OPTIMAL FINANCIAL KEY PERFORMANCE INDICATORS: EVIDENCE FROM THE AIRLINE INDUSTRY

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ABSTRACT

Selecting relevant Key Performance Indicators involves an assessment of both cost- and revenue-driven measures. Cost driven allocation usually predominates, due primarily to a traditional accounting mindset coupled with the need for cost savings in the current economic environment. Using data from the airline industry in all of the major markets in the world, this paper demonstrates that revenue- or profit-driven KPIs, consistently applied, will more likely lead to better financial performance than 'flying' the business based on cost-driven metrics or those representing a mixture of revenue target and cost-driven metrics. Specifically it examines the effectiveness of models that characterize performance based on two performance indicators, in particular – seats and passenger-kilometers. We document strong evidence indicating that Operating Profit per Passenger or per Passenger-Kilometer is the most significant variable when it comes to explaining the variation in airline profitability. Our conclusion is that despite the traditional belief that measuring performance per seat is only appropriate for point-to-point destination services, typically provided by Low Cost Carriers, the same model also fits Full Service Network Carriers and thus, can be used by them as a meaningful tool for financial targeting and strategic decision-making.

JEL: M40; M41; M21

KEYWORDS: Financial KPI's, airline financial performance, airline financial KPI's, profit driving indicators, revenue drivers, profit drivers, key performance drivers, key profit drivers

INTRODUCTION

Despite airline industry growth over recent decades, the majority of airline businesses remain consistently unprofitable over entire business cycles. This paper is an empirical study that attempts to distinguish between cost driven and revenue driving financial performance indicators that may better help us predicate an airline's financial performance. Our main assumption underlines the impact of using two different Key Performance Indicators (KPIs) models. We examine the effectiveness of models characterizing performance based on two activity drivers – seats or passengers (revenue driving) and passenger-kilometers (cost driven). It has been traditionally considered that measuring performance by seats is only appropriate for point-to-point destination services, typically provided by Low Cost Carriers and not relevant for Full Service Carriers.

Our key findings indicate that a performance model based on kilometers fits the industry slightly better than the one based on passengers (seats). Furthermore, we find strong evidence indicating that Operating Profit per Passenger or per Passenger-Kilometer is the most significant variable explaining airline profitability. In spite of classical beliefs, we found it is more meaningful than revenue, cost and load factor traditionally used by the industry. We also found the relationship between profit margin and seats-based model is strong enough for both classes – LCCs and Full Service network carriers. Therefore, we arrive at the conclusion that Operating Profit per Seat can be successfully used for targeting the financial performance of Full Service Network Carriers. The remainder of the paper is organized as follows. Section 2 provides a summary of the relevant literature. Section 3 is a description of data and methodology presented. Section 4 discusses the results of the analysis while Section 5 contains concluding comments.

LITERATURE REVIEW

According to Doganis (1985), the profitability of an airline depends on the interplay of three variables, *unit costs, unit revenues or yields and load factors achieved.* Airline managers must adjust costs, fares and load factors to produce profitable combinations. He characterizes the industry by short-run marginal costs, which are close to zero. Marginal cost of carrying an extra passenger on a flight, which is due to leave with empty seats, is no more than a cost of additional meal, an airport passenger charge, the cost of ground handling and a few pounds of fuel burnt as a result of extra weight. The run of these costs is short, because if the seats remain unsold, these seats flown or seat-kilometers produced will be lost forever. Therefore, he suggests maximizing revenues and load factors.

For passenger airlines, the average revenue per output sold is called Yield and measures average revenue per passenger, per passenger kilometer, per passenger ton kilometer performed. Thus, he reasons the existence of low cost carriers, stating that by combining passenger yields with low cost and relatively high load factors one can achieve profitability. He also demonstrates that low cost itself does not provide big margins interacting with low revenues, nor does high cost necessarily mean low profits if the revenues are high enough. Doganis concludes that airlines deciding on their pricing strategy, and working out various tariffs, must balance and assess all these factors, which transform the various fares into average yield. He states that it is the yield in conjunction with the achieved load factor and the unit costs, which will determine whether an airline's revenue and financial targets can be met. To assure such process airlines apply revenue management process, underlying revenue management systems.

The objective in revenue management is to maximize profits; however, in most situations, it is considered sufficient to seek booking policies that maximize revenues. (McGill and Van Ryzin, 1999). In their 'Revenue Management: Research Overview and Prospects' they reviewed forty-year history of research on transportation revenue management. They define Revenue management as practice of controlling the availability and/or pricing of travel seats in different booking classes with the goal of maximizing expected revenues or profits called. According to McGill and Van Ryzin, before 1972, almost all quantitative research in reservations control focused on controlled overbooking. When in the early 1970s, some airlines began offering restricted discount fare products that mixed discount and higher fare passengers in the same aircraft compartments, it became evident that effective control of discount seats would require detailed tracking of booking histories, expansion of information system capabilities, and careful research and development of seat inventory control rules.

