A Driver-Based Approach to Airport Valuation

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ABSTRACT

This paper presents the first part of results of extensive research on an alternative concept to airport valuation. It reviews traditional and alternative valuation measures, illustrated by a sample of eight publicly quoted European airports. The main objective is to derive a model taking account of the underlying key value drivers.

A peer group analysis shows that only few sector multiples applied by the investors' community are significantly correlated with key performance indicators based on business fundamentals. By contrast to the results of this alternative driver-based valuation approach, these market multiples are affected by stock market fluctuations and do not adequately reflect the financial position and true value, and hence supports this paper's view that airports should be valued by recognising key success factors.

KEYWORDS: Airport Benchmarking, Valuation, Performance, Finance, Privatisation, Europe.

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1. INTRODUCTION

The main aim of this research is to establish an alternative valuation concept which is firmly based on the key value drivers of the airport business. Since financial results reflect a company's achievements over a diverse array of activities, they are arguably by far the most important dimension of performance. Consequently, this paper focuses on instruments and techniques for measuring the financial performance and economic value of airports and to provide an adequate framework derived from the Du Pont-System of Financial Control.

While airports may be attractive businesses, they are not equally appealing. Some are more profitable than others and airports have sold at varying earnings multiples. Therefore, investors and financial markets as well as other interested parties like airlines and academics need to develop the ability to assess the performance and relative attractiveness of airports. From an investor's perspective, profitability or cash earnings available for the distribution to shareholders is the central issue of any performance appraisal. At a basic financial level, the relative attractiveness and associated value is a function of the 'airport value tree', based on the Du Pont-Chart which decomposes return ratios into components. The 'airport value tree' is a refined application of the Du Pont-ROI model to the airport world (for conceptual details see e.g. Palepu, 1997; for sector applications see Morgan Stanley Dean Witter, MSDW, 2000, and Vogel, 2006).

The airport sector is characterised by a high degree of corporate activity which has resulted in an unprecedented level of investor interest in gaining exposure to the dependable and growth characteristics of airport investments. Every time an airport sounds mildly interested in privatising, financial institutions seeking underwriting and advisory fees, construction and consulting companies, other interested airports themselves and other firms involved line up to investigate. This interest is easy to understand. Revenue from fees and concessions are relatively steady, stable and almost risk-free.

Europe's airports have emerged as attractive investment opportunities for the private sector. Many airports are large businesses, providing a complete range of essential services to a broad customer base. They represent a growth business which is relatively recession-proof and commands premiums. Many are essentially 'monopoly suppliers' with limited real competition in

the local marketplace and relatively high entry barriers. They are high-utilisation assets, in use 365 days a year. While short-distance travellers may increasingly opt for high-speed rail links, long-haul passengers can be viewed as captive to this mode of transport. Although they may have a choice between competing airports for some destinations, they will be using the air transport system – and demand is growing rapidly. In short, the relatively low competitive intensity of much of the industry makes airports structurally attractive as investments because the expected earnings are likely to be favourable and above average.

With the new approach of the airport business there is also an increasing interest in monitoring and comparing the performance and corresponding value of individual airports. Performance measures generally describe the relationship between inputs and outputs. The areas of primary interest obviously differ as the particular focus does. Airport managers concentrate on operational aspects, so as to understand how efficiently the airport is using its infrastructure and how cost effectively it is doing so. The finance sector is more interested in comparative levels of commercial revenue and its relationship to aeronautical revenue, liquidity ratios and capital expenditure levels. Those advising investors will definitely look at a wide range of measures covering all aspects of performance, in order to judge the potential for performance improvements once an airport has been privatised.

There are now a number of established techniques for assessing airport performance, each with their own advantages and disadvantages. These include the analysis of partial factor productivity, total factor productivity and financial metrics. Each method will cover different aspects of performance, and have different data and assumptions requirements, which can potentially mean that these various techniques can yield slightly varying results. These can only be meaningfully interpreted by having a thorough understanding of what each approach is actually measuring. For further details see Graham (2005).

The structure of this paper is as follows: Section 2 introduces the eight sample airports and presents the results of partial factor productivity and financial ratio analysis. Section 3 provides the methodological basis for a driver-based valuation approach. Section 4 contains a correlation analysis of the key performance indicators of the alternative driver-based valuation model versus market-driven valuation multiples. The main results of the first stage of this research are

summarised and put into real-life context in section 5, which also indicates the next steps of the ongoing work.

2. BENCHMARKING ANALYSIS OF EUROPEAN AIRPORTS

There has been an increasing number of airport performance evaluations discussed in the academic literature. In addition, there are a number of recent studies which have compared the different performance methods which exist. A detailed overview of the individual applications is provided by Vogel and Graham (2006).

Table 1 - Sample of European Airports as of 2006

IATA Code	Airport Company / Publicly Quoted Entity	IPO Year	ATM	PAX (000)	Air Cargo (t)
ADP	Aéroports de Paris SA	2006	762,332	82,500	2,240,000
BAA	BAA plc*	1987	1,028,200	116,200	1,399,988
CPH	Copenhagen Airports A/S	1994	258,356	20,877	380,024
FLR	AdF-Aeroporto di Firenze SpA	2000	27,521	1,531	205
FRA	Fraport AG	2001	489,406	52,811	2,127,800
VCE	SAVE SpA Group**	2005	99,349	7,683	46,292
VIE	Flughafen Wien AG	1992	237,490	16,856	265,778
ZRH	Unique Flughafen Zürich AG	2000	260,786	19,237	363,325

Note: *delisted in 2006; traffic data for the 9 months period 1 Apr – 31 Dec only; **incl. Treviso

Since measuring airport performance is a prerequisite for valuation, the eight publicly listed European airport companies introduced below have been benchmarked by means of partial factor productivity (PFP) and financial ratio analysis (FRA). Principal sources of data are the respective reports and accounts complemented by sector research published by stock brokers regarding valuation multiples. Aspects of airport service quality have not been explicitly considered. Geographically, the scope has been restricted to Europe, since all sample airports enjoy similar market as well as operational conditions and are subject to the same kind of overall economic and thus traffic development. Moreover, airport privatisation was initially only a European phenomenon, and has resulted in the only existing representative peer group.

Table 2 outlines the main indicators of partial factor productivity and financial ratios calculated for the period 2004-2006, categorised into five major areas of performance measurement:

profitability, revenue generation, cost efficiency, debt and asset management, as well as capital productivity.

