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THE FINANCING BEHAVIOR OF AIRLINE COMPANIES

COMPORTAMIENTOS FINANCIEROS DE LAS COMPAÑÍAS AÉREAS

Kasım Kiracı
Iskenderun Technical University, Hatay (Turkey)
kasim.kiraci@iste.edu.tr
https://orcid.org/0000-0002-2061-171X

Veysi Asker
Dicle University, Diyarbakır (Turkey)
veysi-asker@outlook.com
https://orcid.org/0000-0002-8969-7822

Abstract

Airline companies, including many legacy airlines, have developed global alliances to adapt to dynamic competitive conditions to gain a competitive advantage over other companies. In this way, the number of destinations and network structures of the airline companies have expanded. This study examines the financial factors affecting the capital structure of airline companies that are members of global alliances. In this context, the goal of this study is to reveal the financing behaviors of airlines using theories related to the structure of capital. To this end, we used secondary financial data of member airlines in strategic alliances. For the scope of the study, the period of 2005-2017 was examined, and the panel data analysis method was used. Empirical results of the study indicate that: a) There are significant differences between short-term and long-term debt behaviors of the airlines that were analyzed, b) While long-term debt behavior of airlines is in accordance with the Trade-Off Theory, short-term debt behavior is in accordance with the Pecking Order Theory, and c) In the global alliances, the long-term financial behavior is similar to the traditional low-cost business model of airlines.

Keywords: Global Alliances; Capital Structure; Airlines; Panel Data; Air Transportation.

Resumen

Las compañías aéreas, incluidas muchas compañías aéreas tradicionales, han establecido alianzas mundiales para adaptarse a las condiciones dinámicas de la competencia a fin de obtener una ventaja competitiva sobre otras empresas. De esta manera, se ha ampliado el número de destinos y las estructuras de red de las compañías aéreas. En el presente estudio se examinan los factores financieros que afectan a la estructura de capital de las compañías aéreas que son miembros de alianzas mundiales. En este contexto, el objetivo de este estudio es revelar los comportamientos de financiación de las compañías aéreas utilizando teorías relacionadas con la estructura de capital. Para ello, utilizamos datos financieros secundarios de las compañías aéreas miembros de las alianzas estratégicas. Para el alcance del estudio, se examinó el período de 2005 a 2017 y se utilizó el método de análisis de datos de panel. Los resultados empíricos del estudio indican que: a) Existen diferencias significativas entre el comportamiento de la deuda a corto y largo plazo de las aerolíneas analizadas, b) Mientras que el comportamiento de la deuda a largo plazo de las aerolíneas se ajusta a la Teoría de la Compensación, el comportamiento de la deuda a corto plazo se ajusta a la Teoría de la Orden de Pecking, y c) En las alianzas globales, el comportamiento financiero a largo plazo es similar al modelo de negocio tradicional de bajo coste de las aerolíneas.

Palabras clave: *Alianzas globales; Estructura de capital; Líneas aéreas; Datos de panel; Transporte aéreo.*

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1. Introduction

From the past to the present, with the changes in technological, economic, social and political fields, the world economy has become globalized and the interaction of companies with the external environment has increased significantly. As a result of these developments, the new world order and the intensely competitive environment have forced companies to make critical strategic decisions for their survival and sustainability. This is especially evident in the air transport sector where airlines have been forced to develop new competitive strategies and to cooperate with each other as a result of economic developments, which have affected them significantly, and where competition is experienced intensively. Airline alliances are the most common of the cooperation strategies. (Kleymann and Seristö, 2001; Teng, 2003).

In strategic alliances, airlines reduce risk and transaction costs, create value, expand their network structure, and lower costs (Goetz and Shapiro, 2012). In addition, when airline companies become members of strategic alliances, they also benefit from the network structure of other airline companies. Airline companies gain a cost advantage and create a barrier to the market using the hub and spoke system. Through global alliances, airlines create multiple hub & spoke network systems. Nowadays, there are three global airline alliances, namely, SkyTeam, OneWorld, and StarAlliance. The current data on the three global airline alliances are given in Table 1.

Table 1: General Profile of the World's Largest Airline Alliances

	StarAlliance	SkyTeam	OneWorld
Number of Members	28	19	13
Date Established	1997	2000	1999
Annual Passenger Number	756 Million	630 Million	528 Million
Fleet	5046	3054	3553
Flights Per Day	18800	14500	13100
Staff Number	443703	392155	493650
Destinations (Countries)	193	176	158

Source: www.staralliance.com, www.oneworld.com, www.skyteam.com (2018)

In addition to having the capital required for the continuity of their activities and sustaining their operations, companies must also have a capital structure appropriate for their activities (Taner and Akkaya, 2005: 33). In this respect, capital structure or, more generally, the choice of financing composition that maximizes the value of the firm or how the financial structure should be, is very important for the companies (Korkmaz et al., 2009: 30). It is considered important to examine the capital structure of the airline transportation industry because its global importance has increased due to it being an industry with one of the highest growth rates in the world. Besides, it is thought that the global alliances created by airlines may have affected the capital structure. Therefore, the focus of the study was on the airlines that are members of global alliances.

In the air transport industry, airplanes (tangible fixed assets) are expensive. Therefore, airlines incur high investment costs. In other words, airlines have to allocate significant

budgets to the aircraft they use to carry out their activities. In this case, it requires the airlines to plan their debt-equity balance correctly. The fact that a significant portion of tangible fixed assets is provided by using liabilities increases the risk of airlines. However, it should be considered that large airlines obtain liabilities at a lower cost. In particular, taking into account the advantages that airlines have for joining global alliances, it should be kept in mind that the debt-equity balance of airlines may change with global alliances membership. Therefore, empirical investigation of the effects of debt costs, financing behaviors and financial indicators on the leverage level of member airlines of global alliances has gained importance.

