Determinants of profitability in aviation industry of Europe and America

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***Abstract*— The civil aviation, is an industry evolving at exponential speed despite the significant problems that faces in the last decade (increase of oil price, terrorist attacks etc.) An important feature of aviation firms and generally all companies, is that their size reflects their efficiency and in general their economic growth. In this era of financial crisis, liquidity is a significant factor for the stabilization and growth of economic organizations.**

Therefore, the examination of cash flows as indicator of liquidity limitations is necessary for the measurement of firms' profitability. In this study, we tried to see whether the efficiency of size of European and American airlines listed firms, depends on their growth and cash flows from investment activity

***Keywords*—** *aviation; profitability; size; firm growth; cash flows; listed companies*

1. Introduction

Civil aviation is a sector constantly evolving thinking that in 1903 Wright brothers flew for first time in history, in 1912 the first passenger airline company (Deutsche Luftschiffahrts - Aktiengesellschaft) was established and nowadays International Airline Trade Association (IATA) has 240 registered members comprising 84% of global air traffic (Figure 1).

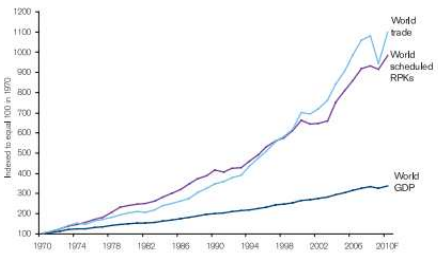

Figure 1. Air travel expansion in the past 40 years[1]

In the past forty years, air travel measured by worldwide scheduled revenue passenger kilometres (RPKs) has expanded significantly and its expansion presents growth three times greater than world's GDP. This progress indicates that air travel facilitated by globalization and has been one of the fastest growing economic sectors (IATA, 2011).

Especially in Europe, as it is presented in the chart 2, the future flight demand is going to overcome the airport capacity. This prospect will pose need for further private and governmental investments in the aviation industry.

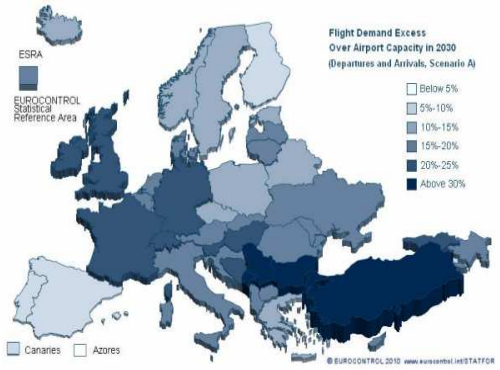

Figure 2. Flight demand excess over Airport capacity in 2030 [2]

[1] Source: ICAO, IATA, Haver, Available at: http://www.iata.org/pressroom/facts_figures/Documents/vision-2050.pdf

Airlines serve millions of passengers, offer jobs in millions of people and reduce dramatically the distance covering millions of kilometres. Aviation is a very significant factor of tourism industry that a properly structured variation network is capable of offering positive primary impact on tourism industry and positive secondary impact in the broader economy [4]. It is obvious thus the size of economic and social impacts by aviation.

In the last decade, both European and American aviation industry face many problems [1] such as the increase of oil price, the terrorist attack of 9/11 etc. Therefore, their growth is induced.

In the next section the literature review of efficiency and profitability in aviation industry is presented. In the third section, the methodology of this study is analysed. In the fourth section, the results of this study are presented and discussed. In the end, the conclusions of this study are presented.

2. Literature Review

There are many ways leading a firm to growth, the bulk of studies have identical indicators for measuring the growth, such as total assets, profits, sales etc. [5]. Nonetheless, the most widely used, are:

The sales growth in five years [12], [13]. This measurement confirms several theories indicating that sales growth leads on profitability. The development of employees with three years study period [15], [18], [20].

In literature, the economic growth of firms is related to their size. Many scholars have examined the relationship between firm size and other characteristics with their growth [9], [14]. Additionally there is evidence that firm size is the most significant factor for its growth [10], [17].

