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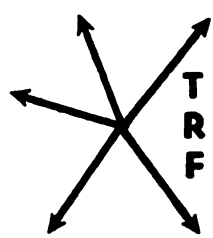


**TRANSPORTATION RESEARCH FORUM**

# Profit Sensitivity and Leverage for Solvent Western Railroads

*by Brian Belt, Ph.D.**

## INTRODUCTION

THE CONCEPT of the leveraging impact of fixed costs on profit is well documented in finance textbooks; however, the idea of making intra-industry and/or inter-temporal comparisons is relatively new (e.g., see [4], [5] or [7]). One reason why such research has not been reported is the lack of intra-industry data of cost structures. Recent Securities and Exchange Commission (SEC) reporting requirements for 10K reports have altered that data deficiency; the SEC requires corporations to itemize the following six (6) costs: (1) depreciation; (2) rents; (3) interest on long-term debt; (4) property and non-employment taxes; (5) pension expenses; and (6) maintenance and repair expense [7]. Although each of these—e.g., pension expenses—is not necessarily fixed over time, Pakkala argues that "each element . . . is essentially fixed in the short term, assuming an ongoing business" [7, p. 47]. Obviously, other expenses also may be fixed, but these aren't readily identifiable under current reporting practices.

The "fixity" of costs in the railroad industry is an area of some controversy. The railroad industry has a widely held reputation for high fixed costs—both operating and financial. For example [2, Aug. 25, 1978, p. 1179]:

> The effect of the grain movement on railroad profits points up the huge operating and financial leverage that is inherent in the railroad business . . . . Most railroads make heavy use of debt, and this adds financial leverage . . . . Therefore, when traffic picks up, profits rise even faster . . .

Although railroads do have heavy fixed costs associated with their rolling stock, roadways, and facilities, these operating fixed costs are not inordinately high relative to other industries. For example, a recent study of 1976 operating ratios (operating expenses divided by operating revenues) showed Class I railroads with the next-to-the-lowest operating ratios out of seven industries surveyed [5, p. 178]. Since profit volatility is directly related to the operating ratio, the researcher showed that only electric utilities are less operating-profit-volatile than railroads while telephone utilities, motor carriers, gas utilities, industrials, and air carriers (the most volatile) are more profit-volatile. Realizing that all costs are variable in the long run, a recent Association of American Railroads (AAR) study concluded that "for a time-frame of twenty-four months, ninety percent of railroad expenses can be considered variable." [2, p. 4].

The "fixity" of railroad operating costs may not be captured adequately by the SEC cost reporting requirements. The biggest problem deals with the costs reported as "maintenance and repair." Recent Interstate Commerce Commission (ICC) accounting changes now require that these costs include, among other items, "car rentals"—an item that is clearly variable dependent on the frequency and distance of hauling non-owned cars. Further, maintenance includes "maintenance of way"—accounting items that are expensed under ICC requirements; these costs would be primarily capitalized by nonrailroading companies. Railroad maintenance expenses may well be contra-cyclical for stronger railroads; i.e., when utilization rates are lower, maintenance can be performed with lower impact on operational efficiency. In addition, railroad maintenance often is contra-seasonal—which, with the possibility of the contra-cyclical aspect, may make SEC-reported maintenance a better fixed cost estimator than might be expected from analyzing ICC accounting requirements.[1]

The fixed operating costs create operating leverage, but total leverage also is impacted by the level of fixed cost financing—particularly debt. Railroads retain an image of being debt ridden for two reasons: (1) the growth and expansion period of railroading was predominantly debt financed; and (2) recent railroad bankruptcies are highlighted by the inability to service existing debt. Western District railroads—as opposed to the more financially-pressed eastern railroads—had long-term debt-to-equity ratios of about 54% in 1978 which was not substantially different from many industrial sectors [12]. Further, Schwartz and Aronson showed that the financial

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ing use of debt as well as preferred stock in the 1923-1962 time period in spite of the economy-wide trend to heavier debt usage [8]. In fact, of the industries surveyed, the railroads were the only ones with a clear downward trend in debt usage [8]. After considering the above discussion with respect to both operating and financial leverage, the railroads may not deserve their reputation for being highly "levered."