Table 2 - Benchmarking Results of Sample Airports (Arithmetic Means 2004-2006)

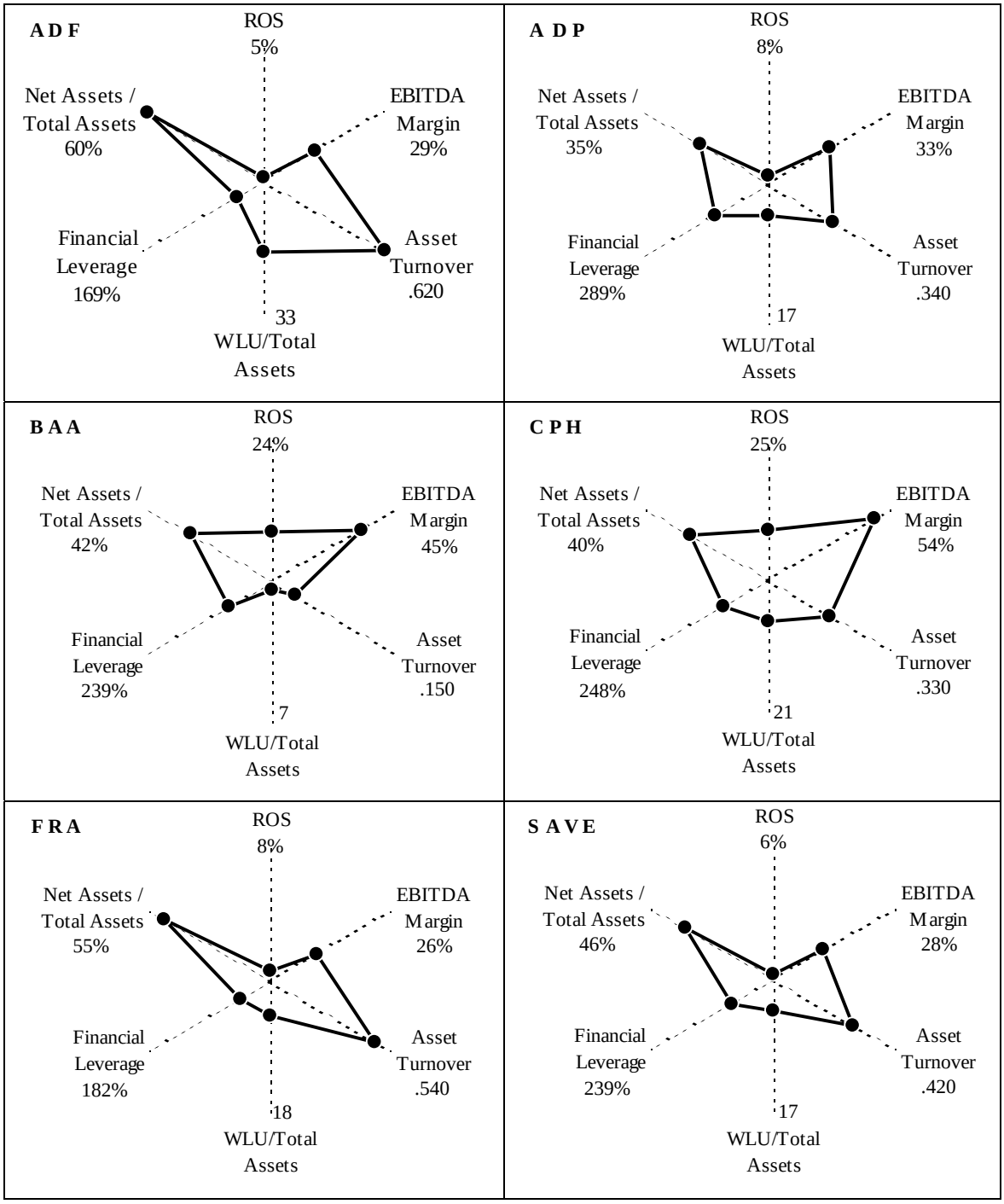
PFP / FRA Indicator / Ratio	ADF	ADP	BAA*	CPH	FRA	SAVE**	VIE	ZRH
Profitability:								
Profit/WLU (€)	1.01	1.52	4.96	3.78	2.43	1.52	4.11	1.54
RevEx	1.06	1.08	1.32	1.33	1.09	1.06	1.20	1.08
ROA (%)	3.48	2.58	3.69	8.00	4.38	2.36	6.34	1.75
ROS (%)	5.45	7.55	24.09	24.53	8.13	5.89	16.86	7.67
ROE (%)	5.74	7.49	8.71	19.73	7.99	5.38	11.02	5.56
EBITDA Margin ***	28.58	32.53	45.43	53.99	25.70	27.57	35.95	51.26
Revenue Generation:								
Total Revenue/WLU (€)	18.59	20.26	20.66	15.39	29.86	25.23	24.36	20.01
Total Revenue/Currency Unit of Shareholders' Funds (€)	1.04	1.00	0.36	0.80	0.99	1.04	0.65	0.77
Cost Efficiency:								
Total Cost/WLU (€)	17.57	18.73	15.70	11.62	27.43	23.71	20.25	18.48
Debt & Asset Mgmt:								
Financial Leverage (%)	168.9	288.6	239.2	247.8	182.0	239.4	176.9	348.9
Debt Ratio (%)	40.33	64.61	57.93	49.57	45.04	54.48	42.67	70.14
Gearing (%)	68.90	188.59	139.18	147.76	81.97	139.37	76.85	248.91
Net Assets in % of Total Assets	59.67	35.39	42.07	40.43	54.96	45.52	57.33	29.86
Capital Productivity:								
Asset Utilisation	33.46	17.02	7.48	21.12	18.16	16.80	15.39	11.06
Total Assets/WLU (€)	30.37	59.00	139.99	47.51	55.16	62.35	65.95	90.71
Total Assets/ATM (€)	1,606	7,934	17,826	4,187	8,161	4,643	5,214	7,445
Total Asset Turnover (x)	0.62	0.34	0.15	0.33	0.54	0.42	0.38	0.22

Note: monetary data converted to EUR; * FY 2006 data for the 9 months period 1 Apr – 31 Dec; ** airport SBU accounts for ~ 75% of Group EBITDA; Source: own calculations based on company data, *** various brokers' research

The PFP and FRA results reveal distinct differences between sample airports across the individual categories. Figure 1 illustrates the major value drivers or roots of value creation according to the 'airport value tree'. Since airports primarily create value by converting traffic into revenue through the provision of infrastructure and related services, their value tree is rooted in aircraft movements and passengers and disaggregates return ratios generated by the business in profit margin and turnover elements. This concept – based on the Du Pont-ROI

model summarising the relations between return on investment (assets), asset turnover, the profit margin and financial leverage – is vital to valuation.

Figure 1 - Performance Profiles of Sample Airports (Average FYs 2004-2006)



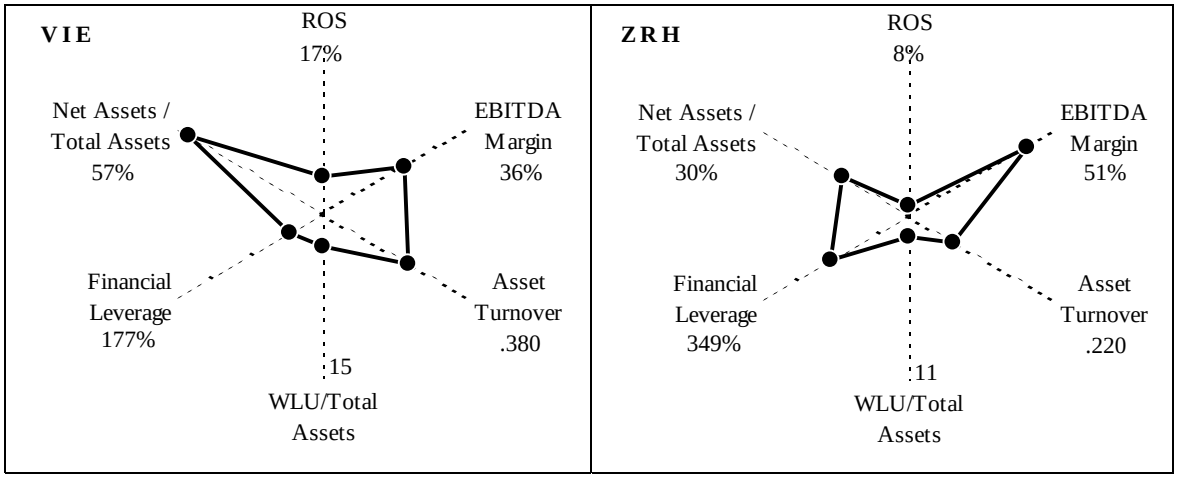


Figure 1 visualizes the main determinants of value creation in terms of Performance profiles of the eight sample airports. It pinpoints strengths and weaknesses like a value driver scorecard, facilitating sector comparisons. The profiles illustrate the marked differences in terms of operating efficiency, represented by ROS and EBITDA margin. The ratios of WLU/total assets and total asset turnover stand for asset utilisation or capital productivity. Capital structure is reflected by the percentage of net assets to total assets and financial leverage. These three key performance indicators (KPIs) summarise the underlying value drivers or roots of value creation, such as traffic volume (and growth), efficiency, regulatory regime, diversion strategy and capital management. They all exert an immediate impact on profitability and valuation.

