

**An Analysis of the Effects of Operating and Financial Leverage
on the Major U.S. Air Carriers' Rates of Return: 1990-2003**

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I. Introduction:

The history of the US airline industry has been composed of a series of “boom/bust” cycles, capped by periods of near panic. The record losses of the early 1990s were followed by the record profits of the late 1990s, only to be supplanted again by the record economic losses starting in 2000 (and exacerbated by the events of 9/11). Since deregulation, over 145 carriers have filed for receivership, and the industry still remains in fragile shape in spite of the success of a few members like Southwest and Jet Blue. Many industry analysts argue that the industry’s problems are the result of high labor costs, fuel cost spikes, overcapacity, etc. The authors do not deny the effects of these factors on the carriers’ plight, but there is a deeper, more fundamental factor at work. That factor is the tremendous over leverage, both at the operating and financial levels, present to this industry. The purpose of this paper is to explore this leverage situation and examine the effects on air carrier profitability that results from this state.

II. The Nature of Risk in Air Transportation:

Almost from the onset, some industry experts argued that the long-term stability of the airline industry was adversely influenced by both the operating and financial cost structures of its members, as well as by its cyclical vulnerability.¹ On the operating side, the pressures of an intensely competitive marketplace and the inherently high fixed-cost structure of the industry pose a continual threat to industry stability. On the financial side, the highly-leveraged nature of airline financing leaves the industry particularly vulnerable to increases in interest rates and/or economic downturns.

This paper examines some basic risk measures that have been proposed to assess risk in the airline industry [Gritta, et.al., 1998]. Values for these risk measures have been computed for the major U.S. air carriers over the period 1990-2003 and are used to support the proposition that the airlines operate within a particularly risky environment. By highlighting the effects of leverage and the differences in carrier financial strategies, the paper will argue that high carrier debt burdens are inappropriate given the volatility of the industry.

All firms face three types of risk [Moyer, McGuigan & Kretlow, 2005]. The three levels of risk are business risk, financial risk and combined risk. Business risk can be defined as the variability in a firm’s operating profit, often referred to as earnings before interest and taxes (EBIT), over time and is generally attributable to the inherent nature of the firm’s operations and the environment within which it operates. This type of risk is driven primarily by the firm’s cost structure, product demand characteristics and intra-industry competitive position. Some companies may face high business risk solely because of external, and therefore largely uncontrollable, factors such as high-fixed costs, the

cyclical nature of its business, government regulation and intense competition.ⁱⁱ However, high business risk can also be the result of poor cost controls, low productivity or pricing practices which dilute revenues. The airline industry is high in business risk on virtually all these counts.

Financial risk is generally defined as the added variability in earnings available to a firm's common shareholders due to the use of debt to finance the acquisition of assets. It often represents the increased probability of insolvency that comes with excessive debt finance because interest on debt must be paid (unlike common stock dividends, which are paid at management's discretion). High financial risk may indicate that high interest charges are overwhelming a business enterprise, forcing it in some cases to seek court protection. Financial risk, unlike business risk, is not the product of the environment within which a company operates. Rather it results directly from a firm's conscious decision to use financial leverage (i.e., long-term debt or preferred stock) instead of issuing common stock to raise funds.

Combined (or total) risk, as the name suggests, refers to the risk that results from the interaction of both operating and financial risk. It is important to note that the interaction of the two risk types has a multiplicative, rather than an additive, effect. The impact of the combined effect can be extremely powerful, as will be evident from the discussion that follows

An important measure of a firm's business risk is its degree of operating leverage, referred to as DOL [Moyer et. al., 2005] Operating leverage generally refers to the firm's incurrence of fixed operating costs. As a general rule, high fixed costs create more unstable DOLs. As an elasticity measure borrowed from microeconomic theory, DOL actually measures the relative changes in operating profits (often referred to as EBIT, or earnings before interest and taxes) given changes in operating revenues. That is, it measures the X% change in operating profits that would be induced by a 1% change in operating revenues. The expression below shows the calculation:

$$\text{DOL} = \frac{\% \Delta OP}{\% \Delta OR} = \frac{\frac{\Delta q(p-v)}{q(p-v)-F}}{\frac{\Delta qp}{qp}} = \frac{\Delta q(p-v)}{q(p-v)-F} \times \frac{q}{\Delta q} = \frac{q(p-v)}{q(p-v)-F}$$