## RESEARCH EFFORT

This study computes, compares, and analyzes the effects of fixed costs on profit sensitivity for Western District railroads. To be included in this research, the railroad (or its holding company) had to: (1) be classified as Western District; (2) be solvent with some profits throughout 1975-79; and (3) at least 50% of revenue derived from railroad operations.[2] The railroads used in this study—as well as 1976 and 1978 railroading contributions to revenue and profits—are shown in Table 1.

The degree of operating leverage (DOL) and degree of combined leverage (DCL) are calculated for each railroad for years ending 1976, 1977, and 1978. The cost structure—i.e., fixed versus variable—is determined from 10K reports; for the purposes of this study, any cost not classified as one of the above-listed "fixed" costs is considered to be variable. The computed DOL and DCL are determined using the following definitions (e.g., see [15, pp. 680-3]):

$$(1)\quad DOL_{\text{at some output}} = \frac{\text{Total Revenue} - \text{Total Variable Cost}}{\text{Total Revenue} - \text{Total Variable Cost} - \text{Total Operating Fixed Cost}} \quad \text{and}$$

$$(2)\quad DCL_{\text{at some output}} = \frac{\text{Total Revenue} - \text{Total Variable Cost}}{\text{Total Revenue} - \text{Total Variable Cost} - \text{Total Fixed Operating Cost} + \text{Other Income} - \text{Interest}}$$ [3]

Formulas (1) and (2) are based on a linear assumption of both revenues and costs relative to quantity of service rendered, i.e., revenue-ton miles. The linear assumption on the revenue side is probably quite close due to ICC price regulation; the linearity assumption on the cost side is more suspect if economies of scale are possible in the short run.

Actual leverage effects are calculated from the income statement for each year 1977 through 1979, using the interpretative definitions [15, pp. 680-3]:

$$(3)\quad DOL = \frac{\%\text{ change in Net Operating Income}}{\%\text{ change in Revenue-Ton Miles}} \quad \text{and}$$

$$(4)\quad DCL = \frac{\%\text{ change in Earnings Before Taxes}}{\%\text{ change in Revenue-Ton Miles}}.$$

Earnings Before Taxes (EBT) are used in lieu of Earnings After Taxes (EAT) or Earnings Per Share (EPS) because the effective tax rates vary across the sample over time. For example, the effective tax rates for the western railroad group varied from 2.1% (FN) to 35.2% (SOO) for 1977. For the 1976-79 interval, the effective tax rate of FN varied from 2.1% to 25.0%. These effective tax rate variations are due to depreciation timing differences, investment tax credits, loss carryback/forward, etc. Hence, pre-tax income (EBT) must be used to determine the leverage effects of volume changes and, thus, eliminate the impact of effective tax rate changes.

Formulas (3) and (4) can be interpreted as representing profit sensitivity (the output) relative to revenue-ton miles (the input). For example, restating formula (4) leaves: (% Change in EBT) = DCL (% Change in Revenue-Ton Miles). Therefore, DCL is the multiplier in the relationship: what happens to profit (output) as the result of changes in revenue-ton miles (output). If DCL is 2x, then a 10% increase in revenue-ton miles should result in a 20% increase in EBT, ceteris paribus.

The levels of leverage effect for the values computed from formulas (1) and (2) for years ending 1976, 1977, and 1978 are compared to actual leverage effects as determined by formulas (3) and (4) for the years 1977-79. The leverage effects are computed from (1) and (2) based on the assumed cost structure for each railroad as shown in Table 2. These leverage effects are computed at the end of any period for application into the next period; hence, the forecasted leverage effect for year-ending 1976 should be compared to the actual leverage effect for 1977.