Thus, revenue management focuses on revenue achievement without a direct link between profit and revenue in a single system. Traditionally, planned or targeted revenue is calculated to cover costs and achieve profit, applied as a further layer of percentage. Calculation of projected revenue usually involves traditional accounting concepts, which focus mainly on cost allocation and therefore based on cost driving metrics (in our case kilometers – more kilometers flown generate greater costs).

During the last 20 years, several profit- (or value-) driver models have been developed (Porter, 1985; Koller, 1994; Foster, Gupta, & Sjoblom, 1996; Kaplan & Norton, 1996, 2001; Epstein, Kumar, & Westbrook, 2000; Ittner & Larcker, 2001). While these models are intended to focus on profit, most models emphasize cost over revenue: explaining and predicting costs, they provide an incomplete understanding of profit drivers, including revenue drivers. (Shields, 2005) For example, 'Activity Based Costing' or ABC (Kaplan and Bruns, 1987), in which costs are allocated according to various activities considered to be *cost 'drivers'*. In practice this approach has found to be time consuming and expensive to implement. Kaplan acknowledged the shortcomings of his approach, suggesting it to be replaced with Time Based ABC (2003), in a belated recognition that costs had been allocated to activities regardless of the time taken by the activity. Even though it was criticized as time-consuming expensive complex by users and accepted as such by Kaplan, ABC remains a widely spread concept.

A *revenue driver* is defined as a variable that influences revenue (Horngren, Datar, & Foster, 2006). In various studies, dedicated to such influence, multiple soft factors such as customer education/wealth or quality of goods/services reviewed in connection with their affect to revenue. In this research, we, however, looking for metrics of financial and operational origin, that interplay would lead to increased revenue/profit. Cleland (1997) suggested an approach to management decision-making for improved bottom-line performance 'Contribution Based Activity' or CBA. The CBA approach suggests a *performance management system* (including pricing and productivity), not denying cost or revenue management, but complementing them. We reviewed this approach, because it links financials (profit = revenue - costs) and operational metrics (units of output) and simplifies the process of comparing planned with actual gross profit per unit. As this method involves revenue, costs and activity, it allows management to overview the whole picture in a timely and relevant manner. CBA method critically demands proper definition of output in terms of the activity considered fundamental to all other activities, in other words it suggests working with a *key profit-driving indicator.*

In looking for appropriate components that drive future financial success, Walsh (1996) differentiated between the key performance drivers (KPDs) that drive financial performance and key performance outcomes (KPOs). KPDs are lead indicators that focus on key business processes and direct employees' actions. In contrast, a KPO is a lag indicator that focuses on what was achieved from the business processes and provides information to management that is useful in planning and control. According to Walsh, management's attention needs to shift to the key performance drivers instead of relying on financial measures that focus on past outcomes. KPDs should provide key information leading to revenue and in turn profit increase and must be easy to understand and measure often. (Gjerde & Hughes, 2009)This is very consonant to CBA and its activity drivers; the difference is however, that Walsh's KPDs are nonfinancial measures, such as customer retention/satisfaction, wait time for check-out/phone-answering, market share, etc.

Summarizing the above, we arrive with two potential models of performance measurement. The one consists of commonly used metrics described by Doganis, focuses on revenue achievement and bases on cost driven measures such as kilometers. Another model consists of revenue driving indicators such as seats (more seats filled with passengers increase revenue). In line with Cleland's approach, we unite seats with focus on Profit instead of Revenue in order to incorporate costs in the suggested model.

DATA AND METHODOLOGY

We were able to collect operational statistics (number of passengers, number of kilometers offered/flown, employees, aircrafts, etc.) from open sources, as for each specific company so for the industry. The classification of airlines in this paper will follow a model used by the Research Unit of German Aerospace Institute (DLR), thus, we distinguished airline companies by those of (abbreviation in brackets): Full Service Network Carriers ("FSNCs"), Low Cost Carriers ("LCCs"), and Regional Carriers ("Regionals") Holiday / Charter Carriers ("Charters").

Full Service Network Carriers are scheduled airlines with a business model that focuses on providing a diverse and extensive service. These are typically international operating companies with a network-oriented system (normally with one or more hubs), covering a wide geographical area and providing transportation in several different classes. Low Cost Carriers category comprises those airlines that offer low prices for the majority of flights and which mainly operate on short and medium-distance routes with low overheads and a relatively high load factor; these airlines use a no-frills business model. We will not work with Regionals or Charters, because their market influence is insufficient. For example in the year 2008, FSNCs supplied 58% of weekly seats available at European airports, followed by LCCs offering 34.1% of total capacity. Charter carriers and Regionals had respective shares of only 4.7% and 3.2%. On average, the top 40 airlines cover almost the whole market: in 2008 - 40 top FSNCs – 91.1% and 40 top LCCs - 99.8% respectively. (DLR, Annual Report 2007, 2008).

