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among Selected Airlines**

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## Macroeconomic Determinants of Demand for Air Cargo Transport among Selected Airlines

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### Abstract

**Purpose:** The study sought to determine the effect of macroeconomic variables on the demand for air cargo for selected airlines.

**Methodology:** The study target population was airlines across the World. The study used a sample of 10 airlines across the World as follows; Kenya airways, British airline, Ethiopian airlines, Emirate airlines, Qatar airways, Turkish airlines, South Africa Airlines, China Southern Airlines, Egypt airlines and Air France. For the purpose of this study, the GDP, interest rate (global) and the GDP, interest rate (domestic) for the home countries of each of the selected airlines were obtained from World Bank data. The countries included; Kenya, United Kingdom, Ethiopia, United Emirates, Qatar, Turkey, South Africa, China, Egypt and France. Secondary data of the selected airlines was collected from the International Air Transport Association (IATA) for the period from 2005 to 2014. The data collected was analyzed using STATA software to generate descriptive, trends and inferential statistics which were used to derive conclusions and generalizations regarding the population. The regression model was used to determine the impact of macroeconomic variables on demand for air cargo transport.

**Results:** The findings revealed that Interest Rate (Domestic), Interest Rates (Global), GDP Growth Rate (Domestic) and GDP per capita (domestic) had a statistically significant relationship air cargo demand (ATK). The relationship between GDP Growth Rate (Domestic) and air cargo demand (ATK) was found to be positive and significant. Based on the findings the study concluded that macroeconomic variables both for origin countries and global economy have significant impacts on the air cargo demand.

**Unique contribution to practice and policy:** The study recommends that airlines in air cargo business should carefully assess the macroeconomic performance of countries along their routes. Countries that have vibrant economic growth and low interest are ideal for cargo business. The study further recommended airlines in cargo business should only expand their routes and their freight capacity when their origin countries and global economy is performing excellently since economic growth impacts positively the demand for air cargo.

**Key words:** *Macroeconomic, Determinants, Demand, Air Cargo, Transport, Airlines, Available Tonne Kilometres*

## INTRODUCTION

### Background of the Study

Long before the aircraft, mail was moved by balloons, dirigibles and carrier pigeons. The first cargo moved by aircraft occurred on 7 November 1910 when a few bolts of silk were transported by air from Dayton to Columbus, Ohio (Allaz, 2005). The following year in 1911 experimentation with the movement of post was stated, and by 1914 regular air service began in the United States. In Germany, the first official air mail flight occurred in 1912. However, it was not until 1925 before a comprehensive airmail service was available in the U.S. On October 7, 1925 the first five Contract Airmail (CAM) routes were issued by the U.S. Postal service to fly airmail between designated points. By 1931 85% of airline revenue was from domestic airmail contracts, with 14.8% from passenger service and only 0.2% from freight (Allaz, 2005).

World War II caused a rapid expansion of the aviation industry and for the first time, large scale movements of freight were carried out to support the war effort. For example, in support of the Nationalist Chinese over 650,000 tons of cargo was transported over The Hump between India and southern China between 1942 and 1945 (Naylor, 2014). Later, in the 1948 and 1949 timeframe, the largest airlift in history occurred to support the blockaded city of Berlin. By 2012, there were 1738 freighters in operation worldwide. Thirty-seven percent of these were large wide-body (>80 tons) aircraft, 36% were medium wide-bodied aircraft (40 to 80 tons) and 27% were standard bodies with carrying capacities of less than 45 tons. Boeing projects the demand for the world freighter fleet to increase to almost 3,200 airplanes by 2031 (Burgan, 2008).

According to the Boeing (2012) annual forecast, between 1987 and 1997, worldwide demand for the movement of air cargo grew at an average rate of 7.1% annually; however, this growth slowed after September 11, 2001, to an annual growth rate of 4.1%. After the terrorist attacks that happened in the U.S. on September 11, 2001, the price of fuel increased, driving up the cost of air shipments and caused companies to migrate toward less expensive road, rail, and maritime transport (Wensveen, 2016). The high costs of providing air transport and the weak economy have pushed many all-cargo airlines to the brink of bankruptcy (Blomberg & Gras Alomá, 2015).

Air cargo traffic carried to and from Africa amounted to 1 million metric tonnes in 2002 (up 1.8% on the previous year), the lowest among the world regions, accounting for only 1.6% of the world total (ACI, 2003). Air trade among African countries was estimated at 66 thousand tonnes in 2001, only 6.4% of the overall African cargo market (Boeing, 2002). The low level, both in absolute and relative terms, of the intra-Africa cargo traffic illustrates an underdeveloped intra-regional trade pattern and deficiencies in air infrastructure (Forecasting, 2003).

Western and Eastern Africa are the sub-regions that recorded the highest number of international cargo flights in 2001 (including inter-continental flights and flights between sub-regions in Africa), with their combined traffic flows accounting for nearly 60% of the African total (Bassens, Derudder, Otiso, Storme & Witlox, 2012). Flights between countries in a sub-region are excluded from these data, which significantly lowers the figure for Southern Africa (Forecasting, 2003). Compared to the international market, the intra-regional cargo market (including flights within a country and between countries in a sub-region) saw little activity in 2001, with most of it concentrated in Central Africa. This is a direct consequence of the

landlocked geography of this region that precludes the use of maritime transport - the most common means used for freight transport (Bassens, *et al.*, 2012).

