Journal of Air Transport Management 24 (2012) 31–35

Contents lists available at SciVerse ScienceDirect

Journal of Air Transport Management

journal homepage: www.elsevier.com/locate/jairtraman

Determinants of systematic financial risk exposures of airlines in North America, Europe and Asia

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Keywords:
Airline financial risk
Systematic financial risk
Airline equity holdings
Airline ownership

A B S T R A C T

A five-factor asset-pricing model is employed to estimate the systematic financial risk exposure of airlines in North America, Europe and Asia between 1990 and 2010. Our panel data reveal that the risk to North America airlines is positively related to operating leverage and profitability, but while European and Asian airlines also have risk positively related to operating leverage, their risks are significant negative related to earnings growth. The most important systematic risk determinant for Asian airlines however is their size. Looking at the effects of operating leases and government ownership on Asian airlines' risk, we find that leasing is equally important as size but acts in the opposite sign; operating leverage is not significant while earnings growth is significant only for government owned airlines.

1. Introduction

Over the last few decades, the world airline industry has been exposed to frequent external shocks. Among others, the September 11 incident, the outbreak of SARS and H1N1, earthquake and tsunami that hit South and East Asian as well as economic based turbulences including the outbreak of the 1997 Asian Financial, the bursting of dot-com bubbles in the early 2000s, the 2008 subprime crisis, and the recent European sovereign debt crisis. In the US, the succession of troubles caused Northwest, US Airways, Delta Airlines and United Airlines to file for Chapter 11 bankruptcy protection in the last decade. American Airlines followed in 2011, after its share price plunged by more than 90% over ten years.

In finance, systematic risk occurs when investors are unable to fully diversify and is estimated using a capital asset pricing model (CAPM); basically the "beta" coefficient that relates the firm's stock return to the market portfolio Beta is used to estimate the weighted average cost of capital (WACC) that is used by business as the discount rate for project evaluations in capital budgeting and financial leasing.

Lee and Jang (2007) and Hung and Liu (2005)in looking at the determinants of systematic risk in aviation, focus on firm size, financial leverage, operating leverage, liquidity, profitability and growth, but do not consider off balance sheet factors, especially the effect of aircraft operating lease. Over the years, leasing of aircraft had been a common practice especially for small company; about half of the world's aircraft in operation are leased, with operating leases account for a third of these (Gavazza, 2010). As operating lease is not capitalized, airlines that operate leased aircraft will show substantial lower assets on their balance sheet as compared to others who own. This can cause a distortion in some of the potential systematic risk determinants, most notably firm size (measured by assets), profitability, financial leverage and operating leverage. We investigate this issue for Asian airlines.

Since the economic deregulation of airlines began in 1977 with the US domestic air cargo market, many airlines have privatized and rely more on external financing. In Asia this trend has been slower because of continued state interventions as part of larger trade and tourism policies as well as job creation and preservation (Chang and Williams, 2001). The general argument, however, is that private ownership can lead to better financial performance and resistance to cyclical downturns because government ownership limits the amounts of capital airlines can raise from other countries and prevents them merging with or taking over other airlines in other countries thus stymying their grow. What we know little about, are what firm-specific factors affect the systematic risk exposure of government-owned airlines, and how airline managers would control these factors to obtain more stable sources of capital.

2. Methodology and data

We examine systematic risk determination using three panels of listed airlines; 11 airlines from North America, 12 airlines from Europe and 18 airlines from Asia (Table 1).[1] We consider whether

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[1] The private airlines were all listed before January 2008.

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http://dx.doi.org/10.1016/j.jairtraman.2012.06.003

Table 1
Sample of airlines.

Airline	Assets (in $millions)	Airline	Assets (in $millions)
Group of North America airlines			
Southwest Airlines	14,179,000	WestJet Airlines	3,309,063
Air Canada	11,271,229	Republic Airways	3,239,658
US Airways Group, Inc.	7,421,000	AirTran Airways	2,098,776
JetBlue Airways	6,158,000	Pinnacle Airlines	1,362,346
Alaska Air	4,779,000	Hawaiian Airlines	973,710
SkyWest Inc	4,022,368		
Group of European airlines			
Air France	37,427,137	Turkish Airlines	5,589,795
Lufthansa	32,731,679	Aeroflot	4,525,900
British Airways	16,374,914	Air Berlin	3,274,765
Ryanair	8,550,153	Finnair	2,894,105
KLM	7,602,692	Aer Lingus	2,669,506
EasyJet	5,749,487	Cyprus Airways	286,475
Group of Asian airlines			
Japan Airline **	21,633,648	China Airlines *	7,402,677
All Nippon Airway **	20,825,502	Eva Air **	5,288,172
Singapore Airline *	19,338,575	Asiana Airlines	5,226,132
Korean Air	16,569,099	Jet Airways	5,200,964
Air China *	15,115,292	Malaysia Airlines *	2,966,974
Cathay Pacific	14,036,819	AirAsia	2,912,211
China Eastern Airlines *	11,025,791	Shandong Airlines	1,152,710
Thai Airways *	8,461,264	Skymark Airlines	221,824
Hainan Airlines	7,773,354	SpiceJet	168,177

All figure are based on exchange 31st December 2010 exchange rates; *denotes airlines with government ownership; **denotes airlines not included in the investigation of the impact of government ownership on systematic risk exposure in for Asia airlines.

systematic risk determinants vary across the regions, that in aggregate account for 80% of global airline business, and across the whole market allowing us to see whether the determinant changes generally as well as by region. In particular we are concerned with the role of operating leases and ownership.

