment trend. However, the unemployment went up again from 1995 until 2002. More programmes to create jobs were introduced around 2003 which saw a decline in the level of unemployment in 2007. However, this was offset by the global economic crisis which led to job shedding in many part of the country. The world cup did not improve the level of employment, hence the country continued to experience higher level of unemployment.

The following figure depicts the fluctuations in oil prices from 1971 to 2012.

Figure 4.5: Oil Prices

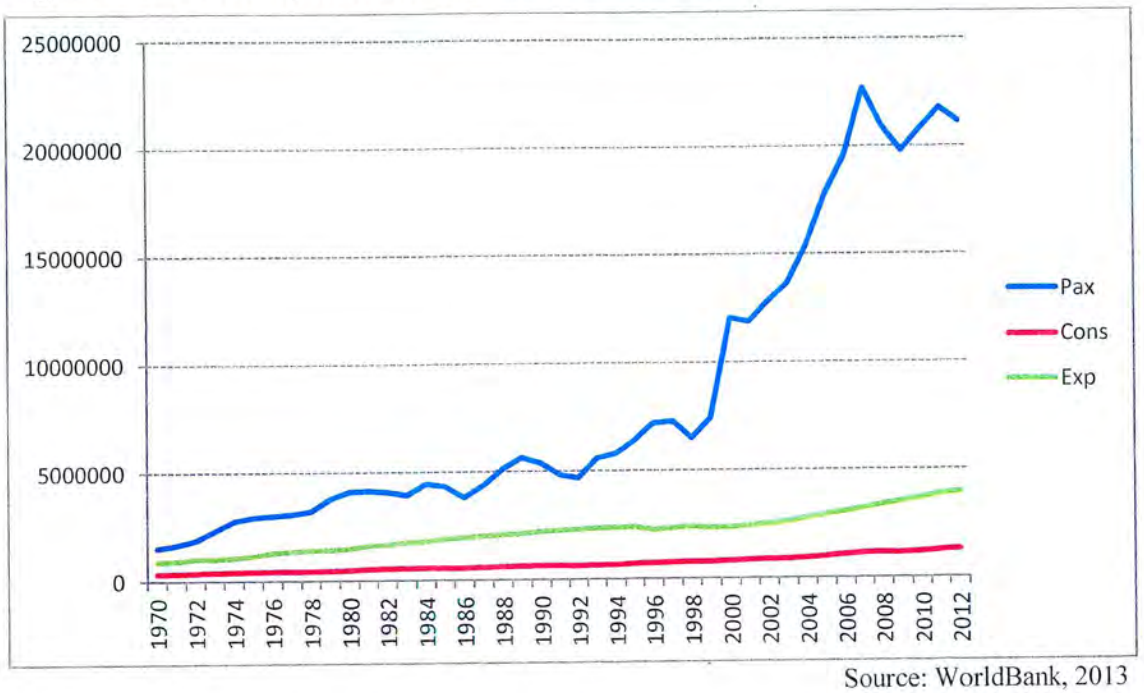


Data Source: World Bank, 2013

The price of crude oil was also selected as one of the variables that may influence the decision to fly. Lower price of crude oil will reduce the cost of operating aircraft and this might influence airlines to charge lower airfares and hence, lead to higher level of demand for air transport travel. The crude oil prices are shown in Figure 4.5. Figure 4.5 show that the oil prices have been increasing since 1971 to 2012. However, there were oil fluctuations and shocks in different period and different decades. During the period of gold standard (1971 -1972: where the US Dollar was redeemable for gold), oil prices were stable. The first oil shock was caused by Yom Kippur War / OPEC oil embargo between 1973 and 1974. The second oil shock was caused by Iranian revolution of 1978 and Iran-Iraq war of 1980. There was an oversupply and / or lower demand in OPEC countries between 1985 and 1986, which dropped the oil price significantly. There was rising demand between 1999 and 2000 which led to high rises in petrol price. The September 11 terrorist attack of 2011 in America resulted in an oversupply of oil. This resulted in a decrease in oil prices for the period. The third oil shock began in in the late 2003 with the oil price quadrupling and sky rocketing in June 2008. However, this third oil shock was immediately followed by a strong counter shock that led to a price drop of 69% between September 2008 and February 2009. The main reason for the sharp decline was a global recession, cutting existing demand and expectations of additional demand. Since then the prices of oil were very high, hovering between 80 and 100 dollars per barrel (Rodrigue, 2013). The following graph

shows the relationship between domestic air passenger demand and the final consumption expenditure (Con) and the total government expenditure (Exp).

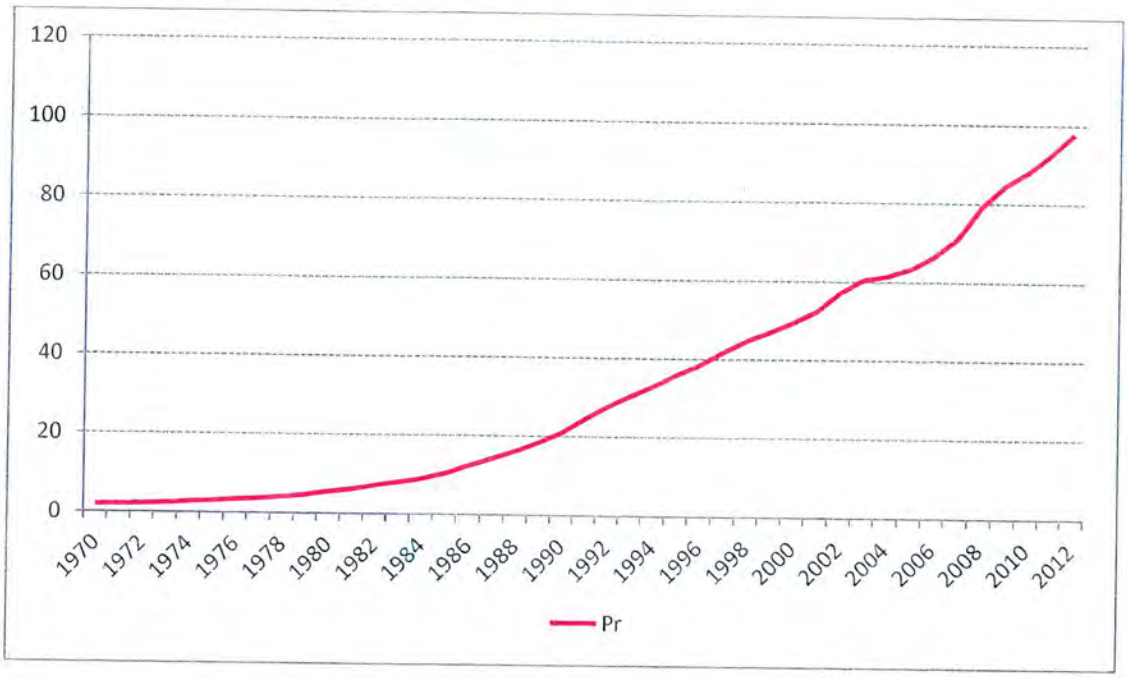
Figure 4.6: Consumption and expenditure movements



Source: WorldBank, 2013

Figure 4.6 above shows the relationship between passenger demand and final consumption expenditure as well as the relationship between the domestic air transport demand and the total government expenditure. The expenditure (Exp) and consumption (Con) follow the same pattern with the passenger demand from 1970 to 1999. From 2000, the passenger demand began rising at a very alarming rate compared to the total expenditure and final consumption. However, the three variables display positive relationships. The following graph shows a continuous increase in prices of tickets for domestic passenger travel.