The dominant economies in the overall African air trade are Egypt, Algeria and Morocco in North Africa and Kenya, Senegal, Nigeria and South Africa in the Sub-Saharan region (Saheed, & Iluno, 2015). Kenya was the most important single market for international cargo flights (i.e. intercontinental traffic and flights to other African countries) with 1,531 flights in 2001, followed closely by South Africa with 1,333 flights and Senegal with 1,218 flights. Again, as with the flow of international passenger traffic, most of the cargo traffic is concentrated in a few countries, with the top five countries accounting for more than 70% of Africa's total (Senguttuvan, 2006).

The cargo transport plays a significant role in the world transport system due to the fact that it makes more money for a transport company in comparison with transport of passengers (Wensween, 2007). The air cargo transport has not yet achieved this success, but still is an indispensable means of transport for specific goods. The speed of air transport and the lower risk of losing or damaging of the consignments make air transport favourable for carrying the perishable, time-sensitive and valuable cargo despite the high charges.

Because of high capitalization of the aviation industry the financial health of the industry is highly correlated with the global economy. As debt loads increase from the purchase of expensive aircraft and high operating expenses, so does the likelihood of financial distress (Button & Stough, 2000). Since the aviation industry is highly related to economic expansion, it is not surprising that the industry also suffers when the economy stalls. Economic fluctuation affects air cargo carriers in an amplified way, so, as the world's economy expands so does the demand for the movement of air cargo. Also, in recent years the increase in fuel prices has put additional financial pressure on the aviation industry. Demand for cargo transport is closely linked with economic development; at the same time air transport is a driver in an economy (Lowe, 2006). The contribution of air transport and related civil aviation industries to local, regional or national economies includes the output and jobs directly attributable to civil aviation as well as the multiplier or ripple effect upon other industries throughout the economy (ICAO, 2012).

## **LITERATURE REVIEW**

### **Theoretical Review**

The economy provides capital and generates demand for passenger and freight travel. The economy's travel and freight needs are determined by the relative business and leisure attractiveness of that economy to the rest of the world. This measure of attractiveness and overall competitiveness in the global environment can be described using four attributes which are based on Porter's theory of competitive advantage (Porter, 2008). The first set of attributes is the factor conditions which in standard economic theory are referred to as the factors of production. Factor conditions can be subdivided into general and specialized. General factors are inherited and consist of land, unskilled labor, and natural resources. Specialized factors are created and are key to establishing the nation's competitiveness. They consist of capital, skilled labor, and infrastructure (Ishutkina & Hansman, 2008). The combination of these attributes determines the

nation's competitive advantage in the global economic environment and influences the economy's travel and freight needs. Air transportation in turn affects these attributes through a set of enabling mechanisms (Porter, 2011).

### **Empirical Review**

Aderamo (2010) focused on demand for air transport in Nigeria. The results showed that, of the selected variables, Gross Domestic Product, Inflationary Rate and Consumer Price Index are important in the explanation of the demand for air transport in Nigeria. Button (2008) focused on the impacts of globalization on international air transport activity, global forum on transport and environment in a globalizing world 10-12. The study concluded that while the demand for air transport is derived, the institutional context in which air transport services are delivered have knock-on effects on the economic system.

Rothengatter (2011) also conducted a study on economic crisis and consequences for the transport sector. The study concluded that the economic crisis hit the industrialized countries badly and had a big impact on freight transport, which collapsed temporarily in line with the trade activities. Rothengatter (2011) further noted that while passenger transport is mainly driven by the disposable income of consumers, freight transport is in particular dependent on trade activity. Often GDP is used as an explaining variable for both, but its explanatory power is very limited.

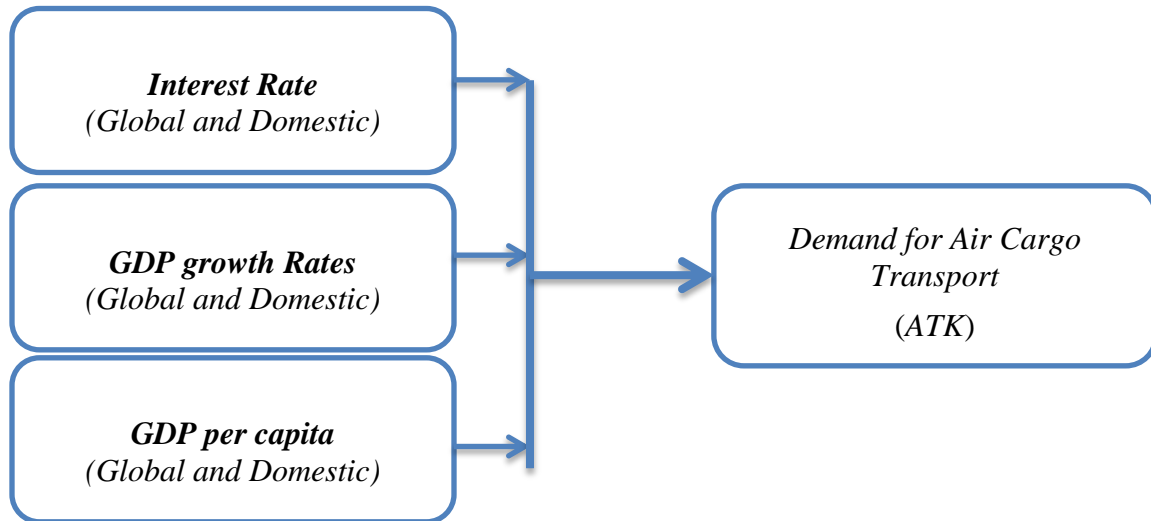
According to Piecyk and McKinnon (2010) as a derived demand, freight demand is primarily influenced by the volume of goods produced and consumed. They argue that expansion in the national economy, or the economy of any region, results in increases in overall demand (in terms of volume) for goods and services, while economic contractions result in demand reductions. Overall economic condition is also indicative of the buying/purchasing power of the population. The types and values of commodities produced and consumed usually reflect this economic condition.