The differences between computed and actual leverage effects are discussed in light of economic conditions and other pertinent factors. If railroads are truly heavily fixed-cost oriented, then one hypothesis is that the larger the percentage of railroad revenues, the more sensitive profits are to revenue-ton miles variability. In addition, an inter-temporal analysis of leverage effects will be made to see what effect the cyclical expansion of the economy during 1976-79 had on leverage effects. Another hypothesis in-

TABLE 1

## WESTERN DISTRICT RAILROAD HOLDING COMPANIES AND THEIR RAILROADING EXPOSURE

| Company Name | Stock Symbol | RR as % of Total Revenues 1976 | RR as % of Total Revenues 1978 | RR as % of Net Operating Income 1976 | RR as % of Net Operating Income 1978 |
|---|---|---|---|---|---|
| Burlington Northern | BNI | 92 | 91 | 94 | 49 |
| Chicago & Northwestern | CNWEA | 100 | 100 | 100 | 100 |
| Kansas City Southern | KSU | 84 | 87 | 58 | 82 |
| Missouri Pacific | MIS | 79 | 74 | 77 | 74 |
| Rio Grande Ind. | RGI | 81 | 82 | 86 | 84 |
| St. Louis-San Francisco | FN | 100 | 96 | 98 | 98 |
| Sante Fe Ind. | SFF | 72 | 78 | 28 | 47 |
| Soo Line | SOO | 100 | 100 | 100 | 100 |
| Southern Pacific | SX | 87 | 84 | 70 | 51 |
| Union Pacific | UNP | 57 | 52 | 58 | 53 |

vestigated is that as the economy expanded, the individual railroads should have moved farther from their break-even points and thus, the effects of leverage should have declined.

## RESEARCH RESULTS

As indicated above, the assumed fixed costs for each railroad are shown in Table 2. Also shown are fixed costs as a percentage of revenues as well as the operating ratio (see [7] for discussion of the former on profit volatility and see [5] for discussion of the latter). The average fixed cost as a percentage of western railroad revenues declined slightly from 41.3% in 1976 to 40.9% in 1978, while the average operating ratio declined from 84.6% in 1976 to 83.2% in 1978. Both of these declines for the railroads support the idea that, as a group, the western district railroads are moving away from their respective break-even points as the cyclical expansion in the economy proceeds.

Table 3 shows the computed or forecasted values of DOL and DCL for each railroad for 1976-78. In general, both forecasted leverage effects decline slightly over time during the economic expansion of 1976+. The decline in leverage was pronounced in 1977, but then increased slightly for the group in 1978; 1978 was the year in which inflation began to outrun ICC rate relief reviews.[4] The results support the hypothesis that railroads do have high fixed costs, but become somewhat less profit sensitive as the business cycle proceeds from a recession—particularly in the early stages of an economic expansion. A correlational analysis of the 1978 percentage of railroad revenues (Table 1) versus the 1978 computed DOLs shows a correlation coefficient (r) of +0.56; 1978 percentage rail revenues versus 1978 computed or forecast DCLs also has an "r" of +0.56. These findings support the hypothesis that profit sensitivity (i.e., leverage effects) is related positively to the proportion of railroad operations. Further, about 30% ($r^2$ or the coefficient of determination) of the variation in profit sensitivity can be ascribed to variability in the proportion of railroading operations.

The actual level of leverge effects is shown in Table 4. Negative values in Table 4 indicate that revenue-ton-miles declined or profits declined in spite of increases in revenue-ton-miles. For example, BNI had negative leverage effects, but was not operating in the loss area [15, p. 72]; that is, revenues increased during 1977, but profits declined. As with the leverage effects computed based on the assumed fixity of costs (Table 3), the actual profit volatility declined as the economy expanded during the first two years from the cyclical low.

