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Ralf Günther

Impact of Aircraft Sourcing & Financing on Financial Success

A strategic view on basic aircraft sourcing & financing characteristics and their impact on stock market and long term financial performance of aircraft operating and holding companies

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To my parents
& my wife

Preface

In the view of current developments in the airline market the present thesis investigates the question, whether fundamental characteristics of an aircraft fleet have a (statistically significant) correlation to the financial accomplishments of an airline or to a corresponding holding company, respectively. For this, an empirical analysis is carried out to examine the influence of elementary decisions concerning aircraft acquisition and financial structures upon the development of stock values and of selected performance figures of airlines. Hereby a strategic viewpoint of investors and of top decision-makers of airlines is chosen, which directly results in the choice of the empirical method of multivariate regression analysis with abnormal gains or losses of stocks as well as with key indicators of profitability, efficiency and sales increase of companies.

In addition to this perspective and methodical extension, the present dissertation complements previous studies with till now not examined aircraft fleet characteristics and their influence on the financial success of airlines. These features include the relation of own to leasing, the ratio of already planned aircraft acquisitions compared to the size of the existing fleet and the proportion of prolonged parked or temporarily not used aircraft in comparison with those operatively in use. For all these variables the analyses of this study prove a statistical relevance in reference to abnormal returns in stock prices, to profitability and to sales growth of airlines. Additional new knowledge is gained relating to the financial variables equity ratio, ratio of net debt over earnings before interest, taxes, depreciation and amortization (EBITDA) as well as to interest coverage and their correlation with long-term growth in turnover and high profit margins.

Analyses of the development of stock prices of airlines during economic cycles or following industry-wide or company-specific incidents already exist repeatedly in the literature. Examples for this are among others the events of 9/11, the reaction of stock markets to airplane crashes and the cyclical industrial development over several years. In addition, the present thesis analyzes the consequences of the financial crisis 2008 for the performance of airline stocks. By supplementing this research period, the effects of two shock-events and the resulting global crises (referring to the airline industry) can for the first time be compared with each other.

Altogether, the present dissertation explores – in examining the connection between strategic aircraft fleet decisions and short- or long-term stock price development or key performance indicators, respectively – a theoretically demanding and a practically

contemporary and relevant subject area. The undertaking to present a differentiated empirical research to this topic bears considerable potential. The study imparts very informative and innovative results. I wish this thesis a lively discussion in science and in practice.

Werner Delfmann

Acknowledgement

The dissertation project took more than five years from the first thought till publication. Although a doctoral thesis is a lonely undertaking for many hours, it does not succeed without supporting inspiration, trust, and motivation from others to discuss content and to stay focused on the objectives.

My thanks go to Professor Dr. Dr. h.c. Werner Delfmann, Department of Business Policies and Logistics at the University of Cologne, for the scientific support as my doctoral father and guidance throughout the time of my research, as well as to his team members with whom I enjoyed discussing and laughing over the last years,
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Ralf Günther

Abstract

Aircraft operating and holding companies apply different strategies to source and finance aircraft. The basic sourcing decision is to acquire air capacity on demand or to plan future capacity by committing to aircraft firm orders and purchase options. The general financing choice is between buying (via direct purchase or capital lease) and operating lease of aircraft.

This study takes the perspective of investors and evaluates the correlation of basic sourcing and financing strategies with a company's financial success in shocks and crises, company specific isolated positive and negative events, and over long term business cycles.

Multivariate regression methodology is used to analyze abnormal returns in stock market's reaction to the terrorist attacks on September 11, 2001, the Financial Crisis 2008, and to aircraft accidents and aircraft orders 1994-2009. In further regressions the relationship of basic aircraft fleet and fleet planning variables to a company's long term revenue growth and profitability is examined.

The findings show a positive correlation of aircraft ownership (buy or capital lease) and of future oriented aircraft acquisition (firm orders and purchase options) with a company's long term average EBITDA and EBIT margins. Merely in times of strong business growth, operating lease is the right measure to quickly supply capacity, beside firm orders and purchase options. The findings further support the theory of rational pricing and the assumption that the stock market distinguishes between different basic aircraft sourcing and financing strategies. A high portion of owned or capital leased aircraft in the fleet, long term orders, and purchase options proved to positively influence also a company's stock return in times of crises. Exception to this is found when governmental financial aid actions influenced stock market's behavior. The analysis of stock market reaction on aircraft accidents and aircraft firm orders is of low explanatory power; hence, the results allow for speculation but not for reliable conclusions on the influence of basic fleet characteristics.