Ba-Fail, Abed and Jasimuddin (2010) study findings reveal a positive correlation between domestic air travel expansion and individuals' income growth. Dargay and Hanly (2011) observes that the growth in air travel can be explained by rising incomes. Per capita income (or GDP), and consumer expenditure are widely discussed income types in the literature. Steiner (2007) concludes that, beside the changing habits, discretionary income is the most important factor that is causing air traffic growth. However, in some studies (e.g. Graham, 2010) GDP is referred to as an alternative measure of income together with disposable income and consumer expenditure. Karagülle and Yıldırım (2014) concluded that as the global crises effects all economies of the world, transportation industry cannot be kept separate considering its importance in commercial movements. The decrease in the volume of transported goods effected transportation industry negatively.

### **Conceptual Model**

Using the proposed conceptual model in Figure 1, the study sought to interest rates (global and domestics), GDP growth rate (global and domestics) and domestics GDP per capita affect the demand for Cargo air transport. The dependent variable is the demand for Cargo air transport measured by Available Tonne Kilometer for selected airlines. The conceptual model is derived

from the economic theory of demand which states that, demand is negatively related to price, ceteris paribus( holding all other factors constant).



**Figure 1: Conceptual Model**

## RESEARCH METHODOLOGY

The study sought to determine the effect of macroeconomic variables on the demand for air cargo for selected airlines. The study target population was airlines across the World. The study used a sample of 10 airlines across the World as follows; Kenya airways, British airline, Ethiopian airlines, Emirate airlines, Qatar airways, Turkish airlines, South Africa Airlines, China Southern Airlines, Egypt airlines and Air France. For the purpose of this study, the GDP, interest rate (global) and the GDP, interest rate (domestic) for the home countries of each of the selected airlines were obtained from World Bank data. The countries included; Kenya, United Kingdom, Ethiopia, United Emirates, Qatar, Turkey, South Africa, China, Egypt and France. Secondary data of the selected airlines was collected from the International Air Transport Association (IATA) for the period from 2005 to 2014. The data collected was analyzed using STATA software to generate descriptive, trends and inferential statistics which were used to derive conclusions and generalizations regarding the population. The regression model was used to determine the impact of macroeconomic variables on demand for air cargo transport. The regression model helped to explain the magnitude and direction of relationship between the variables of the study through the use of coefficients like the correlation, coefficient of determination and the level of significance. Thus the proposed demand model for the study is;

$$Y = b_0 + b_1 Dr + b_2 Gr + b_3 Dgdp_1 + b_4 Ggdp_2 + b_5 ppp_1 + \mu \dots \dots \dots (1)$$

Where:

Y = Available Tonne Kilometres (ATK)

Dr = Interest rate (Domestic)

Gr = Interest rate (Global)

Dgdp<sub>1</sub> = GDP growth (Domestic)

Ggdp<sub>2</sub> = GDP growth (Global)

ppp<sub>1</sub> = GDP per capita (Domestic)

μ = Error term

b<sub>0</sub>, b<sub>1</sub>, b<sub>2</sub>, b<sub>3</sub>, b<sub>4</sub>, b<sub>5</sub> are the coefficients of the demand equation.

The study sought to test the following hypotheses:

**H<sub>01</sub>:** Interest rates (domestic & global) has no significant effects on available tonne kilometres (ATK)

**H<sub>02</sub>:** GDP growth rates (domestic & global) has no significant effects on available tonne kilometres (ATK)

**H<sub>03</sub>:** GDP per capita (domestic) has no significant effects on available tonne kilometres (ATK)

## ANALYSIS AND RESULTS PRESENTATION

The study primarily relied on secondary data collected from world banks and IATA reports on the performance of the selected airlines. The study employed both descriptive and inferential statistics in testing the research hypotheses.

### Descriptive Statistics

This section contains the descriptive statistics results for variables under study. These include minimum, maximum, mean and standard deviation. Descriptive Statistics were used to present quantitative descriptions of the data in a manageable form.

**Table 1: Summary Descriptive Statistics**

	N	Minimum	Maximum	Mean	Std. Deviation
ATK	100	1096097	45977974	12824983.43	10047942.773
Interest Rate (Domestic)	100	-18	41	2.90	8.821
Interest Rate (Global)	100	5.945	6.495	6.14140	0.181007
GDP growth (Domestic)	100	-5.2	26.2	5.638	5.1125
GDP growth (Global)	100	-1.704	4.338	2.76850	1.725407
GDP per capita (Domestic)	100	-15.150	13.636	2.48044	4.850225
GDP per capita (Global)	100	-2.89	3.08	1.6127	1.70344

The finding showed that domestic interest rates for selected airlines had a minimum value of -18%, maximum value of 41%. The mean and standard deviation were 2.90 and 8.821 respectively. These findings implied that some of the countries of origin of the airlines in the study had low interest rates as shown by the minimum values of -18% while other had very high interest rates shown by the maximum value of 41%. On average interest rates was moderate however, a standard deviation of 8.821 implying large variation from one country to another. On the other hand, the global interest rates remained stable as shown by the standard deviation of 0.181007 which implied a slight variation of global interest rates over the study period.

