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The Definition and Measurement of Financial Fitness in the Trucking Industry

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ABSTRACT

Canadian trucking industry is moving towards a more deregulated environment in which the market is expected to govern the decisions and subsequent penalties and rewards of its members. The United States regulatory environment has already been substantially deregulated with respect to entry and rate control. In such an environment, shippers, industry suppliers, carriers and public officials are more concerned about the financial fitness and condition of motor carriers. Greater competition may results in greater rates of entry and exit. Shippers want to minimize the risk of having freight delayed or lost by carriers declaring bankruptcy. Suppliers want to minimize their dealings with potentially bankrupt carriers which may not be able to pay their bills. Motor carriers can better plan their marketing and operating strategies given knowledge of impending exit from the industry. Finally, the fitness test is the remaining element of entry regulation un U.S. regulatory reform and potentially under Canada's version of trucking re-regulation. Public officials would like new entrants to be fit enough to actually provide the service that they promised the public when applying for new authority.

This paper describes the C-Score Model which combines financial statement analysis with statistical techniques to develop an index of financial distress. The C-Score Model was determined to be superior to existing models that are publicly available. The C-Score model was used to examine the relative stability of the general freight segment of U.S. trucking since 1981, compare the financial condition of U.S. versus Canadian trucking, and compare the relative strength of different segments of the general freight industries in Canada and the United States.

I. INTRODUCTION

The financial fitness of motor carriers has always been a concern of shippers, industry suppliers, carriers, and public officials. This concern will be heightened by the deregulation of the Canadian trucking industry. The U.S. experience with deregulation has already shown that greater competition resulted in greater rates of entry and exit and greater uncertainty about the quality and availability of service. Bankruptcy since 1980 has become commonplace in the U.S. trucking industry. Dun & Bradstreet report that 4207 trucking companies have gone bankrupt in the years 1981 through 1984, and the rate of failures in trucking since 1978 has risen faster than the failure rate of business in general.[1]

This paper describes an approach to measuring and evaluating financial distress which may be used to evaluate the financial condition of individual carriers or segments of the motor carrier industry. The application of financial models is demonstrated using Canadian and U.S. data.

II. THE IMPORTANCE OF FINANCIAL CONDITION

The financial condition of a carrier is important for many reasons, although the reasons may vary for different participants in the trucking services market.

Shippers want to minimize the risk of having freight delayed or lost by carriers declaring bankruptcy. Shippers may prefer long term shipper-carrier relationships to insure service availability. Carriers in financial distress may also reduce service quality which is not perceptible until damage or delays occur.

Suppliers want to minimize their dealings with potentially bankrupt carriers which may not be able to meet their obligations. These include suppliers of capital, fuel, insurance and equipment. An equipment dealer, for example, may extend credit to carriers for up to three years to finance the purchase of line haul equipment.

Carrier knowledge of impending bankruptcy or financial strength of its competitors is essential in strategic planning. Strategic pricing and marketing decisions take into account the strength of competition. A carrier should be prepared to take advantage of additional freight volume that may no longer be shipped by carriers going out of business. Carriers considering acquisition and merger should evaluate the financial condition of prospective carriers as with any investment.

Public officials would like new entrants to be fit enough to actually provide the service that they promise the public when applying for new authority. The fitness test is the cornerstone of fair entry regulation under Canada's proposed extra-provincial trucking deregulation. More importantly, public officials are still charged with the responsibility to insure that the public has access to efficient but safe transportation. Financially distressed carriers must be a concern of regulators if they have less regard for public safety on the highways.

These important concerns by a wide spectrum of participants in the trucking industry indicate a strong

need for an objective but timely approach to the evaluation of financial conditions in the trucking industry or of individual carriers.

III. EVALUATING FINANCIAL DISTRESS

Financial analysts have long searched for more accurate methods of gauging financial health and forecasting insolvency. Single financial ratios used individually are not adequate measures of the financial condition of a firm. A carrier with negative earnings may have enough liquidity to stay in business long enough to return to profitabilty. A carrier with positive earnings may not have the cash flow to meet current obligations. Most lenders and credit analysts will look at a variety of financial indicators to make a balanced assessment of one's credit worthiness. These indicators are often grouped into separate catagories, each of which measures a particular aspect of financial strength. The following is one such breakdown:

Profitability Ratios—Ratios in this group gauge the rate of profit relative to some base. That base can be sales, equity, or assets resulting in profit margin, return on equity and return on assets respectively. Common ratios used in the trucking industry are operating ratio and return on transportation investment. Higher profitability ratios are favorable and decrease the risk of bankruptcy.

