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The risk in using financial reports in the study of airline business models

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ABSTRACT

A review of published articles has shown that many researchers use financial reports as the main source of information in regard to airline business models. A study of accounting policies and other external information, however, has highlighted the differences in assumptions as to useful lives and the residual values of aircraft, which are the principal assets of airlines. While the considerable, unexplained differences in the accounting policies of enterprises with similar business models indicate there may be risk in using this data, the risk can be eliminated by making appropriate adjustments in the financial statements.

1. Introduction

While many researchers use financial reports to study airline business models, the experts charged with setting accounting standards refuse to introduce the concept of the business model in external reporting. The aim of this article is to identify and present the risk of relying on these financial reports. The focus is on owned and leased aircraft, which are the principal assets of every airline.

To illustrate this risk, the results of a study of the most recent annual reports of selected full-service and low-cost carriers are presented in the third and fourth chapters. The rationale for selecting these two types of business models was to investigate whether accounting policies vary with factors influencing the book value of the owned and leased aircraft. This follows the critical review of literature method.

The article is structured as follows. The first two chapters consider the theoretical background for the use of financial reports in the study of airline business models, and the methodology and sample selection. Then, consideration is given to the risk of relying on these annual reports in the study of the business models of different airlines. Finally, conclusions are presented.

2. Theoretical background

In order to identify publications which used financial reports in the study of airline business models, database searches of Science Direct were conducted in November 2015 and March 2016. Additional papers were identified through the careful study of the found publications.

Based on accounting data, Hunter (2006), pp. 315–316 referred to two business models: the full-service carrier model (FSC) and the low-cost carrier model (LCC). The FSC incurs generally higher operating expenses owing to the extra services provided but for which a premium price is charged. By contrast, the LCC cuts operating expenses significantly by providing no-frills services and often using secondary airports with cheaper landing charges, cf. (Kalakou and Macario, 2013, pp. 4–5). Inventory management is simplified by the absence of feeder routes, direct or online booking, and ticketless operation. By significantly reducing expenses and fares, the LCC opens up a much wider range of point-to-point flights, many not served by the FSC, attracting at least some price-conscious passengers from the high-fare FSC, cf. (Fageda et al., 2015, p. 294). O'Connell and Williams (2005), pp. 259, 270 and 271 surveyed passengers for answers to a number of critical questions concerning the two types of airlines in the mature European market and in the rapidly developing Asian economy. The survey confirmed differences in passengers' perceptions between the two main types of airline business models. Passengers selected low-cost carriers primarily because of their low fares, while full-service

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airlines were chosen for a variety of reasons, including the reliability of service, quality, flight schedules, comfort, and safety. In terms of accounting, the authors also examined the operating cost performance of selected airlines as background on the surveyed airlines. Nair et al. (2011), p. 53 also analysed different types of airline business models using such accounting data as profitability, cost drivers, and revenue achievement.

Morrison and Mason (2007), pp. 1 and 14 and Mason and Morrison (2008), p. 9 explained how the various elements of airline business models interrelated to define an overall strategy, using product and organizational architecture (POA). A set of indices was developed to apply the POA model to the components of airline business models. Among these indices were profitability, which used a carrier's operating ratio, and unit cost. Benchmarks were calculated using the published annual reports of various airlines.

Lohmann and Koo (2013), pp. 7–8 compared nine major US airline business models, benchmarking some of the POA variables to establish a spectrum on which airlines were positioned. The authors adopted a list of items from Mason and Morrison to develop six indices: revenue, connectivity, convenience, comfort, aircraft and labour. The study was based on information compiled from the airlines' websites and their annual reports, among other sources.

Daft and Albers (2013a), p. 52 and Daft and Albers (2013b), p. 6 also collected data from annual reports to identify relevant dimensions and elements of airline business models. Their framework of a business model was based on three main components that fully describe an airline's value creation system: strategic level, structural level, and resource level. The latter component covered the unique set of resources and capabilities of a firm differentiating tangible from intangible assets.

Bazargan and Hartman (2012), pp. 27–29 introduced a model highlighting major factors in aircraft replacement strategy for the airlines, and minimizing the total discounted cost by identifying the number of aircraft to lease, buy and sell over a planning horizon. Regardless of the type of business model, the authors recommended the following:

- buy or lease brand new aircraft
- lease short-term
- sell aircraft aged 12 years and older
- discourage fleet diversity
- lease aircraft rather than buy.