The findings of this study suggest to companies, which historically have been relying on operating lease and purchasing capacity ad hoc, to review their aircraft sourcing and financing strategy. This is stated under the assumption that demand of air transport grows as currently predicted by the aviation industry and anticipating an increasing shortage of capacity and price increase caused by ongoing carrier consolidation, insolvencies among airlines, decommissioning programs for aging aircraft, shortage in production slots for new aircraft, and an insufficient number of passenger-to-cargo conversions.

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List of abbreviations & symbols

*	Statistically significant at the ten percent level
**	Statistically significant at the five percent level
***	Statistically significant at the one percent level
=	equals
<	is less than
≤	is less than or equal to
>	is greater than
≥	is greater than or equal to
#	number (count)
%	percent
Σ	sum
1YOPTION	Explanatory variable: number of purchase options with execution day in the next calendar year over total number of aircraft in the fleet
3PL	Third-party logistics
9/11	September 11, 2001
α	Alpha (residual risk)
α'	Change in alpha
β	Beta (systematic risk)
β'	Change in beta
Δ	Delta
ε	Epsilon (random disturbance term)
σ	Sigma (standard deviation)
A	Airbus (e.g. A320 Airbus 320)
A/C	Aircraft
A/L	Airline
AAGR	Average annual growth rate
AARG	Average annual revenue growth (average annual rate of net sales or revenue growth with one year equal to a full calendar year ending December 31)
AB	Aktiebolag [Swedish for: stock company]
ABX/ABX Air	Airborne Express
ACMI	Aircraft, Crew, Maintenance, and Insurance
ACPORDER	Explanatory variable: aircraft per order (number of aircraft per single firm order)
add.	additional

AG	Aktiengesellschaft [German for: stock company]
AIG	American International Group
AMR	American Airlines
AMR/UAL	Explanatory variable: American Airlines or United Airlines
ANA	All Nippon Airways
AOC	Air Operator Certificate
APAC	Asia Pacific
AR	Abnormal return
ARG	Annual revenue growth (year-on-year revenue growth with one year equal to a full calendar year ending December 31)
ATA	Air Transport Association (not to confuse with ATA Holdings)
ATI	Air Transport International
ATK	Available Ton Kilometer
AVAC	Aircraft Value Analysis Company
AVGAGE	Explanatory variable: average age of total number of existing aircraft in service or stored
AVGEBITDAMAR	Average margin of annual earnings before interest, taxes, depreciation and amortization
AVGEBITMAR	Average margin of annual earnings before interest, taxes, depreciation and amortization
B	Boeing (e.g. B737 Boeing 737)
bn	billion
C	Consumption
CAGR	Cumulated Annual Growth Rate
CAR	Cumulative Abnormal Return
CASM	Cost per Available Seat Mile
CEO	Chief Executive Officer
CFO	Chief Financial Officer
cf.	confer (compare)
Co. (or comp.)	Company
Corp.	Corporation
OYJ	Osakeyhtiö [Norwegian for: stock company]
CRSP	Center of Research in Security Prices
D _s	Dummy variable representing a shift in stock risk after an event
DEA	Data Envelopment Analysis
e.g.	exempli gratia [Latin for: for example]
EBIT	Earnings before interest and taxes (operating income)
EBITDA	Earnings before interest, taxes, depreciation and amortization

EBITDAFY	Total earnings before interest, taxes, depreciation and amortization in a company's fiscal year
EBITDAMAR	EBITDA margin (earnings before interest, taxes, depreciation and amortization over total operating revenue)
EBITFY	Total earnings before interest and taxes in a company's fiscal year
EBITMAR	EBIT margin (earnings before interest and taxes over total operating revenue)
EMEA	Europe, Middle East and Africa
EQUITRAT	Explanatory variable: equity ratio (owners' equity over total assets)
EUR	Euro
excl.	excluding
f	risk free rate
F-stat.	F-statistics
FAA	Federal Aviation Administration
FATALITY	Explanatory variable: on-board fatality (number of passengers and crew killed in an aircraft accident over total number of passengers and crew on board)
FedEx	Federal Express
Fin. (or fin.)	Financial (or financial)
FLYI	Independence Air (former Atlantic Coast Airlines)
FREIGHT(ER)	Freight carrier
FTK (or RTK)	Freight Ton Kilometer (or Revenue Ton Kilometer)
FTKMKTSHR	Explanatory variable: Freight Ton Kilometer Market Share
G	Government spending
G7	Group of seven (industrial nations)
GDP	Gross Domestic Product
GWP	Gross World Product
Hlg.	Holdings
H.R. (or HR)	(U.S. Congress) House Bill
I	Investment
i	Individual company stock
ICAO	International Civil Aviation Organization
i.e.	id est [Latin for: that is to say]
Inc.	Incorporated
incl.	including
INJURY	Explanatory variable: on-board injury (number of passengers and crew injured in an aircraft accident over total number of passengers and crew on board)