Where q is a firm's output and p , v and F are price per unit of output, variable cost per unit, and total fixed costs, respectively. Operating profit (EBIT) is thus $q(p-v)-F$ and the change in EBIT that results from an increase in q is therefore $\Delta q(p-v)$ since fixed costs do not change (by definition). Since qp is total revenue and qv is total variable cost, this can be simplified to:

$$\text{DOL} = \frac{R - V}{R - V - F}$$

The sign and the magnitude of DOL are both important indicators of risk. If revenues (R) exceed the sum of variable plus fixed costs ($V+F$), then the firm is above its operating break-even point and DOL is positive. A positive DOL indicates that as R increases, operating profits will increase (and vice versa). If $\text{DOL} = +4.0$, for example, this would indicate that a 1% increase in revenue would result in a 4% increase in EBIT. When R exceeds the sum of ($V+F$), DOL will take on a value between +1 and $+\infty$. A relatively small positive value for DOL indicates a relatively low business risk (i.e., low variability in operating profit), since changes in revenue will induce relatively small changes in operating profits. In contrast, the higher the fixed cost burden (F) in relation to ($R-V$), the higher the measured DOL, indicating a significantly higher level of business risk. Note that if the firm has no fixed costs ($F = 0$), then there is no operating leverage. Thus business risk would be low and DOL would equal +1.0.

If total costs ($V + F$) exceed operating revenues, then operating profits are negative and the situation is more severe. The negative sign indicates that when revenues increase, operating losses will decrease (and vice versa). In this case, relatively large absolute value for DOL implies a relatively high degree of variability in operating profits (losses), which can be dangerous since the firm is operating below its breakeven point. But such large negative values can actually be interpreted as less serious than very low negative numbers, since large absolute values indicate that current losses are relatively small and that a small increase in operating revenues can be expected to cut deeply into operating losses. This smaller absolute value would be especially alarming since (1) it reflects the large size of current operating losses and (2) it implies that positive changes in operating revenues will have only a minimal effect on reducing those losses. Negative DOL values can range between 0 and $-\infty$.

Finally, although fixed costs are generally seen as the key to determining the value of DOL, inefficient management policies affecting variable costs or gross revenues can also contribute to high business risk. In the airline industry, for example, factors such as poor cost controls or inefficiencies in a carrier's route structure can contribute to unfavorable DOLs. Reduced revenues caused by aggressive fare wars may have a similar effect.

Financial risk can be measured by its degree of financial leverage (DFL). This interest-driven measure reflects the responsiveness of net profit to changes in operating profit or EBIT. If I = interest, then as an elasticity measure, $\text{DFL} = \frac{\% \text{ change in net profit (NP)}}{\% \text{ change in operating profits (OP or EBIT)}}$, or more completely

$$\text{DFL} = \frac{\% \Delta \text{NP}}{\% \Delta \text{EBIT}} = \frac{\frac{\Delta \text{NP}}{\text{NP}}}{\frac{\Delta \text{EBIT}}{\text{EBIT}}}$$

Since $NP=R-V-F-I$ and $EBIT=R-V-F$, then

$$DFL = \frac{\frac{\Delta(R-V)}{R-V-F-I}}{\frac{\Delta(R-V)}{R-V-F}} = \frac{R-V-F}{R-V-F-I}$$

and this reduces to

$$DFL = \frac{EBIT}{EBIT - I}$$

As was the case with the concept of DOL, DFL is an elasticity measure, here measuring the percentage change in net profit ($R-V-F-I$) that would be produced by a 1% change in operating profits. It is usually assumed that tax rates are relatively constant, so that net profits before and after taxes will vary in unison. As in the case of DOL, both the sign and the magnitude of DFL are very significant.

A positive sign reflects the fact that the firm is above its financial breakeven (i.e., operating profits exceed interest). It also indicates that when operating profits increase, net profits will increase; when operating profits decrease, net profits will decrease. A low value of DFL here means that net profit is relatively large, (relative to operating profit), and that the variability in net profit (i.e., risk) is relatively small, and vice versa. For positive DFLs, values will range from +1 (when the firm is debt-free, i.e., when $I=0$) to $+\infty$ (when $I = \text{Operating Profit}$).