It is expected that this study, in which an empirical analysis of the capital structure decisions of airlines joining global alliances, will contribute to literature in many ways. First, studies that empirically analyze the capital structure of airlines are rare in literature. Second, global alliances give competitive advantages to airlines and affect the capital structure decisions of airlines. Finally, in literature, there are only a few studies related to the empirical examination of capital structure decisions of airlines that are members of global alliances. Therefore, this study is expected to fill these gaps in literature.

The section structure of the study is organized as follows. In section 2, the existing literature is discussed. In section 3, the theoretical background is elaborated, and in section 4, the data and method of the study are outlined. Section 5 includes the research model, the sixth section; the empirical findings, and the seventh section includes the results of the study.

2. Literature Review

Capital structure is one of the most researched and debated issues in finance literature. Investigations which consider the relationship between capital structure and business value, that determine the factors affecting the capital structure decisions of enterprises, and those which examine the capital structure theories of firms provide the ability to explain capital structures and constitute the subjects of the studies in this field. When the studies in literature are examined, it is seen that the decisions of the capital structure of many companies or industries are examined empirically. The focus of the studies is to examine the factors affecting the capital structure in the context of the industry. Among the studies conducted, as well as studies on the factors affecting the capital structure of Small and Medium-Sized Enterprises (SMEs) are analyzed empirically; (Bhaird and Lucey; 2010; Palacin-Sanchez and Pietro, 2016; Lopez-Gracia and Sogorb-Mira, 2008). Studies that examine the financial factors that determine the capital structure of sector enterprises are also found (Ajanthan, 2013; Serrasqueiro and Nunes, 2014). In literature, it is also observed that there are studies which have examined the capital structure decisions of the companies and the factors affecting the capital structure are examined in the context of the country or the region (Bancel, and Mittoo, 2004; Chang, et al., 2014; Crnigoj and Mramor, 2009).

In this study, the factors determining the capital structure of member airlines of global alliances will be examined. When literature is examined, it is seen that the number of studies on the capital structure of the member airlines in the global airline are few. Therefore, this study is expected to contribute to literature in this respect. Table 1 summarizes the factors that determine the capital structure of the companies.

Table 2: Studies on the Factors Determining the Capital Structure

	Kiracı and Aydın (2018a)	Kiracı and Aydın (2018b)	Le and Phan (2017)	Vo (2017)	Seo and Choi (2016)
Period	2004-2015	2004-2015	2007-2012	2006-2015	2008-2012
Sample	15 Firms	31 firms	2625 Observations	30 Firms	86 Firms
Dependent variable	Book leverage	Book leverage	Book leverage	Book leverage	Book leverage
Firm size	Total asset (-/+)	Total asset (+/-)		Total asset (+/-)	Sales (-)
Growth opportunities	Sales (+/-)	Sales (+/-)	Sales (+)	Tobin q (+)	Percent change in Sales (-)
Profitability	Operating income/total asset (+/-)	Operating income/ total asset (-/+)	EBIT / total sales (-/+)	ROA (+/-)	Net profits/asset (-)
Tax	Non-debt tax shields (-/+)	Non-debt tax shields (-)			
Firm risk	Std. dev. of EBIT (-)	Std. dev. of EBIT (-)	Std. dev. of EBIT(-)		
Asset structure	Fixed asset/total assets (-/+)	Fixed asset/ total as-sets (+/-)		Fixed asset/total assets (+/-)	Tangible asset /total asset(+)
Liquidity ratio	Current total/short term liabilities (-/+)	Current total/short term liabilities (-/+)	Current total/total asset (+/-)	Current total/short term liabilities (+/-)	
	Keefe and Yoghoubi (2016)	**Bandyopadhyay and Barua (2016)**	**Arsov and Naumoski (2016)**	**Pacheco and Tavares (2015)**	**Handoo and Sharma (2014)**
Period	1974-2012	1998-2011	2008-2013	2010-2013	2001-2010
Sample	109613 observations	1594 firms	172 firms	70 firms	870 firms
Dependent variable	Book leverage	Book leverage	Book leverage	Book leverage	Book leverage
Firm size	Total asset (+)	Total asset (+)	Total asset (+)	Total asset (+)	Total asset (-)
Growth opportunities		Total sales/ total asset(-)	Sales (+)	Sales(+)	Total sales/total asset (+)
Profitability	Operating income/total asset (-)		Operating income/total asset (-)	EBIT/total assets (-)	EBIT/total assets (-)
Tax			Non-debt tax shields (-)		Non-debt tax shields (-)
Firm risk,	Std. dev. of EBIT(+)		Std. dev. of ROA(-)	Equity/total liabilities (-)	
Asset structure	Fixed asset/total assets (+)	Tangible asset/total assets (+)	Tangible asset/total assets(-)		Fixed asset/total assets (+)
Liquidity ratio				Current Total/Short Term Liabilities (+)	

3. Theoretical Background

Since the 1950s, many theoretical approaches have been developed based on different assumptions related to capital structure. The most well-known of these approaches is the Modigliani and Miller (M & M) approach, which was based on a study by Modigliani and Miller in 1958. According to this approach, it is argued that the capital structure cannot affect the market value of the company in an efficient market and no tax environment. Therefore, the value of the company cannot be increased by using the capital structure (Modigliani and Miller, 1963). However, in the study conducted by Modigliani and Miller, ignoring factors such as representative and bankruptcy cost and tax factor have led to the emergence of new theories of capital structure which better explain capital structure decisions. These theories include; tax factor theory, financial distress costs theory, asymmetric information theory, representative costs theory, balancing theory and pecking order theory (Korkmaz et al., 2009: 31). These theories are mentioned briefly, below. These theories will be mentioned briefly.