The correlation coefficient of railroad revenues as a percentage of 1978 total revenues versus actual 1979 DOLs was +0.51, while the "r" compared to actual DCLs was +0.44.[5] The correlation coefficients have positive signs; hence, profit sensitivity is directly related to

## TABLE 2
## WESTERN DISTRICT RAILROAD FIXED COST ESTIMATES
## ($ Millions)

| 1976 | BNI | CNWEA | KSU | MIS | RGI | FN | SFF | SOO | SX | UNP | Ind. Totals or Ind. Ave. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Depreciation | $ 86.8 | $ 21.8 | $ 9.1 | $ 41.7 | $-14.2 | $ 15.0 | $ 82.2 | $ 7.1 | $131.3 | $129.7 | |
| Rentals & Leases* | 38.2 | 38.5 | 12.8 | 69.0 | 4.7 | 5.0 | 20.1 | 13.7 | 31.5 | ** | |
| Interest | 65.3 | 25.7 | 7.2 | 68.3 | 9.0 | 11.9 | 46.4 | 6.7 | 65.8 | 60.7 | |
| Non-Inc. or Empl.Tax | 49.2 | 9.0 | 3.5 | 21.6 | 5.8 | 7.5 | 46.6 | 6.7 | 90.1 | 54.1 | |
| Pensions | 13.0 | ** | ** | 7.8 | 1.6 | 1.6 | 68.2 | .7 | 13.1 | 16.4 | |
| Maint. & Repairs | 509.2 | 134.8 | 45.3 | 327.6 | 47.4 | 94.0 | 357.0 | 46.9 | 481.9 | 335.8 | |
| TOTAL FIXED COSTS | $ 761.7 | $227.8 | $77.9 | $536.0 | $ 82.7 | $135.0 | $620.5 | $81.8 | $813.7 | $596.7 | $3,933.8 |
| Fixed Costs as % of Total Revenues | 40.2% | 43.1% | 43.7% | 41.6% | 41.1% | 42.0% | 38.9% | 43.2% | 50.0% | 28.9% | 41.3% |
| Operating Ratio (%)*** | 88.1% | 90.5% | 86.9% | 82.5% | 79.7% | 87.5% | 82.0% | 83.4% | 84.9% | 80.6% | 84.6% |
| 1977 | | | | | | | | | | | |
| Depreciation | $ 92.0 | $ 21.9 | $13.9 | $ 46.3 | $ 14.8 | $ 17.7 | $ 85.2 | $ 7.7 | $138.1 | $147.6 | |
| Rentals & Leases* | 49.5 | 41.5 | 11.2 | 70.5 | 6.4 | 5.0 | 34.4 | 15.1 | 34.9 | ** | |
| Interest | 68.1 | 25.9 | 6.8 | 70.7 | 9.0 | 14.6 | 49.7 | 7.6 | 79.4 | 66.8 | |
| Non-Inc. or Empl. Tax | 52.0 | 4.8 | 3.8 | 20.5 | 5.5 | 7.3 | 51.1 | 6.8 | 100.2 | 60.0 | |
| Pensions | 12.1 | ** | ** | 8.2 | 2.1 | 1.9 | 77.0 | .8 | 15.3 | 18.1 | |
| Maint. & Repairs | 594.3 | 148.9 | 46.7 | 369.5 | 51.0 | 88.3 | 438.7 | 56.3 | 536.2 | 380.7 | |
| TOTAL FIXED COSTS | $ 873.0 | $243.0 | $82.4 | $585.7 | $ 88.8 | $134.8 | $736.1 | $94.3 | $904.1 | $673.2 | $4,415.4 |
| Fixed Costs as % of Total Revenues | 41.4% | 43.2% | 42.8% | 38.4% | 40.6% | 37.8% | 39.8% | 43.4% | 50.4% | 26.4% | 40.4% |
| Operating Ratio (%)*** | 88.8% | 89.9% | 80.3% | 81.8% | 78.5% | 87.8% | 81.5% | 82.0% | 84.5% | 79.2% | 83.4% |
| 1978 | | | | | | | | | | | |
| Depreciation | $ 98.5 | $ 22.7 | $15.5 | $ 51.0 | $ 15.3 | $ 18.2 | $ 93.8 | $ 8.1 | $149.4 | $166.8 | |
| Rentals & Leases* | 57.1 | 56.8 | 13.7 | 79.5 | 7.4 | 5.2 | 39.6 | 16.6 | 27.4 | ** | |
| Interest | 73.6 | 26.8 | 7.9 | 72.5 | 8.0 | 17.1 | 53.2 | 8.5 | 81.1 | 68.3 | |
| Non-Inc. or Empl. Tax | 60.7 | 6.7 | 3.9 | 18.7 | 6.0 | 7.2 | 49.4 | 6.4 | 91.4 | 67.0 | |
| Pensions | 17.8 | .2 | ** | 7.5 | 2.5 | 2.3 | 83.4 | .8 | 17.1 | 19.2 | |
| Maint. & Repairs | 916.7 | 177.9 | 53.3 | 408.9 | 66.2 | 99.3 | 481.6 | 67.8 | 619.5 | 450.7 | |
| TOTAL FIXED COSTS | $1224.4 | $291.1 | $94.3 | $638.1 | $105.4 | $149.3 | $801.0 | $108.2 | $985.9 | $772.0 | $5,169.7 |
| Fixed Costs as % of Total Revenues | 48.4% | 44.7% | 41.1% | 37.6% | 40.3% | 37.8% | 38.2% | 43.6% | 51.4% | 25.8% | 40.9% |
| Operating Ratio (%)*** | 88.5% | 91.1% | 78.9% | 81.2% | 76.8% | 85.9% | 82.0% | 81.6% | 86.4% | 79.5% | 83.2% |