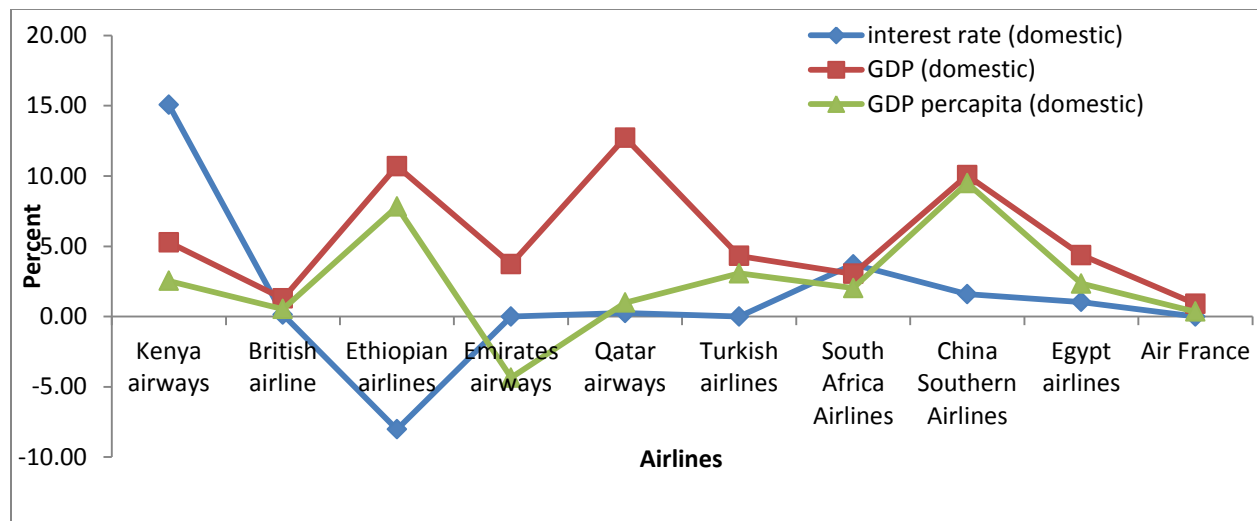
The results further revealed that the economic growth rate of some countries was as low as -5.2% while other countries flourished with GDP growth rates of 26.2% in the period of the study. The mean GDP growth rate for origin countries of selected airlines was 5.638. The average global GDP growth rate during the study period was 2.76850% which varied slightly as demonstrated by the standard deviation of 1.725407. This study concludes that the study period had a favourable environment gauging by GDP growth rates for business expansion.

The findings also showed that the maximum and minimum values of GDP per capita for origin countries of selected airlines were 13.636 and -15.150 respectively against the global values of -2.89 and 3.08. These findings implied that relatively some countries performance extremely better than others which varied significantly as shown by the standard deviation of 4.850225. The findings implied some countries had higher standard of living compared to other in the selected sample. Finally the results showed that the mean for Available Tonne Kilometres (ATK) for sample airlines was 12824983.43 however, some airline had as low as 1096097 while others had a high as 45977974 implying greater freight/cargo capacity.

### **Trend Analysis**

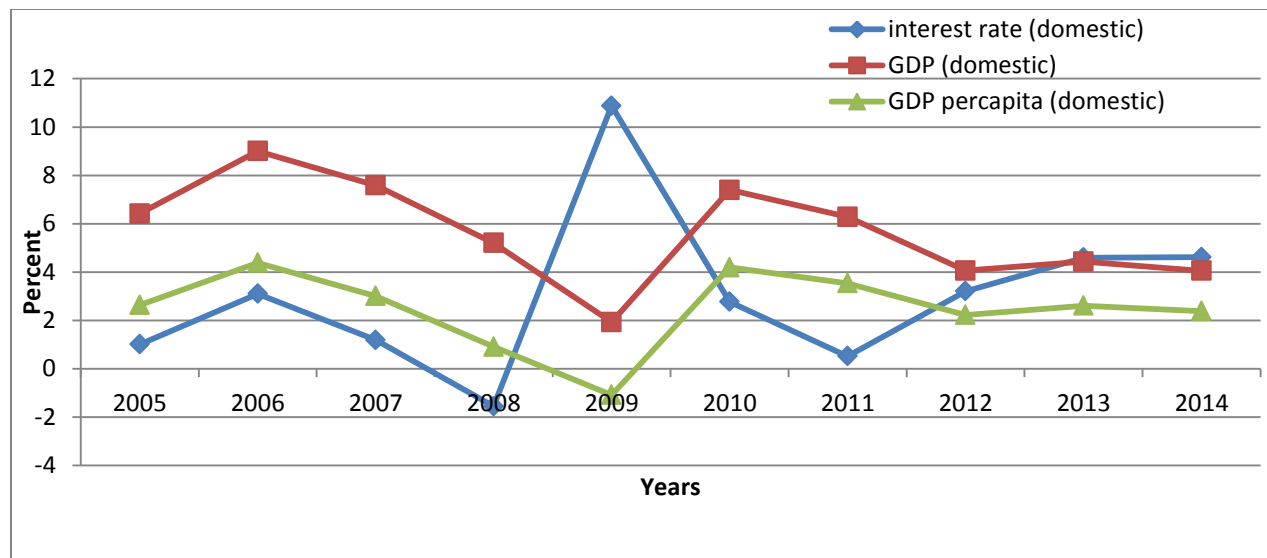
This section contains trend analysis for the study variables. The trends were carried to find how interest rates, GDP growth and GDP per capita vary from one country of origin to another for the selected airlines (Figure 2). The study further sought to find out how macro-economic variables varied across the period of this study (Figure 3).