It is indicated that small firms cannot develop as the big, due to difficulties in access to funding sources [8]. Other studies concluded that pressures of financial markets have positive impact more in small firms than large [2], [3].

[2] Source: Eurocontrol (2010), Available at: www.eurocontrol.int/sites/default/files/publication/files/long-term-forecast-2010-2030.pdf

However, if the availability of funding is a key factor for the size, firm size must be related to factors associated with the development of money markets. It is noticed negative correlation between development and leverage [11], while it is denoted that leverage is a determinant of firm growth [9]. The firms with high level of leverage may cannot seize opportunities from their growth or the firms with a few opportunities, during their growth spend their cash in inefficient plans-projects. That negative correlation appears in firms with low ratio Tobin q and not in these with high [11].

Cash flows are also an indicator of liquidity limitations [6], [7]. More specifically, it is noticed that the empirical proportion of investment is highly correlated with the cash flows [7].

Apart from whether cash flows provide or not information for liquidity limitation, are also a source of funding. The more lower a firm is the more sensitive is in its cash flows, while smaller firms have lower cash flows than larger [7].

The cash flows, according to IAS7, are classified into three categories: a) Cash flows from operating activities, b) Cash flows from investments and c) Cash flows from financing.

Subsequently, Ref. [16] following the methodology of [7] studied how financing limitations can induce the elements of firm growth as well as the sensitivity of growth rate in cash flows. It is noticed that firms' cash flows have a correlation with the growth rate of firms [6]. Moreover, it is found that firms with high cash flows grow faster, thus cash flows are correlated with growth rate of firms [19].

3. Methodology

The data sample consisted of 50 (25 European and 25 American) publicly traded aviation firms in balanced panel data. The research covers the time period of 2005-2011. The sample includes 25 European and 25 American listed companies in aviation for the whole period under study.

In order to examine the determinants of profitability in aviation industry financial firm level data are used. Determinants of profitability are investigated through econometric regression. Principal Component Analysis (PCA) is used in order to eliminate the number of variables and exclude the observations of possibly correlated

variables. The methodology used is EGLS multivariate regression on balanced panel data. From the results, significant conclusions about factors affecting aviation's firm profitability could be extracted for the examining period.

In this study, Return on Assets (ROA) as independent variable was selected on the basis of theory and international literature in order to examine the factors that affect the profitability ratio of firms. A dummy variable (LOC) is used to indicate the location based of aviation firm, taking value equals to zero for European aviation firm and one for American. Size of firms is measured in term of log total assets demonstrating whether small firms are more profitable than large ones.

Table 1. Variables Selection

	Symbol	**Variable Description**
Dependent variable	ROA	Return On Assets
Explanatory Variables	CF_CL	Cash Flow/Current Liabilities
	AP	Accounts Payable
	CE	Common Equity
	NM	Net Margin
	ROIC	Return On Invested Capital
	SIZE	LogTotalAssets
	STI	Short Term Investments
	LOC	Dummy variable for location takes values: 0=Europe/ 1=America
	QR	Quick Ratio
	PPE	Property Plant & Equipment - Net

Table 2. Descriptive Statistics of selected variables

	Mean	**Std. Deviation**
Return On Assets	,0523	,086273
Cash Flow/Current Liabilities	,1026	3,0273
Accounts Payable	170,9510	241,9117
Common Equity	398,212	1576,5855
Net Margin	,0441	,16004
Return On Invested Capital	,0858	,12045
Log Total Assets (SIZE)	2,927	,8155
Short Term Investments	188,935	302,79445
0=Europe/ 1=America	,50	,501
Quick Ratio	1,0844	,5859
Property Plant & Equipment - Net	1334,5285	2006,924

The model used in this research is the following:

$$ROA_{i,t}= \beta_0+\beta_1 CF\_LIAB+\beta_2 AP+\beta_3 COEQ+\beta_4 NM+\beta_5 ROIC+ \beta_6 SIZE+\beta_7 STI+\beta_8 LOC+\beta_9 QR+\beta_{10} PPE+\varepsilon_{i,t}$$

, where $\varepsilon_{i,t}$ is the error term.