When interest exceeds operating profit, the firm is showing a net loss and DFL is negative. This negative DFL means that an increase in operating profit will lead to a decrease in the firm's net loss and vice versa. As in the case of negative DOLs, small absolute values for negative DFLs are especially serious since they indicate (1) large net losses for the firm and, (2) a lack of net loss responsiveness to improvements in operating profits. Negative DFL values will range from $-\infty$ to 0. It should also be noted that if operating profits are negative, DFL will be reported as negative irrespective of the value of I .

Combined (or total) risk, the product of its business and financial risks, can be measured by its degree of combined leverage (DCL). The interaction of these risks is multiplicative, not additive. That is, it is similar to the effect of levers in physics. The second lever (interest) magnifies what the first lever (fixed costs) has already magnified.

$$DCL = DOL \times DFL$$

$$= \frac{R - V}{R - V - F} \times \frac{R - V - F}{R - V - F - I}$$

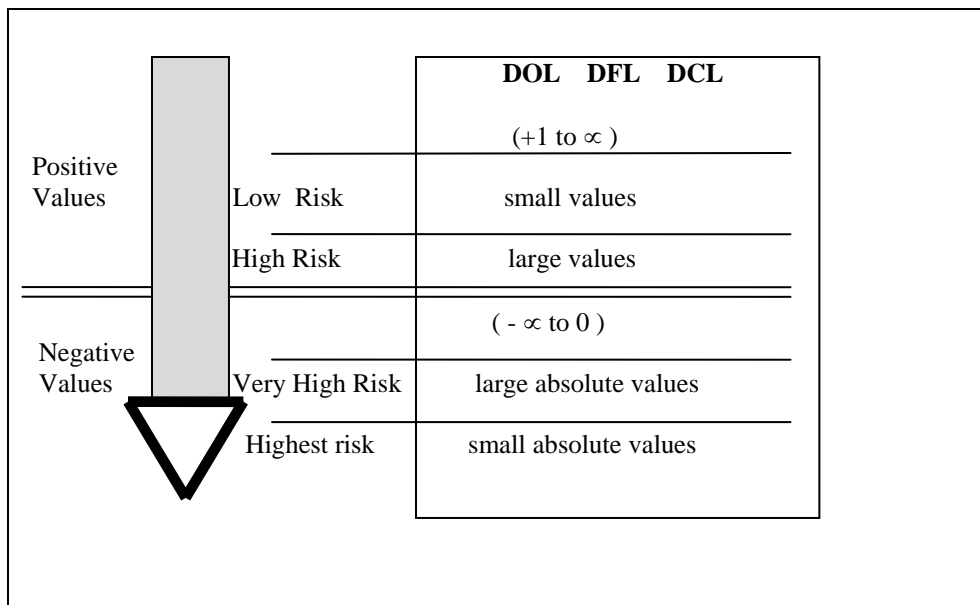
And

$$\text{DCL} = \frac{R - V}{R - V - F - I}$$

As defined here, DCL measures the percentage change in net profit that would be produced by a 1% change in operating revenues. If revenue (R) is greater than total costs (V+F+I), then the firm is operating above its total breakeven point and DCL will be positive. In such a case, smaller DCL values indicate relatively low combined risk since fixed costs and interest would be relatively low when compared to revenue. In the extreme, if DCL is +1, combined risk is minimal since fixed costs and interest would necessarily be 0. When total costs (V + F + I) exceed revenue, the firm is operating below its combined breakeven point and DCL will be negative. Low absolute values for DCL are especially alarming here since they indicate that losses are large and that responsiveness to improvements in revenue will be sluggish. Insolvency is more likely and the firm has a long way to go to restore profitability. It is important to note that, if either DOL or DFL is negative, or if *both* DOL and DFL are negative, DCL will be reported as negative. It is the *absolute values* that are important in this case.

The multiplicative interaction that produces combined risk highlights the danger of employing debt finance (significant financial risk) when a company faces a high level of business risk. To illustrate, assume two companies face the same large positive DOL, say a DOL of +20.0, indicating that a 1% decline in revenue can precipitate a twenty-fold decrease in net profits. Airline X, perceiving the business risk it faces and wary of any downturn in the economy, decides to utilize no long-term debt in its capital structure, and thus has a DFL of +1. Its resulting DCL is $20 \times 1 = +20$. Airline Y, on the other hand, chooses to ignore the incremental risk associated with debt financing and, as the result of interest on its debt, faces a DFL of +4.0. DCL for this firm is a far more dangerous +80 (20×4). Should the industry experience a slowdown in activity or face a recession, the latter carrier is clearly more vulnerable to failure. A 5% reduction in revenue will cause a 100% reduction in Airline X's net profits ($5\% \times 20$), a serious enough drop, but Y's net profits will plummet by 400% ($5\% \times 80$). The situation is even worse in cases where DCL values are negative with small absolute values, especially where such conditions persist over a long period of time. (As suggested earlier, this is because the base of losses is so large that the financial solvency of the enterprise in the long run may be severely threatened.) Of course, the situation is reversed if revenues increase. The levers then work in the positive direction.