The model employed parameters such as fixed cost for introducing or keeping aircraft in the fleet, unit annual operating and maintenance costs for owned and leased aircraft, and unit salvage value for owned aircraft. These parameters were based on accounting data. But as Bazargan and Hartman (2012), p. 27 noted airlines typically do not have to, or do not wish to, disclose the relevant parameters, which led the authors to initiate an alternative search.

Gibson and Morrell (2005), pp. 3–6, 10–11, and 13 surveyed airline Chief Financial Officers around the world. Among other issues, they asked the respondents to identify their airline's total assets, total revenue, and revenue growth rate. These metrics were used to present the strength of preferences for the different approaches to valuation (investment valuation methods, interactions between investment and financing decisions, and risk management) in a broader context. According to the authors, the predominant question was whether managers should focus on accounting profits or cash returns in evaluating projects. It was found that airlines indicated a strong preference for Net Present Value and a weaker preference for Rate of Return than for the cash-based techniques. This result was consistent with trends observed in the survey of publications. As regards the cash-based techniques, 68% of airline financial managers preferred to calculate cash flow directly, rather than indirectly starting with profit and adding back depreciation.

Oum et al. (2000), pp. 17 and 22 developed a model for airlines to determine their optimal mix of leased and owned capacity. The annual reports of carriers were only used to supplement, cross-check and correct errors in the International Civil Aviation Organization data.

The abovementioned studies used accounting data from financial reports, notwithstanding the fact that the setters of accounting standards have refused to introduce explicitly the concept of the business model in financial reporting (IASB, 2014, p. 11).

3. Methodology and sample selection

In the research underlying this paper, the annual reports of 8 airlines were studied, including 4 low-cost and 4 full-service carriers. The empirical analysis of financial reports, including financial statements, used in this paper was described by Crawley and Wahlen (2014), pp. 583–584. According to the authors, such research comprises the largest body of literature within accounting. One of the main problems is that the information stakeholders obtain from accounting varies as does its usefulness for predicting the timing, magnitude, and certainty of a firm's future cash flows. This literature also helps to explain the impact of financial accounting information on risk when evaluating investment opportunities. In order to illustrate the risk of using financial reports in the study of airline business models, accounting information was adjusted using the techniques described by Palepu et al. (2010), pp. 149–154, Imhoff et al. (1991), pp. 51 and 60, and Imhoff et al. (1997), p. 20.

In selecting airlines for inclusion in the sample, the first determining factor was the availability of the carrier's annual report on its webpage, an important consideration as not every company is obliged to publish its annual report there. Carriers were then identified and selected to reflect the range of variations in operating approach within the two main airline business models:

- representation of low-cost carriers; Ryanair – the archetypical low-cost carrier offering short-haul, point-to-point service; easyjet – the adapted low-cost carrier offering fare bundling but not connecting flights; JetBlue – the adapted low-cost carrier now offering some connecting flights; and AirAsia – the carrier which sees feeder routes as a requirement for its low-cost, long-haul services; cf. (Fageda et al., 2015, pp. 290–292),
- representation of full-service carriers; Turkish Airlines – the contemporary full-service model, which still focuses on superior passenger comfort and maintains a high ratio of long-distance routes to regional ones; SAS Scandinavian Airlines – the hybrid model, which seeks to deepen price differentiation among passengers; Lufthansa – a portfolio of airline business models based on the operation of two carriers: the first competing directly with low-cost carriers through economies of scale and scope, and the second, a full-service airline, positioned higher, and operating via hubs; cf. (Karwowski, 2015, p. 484); and United Continental, as pre-merger Continental scored very high in the LCC-FSC spectrum of Lohmann and Koo (2013), p. 9 before being combined with UAL Corporation.