There are some issues concerning the estimation of risk. Turner and Morrell (2003) argue that CAPM may not be a good model for estimating airline betas because of its weak statistical powers, while Hung and Liu (2005) estimate betas for airlines using CAPM and the Fama–French 3-factor model (FF3F) that includes a value and a size premium, found that the values of the systematic risk could be significantly different. More recent studies, however, have show that the FF3F model fails to captures momentum and industry-related anomalies. Jegadeesh and Titman (1993), for example, find that stocks that outperform the average over the last three to 12 months tend to continue their uptrend trajectories for the next few months, and stocks that underperform continue to do poorly. This momentum effect is different from the value effect captured by book-to-market equity and other price ratios. To account for this, we include a momentum premium in estimating systematic risk. This is the difference in average return between winner and loser portfolios (winner minus loser).[2]

We estimate an augmented FF3F model that account for both the momentum factor and industry-related factor, but as with the CAPM model, assume the local equity market is segmented from the world because of the segmented international financial market. Since the airline industry is a global business, beta measures that assume a segmented world stock market do not really capture the systematic risk of the airline companies that are expose to world systematic risk. Thus, a global, capital asset pricing model would be more relevant where the beta of each stock is measured with reference to the global capital market index and the market premium to be used is the global equity risk premium. We thus use a hybrid of the International CAPM (ICAPM) and the augmented FF3F model that accounts for both the momentum and industry factors; the International 5-factor model:

$$R_i - R_F = \alpha_i + \beta_i(R_W - R_F) + \tau_i \mathrm{SMB} + \lambda_i \mathrm{HML} + \kappa_i \mathrm{MOM} + \gamma_i \mathrm{IND} + \varepsilon_i \quad (1)$$

where R_i is expected rate of return of company i, R_F is the international risk free rate, R_W the return of world market portfolio (proxy by the MSCI US Price Index), SMB is the small minus big factor (market capitalization) or the size premium, HML is the high minus low factor (book to market value) or the value premium, MOM is the momentum premium, IND is the industry-related premium and $\tau_i, \lambda_i, \kappa_i$ and κ_i are estimated coefficients. The latter are positive if investors expect to be compensated with a positive risk premium on each loading factors.α_i and β_i are the intercept and coefficient; and ε_i the residual. The systematic risk or beta of the firm is captured by the β_i.[3]

Based on Equation (1), the annual betas over the period of 1993–2010 are calculated with three-year rolling parameters of monthly firm stock returns for January 1990 to December 2010. We assume markets are internationally integrated and hence the risk premium is common across the globe. We utilize size, value, momentum and industry premiums of the US market as a proxy for the world risk premiums for the various factors.[4]

To investigate the determinant of the systematic risk we estimate a panel regression of the annual betas with the annual series of the explanatory variables:

$$\beta_{it} = \delta_0 + \delta_1 \mathrm{FS}_{it} + \delta_2 \mathrm{LQ}_{it} + \delta_3 \mathrm{PF}_{it} + \delta_4 \mathrm{FL}_{it} + \delta_5 \mathrm{OL}_{it} + \delta_6 \mathrm{GR}_{it} + \eta_i + \xi_t + \varepsilon_{it} \quad (2)$$

where δ, the list of the coefficients is the sensitivity of the airline betas to various potential systematic risk determinants. Definition for the variables are in Table 2.

Table 2
Explanatory variables.

Variable	Measurement
Firm size	Total assets
Liquidity	Quick Ratio
Profitability	Returns on Assets
Financial leverage	Debt ratio: debts/assets
Operating leverage	$\frac{\Delta \mathrm{EBIT}}{\mathrm{EBIT}} \times \frac{\mathrm{Sales}}{\Delta \mathrm{Sales}}$
Growth	EBIT (earning) growth: annual % change in EBIT
Operating lease	Operating lease expense

Information was collected from the annual report of individual airlines from 1993 to 2010, but due to data availability and inconsistencies, the period is shorten from 1997 to 2010 for the investigation on the effect of operating lease and government ownership[5] on Asian airlines.

The panel model also controls for a cross-firm effects, captured by η_i and period effects captured by ξ_t. The inclusion of firm effects is to allow companies to have various level of systematic risk due to different aviation policies in each country. Similarly, the panel

[2] Companies within the same industry may show higher comovements in their stock returns because their shares have more common fundamentals than companies across different industries. Chou et al. (2012) finds that industry portfolios carry significant risk premiums that provide additional explanatory power for stock returns beyond size, book-to-market, and momentum effect.

[3] As we use rolling regression method to generate a time series of beta for every firm, we do not report the estimations in this paper to conserve space.

[4] These data are available at http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html.

[5] The list of government ownership airlines in Asia is based on Gibson and Morrell (2010).