The following should help clarify the discussion. As the arrow indicates, the direction of increasing risk is down the chart.



Because of the multiplicative effect of business and financial risks, most companies and industries try to balance risk. That is, a company high in business risk will tend to avoid significant long term debt finance. A company low in business risk will be more likely to use debt finance since it will tend not to threaten the firm's basic stability.ⁱⁱⁱ

III. Analysis of Air Carrier Risk (DOL, DFL and DCL) and Effects on Returns:

Values for the leverage measures described in Section II were calculated for the U.S. major U.S. air carriers for the years 1990-2003. Exhibit I shows the calculated DOL, DFL, and DCL. Appendix A graphs the median levels over time for the degrees of leverage for all the carriers. In the computation of these values, variable costs (V) were defined as the sum of flying operations, maintenance, passenger service, and air traffic costs. Fixed costs (F) are the summation of promotion and sales expenses, general and administrative costs, depreciation and amortization expenses, and various transportation related costs.)^{iv}

The difficult and volatile financial situation faced by the carriers is clearly evident for this exhibit.^v The vast majority of the carriers have very unsettling degrees of operating leverage as measured by DOL. In spite of this, however, many carriers have followed aggressive debt strategies as evidenced by the high degrees of financial leverage (DFL). The significant swings in these measures (from positive to negative and in magnitude) are the root cause of the "boom and bust" nature of this industry. This is a pattern that has persisted for many decades, including the years before deregulation [Gritta, 1998]. If the entire time period is considered, only Southwest is the exception to this rule.

		1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
American	DOL	50.01	217.74	-54.42	9.02	6.36	6.20	4.12	3.89	3.41	5.37	4.38	-1.18	-0.42	-3.22
	DFL	-0.36	-0.05	-0.17	3.62	2.01	2.36	1.32	1.10	1.05	1.15	1.13	-0.91	-0.88	-0.75
	DCL	-17.92	-11.85	-9.07	32.67	12.76	14.59	5.44	4.28	3.58	6.18	4.95	-1.07	-0.37	-2.43
Continental	DOL	-5.97	-5.36	-7.10	-33.49	-16.51	7.02	5.06	3.54	4.11	5.68	4.91	-6.15	-4.27	55.09
	DFL	-0.52	-0.68	-0.62	-0.23	-0.31	3.96	1.46	1.19	1.20	1.57	1.48	-0.59	-0.60	-0.10
	DCL	-3.13	-3.64	-4.44	-7.56	-5.08	27.77	7.40	4.21	4.93	8.93	7.29	-3.63	-2.58	-5.40
Delta	DOL	-10.12	-10.69	-3.47	-13.19	-18.09	4.49	8.44	3.41	3.28	4.66	3.65	-3.23	-2.87	1.05
	DFL	-0.71	-0.61	-0.80	-0.51	-0.44	1.32	1.61	1.14	1.10	1.24	1.42	-0.71	-0.62	-0.63
	DCL	-7.22	-6.53	-2.76	-6.77	-8.03	5.91	13.62	3.88	3.62	5.79	5.19	-2.29	-1.78	-0.66
Northwest	DOL	-16.07	-41.86	-34.03	9.48	4.23	3.47	3.07	2.95	-17.27	4.13	4.82	-2.05	-2.11	-6.51
	DFL	-0.56	-0.24	-0.63	2.78	1.35	1.35	1.20	1.19	-0.33	1.73	1.81	-0.72	-0.67	-0.40
	DCL	-9.03	-10.01	-21.54	26.31	5.70	4.69	3.69	3.51	-5.77	7.14	8.73	-1.48	-1.42	-2.59
Southwest	DOL	11.10	4.36	3.72	3.18	3.52	3.98	3.96	3.19	2.89	2.82	2.52	3.41	4.42	3.85
	DFL	1.65	3.43	1.48	1.25	1.22	1.23	1.20	1.14	1.09	1.07	1.07	1.12	1.34	1.23
	DCL	18.27	14.95	5.50	3.96	4.30	4.90	4.76	3.63	3.15	3.03	2.71	3.83	5.91	4.73