The data used for the analysis has been taken from published annual reports of commercial airlines, also containing the main financial statements. Table 1 presents commonly used operational measurements in airline industry, further our approach in selecting the best combinations of them follows.

Table 1: Main Operational Measures Used by Airline Industry

ASK, available seat kilometers	*obtained by multiplying the number of seats available for sale on each flight by the stage distance flown (sometimes miles, then referred as ASM)*
RPK, revenue passenger kilometers or passenger kilometers	*obtained by multiplying the number of fare-paying passengers on each flight stage by flight stage distance. They are measures of airline passenger traffic*
Load factor (percent), or Passenger load factor	*is passenger kilometers RPK expressed as a percentage of available seat kilometers ASK. Load factor considered being one of the most important indicators of airline operations and for certain airlines; it remains the main management focus.*
Number of Passengers, or Passengers carried (**PAX**)	*equals the number of passengers, which boarded each aircraft and summed over a certain period*
Yield	*is the average revenue collected per passenger kilometer or RPK. Passenger Yield is calculated by dividing the total passenger revenue on a flight by the* ***passenger kilometers*** *generated by that flight. It is a measure of the weighted average fare paid. It is considered that airlines should focus on Yield increase*
Cost per ASK	*a measure obtained by dividing total operating costs by total ASKs. Operating costs exclude interest payments, taxes and extraordinary items. Costs could also be measured by RPK, but measuring costs by ASK is more relevant and therefore very common*

This table summarizes main operational measurements taken from airlines annual reports and literature on airline economics (definitions according to R. Doganis "Economics of international airlines").

While FSNCs rely traditionally on cost driven metrics, calculating everything per kilometer, LCCs often use revenue or profit driving indicators such as per seat or per passenger metrics. The following 'per seat measures' were used for reporting by European LCC easyJet (easyJet full year results 2009):

Profit before tax per seat (£), Revenue per seat (£), Cost per seat (£), Cost per seat excluding fuel (£)

This is more typical for LCCs as they mostly sell one-way single restricted fares. FSNCs in contrast sell far more complex product, and therefore consider the kilometer version as more appropriate. For our analysis we focused on 20 top airlines in each class (FSNC and LCC), accessing financial data for 5 years (2004-2008). Our sample includes 15 top FSNCs and 12 LCCs, reflecting worldwide geography. We did not manage to get data for all 40 companies because some of them are not publically traded and do not publish reports while others are unavailable because of recent mergers and organizational changes. The data in the form of annual financial statements, annual filings and business reports were transferred into US dollars and processed into a consistent basis, and was clustered by three criteria: (a) Business model (FSNC or LCC), (b) Region of origin and operations (Europe, Americas, Asia-Pacific and Middle East) and (c) Financial performance (High or Low).

Due to a slight inconsistency in data regarding the load factor, reported by airlines, we calculated load factor ourselves to assure this ratio is consistent. It is not clear from the reports whether they use passenger load factor or seat load factor, which counts not only fare-paying passengers, but can also include crew travelling to the point of their future destination. Profit normally considers costs. In order to involve both participants in the profit process – *revenue and costs* – we suggest planning and targeting *profit* instead of revenue and costs, combined with planned load factor. Should we apply CBA approach and use the Gross Profit (sales minus cost of materials), GP would tend to Revenue, as direct material costs here are only marginal. Therefore in this *case Operating Profit* is the most informative and consistent variable to express financial contribution produced by the key activity. We distinguish Operating Profit from Net Profit because the latter already contains extraordinary items, government grants, write offs and the like.

Nevertheless, net profit is still an important indicator and it is incorporated in the ratio Return on Assets ROA percentage. Key metrics mainly represent ratios, which consist of numerator and denominator. Numerator indicates a targeted value and Denominator indicates a measure, in this case a measure of output. Instead of revenue, we suggest expressing targets as financial contribution per unit of output, such as seats sold or revenue passenger kilometers:

Target: Operating Profit per output rather than Revenue per output

We are now in a position to distinguish between cost and revenue driving metrics and compare the effectiveness of two existing models to airline performance measurement per seat and per passenger kilometer. For the purpose of this research, we identify seats sold with passengers carried, primarily because any existing difference between the two is insignificant and in any case, it is not possible to access the data from most company reports. Therefore, we used the number of passengers carried in both – data collection and empirical testing. Thus, the second suggestion relates to output:

Output: Target per Passenger carried rather than Target per RPK

Both these suggestions specifically result in the following ratios, which are used in the empirical testing:

Operating Profit per passenger carried, Revenue per passenger carried, Operating cost per passenger carried (Operating costs, excluding interest expenses, taxes, extraordinary items and other non-operating expenses)

Further, we develop models involving above ratios, including traditional KPI's as well. The goal of this analysis is to establish whether there is a measurable significance in profitable performance between focusing on Operating Profit per passenger or per RPK (passenger-kilometer) instead of Revenue. This suggested model is compared with traditional models, consisting of revenue, load factor and RPKs.