3.1. Tax Factor Theory

Tax factor theory was created by Modigliani and Miller in 1963 by adding the corporate tax factor to their previous proposal. According to this theory, it is argued that the deduction of the interest paid due to the debt is an advantage, but because the profit share does not provide such an advantage, the companies can reach their maximum market value by full borrowing (Durukan, 1997: 30). At the same time, the use of debt financing instead of financing with equity maximizes the value of the company by reducing the amount of taxable income (Ehrhardt and Brigham, 2008: 577).

3.2. Financial Cost Theory

The financial costs theory argues that the tax advantage obtained by the borrowing of companies will increase the debt / equity ratio after a certain period and hence, there may be difficulties in interest and principal payments. In other words, as the financing increases through borrowing, the capital cost of the company will increase and after a certain stage, interest payments and other payments may be difficult and this situation will increase the cost of bankruptcy (Van Horne, 2002: 458). In this respect, it is argued that companies with variable yields may face financial hardship and bankruptcy risk, such as high-paying companies, and thus must borrow less than those with fixed returns (Brigham and Houston, 1999: 474).

3.3. Asymmetric Information Theory

Asymmetric information theory aims to maximize the value of the company by sending signals about the operation to the people outside the company, thus making the capital owners profit. In general, managers prefer financing through borrowing rather than financing by issuing shares. This is because the investors perceive the borrowing of the company as positive and issuing shares as a negative signal (Gitman, 2003: 534). In other words, investors agree that the financial performance of the companies that prefer debt finance is good. However, investors believe that companies issuing shares have difficulties in finding loans and that their financial performance is not good (Stiglitz, 1988: 123).

3.4. Agency Theory

The agency theory consists of conflicts of interest between company managers, partners and shareholders, or between shareholders and creditors (Harris and Arthur, 1991: 301). In other words, it is a theory that managers do not want to pay

dividends to shareholders in order to strengthen their positions. Executives argue that leaving the profit obtained in the company will save the company from the control of the capital market. On the other hand, shareholders demand the dividends that are the equivalent of their capital. As a result, a conflict of interest arises between managers and shareholders. In order to reduce this conflict of interest, companies prefer financing through borrowing. Here, the problem of agency costs arises as a result of the problems experienced between the shareholders and the creditors of the companies (Gürsoy, 2012: 551).

3.5. Equilibrium Theory

The most important criticism of Modigliani and Miller's study in 1963 was that they took into account the benefits of financing through borrowing and ignored the cost of delegates and financial costs. However, the increase in the level of borrowing leads to an increase in the bankruptcy cost of the company. In this respect, according to the equilibrium theory taking into account the cost of bankruptcy, there is an optimal debt level determined by a balance between the benefits and the cost of financing through borrowing (Sayılgan and Uysal, 2011: 104). In other words, the equilibrium theory is the creation of an optimal capital structure by establishing a balance between the tax advantage provided by financing through borrowing and the cost of bankruptcy that the company may face (Ehrhardt and Brigham, 2008: 579).

3.6. Pecking Order Theory

According to the pecking order theory developed by Myers in 1984, while companies finance their investments, firstly they prefer auto-financing and then financing with debt and finally, by issuing shares. The reason for this is the asymmetric information problem between managers and investors. In this respect, investors perceive the new shares cause prices to be lowered. For this reason, companies firstly prefer self-financing to reduce the cost of asymmetric information. Then, in cases where self-financing is insufficient, companies prefer liabilities. In cases where the financing is very costly, companies prefer the issuance of shares (Wattson and Wilson, 2002: 562). According to the pecking order theory, the first reason that companies follow a certain sequence in the resource usage is to try to reduce the costs of asymmetric information. In other words, the company refrains from sending negative signals to investors. The second reason is flexibility and control. In other words, it means that outsourcing may destroy the future financing flexibility of the company and that the management's influence on the company may be reduced. In this respect, companies need to use internal resources first for financing (Damodaran, 1999: 249).

4. Data and Method

In this study, the factors that determine the capital structure of airlines which are members of global alliances are examined. Within the scope, the financial data of the member airlines of the three global alliances (StarAlliance, SkyTeam or OneWorld) was investigated and the data for 26 airlines, for which full financial data for the period 2005-2017 was acquired, have been included in the analysis. Panel data analysis has been used as a method. The panel data model is a regression model estimated by panel data. For this reason, the tests to be applied for the regression model are also applied to panel data models (Güriş, 2015: 4). In panel data analysis, it is aimed to estimate the economic relationships by using the horizontal sections

with a time dimension. In this method, it is generally encountered that the number of horizontal section units (N) is higher than the number of periods (T) (Yerdelen Tatoglu, 2016: 4).

In the panel data equation, *i* shows the horizontal section units (*i* = 1, Y, N), t the time change (t = 1, t, N) and the Y dependent variable, X independent variable or variables. In general, a panel data model is shown as follows.

$$Y_{it}=\alpha_{it}+\beta_{it} X_{it}+ \varepsilon_{it}$$

Here, shows the error terms. Firstly, descriptive statistics about variables will be included in the study. Then, the correlation matrix and pre-test results between the variables used will be presented. In the last part of the study, the results regarding the established models will be included.

5. Research Model

In this study, the factors affecting the capital structure decisions of the airlines that are members of the global alliances are analyzed and three different ratios are used as indicators of the capital structure. The main objective is to investigate empirically the financial factors that affect the total debt behavior, long-term debt behavior and short-term debt behavior of the airlines. The dependent and independent variables used, and their measurement indicators are given in Table 3.