It becomes quite obvious from these benchmarking results discussed above that airports are different on a number of criteria and that not all earnings are created equal. Hence different values may be associated and different pricing attached. In general, it is management's primary goal to maximize shareholder wealth, which translates into maximizing the value of the firm. For quoted airport companies this value is measured by the price of their common stock. The stock market evaluates every facet of a business in a nutshell, expressed by the investors' appreciation of the respective shares. The principles of company value and some specific valuation measures will be described next.

3. VALUATION ISSUES

3.1 TRADITIONAL VALUATION MEASURES

A common tool for judging the real business performance, as reflected by the investors' demand for an equity share in an airport company, is assessment of the actual stock price relative to the overall development of the respective capital market. Price and price relative charts can plot the market price of the respective equity (airport) together with its price relative to the local market index. But against the background of the overall economic or investment climate are the business fundamentals and their impact on the value drivers which are the principal determinants of financial and ultimately share price performance (Damodaran, 1996; O'Connor, 1996; Ryland, 2000).

A company's share price is mainly driven by its price to earnings (P/E) ratio. Higher ones imply that the market expects faster-than-average future growth from these stocks in intra-sectoral comparison, and vice versa. P/E bands plot chart lines at specified price earnings levels depending on the earnings per share (EPS) record of the respective security. The charts plot the historical price overlaid with bands which are EPS multiples. Typically, multiples are entered so that the top band passes through the high and the bottom band passes through the low price. In general, P/E bands measure the progress of the stock in relation to its actual earnings and serve as an indicator to project the future share price based on expected earnings (Damodaran, 1996; O'Connor, 1996; Ryland, 2000).

Airport stocks are particularly vulnerable with regard to external events affecting the aviation industry as a whole. Moreover, airports face conflicting interests, such as business, politics, environmental protection, regulatory authorities and neighbouring communities. In particular political controversies and environmental concerns are hampering growth. Owing to the very nature of the business, airports operate with high fixed costs and limited flexibility with regard to traffic downturns which also has a direct impact on the majority of revenue sources. On the other hand, airports frequently have sound balance sheets and assets which consist almost entirely of long-term tangible fixed assets. Despite recent developments traffic growth is likely to outpace GDP growth and locally speaking, airports are arguably quasi-monopolies and entry barriers for competitors are high (Airbus, 2007; HypoVereinsbank, 2002).

Historical share performance, of course, can only give limited guidance and expected future earnings are key to the valuation and share price performance of any business. Apart from external effects and hostile takeovers, it is basically the investors' perception of likes and dislikes which are anticipated by the stock market and determine the respective share price. Investors' likes include everything bearing the potential for sustained growth in volume and earnings (such as strength of carrier/passenger base, capacity/investment cycle, regulatory framework, environmental constraints etc.) – and vice versa. As with any other business entity, an airport is valued on the basis of its current and expected revenues, earnings and cash flow. With regard to the stock market, it is useful to differentiate between traditional single-period and alternative multi-period approaches to evaluate a business.

Traditional valuation measures are performance indicators for the very near future. The earnings and enterprise value multiples are calculated on the basis of historical data and projected for the next one to three years. The price/earnings (P/E) and price/cash flow (P/CF) ratios are the most important ones and frequently used by analysts and investors. Despite their simplicity, different depreciation policies in the sector may have an impact on comparative earnings per share (EPS) valuations. Therefore, cash valuations are the key comparatives for international airports and price/cash earnings per share (P/CEPS) multiples appear to be more appropriate for comparison (UBS, 1996; Ryland, 2000).

Table 3 compares some additional airport valuation measures as applied by the finance community. The initial problem is that there still are only a small number of airport operators for drawing comparisons, exacerbated by the lack of uniformity provided by traditional valuation measures. There may also exist variations in the actual level of these ratios due to the differences inherent in the individual airport companies. A major methodological weakness of these static snapshot valuation measures is that they are based on constant share prices and market capitalisation (number of shares outstanding x share price). This does not reflect the dynamics of the business and results in rather 'stable' multiples.

Still, the enterprise value multiple EV/EBITDA, defined as the ratio of market capitalisation plus net debt (EV) versus earnings before depreciation, interest and taxes, seems to provide one useful basis for comparative valuation of the sector. The reason for this is that it fluctuates far

less over the investment cycle – which will be elaborated on next – than other traditional earnings measures. The downside of less fluctuation, however, is concealment of the considerable depreciation effects on accounted earnings.

Table 3 - Traditional Valuation Measures of Publicly Quoted Airport Companies

Airport/ Year	Share Price (€)	Market Cap (000 €)	EV/ Sales (x)	EBITDA Margin (%)	EV/ EBITDA (x)	EV/ EBIT (x)	P/E-Ratio (x)	Div. Yield (%)
ADF 04	10.60	95,768	3.60	31.80	13.10	-	94.20	0.40
ADF 05	15.48	139,858	4.15	31.85	14.20	-	55.30	1.00
ADF 06	18.67	168,679	5.63	22.10	17.54	47.30	71.70	1.40
ADP 04	0.00	0	-	35.00	12.00	-	33.85	-
ADP 05	47.60	4,063,207	3.52	31.83	13.42	-	33.82	1.12
ADP 06	74.01	7,324,074	4.26	30.77	13.64	22.95	38.60	1.25
BAA 04	8.87	9,548,941	4.63	-	10.60	14.30	18.90	4.10
BAA 05	13.56	14,651,300	4.21	46.07	12.03	-	18.83	2.77
BAA 06	0.00	0	-	44.80	15.70	-	23.10	2.40
CPH 04	161.89	1,348,515	5.35	-	9.15	14.00	17.15	-
CPH 05	242.65	1,904,344	6.55	52.25	14.38	18.90	24.03	3.47
CPH 06	305.86	2,400,447	7.27	55.73	13.10	16.17	23.82	4.44
FRA 04	31.34	2,840,617	1.33	25.50	6.48	9.50	21.55	2.90
FRA 05	59.96	5,467,894	2.33	25.37	9.21	18.00	29.11	1.70
FRA 06	54.89	5,021,246	2.43	26.23	9.17	15.70	23.91	2.14
SAVE 04	10.74	214,800	-	30.60	15.30	-	96.45	-
SAVE 05	10.90	301,603	4.25	28.10	13.75	-	42.93	1.70
SAVE 06	13.17	364,414	4.45	24.00	11.43	14.70	32.63	2.20
VIE 04	52.00	1,092,000	2.50	-	7.47	9.75	16.13	-
VIE 05	63.04	1,323,840	3.05	35.60	9.92	13.10	18.85	3.02
VIE 06	77.71	1,631,910	3.79	36.30	10.35	15.40	20.82	2.83
ZRH 04	110.84	544,478	4.15	-	9.30	21.95	46.90	-
ZRH 05	171.95	844,664	5.00	51.65	10.04	19.90	27.18	0.63
ZRH 06	295.82	1,816,468	5.40	50.87	10.82	22.90	35.91	0.71