Turnover Ratios—These statistics indicate the efficiency of assets, capital and labor. The widely used ratio in this group is the capital turnover ratio. Productivity measures are variants of this type of performance measure. However productivity information is not always in standard income and balance sheet statements. Greater efficiency is correlated with lower bankruptcy risk.

Leverage Ratios—This catagory of ratios indicate the extent to which a firm used debt to finance its asset base. The excessive use of debt can create significant profitability and liquidity problems should revenues not reach breakeven volumes. Interest charges are fixed charges which are unavoidable. Excessive debt is thus a direct cause of bankruptcy risk.

Liquidity Ratios—These ratios measure the ability of the firm to pay its current debts (current liabilities) as they become due. The less liquid the firm, the greater the danger that creditors will force the firm into involuntary cessation of operations. Liquidity ratios include the current ratio, debt coverage and cash flow. A variation of cash flow used in trucking is the cash throw ratio.

All of these types of ratios (except certain productivity ratios as noted above) can be derived from basic financial statements of motor carriers. The challenge is to determine what importance should be placed on each dimension of financial performance. The use of predictive models which combine financial statement analysis (ratio analysis) with statistical techniques is one approach to overcoming this difficulty.

IV. A MODEL OF FINANCIAL DISTRESS FOR TRUCKING

Bankruptcy models have been applied to a variety of industries. The most publicized are the Altman Z models.[2] Chow and Gritta demonstrated that the Z" version provides reasonable estimates of the financial condition of selected segments of the trucking industry.[3] The Z" version was found to be superior to the Z or Z' versions since they did not rely on the market value of equity and did not include an asset turnover ratio. Most trucking companies are not publicly held firms and trucking companies have fewer assets than manufacturing firms. Thus the Z" version better reflects the economic and ownership characteristics of the trucking industry.

The most current version of the Z model, the ZETA model is claimed to be applicable to a wide range of industries since it was developed from a cross section of bankruptcies of publicly held firms. In 1982, the ZETA model was used to suggest that Carolina Freight Carriers was a candidate for bankruptcy.[4] Hindsight verifies what most industry observers believed at the time; Carolina Freight was in fact one of the outstanding carriers in the trucking industry in terms of financial strength and future profitability. A model that is estimated from the data of carriers in the trucking industry may have made a better prediction for the same reasons that the Z" model was superior to the Z or Z' models. Furthermore when the economic and regulatory environment changes, the factors that best explain financial distress may change. Chow, Gritta, Adrangi and Ebelt have shown that the financial indicators that best predicted financial distress in the U.S. trucking industry before deregulation are different from those after deregulation in 1980.[5]

A model of financial distress which we shall call the "C" model was estimated. Actually a set of models were developed, where each model was specific to different segments of the U.S. trucking industry. Motor carriers were classified as financially distressed if they had gone bankrupt or were technically insolvent. The financial distress model was developed using Multiple Discriminant Analysis (MDA) where the dependent variable was a 0 - 1 variable indicating whether the carrier was financially distressed (1) or not financially distressed (0). Dependent variables were financial ratios as discussed above. MDA provided statistically determined weights for financial ratios which significantly characterized firms in financial distress.

One of the early versions of the C model was calibrated from a sample of U.S. general freight carriers in financial distress between 1982 and 1986 and has the following form:

$$C = a + b_1X_1 - b_2X_2 - b_3X_3 - b_4X_4 - b_5X_5$$

Where:

C — Financial distress score
X1 — Retained Earnings/Total Tangible Assets
X2 — Total Liabilities/Total Tangible Assets
X3 — Shareholder Equity/Total Tangible Assets
X4 — Current Liabilities/Total Tangible Assets

X5 — Working Capital/Total Tangible Assets

The financial data was obtained from the carrier annual report statements submitted to the Interstate Commerce Commission (ICC) as reported by the American Trucking Associations, Inc.[6] Financial data was collected for the four years prior to the year of bankruptcy or classification of technical insolvency for carriers in financial distress. Financial data for 1979 to 1983 was used for nonbankrupt carriers.

The C model outperforms the best publicly available model of its kind in use, Altman's Z" model. A comparison of the two models reveals the superiority of the C model. The Z" model's classification rules lead to a correct classification rate of 76 percent. When we apply similar rules with the C model, we correctly classify 87 percent of the population of general freight carriers.