Table 3: Definitions of variables

	Acronym	Variables	Measurement indicator
Dependent variables	TDR	Total debt ratio	Total debt / total assets
	LTDR	Long term debt ratio	Long term debt / total assets
	STDR	Short term debt ratio	Short term debt / total assets
Independent variables	ROA	Profitability	Gross income / total assets
	ROE	Profitability	Gross income / total capital
	ROS	Profitability	EBIT / total sales
	SIZE	Firm size	LN(total assets)
	GROW1	Growth opportunity	% change in assets
	GROW2	Growth opportunity	% change in sales
	TANG	Tangibility	Property, plant & equipment / total assets
	NDTS	Non-debt tax shield	Depreciation / total assets
	RISK1	Firm Risk	Standard Deviation of EBIT / total assets
	RISK2	Firm Risk	Standard Deviation of Sales / total assets
	LIQ	Liquidity	Current assets / short-term liabilities

In order to measure the profitability of airlines, three different ratios were used; return on assets, return on equity, and return on sales. In addition, multiple indicators were used to measure growth opportunities and firm risk. The main reason for using more than one indicator is due to certain characteristics of the air transportation industry. The main aim of the study is to reveal the financing behaviors of airlines by using the best and most sensitive measurement indicators. Both the dependent and independent variables used in the study were determined from the indicators widely used in literature. Within the scope of the study, three different models were created in order to reveal the financing factors that affect the total, long term and short-term debt behavior of the airlines. These models are as follows.

Model 1 - $TDR_{it}=\beta_{1,0}+\beta_{1,1}\ ROA_{it}+\beta_{1,2}\ ROE_{it}+\beta_{1,3}\ ROS_{it}+\beta_{1,4}\ SIZE_{it}+\beta_{1,5}\ GROW1_{it}+\beta_{1,6}\ GROW2_{it}+\beta\_1,7\ TANG_{it}+\beta_{1,8}\ NDTS_{it}+\beta_{1,9}\ RISK1_{it}+\beta_{1,10}RISK2_{it}+\beta_{1,11}\ LIQ\_it+\varepsilon_{it}$

Model 2 - $LTDR_{it}=\beta_{2,0}+\beta_{2,1}\ ROA_{it}+\beta_{2,2}\ ROE_{it}+\beta_{2,3}\ ROS_{it}+\beta_{2,4}\ SIZE_{it}+\beta_{2,5}\ GROW1_{it}+\beta_{2,6}\ GROW2_{it}+\beta_{2,7}\ TANG_{it}+\beta_{2,8}\ NDTS_{it}+\beta_{2,9}\ RISK1_{it}+\beta_{2,10}\ RISK2_{it}+\beta_{2,11}\ LIQ\_it+\varepsilon_{it}$

Model 3 - $STDR_{it}=\beta_{3,0}+\beta_{3,1}\ ROA_{it}+\beta_{3,2}\ ROE_{it}+\beta_{3,3}\ ROS_{it}+\beta_{3,4}\ SIZE_{it}+\beta_{3,5}\ GROW1_{it}+\beta_{3,6}\ GROW2_{it}+\beta_{3,7}\ TANG_{it}+\beta_{3,8}\ NDTS_{it}+\beta_{3,9}\ RISK1_{it}+\beta_{3,10}\ RISK2_{it}+\beta_{3,11}\ LIQ_{it}+\varepsilon_{it}$

In Model 1, the aim was to the financing factors that determine the total debt behavior of airlines. Therefore, the ratio of total debt to total assets was used as a dependent variable. In Model 2, the aim was to identify financing factors that determine the long-term debt behavior of airlines. Therefore, the ratio of long-term debt to total assets was used as a dependent variable. In Model 3, establishing the financing factors that affect the short-term debt behavior of was the aim. Therefore, the ratio of short-term debt to total assets was used as the dependent variable. Considering the Trade-Off, Pecking Order and Agency Cost theories, the study's hypotheses were created as follows.

H1 - There is a significant negative/positive relationship between profitability and debt.

H2 - There is a significant negative/positive relationship between firm size and debt.

H3 - There is a significant negative/positive relationship between growth opportunity of the firm and debt.

H4 - There is a significant negative/positive relationship between tangibility and debt.

H5 - There is a significant negative relationship between non-debt tax shield and debt.

H6 - There is a significant negative relationship between firm risk and debt.

H7 - There is a significant negative/positive relationship between liquidity and debt.

Using the hypotheses above, the aim was to examine the capital structures of the airlines that are members of strategic alliances. In the hypothesis development phase, Trade-Off, Pecking Order and Agency Cost theories were taken into consideration.

6. Application and Findings

In this part of the study, the descriptive statistics, the correlation matrix, the cross-section dependence and unit root test results of variables are given. In addition to these, appropriate model determination tests, pre-test results and resistance standard error test results are presented.

Table 4: Descriptive statistics

	TDR	LTDR	STDR	ROA	ROE	ROS	SIZE
Mean	0.4033	0.3126	0.0908	0.2546	0.4430	0.0332	6.9998
Maximum	0.7936	0.5577	0.3896	1.7725	54.962	0.9320	7.7190
Minimum	0.0426	0.0319	0.0017	-0.0401	-54.860	-1.7701	5.2110
Std. Dev.	0.1651	0.1182	0.0741	0.2706	4.3689	0.1439	0.5048
Skewness	-0.2564	-0.5490	1.4263	2.9980	-0.3335	-6.3643	-1.1350
Kurtosis	2.4761	2.7626	4.8092	14.566	148.84	89.183	4.0901
J-B	7.5688	17.815	160.71	2390.1	299555	106885	89.407
p-value	0.0227	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000
Obs.	338	338	338	338	338	338	338
	GROW1	**GROW2**	**TANG**	**NDTS**	**RISK1**	**RISK2**	**LIQ**
Mean	0.0849	0.0940	0.5968	0.0565	0.0499	0.0610	0.8371
Maximum	1.4751	4.3412	0.8822	0.1057	1.6718	0.7997	2.9354
Minimum	-0.3690	-0.3921	0.1323	0.0121	0.0000	0.0000	0.1719
Std. Dev.	0.2133	0.2996	0.1341	0.0141	0.1496	0.0808	0.3758
Skewness	2.4070	8.6095	-0.4982	-0.0501	8.0795	4.2959	0.9971
Kurtosis	14.291	121.01	3.8026	3.4213	75.715	30.385	5.8818
J-B	2121.8	200311	23.051	2.6406	78144	11601	172.96
p-value	0.0000	0.0000	0.0000	0.2671	0.0000	0.0000	0.0000
Obs.	338	338	338	338	338	338	338

Table 4 shows the descriptive statistics used. In this study, 3 dependents and 11 independent variables were used, and the data related to all the variables are shown in the table.