Figure 4.7: Airfares (cpi)



Data source: StatsSA, 2013

The airfares have been rising at a startling pace between 1970 and 2012. The literature suggests that an increase in airfares will lead to a decline in the demand for air travel. However, in the case of air passenger demand in South Africa, there is lack of appropriate substitute service for air travel. Hence, even though the price of air tickets has been increasing over the years, the demand for domestic air travel has also increased until 2007 and started declining in 2008 due to the global economic recession.

4.6. DOMESTIC AIR TRANSPORT DEMAND MODEL FOR SOUTH AFRICA

This section explained the stages followed by this study in order to develop the relationship between dependent and independent variables in the demand model of domestic air transport. In order to do that, a regression analysis was run, which is a strong tool to assess this relationship. The main focus of this research focused on South African domestic air transport demand. The regression analysis assumes:

- A linear relationship between variables;
- Usage of appropriate variables (dependent and independent);
- Number of highly correlated independent variables which leads to a multicollinearity problem; and
- Constant error terms, in other words no heteroskedasticity.

From equation (1), the study adjusts its model by taking natural logarithm of all variables. Thus, this allows for making elasticity estimates. After these adjustments on the preliminary model *(1)* the second step of the model can be expressed as:

$$logpax = \alpha + \beta_1 loggdp + \beta_2 loginc + \beta_3 logpop + \beta_4 logcon + \beta_5 logexp + \beta_6 logemp + \beta_7 logoil + \beta_8 logPr\ \varepsilon \quad (2)$$

The model has about nine (9) variables and as a result this could have led to the problem of multicollinearity. Multicollinearity indicates that, variables may be correlated within each other, which may cause biased results. The multicollinearity may be caused by the improper use of dummy variables such as failure to exclude one category. This includes a variable that is computed from other variables in the equation. In effect, including the same or almost the same variable twice will result in the multicollinearity in the regression model. This will imply some sort of error on the researcher's part since the variables are highly correlated. In many cases where there is high multicollinearity, none of the t-ratios for the individual coefficients is statistically significant, yet the overall F statistic is significant.

4.7. THE RESEARCH RESULTS

The next section provided results from the quantitative research in the form of multiple regressions. The objective was to quantify the effects of selected explanatory variables on South Africa's domestic air passenger traffic demand. The study examined a model in which domestic air passenger demand is postulated to be determined by eight variables, being population, gross domestic product, income, consumption, expenditure, airfares, unemployment and crude oil prices. The natural logarithms transformation was used to ensure that the distribution of these predictors was not skewed. Log transformation made the

distribution more normal, enhanced the symmetry and stabilises the spread, as well as helped the predictors to fit better into the model.

4.7.1. Correlation significance

Table 4.1 shows that the coefficient of determination or the R-square value for the overall model returned an extremely high value of 0.9914, which indicated that, in the South African context, 99.2% of the variability of domestic air passenger traffic flows was explained by the eight predictors, as mentioned in the hypothesis. These statistics, together with the F tests (testing the significance overall regression model), were found to be statistically significant (i.e., F- value = 473.82, Prob > F = 0.0000) shows that the estimated model fits the data extremely. However, the initial regression results shows that all variables selected for the study (except for logoil and logpop) were found to be not significant because at 5% level of significance, the P-value for most variables are greater than 0.05. Again, logpr was significant at 10% level of significance. This gives us a spurious regression analysis results. Thus, there is an element of multicollinearity in the overall model.

Table 4.1: Regression Model (A)

Source	SS	df	MS	Number of obs	= 42
				F(8, 33)	= 473.82
Model	22.6796336	8	2.8349542	Prob > F	= 0.0000
Residual	0.197443822	33	0.005983146	R-squared	= 0.9914

					Adj R-squared = 0.9893
Total	22.8770775	41	0.557977499		Root MSE = 0.07735

logpax	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
loggdp	0.24297	0.6494256	0.37	0.711	-1.078296	1.564236
logpr	-0.7516525	0.436178	-1.72	0.094	-1.639063	0.1357582
logcon	0.1105803	0.2488006	0.44	0.660	-0.3956083	0.6167688
logemp	0.2305604	0.2725662	0.85	0.404	-0.3239797	0.7851004
loginc	0.2305236	0.4793346	0.48	0.634	-0.7446901	1.205737
logexp	-0.6971975	0.5028474	-1.39	0.175	-1.720248	0.3258533
logoil	0.1932653	0.0586649	3.29	0.002	0.0739107	0.31262
logpop	5.390471	1.642632	3.28	0.002	2.048512	8.73243
_cons	-39.39943	14.89287	-2.65	0.012	-69.6992	-9.099658

The spurious regression result provided in Table 4.1 led us to run a correlation coefficient matrix in Tables 4.2 and 4.3 respectively.

Table 4.2: Correlations between variables and their significance levels

	logpax	logpr	loggdp	logcon	logemp	loginc	logexp	logoil	logpop
logpax	1.0000								
logpr	0.9265	1.0000							
loggdp	0.9873	0.9416	1.0000						
logcon	0.9742	0.9346	0.9742	1.0000					
logemp	0.8638	0.7553	0.8945	0.8344	1.0000				
loginc	0.9480	0.9976	0.9610	0.9539	0.7860	1.0000			
logexp	0.9421	0.9666	0.9706	0.9286	0.8791	0.9734	1.0000		
logoil	0.3293	0.0505	0.3202	0.2329	0.5480	0.0958	0.2550	1.0000	
logpop	0.9608	0.9936	0.9696	0.9604	0.7953	0.9984	0.9722	0.1238	1.0000

The regression model for this study also shows effects of multicollinearity, as indicated in Table 4.1. To see if the selected variables have multicollinearity problem or not, variance inflation factor test (VIF) is carried out. In order to run VIF test, first the equation (2) is run by OLS estimation and then VIF test is carried out. Variance Inflation Factor test indicates a multicollinearity problem.

Therefore, the correlation test was run in order to see these interactions between variables. Correlation test shows all the pairwise correlations coefficients between the variables with their significance level. The results are shown in Table 4.2. Numbers close to one (-ve or +ve) represent strong correlation between these variables. Some degree of correlation between

variables is acceptable; however, there is no straightforward rule as to what it should be (Demirsoy, 2012).

In this study, it was assumed that the correlation over 0.75 represents a strong correlation and these variables should be removed from dataset. From the results it is clear that almost all variables are more than 0.75, i.e., they are highly correlated to each other, hence, we run the Variable Inflation Factor (VIF) using the Stata commands vif and vce, corr. The results are then presented in Table 4.3 below.

Table 4.3: Co-variance matrix of coefficients of regress model

e(V)	loggdp	logpr	logcon	logemp	loginc	logexp	logoil	logpop
oggdp	0.42175357							
logpr	0.16222937	0.19025123						
logcon	-0.05384325	0.025293	0.06190172					
logemp	-0.0092391	0.03142621	-0.02109878	0.07429232				
loginc	-0.05895938	-0.16285587	-0.06953748	-0.00149096	0.2297617			
logexp	-0.13993429	-0.0640185	0.08176847	-0.0926298	-0.06257933	0.25285555		
logoil	-0.00370333	-0.00094587	-0.00551747	0.00373774	0.01147654	-0.01681309	0.00344157	
logpop	-0.58116942	-0.0092407	0.19592333	-0.01960738	-0.44971081	0.45585013	-0.03728475	.6982383
_cons	2.8497269	-0.41171601	-2.1372355	1.271957	4.7818497	-5.4307547	0.54639402	-22.378853

e(V)	_cons
_cons	221.79756

Here, it is clear that most variables are still highly correlated, i.e., there is a problem of multicollinearity. Hence, the stepwise method was utilised to eliminate those variables with high multicollinearity problems and building the model for this study. The study began by eliminating variables with higher values of P.