INTRSTCOVRG	Explanatory variable: interest coverage (interest expenses for debt over earnings before interest and taxes)
IR	Interest rate
IT	Information Technology
JAR(s)	Joint Aviation Requirement(s)
JAR-OPS	Joint Aviation Requirement for the operation of commercial air transport (aeroplanes)
JIT	Just in time
JP	Japan
KLM	Koninklijke Luchtvaart Maatschappij (Royal Dutch Airlines)
LAN	Línea Aérea Nacional (de Chile)
LATAM	Latin America
LCC	Low Cost Carrier
LIQUIDITY	Explanatory variable: cash & cash equivalents over current liabilities
LN	Natural logarithm
LOSTVALUE	Explanatory variable: lost value (book value of the aircraft before hull loss)
Ltd.	Limited (company)
M	Import
m	market (benchmark)
mYTFYE	Number of months from calendar year start to end of a company's fiscal year
MAIR	Mesaba Holdings
Mesa	Mesa Air Group
MFSC	Major Full Service Carrier (or major network carrier)
mn	million
MSCI	Morgan Stanley Capital International
MTOW	Maximum Takeoff Weight
MVRM	Multivariate Regression Methodology
n	(total) number of something (1, 2, ..., n)
N/A (or n/a)	not applicable or not available
NASDAQ	National Association of Securities Dealers Automated Quotations
NDTEBITDA	Explanatory variable: net debt over earnings before interest, taxes, depreciation and amortization
NFSC	Non-major Full Service Carrier (or non-major network or regional carrier)
NORAM	North America
Nov	November

nYROPTION	Explanatory variable: total number of purchase options total number of aircraft in the fleet count
nYRORDER	Explanatory variable: total number of jet aircraft orders to existing fleet count
NYSE	New York Stock Exchange
O&D	Origin & Destination
Oct	October
OECD	Organisation for Economic Co-operation and Development
OEM	Original Equipment Manufacturer
OPSLEASE	Explanatory variable: operating lease (ratio of aircraft on operating lease to total number of aircraft)
p. (pp.)	page(s)
p.a.	per annum
PFREIGHT	Explanatory variable: portion of freight business (revenue of express, cargo and mail over total operating revenue)
PINT	Explanatory variable: portion of international business (non-intra-regional revenue over total operating revenue)
PINT1	Explanatory variable: portion of international business (non-narrow home market revenue over total operating revenue)
PLC	Public limited company
Q	Quarter
r	Excess return
R	Revenue (full calendar year net sales or revenue)
R ²	Coefficient of determination of the proportion of variability; in this thesis R ² refers always to adjusted R ² (adjusting for the number of explanatory terms in a model)
RFY	Revenue of fiscal year (full fiscal year net sales or revenue)
RI	Return index
RoW	Rest of world
RPK	Revenue Passenger Kilometer
RPKMKTSHR	Explanatory variable: Revenue Passenger Kilometer Market Share
RTK (or FTK)	Revenue Ton Kilometer (or Freight Ton Kilometer)
S.A. (SA)	Sociedad Anónima (or Société Anonyme)
SARS	Severe Acute Respiratory Syndrome
SAS	Scandinavian Airline Systems
SEC	(U.S.) Security and Exchange Commission
Sep	September
SIZE	Explanatory variable: natural logarithm of total assets
SPC	Special purpose company

STORAC	Explanatory variable: stored aircraft (ratio of aircraft on storage to total number of aircraft)
t (or T)	time (referring to a day t in the MVRM)
T-bill	Treasury bill
T-stat.	T-statistic
TAM	TAM (Táxi Aéreo Marília) Linhas Aéreas
TOTALAC	Explanatory variable: total aircraft (sum of all jet aircraft in a fleet)
U.S. (or US)	United States
UAL	United Airlines
UPS	United Parcel Service
USD	United States Dollar
WaMu	Washington Mutual
X	Export
y	Daily abnormal return
Ye	Year end