Note: BAA delisted 15 August 2006 after takeover by Grupo Ferrovial; SAVE airport SBU accounts for ~ 75% of Group EBITDA; Source: Datastream, Yahoo Finance, various brokers' research, own calculations

The traditional ratio-based methods of valuation introduced above undoubtedly serve a useful function. In particular, the use of EBITDA appears to exhibit some correlation in valuation between the quoted airport companies. But investors will wish, no doubt, to use a number of different valuation tools. From the investors' point of view, alternative valuation techniques such as the discounted cash flow approach (DCF), the combined valuation of the sum-of-the-parts

(SOTP) and/or a valuation of the regulated asset base (RAB), may provide a superior means of establishing a long-term valuation in addition to traditional stock market-related measures. One advantage of the SOTP approach is to account for the diversity of individual business units/segments, while the RAB approach focuses on airside operations and usually neglects necessary investment to maintain the achieved position and to generate future earnings. Yet, no method can be considered definitive (Damodaran, 1996; ABN-AMRO, 2006; MorganStanley, 2006; JPMorgan, 2006).

One long-established alternative valuation technique is the (multiple stage) discounted cash flow approach. Rather than looking at the short-term snapshots of P/E ratios or EV to EBITDA, it is aimed at the medium- to long-term valuation of a business, providing interesting insight for investors. Generally, the DCF-method determines the enterprise value of a firm by discounting the stream of cash flows at the weighted average opportunity cost of capital of the firm. Key components of this concept are the estimated free cash flows, the terminal value of the company at the end of the forecast period and the weighted average cost of capital (WACC) (Damodaran, 1996; Ross et al, 1996; Weston et al, 1996).

The discounted cash flow methodology involves forecasting the operating free cash flows, which will reflect the earnings before depreciation and interest, less capital expenditure plus changes in working capital and adjusted for corporation tax. Then the internal rate of return is calculated which discounts these future cash flows back to the present enterprise value, defined as current market capitalisation plus net debt. This procedure allows one to 'look through' the investment cycle and constitutes a long-term model which reveals the generated return rate. It provides useful insight into a longer-term valuation framework by looking through the investment cycle (Damodaran, 1996; SBC Warburg, 1996, 1997).

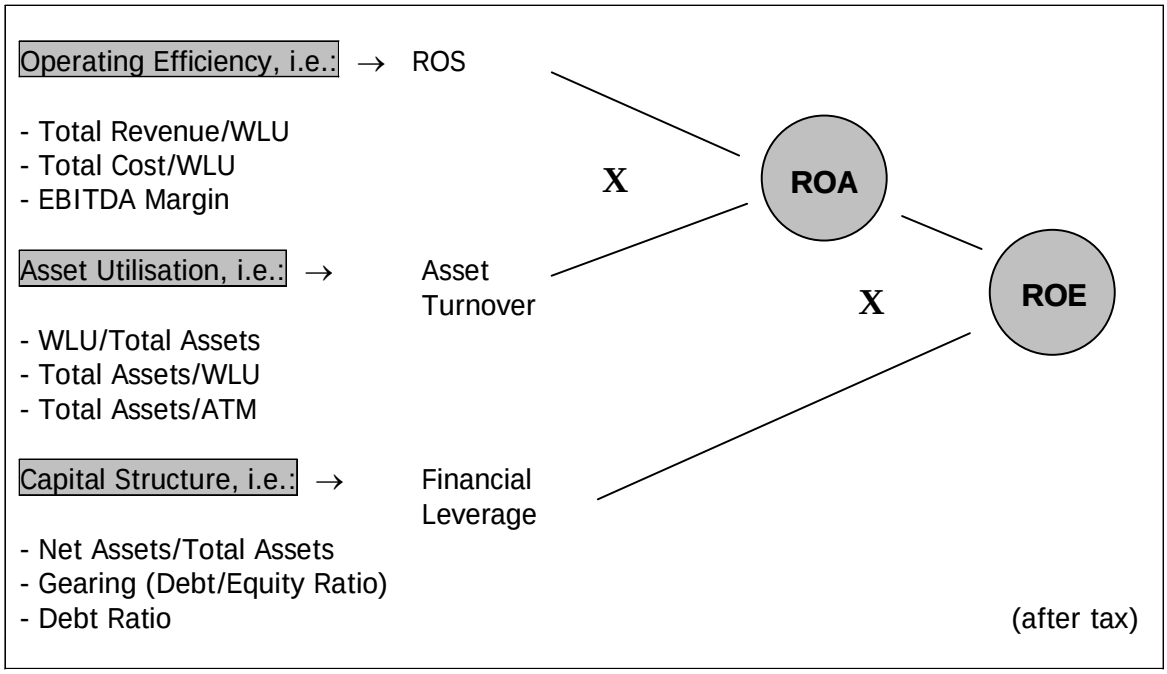
Although rather straight forward in conceptual terms, establishing integrated DCF-models is a complex exercise, which is clearly beyond the scope of this paper. Examples of (primarily) listed airports are included in brokers' research, e.g. ING (2005), Davy (2006), Morgan Stanley (2006) or Sal. Oppenheim (2006). In accordance with the focus of this research, the underlying key

success factors and value divers which are so crucial to the business and essential for any valuation attempt will be analysed instead.

3.2 KEY SUCCESS FACTORS AND VALUE DRIVERS

With any valuation method, identifying and understanding key success factors or value drivers is a prerequisite for controlling them and for creating shareholder value. As per the mechanics of the 'airport value tree' and results of earlier research (Vogel, 2006) the key value drivers of the airport business within a given framework of traffic demand and regulatory control have been identified as operating efficiency, asset utilisation or capital productivity and capital structure. The key drivers themselves, in turn, are influenced by various factors. Each of those have an immediate impact on the return rate generated by the airport's assets and ultimately on the return rate which may attract investors, as illustrated by Figure 2.

Figure 2 - The Roots of Key Value Drivers and their Effect on Returns



Return on sales is primarily dependent on operating efficiency, which is driven by revenue generation, cost management, and the EBITDA margin. Asset turnover is dependent on 'sweating' the assets in terms of high asset utilisation or faster growth in revenues than assets. The product of return on sales and asset turnover results is the return on assets. The return

rate generated by the airport's assets multiplied by financial leverage, which is determined by capital structure, finally results in return on equity. Tax deductible interest expense lowers net income, thus decreasing ROA. The use of debt, however, decreases equity and as long as equity is lowered more than net profit, ROE will increase. Figure 2 emphasizes that the rationale of this driver-based valuation approach is the framework provided by the 'airport value tree'. The value tree is predicated on the Du Pont-Chart, which disaggregates return ratios in the profit margin and turnover elements.