*Leases include both operating and capital leases expenses.
**Not reported since amount was not material
***Operating expenses divided by operating revenues

SOURCES: Individual company 10-K and annual reports, 1976-9; Standard and Poor's "Stock Reports," and "Industry Surveys," various issues.

## TABLE 3

## COMPUTED LEVERAGE EFFECTS*
## [Tabular Values are Times (x)]

| Year Ending | Western District Railroad | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1976 | BNI | CNWEA | KSU | MIS | RGI | FN | SFF | SOO | SX | UNP | Western District Railroad Average: |
| DOL* | 5.7 | 8.3 | 5.3 | 3.5 | 3.5 | 5.5 | 4.0 | 3.9 | 5.7 | 2.7 | 4.8x |
| DCL* | 9.7 | 26.1 | 9.3 | 4.6 | 4.3 | 8.1 | 4.6 | 4.3 | 7.0 | 3.4 | 8.1x |
| 1977 | | | | | | | | | | | |
| DOL* | 6.6 | 7.5 | 4.2 | 3.2 | 3.5 | 5.0 | 3.9 | 3.8 | 3.2 | 2.5 | 4.3x |
| DCL* | 12.6 | 16.4 | 5.7 | 4.1 | 4.3 | 8.0 | 4.2 | 4.1 | 3.4 | 3.0 | 6.6x |
| 1978 | | | | | | | | | | | |
| DOL* | 7.0 | 8.6 | 3.6 | 3.2 | 3.2 | 4.5 | 3.9 | 3.6 | 6.7 | 2.5 | 4.7x |
| DCL* | 10.9 | 18.0 | 4.7 | 4.0 | 3.6 | 7.5 | 4.2 | 3.9 | 8.4 | 2.9 | 6.8x |

*Computed leverage effect values are determined using the algebraic formulas (1) and (2), assuming Table 2 values are all the fixed costs, and any other cost is variable.

the proportion of railroading revenues. Profit sensitivity is, in turn, directly related to the "fixity" of costs as can be seen in formulas (1) and (2).

One interesting element of Table 4 is that actual profit sensitivity increased for 1979—several years after the economic expansion occurred. This increased sensitivity meant that profits grew much faster in 1979 relative to revenue-ton-mile growth than in the preceding years. The primary cause of this was the impact of ICC-granted rate increases which had lagged behind cost increases in 1977 and 1978. The general rate increase in December, 1978, obviously impacted 1979 results. The first three 1979 rate increases were small and fuel-related and, therefore, had little profit impact other than to pass through higher costs. The general tariff increase in October, 1979, was large enough to impact overall 1979 profits; therefore, those last five rate increases helped profits to grow faster than revenue-ton-miles.