Table 5: Correlation matrix of independent variables

	ROA	ROE	ROS	SIZE	GROW1	GROW2	TANG	NDTS	RISK1	RISK2	LIQ
ROA	1										
ROE	0.150	1									
ROS	0.207	0.057	1								
SIZE	-0.349	-0.061	-0.054	1							
GROW1	0.041	0.007	0.201	-0.048	1						
GROW2	0.085	0.001	0.106	-0.017	0.450	1					
TANG	-0.569	-0.086	-0.075	0.288	-0.038	0.012	1				
NDTS	-0.433	-0.054	-0.189	-0.025	-0.292	-0.145	0.422	1			
RISK1	0.081	0.016	-0.124	-0.014	-0.029	-0.046	-0.156	0.024	1		
RISK2	0.326	0.035	0.050	-0.338	0.309	0.321	-0.322	-0.236	0.146	1	
LIQ	0.247	0.014	-0.074	-0.237	0.034	-0.022	-0.567	-0.153	0.176	0.108	1

In the regression analysis, a high correlation between the independent variables, in other words, the correlation coefficient above 0.80, might causes multiple multicollinearity problems. Table 5 shows the correlation matrix between the independent variables. Accordingly, the correlation coefficient between the variables is well below the critical value of 0.80.

Table 6: Cross-Sectional Dependence Test Results

LM adj (PUY, 2008)		
Variables	**Stat**	**p-value**
TDR	1.008	0.1570
LTDR	-1.484	0.9310
STDR	0.635	0.2630
ROA	-0.776	0.7810
ROE	0.105	0.4580
ROS	0.370	0.3560
SIZE	-1.311	0.9050
GROW1	-1.095	0.8630
GROW2	4.614	0.0000
TANG	4.087	0.0000
NDTS	-1.167	0.8780
RISK	-0.562	0.7130
RISK2	0.875	0.1910
LIQ	0.657	0.2560

Table 6 shows the cross-sectional dependency test results of the variables used in the analysis. In this context, the hypothesis established as “no horizontal cross-section dependence” was rejected for some variables. It is seen that hypothesis was not rejected for GROW2 and TANG variables. This situation shows that, in the unit root analysis, GROW2 and TANG variables should be determined for the second and second variables for the first variables. As a result, GROW2 and TANG variables’ stability levels should be determined by second-generation unit root analysis, the stability levels of other variables should be determined by first generation unit root analysis.

Table 7: Panel Unit Root Test Results

Varia-bles	Model	LLC -t test		IPS -W test		ADF - Fisher	
		Stat	**p-value**	**Stat**	**p-value**	**Stat**	**p-value**
TDR	Constant	-4.46511	0.0000	-1.91459	0.0278	70.5537	0.0443
	Constant and Trend	-7.26481	0.0000	-2.94662	0.0016	88.5899	0.0012
LTDR	Constant	-4.78347	0.0000	-3.43371	0.0003	90.3414	0.0008
	Constant and Trend	-6.82412	0.0000	-3.20298	0.0007	92.9102	0.0004
STDR	Constant	-4.88134	0.0000	-3.15293	0.0008	84.0641	0.0032
	Constant and Trend	-3.71437	0.0001	-1.67197	0.0473	68.4614	0.0626
ROA	Constant	-3.34388	0.0004	-1.26107	0.1036	64.5619	0.1134
	Constant and Trend	-4.56557	0.0000	-1.33984	0.0901	65.5359	0.0983

Variables	Model	LLC -t test		IPS -W test		ADF - Fisher	
		Stat	p-value	Stat	p-value	Stat	p-value
ROE	Constant	-3.98589	0.0000	-2.57572	0.0050	82.0877	0.0049
	Constant and Trend	-7.23474	0.0000	-2.37665	0.0087	77.9034	0.0115
ROS	Constant	-8.20876	0.0000	-5.04891	0.0000	111.427	0.0000
	Constant and Trend	-21.3901	0.0000	-5.32968	0.0000	91.0563	0.0007
SIZE	Constant	-6.55716	0.0000	-2.70493	0.0034	92.4989	0.0005
	Constant and Trend	-13.6191	0.0000	-1.49232	0.0678	72.7238	0.0304
GROW1	Constant	-7.51862	0.0000	-5.29151	0.0000	116.867	0.0000
	Constant and Trend	-9.51773	0.0000	-4.34837	0.0000	105.732	0.0000
NDTS	Constant	-10.1414	0.0000	-5.27601	0.0000	114.91	0.0000
	Constant and Trend	-5.97572	0.0000	-5.30183	0.0000	118.434	0.0000
RISK1	Constant	-20.7072	0.0000	-6.12517	0.0000	99.9425	0.0001
	Constant and Trend	-11.7092	0.0000	-3.11749	0.0009	84.6372	0.0028
RISK2	Constant	-2.79334	0.0026	-3.64317	0.0001	89.9153	0.0009
	Constant and Trend	-2.99925	0.0014	-2.26982	0.0116	74.1074	0.0237
LIQ	Constant	-4.43226	0.0000	-1.91551	0.0277	69.6661	0.0514
	Constant and Trend	-9.27192	0.0000	-2.78515	0.0027	87.6619	0.0014

Note: The maximum delay length is 1 and the optimal delay length was determined according to the SIC (Schwarz Info Criteria) criteria.

Table 7 shows the panel unit root test results. When p-values values are examined, it is seen that all the variables included in the analysis are significant at the level. Therefore, all the variables were used in the analysis with level values.