The final regression model for this study was presented in Table 4.4 as follows:

Table 4.4: Regression Model (B)

Source	SS	df	MS		Number of obs	= 42
Model	22.6671642	4	5.66679106		F(4, 37)	= 998.85
Residual	0.209913213	37	0.00567333		Prob > F	= 0.0000
Total	22.8770775	41	0.557977499		R-squared	= 0.9908
					Adj R-squared	= 0.9898
					Root MSE	= 0.07532

logpax	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
logpr	-0.8630327	0.01274706	-6.77	0.000	-1.121313	-.6047528
logcon	0.3293136	0.1391634	2.37	0.023	0.0473417	6112855
logoil	0.132595	0.0312857	4.24	0.000	0.0692041	1959859
logpop	6.5483	0.7539999	8.68	0.000	5.020551	8.076049
_cons	-54.80462	6.461257	-8.48	0.000	-67.89637	-41.71287

Regression results show that four (4) variables can significantly influence the domestic air transport passenger demand (logpax), these are population (logpop), crude oil price (logoil), the price of air ticket (logpr) and the household consumption (logcon).

The F-test is 998.85 and Prob > F = 0.0000 which indicate that all coefficients of the independent variables are equal to zero.

H_0 = Coefficient on all independent variables are equal to zero

H_1 = Coefficients on all independent variable are not equal to zero

From the above, we reject the null hypothesis with extremely high confidence – above 99%.

The R-squared (R^2) is the proportion of variance in the dependent variable (logpax) which can be explained by the independent variables (logoil, logcon, logpr and logpop). This is an overall measure of the strength of association and does not reflect the extent to which any particular independent variable is associated with the dependent variable.

In this study, $R^2 = 0.9908$ (99%), which means that the dependent variable (logpax) is strongly determined by the independent variables (logoil, logpr, logcon and logpop). Thus, the domestic air passenger demand in South Africa is

strongly influenced and explained by the price of air ticket, price of brent crude oil, the consumer expenditure and the population size.

The adjusted R- squared refers to the adjustment of R^2 that penalises the addition of extraneous predictors to the model. Adj R-squared is computed using the formula 1 – ((1-R2) ((N-k-1)) where k is the number of predictors. The adjusted R-squared for this study is 0.9899 (99%).

The last variable in the regression equation (–cons) represent the constant or the intercept. The constant for the regression model of this study is 54.80462

Coef – represents coefficients of variables. These are the values of the regression equation for predicting the dependent variable from the independent variable. The regression equation is presented in many different ways.

logoil – the coefficient is 0.132595, so for every unit increase in logoil, a 0.132595 unit increase in logpax is predicted, holding other variables constant.

logpr – the coefficient is -0.8630327, which means for every unit increase in logpr, we expect a -0.8630327 unit decrease in the logpax, holding other variables constant.

logpop – the coefficient is 6.5483, we expect a 6.5483 increase in logpax for every unit increase in logpop, ceteris paribus.

Finally, logcon has the coefficient of 0.3293136, which means that, a 1 unit increase in logcon will increase logpax by 0.3293136 units.

The formula for this study will then be:

$$logpax = -54.80462 + 6.5483\ logpop + 0.132595\ logoil - 0.8630327\ logpr + 0.3293136\ logcon + \varepsilon \qquad \text{.....(3)}$$

The t-statistics was used to test whether a given coefficient is different from zero. In this study all the coefficients for independent variable were different from zero; hence, the coefficients for this model were significant.

The P>|t| shows a two-tailed p-values used in testing the null hypothesis that the coefficient (parameters) is zero (0). Using an alpha (α) of 0.05:

Oil price (logoil) is significant at 5% level of significance and the magnitude of its coefficient is 4.24, which is significantly different from zero (0). Its p-value is 0.000 which is smaller than 0.05. This shows that oil price has positive impact on domestic air travel demand. Theoretically, when oil price are high the ticket prices of different modes of travel also rise, resulting in less demand for travel. However, in South Africa, when oil price rises, the demand for other modes goes down and passenger prefers to spend more on air transport travel.

Airfare (logpr) is also significant at 5% level of significance with the coefficient of 6.77, which is significantly different from zero and the p-value of

0.000, which is also smaller than 0.05. Therefore, airfare is also significantly different from zero (0). The negative coefficient indicates that there is a negative relationship between airfares and domestic air passenger demand. The literature shows that when price for air tickets are high, then the demand to fly will drop.

Similarly, the coefficient for population is 8.68 which is significantly different from zero (0) and positive. This reflects a positive relationship between the population size and the demand for air travel. Similarly, population is significant at 5% level of significance with the p-value of 0.000, which is smaller than 0.05. In this case, a 1% increase in population leads to a 8.68% increase in the domestic air passenger demand.

Furthermore, the coefficient for household consumption is 2.37, which is significantly different from zero and positive. Thus, there is a positive relationship between household consumption of goods and service and their willingness to spend more on air travel.

The constant (-cons) is significant at 5% level of significance because its p-value is 0.000, which is less than 0.05. Its coefficient is also 8.48 but negative. A constant shows that when the coefficients of independent variables are zero, we should expect a drop of more than 54 million domestic air passenger demands in South Africa.

4.8. SUMMARY AND CONCLUSION

The model of this study specified that the domestic air passenger demand in South Africa is explained by the population's size, the level of consumer consumption, the price of oil airfares. Thus, the bigger size of the population will trigger high demand for domestic air travel and the shrivelling thereof will result in poor demand.

On the other hand, the higher prices of crude oil will results in high fuel costs. This will eventually trigger the airliners to pass the burden to consumers by increasing the price of ticket sold or somehow compromise the quality of service. Consequently, high ticket prices or poor quality of service will reduce the demand of domestic air travel, especially when travel is for leisure.

Finally, the domestic air travel is influenced by the ability and willingness of the consumer to spend on different commodities. Consumers with high consumption level will save some of their spending and redirect such expenditure towards a purchase of air ticket. Therefore, the high the rate of consumer consumption, the higher the demand for domestic air travel is expected.

The next chapter provides a summary and conclusion of the research as well as the results of the tested hypotheses. Furthermore, recommendations and the limitations of the research were discussed in the forthcoming chapter.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1. INTRODUCTION

This dissertation has investigated the possible determinants of domestic air travel in South African context. The preponderant purpose of this study was to determine factors that influence the demand for air transport. To accomplish that goal, it became apparent to reach some pre-requisite goals. Amongst these was to investigate the relationships between air transport demand and these exogenous variables. In similar vein, studying the determinants of domestic air passenger demand assumed a high degree of significance during the literature review conducted for this dissertation. Related to that effort, it became apparent to reach as certain level of econometric analysis. Consequently, the study attempted to build a regression model for studying the relationships between domestic air passenger demand and its possible determinants.

To provide for the possibility that the domestic air passenger may be measured as a viable component of the civil aviation industry and contribution towards airport development in South Africa, it was imperative therefore to develop a model with the potential to estimate the future air passenger travel demand. This chapter gives a summary as well as reports the conclusions and recommendations that resulted from this study.