		1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
TWA	DOL	-0.34	-1.93	-0.42	154.92	-4.75	27.08	-4.89	-31.04	-13.49	-2.01	-2.65	-0.36	n/a	n/a
	DFL	-0.32	-0.53	-0.77	-0.67	-0.55	-0.36	-0.64	-0.22	-0.37	-0.78	-0.73	-0.91	n/a	n/a
	DCL	-0.11	-1.02	-0.33	-103.52	-2.62	-9.64	-3.12	-6.86	-4.99	-1.56	-1.93	-0.33	n/a	n/a
United	DOL	-72.77	-8.16	-9.96	18.49	9.18	6.18	5.05	4.88	4.24	4.49	8.53	-0.27	-0.53	-1.99
	DFL	-0.27	-0.74	-0.63	-10.40	2.92	1.69	1.34	1.28	1.28	1.30	3.82	-0.88	-0.84	-0.76
	DCL	-19.77	-6.03	-6.31	-192.28	26.77	10.45	6.74	6.26	5.40	5.85	32.60	-0.24	-0.45	-1.50
USAir	DOL	-2.12	-7.35	-3.71	-13.23	-3.13	9.62	7.23	5.57	3.70	15.28	-65.02	-1.53	0.87	-5.06
	DFL	-0.80	-0.53	-0.66	-0.37	-0.65	-3.95	3.53	1.77	1.29	20.13	-0.15	-0.80	-0.75	-0.65
	DCL	-1.69	-3.91	-2.43	-4.89	-2.03	-38.00	25.52	9.89	4.78	307.52	-9.82	-1.23	-0.65	-3.27
Alaska	DOL	17.64	14.10	-1.58	-7.52	5.38	5.02	92.32	7.34	2.92	3.26	-35.21	-6.06	-4.46	-41.60
	DFL	10.28	-1.69	-0.77	-0.51	2.20	2.22	1.57	1.23	1.10	1.08	-0.26	-0.58	-0.64	-0.20
	DCL	181.29	-23.88	-1.21	-3.80	11.83	11.12	144.76	8.99	3.20	3.51	-9.09	-3.51	-2.87	-8.15
America West	DOL	-12.17	-3.52	-5.08	4.44	3.98	4.00	1.46	1.39	3.76	3.76	-40.85	-0.64	-1.73	18.28
	DFL	-0.32	-0.60	-0.57	1.81	1.64	1.66	3.54	1.32	1.24	1.22	-0.28	-0.87	-0.67	-0.37
	DCL	-3.90	-2.13	-2.91	8.04	6.53	6.62	5.18	1.84	4.68	4.59	-11.64	-0.56	-1.15	-6.78

What is more worrisome is the number of years where leverage has adversely affected (that is, has been negative) the carriers. Exhibit II summarizes the results on that basis.

	1990-2003 (14 years)		
	DCL	DOL	DFL
American	6	4	6
Continental	8	7	8
Delta	8	7	8
Northwest	7	7	7
Southwest	0	0	0
TWA (12 years)	12	10	12
United	7	6	7
USAir	10	8	10
Alaska	7	6	7
America West	7	6	7

The number of carriers that have experienced negative total or combined leverage over the 14 year period is simply appalling. Only Southwest can claim stability over the period. All of the other carriers are at 50% or higher. TWA, US Airways, Continental and Delta are particularly noteworthy for their high rates of negative leverage. The pattern is similar to that found in a prior study [Gritta, 1998]. It is important to note the tremendous cyclicity of this industry seen on this exhibit. When things go well, they go very well. When they go back, they go very bad. This is directly caused by the high degrees of operating leverage being compounded by the presence of significant degree of financial leverage over time. The latter leverage helps in good times but magnified the hurt in down years.

The effect of leverage on air carrier rates of return can be seen in the following exhibits. As discussed above, high degrees of operating leverage are associated with more variable EBIT levels. This will translate into more variable rates of return on assets (ROA), since ROA is EBIT divided by total assets (EBIT/TA). High degrees of financial leverage will then magnify those changes in EBIT into even more volatile changes in net profits. The total effect of leverage, gauged by DCL, will be to destabilize the returns to equity (ROE). ROE is defined as net profits/equity (NP/EQ).