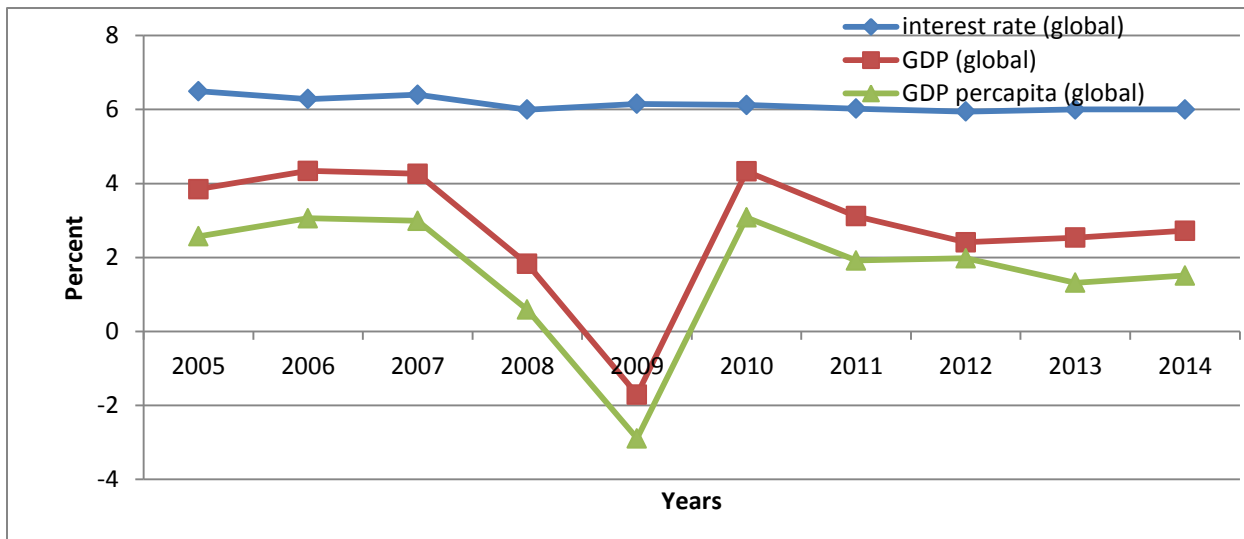
**Figure 2: Trend in Macroeconomic Variables across Origin Countries for Selected Airlines**

The findings in Figure 2 showed that interest rates, GDP growth and GDP per capita varied significantly from one origin country to another. Kenya home to KQ had the highest average interest rates followed by South Africa (home country for SAA). The two countries also recorded a lowest ATK. On the other hand Ethiopia (Ethiopian airline) had the lowest interest rates. The findings further showed that Ethiopia, Qatar and China had the highest GDP growth rate while UK and France had the lowest GDP growth rate. Despite the slow GDP growth rate, UK and France being developed countries offer favorable business environment compared to developing economies. The results also showed that an increase in GDP growth rates was highly comparative to GDP per capita; naturally therefore countries with high GDP growth rates also had high GDP per capita.



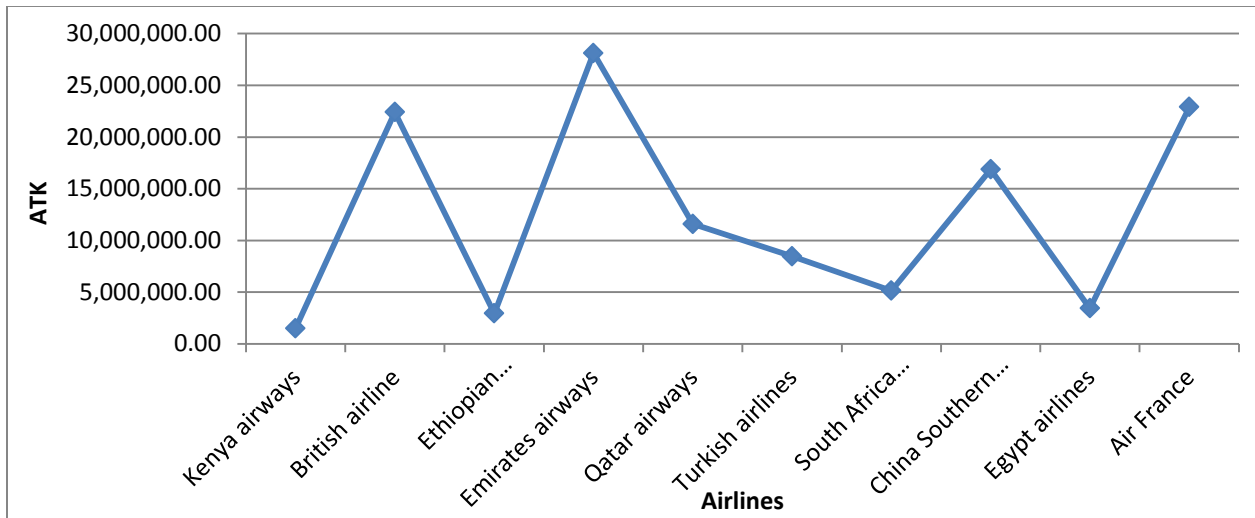
**Figure 3: Trend in Domestic Macroeconomic Variables for Selected Airlines Origin Countries**

The results in figure 3 showed that interest rates for origin countries of selected airlines were very volatile across the study period. However on average there was significant drop in 2008 followed by steady increase in 2009 which coincided with global economic crisis famously known as 2008 financial crisis. An increase in interest rates coincided with a drop in both GDP growth rate and per capita. GDP growth rate recovered in 2010 which saw a significant drop in interest rates. Macroeconomic variables were less volatile from 2011 to 2014.