Table 8: Second Generation Unit Root Test Results

CADF Panel Unit Root Test					
Variables		Stat	1 %	5 %	10 %
GROW2	Constant	-2.420	-2.34	-2.17	-2.07
	Constant and Trend	-4.524	-2.89	-2.70	-2.60
TANG	Constant	-2.229	-2.34	-2.17	-2.07
	Constant and Trend	-2.608	-2.89	-2.70	-2.60

Note: Critical values derived from Pesaran (2007) tables II (a) and II (b).

Table 8 shows the results of second-generation analysis applied to GROW2 and TANG variables. Analysis results show that these variables can be used with level values.

Table 9: Tests for identification of appropriate model

F Test		LM Test		Hausman Test		Appropriate Model
Stat.	p-value	Stat.	p-value	Stat.	p-value	
21.0267	0.0000	578.669	0.0000	8.8700	0.5441	Random Effects
17.0887	0.0000	541.247	0.0000	2627.8	0.0000	Fixed Effects
25.2901	0.0000	606.858	0.0000	15.730	0.1077	Random Effects

In panel data analysis, it is necessary to carry out tests to determine the appropriate model after the stability analysis. Modeling the test results shows that the model of random effects is appropriate for the first model (Model 1) and the third model (Model 3), however, the model of fixed effects is necessary for the second model (Model 2) the model of random effects are appropriate.

Table 10: Heteroscedasticity test results

Levene, Brown and Forsythe test				
	Test	W0	W50	W10
Model - 1	Stat.	7.1737	4.3147	6.5233
	p-value	0.0000	0.0000	0.0000
Model - 3	Stat.	6.9303	3.8526	6.6038
	p-value	0.0000	0.0000	0.0000
Modified Wald				
Model - 2	Stat.	3267.33		
	p-value	0.0000		

Heteroscedasticity test results for the models (Model 1, Model 2 and Model 3) created are given in Table 10. Results show that H_o hypothesis was rejected for all models. This shows that the variance is not constant in all models and that there is heteroskedasticity problem.

Table 11: Autocorrelation test results

	Durbin Watson	Baltagi–Wu
	Stat.	Stat.
Model - 1	0.76375	1.05083
Model - 2	0.79395	1.07719
Model - 3	1.07822	1.21874

Table 11 shows the results of the DW autocorrelation test of Bhargava, Franzini and Narendranathan and Baltagi and Wu's LBI autocorrelation test. There is no critical value for DW and LBI autocorrelation tests in literature. However, the DW and LBI statistical values when less than 2 indicate autocorrelation.

For the models used in the study, (Model 1, Model 2 and Model 3), after changing the variance in the autocorrelation test, the resistant standard errors can be obtained. In the next part of the study, for Model 1, Model 2 and Model 3 the findings of the models, which were calculated by the resistant standard errors in which the problems related to the changing variance and autocorrelation were eliminated, will be given.

Table 12: Random-effects GLS regression for Model - 1

	Coef.	Std. Err.	z	p-value	[95% Conf. Interval]	
ROA	-0.06938	0.04760	-1.46	0.1450	-0.16267	0.02391
ROE	0.00006	0.00042	0.14	0.8870	-0.00077	0.00089
ROS	-0.00385	0.06394	-0.06	0.9520	-0.12916	0.12147
SIZE	0.01063	0.03613	0.29	0.7690	-0.06019	0.08144
GROW1	-0.01351	0.02831	-0.48	0.6330	-0.06900	0.04198

	Coef.	Std. Err.	z	p-value	[95% Conf. Interval]	
GROW2	-0.04217	0.01232	-3.42	0.0010	-0.06632	-0.01802
TANG	0.09632	0.14054	0.69	0.4930	-0.17914	0.37178
NDTS	-0.29507	0.66660	-0.44	0.6580	-1.60159	1.01145
RISK1	0.05792	0.03406	1.70	0.0890	-0.00884	0.12468
RISK2	0.20868	0.06101	3.42	0.0010	0.08910	0.32825
LIQ	-0.16988	0.05578	-3.05	0.0020	-0.27921	-0.06055
_cons	0.43759	0.24409	1.79	0.0730	-0.04082	0.91601
Number of obs. = 338				Wald chi2(11) = 142.06		
Number of groups = 26				Prob > chi2 = 0.0000		

Table 12 presents the first model (Model 1) findings of TDR (total debt / total assets) as dependent variables. Analysis of the findings indicates that the growth opportunities of the airlines included in the study', the firm risk, and the liquidity ratio have an effect on the total debt level. Accordingly, it is observed that the growth opportunities of the airlines have a negative effect on the total debt level. On the other hand, the results indicate that firm risk has a positive effect on the total leverage level. The findings also show that the liquidity level of airlines has a negative impact on the total debt level. This indicates that airlines with high liquidity tend to use their existing liquidity instead of using liability. When we compare Model 1 findings with other studies in literature (see Kiracı and Aydın, 2018b), it is seen that the total debt behavior of traditional airlines is like the total debt behavior of member airlines of global alliances.