A typical annual report aggregates and summarizes the results of many transactions and events into the financial statements: the statement of financial position (the balance sheet), the statement of profit or loss and other comprehensive income, the

statement of cash flows, the statement of changes in equity. The above financial statements are supplemented by disclosing notes to the consolidated financial statements that explain the accounting policies, methods, and estimates. In addition, the annual report also typically provides management's discussion and analysis (the management commentary), conveying management's assessment of the firm's performance, risk, capital structure, and liquidity, as well as their expectations for the future, cf. (Crawley and Wahlen, 2014, pp. 589–590). The following financial reports were studied:

- Annual report 2014 of Ryanair Holdings plc, in particular Information on the company, Key Information, Consolidated financial statements
- Annual report and accounts 2014 of easyJet Airline Company Limited, in particular Chairman's statement, Strategic report, Notes to the accounts
- Annual report for the fiscal year ended December 31, 2014 of JetBlue Airways Corporation, in particular Notes to consolidated financial statements
- Annual report (Corporate and Financials) 2014 of AirAsia Berhad, in particular Summary of significant accounting policies
- Annual report 2014 of Turkish Airlines, Inc. in particular Chairman's message, Notes to consolidated financial statements
- Annual report with Sustainability Review, November 2013–October 2014 of SAS AB, in particular Strategy, Notes to the financial reports
- Annual report 2014, and financial statements 2014 of the Lufthansa Group
- Annual report with a comprehensive overview of the company of 2014 of United Continental Holdings, Inc., in particular Strategy, Properties, Significant accounting policies.

From the above list of documents, it can be concluded that the financial statements were the main source of data, especially the balance sheet, the income statement, and the notes to the financial statements (the description of accounting policies, and notes concerning initial cost, accumulated depreciation and the lease of aircraft). The main advantage of financial accounting data is high comparability among accounting periods.

In the following chapters the risk in using annual reports to study airline business models is discussed.

4. The reflection of airline business models in the financial reports of selected carriers

4.1. The importance of aircraft in airline business models

The study of accounting literature in regard to the airline industry highlights the importance of owned or leased aircraft. This is confirmed by the study of the financial reports of eight carriers which represent different business models: low-cost carriers (EasyJet, Ryanair, JetBlue, and AirAsia) and full-service carriers (Turkish Airlines, SAS Scandinavian Airlines, Lufthansa, and United Continental). Table 1 presents the percentage the carrying value of each airline's aircraft fleet represents to the total assets of the carrier.

Table 1 shows that aircraft fleets constitute more than half of the carriers' total assets. This high ratio means that these assets have considerable impact on reported earnings, which impact is a function of the assumptions made by company management as to their aircraft's useful lives, residual values, and depreciation methods. These estimates are subjective and, if they are overly optimistic, non-current assets and earnings are overstated (Palepu et al., 2010, p. 149). Aircraft can be owned or leased. Lease agreements can be structured so as to meet specific criteria for reporting leases, potentially leading to the desired effect for a company, for instance, the understatement of assets because aircraft under operating leases are not recognized as assets in statements of financial position (the balance sheet), in contrast to finance leases (Palepu et al., 2010, p. 152). The accounting policies in regard to the aircraft of selected airlines are studied in the following two subchapters.

4.2. The case of low-cost carriers and their accounting policies in regard to aircraft

Low-cost carriers describe their business models sufficiently in financial reports, underscoring key characteristics of the adopted model: point-to-point connections, low expenses, and low fares.

EasyJet, according to its financial report, typically operates point-to-point connections with limited or no connectivity to other flights, using primary airports. The company is able to deliver sustainable growth and returns for shareholders by focusing on customer service and capital allocation. A less complicated business model and a cost advantage are also contributing factors (EasyJet plc. Annual report and accounts 2014, Chairman's statement, pp. 8–9).

Ryanair also underscores in its financial report frequent point-to-point service on short-haul routes, but to secondary, regional airports. The other key factors in its business model are low fares that are designed to stimulate demand, especially from price-conscious leisure and business travellers, and operating expenses among the lowest of any European scheduled passenger airline. Ryanair reduces or controls four of the primary costs: aircraft equipment costs thanks to a single aircraft type, personnel costs, customer service costs, and airport access and handling costs (Ryanair. Annual-Report, 2014, Information on the Company, pp. 64–65).

JetBlue's fares are also lower than many competitors due to its cost structure. Its cost advantage is due to the following factors: high aircraft utilization, new and efficient aircraft, relatively low distribution costs, and a productive workforce (JetBlue. Annual Report 2014, p. 09).

AirAsia bases its low-cost model on high usage and short turnaround times, among other factors. Additionally, the airline has been named The World's Best Low-Cost Airline six times in a row (AirAsia. Annual Report, 2014a – Corporate, pp. 143 and 181).

The fleet structures of the four low-cost carriers are presented in Table 2.

Table 1
The carrying value of aircraft to total assets of selected airlines.