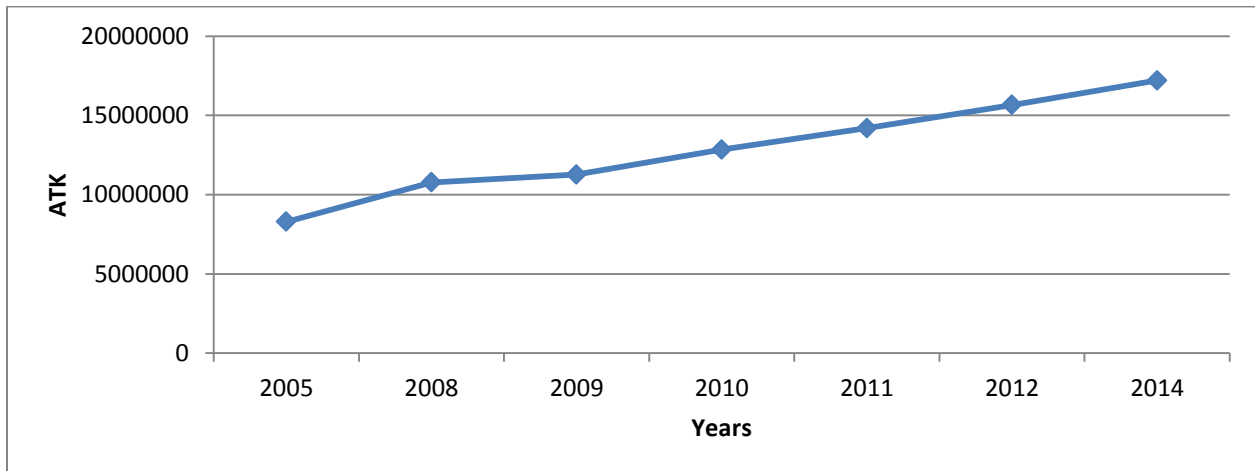
**Figure 4: Trend in Global Macroeconomic Variables**

The performance of global interest rates remained almost stable during the period of the study but experience a small knock in 2008. However both global GDP growth and GDP per capita experience a significant drop in 2009 and this could be attributed to the financial crisis of 2008. Global GDP growth and GDP per capita managed to stabilize in 2010 and since had almost constant trend.



**Figure 5: Trend in Available Tonne Kilometres (ATK) for Selected Airlines**

The findings in figure 5 show the variation in ATK among the selected airlines. The results show that Emirates Airways, British Airways, Air France and China Southern Airlines had the highest ATK in the order. Kenya airways, Ethiopia Airlines and Egypt Airlines had the lowest ATK.



**Figure 6: Trend in Available Tonne Kilometres (ATK) across the Study Period**

The findings presented in figure 6 shows that on average there had been an increase in the Available Tonne Kilometres (ATK) for the selected Airlines despite slight drop in the ATK trajectory during the 2008 financial crisis. The findings implied that the demand for air cargo has been on the rise despite the volatility in both global and countries of origin economic performance.

## Correlation Results

The study employed correlation analysis to test the association between the study variables. The findings are presented in Table 4.

**Table 4: Correlation Results**

	interest rate (domestic)	Interest rate (global)	GDP domestic	GDP global	GDP per capita (domestic)	GDP per capita (global)
interest rate (domestic)	1					
Interest rate (global)	-0.0392	1				
GDP domestic	-0.1695	0.2033*	1			
GDP global	-0.2368	0.3579*	0.3427*	1		
GDP per capita (domestic)	-0.1202	0.061	0.6110*	0.2952*	1	
GDP per capita (local)	-0.2351	0.2985*	0.3270*	0.9900*	0.2935*	1
<b>ATK</b>	<b>-0.2925*</b>	<b>-0.2206*</b>	<b>0.2945*</b>	<b>0.0272</b>	<b>0.2355</b>	<b>0.0457</b>

The results presented in table 4 show that domestic interest rates had a correlation of 0.2925 with ATK. The correlation was positive which implied that increasing domestic interest rates would result to decrease in ATK. The findings further showed that global interest rates had negative correlation with ATK implying that a drop in global interest rates would lead to increase in ATK. The correlation results further showed that both domestic and global GDP growth rate had a positive correlation with ATK. Similarly, GDP per capita both domestic and global had a positive correlation with ATK.

## Hypothesis Testing

This section contains results on hypotheses testing. The study employed a random effect regression model to test the effect of macroeconomic indicators on air cargo demand. In order to establish the statistical significance of the hypothesized relationships, multiple linear regression was conducted at 95 percent confidence level ( $\alpha=0.05$ ).

## Diagnostic Tests

Prior to conduct regression analysis the study conducted multicollinearity test and Hausman test. Multicollinearity was assessed using the variance inflation factors (VIF). According to Field (2009) VIF values in excess of 10 is an indication of the presence of Multicollinearity. The results in Table 2 present variance inflation factor results and were established to be less than 10 and thus according to Field (2009) indicate that there is no Multicollinearity.