5.2. SUMMARY

This study set out to determine the factors influencing the domestic air transport demand in South Africa. In this investigation, the aim was to assess the effects of certain selected variables on the demand for air passenger travel. The focus area of this study was the domestic air travel. This study has shown that air transport is a very important mode of travel which provides the worldwide accessibility and makes it essential for global business and tourism. It was also shown that the worldwide air transport handles approximately 2 billion passengers annually and 40 percent of the inter-regional exports. The literature on the determinants of domestic air passenger demand was reviewed with the aim to create a comprehensive knowledge of domestic air transport demand and its determinants. The literature suggests that air transport industry is a capital intensive and essential component of the economy. The continuing demand for air transport has led to airports congestion in many airports throughout the world. South African airports experienced congestion in some major airport during the 201 FIFA Soccer World Cup.

The world economy (WGP) is expected to grow at an average rate of 3.3 % annually for the next 20 years. Hence, the global air passenger traffic growth is projected to be higher than the world GDP growth. In similar breath, the worldwide passenger capacity rose to 3.2 % in 2012. Both passenger and cargo volumes are estimated to rise by 4.5% and 1.5% respectively in 2014.

Furthermore, the liberalization processes (Yamoussoukro decision, bilateral and multilateral agreements, Chicago convention) has promoted the birth of new business models such as the Low Cost Carriers (LCC). The LCC's are expected to enable more and more people to fly by introducing considerably lower and more affordable airfares and thus target the low income population.

In South Africa, air passenger demand went up and is expected to rise further due to the introduction of the low cost carriers such as Mango, Kulula.com and Comair. The hosting of 2010 FIFA Soccer World cup in South Africa has also contributed immensely to the air traffic growth.

It was also shown that airports play a significant role as enablers of economic and social activities. Airports play a critical role in economic growth and development of the country, region and globalization. They also form a greater part of the country's infrastructure and foster economic activities by facilitating and encouraging international commerce and tourism as well as generating employment opportunities. Airports support both direct and indirect employment opportunities. Direct opportunities include workers from the construction sector when the airport is being built and the personnel required for a range of service when the airport is operational. These include airport management and operations, aircraft maintenance, storage facilities, charter services and leasing activities.

Returning to the hypothesis / question posed at the beginning of this study, the literature suggests that there are various factors influencing the air transport

demand. Amongst factors influencing demand for air transport demand, the following factors are very important to mention:

- Basic quantitative indicators such as population, gross domestic product, tourism activities, personal consumption expenditure and or retail sales; and
- Derived socioeconomic and psychological indexes such as propensity to travel, frequency of service, personnel income, employment categories, educational levels, customer loyalty, availability of other modes, inflight amenities, safety, aircraft characteristics (size, speed, and operational cost), scheduled frequency, or structure of air carrier industry, random effects such as SARS[5], terrorism attacks and recession.

Air transport and economic activity are interconnected and have spontaneous effect on one another. Thus, these economic activities are somewhat stimulated by air transport and in turn generate a platform for the operations of air transport activities. Therefore, GDP is likely to influence the demand for air transport positively. The literature also suggests that interest rates and exchange rates may have a strong influence on growth level of passenger movement but only for short term. Similarly, exchange rates can be a valid determinant of air transport demand but mainly for the international routes.

Studies also indicated that income and consumer expenditure are amongst significant factors influencing air traffic growth. In similar vein, price (airfares)

[5] Severe and acute respiratory syndrome

has an important influence to the demand for air transport. Thus, people will ordinarily fly more at lower air ticket prices and less at higher prices. Therefore, airfares (prices) of alternative modes of transport are crucial determinants of air transport demand. Airfares are assumed to move in line with airline costs such as fuel and no-fuel costs.

This study has found that generally, the demographic factors such as population size and urbanization also have an influence on air transport demand. The bigger the population size, the more people willing to fly. Again, urbanization plays a critical role in that, urban population are densely populated and likely to have more people wanting to fly than their rural counterparts.

Similarly, market structures also influence the air transport demand. New business models such as the low cost carriers (LCC), liberalization (YD), competition and bilateral agreement will continue to stimulate air transport demand. Again, air passenger demand is correlated to the motivation of individuals to travel as well as socio economic activities and measure that support travel as well as the availability of related services and infrastructure. However, social factors are generally very difficult to quantify.

This study followed both quantitative and qualitative methods. As narrated above, the literature on the subject matter was reviewed and discussed in this document. Similarly, the quantitative approach was followed where data was collected and analysed using statistical techniques. The ontological approach followed in this study followed a belief that the objectives of this thesis are not

only a purely deterministic in nature, thus they need to be interpreted in terms of the contextual influence and understanding of what people think about certain concepts discussed in the study. Therefore, the epistemology is that of a mixed method approach. The research paradigm adopted for the analysis of data is that of constructivism, embracing a pragmatic approach.

The analysis of determinants of domestic air transport demand was based on a theory obtained through literature review (qualitative) and also through a scientific data collection and analysis thereof (quantitative) approach. A multiple regression analysis model was employed as a technique to measure the magnitude of the relationship between the domestic air transport demand and independent variables selected for this study. The independent variables includes but is not limited to gross domestic product, airfares, employment, oil prices, final consumption expenditure, final government expenditure, population and income.

The target population of this study was the domestic air passenger travel in South Africa. The quantitative part of the study focused on data collected between 1971 and 2012. Data was then captured and analysed using statistical software (STATA 12) and the results were presented in chapter 4 of the study. Next section continues with the conclusion of the research and results of the tested hypotheses. Recommendations and the limitations of the research are discussed in the forthcoming sections.

5.3. CONCLUSIONS

This study was aimed to answer the following question: "What are the main determinants of domestic air passenger demand in South Africa?" In order to answer this question, we created 8 different hypotheses. To test these hypotheses, demand model for domestic air transport is generated. One of the more significant findings to emerge from this study is that there is a problem of multicollinearity, whereby, most of the "*supposed to be*" exogenous variables influence one another within the model and as a result gives spurious results. The model shows that the domestic air passenger demand is highly (99%) influenced by all independent variables chosen for the study. However, the p-values for some variables are more than 0.05 at 5% level of significance, making them insignificant variables to explain the domestic air passenger demand in the South African situation. These variables are gross domestic product, consumption expenditure, population, unemployment, and income as well as government expenditure. There were only four among these variables with p-value smaller than 0.05 at 5% level of significance. These are crude oil prices, airfares, household consumption expenditure and population size. In the light of the outcomes of demand model and the reviewed literature, the following hypotheses were tested.

First of all, we do not reject $\mathbf{H_1}$, which states that: "Consumer expenditure has a significant impact on the demand for air transport demand". The model

indicates that the consumer expenditure is a significant variable to influence the demand for domestic air passenger demand; its p-value is 0.023 which is smaller than 0.05 at 5% level of significance. Thus, the demand for air travel is influenced by the ability of household to spend more on goods and services, including their ability on spend on air ticket.

Secondly, we do not reject $\mathbf{H_2}$, which states: "Population plays as major role in influencing the need to travel". The results show a strong and positive relationship between population and the domestic air transport demand with the p-value of 0.000 which is smaller than 0.05 at 5% level of significance. Thus, population increase is stimulating air transport passenger demand.

Thirdly, the study tested if unemployment triggers a serious impact on the demand for domestic air travel ($\mathbf{H_3}$). Unemployment has a p-value of 0.757 which is greater than 0.05 at 5% significance level. Hence we do not accept $\mathbf{H_3}$. Thus unemployment does not trigger a serious effect on the domestic air passenger demand in South Africa. Fourthly, we do not accept $\mathbf{H_4}$, which states that: "Gross Domestic Product has a significant effect to the changes in domestic air transport demand". The p-value for this GDP is 0.094, which is greater than 0.05 at 5% level of significance. This means that in South Africa, gross domestic product does not significantly stimulate the demand for domestic air passenger. Fifthly, we do not reject $\mathbf{H_5}$ which states that: "Oil prices have a significant impact on domestic air transport demand". The p-value for oil prices

is 0.000 which is smaller than 0.05 at 5% level of significance. Thus, oil prices have a significant influence on the price of air ticket and hence that trigger the willingness to fly. Again, at high oil prices, the competing modes of travel may be very costly, prompting individuals to use air transport.