4. THE ALTERNATIVE DRIVER-BASED VALUATION APPROACH

4.1 VALUE PROFILES OF EUROPEAN AIRPORTS

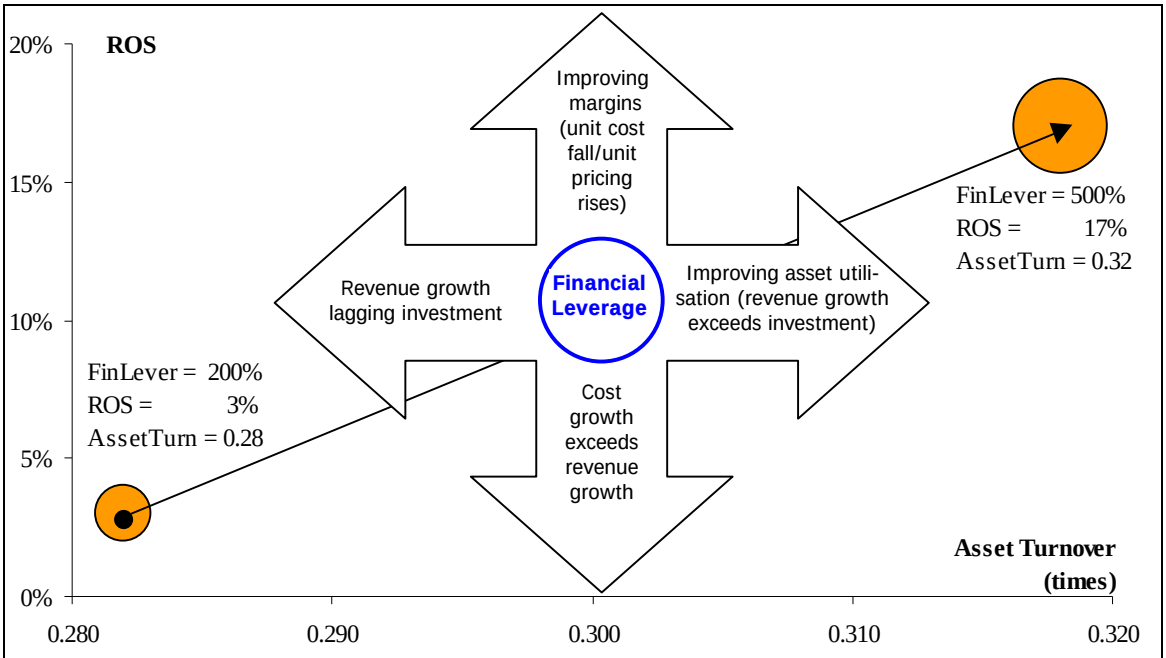
The implications of the investment cycle for earnings, productivity and financial ratios and ultimately for the share price performance of quoted airport companies are paramount. Therefore, conventional valuation measures are not particularly helpful tools for long-term evaluation of airport companies. Based on the key value drivers operating efficiency, asset utilisation/capital productivity and capital structure value profiles may be established for the sample of eight European airports for the period under consideration.

Like the discounted cash flow analysis, visualizing value profiles is actually an alternative valuation approach, as opposed to traditional techniques or conventional earnings multiples such as the short-term snapshots of EV/EBITDA and P/E-ratios as described during the discussion of share price performance. While DCF aims at looking through the investment cycle establishing a long-term valuation, the value profiles below are initially based on historical data. The very merit of this approach as opposed to the other valuation techniques is, however, that it gives a clear picture of the underlying drivers involved and the direction as well as magnitude of improvements required in order to noticeably increase financial performance – and it clearly reduces the problem of predicting earnings.

The framework for visualizing value profiles is illustrated in Figure 3. The dimensions of this chart, asset turnover on the x-axis, ROS on the y-axis and financial leverage, represented by the size of the bubbles, are made up of the three KPIs or main drivers of returns. The compass card explains the economic meaning of the respective positioning of an airport within this

coordinate system, at the same time indicating actions for improvements. Furthermore, plotting paths over time allows for keeping track of changes of individual airport companies and sector benchmarking.

Figure 3 - Framework for visualizing Value Profiles – The three Drivers of Returns



ROS (Return on Sales)	Net Income over Total Revenue
Total Asset Turnover	Total Revenue over Total Assets
Financial Leverage	Total Assets over Shareholders' Funds
	• The size of the bubble is determined by financial leverage • The position of the bubble is determined by ROS and asset turnover

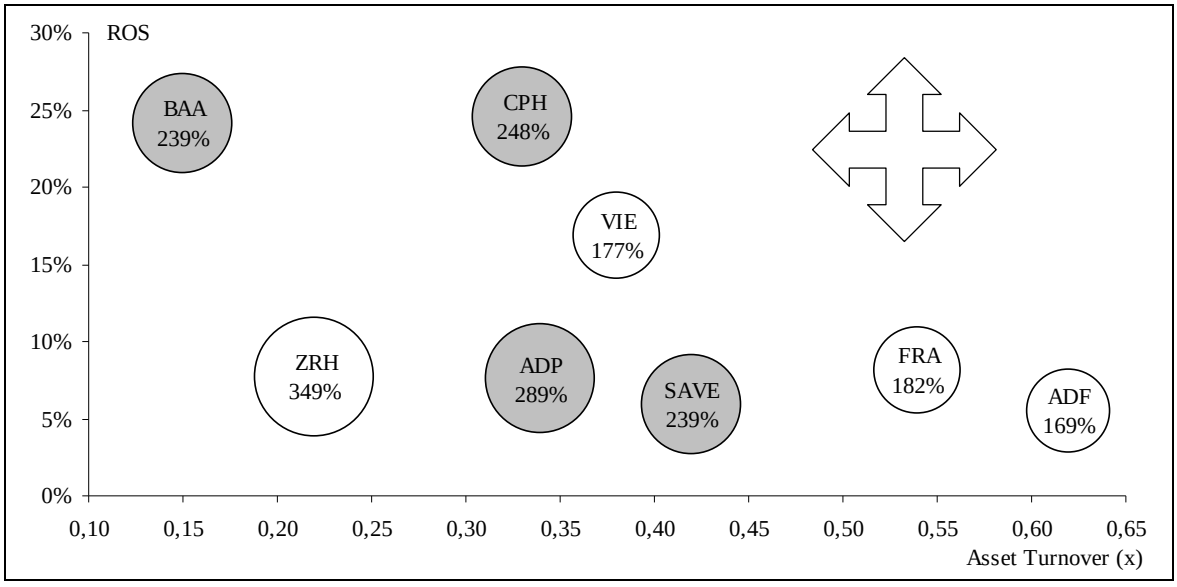
Source: illustration derived from MSDW, 2000

Increasing ROS will be caused by an improved operating margin as a result of revenue enhancement and/or a reduction in operating costs, while a growth in costs exceeding the growth in revenues will result in the contrary. Revenue growth exceeding investment will accelerate asset turnover and vice versa. The magnitude of financial leverage is based on the respective capital structure in terms of gearing of the balance sheet. This is related – amongst other things – to debt capacity and credit standing and the value creating margin between the

return on assets and the cost of debt. (For a topical illustration of the latter see e.g. Standard & Poor's, 2006).

Figure 4 displays the value profiles of the eight publicly quoted airport operators. The illustration is based on the above-described dimensions of total asset turnover (x-axis), ROS (y-axis) and financial leverage (represented by the size of the bubbles). The positioning within this framework is determined by the respective three-year averages for the fiscal years (FYs) 2004 - 2006. Those entities which were only recently listed at a stock exchange (ADP, SAVE) or taken over (BAA, CPH) are shaded.