**Table 2: Multicollinearity results using VIF**

Variables	Tolerance	VIF
Interest Rate (Domestic)	0.857	1.166
Interest Rate (Global)	0.924	1.083
GDP (domestic)	0.65	1.537
GDP (global)	0.811	1.233
GDP per capita (domestic)	0.654	1.529

### Hausman Test

Hausman test was used to determine whether the fixed or random effects model is appropriate. The Hausman test fundamentally tested whether the unique errors ( $ui$ ) are correlated with the regressors. The results in table 5 below illustrate the results of the Hausman test. A resultant p value of 0.547 was larger than the conventional p value of 0.05 leading to the acceptance of the null hypothesis that the unique errors ( $ui$ ) are not correlated with the regressors and thus the random effects model is more appropriate. Therefore, the study tested the hypothesis using random effect regression model.

**Table 3: Hausman Test Results**

	(b) fixed	(B) random	(b-B) Difference	sqrt(diag(Vb-V <sub>B</sub> )) S.E.
Interest rate (domestic)	-2190.17	-745.828	-1444.343	.
Interest rate (global)	-40740.4	-48271.9	7531.481	16558.99
GDP growth (domestic)	4541.905	17208.84	-12666.94	.
GDP growth (global)	-1823.81	-946.445	-877.3637	.
GDP per capita	0.04519	6.444728	-6.399538	1.560637
chi2(2)	36.14			
Prob>chi2	<b>0.547</b>			

**Table 5: Random Effect Regression Results**

ATK	Coef.	Std. Err.	z	P> z
Interest Rate (Domestic)	-98200.87	45180.79	-2.17	0.030
Interest Rate (Global)	-7676281	1946764	-3.94	0.000
GDP Growth Rate (Domestic)	769838.1	160241.1	4.8	0.000
GDP Growth Rate (Global)	380927.4	210076.7	1.81	0.007
GDP Per Capita (Domestic)	722176.8	193936.7	3.72	0.000
_cons	5.74E+07	1.26E+07	4.54	0.000
R-Square	0.5887			
Wald chi2(5)	46.08			
Prob > chi2	0.000			

The results in Table 3 indicate an R squared of 0.5887. This implies that the Interest Rate (Domestic), Interest Rate (Global), GDP Growth Rate (Domestic), GDP Per Capita (Domestic) and GDP Growth Rate (Global) had high explanatory power on ATK as it accounted for 58.9% percent of the variation ATK. This indicates that this combination of variables can adequately explain variation in demand of air cargo. The Wald  $\chi^2$  (equivalent to F statistics in fixed effect regression analysis) value was 46.08 with a p value of 0.000 which is less than 0.05. This indicated that macroeconomic variables had a significant effect on air cargo demand (ATK) of the selected airlines.

The coefficient of Interest Rate (Domestic) was at ( $\beta=-98200.87$ ,  $p=0.000$ ,  $>0.05$ ) showed a statistically significant relationship between Interest Rate (Domestic) and air cargo demand (ATK). Hence the study rejected  $H_{01(a)}$  at  $\alpha=0.05$  and concluded that Interest Rate (Domestic) affect air cargo demand (ATK). The regression coefficient of -98200.87 obtained in this case implies that a unit increase of the Interest Rate (Domestic) would lead to 98200.87 decreases in ATK hence decreasing air cargo demand. The findings are in line with theory of demand which stipulates that the demand of a normal good depend on price, Ceteris paribus. The higher the price, the lower the demand of a normal product.

The results further revealed that a coefficient of Interest Rates (Global) was at ( $\beta=-7676281$ ,  $p=0.000$ ,  $<0.05$ ) showed a negative and statistically significant relationship between Interest Rate (global) and air cargo demand (ATK). The therefore study rejected  $H_{01(b)}$  at  $\alpha=0.05$  and concluded that Interest Rate (global) affect air cargo demand (ATK). The regression coefficient of -7676281 obtained implies that a unit increase of the Interest Rate (global) would lead to 7676281 decreases in ATK units hence decreasing air cargo demand. The findings are in line with theory of demand which stipulates that the demand of a normal good depend on price, Ceteris paribus; the higher the price the lower the demand of a normal product.

The results also revealed that a coefficient of GDP Growth Rate (Domestic) was at ( $\beta=769838.1$ ,  $p=0.030$ ,  $<0.05$ ) showed a statistically significant relationship between GDP Growth Rate (Domestic) and air cargo demand (ATK). The therefore study rejected  $H_{02(a)}$  at  $\alpha=0.05$  and concluded that GDP Growth Rate (Domestic) affect air cargo demand (ATK). The regression coefficient of 769838.1 obtained implies that a unit increase of the GDP Growth Rate (Domestic) would lead to 769838.1 increases in ATK hence increasing air cargo demand. The finding of this study concurs with those of Aderamo (2010) who established that Gross Domestic Product is important in the explanation of the demand for air transport in Nigeria. According to Piecyk and McKinnon (2010) as a derived demand, freight demand is primarily influenced by the volume of goods produced and consumed. They argue that expansion in the national economy, or the economy of any region, results in increases in overall demand (in terms of volume) for goods and services, while economic contractions result in demand reductions. The findings are in line with the economic theory of demand, which states that the demand for a normal good depend on price as well as income related factors. The higher the income of an economic agent(a government, firm or an individual), the higher his ability to purchase and the higher the demand for a normal good. .

The results also revealed that a coefficient of GDP Growth Rate (global) was at ( $\beta=380927.4$ ,  $p=0.007$ ,  $<0.05$ ) showed a statistically insignificant relationship between GDP Growth Rate (global) and air cargo demand (ATK). The therefore study failed to reject  $H_{02(a)}$  at  $\alpha=0.05$  and

concluded that GDP Growth Rate (global) affects air cargo demand (ATK). The regression coefficient of 380927.4 obtained implies that a unit increase of the GDP Growth Rate (global) would lead to 380927.4 increases in ATK hence increasing air cargo demand. According to Grosso and Shepherd, (2012) air cargo sector was influenced by global crisis with downturns on economic slowdown. The products which are generally elements of this sector have high income elasticity and consumers tended to reduce their consumption on these goods at the financial economic crisis times. Declines of these goods directly resulted in reduction in airline transport demand.