A comparison of the forecasted (computed) leverage effects (Table 3) with actual leverage effects (Table 4) shows that the forecasted values overstated leverage effects for 1976/7 and 1977/8, but understated them for 1978/9. As discussed above, the 1979 experience was more heavily impacted by rate increases than by revenue-ton-mile growth. One reason why the computed values may

## TABLE 4

## ACTUAL LEVERAGE EFFECTS
## [Tabular Values are Times (x)]

| Year Ending | Western District Railroad: | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1977 | BNI | CNWEA | KSU | MIS | RGI | FN | SFF | SOO | SX | UNP | Western District RR Average *** |
| DOL* | -0.3** | -16.1** | 3.6 | 4.1 | 1.6 | 3.3 | 1.6 | 2.8 | 6.6 | 4.0 | 3.5x |
| DCL* | -0.8** | -60.5** | 6.6 | 5.6 | 1.7 | 3.1 | 2.3 | 3.0 | 9.1 | 5.1 | 4.6x |
| 1978 | | | | | | | | | | | |
| DOL* | 1.8 | 0.7 | 1.6 | 0.7 | 3.1 | 2.9 | 0.8 | 2.8 | -6.8 ** | 1.4 | 1.8x |
| DCL* | 2.9 | 1.1 | 1.9 | 1.0 | 3.8 | 2.6 | 0.7 | 3.1 | -7.8 ** | 1.5 | 2.1x |
| 1979 | | | | | | | | | | | |
| DOL* | 2.1 | -12.1** | -4.3 | 0.4 | 1.5 | -1.8** | 2.9 | 23.6 | 5.6 | 4.2 | 5.8x |
| DCL* | 2.6 | -27.9** | -4.2 | 1.3 | 2.1 | 4.4 | 3.3 | 31.2 | 14.5 | 4.9 | 8.0x |

*Actual leverage effect values are determined using the interpretative formulas (3) and (4).
**Negative values indicate that revenue-ton-miles declined or operating profits/EBT declined in spite of revenue-ton-mile increases.
***Western District Average leverage effects exclude negative (—) values.

have overstated actual values lies in the definition of costs—fixed versus variable. The arbitrary cost distinctions as reflected in Table 2 do not permit accurate forecasting of leverage effects. Further, the costs assumed to be fixed (Table 2) grew at a rate of over 14% per year (i.e., more than 1% per month). If costs are growing at this rate throughout the planning period, then the costs are clearly not fixed during a year. A better approach might be to use a shorter comparison period such as the first quarter of each year following the computed leverage effects (Table 3). Unfortunately, operations in western railroads are heavily seasonal due to weather and agricultural harvest shipping.

One area not explicitly shown in Tables 3 and 4 is the degree of financial leverage (DFL); arithmetically, the DFL is shown as:

$$(5)\quad DCL = DOL * DFL \text{ or}$$
$$DFL = \frac{DCL^{\delta}}{DOL}.$$

By inspecting Table 3 and 4, the DFL is about 1.5 times for the computed leverage effects (Table 3), and about 1.3 times for the actual leverage effects (Table 4). Hence, the use of financial leverage has relatively small impact on profit sensitivity for the average western railroad. The dominance of operating leverage (DOL) versus financial leverage (DFL) on overall profit sensitivity was shown numerically in an earlier study [3].

## CONCLUSIONS

This research suggests that western railroads are relatively fixed-cost businesses; the strong positive correlation between profit sensitivity and the proportion of railroading revenue tends to support this view. This view of railroads as heavier-fixed-cost organizations is not universally accepted (e.g., see: [2]). The fixed costs of the railroads are more heavily operating fixed costs as opposed to financial fixed costs. The western railroads as a group moved away from their breakeven points as the economic expansion following 1975 proceeded in spite of a growth rate of almost 15% per year in the assumed fixed costs. This movement away from breakeven levels is shown by the declining leverage effects through 1978. 1979 leverage effects are affected by several general rate increases.