Name of airline	easyJet	Ryanair	JetBlue	AirAsia	Turkish Airlines	SAS	Lufthansa	United Continental
Country	United Kingdom	Ireland	United States	Malaysia	Turkey	Sweden	Germany	United States
Carrying value of aircraft ÷ total assets	56.2%	56.8%	64.9%	59.5%	57.2%	25.7%	39.7%	50.2%[a]

[a] Total net value of property and equipment ÷ total assets, since there is no information about the net value of only the flight equipment. The initial value of the flight equipment consists of 84 percent of the initial value of total property and equipment.
Source: Own study.

Table 2
The fleet structures of the four low-cost carriers.

Name of airline	easyJet	Ryanair	JetBlue	AirAsia
Aircraft recognised as assets in the statement of financial position (owned or finance lease)	154 (68%)	246 (83%)	143 (70%)	No data
Aircraft not recognised as assets in the statement of financial position (operating lease)	72 (32%)	51 (17%)	60 (30%)	No data
Total	**226 (100%)**	**297 (100%)**	**203 (100%)**	**172 (100%)**

Source: Own study.

Table 2 shows that the use of operating leases is quite high, particularly compared to the full-service carriers. This is a key observation because aircraft under operating leases are not recognised as assets in the statement of financial position (the balance sheet). The annual reports also provide information about the types of aircraft used by the low-cost airlines. EasyJet's fleet as of September 30, 2014 comprised 226 aircraft: 156-seat Airbus A319s and 180-seat A320s (EasyJet plc. Annual report and accounts 2014, Strategic report, p. 14). As of June 30, 2014 Ryanair had a fleet of 297 Boeing 737–800 aircraft, each having 189 seats (Ryanair. Annual-Report, 2014, Information on the Company, p. 70). As of December 31, 2014, JetBlue operated a fleet consisting of 13 Airbus A321 aircraft, 130 Airbus A320 aircraft and 60 EMBRAER 190 aircraft (JetBlue. Annual Report 2014, p. 18). AirAsia's fleet as of December 31, 2014 consisted of 172 Airbus A320 aircraft, a young fleet with an average age of 3 years (AirAsia. Annual Report, 2014a – Corporate, p. 6). The annual report contains no information about the number of aircraft operated under finance and operating leases.

The aircraft of the low-cost carriers are valued in the statements of financial position at cost less accumulated depreciation and impairment. Table 3 presents the airlines' principal assumptions in regard to aircraft depreciation.

All the low-cost carriers use the straight-line method of depreciation with expected useful lives ranging from 23 to 25 years. EasyJet does not disclose the percentage of residual value of its aircraft, while the residual values of Ryanair and JetBlue are quite high compared to the full-service carriers.

EasyJet additionally states that aircraft held under finance leases are depreciated over the shorter of the lease term or their expected useful lives (EasyJet plc. Annual report and accounts 2014, Notes to the accounts, p. 105). JetBlue aircraft under capital leases are initially recorded at an amount equal to the present value of the future minimum lease payments computed on the basis of an incremental borrowing rate or the interest rate implicit in the lease (when known). They are depreciated over their expected useful lives with the result included in depreciation expense (JetBlue. Annual Report 2014, Notes to consolidated financial Statements, p. 47). AirAsia depreciates aircraft acquired under finance leases over the estimated useful life of the asset. If there is no reasonable certainty that the ownership will be transferred to the company, the asset is depreciated over the shorter of the lease term and its useful life. Payments made under operating leases (net of any incentives received from the lessor) are charged to profit or loss on a straight-line basis over the lease period (AirAsia. Annual Report, 2014b – Financials, Summary of significant accounting policies, p. 36).

4.3. The case of the full-service carriers and their accounting policies in regard to aircraft

Descriptions of the full-service carriers' business models are more varied than those of the low-cost airlines. The key similarity is a long-range flight network using primary airports.

According to its financial report, the mission of Turkish Airlines is to develop its standing as a global airline by expanding the coverage of its long-haul network. Attainment of this vision anticipates, among other factors, sustained growth above the industry average, unit costs equal to the low-cost carriers, and sales expenses below the industry average (Turkish Airlines. Annual Report 2014, Chairman's message, p. 19).

In 2014 SAS intensified its efforts to reduce costs and increase flexibility with the aim of creating an even more efficient production platform. The company also streamlined and renewed its aircraft fleet (SAS. Annual Report with Sustainability Review, pp. 7 and 12). These activities correspond to the hybrid model of a full-service carrier.