		1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
American	ROA	0.54%	0.12%	-0.44%	3.18%	5.12%	5.37%	7.35%	8.15%	9.09%	4.61%	5.37%	-9.08%	-11.98%	-5.46%
	ROE	-6.24%	-8.31%	-14.72%	4.91%	14.05%	11.27%	22.25%	24.62%	25.85%	12.19%	17.09%	-43.49%	-214.50%	-555.23%
Continental	ROA	-7.82%	-8.33%	-6.29%	-0.91%	-2.02%	5.69%	8.93%	11.91%	9.73%	5.71%	6.49%	-3.51%	-4.56%	0.28%
	ROE	-26.71%	-19.19%	-14.66%	-28.44%	-270.28%	19.64%	46.46%	59.13%	46.00%	19.13%	34.52%	-50.26%	-69.94%	-26.52%
Delta	ROA	-3.16%	-2.93%	-8.07%	-2.36%	-1.90%	8.69%	4.77%	12.36%	12.28%	6.40%	7.03%	-4.22%	-4.44%	-4.84%
	ROE	-15.43%	-18.76%	-37.02%	-28.34%	-29.19%	36.95%	13.90%	40.51%	39.14%	19.70%	19.41%	-33.53%	-42.54%	-82.84%
Northwest	ROA	-1.95%	-0.75%	-3.79%	3.87%	9.32%	8.51%	9.79%	9.70%	-0.93%	5.55%	4.74%	-4.83%	-4.45%	-1.48%
	ROE	-10.45%	-10.54%	-24.48%	5.82%	25.00%	19.17%	20.74%	19.80%	-8.76%	9.37%	7.28%	-24.90%	-44.70%	-20.18%
Southwest	ROA	5.55%	3.37%	7.94%	11.60%	10.32%	9.47%	9.39%	12.35%	14.53%	13.81%	15.27%	7.01%	4.66%	4.88%
	ROE	8.15%	2.87%	14.38%	22.08%	19.17%	17.54%	17.68%	15.34%	26.19%	25.67%	27.56%	14.00%	7.06%	7.77%
TWA	ROA	-4.91%	-12.89%	-17.45%	-8.52%	-8.63%	1.40%	-7.41%	-1.05%	-2.55%	-16.01%	-11.54%	-21.54%	-4.77%	7.07%
	ROE	-71.88%	-82.93%	-41.59%	-2024.16%	-100.22%	-37.06%	-131.35%	-49.35%	-95.03%	-257.86%	-73.99%	-215.80%	-163.52%	402.67%
United	ROA	-0.68%	-4.95%	-4.11%	2.43%	4.29%	7.30%	8.76%	7.61%	7.62%	6.30%	1.88%	-14.54%	-12.16%	-6.84%
	ROE	-11.29%	-41.17%	-106.15%	-4.21%	-316.15%	354.71%	62.11%	35.34%	30.97%	18.61%	2.18%	-123.41%	-425.76%	-45.36%
USAir	ROA	-8.39%	-3.07%	-5.59%	-1.89%	-7.57%	3.44%	4.98%	7.09%	11.25%	2.13%	-0.39%	-11.58%	-10.54%	-5.05%
	ROE	-28.68%	-18.13%	-66.39%	-85.32%	-284.88%	-19.10%	-122.70%	29.98%	45.08%	0.55%	-16.56%	-378.57%	-45.59%	-735.66%
Alaska	ROA	1.73%	1.78%	-10.01%	-2.81%	4.99%	5.74%	6.47%	9.71%	12.59%	8.92%	-0.51%	-2.36%	-2.86%	-0.34%
	ROE	0.52%	-3.09%	-48.46%	-21.85%	9.85%	10.49%	14.41%	25.08%	32.37%	24.51%	-6.81%	-16.19%	-22.07%	-7.76%
America West	ROA	-2.66%	-9.24%	-7.08%	11.69%	9.47%	10.06%	4.30%	10.51%	12.41%	11.90%	-0.71%	-17.81%	-10.05%	1.32%
	ROE	-230.56%	-119.85%	-47.63%	-28.42%	14.97%	14.39%	3.11%	17.95%	20.69%	18.41%	-5.07%	-49.86%	-82.41%	-18.18%

The impact of the leverage detailed in Exhibit I is clearly seen in the returns on Exhibit III. The following Exhibit IV summarizes the results of Exhibit III. This chart shows the average (mean) rate of return on both assets and equity for each carrier. In addition, the median return (that return which divides the distribution in half) is added because of the fact that extreme measures can distort the true picture.^{vi} Finally, the coefficient of variation (CV) is provided.