The results of this study may provide useful insights for railroad managers, security analysts, ICC rate analysts, or transportation experts who are currently trying to revise and rationalize the U. S. railroad system. The results from this study should prove particularly useful since the research is based on a dynamic (flow) analysis rather than a static (stock) analysis of change in profits.

## SELECTED BIBLIOGRAPHY


[1] Annual and 10K Reports — 1976-1979.

[2] Association of American Railroads (AAR) Staff Memorandum 79-5, "Railroad 'Fixed Costs'," July, 1979, Washington, D.C.

[3] Belt, Brian, "Fixed Costs, Leverage, and Profit Sensitivity for Selected Midwestern Railroads," *1980 Proceedings*, 10th Annual Southeastern AIDS, Orlando, Florida, February, 1980.

[4] Gritta, Richard D., "The Effect of Financial Leverage on Air Carrier Earnings: A Break-Even Analysis," *Financial Management*, Summer, 1979, Vol. 8, pp. 53-60.

[5] Gritta, Richard D., "The Significance of the Operating Ratio in Air Transportation," *Proceedings — Twentieth Annual Meeting, Transportation Research Forum*, Chicago, Illinois, October, 1979, pp. 177-9.

[6] Moody's *Transportation Manual*, various years, Moody's Investor Service, New York.

[7] Pakkala, A. L. "Fixed Costs Impact Earnings Predictions." *Financial Analysts Journal*, Jan.-Feb., 1979, Vol. 35, pp. 46-48.

[8] Schwartz, Eli, and J. Richard Aronson, "Some Surrogate Evidence in Support of the Concept of Optimal Financial Structure." *Journal of Finance*, March, 1967, Vol. 22, pp. 10-18.

[9] Shalit, Sol S., "The Mathematics of Financial Leverage," *Financial Management*, Spring, 1975, Vol. 4, pp. 57-66.

[10] *Standard & Poors Industrial Survey*, April, 1979. pp. R41-R51.

[11] Stickney, Clyde P., "Analyzing Effective Corporate Tax Rates," *Financial Analysts Journal*, July-August, 1979, Vol. 35, pp. 45-54.

[12] *Value Line*, "Railroad (West) Industry Survey," Various issues.

[13] Vellenga, Daniel R. & Cattanach, Katherine A., "The Use of Operating and Financial Leverage in the Oil Pipeline Industry," 17th Annual Meeting, Southwestern Finance Association, March 8-11, 1978, Dallas, Texas.

[14] *Yearbook of Railroad Facts*, Association of American Railroads, 1977-1979.

[15] Weston, J. Fred and Eugene F. Brigham, Managerial Finance, 6th Ed. (Hinsdale, Illinois: Dryden Press, 1978).

## FOOTNOTES

1 The contra-cyclical and/or contra-seasonal maintenance argument above is conjectural in nature and warrants further study before being accepted at face value.

2 Western District trunk railroads not meeting these restrictions are the: Milwaukee, Missouri-Kansas-Texas (Katy), and Rock Island. Due to corporate reorganization, adequate information on the Western Pacific was not available, and, therefore, this railroad is not included in the study.

3 The basic algebraic formulas (e.g., [15, pp. 680-3]) are based on a linear model assuming no "Other Income." Western District railroads—like many firms—have material levels of "other income"; formula (2) above is developed in the same methodology as Weston and Brigham [15, p. 681] to incorporate "other income."

4 There were two (2) general rate increases in 1978 (versus four (4) in 1979); however, the larger of the 1978 increases (7.0%) wasn't granted until December, 1978.

5 These correlation coefficients (r) for the relationship between the proportion of 1978 railroading revenue (Table 1) and 1979 DOL and DCL (Table 4) are computed for positive DOLs and DCLs only.

6 For a more complete discussion of the degree of financial leverage (DFL), see: [15, pp. 680-3].