The core business segment of the Lufthansa Group is passenger transport. Customers are at the centre of the airline group's market strategy, which is based on high quality, safety, punctuality, reliability, and professional service. By developing its product portfolio further, the group (Lufthansa, together with Germanwings) can offer its customers a global route network (Lufthansa Group. Annual Report 2014, p. 61).

United Continental has the world's most comprehensive global route network, with key air rights in North America, Asia-Pacific, Europe, the Middle East, Africa and Latin America. All of United Continental's domestic hubs are located in large business and population centres, contributing to a large amount of "origin and destination" traffic. The hub and spoke system enables the transport of passengers between a large number of destinations with substantially more frequent service than if each route were served directly (United Continental. Annual report 2014, Strategy, pp. 3–4).

The fleet structures of the four full-service carriers are presented in Table 4.

Table 4 shows that there are very few if any operating leases among the full-service carriers studied. At the end of 2014, the number of aircraft in the Turkish Airlines' fleet was 261: 55 wide-body, 197 narrow-body, and 9 cargo (Turkish Airlines. Annual

Table 3
Principal assumptions in regard to aircraft depreciation at select low-cost carriers.

Name of airline	easyJet	Ryanair	JetBlue	AirAsia
Method of depreciation	Straight-line	Straight-line	Straight-line	Straight-line
Expected useful life	23 years	23 years	25 years	25 years
Residual value	No information	15%	20%	10%

Source: Own study.

Table 4
The fleet structures of the four full-service carriers.

Name of airline	Turkish Airlines	SAS	Lufthansa	United Continental
Aircraft recognised as assets in the statement of financial position (owned or finance lease)	261 (100%)	138 (100%)	598 (97%)	No data
Aircraft not recognised as assets in the statement of financial position (operating lease)	0 (0%)	0 (0%)	17 (3%)	No data
Total	**261 (100%)**	**138 (100%)**	**615 (100%)**	**1257 (100%)**

Source: Own study.

Report 2014, Chairman's message, p. 31). At the end of the 2013/2014 fiscal year, the SAS aircraft fleet totalled 138 aircraft, of which 99 were leased. Only 12 aircraft were used on long-haul flights, 109 aircraft were short or medium-haul jets, and 17 regional jets (SAS. Annual Report with Sustainability Review, Strategy, p. 12). Lufthansa's fleet of 615 aircraft consisted of 20 types of aircraft (Lufthansa Group. Annual Report 2014, Economic report, pp. 56–57). The most varied fleet was operated by United Continental, which had 1257 aircraft of 15 mainline types, and 10 regional types. The annual report presents no information about the number of aircraft operated under finance and operating leases (United Continental. Annual report 2014, Properties, p. 23).

The aircraft of the full-service carriers are valued at cost less accumulated depreciation and impairment, the same as the low-cost carriers. No carrier measures the carrying value of aircraft using fair value, an optional model according to International Accounting Standard 16 "Property, Plant and Equipment" (IAS 16, 2003, § 30–31). Table 5 presents the airlines' principal assumptions in regard to aircraft depreciation.

The four full-service carriers use the same method of depreciation, while three of them use the same expected useful lives. They differ in the estimates of residual value. Turkish Airlines categorized the cost of assets that are acquired directly or through finance leases in the following components: fuselage, overhaul maintenance for the fuselage, engines and overhaul maintenance for engines. Overhaul maintenance for the fuselage and overhaul engine repair parts are depreciated over the shorter of the remaining period until the next maintenance or the remaining period of the aircraft's useful life (Turkish Airlines. Annual Report 2014, Notes to consolidated financial statements, p. 107). SAS also separated the components of aircraft for depreciation purposes, as they had varying useful lives (SAS. Annual Report with Sustainability Review, Notes to the financial reports, p. 35). United Continental expenses the cost of maintenance and repairs and the cost of minor replacements as incurred, except for costs incurred under power-by-the-hour engine maintenance agreements, which transfer certain risk to third party service providers and fix the amount paid per flight hour or per cycle under a predefined maintenance program (United Continental. Annual report 2014, Significant accounting policies, p. 72).