RESULTS

This section describes results of analysis and empirical testing. The sample includes 5 years data for 27 companies, i.e. 135 cuts on an annual basis. The analysis overlooks all variables and ratios used in both Kilometers and Passenger modes and includes Minimum, Maximum, Mean, Standard Deviation, Skewness and Kurtosis. We ran the correlation analysis for both models and three data clusters (Region, Model, Performance). Analysis of separate clusters uncovered interesting facts about the airline business in different classes and continents, relevant to cost-driven and revenue driving metrics. For the empirical testing of two KPIs models, we applied regression analysis.

Region of Origin and Operations (Asia & Pacific and Rest of the World, Europe, Americas)

Despite the similarity in Operating margin percentage for Asia and Europe (6.9% and 6.1%), Asia demonstrates the greatest Operating profit per passenger absolute, probably because of longer overall average length of passenger haul and lack of competition, attributable to this region. Through the lenses of profit drivers, it means that carrying fewer passengers requires higher profit per passenger in order to cover costs and earn profit. Asian companies achieve the highest margins and the lowest by American, Europe is in between. Similar passenger revenues of $179.5 in Europe and $172.9 in Americas have a noticeable difference in Operating profit per passenger ($7.7 and $(-0.2) respectively) with an average Operating margin of 6% and 2%. The bulk of our sample belongs to American companies (in most part big FSNCs and unprofitable), which means the American national carriers dominate the sample.

In Europe, there is a negative correlation between Load Factor and Revenue per Seat with the coefficient -0.411. In addition, there is a negative correlation of -0.390 between Number of Passengers carried and Operating Profit per seat. Unlike Asia and America, in Europe, Revenue and Profit drop while the Load Factor and Number of Passengers increase. This speaks for the competitiveness of the European Market and represents a well-functioning market, when passengers pay enough to cover costs and earn profit that permits lower prices in order to handle competition. Such a trend is not the case for Asia and America.

Business Model (FSNC versus LCC)

The results of this analysis confront common opinion that LCCs fly with very cheap fares and high loads, so they have a significant advantage when compared with FSNCs, operating with high costs and less flexibility. There is no big difference in average load factors, nor in mean values or in the extremes. With a nearly identical mean of 77.3% for FSNCs and 77.9% for LCCs, the minimal value of 64.9% for FSNCs, even higher than 61.6%, belonged to LCCs; however, with the maximal load factor of 85.6% LCCs overcame FSNC's 82.7%. In spite of the range in passenger revenues ($308.4 versus $105.3), which we rather predicted, operating profit per passenger – the value we are focusing on – is nearly identical and differs by only 9% (FSNCs $8.5, LCCs $7.7).

For FSNCs there is a strong negative correlation between the number of passengers carried and Operating Profit per passenger as well as Operating Margin (Correlation coefficients -0.481 and -0.452 accordingly). In contrast, for LCCs correlations between the number of passengers and Operating profit per passenger as well as Operating profit percentage are insufficient, in other words for LCCs poor or high financial performance doesn't depend on company's scope of operations. This anomaly about profit decrease with increase of the number of passengers can be explained that US companies dominate FSNCs sample, moreover, negative correlation between Load Factor and Operating Profit percentage (-0.259) is given for American companies only. In other words, in spite of high loads up to 85%, American companies did not manage to achieve operating profitability (decrease costs or increase revenues) unlike their Asian and European colleagues. Taking a closer look at operating profit per passenger in America, we can see the mean -$0.2 compares adversely with $7.7 in Europe and $8.1 industry average.

Table 2 compares data of two specific European airlines, different in scope and business model, but similar in their targets. This comparison demonstrates how we can define the key driving activity and drill into the heart of the business, deriving KPI's which pinpoint and focus on the business goal achievement. If we liken the airline business to a machine driven by passengers, we find the operating profit from one turn of a small machine equals the operating profit from one turn of a big machine. Traditionally, airlines consider that the machine is driven by kilometers, although some tend to view the machine as driven by passengers. We believe this difference is an important aspect of success applicable to business in general.

We found Load Factor an important variable for LCCs profitability, measured by Operating margin and, ROA. In contrast, there is no strong correlation of Load factor to profit for FSNC's. However, Revenue per seat is important for FSNC's profitability, but not that important for LCCs to achieve their financial targets. In other words, Low Cost carriers can afford decreasing prices for competition purposes. We can say that LCCs with their thin margins and focus on earnings per passenger must watch their Load Factors, attracting more customers for the same number of flights. In other words, in order to sustain profit they must manage the key activity, and attract a sufficient number of passengers. *Number of passengers* is a key leverage for *LCCs* in conjunction with operating profit per passenger.