Again, we do not accept $\mathbf{H_6}$ which states that: "Total Government Expenditure triggers a serious impact in the air transport demand". The p-value for government expenditure is 0.255 which is greater than 0.05 at 5% level of significance. Thus, in South African context, the domestic air passenger demand cannot considerably be determined by government expenditure.

Moreover, we do not reject $\mathbf{H_7}$ which states that: "Airfares have a significant effect on domestic air passenger demand". The law of demand states that at high prices, the demand shall be low and vice-versa, ceteris paribus. In similar breath, the demand for domestic air passenger will be high at lower ticket prices and low at high ticket prices.

Finally we test $\mathbf{H_8}$ which states that: "Income triggers a significant impact on the demand for domestic air travel". The p-value for income, just like that of GDP is 0.094, which is greater than 0.05 at 5% level of significance. This means that in South Africa, income does not significantly stimulate the demand for domestic air passenger.

In precipitous, South African domestic air transport demand is stimulated by 4 major factors. These factors are population, oil prices, household consumption expenditure and airfares. The most obvious finding to emerge from this study is that domestic air transport demand is positively related to population. This study has found that generally a 1% increase in population size positively increase the domestic air passenger demand by more 6%. Similarly, there is a positive relationship between crude oil prices and the demand for a transport. This sounds strange because the theory suggests otherwise. However, the model assumes that in South Africa, when the oil prices are high, and then demand for other modes of travels will be low. Some passengers will then shift from other modes of travel and opt to use air transport. The model shows that a 1% increase in the price of oil will trigger the demand for air transport to increase by 2%.

On the other hand, the study indicated that the price of air tickets (airfares) is negatively related to the domestic air passenger demand. Thus a 1% change in the air ticket price will result in a 1% change in the opposite direction. Over and above, the multiple regression analysis revealed that the overall model fit is significant.

Finally, the study has established that the consumption expenditure by households have a positive influence on the demand for air ticket. Thus a 1% increase in the household consumption expenditure will trigger the demand for air travel to increase by 3.1%, ceteris paribus.

This research study importantly provided the basis for further empirical research work in the area and add substantially to our understanding of the determinants of domestic air passenger demand in South Africa and will add to a growing body of literature on the determinants of air transport travel demand. Knowledge is practically lacking on which factors determine the air transport demand in South Africa. The study is among the few researches into the determinants of the demand for air passenger travel within the borders of South Africa. It provides empirical support for the fact that; airfares, population, household consumption expenditure and oil prices one way or another influence the demand for domestic air transport.

5.4. LIMITATIONS OF THE STUDY

Finally, a number of caveats need to be noted regarding the present study. The most important limitation lies in the fact that the model has the problem of multicollinearity resulting from the use of variables influencing one another. This is an obvious challenge when the multiple regression analysis with many exogenous variables is employed in the study. Thus, many variables in the model influence one another. This has limited the current investigation of the influence of other variables such as gross domestic product, income, employment and government expenditure. Moreover, as important determinant of demand beside oil prices and population, airfares are not available in South Africa, hence the study used consumer price index to measure the airfares.

Thus, we cannot acquire price elasticity of demand for domestic air passenger demand. For further researches, analysing domestic air transport demand with sufficient number of observation by using time series model with quarterly or monthly observation is inevitable. Even though the model used in this study is increasing capability of model, it has some disadvantages as well. Moreover, demand model for domestic Origin - Destination (O &D) market is important to investigate domestic market in micro level. Furthermore, this study focused only on the domestic air passenger demand. Thus, excluding international travel and freight volumes.

5.5. RECOMMENDATIONS OF THIS RESEARCH

Air transport industry is a very fragile market and demand is dependent on a number of exogenous factors such as airfares, oil prices, and population. Since airlines do not have control over these exogenous factors, predictions come into prominence. Therefore, all the above mentioned factors indicate that for airlines, government agencies, airport, airline managers and airports managers, it is crucial to predict airfares, oil prices, and household consumption expenditure and population changes. Successful predictions about determinants of air transport demand and how they evolve in the course of time are a key factor for achieving success in aviation. A serious planning and forecasting on domestic air transport will help to ensure high future demand for air passenger numbers in the country. While South African civil aviation is developing into

the one of Africa's biggest domestic markets, there are insufficient researches in this field. This study provides important information and results for South African domestic air transportation. This research will contribute to academic literature on South Africa's air transport industry, where there is a significant shortage of empirical approaches for air transport demand models.

5.6. AREAS OF FURTHER RESEARCH

The is a high need for conducting a passenger survey to obtain airfares and O & D statistics in the Republic of South Africa. This would help enhance the future researches. Further investigation and experimentation into the effects of maturity, interest rates, exchange rates, and level of trade variables is strongly recommended. This information can be used to develop targeted interventions aimed at developing an aviation demand forecasting framework for the country. There is also a room for further research on the freight component and looking further into investigating the international passenger and freight air transport demand.

6. LIST OF REFERENCES

Abed, S.Y., Ba-Fail, A.O. and Jasimuddin, S.M. (2001). An Econometric Analysis of International Air Travel Demand in Saudi Arabia. Industrial Engineering Department. King Abdulaziz University. Jeddah. Saudi Arabia. *Journal of Air Transport Management* vol. no. 7 (2001) 143 – 148.

ACRP. (2007). *Airport Aviation Activity Forecasting Synthesis 2*. Airport Cooperative Research Program (ACRP). Transportation Research Board.

ACSA. (2006). *Annual Financial Report 2006.*

ACSA. (2010*). Statistics on passenger and aircraft movements received from ACSA*. Airports Company South Africa. South Africa. Johannesburg.

ACSA. (2011). *Statistics on passenger and aircraft movements received from ACSA. Airports Company South Africa*. South Africa. Johannesburg.

ACSA. (2012a). *Economic Impact Study on all the airports managed by ACSA.* Airports Company South Africa. South Africa. Johannesburg.

ACSA. (2012b). *Statistics on passenger and aircraft movements received from ACSA*. Airports Company South Africa. South Africa. Johannesburg.

ACSA. (2013). *Statistics on passenger and aircraft movements received from ACSA.* Airports Company South Africa. South Africa. Johannesburg.

Aderamo, A.J. (2010). *Demand for Air Transport in Nigeria.* Department of Geography. University of Ilorin. Ilorin. Nigeria. Journal of Economics, vol 1 (1): 23 – 31 (2010).

African Development Bank. (2012). *The launch of African Economic Outlook in the united States*. Internet Source accessed at www.africandevelopmentbank.org on the 06th December 2012.

African Economic Outlook. (2012). *Macroeconomic Prospects in Africa.* Internet Source, accesses at www.Africaneconomicsoutlook.org/en on the 17th December 2012.

Airbus. (2003). *Global Market Forecast 2003 – 2022.* December 2004. Toulouse

Airbus. (2011). *Delivering the future: global market forecast 2010-2030.* Toulouse.

Alam, J.B. and Karim, D.M. (1998). *Air Travel Demand Model for Domestic Air Transportation in Bangladesh.* Journal of Civil Engineering. The Institute of Engineers, Bangladesh. Vol. Ce26, No.1, 1998.

Alperovich, G. and Machnes, Y. (1994). The role of wealth in the demand for international air travel. *Journal of Transport Economics and Policy, 28(2),* 163–173.