5. The accounting analysis of airlines' key assets

5.1. The risk arising from varied assumptions as to useful lives, residual values, and depreciation methods of aircraft

Accounting standards require the systematic depreciation of the value of aircraft, the principal asset of airlines, because this value decreases over time. The reduction in the carrying value of the assets is recognized as depreciation expense in the statement of profit or loss (the income statement). In order to calculate depreciation expense, managers make assumptions as to the useful lives of tangible assets, their residual values, and depreciation methods. Overly optimistic estimates cause overstatement of non-current assets and earnings. The risk of distortion in these estimates is the most pertinent for airlines because their earnings contain large depreciation components.

As presented in chapter 3, Lufthansa, a full-service carrier, depreciated its aircraft in 2014 on a straight-line basis over 20 years, with an estimated residual value of 5 percent of initial cost. These assumptions imply that Lufthansa's annual depreciation expense was, on average, 4.75 percent [(1–0.05) ÷ 20] of the initial cost of its aircraft. United Continental, which also represents the business model of a full-service carrier, estimated its aircraft depreciation using the straight-line method, but with a useful life of 25–30 years and estimated residual value of 10–11 percent of initial cost. Assuming a useful life of 25 years and an average residual value of 10%, United Continental's annual depreciation expense was, on average, 3.60 percent [(1–0.10) ÷ 25] of the initial cost of its aircraft.

Reasonable explanations should be provided in the airlines' annual reports to justify their respective depreciation policies: for example, the airlines fly different types of routes, have different asset management strategies, operate newer planes to attract more business travellers, or benefit from lower maintenance and/or fuel expenses. In the case of United Continental's report, insufficient explanation is provided as to why the residual value of its fleet is higher than that of Lufthansa's even though United Continental assumed a longer useful life for its aircraft. According to AirSafe.com, the average age of Lufthansa's fleet is 11.4 years, while United Continental's aircraft average 13.6 years. According to Lufthansa's financial report, the average daily flight hour utilization was 9.5 h per day (Lufthansa Group. Annual Report 2014, p. 236), while for United Continental it was 10.43 h (United Continental. Annual report 2014, Selected financial data, p. 29). As there do not appear to be operating differences that explain the differences in the two firms' depreciation rates, it is necessary to adjust the depreciation rate for one or both carriers to ensure that the respective presentations of their performance are comparable.

In the following example Lufthansa's depreciation rate has been lowered to match that of United Continental. The opposite adjustment is not possible as United Continental discloses only accumulated depreciation of total property and equipment, not

Table 5
Principal assumptions in regard to aircraft depreciation at select full-service carriers.

Name of airline	Turkish Airlines	SAS	Lufthansa	United Continental
Method of depreciation	Straight-line	Straight-line	Straight-line	Straight-line
Expected useful life	20 years	20 years	20 years	25–30 years
Residual value	10–30%	10%	5%	10–11%

Source: Own study.

accumulated depreciation of its aircraft. The following adjustments would then be required to Lufthansa's financial statements (Palepu et al., 2010, pp. 149–151):

- Increasing the book value of the fleet at the beginning of the year to adjust for the relatively high depreciation rate that had been used in the past. The required adjustment would equal: the original minus the adjusted depreciation rate × the average asset age × the initial asset cost.
- Calculating the offsetting increase in equity and in the deferred tax liability (for simplicity the issue of deferred tax has been omitted in this article).
- Reducing the depreciation expense (and increasing the book value of the fleet) to reflect the lower depreciation for the current year (as additions and disposals during the year were immaterial, the issue of new aircraft acquired in 2014 has also been omitted in this article for simplicity).

In the notes to its financial statements, Lufthansa reported that its fleet's initial cost was €23.188 billion at the beginning of 2014, and accumulated depreciation was €12.202 billion. This implies that the average age of Lufthansa's fleet was 11.1 years [20 × 12.202 ÷ (23.188 × (1–0.05))]. If Lufthansa had used the same useful life and residual value assumptions as United Continental, the annual depreciation rate would be 3.60 percent implying that, given the average age of its fleet, accumulated depreciation would have been €9.266 billion (11.1 × 0.036 × 23.188) versus the reported €12.202 billion. Then the company's non-current tangible assets would have increased by €2.936 billion (12.202–9.266), and the depreciation expense for 2014 would have been €835 million (0.036 × 23.188) versus €1.101 billion (0.0475 × 23.188).

The purpose of the foregoing adjustments is not to reflect a change in the assumptions for the current and subsequent years, but to show Lufthansa's result as if it had always used the same depreciation assumptions as United Continental.