FSNCs in turn appear have greater stability in number of passengers, and any efforts to increase their number or Load factor will not pay back if the revenue per passenger results in an inadequate operating profit. If every passenger brings a negative profit (because of insufficient revenue), multiplied by tens of millions of passengers their business results in financial disaster.

Table 2: Comparison of Key Financial Data for Two European Air Carriers, Ryanair and Lufthansa

	Ryanair	Lufthansa*
Region of operations	Europe	Europe
Business model	LCC	FSNC
Passenger Revenue, m. EUR	2,714	18,393
Total Costs, m. EUR	2,177	17,671
Operating Profit, m. EUR	537	261
Passengers Carried, m. EUR	50.931	70.543
Number of passenger aircrafts	163	494
Average revenue per passenger	EUR 53.3	EUR 260.7
Average passenger fare	EUR 43.7	EUR 238.9
Operating Profit / passenger	**EUR 10.6**	**EUR 10.2**

*This table contains selected key data for two very different airline companies, which in terms of profitability are very successful and are the 1st and 2nd large European carriers in their segments. The first part of this table highlights the difference in scope of these two businesses. However, when it comes to operating profit per passenger, the figures are surprisingly equal. *Lufthansa Group, passenger segment*

We can reasonably conclude that for *FSNCs,* the key leverage is *Revenue per passenger or Operating profit per passenger* in conjunction with passenger numbers. Increase in revenues does not necessary mean an increase in airfares. Many LCCs fly based on airfare with zero or negative profits and yet earn from ancillaries. Thus, every extra dollar in revenue multiplies profit by millions of passengers. This dollar in turn consists of multiple ancillaries (car rentals, hotel booking, in flight sales, etc.) and company staff is motivated for such increase accordingly. On the other hand, flying with such thin margins is dangerous – should the numbers of passengers drop, profit or loss will be leveraged accordingly. Nevertheless, American FSNCs recently picked up some ideas from their LCCs competitors such as implementing ticketing and check-in luggage fees, which helps them raise extra billions in revenue. Indeed, carrying most of the passengers worldwide, even 1 dollar in revenue per passenger multiplies by the greatest leverage.

Financial Performance (High Performers versus Low Performers)

We sorted the data according to Operational margin percentage. At the mean value of 0.045 or 4.5% we separated the data under +0.045 and over +0.045. The result was 67 low performing annual cuts and 68 high performing annual cuts. Interesting to note the difference in mean Operating margin percentage and operating profit per passenger from -1.7% to 10.8% and $-4.3 to +$20.4, while revenue per passenger fluctuated only within $206.2 and $230. Moreover, the smallest passenger revenue of $42.8 belonged to high performers, when at the same time, lowest average revenue for low performers achieved $63.9. Yields did not differ dramatically, but the highest Yield still found among Low performers; likewise with load factors, averaging between 76.6% and 78.5%. The, highest load factor of 85.6% was found among the low performers. Operating costs per passenger for low performers were even $0.5 lower than for high performers i.e. $210.8 and $211.3 respectively.

The financial statements of all 27 companies demonstrated a rather stable relationship between Profit and KPI's. While the majority of companies achieved consistent gradual increase in Yields, RPKs and Load Factors, only few improved profitability. Most of high performing companies demonstrated consistency in focusing on profit according to interplay of Operating profit per Passenger and Number of passengers. In other words, by increasing its Total Operating Profit, a company can increase Operating profit per Passenger or Number of Passengers (Flights) or increase both.

The Irish discounter, Ryanair, demonstrated its dedication to aggressive growth (Number of passengers increases about 20% annually) and strong focus on Operating Profit per Passenger (~ 11 US dollars). Its competitor FSNC British Airways in contrast, slightly decreased number of passengers, probably optimizing the routes, but focused on increase and maximization of Operating profit per passenger. Thus, BA recently offered regular service between London and New York with business class seats exclusively.

Finally, another British LCC easyJet demonstrated slight but stable increase in both – Operating Profit (~ 2.8 dollars) and Number of Passengers (~ 15% per annum). In contrast, there was no single airline out of the poor performing ones, which could display such consistency per passenger performance over 5 years. However, highest Yields and Load Factors were attributable to Low performing airlines. In addition, it was a consistent increase or stability over 5 years for these metrics, unlike per passenger ones.
On the other hand, some companies, improving Total Operating Profit, tried to increase Operating profit per Passenger or Number of Passengers (Flights) or increase both (Table 3). Such consistent patterns were attributable only to High Performers and none of the poor performers demonstrated this in financial statements.