Ashford, N.J., Mumayiz, S. and Wright, P.H. (2011). *Airport Engineering: Planning, Design and Development of 21st Century Airports.* Technology and Engineering. 4th Edition. John Wiley and Sons, Inc. New Jersey.

ATAG. (2005). *The economic and social benefits of air transport.* Air Transport Action Group. Karakas, Switzerland. Geneva.

ATAG. (2007). *The Economic and Social Benefits of Air Transport.* Air Transport Action Group. Switzerland, Geneva.

Babbie, E.R. (2010). *The Practice of Social Research.* 09th ed. Belmont, CA: Wadworth.

Ba-fail, A.O., Abed, S.Y. and Jasimuddin, S.M. (2000). The determinants of domestic air travel demand in the Kingdom of South Arabia. *Journal of Air Transportation World Wide*, 5(2), 72 -86.

Bethlehem, J. (2009). *Applied Survey Methods: A statistical perspective*. Wiley Series in Survey Methodology. Candid, New Jersey. John Wiley & Sons.

Bhadra, D. (2003). *Demand for Air Travel in the United States: Bottom-Up Econometric Estimation and Implications for Forecasting by Origin-Destination Pairs.* Centre for Advanced Aviation System Development (CAASD). The MITRE Corporation. Journal of Air Transportation. Vol. 8, No. 2. 2003.

Bhadra, D. and Kee, J. (2008). *Structure and dynamics of the core US air travel markets: A basic empirical analysis of domestic passenger demand.* Journal of Air Transport Management, 14(1), 27–39.

Bhadra, D. and Wells, M. (2005). Air travel by state: Its determinants and contributions in the United States. *Public Works Management & Policy, Vol. 10, No.2.* October 2005 pp.119-137.

Bluestone, D.W., Glover, J., McGrath, D. and Schauffler, P. (2010). *Airport System Development.* Forecasting and Trends Methods. Priceton Edu. Diane Publishing.

Boeing. (2011). *Boeing current market outlook 2011-2030.* Seattle

Bofinger, H.C. (2008). *Africa Infrastructure Country Diagnostic.* Air Transport: Challenges to Growth. World Bank and SSATP.

Bostrom, B. (2002). *Airport Demand Forecasting in Developing Nations. Transportation Research.* E-Circular No. E-C040. August 2002. ISSN 0097-8515.

Burt, J.E., Barber, G.M. and Rigby, D.L. (2009). *Elementaty Statistics for Geography.* 3rd ed. The Guildford Press. New York. United States of America.

Carson, R.T., Cenesizoglu, T. and Parker, R. (2010). *Forecasting (aggregate) Demand for US Commercial Air Travel.* International Journal of Forecasting. Doi:10.1016.

Chin, A.T.H. (2002). *Impact of Frequent Flyer Programme on the Demand for Air Travel. Department of Economics.* National University of Singapore. Journal of Air Transportation. Vol.7, No2. 2002.

City of Columbia. Aviation Demand. (2008). *Columbia Regional Airport Master Plan Update*. Aviation Demand Forecast. Columbia.

Cohen, J.P. and Coughlin, C.C. (2003). *Congestional Airports: The Economics of Airport Expansions*. The Federal Reserve Bank. St. Loius. May Issue. Pp. 9 - 26.

Dargay, J. and Hanly, M. (2001). *The determinants of the demand for international air travel to and from the UK.* Paper presented at the 9th World Conference on Transport Research, Edinburgh, Scotland, May, 2001.

De Livera, M.D. and Hyndman, R.J. (2009). *Forecasting Time Series with Complex Seasonal Patterns Using Exponential Smoothing.* Monash Econometrics and Business Statistics Working Paper. 15 September 2009. Monash University, Department of Economics and Business Statistics. Monash.

De Vaus, D. (2006). *Survey: Social Science*. 5th ed. British Library Catalogue. Britian. United Kingdom.

Demirsoy, C. (2012). *Analysis of Stimulated Domestic Air Transport Demand in Turkey.* What are the drivers? Masters Research Thesis. School of Economics. Erasmus University. Rottedam.

DfT. (2010). *Air transport market maturity summary report.* University of Westminster. United Kingdom.

DfT. (2011). *UK Aviation Forecasts.* Department for Transport United Kingdom.

Dobruszkes, F., Lennert, M. and Hamme, G. V. (2011). An analysis of the determinants of air traffic volume for European metropolitan areas. *Journal of Transport Geography, 19,* 755-762.

DoT. (2010). *The Contribution of Civil Aviation to the South African Economy.* Unpublished Research Report conducted on behalf of the Department of Transport. South Africa. Pretoria.

DoT. (2012). *Socio-econmic Impact of Air Transport Liberalisation Agreements (Yamoussoukro Decision) in the Southern African Development Community.* Unpublished Study conducted my Graham Muller on behalf of Department of Transport. Pretoria. South Africa.

Econowatch. (2010). *The 12 fastest growing economies in 2010.* Internet Source, accessed at www.econowatch.com on the 13th October 2010.

Enders, W. (2011). *Applied Econometric Time Series 3e*. 3rd edition. Wiley. United States of America.

Frankel, R.M. and Devers, K. (2000). Study Design in Qualitative Research-1: Developing Questions and Assessing Resource Needs. Practical Advice. *Education for Health*, Carpax. Vol 13. No.2. pp 251-261.

Gillen, D. (2009). *International Air Passenger Transport in Future*. The future for interurban passenger transport: bringing citizens closer together. Joint Transport Research Centre. Discussion Paper No. 2009-15. University of British Columbia. Vancouer, Canada.

Graham, A. (2000). Demand for leisure air travel and limits to growth. *Journal of Air Transport Management, 6,* 109-118.

Graham, A. (2006). Have the major forces driving leisure airline traffic changed? *Journal of Air Transport Management, 12(1)*, 14–20.

Gujarati, D.N. and Porter, D.C. (2010). *Basic Econometrics*. 5th edition. MaGraw-Hill International Edition. Singapore.

Harvey, D.R. (2002). *Research methods*. Available at: http://www.lamp.ac.uk/mit/pdf/report/pdf.

Hyndman, R.J., Koehler, A.B., Ord, J.K. and Snyder, R.D. (2008). *Forecasting with exponential smoothing: the state space approach,* Spinger-Verlag, Berlin.

Hyndman, R.J. (2009). *Business Forecasting methods,* Spinger-Verlag, Berlin.

Ishutkina, M. & Hansman, R. J. (2008). Analysis of interaction between air transportation and economic activity. *International Center for Air Transportation.* Massachusetts Institute of Technology, Cambridge

Ishutkina, M. (2009). *Analysis of the Interaction Between Air Transportation and Economic Activity: A Worldwide Perspective.* Doctoral dissertation. Massachusetts Institute of Technology.

Johnson, M. (2012). *Aviation Demand Forecast. Great Binghamton Airport Master Plan Update*. Broome County.

Jordan, A.J. and Cruz, R.N. (2011). *Qualitative and Quantitative Methods of Research.* Online Marketing Education. Available on http://www.slideshate.net/quantitative/qualitaitve/methods.

Karlafitis, M.G. (2008). *Demand Forecasting in Regional Airports*. Dynamic Tobit Models with Garch Erros. Department of Transportation Planning and

Engineering. National Technical University of Athens. VII STRAER. Vol. 7, pp 100-111, 2008.

Kennon, P. (2002a). *Urban Air Transport Passenger and Aircraft Movement Forecast.* A Survey Methodology. Transportation Research. E-Circular no. E-C040. August 2002. ISSN 0097-8515.