The results presented in Table 5 revealed that a coefficient of GDP per capita (domestic) was at ( $\beta=722176.8$ ,  $p=0.000$ ,  $<0.05$ ) showed a statistically significant relationship between GDP per capita (domestic) and air cargo demand (ATK). The therefore study rejected  $H_{03}$  at  $\alpha=0.05$  and concluded that GDP per capita (domestic) has a significant effect on air cargo demand (ATK). The regression coefficient of 722176.8 obtained however implies that a unit increase of the GDP per capita (domestic) would lead to 722176.8 increases in ATK hence increasing air cargo demand. Similarly, Rothengatter (2011) noted that while passenger transport is mainly driven by the disposable income of consumers, freight transport is in particular dependent on trade activity. Similarly, Ba-Fail, Abed and Jasimuddin (2010) study findings revealed a positive correlation between domestic air travel expansion and individuals' income growth.

## CONCLUSION

Based on the findings the study concluded that macroeconomic variables at origin countries and global economy level have significant impact on the air cargo demand. Interest rates of origin countries affect rate of borrowing and investments. High interest rates reduce accessibility to credit hence reducing the volume of investment which impacts on freight transported by air. On the other hand increase in GDP growth rate and the resultant increase in GDP per capita provide favourable environment for business growth which in turn propel upwards, exports and imports and general demand for air cargo transport.

Global economic trend is a very significant ATK variation predictor since the demand for air cargo relies on economic performance of origin countries and destinations countries through increased volumes of exports and imports. Expansion in the national economy, or the economy of any region, results in increases in overall freight demand, while economic contractions result in reductions in freight demand.

## RECOMMENDATIONS

Based on the findings the study made the following recommendations;

### Recommendations for Practice

The study established that economic growth leads to a significant increase in international trade and freight transport. Therefore, the study recommends that airlines in freight transport business should adjust to uncertain global and domestic economy through short-term contracting and lean inventory holding to save costs in the short-run and foster flexibility in a phase of high uncertainty. Investors and managers under the employment of airlines should be able to predict and take advantage of improved economic growth by ensuring that they capture the income led

demand. They can achieve this by expanding the cargo business during times of improved economic growth.

The study recommends that airlines should take advantage of any declines in interest rates ( both global and local) through increasing the allocation of more space and manpower to the cargo business. This is because low interest rates lead to increased demand for cargo transport. Investment in cargo business should then be reduced once the interest rates go up as there will be less demand for cargo services. It is recommended that airlines should target individuals, households and firms located in economies with a higher GDP per capita/disposable income. This is because such economic agents are more likely to consume more cargo transport services as opposed to economic agents in economies with low GDP per capita.

Finally, in a Schumpeter world, the management of air cargo transport sector should ensure more energy-efficient and environmentally friendly operations. The Schumpeter Scenario describes a possible change of trends in a consistent way if the economy and the transport sector change to this trajectory it becomes probable that additional market forces will emerge, which foster the technological change towards even more sustainable air cargo transport.

### **Recommendation for Policy**

The governments should engage monetary organ such as Central Banks to reduce interest rates. The monetary organ can do this through open market operations, interest rate caps (example is the interest rate cap enacted in Kenya last year), and reduced government borrowing from the domestic market. This is because a reduction in interest rates is tantamount to a reduction in prices of normal goods including cargo goods and services. This would boost airline cargo transport.

The governments should relook at the infrastructure pricing for all air cargo transport networks because higher costs of infrastructure leads to an increase in the cost of doing business. Improving transport infrastructure will reduce the cost of operations hence improving the performance of airlines during poor economic times. The study recommends that governments should provide tax subsidies for imported fuel to reduce the cost of transport especially during bad economic times to increase the competitiveness of domestic airlines. This would lead to increased demand for cargo transport especially when these costs are factored into the pricing of cargo transport.

While passenger transport is mainly driven by the disposable income of consumers, freight transport is in particular dependent on trade activity. The study therefore recommends that governments should address the weakness in foreign trade that is mainly responsible for reduction of GDP growth rates in many countries. At the same time, it should put in place polices to boost disposable income of economic agents so that they can afford to pay for cargo transport. The twin measures will enhance international and domestic trade activities and consequently having a positive impact demand of air cargo transport.

The study recommends that the governments should liberalize air cargo markets between trading bloc to open up routes to competition, and lead to increase in bilateral air cargo trade, which in turn improves in the demand of air cargo transport and strengthens the position of an airport in the competitive airport industry. This will help in mitigating the impacts of domestic economic uncertainty.



### Recommendations for theory

This study has succeeded in testing and validating the economic theory of demand, which states that, demand of a normal good is influenced negatively by price, ceteris paribus. Price in this case was proxied by domestic and global interest rates. The ceteris paribus assumption has been relaxed to include income at national level (GDP growth rate-global and local) and disposable income (GDP per capital). However, demand of a normal good is known to be influence by other factors other than price and income. It is therefore suggested that future studies should relax the ceteris paribus assumption further and test other factors such as price of substitute goods, advertising, tastes and preferences. In addition, the moderating role of shocks such as terrorism, war and financial meltdowns (for instance the 2008 subprime mortgages financial meltdown) should be tested.

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