Table 3: Financial KPIs for Selected High Performing Airlines

	Variable	2004	2005	2006	2007	2008
British Airways	**Operating profit per passenger**	**15,12**	**21,40**	**18,20**	**26,39**	**-6,64**
	Passengers, thousands	35 717	32 432	33 068	33 161	33 117
	YIELD, cents €	7,2	7,5	7,5	7,7	7,9
easyJet	**Operating profit per passenger**	**2,07**	**2,24**	**3,27**	**4,26**	**2,08**
	Passengers, thousands	24 351	29 562	32 969	37 216	43 700
	YIELD, cents €	5,1	4,9	5,1	4,9	5,0
Ryanair	**Operating profit per passenger**	**11,94**	**10,79**	**11,10**	**10,55**	**2,46**
	Passengers, thousands	27 594	34 769	42 509	50 931	58 566
	YIELD, cents €	5,6	5,2	5,2	4,9	4,7

This Table demonstrates on selected examples how high performing companies demonstrated interplay of Operating profit per Passenger and Number of passengers, independently from Yield trends.

Moreover, companies with above-mentioned regularity had better share price performance than even profitable airlines without such regularity. Finally, Beta negatively correlated with size (RPK) of FSNCs and indicated higher risk for bigger companies. For LCCs, however, lower costs and higher profits decrease the risk expressed in Beta. Out of the above summary, we can accept that Operating Profit per unit of output is a stronger Performance indicator than Revenue per unit of output. The suggested denominator (Passengers) is equally good as passenger-kilometers and can be used independently of an airline's business model. Focus on number of Passengers and Target per passenger helped successful airlines to improve operating profitability and create company value.

According to traditional KPI's model, Low Performers appear to have out-performed High Performers, whereas in reality, they underperformed financially. In contrast, according to the passenger model, High performers, supported by higher operation margins, did better than Low performers.

Out of 40 top global carriers reviewed, the financial performance of 27 companies did not directly correlate with its business model applied, or on the region of operation, nor on their size. They flew with average load factor about 77.6%, charging on average $218 and earning in average $8 per passenger. Traditional business drivers, such as Yield, Load factor, Air fare and costs did not appear to drive successful financial performance.

Modeling KPI'S Using Regression Analysis

For the regression analysis, we propose the existence of two KPIs models. The first model traditionally focuses on revenue increase (Yield) per item of cost-driver (kilometer) to achieve financial targets. In this model, management focuses on revenue and load factor increase as well as on costs reduction. We will refer to it as well as the "*Kilometers model"*. The second model focuses on operational profit achievement, which is expressed as a multiple of number of passengers carried and operating profit per passenger. In this case, Operating Profit already incorporates Revenue and Cost, while Number of Passengers carried derives from the relation between number of available seats and Load Factor. This model we name the *"Passenger model*". In both models, β-coefficients shown that either "Operating profit per passenger" or "Operating profit per RPK" is found to be the best predictor of firm performance. In other words, Operating Profit per Output would appear to represent a powerful driver for predicting success. According to data clustering, there are 12 models for each performance measure. We checked all the participating variables for multicolinearity and excluded variables strongly correlating with the dependent variable. The dependent variables were the performance measures such as Operating margin percentage and Return on Assets (ROA) percentage. The purpose of the analysis was to answer the question "Is *measuring Operating Profit per Passenger* is a better model than *measuring Yield (Revenue per RPK) or Operating Profit per RPKs* for predicting airline profitability?". To identify the predictors of ROA and Operating margin the following regression equations were estimated:

$$\text{Operating margin} = \text{Constant} + \beta_1(\text{Variable 1}) + \beta_2(\text{Variable 2}) + \beta_3(\text{Variable 3}) \quad (1)$$
$$\text{ROA} = \text{Constant} + \beta_1(\text{Variable 1}) + \beta_2(\text{Variable 2}) + \beta_3(\text{Variable 3}) \quad (2)$$

Out of 24 models, we selected those, with the highest R squared and summarized in Table 4 (ROA) and Table 5 (Operating Profit), including the list of variables for each model. Judging by the higher R-squared, in comparison with ROA, the Operating Margin model was found to be a better model explaining variation in the performance of airlines. The analysis reveals that *Operating Profit per output sold* (RPK or Passenger) is the dominant variable in explaining firm performance. However, in the cases of ROA models, we can see more clearly the potential impact of size as reflected by the "Number of Passengers" variable. In the ROA models, number of passengers and Yield appear as important variables. In most cases, the number of passengers variable has a negative relation to performance, suggesting that smaller airlines are more likely to be profitable than larger airlines, suggesting it could be easier to stay focused in a small company rather than in a large one. The biggest carriers originate from America and they are mostly unprofitable, while several times smaller carriers from other regions are more successful.