Kennon, P. (2002b). *Non-Urban Air Transport Passenger and Aircraft Movement Forecast.* A Survey Methodology. Transportation Research. E-Circular no. E-C040. August 2002. ISSN 0097-8515.

Kerlinger, F.N. (1986). *Foundations of Behavioural Research.* 3rd ed. Fort Worth, TX: Holt, Renehart & Winston.

Kohlbacha, F. (2006). The use of qualitative content analyses in case study research. *Forum: Quantitative Social Research.* Vol 7. No. 1. 21 January 2006.

Kruger, D.J. (2003). *Integrating Quantitative and Qualitative Methods in Community Research.* The Community Psychologist, 36, pp 18 -19.

Kwakkel, J.H., Walker, W.E. and Marchau, V.A.W.J. (2010). *Adaptive Airport Strategic Planning.* European Journal of Transportation and Infrastructure Research, Vol.10 N0.3, pp. 249 – 273.

Landrum and Brown Team. (2009). *Lamberts-St. Loius International Airport Master Plan Update.* Preliminary Draft.

Lynnes, J. (2006). *System Dynamics for market Forecasts and Structural Analysis. Systems Dynamic Review*. Vol. 16, pg 13-15. 2006.

Marazzo, M., Scherre, R. and Fernandes, E. (2010). Air transport demand and economic growth in Brazil: A time series analysis. *Transportation Research Part E, 46,* 261-271.

Marazzo, M., Scherre, R. and Fernandes, E. (2007). *Air Transport Demand and Economic Growth in Brazil: A Time-Series Analysis.*

MassDOT (2010). *Aviation Demand Forecast*. Massachusetts Statewide Airport System Plan. Massachusetts Department of Transportation. Aeronautics Division.

Matlabe, A.M. (2006). Advertising *in Small Business Enterprises in Kgalagadi region.* Unpublished Masters Dissertation. North West University. Mahikeng. South Africa.

Matsomela, J.JM. (1998). *The perception of business managers with regard to business opportunities in South Africa since the 1994 democratic elections with*

special reference to Mafikeng, Capital City of the North West Province. Unpublished Masters Dissertation. University of South Africa (Unisa). Pretoria. South Africa.

McFarland, J. (2010). *Aviation Demand Forecasts.* Master Plan update. Greater Binghamton Airport. Broome County.

Mitchel, M.F. (2009). *A critical analysis of selected aspects of South African transportation policy.* Masters Dissertation. Univeristy of Johannesburg. RSA Johanneburg.

Mohr, P. (2012). Economic Indicators. 4th edition. Unisa Press. Pretoria. South Africa. ISBN 9781-1-86888-688-6.

Mohr, P., Fourie, L. and Associates. (2009). *Economics for South African Students*. 4th edition.Van Schaick. Pretoria. South Africa.

OECD. (2012). *Economic Outlook Analysis and Forecast*. Internet Source accessed on the 06 December 2012 at www.oecd.org.eco/outlook/economicoutlook.htm

Oxford Economic Forecasting. (2003). *The Contribution of Air Transport to Sustainable Development in Africa.* Draft Final Report on Study for the Air Transport Action Group.

Parker, R., Carson, R. and Cenesizoglu, T. (2005). *Aggregation Issues in Forecasting Aggregate Demand.* An Application to U.S. Commercial Air Travel. American Marketing Association's Advanced Research Technigues Forum, Couer D'Alene. June 2005.

Postorino, M.A. and Russo, F. (2001). *Time Series Unimode and Random Utility Multi-Mode Approaches in National Passenger Models: The Impact of Italian Air Demand Forecast*. University of Reggio Calbria, Italy.

Qualitative Research. (2007). Internet Source available at http://en.wikipedia.org/wiki/qualitative_research, accessed on 23/09/2007.

Quantitative Research. (2007). Internet Source available at http://en.wikipedia.org/wiki/quantitative_research, accesses on 25/09/2007.

Reeven, van. P. (2011). On the effectiveness of pricing urban car usage. *Journal of Transport Economics and Policy, 45(3),* 367-381.

Rodrique, J. and Notteboom, T. (2013). *The Geography of Transport System: Transportation and Economic Development.* 3rd edition. New York.

Shen, N. (2006). *Prediction of International Flight Operations at Sixty-six U.S.* Airport. Masters Study Report. Blackburg. Virginia.

SAGCIS. (2013). Internet source accessed on South African Government Communication and Information System at www.gov.za/transport.htm.

South African Reserve Bank. (2012). Quarterly Bulletin, no. 267. March 2012. Pretoria. RSA. ISSN 0038-2620.

STATA. (2012). *Stata 12 for Data Analysis*. Stata Inc, 2012.

Steiner, J. E. (1967). *Aircraft evolution and airline growth.* Financial Analysts Journal, *23(2),* 85-92.

Steiner, S., Bozicevic, A. and Mihitec, T. (2008). Determinants of European air traffic development. *Transport Problems.*

Studenmund, A.H. (2002). *Using Econometrics: A Practical Guide*. 6th edition. Pearson Education, Inc.

Suryani, E., Chou, S., and Chen, C. (2009). *Air Passenger Demand Forecasting and Passenger Terminal Capacity Expansion.* A System Dynamics Framework. Department of Industrial Management. National Taiwan University of Science and Technology. Elsevier LTD. Taiwan.

Suryani, E., Chou, S. and Chen, C. (2009). *Air Passenger Demand Forecasting and Passenger Terminal Capacity Expansion.* A System Dynamics Framework. Department of Industrial Management. National Taiwan University of Science and Technology. Elsevier LTD. Taiwan.

Swan, W.M. (2008). *Forecasting Air Travel with Open Skies*. Seabuy Airline Planning Group.

Thanasegaran, G. (2005). *Reliability and Validity Issues in Research. Department of Management and Marketing*. Universiti Putra Malaysia. Integration and Dissemination. pp 25-40.

University of Johannesburg. (2008). *An overview of the Airport Industry In South Africa and Determinants of the Economic Impacts of O.R. Tambo International Airport, Cape Town International Airport and Durban International Airport.* 1st Draft. 2008. Johannesburg, South Africa.

United Nations. (2009). *African Review Report on Transport*. 6th Session of the Committee on World Transport. New York

United Nations. (2013). *World Economic Situation and Prospects 2013*. Global Outlook. Pre-release. New York.

Vasigh, B., Flemming, K. and Tacker, T. (2012) *Introduction to Air Transport Economics: from Theory to Applications*. Ashgate Publishing, LTD (PTY). Business and Economics. Second Edition.

Walliman, N. (2008). *Your research project. A step-by-step guide for the first time researcher*. 2nd ed. SAGE. London.

Wells, A.T. (2003). *Air Transportation.* A Management Perspective. 2nd edition. Wadsworth. USA

Wensveen, J.G. (2012). *Air Transportation.* A Management Perspective. 7th edition. Ashgate Publishing. Burlington. USA

Woods, M. (2011). *Interviewing for research and analysing quantitative data: an overview.* School of Health and Social Services. Massey University.

Zikmund, W.G. (2003). *Business Research Methods,* (7th edn), Thompson South-Western: Ohio.