Figure 4 - Value Profile of Sample Airports (Average FYs 2004-2006)



This graph illustrates the distinct positions of the eight sample airports within the above-described framework. The performance and thus value differs considerably in terms of operating efficiency as represented by the return on total revenue, total asset turnover, and capital structure as reflected by financial leverage. Furthermore, there appears to be a significant difference between companies recently listed or taken over and those, which already went public before the period under consideration – specifically regarding financial leverage.

The economic significance of increased asset turnover and capital productivity in terms of traffic throughput over productive assets is striking. In case investment grows faster than revenue, asset turnover will deteriorate, with an immediate effect on the return generated by the airport's assets. Investment in traffic growth and possibly additional commercial facilities must be profitable, otherwise it may not be rewarded by the investor.

Maximizing capacity utilisation appears to be the formula for success in the airport business. This is especially true nowadays, when market conditions demand decreases of aeronautical charges and the previously familiar ever-increasing retail spend per passenger has slowed down considerably. 'Sweating' the assets includes efficient management of traffic flows and optimal allocation of capital, finally maximizing the effectiveness of fixed assets investment, return rates and shareholder value (see also Feldman, 2007).

4.2 CORRELATION ANALYSIS OF KEY PERFORMANCE INDICATORS AND MARKET MULTIPLES

In order to explore the relevance of the identified key performance indicators regarding the valuation of airports correlation analysis has been conducted. Although this does not establish cause-effect relationships, it does attempt to determine whether a statistically significant relationship exists between two or more quantifiable variables. The three key performance indicators (KPIs) as well as various additional indicators of partial factor productivity (PFP) and financial ratio analysis (FRA) have been considered in this analysis and results are listed in Table 4. On a 95% confidence level only a few statistically valid relationships can be established: ROS is significantly correlated to EBITDA margin, P/E-ratio and dividend yield. Turnover of total assets is correlated with EBITDA margin and P/E-ratio, whereas financial leverage is only related to EBITDA margin.

Detailing further for partial factor productivity indicators and financial ratios reveals a number of other significant relationships with regard to KPIs as well as the six market multiples. As far as profitability is concerned, there is a fit between net profit per WLU and return on assets (ROA), return on equity (ROE), the revenue/expenditure ratio (RevEx), return on sales (ROS), asset turnover, EBITDA margin, EV/EBIT, P/E-ratio and dividend yield. Revenue generation in terms

of total revenue per WLU is related to ROE, EV/Sales, EBITDA margin and EV/EBITDA, while total revenue per currency unit of shareholders' funds correlates with RevEX, ROS, asset turn and P/E-ratio. Total cost per WLU or cost efficiency has a significant impact on ROE, RevEx, ROS, asset turn, EV/Sales and EBITDA margin.

Regarding debt and asset management, there appears to be a significant correlation between ROA, debt ratio, gearing (debt/equity ratio), net assets as percent of total assets, asset turnover, financial leverage and EBITDA margin. Capital productivity or asset utilisation (WLU/assets) is related to assets per WLU, assets per ATM, asset turnover, ROS and P/E-ratio. Asset turnover is also the only KPI which is influenced by airport size, while traffic volume in terms of WLUs is significantly correlated with net profit, market capitalisation and P/E-ratio.

Moreover, several valid relationships exist amongst the traditional multiples, to some extent due to the very definitions: share price is significantly related to EV/Sales and EBITDA margin; EV/Sales to EBITDA margin and EV/EBITDA and P/E-ratio to EV/EBITDA, EV/EBIT as well as dividend yield. Not a single valid relationship, however, appears to exist between market capitalisation and any of the market multiples, whereas share price is significantly correlated with (ROA, ROE) EV/Sales and EBITDA margin.

It is worthwhile noting that all three KPIs are significantly correlated to EBITDA margin but not with those multiples involving enterprise value: EV/Sales, EV/EBITDA and EV/EBIT, while EV is defined as market capitalisation (number of shares outstanding x share price) plus net debt. Although P/E-ratio is significantly correlated with ROS and asset turnover, share price appears to be the crucial factor in this equation. This is supported by the fact that not a single valid

Table 4 - Correlation Results: Total Sample

	WLU	ROA	ROE	RevEx	Debt Ratio	Gearing	ROS	Asset Turn	Fin. Lever.	EV/ Sales	EBITDA Margin	EV/ EBITDA	EV/ EBIT	P/E-Ratio	Div. Yield
PAX	++	-	-	+	-	-	+	+	-	-	-	-	-	+	-
Cargo	++	-	-	-	-	-	-	-	-	-	-	-	-	-	-
WLU	n/a	-	-	-	-	-	-	+	-	-	-	-	-	+	-
ATM	++	-	-	+	-	-	+	+	-	-	-	-	-	+	-
Net Profit	++	-	-	+	-	-	+	+	-	-	-	-	-	+	-
Profit/WLU	+	+	+	++	-	-	++	+	-	-	+	-	+	++	++
Tot. Revenue	++	-	-	-	-	-	-	-	-	-	-	-	-	+	-
T.Rev./WLU	-	-	+	-	-	-	-	-	-	++	+	+	-	-	-
Rev./S.Funds	-	-	-	+	-	-	+	++	-	-	-	-	-	+	-
Tot. Cost	++	-	-	-	-	-	-	-	-	-	-	-	-	+	-
T.Cost/WLU	-	-	+	+	-	-	+	+	-	++	++	-	-	-	-
Shareh. Funds	++	-	-	+	-	-	+	+	-	-	-	-	-	-	-
Total Assets	++	-	-	+	-	-	+	+	-	-	-	-	-	-	-
Ass.Utilisation	+	-	-	-	+	-	-	++	-	-	-	-	-	+	-
Ass./WLU	+	-	-	+	-	-	+	++	-	-	-	-	-	+	-
Ass./ATM	+	-	-	+	-	-	+	++	-	-	-	-	-	+	-
Asset Turnover	+	-	-	+	+	+	+	n/a	+	-	+	-	-	+	-
RevEx	-	++	++	n/a	-	-	++	+	-	+	++	-	-	+	++
ROA	-	n/a	++	++	-	+	++	-	+	-	-	-	-	+	+
ROE	-	++	n/a	++	-	-	++	-	-	+	+	-	-	+	+
ROS	-	++	++	++	-	-	n/a	+	-	-	++	-	-	+	++
N.Assets/T.Ass.	-	-	-	-	++	++	-	+	++	+	+	-	-	-	-
Debt Ratio	-	-	-	-	n/a	++	-	+	++	+	+	-	-	-	-
Gearing	-	+	-	-	++	n/a	-	+	++	-	+	-	-	-	-
Fin. Leverage	-	+	-	-	++	++	-	+	n/a	-	+	-	-	-	-
Share Price	-	+	+	-	-	-	-	-	-	+	++	-	-	-	-
Mkt. Cap.	++	-	-	-	-	-	-	-	-	-	-	-	-	-	-
EV/Sales	-	-	+	+	+	-	-	-	-	n/a	+	+	-	-	-
EBITDA Mar.	-	-	+	++	+	+	++	+	+	+	n/a	-	-	-	-
EV/EBITDA	-	-	-	-	-	-	-	-	-	+	-	n/a	++	+	-
EV/EBIT	-	-	-	-	-	-	-	-	-	-	-	++	n/a	++	-
P/E-Ratio	+	+	+	+	-	-	+	+	-	-	-	+	++	n/a	+
Dividend Yield	-	+	+	+	-	-	++	-	-	-	-	-	-	+	n/a