4. Discussion

The EGLS model used to examine relationship between profitability with cash flows, size and location (see Table 3) for all the aviation firms. Using balanced panel data for the whole period (2005-2011) with diagonal correction of standard errors for heteroscedasticity and autocorrelation (according to the White methodology) and cross-section weights. Data were treated for outliers at the 5% level. There is no indication that the data structure is characterized by period specific heteroskedasticity, contemporaneous and between-period covariances. More specifically, it is observed that six explanatory variables are statistically significant at 1% level of significance, while variable of firm size is statistically significant at 5% level of significance.

Table 3. Regression results

Dependent Variable: **ROA**			
Method: Panel EGLS (Cross-section weights)			
Sample: 2005 2011			
Periods included: 7			
Total panel (balanced) observations: 350			
Linear estimation after one-step weighting matrix			
White cross-section standard errors & covariance (d.f. corrected)			
Variable	Coefficient	Std. Error	t-Statistic
C	-0.023101** (0.0002)	0.006062	-3.811065
CF_LIAB	0.000864** (0.0034)	0.000293	2.950072
AP	-6.10E-06	5.40E-06	-1.130763

	(0.2590)		
COEQ	1.85E-06 (0.4025)	2.21E-06	0.838197
NM	0.229612** (0.0001)	0.056441	4.068174
ROIC	0.375525** (0.0000)	0.024504	15.32480
SIZE	0.006374* (0.0131)	0.002554	2.495230
STI	-1.29E-05** (0.0000)	1.04E-06	-12.37450
LOC	0.013511** (0.0000)	0.001416	9.540290
QR	0.010068** (0.0000)	0.000937	10.74284
PPE	-1.21E-06 (0.0876)	7.06E-07	-1.713066
Weighted Statistics			
R-squared	0.925474		
Adjusted R-squared	0.923275		
F-statistic	420.9737	Sum squared resid	0.862332
Prob(F-statistic)	0.000000	Durbin-Watson stat	1.210321
(*) significance at 5% (**) significance at 1%			

From the results of the regression model, it is observed that there is positive relationship between firm' profitability and ratio of cash flow to liabilities, size, return on invested capital, net margin, quick ratio, location while negative relationship between firms' profitability and short term investments exists. More specifically, firms that have higher ratio of cash flows to liabilities present more liquidity and have higher return on invested capital (ROIC) present higher level of profitability. Net margin and quick ratio are positively correlated with profitability ratio of aviation firms indicating that profits remaining after operating after all operating expenses, interest, taxes and preferred stock dividends have positive impact in firm's profitability. Additionally, from the dummy variable used for firms' location of firms is noticed that American aviation firms are more profitable than European. The positive relationship between ROA and size indicates that larger firms are more profitable than smaller firms in aviation industry. The variable of short-term investments has negative value indicating negative correlation with profitability ratio. Aviation firms appear to be less profitable with the decrease of their liquidity for investments in the short-term.

5. Conclusion

Aviation industry is one of the most rapidly developing sectors with growth rate greater than world's GDP. It is significant for the country and continent development as it contributes to reduction of unemployment and increase of growth. Therefore, this research investigates the factors affecting the profitability of European and American listed companies in aviation industry during the time period 2005-2011.

Significant conclusions came from the results of this study. Measuring profitability with return on assets based on theory and literature, the study attempted to identify the factors of profitability in American and European publicly traded aviation firms. The results indicate that the main differences of more profitable aviation firms are the size, cash flows to liabilities return on invested capital, net margin, location, quick ratio and short term investments suggesting that larger aviation firms from America are more profitable than smaller firms from Europe.

Location of aviation firms found to play significant role in profitability as American firms seem to be more profitable than European. In addition, larger enterprises appear to gain more profits than smaller indicating that increased total assets lead on an increase of profitability. Also, investments in short term present negative sign suggesting negative impact in profits of aviation firms, while Property, Plant & Equipment seem to have no impact to profitability.