LIST OF ABBREVIATIONS USED

ACI	Airports Council International
ACRP	Airport Cooperation Research Council
ACSA	Airports Company of South Africa
ADB	African Development Bank
AEO	African Economic Outlook
ATAG	Air Transport Action Group
ATNS	Air Traffic and Navigation Services Company
BFN	Bloemfontein Airport
BRICS	Brazil, Russia, India, China and South Africa
CAA	Civil Aviation Authority
CIA	Cape Town International Airport
Con	Consumption
CPI	Consumer Price Index
DBSA	Development Bank of Southern Africa
DfT	Department for Transport UK
DIA	Durban International Airport
DoT	Department of Transport (RSA)
EC	Eastern Cape
EU	European Union
FIFA	Fédération Internationale de Football Association

FS	Free State
GCIS	Government Communications and Information Systems
GDP	Gross Domestic Product
GP	Gauteng
GNP	Gross National Product
GNI	Gross National Income
GRJ	George Airport
ELS	East London Airport
Exp	Expenditure
IATA	International Air Transport Association
ICAO	International Civil Aviation Organization
IMF	International Monetary Fund
Inc	Income
KIA	King Shaka International Airport
KIM	Kimberly Airport
KZN	Kwazulu-Natal
LCC	Low Cost Carriers
LP	Limpopo
MDGs	Millenium Development Goals
MP	Mpumalanga
NC	Northern Cape
NW	North West

O & D	Origin and destination
OECD	Organisation for Economic Co-operation and Development
OPEC	Organisation for Petroleum Exporting Countries
ORTIA	OR Tambo International Airport
OLS	Ordinary Least Squares
Pax	Passengers
PE	Port Elizabeth
PLS	Port Elizabeth Airport
Pop	Population
Pr	Price
R	South African Rand
RPK	Passenger Revenue Kilometre
SAA	South African Airways
SADC	Southern African Development Community
SARPs	Standards and Recommended Practices
SARS	Severe Acute Respiratory Syndrome
StatsSA	Statistics South Africa
UK	United Kingdom
UN	United Nations
Une	Unemployment
US	United States
UTN	Upington Airport

VFR	Visiting friend and relatives
VIF	Variance Inflation Factor
WC	Western Cape
WB	World Bank
WGP	World Gross Product

ANNEXURE A

Regression model A

Source	SS	df	MS		Number of obs = 43
					F(8, 34) = 490.39
Model	24.7213319	8	3.09016648		Prob > F = 0.0000
Residual	0.214249615	34	0.006301459		R-squared = 0.9914
					Adj R-squared = 0.9894
Total	24.9355815	42	0.593704321		Root MSE = 0.07938

logpax	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
loggdp	-260.3555	151.3196	-1.72	0.094	-567.8739	47.16286
logcons	-0.2013443	0.7999536	-0.25	0.803	-1.827046	1.424357
logexp	-0.0424145	0.0366388	-1.16	0.255	-0.1168735	0.0320445
logpop	268.2664	151.4982	1.77	0.086	-39.6151	576.1478
loginc	261.1184	151.5121	1.72	0.094	-46.79121	569.0281
logune	0.0430907	0.1379116	0.31	0.757	-0.2371794	0.3233607
logoil	0.0642874	0.0551873	1.16	0.252	-0.0478667	0.1764414
logpr	-1.003765	0.1659491	-6.05	0.000	-1.341014	-0.6665153
_cons	-1266.595	699.4246	-1.81	0.079	-2687.997	154.8065

Correlation Matrix 1

(obs=43)

	logpax	loggdp	logcons	logexp	logpop	loginc	logune	logoil	logpr
logpax	1.0000								
loggdp	0.9882	1.0000							
logcons	0.9850	0.9967	1.0000						
logexp	0.3713	0.4158	0.4161	1.0000					
logpop	0.9639	0.9720	0.9847	0.4156	1.0000				
loginc	0.5315	0.5501	0.4915	0.1884	0.3383	1.0000			
logune	0.8628	0.8711	0.8955	0.2953	0.9487	0.1166	1.0000		
logoil	0.3734	0.3633	0.3033	-0.1111	0.1801	0.8140	0.0414	1.0000	
logpr	0.9322	0.9460	0.9646	0.4147	0.9941	0.2556	0.9668	0.1107	1.0000

Stepwise Correlation Matrix

	logpax	loggdp	logcons	logexp	logpop	loginc	logune
logpax	1.0000						
loggdp	0.9882	1.0000					
logcons	0.9850	0.9967	1.0000				
logexp	0.3713	0.4158	0.4161	1.0000			
logpop	0.9639	0.9720	0.9847	0.4156	1.0000		
loginc	0.5315	0.5501	0.4915	0.1884	0.3383	1.0000	
logune	0.8628	0.8711	0.8955	0.2953	0.9487	0.1166	1.0000
logoil	0.3734	0.3633	0.3033	-0.1111	0.1801	0.8140	0.0414
logpr	0.9322	0.9460	0.9646	0.4147	0.9941	0.2556	0.9668

	logoil	logpr

logoil	1.0000
logpr	0.1107 1.0000

Variable Inflation Factors (vif)

Variable	VIF	1/VIF
loggdp	1.30e+07	0.000000
logpop	1.03e+07	0.000000
loginc	816931.75	0.000001
logcons	629.99	0.001587
logpr	298.73	0.003348
logemp	34.67	0.028841
logoil	5.16	0.193749
logexp	2.00	0.500747
Mean VIF	3.02e+06	

Correlation matrix of coefficients of regress model (vce, corr)

e(V)	loggdp	logcons	logexp	logpop	loginc	logune	logoil	logpr	_cons
loggdp	1.0000								
logcons	0.0703	1.0000							
logexp	0.0777	0.3184	1.0000						
logpop	-1.0000	-0.0769	-0.0793	1.0000					
loginc	-1.0000	-0.0760	-0.0800	1.0000	1.0000				
logune	-0.3318	0.2194	0.3871	0.3306	0.3313	1.0000			

logoil	0.3488	0.3694	0.4045	-0.3510	-0.3526	-0.1764	1.0000	
logpr	0.2356	-0.1795	-0.2714	-0.2386	-0.2335	-0.4832	0.0368	1.0000
_cons	0.9999	0.0796	0.0797	-1.0000	-0.9999	-0.3323	0.3545	0.2415	1.0000

Source	SS	df	MS	Number of obs	= 43
				F(6, 36)	= 636.08
Model	24.702569	6	4.11709484	Prob > F	= 0.0000
Residual	0.23301246	36	0.006472568	R-squared	= 0.9907
				Adj R-squared	= 0.9891
Total	24.9355815	42	0.593704321	Root MSE	= 0.08045

logpax	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
logexp	-.0360084	0.0351406	-1.02	0.312	-0.1072768	0.0352599
logpop	7.480821	0.7371751	10.15	0.000	5.985761	8.975881
loginc	0.3238444	0.4464385	0.73	0.473	-0.5815749	1.229264
logune	-0.0312495	0.1273897	-0.25	0.808	-0.2896077	0.2271088
logoil	0.0999124	0.0487215	2.05	0.048	0.0011005	0.1987243
logpr	-0.9407688	0.1600763	-5.88	0.000	-1.265419	-0.616119
_cons	-62.42909	6.209385	-10.05	0.000	-75.02231	-49.83588

Regression Model B

Source	SS	df	MS	Number of obs	= 42
Model	22.6671642	4	5.66679106	F(4, 37)	= 998.85
Residual	0.209913213	37	0.00567333	Prob > F	= 0.0000
Total	22.8770775	41	0.557977499	R-squared	= 0.9908
				Adj R-squared	= 0.9898
				Root MSE	= 0.07532

logpax	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
logpr	-0.8630327	0.01274706	-6.77	0.000	-1.121313	-.6047528
logcon	0.3293136	0.1391634	2.37	0.023	0.0473417	6112855
logoil	0.132595	0.0312857	4.24	0.000	0.0692041	1959859
logpop	6.5483	0.7539999	8.68	0.000	5.020551	8.076049
_cons	-54.80462	6.461257	-8.48	0.000	-67.89637	-41.71287