In summary, if Lufthansa had been using the same depreciation assumptions as United Continental, its financial statements for the last year would have to be modified as presented in Table 6.

5.2. The risk of altering the value of assets through leasing transactions

According to Gavazza (2010), pp. 63–64 and 82–83, aircraft were one of the most important types of leased equipment, representing 11% of the total of new leases in 2004, second only to computer equipment. In 2003 the average maturity of aircraft operating leases decreased to 80 months, while the average maturity of finance leases increased to approximately 225 months, suggesting that operating and finance leases are substantially different contracts. The author found that aircraft, which might seem relatively liquid compared to the market for other, more specialized equipment, were more likely to be leased, particularly through operating leases; had shorter operating leases or longer capital leases; and commanded lower markups on operating lease rates. Empirical results from the study by Oum et al. (2000), pp. 27–28 based on data from 23 major airlines around the world suggested that the optimal mix of leased and owned capacity ranged between 40% and 60% of the total fleet, with a reasonable range of premiums on the operating lease. The demand for leases decreased as the premium increased, which revealed that the flexibility of an operating lease was highly valuable to the airlines.

The statement of financial position (the balance sheet) should reflect a company's true commitments and risks. One of its objectives is to report the assets for which a firm receives rewards and bears risks. These can include assets the firm does not legally own but leases from another party. Leased assets can be reported in two ways, depending on whether or not the lessee has effectively accepted most of the risks of ownership, such as obsolescence and physical deterioration. Under the operating method, the company recognises the lease payment as an expense in the period in which it occurs, keeping the leased asset off its statement of financial position. Under the finance lease, in contrast, the lessee records the asset and lease liability on its statement of financial position and also recognises depreciation and interest expenses.

Assessing whether a lease arrangement should be considered a rental contract (and hence recorded using the operating method) or equivalent to a purchase (and hence shown as a finance lease) is subjective. One company can have a different statement of financial position from another with a similar business model that either uses finance leases or borrows from the bank to actually purchase the equipment, by structuring transactions to avoid showing lease assets and obligations. So there is a risk of altering the value of aircraft assets through leasing transactions. This is an important issue for airlines because they use leasing as a principal source of financing aircraft acquisitions (Palepu et al., 2010, pp. 151–154). As measured by Imhoff et al. (1991), pp. 51 and 61, the average increase in debt to equity ratios amounted to 191 percent for the industries where the average ratio of operating lease cash flows in years 1–5 to total reported assets was relatively high, compared to only 47 percent for the lessees with a low ratio. This implies that constructive capitalization of operating lease commitments enhances the relevance and comparability of firm specific measures of risk and performance.

Ryanair accounts for part of its leased flight equipment using the operating method. These leased resources are therefore excluded from the statement of financial position, making it difficult to

Table 6
The modification of Lufthansa's financial statements in accordance with United Continental's depreciation assumptions.

€ billions	December 31, 2014	December 31, 2013
Assets		
Aircraft and reserve engines before adjustment	10.986	12.089
Adjustment of beginning value as of January 1, 2014 of aircraft and reserve engines	+2.936	+2.936
Adjustment of depreciation expense in 2014	+0.266	
Total adjustment of assets	**+3.202**	**+2.936**
Change in assets	Increase of 29%	Increase of 24%
Equity		
Retained earnings before adjustment	2.511	1.237
Adjustment of beginning value as of January 1, 2014 of aircraft and reserve engines	+2.936	+2.936
Adjustment of depreciation expense in 2014	+0.266	
Total adjustment of equity	**+3.202**	**+2.936**
Change in equity	Increase of 128%	Increase of 237%

Source: Own study.

Table 7
The minimum payments on operating leases and the present value of minimum payments on operating leases on Ryanair's financial statements.

	March 31, 2014		March 31, 2013	
	Minimum payments	Present value of minimum payments	Minimum payments	Present value of minimum payments
	€ billions	€ billions	€ billions	€ billions
Due within one year	118.7	112.7	107.2	98.4
Due between one and five years	292.1	246.5	342.4	258.0
Due after five years	61.9	44.4	94.5	53.3
Total	**472.7**	**403.6**	**544.1**	**409.7**

Source: Ryanair. Annual-Report 2014, Consolidated financial statements, pp. 196–197.

compare Ryanair's financial performance with other airlines that have a different mix of finance and operating leases. To correct for this accounting, information on the present value of minimum lease payments of aircraft is used to estimate the value of the assets and liabilities that are omitted from the statement of financial position. This information is presented in the lease note on page 197 of Ryanair's consolidated financial statements for 2014 (see Table 7).