		Exhibit IV			
Carrier		Return	SD	Median	CV
American	ROA	1.6%	6.4%	3.9%	+4.0
	ROE	-50.7%	157.6%	8.1%	-3.1
Continental	ROA	1.1%	6.9%	-0.3%	+6.3
	ROE	-20.1%	82.0%	-16.9%	-4.1
Delta	ROA	1.4%	6.9%	-2.1%	+4.9
	ROE	-8.4%	37.1%	-17.1%	-4.4
Northwest	ROA	2.4%	5.6%	1.6%	+2.3
	ROE	-2.6%	21.1%	-1.5%	-8.1
Southwest	ROA	9.3%	3.9%	9.4%	+0.4
	ROE	16.1%	7.7%	16.4%	+0.5
TWA	ROA	-7.8%	7.8%	-8.0%	-1.0
	ROE	-210.2%	543.5%	89.0%	-2.6
United	ROA	0.2%	7.7%	2.2%	+38.5
	ROE	-40.7%	179.9%	-7.8%	-4.4
US Air	ROA	-1.8%	6.9%	-2.5%	-3.8
	ROE	-123.3%	212.4%	-37.1%	-1.7
Alaska	ROA	2.4%	6.1%	1.8%	+2.5
	ROE	-0.6%	22.1%	-1.3%	-36.8
America West	ROA	1.7%	9.9%	2.8%	+5.8
	ROE	-35.2%	70.4%	-11.6%	-2.0

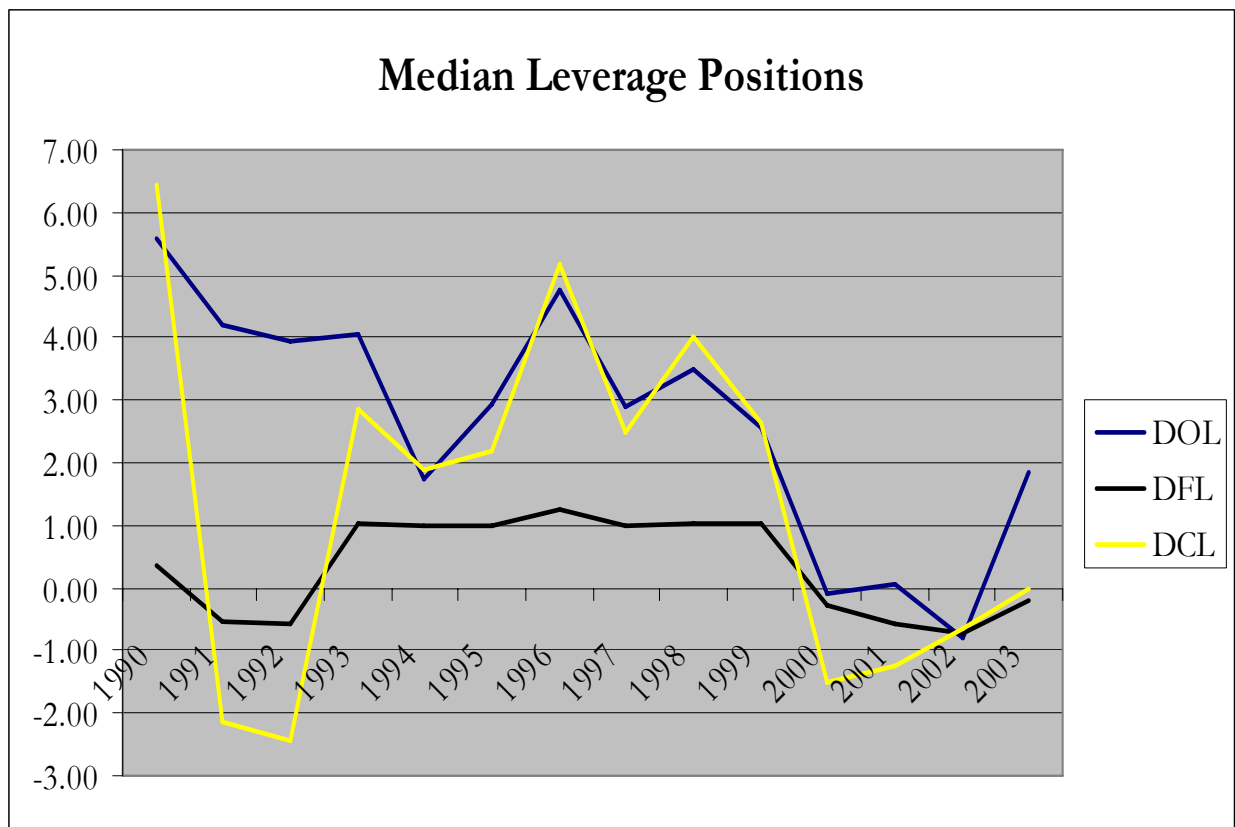
CV is computed by dividing the standard deviation of a population by its mean. It helps in comparisons when there are large differences in the cross-sectional means. A small positive CV value, lower volatility relative to positive firm performance, is viewed as stable strength. A small negative CV value, lower volatility relative to negative firm performance, is viewed as consistent weakness.