Note: + statistically significant; ++ highly significant; - not significant

Table 5 - Correlation Results and Comparison of Significant Differences between Split Samples

	WLU		ROA		ROE		RevEx		Debt Ratio		Gearing		ROS		Asset Turn		Fin. Lever.		EV/ Sales		EBITDA Margin		EV/ EBITDA		EV/ EBIT		P/E-Ratio		Div. Yield	
	S1	S2	S1	S2	S1	S2	S1	S2	S1	S2	S1	S2	S1	S2	S1	S2	S1	S2	S1	S2	S1	S2	S1	S2	S1	S2	S1	S2	S1	S2
PAX	++	++	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	+	-	-	-	+	-	-	-	+	-	-	-
Cargo	++	++	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-
WLU	n/a	n/a	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	+	-	-	-	+	-	-	-	-	-	-	-
ATM	++	++	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	+	-	-	-	+	-	+	-	+	-	-	-
Net Profit	++	++	-	-	-	-	-	+	-	-	-	-	-	+	-	++	-	-	+	-	-	-	+	-	-	-	+	-	-	-
Profit/WLU	-	-	+	-	++	-	++	++	-	-	-	-	++	++	-	++	-	-	-	-	-	+	-	-	+	-	+	+	+	+
Tot. Revenue	++	++	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	+	-	-	-	+	-	-	-	-	-	-	-
T.Rev./WLU	++	-	-	+	-	+	-	+	-	-	-	-	-	+	-	-	-	-	+	-	-	+	+	-	+	-	+	-	+	-
Rev./S.Funds	-	-	-	-	-	-	+	+	-	+	-	+	+	+	+	++	-	+	-	-	-	-	-	-	-	-	-	+	-	-
Tot. Cost	++	++	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	+	-	-	-	+	-	-	-	-	-	-	-
T.Cost/WLU	++	-	-	+	-	+	-	+	-	-	-	-	-	+	-	-	-	-	+	-	-	++	+	-	-	-	-	-	-	+
Shareh. Funds	++	++	-	-	-	-	-	-	-	-	-	-	-	-	-	++	-	-	+	-	-	-	+	-	-	-	+	-	-	-
Total Assets	++	++	-	-	-	-	-	-	-	-	-	-	-	-	-	++	-	-	+	-	-	-	+	-	-	-	+	-	-	-
Ass.Utilisation	-	+	-	-	-	-	-	-	+	-	+	-	-	-	++	+	+	-	-	+	-	-	+	-	-	-	+	-	-	-
Ass./WLU	-	+	-	-	-	-	-	-	+	-	+	-	-	-	++	+	+	-	-	-	+	-	-	-	-	-	-	-	-	-
Ass./ATM	+	+	-	-	-	-	-	-	-	-	-	-	-	-	-	++	-	-	-	-	-	-	+	-	-	-	+	-	-	-
Asset Turnover	-	+	-	-	-	-	-	+	+	-	+	-	-	+	n/a	n/a	+	-	-	-	+	-	-	-	-	-	-	+	-	-
RevEx	-	-	+	+	++	+	n/a	n/a	-	-	-	-	++	++	-	+	-	-	-	-	-	++	-	-	-	-	+	+	-	+
ROA	-	-	n/a	n/a	++	++	+	+	+	-	+	-	+	+	-	-	+	-	-	++	-	+	-	-	-	-	-	-	+	+
ROE	-	-	++	++	n/a	n/a	++	+	-	-	-	-	++	+	-	-	-	-	-	+	-	+	-	-	+	-	+	-	+	+
ROS	-	-	+	+	++	+	++	++	-	-	-	-	n/a	n/a	-	+	-	-	-	-	-	++	-	-	-	-	+	+	-	+
N.Assets/T.Ass.	-	-	+	-	-	-	-	-	++	++	++	++	-	-	+	-	++	++	-	-	+	-	-	-	-	-	-	-	-	-
Debt Ratio	-	-	+	-	-	-	-	-	n/a	n/a	++	++	-	-	+	-	++	++	-	-	+	-	-	-	-	-	-	-	-	-
Gearing	-	-	+	-	-	-	-	-	++	++	n/a	n/a	-	-	+	-	++	++	-	-	+	-	-	-	-	-	-	-	-	-
Fin. Leverage	-	-	+	-	-	-	-	-	++	++	++	++	-	-	+	-	n/a	n/a	-	-	+	-	-	-	-	-	-	-	-	-
Share Price	-	-	-	++	-	++	-	-	+	-	+	-	-	-	+	-	+	-	-	++	+	+	-	-	-	-	-	-	-	-
Mkt. Cap.	++	+	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	+	-	-	-	-	-	-	-	-	-	-	-
EV/Sales	+	-	-	++	-	+	-	-	-	-	-	-	-	-	-	-	-	-	n/a	n/a	-	+	+	-	+	-	-	-	+	+
EBITDA Mar.	-	-	-	+	-	+	-	++	+	-	+	-	-	++	+	-	+	-	-	+	n/a	n/a	-	-	-	-	-	-	-	+
EV/EBITDA	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	n/a	n/a	++	-	+	-	-	-
EV/EBIT	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	++	-	n/a	n/a	++	-	-	-
P/E-Ratio	-	-	-	-	+	-	+	+	-	-	-	-	+	+	-	+	-	-	-	-	-	-	+	-	++	-	n/a	n/a	+	+
Dividend Yield	-	-	+	+	+	+	-	+	-	-	-	-	-	+	-	-	-	-	+	+	-	+	-	-	-	-	+	+	n/a	n/a

Note: + statistically significant; ++ highly significant; - not significant; significantly different; S1 = ADF, FRA, VIE, ZRH; S2 = ADP, BAA, CP

relationship could be established between any of the three KPIs and share price as well as market capitalisation.

This may be due to the fact that ROS, asset turnover and financial leverage are based on the business fundamentals – or rooted in the 'airport value tree' – while share prices are affected by external factors and market expectations. In order to control the most important external factors exerting an impact on share price performance the total sample has been split into two. Subgroup 1 (S1) consists of ADF, FRA, VIE, ZRH, which were all floated on the stock market well before the period under consideration. Subgroup 2 (S2) comprising ADP, BAA, CPH and SAVE, on the other hand, has experienced important changes during this period: The initial public offering (IPO) of SAVE Group only took place in early 2005 while Macquarie seized majority control of CPH later that year, and ADP's IPO as well as Ferrovial's takeover of BAA did not happen before mid 2006.

The identical correlation analysis has been run for the two split samples, the results of which are summarised by Table 5. Although this analysis basically confirms the above-discussed findings, it reveals significant differences between the subgroups under scrutiny, most notably regarding market multiples: While there is no connection between ROS of subgroup 1 and EBITDA margin or dividend yield there appears to be a valid relation to split sample 2 in both cases. As opposed to subgroup 2, total asset turnover of split sample 1 appears to be significantly correlated to EBITDA margin, whereas the turnover of subgroup 2, in contrast, is related to P/E-ratio. Only one statistically significant correlation has been detected for financial leverage, regarding split sample 1 and EBITDA margin. In summary, the results reveal profound differences between the individual subgroups and the valid relationship between ROS and P/E-ratio established above for the total sample is the only one which remains significant for both subgroups.