The regression analysis shows that the Kilometers model involving *Operating profit per RPK and number of RPK* fits the industry better than the Passenger model involving Operating Profit per passenger. This conclusion is based on regression coefficients in both – Operating Margin and ROA models. Tables do not contain data on the Passenger model for the Full sample, because key coefficients were insufficient for comparison with other models. One of possible explanations why RPK might predict firm's performance better is that unlike number of passengers, RPK not only incorporates load factor, but also contains such important numbers as average haul length, aircrafts number/size, and thus, characterize the industry better. Another explanation is still there – American companies are the biggest, FSNCs Low Performers, and they dominate the sample. This can be validated if see the better fit of Kilometers model for Low Performers and FSNCs as well.

Comparison of high versus low performing carriers for both dependent variables, more adequately explains the performance of low performing airlines than the high performing ones. For both models, we observe a much lower R-squared for the high performing airlines than the regressions with low performing ones. A possible explanation for this result might be that the large, traditional and likely unprofitable airlines use traditional financial performance metrics focusing on Yield, Kilometers and Load Factor to guide them. Again, large and unprofitable airlines originate mainly from America and the successful European carriers (both FSNC and LCC) are of smaller size. In our sample, most large, traditional airlines appeared to be low performers and therefore traditional airlines performance model appears to explain their behavior better than the relatively fewer high performers, which probably are more creative and expand the traditional airline performance model with more relevant and timely KPIs.

Table 4: Model Summary and Coefficients. Dependent Variable ROA %

Model			Standardized Coefficients **Beta**	**T**	**Adjusted R Square**
Passenger model, Total sample		(Constant)		-2.645**	.539
	Variable 1	Operating profit per passenger	.618***	8.567***	
	Variable 2	Operating Cost/Revenue per passenger	.182**	2.520**	
Kilometers model, Total sample		(Constant)		-2.123*	.560
	Variable 1	RPK million	.062	1.013	
	Variable 2	Operating Profit per RPK	.771***	12.687***	
Passenger Model High Performers		(Constant)		5.262***	.238
	Variable 1	Number of passengers	-.293**	-2.632**	
	Variable 2	Operating profit per passenger	.341***	3.059***	
Kilometers Model High Performers		(Constant)		-3.415***	.247
	Variable 1	Rev. ASK/cost ASK	.508***	4.793***	
Passenger Model Low Performers		(Constant)		-3.009**	.471
	Variable 1	Number of passengers	.158*	1.740*	
	Variable 2	Operating profit per passenger	.708***	7.792***	
Kilometers Model Low Performers		(Constant)		-3.286**	.495
	Variable 1	RPK million	.177**	1.961**	
	Variable 2	Operating Profit per RPK	.738***	8.171***	
Passenger Model FSNC		(Constant)		-2.516**	.703
	Variable 1	Operating profit per passenger	.841***	13.268***	
Kilometers Model FSNC		(Constant)		-1.317	.710
	Variable 1	Operating Profit per RPK	.845***	13.508***	
Passenger Model LCC		(Constant)		2.943**	.415
	Variable 1	Revenue per seat sold	-.393***	-3.758***	
	Variable 2	Operating profit per passenger	.665***	6.356***	
Kilometers Model LCC		(Constant)		2.610**	.482
	Variable 1	YIELD, cents €	-.360***	-3.344***	
	Variable 2	Operating Profit per RPK	.811***	7.527***	
Passengers model Europe		(Constant)		-2.528**	.348
	Variable 1	Number of passengers	.133	.917	
	Variable 2	Operating profit per passenger	.399**	2.691**	
	Variable 3	Operating Cost/Revenue per passenger	.381**	2.655**	
Kilometers model Europe		(Constant)		-.736	.451
	Variable 1	Operating Profit per RPK	.711**	5.447***	
	Variable 2	YIELD, cents €	.093	.712	

*This table summarizes regression coefficients for models, with the highest R squared out of 24 models. Judging by the higher R-squared and in comparison with ROA the Operating Margin model found to be a better model explaining variation in the performance of airlines Significance levels indicated as * 10% (0.1), **5% (0.05), 1% (0.01) and ***0.1% (0.001)*

The Operating Margins models appeared better able to describe performance of full service carriers than of low cost carriers (compare the R-squared of 0.918 and 0.858 with 0.783 and 0.729). A closer look at Operating Profit table shows that the Kilometers model better fits the FSNC sample while the Passenger model better explains performance of LCCs, which was rather expected. According to theorists, 'per passenger' models attributable for single leg 'Origin-Destination' routes, is normally the case for LCCs and not the case for FSNCs. However, Operating profit per Passenger and Operating profit per RPK got the same Beta of 0.958 and different but high enough *t* (18,438 and 28,726 accordingly). In other words, the Kilometers model with Operating Profit per RPK better fits FSNCs, whereas *Passenger model with Operating profit per Passenger fits both airlines classes* – LCCs as well as FSNC. Judging from the Adjusted R Square, the passenger model fits FSNCs sample (0.858) even better that it does LCCs (0.729), despite the traditional view that the passenger model can be used only by LCCs.