The method for capitalization of operating leases was described by Palepu et al. (2010), pp. 151–154, Imhoff et al. (1991), p. 60, and Imhoff et al. (1997), p. 18. The impact of capitalizing the present value of the minimum payments on the statement of financial position is presented in Table 8.

In the above example, the net income adjustments might be computed by taking the difference between the changes in assets and liabilities. According to Imhoff et al. (1991), p. 58 and 61, the asset adjustment will be generally between 60 and 80 percent in most cases, and a rule of thumb in estimating the unrecorded assets may be 70 percent. Imhoff et al. (1997), pp. 22–23 also focused on illustrating the impact of constructive capitalization on operating income before interest expense but after taxes, which eliminates the effects of how the firm is financed from both operating income and return on assets. This is an appropriate measure of performance used frequently for managerial compensation purposes and for comparisons across business entities or their various divisions.

The distinction between operating leases and finance leases is often considered as artificial. International Financial Reporting Standard 16 "Leases"(IFRS 16, 2016), which will be effective from 2019, removes the difference between finance and operating leases. According to the new standard, all lease assets (i.e. the right to control the use of an identified asset for a period of time in exchange for consideration) and liabilities will be presented on statements of financial position and depreciation and interest expenses – on statements of profit or loss (the income statement). IFRS 16 is in substantial agreement with the principles set by the Financial Accounting Standard Board on this point.

6. Conclusions

The review of published articles showed that many studies have used financial reports as one of the primary sources of information about airline business models. On the other hand, it was stated that the setters of accounting standards have refused to introduce the concept of the business model in financial reporting.

This paper presents the risk of using accounting data to analyse the performance of carriers' business models. It is based on owned and leased aircraft, which are critical to the industry as they constitute more than half of airlines' total assets. The information researched in the paper was derived from the financial reports of selected carriers.

The reported value of aircraft depends on management's assumptions as to asset lives, residual values, and depreciation methods. Due to the subjective nature of these assumptions and the significant proportion that aircraft represent of airlines' total assets, there is risk in the use of financial reports in the study of airline business models.

To identify this risk, it is important to study the carriers' accounting policies. In the case of airlines, accounting analysis can show material differences in accounting policies concerning their key assets and liabilities. These differences may significantly impact profitability.

The results of the study of the financial reports of selected

Table 8
The impact of capitalizing the present value of the minimum payments on Ryanair's statement of financial position.

€ billions	March 31, 2014
Assets	
Property, plant and equipment before adjustment	**5.060**
The impact of unrecorded lease assets (increase of liability × 0.7)	+282
Change in property, plant and equipment	+6%
Net effect on assets	**+282**
Change in assets	+3%
Liabilities and equity	
Retained earnings before adjustment	**2.465**
The cumulative effect on retained earnings	−122
Change in retained earnings	−5%
Non-current liabilities before adjustment	**3.252**
The impact of capitalizing the present value of the minimum payments – due after one year	+291
Change in non-current liabilities	+9%
Current liabilities before adjustment	**2.275**
The impact of capitalizing the present value of the minimum payments – due within one year	+113
Change in current liabilities	+5%
Net effect on liabilities and equity	**+282**
Change in liabilities and equity	+3%

Source: Own study.

airlines highlight the differences in assumptions as to useful lives and residual values. The airlines used different useful lives, depending on the kind of business model (from 20 to 30 years) and residual values (from 5% to 30%). Only the basis of measurement and the method of depreciation were the same. It was interesting to note that one airline representing the full-service business model assumed a smaller residual value after a shorter expected useful life than other full-service airlines, an issue not adequately explained in its financial report. Such lack of explanation suggests risk in relying on this data. It was also shown that even a small difference in the calculation of depreciation can change earnings considerably.

The issue of distinctions between finance and operating leases is also important. The lease agreement can be structured in order to meet specific criteria for reporting leases, potentially leading to a desired effect for a company, for instance the understatement of assets because aircraft under operating leases are not recognized as assets in the statements of financial position, in contrast to finance leases.

Based on the foregoing studies, it is important to recognise the risk in using financial reports to study airline business models, because financial reports do not sufficiently reflect the business models of airlines.

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