Under the split samples design the total number of valid relations between financial ratios and indicators of partial factor productivity is higher in general and refers to subgroup 1 in the majority of cases regarding market multiples. While various statistically significant correlations appear to exist amongst market multiples themselves – again specifically in respect to split sample 1 comprising airport companies which had already been listed before the period under

scrutiny – a considerable number of contradicting regression results confirms the distinct differences between the two subgroups.

It needs to be reiterated, however, that in the vast majority of cases no statistically significant correlation could be detected between KPIs derived from the 'airport value tree' and based on business fundamentals and conventional multiples accounting for external factors and market expectations. This holds true for the analysis of split samples as well, which can only control for some but not all external effects. Wherever the actual share price is involved, most notably regarding EV, the key value drivers comprising operating efficiency, capital productivity and capital structure appear to be the more accurate metric.

This alternative valuation approach is not prone to misleading effects resulting from the overall investment climate, IPOs, unfriendly takeover bids, share buyback programmes or sector revaluation. They all affect the market sentiment and dealings in securities and may drive prices as well as multiples not backed by the business, possibly leading to overheated markets. Therefore, airports should not be valued by traditional multiples exclusively, but also by alternative business-based key performance indicators, since market- (or price-) driven metrics do not adequately reflect the earning power, profitability, financial and assets position, and thus the true value of the company.

5. CONCLUSION AND OUTLOOK

It is essential to understand that airports are asset-backed businesses with long-term visibility of cost and revenue structures. This makes them attractive lending propositions for banks. As long as debt is cheaper than the return earned by the assets the funds are invested in, it is efficient to employ more capital in the business. What will ultimately determine successful management in this industry is the ability to phase capital allocation in such a way that it generates a maximum return. This requires project management as well as financial skills for a thorough phasing of major investment spending and an optimisation of the use of debt facilities and equity supply.

Although based on the same business model, not all airport earnings are created equal. Functional similarities mask profound operational and financial variations. For example,

comparatively low operating efficiency can be made up for by relatively high asset turnover and financial leverage. The individual value profiles visualize the distinctive features of the sample airports with different intensity of the ultimate value drivers, basically plotting an aggregated scorecard of key investment criteria. This is the added value of this valuation approach, which neither traditional nor other valuation techniques can equally accomplish.

Regarding investments in airports, this translates into a fundamental set of decision criteria as, for example, outlined by Kerrie Mather, CEO of Macquarie Airports (Map), in a recent ACI-interview: 1. A general (traffic) growth potential, 2. commercial potential, 3. margin growth potential, 4. existing physical capacity to accommodate future growth, 5. a regulatory framework allowing for a clear focus on investment and commercial opportunities, and 6. an appropriate capital finance structure (Airport Business Communiqué, 2006; see also Booth, 2008). It is quite evident that these decision criteria basically reflect the key value drivers of the driver-based alternative valuation approach introduced above. These are operating efficiency, asset utilisation or capital productivity and capital structure, and are summarised by the key performance indicators return on sales, asset turnover and financial leverage in model terms (see also Feldman, 2007).

Airports should not be valued with a single multiple but with measures recognising the key features of success of their value tree. The key value drivers comprising operating efficiency, capital productivity and capital structure appear to be the more accurate metric than price-driven market multiples not backed by the business. The alternative valuation approach is not prone to overall stock market fluctuations or sector revaluation and effects resulting from IPOs, unfriendly takeover bids or corporate share buyback programmes. Therefore, airports should not be valued by conventional multiples exclusively, but also by 'alternative' business-based key performance indicators, since market-driven metrics do not adequately reflect the financial position and true value of the company.

This approach is also expected to be much more reliable in times of a series of financial sector earthquakes, which recently forced American International Group (AIG) to sell its 50% stake in London City Airport (LCY). Moreover, it will be very interesting to see how the current global credit crunch and the resulting overall economic climate may affect airport privatisations and acquisitions. Several airports have already delayed infrastructure expansion as the crisis bites.

But as long as the underlying business fundamentals in terms of key investment criteria remain basically intact, there may even arise some interesting projects for potential buyers; if they only can be financed, which will be very difficult if an investor needs to borrow funding from banks. BAA's intended sale of London Gatwick (LGW) accelerated by the provisional findings of the UK Competition Commission's (CC) August 2008 interim report could be an acid test in unstable markets.

Additional research is indispensable, however, in order to complete this alternative approach to airport valuation, as this first stage primarily focused on establishing a framework and methodology and examined relations between the key value drivers and traditional valuation multiples applied by the investor community. The second stage will broaden the empirical basis in terms of scope of data and period under consideration. Due to the small peer group of publicly quoted European airport company observations from FYs 2003 and 2007 will be added. The analysis of partial factor productivity and financial ratios shall be detailed further for traffic growth and mix in terms of international passengers on the one hand and aeronautical revenue and concession income on the other. Furthermore, an in-depth share price analysis will be conducted, taking the performance relative to the local market index into consideration and accounting for capital expenditure and the investment cycle of airports. Resulting changes of KPIs over time will be analysed. Based on the anticipated findings, modelling of the relationships between market-driven multiples and KPIs embodying the roots value creation shall be pursued. Finally, implications for managing the value of airports will be addressed.

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LIST OF ABBREVIATIONS

ACI	Airports Council International
ADF	AdF-Aeroporto di Firenze SpA
ADP	Aeroports de Paris Group, France
AIG	American International Group
ATM	Air Transport Movements
BAA	BAA plc Group, (now BAA ltd) UK
CC	Competition Commission
CEO	Chief Executive Officer
CEPS	Cash Earnings per Share
CPH	Copenhagen, Denmark
DCF	Discounted Cash Flow
EBIT	Earnings before Interest and Taxes or Operating Profit
EBITDA	Earnings before Interest, Taxes, Depreciation and Amortization
EPS	Earnings per Share
EUR / €	Euro (currency)
EV	Enterprise Value
EV/EBIT	Enterprise Value versus Earnings before Interest and Taxes
EV/EBITDA	Enterprise Value over Earnings before Depreciation, Interest and Taxes
EV/Sales	Enterprise Value to Sales (Revenue)
FCF	Free Cash Flow
FLR	Florence, Italy
FRA	Financial Ratio Analysis
FRA	Frankfurt, Germany
FY	Fiscal Year
GDP	Gross Domestic Product
IATA	International Air Transport Association
IPO	Initial Public Offering
KPI	Key Performance Indicator
LCY	London City Airport
LGW	London Gatwick Airport
Mkt Cap	Market Capitalization

P/CEPS	Price / Cash Earnings per Share
P/CF	Price / Cash Flow
P/E	Price / Earnings
PAX	Passengers
PFP	Partial Factor Productivity
RevEx	Revenue / Expenditure Ratio
RAB	Regulated Asset Base
ROA	Return on Assets
ROE	Return on Equity / Shareholders' Funds
ROI	Return on Investment
ROS	Return on Sales / Total Revenue
SAVE	SAVE SpA Group
SBC	Swiss Bank Corporation
SBU	Strategic Business Unit
SOTP	Sum-of-the-Parts
S1	Subgroup 1
S2	Subgroup 2
t	Tonnes
UBS	Union/United Bank(s) of Switzerland
VCE	Venice, Italy
VIE	Vienna, Austria
WACC	Weighted Average Cost of Capital
WLU	Work Load Unit
WLU/Assets	Asset Utilisation
(x)	Times
ZRH	Zurich, Switzerland