Table 5: Model Summary and Coefficients. Dependent Variable Operating Margin %

Model			Standardized Coefficients **Beta**	**T**	**Adjusted R Square**
Kilometers Model		(Constant)		3.468***	.833
TOTAL sample	Variable 1	RPK million	-.087***	-2.329***	
	Variable 2	Operating Profit per RPK	.881***	23.498***	
Kilometers Model		(Constant)		3.022***	.884
Europe	Variable 1	YIELD. cents €	-.243***	-4.055***	
	Variable 2	Operating Profit per RPK	.858***	14.323***	
Passenger Model		(Constant)		-.822	.821
Low Performers	Variable 1	Number of passengers	-.122*	-2.223**	
	Variable 2	Revenue per seat sold	.138**	2.508**	
	Variable 3	Operating profit per passenger	.902***	16.890***	
Kilometers Model		(Constant)		-.435	.880
Low Performers	Variable 1	Operating Profit per RPK	.939***	22.001***	
Passenger model		(Constant)		2.300*	.858
FSNC	Variable 1	Number of passengers	-.093*	-1.630*	
	Variable 2	Revenue per seat sold	-.170**	-3.001**	
	Variable 3	Operating profit per passenger	.958***	18.438***	
Kilometers Model		(Constant)		.941	.918
FSNC	Variable 1	Load Factor	-.031	-.926	
	Variable 2	Operating Profit per RPK	.958***	28.726***	
Passenger model		(Constant)		6.323***	.729
LCC	Variable 1	Revenue per seat sold	-.392***	-5.508***	
	Variable 2	Operating profit per passenger	.896***	12.571***	
Kilometers Model		(Constant)		-3.923***	.783
LCC	Variable 1	Operating Profit per RPK	.491***	4.734***	
	Variable 2	Rev. ASK/cost ASK	.443***	4.276***	

*This table summarizes regression analysis with the dependent variable Operating Profit percentage. It contains models with highest R squared out of 24, and shows that kilometers model involving Operating profit per RPK and number of RPK fits the industry better than the passenger model, involving Operating Profit per Passenger. Significance levels indicated as * 10% (0.1), **5% (0.05), 1% (0.01) and ***0.1% (0.001)*

CONCLUDING COMMENTS

In attempting an empirical study identifying a workable model for predicating airline financial performance, this paper reviewed commonly used metrics in the airline industry and in particular examined the effectiveness of models that characterize performance based on two activity drivers – passengers and kilometers, revenue drivers being passenger based, and cost drivers, being kilometer based. The study covered 27 top carriers over a 5-year period. The data was initially clustered according to airline type, region of origin and operation, high or low financial performance, and then, analyzed in terms of peculiar properties followed by a correlation analysis for three data clusters. Participating variables were checked for multicolinearity, and variables strongly correlating with the dependent variable were excluded. 12 multiple regressions were run on each data cluster with two different dependent variables such as Operating margin percentage and Return on Assets percentage.

The main results indicate that Operating Profit per Passenger or per Passenger-Kilometer is the most significant variable predicating airline profitability. It was found to be more important than revenue, unit cost and load factor traditionally used by the industry. There was no significant correlation between size, business model or region, which would explain low or high profitability of an airline. Out of the regression analysis, Seats were not found to be a better denominator than Passenger-kilometers, as the regression analysis shown that Operating Profit per passenger-kilometer fits the industry better. The Passenger model fits the FSNCs sample even better than LCCs, despite the traditional view that passenger model can be used only by LCCs providing single point-to-point destination services. Operating Profit per Passenger is almost as good as Operating Profit per RPK. In light of the above, this could be the most important finding.

Operating Profit per Passenger in conjunction with Number of Passengers is a fundamental KPI, which is recommended for analysis, planning, benchmarking and certainly for internal reporting. If Average Operating Profit per Passenger becomes part of the revenue management system, it would greatly assist poor performing companies. Apart from revenue management, average Operating Profit per passenger can be tracked on daily and weekly basis against targets. This should be broken down to fit the various routes, flights, classes and load factors. Not denying the importance of per RPK measures, the study would suggest big traditional companies could be better served using Operating Profit per passenger carried or per Seat sold as a tool in achieving Operating profit per RPK.

This research was limited in respect to information access. It proved difficult if not impossible to obtain larger samples providing better statistical significance. Expanding the level of details down to fare classes, haul length (short or long) or seasonality, would have given more insights, and provided practical examples on how the findings and recommendations could be applied in practice. The suggestion for future research would be a real-life case study coming to grips with the limitations and benefits of the approach suggested.

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