Table 13: Regression with Driscoll-Kraay standard errors for Model - 2

	Coef.	Std. Err.	t	p-value	[95% Conf. Interval]	
ROA	-0.01108	0.02691	-0.41	0.6840	-0.06650	0.04433
ROE	0.00000	0.00020	0.00	0.9970	-0.00042	0.00042
ROS	0.02502	0.05165	0.48	0.6320	-0.08135	0.13139
SIZE	0.07197	0.03005	2.39	0.0240	0.01007	0.13386
GROW1	-0.02209	0.02205	-1.00	0.3260	-0.06751	0.02334
GROW2	-0.03232	0.00874	-3.70	0.0010	-0.05031	-0.01432
TANG	0.20805	0.07631	2.73	0.0120	0.05089	0.36520
NDTS	-0.82421	0.47546	-1.73	0.0950	-1.80345	0.15502
RISK1	0.03787	0.03655	1.04	0.3100	-0.03742	0.11315
RISK2	0.14078	0.04355	3.23	0.0030	0.05109	0.23048
LIQ	-0.05664	0.01597	-3.55	0.0020	-0.08954	-0.02374
_cons	-0.22495	0.27041	-0.83	0.4130	-0.78188	0.33197
Number of obs. = 338				F(11, 25) = 1135.49		
Number of groups = 26				Prob > F = 0.0000		

Table 13 shows the results of the second model (Model 2) in which the long-term total debt / total assets were used as dependent variables. Analysis of the findings shows that the size, growth opportunities, asset structure, non-debt tax shield, firm risk and liquidity ratio variables in the member airlines of the global alliances have a significant effect on the long-term debt level. Accordingly, it is seen that the airline size, asset structure and firm risk variables have a positive effect on the long-term

debt level of airlines. The results also indicate that the growth opportunities of the airlines, the non-debt tax shield and the liquidity ratio variables negatively affect the long-term debt level. Therefore, it is possible to say that large airlines (in terms of total assets), airlines with more tangible assets, and airlines with higher risk have more long-term debt. On the other hand, it is observed that the airlines, which have high growth opportunities, non-debt tax shielding and liquidity ratios have a relatively lower liability ratio. When we compare Model 2 findings with other studies in literature (see Kiracı and Aydın, 2018a; Kiracı and Aydın, 2018b), it is seen that the long-term debt behavior of the member airlines of the global alliances is similar to the traditional business model in terms of growth opportunities and firm size. In addition, the long-term debt behavior of the member airlines of the global alliances is similar to that of the traditional business model and low-cost business model in terms of non-debt tax shield and asset structure.

Table 14: Random-effects GLS regression for Model - 3

	Coef.	Std. Err.	z	p-value	[95% Conf. Interval]	
ROA	-0.05741	0.02052	-2.80	0.0050	-0.09762	-0.01720
ROE	0.00007	0.00004	1.80	0.0710	-0.00001	0.00015
ROS	-0.02743	0.02056	-1.33	0.1820	-0.06772	0.01286
SIZE	-0.04655	0.02238	-2.08	0.0380	-0.09042	-0.00268
GROW1	0.00721	0.00997	0.72	0.4690	-0.01232	0.02674
GROW2	-0.00973	0.00465	-2.09	0.0360	-0.01885	-0.00061
TANG	-0.12736	0.06707	-1.90	0.0580	-0.25881	0.00409
NDTS	0.60570	0.30281	2.00	0.0450	0.01220	1.19920
RISK1	0.02187	0.00835	2.62	0.0090	0.00550	0.03823
RISK2	0.07125	0.02189	3.25	0.0010	0.02834	0.11415
LIQ	-0.10938	0.02025	-5.40	0.0000	-0.14907	-0.06970
_cons	0.56031	0.18405	3.04	0.0020	0.19958	0.92105
Number of obs. = 338				Wald chi2(11) = 224.56		
Number of groups = 26				Prob > chi2 = 0.0000		

In Table 14, the third model (Model 3), in which STDR (short term debt / total assets) was used as a dependent variable, is presented. The analysis results show that return on assets, return on equity, firm opportunity, tangibility, non-debt tax shield, firm risk and liquidity variables of airlines which are members of global alliances have a significant effect on short-term debt level. Accordingly, it is seen that the return on assets, firm opportunity, growth opportunity, tangibility and liquidity variables of airlines have a negative effect on short-term debt level. However, the results indicate that the return on equity, non-debt tax shield, and firm risk variables have a positive effect on the short-term leverage level. When we compare Model 3 findings with other studies

in literature (see Kiracı and Aydın, 2018b), it is seen that the short-term debt behavior of the member airlines of the global alliances is similar to the traditional business model in terms of firm size, growth opportunities, asset structure, and liquidity ratio.

Table 15: Comparison of Theoretical Expectations with Findings

Measurement	Trade-Off	Pecking Order	Agency Cost	Model 1	Model 2	Model 3
Profitability	+	-	na	na	+	-/+
Firm size	+	-	+	na	+	-
Growth opportunity	-	+	-	-	-	-
Tangibility	+	-	+	na	+	-
Non-debt tax shield	-	na	na	na	-	+
Firm Risk	-	-	-	+	+	+
Liquidity	+	-	na	-	-	-

Table 15 shows the comparison of the findings of the models created with the expectation of the signs of capital structure theories. The findings can be evaluated by considering the signaled expectations based on capital structure theories. In this context, according to the Trade-Off theory, there is a positive relationship between profitability, firm size and tangibility, and debt. Besides, also according to the Trade-Off theory, there is a negative relationship between growth opportunity and non-debt tax shield and debt ratio. According to the Agency Cost theory, there is a positive relationship between firm size and tangibility variables and debt level, but there is a negative relationship between growth opportunity and debt ratio. Model 2 findings correspond to the expectations of the Trade-Off and Agency Cost theories. The Pecking Order theory reveals that there is a negative relationship between profitability, firm size, tangibility and liquidity variables and debt level. When the Model 3 results are analyzed, it is seen that the findings suitable for the Pecking Order theory are obtained.

If the empirical findings obtained as a result of the analysis are detailed, the Model 1 findings produced results that are consistent with the expectation of the Trade-Off theory and agency cost theory for the growth opportunity variable. In Model 1, the liquidity variable corresponds to the pecking order theory. In addition, when Model 2 findings are evaluated in general, it is seen that airlines behave in accordance with trade-off theory and agency cost theory for long-term liabilities use. The results of Model 3 were developed to reveal the short-term debt behavior of airlines. Accordingly, short-term financing behavior of airlines is generally consistent with the pecking order theory.