For a majority of the carriers the CV of their ROA is positive, and, as expected, Southwest has the strongest CV with a value of 0.4. The two exceptions are TWA and US Air, whose small negative ROA CVs confirm their steady poor performance over our sample period. ROE, which includes the effects of leverage, illustrates a much worse picture of the airline industry. All the airlines in our sample, save Southwest, have negative ROE CVs. The results in Exhibit IV confirm the negative effects of leverage on our sample firms. The graph below shows the results charted over time.

IV. Conclusion:

The volatile financial situation faced by airline carriers is evident in the significant swings in the degrees of leverage and the consistently negative ROE ratios for the firms in our sample. With the exception of the consistently positive figures of Southwest and the consistently negative figures of TWA, the other eight airlines exhibit a predictable boom – bust cycle over the 14 years of our sample brought on by the effects of both operating and financial leverage.

APPENDIX A-Levels of DOL, DFL and DCL for all carriers



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ⁱ Frederick [1961] was one of the first to discuss the cost structure of the air carriers and its effects on risk. That the industry has been very cyclical has been demonstrated in several early studies, including Ghosal,[1981] and Jung and Fugii [1976]. And this was long before deregulation increased its cyclicity.

ⁱⁱ Brigham [2004] has noted that airlines must invest heavily in fixed assets, which results in high operating leverage. This situation is therefore, to some degree, outside the control of management.

ⁱⁱⁱ The need to balance business and financial risk is a principle of finance advanced in virtually every financial management textbook [Moyer]. Gritta [1975] and Gritta, Seal and Hicks [2003] found this to be true in a several empirical studies contrasting levels of business, financial and total risk facing the U.S carriers with risks levels in a large sample of other industries..

^{iv} The accounts used are the standard account lines presented in the publication, *Air Carrier Financial Statistics*. One point must be noted here: To the extent that some airline variable costs, such as fuel, are “sticky” or “constant” in the economic lexicon (or as accountants would say are step-variable in nature), the analysis of the DOL presented in this paper actually *understates* the true level of risk in the airline industry. Decades ago Caves [1962] argued that, to a large extent, costs which might appear to be structurally quite variable, may be in fact far less so in the airline industry. As traffic declines, classical variable costs, such as fuel, cannot be cut immediately in response to the decline in traffic. Hence, they behave in a “sticky” manner, increasing operating leverage.

^v As described earlier, the most severe conditions a carrier can face are (1) Small negative DOLs, DFLs, and DCLs, the latter being the most severe; and (2) Volatile DOLs, DFLs, and DCLs over time. According to the discussion in section II, there are several reasons for this. First, very small negative DCLs indicate considerable financial distress since net profits (EBIT-I) are strongly negative and the carrier could default on loan payments (interest, principal, and lease obligations.) Several bankruptcy studies [Goodfriend, et.al, 2004] and [Gritta, Davalos and Chow, 2003] clearly demonstrate the effect of excess leverage on carrier solvency. For a list of all the studies, see Gritta [Handbook]. Second, volatility (extreme variability) is abhorrent to stockholders and other investors, unless compensated by commensurably higher rates of return. Investors, ex-post, must perceive that they will be rewarded for assuming risk. Ex-ante, their expectations may not be fulfilled. [Jones,2004].

^{vi} For example, American’s huge negative ROE of -555.2% distorts the average return for that carrier because the negative return is so large. In turn, that return is distorted by the carrier’s very small positive equity, itself a function of past losses eating into