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Appendix

Appendix 1

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	,826	1	,826	162,336	,000[b]
	Residual	1,771	348	,005		
	Total	2,598	349			
2	Regression	1,290	2	,645	171,154	,000[c]
	Residual	1,308	347	,004		
	Total	2,598	349			
3	Regression	1,315	3	,438	118,306	,000[d]
	Residual	1,282	346	,004		
	Total	2,598	349			
4	Regression	1,340	4	,335	91,908	,000[e]
	Residual	1,258	345	,004		
	Total	2,598	349			
5	Regression	1,354	5	,271	74,940	,000[f]
	Residual	1,243	344	,004		
	Total	2,598	349			
6	Regression	1,380	6	,230	64,826	,000[g]
	Residual	1,217	343	,004		
	Total	2,598	349			

a. Dependent Variable: Return On Assets

b. Predictors: (Constant), Return On Invested Capital

c. Predictors: (Constant), Return On Invested Capital, Net Margin

d. Predictors: (Constant), Return On Invested Capital, Net Margin, 0=Europe/1=America

e. Predictors: (Constant), Return On Invested Capital, Net Margin, 0=Europe/1=America, Quick Ratio

f. Predictors: (Constant), Return On Invested Capital, Net Margin, 0=Europe/1=America, Quick Ratio, Property Plant & Equipment - Net

g. Predictors: (Constant), Return On Invested Capital, Net Margin, 0=Europe/1=America, Quick Ratio, Property Plant & Equipment - Net, Short Term Investments

Appendix 2

Correlations

		Return On Assets	Cash Flow/ Current Liabilities	Accounts Payable	Common Equity	Net Margin	Return On Invested Capital	Size	Short Term Investments	Location	Quick Ratio	Property Plant & Equipment - Net
Pearson Correlation	Return On Assets	1,000	,105	,012	,099	,542	,564	,013	-,108	,199	,210	,042
	Cash Flow/Current Liabilities	,105	1,000	,024	,015	,071	,116	,050	,023	-,016	-,082	,038
	Accounts Payable	,012	,024	1,000	-,042	-,051	,033	,584	,374	,122	-,100	,527
	Common Equity	,099	,015	-,042	1,000	,052	,059	,124	,081	-,104	,107	-,087
	Net Margin	,542	,071	-,051	,052	1,000	,232	-,010	-,044	,125	,136	,037
	Return On Invested Capital	,564	,116	,033	,059	,232	1,000	-,117	-,113	,101	,133	-,113
	LogTotalAssets (SIZE)	,013	,050	,584	,124	-,010	-,117	1,000	,527	,164	-,053	,659
	Short Term Investments	-,108	,023	,374	,081	-,044	-,113	,527	1,000	,198	-,041	,465
	0=Europe/ 1=America	,199	-,016	,122	-,104	,125	,101	,164	,198	1,000	-,038	,257
	Quick Ratio	,210	-,082	-,100	,107	,136	,133	-,053	-,041	-,038	1,000	-,197
	Property Plant & Equipment - Net	,042	,038	,527	-,087	,037	-,113	,659	,465	,257	-,197	1,000
Sig. (1-tailed)	Return On Assets	.	,025	,410	,032	,000	,000	,407	,022	,000	,000	,215
	Cash Flow/Current Liabilities	,025	.	,327	,390	,094	,015	,175	,335	,386	,064	,238
	Accounts Payable	,410	,327	.	,216	,169	,269	,000	,000	,011	,031	,000
	Common Equity	,032	,390	,216	.	,166	,137	,010	,066	,027	,023	,052
	Net Margin	,000	,094	,169	,166	.	,000	,429	,204	,009	,005	,247
	Return On Invested Capital	,000	,015	,269	,137	,000	.	,014	,017	,030	,007	,018
	LogTotalAssets (SIZE)	,407	,175	,000	,010	,429	,014	.	,000	,001	,162	,000
	Short Term Investments	,022	,335	,000	,066	,204	,017	,000	.	,000	,221	,000
	0=Europe/ 1=America	,000	,386	,011	,027	,009	,030	,001	,000	.	,238	,000
	Quick Ratio	,000	,064	,031	,023	,005	,007	,162	,221	,238	.	,000
	Property Plant & Equipment - Net	,215	,238	,000	,052	,247	,018	,000	,000	,000	,000	.
	Property Plant & Equipment - Net	350	350	350	350	350	350	350	350	350	350	350