When the results of the models are compared with the studies in literature (see Kiracı and Aydın, 2018a; Kiracı and Aydın, 2018b), it is seen that the total debt, long-term debt and short-term debt behavior of the member airlines of global alliances is similar in many respects to airlines with traditional business models. In addition, the long-term debt behavior of the member airlines of the global alliances is similar to not only the airlines applying a traditional business model but also to the airlines applying low-cost business models.

7. Discussion and Conclusion

Airlines become members of a number of collaborations to expand their network structures and reduce costs. In this study, the factors that determine the capital structure of airlines that are members of strategic cooperation were examined. Within the scope of the study, the capital structure decisions of the member airlines of any of the global strategic alliances (StarAlliance, SkyTeam or OneWorld) were analyzed empirically. A total of 26 airlines for which financial data were obtained for the period 2005-2017 were analyzed and panel data analysis was used as the method considering the structure of the data.

In this study which examines the financial factors affecting the capital structure of the member airlines of the global alliances, three different models were formed in order to determine the capital structure decisions. In these models, created by taking into consideration the studies in literature, indicators measuring the level of leverage of firms were used. In this context, the ratio of total liabilities to total assets was used as a dependent variable in the first model. In the second model, the ratio of long-term liabilities to total assets was preferred as a dependent variable. In the third model, the ratio of short-term liabilities to total assets was used as a dependent variable. In this way, the aim was to reveal the financial factors affecting the long-term and short-term financing behavior of airlines. The independent variables used in the study are profitability, firm size, growth opportunity, tangibility, non-debt tax shield, firm risk, and liquidity.

The findings of the study show that total, long and short term financing behaviors of member airlines of global alliances are different from each other. Accordingly, the first model findings, in which the ratio of total liabilities to total assets were used as dependent variables (TDR), show that the growth opportunities in the airlines, firm risk and liquidity ratio have a significant effect on the total debt level. Accordingly, it is seen that having high growth opportunities has a negative impact on the total debt level for the airlines. In addition, having a high liquidity ratio affects the total debt level negatively. This indicates that firms with high liquidity tend to use their existing liquidity instead of using liability. The results show that, in contrast to the theoretical expectations, the firm risk in airlines has a positive effect on the total leverage.

The second model, in which long-term liabilities to total assets was used as a dependent variable (LTDR), shows that firm size, growth opportunities, asset structure, non-debt tax shield, firm risk and liquidity ratio variables have a significant effect on the long-term debt level in member airlines of global alliances. Accordingly, it is seen that the airline size, asset structure and firm risk variables have a positive effect on the long-term debt level in airlines. This suggests that airlines with relatively large and more tangible assets prefer equity instead of using long-term liabilities. From a theoretical point of view, there are also many studies that emphasize that firms having large and more tangible assets will tend to use more liabilities because their debt costs will be lower. The results also indicate that the growth opportunities, the non-debt tax shield and the liquidity variables of the airlines negatively affect the long-term debt level. Therefore, it can be claimed that the airlines which have high growth opportunities, non-debt tax shield and liquidity ratio, have a relatively greater liability rate.

The third model findings, in which short-term liabilities to total assets was used as a dependent variable (STDR), show that return on assets, return on equity, growth opportunity, tangibility, non-debt tax shield, firm risk and liquidity variables have a significant effect on the short-term debt level. Accordingly, firms with a high return

on equity have a higher level of short-term debt. In addition, the findings show that airlines use more short-term liabilities to take advantage of the non-debt tax shield. On the other hand, the results indicate that firms with a higher return on assets, higher tangible fixed assets, higher growth opportunities and higher liquidity ratios use fewer short-term liabilities. From a theoretical standpoint, the findings were in accordance with the Pecking Order theory. Accordingly, companies with a high return on assets prefer to use their equity instead of borrowing. This situation provides a relatively low short-term debt ratio. In addition, it is supported theoretically by the fact that firms with high tangibility prefer to use equity instead of using liabilities. As a result, it can be said that total, long-term and short-term financing behaviors in member airlines of global alliances are different.

When the findings of the study are compared with the previous studies in literature (see Kiracı and Aydın, 2018a; Kiracı and Aydın, 2018b), the long-term financing behavior of airlines that are members of global alliances is similar to airlines implementing low-cost business models and traditional business models. Therefore, long-term financing behavior of both airlines that are members of global alliances and airlines that are implementing low-cost and traditional business models are appropriate to the Trade-Off Theory.

When the results obtained in the study are evaluated in general, it is seen that firms with high profitability and high growth opportunities tend to borrow more. In addition, large airline companies (in terms of asset structure, number of passengers and number of aircraft) use borrowing for their long-term financing needs, and use their own funds for short-term financing needs. In addition, when the liquidity level is taken into consideration, it is seen that airline companies prefer to use their own funds instead of borrowing to meet their short-term financing needs. It is suggested that the asset sizes of the airline companies should be taken into consideration in future studies on capital structure. In addition, examining the capital structure of airlines that implement a regional business model can contribute to literature.

Annex: List of Airlines

ID	AIRLINE	ID	AIRLINE
1	AMERICAN AIRLINES	14	CHINA SOUTHERN AIR
2	QANTAS AIRWAYS	15	ASIANA AIRLINES
3	AIR CANADA	16	KOREAN AIR LINES
4	LATAM AIRLINES	17	FINNAIR
5	AIR CHINA LIMITED	18	THAI AIRWAYS
6	CHINA EASTERN	19	AEROFLOT-ROSSIY
7	LUFTHANSA	20	SINGAPORE AIRLINES
8	AIR FRANCE - KLM	21	TURKISH AIRLINES
9	AEGEAN AIRLINES	22	CHINA AIRLINES
10	ANA HOLDINGS	23	EVA AIRWAYS
11	JAPAN AIRLINES	24	DELTA AIR LINES
12	ALIA - THE ROYAL	25	UNITED CONTINENTA
13	CATHAY PACIFIC AIR	26	AIR NEW ZEALAND

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