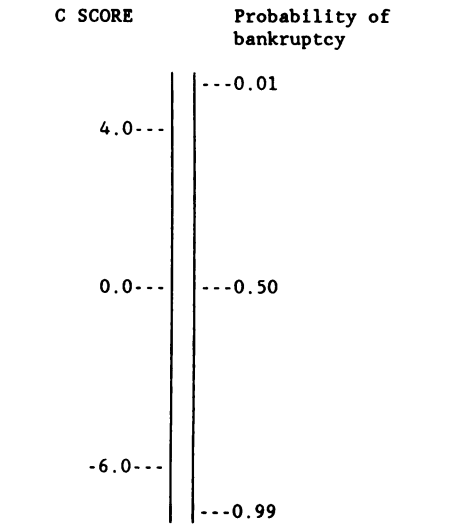
The C model estimates were tested for the accuracy of the model over longer periods. It was found that overall accuracy was reduced by 5 percent when we tried to predict four years in advance. Theoretically the accuracy will continue to decrease for periods past four years. However we were unable to validate this hypothesis since we believe that the model is not applicable to the industry under the regulated environment that ended in 1980.

The simplest interpretation of the C model is that a positive C score corresponds to a probability of bankruptcy *less* than 0.50 while a negative C score corresponds to a probability of bankruptcy *greater* than 0.50. Viewed in this manner, a C score of 0 corresponds to a 0.50 probability of bankruptcy, and the higher the C score the lower the associated probability of bankruptcy. This "probability of bankruptcy" is based on the degree to which a firm "resembles" a firm that is known to have failed or be in a prolonged state of technical insolvency.

The C scores and the probabilities of bankruptcy have a one-to-one correspondence and the information content of one rating system is identical to the other. Figure 1 is a depiction of this informational relationship. The symmetry of the systems and the relative ease of computing C scores lead us to choose C scores over probabilities as the preferred method of presenting results and using the model.

Figure 1

C SCORES AND PROBABILITIES OF BANKRUPTCY



V. TRENDS IN THE FINANCIAL CONDITION OF THE U.S. GENERAL FREIGHT TRUCKING INDUSTRY

The C model was used to estimate the number and percentage of carriers in our U.S. general freight carrier data base which are candidates for financial failure from 1981 to 1985. Only Instruction 27 carriers, carriers who earned 75 percent or more of their revenues from intercity movement of general freight, with average shipment weights below 5000 pounds were selected to concentrate on specialists in this segment of the industry. All of these firms will not necessarily go out of business but they do have the financial characteristics of carriers who have gone out of business in the past or are classified as technically insolvent. The estimates are shown in Table 1. Eighteen percent of the Class I and II

TABLE 1

Financial Condition of the General Freight/LTL Segment of the Trucking Industry (1981-1985)

YEAR	NUMBER OF FIRMS WITH LOW RISK OF BANKRUPTCY	NUMBER OF FIRMS WITH HIGH RISK OF BANKRUPTCY	FIRMS FOR WHICH NO PREDICTION IS MADE	TOTAL NUMBER OF FIRMS*
1985	138 (59%)	43 (18%)	52 (22%)	233 (99%)
1984	174 (63%)	43 (16%)	59 (21%)	276 (100%)
1983	171 (62%)	53 (19%)	53 (19%)	277 (100%)
1982	188 (61%)	59 (19%)	59 (19%)	306 (99%)
1981	215 (67%)	47 (14%)	61 (19%)	323 (100%)

* Sum may not equal 100 due to rounding.

carriers specializing in the transport of general freight were in financial distress in 1985. The financial condition of the industry has improved marginally since 1982 when approximately 19 percent of the industry was in financial distress. 1982 was the year in which the effects of deregulation and the sluggish economy on industry viability peaked. It represented the last year of continual decline in the overall financial wellness of the industry since pre-deregulation. As can be seen, the industry is just now regaining the financial strength that it had in 1981.

The aggregated C scores may mask trends in specific segments of the general freight industry. Table 2 displays the weighted average and median C scores for selected segments of the general freight trucking industry. The weighted averages reflect the financial condition of the group as if the balance sheets and income statements of all of the carriers in the segment were combined. The median separates exactly half of the individual C scores from highest to lowest. A large difference between the two measures indicates that some very important carriers are either doing extremely well or extremely poor. In all groups there will be carriers performing well above and well below these two measures of the average carrier.

TABLE 2

Weighted Average (WTD-AVG) and Median C Scores for Selected Segments of the U.S. General Freight/LTL Trucking Industry

SEGMENT	YEAR	WTD-AVG C-SCORE	C-SCORE MEDIAN
ALL:			
	1985	.75	.65
	1984	.74	.68
	1983	.68	.68
	1982	.64	.64
	1981	.78	.68
LONG-HAUL:			
	1985	.79	.51
	1984	.79	.40
	1983	.71	.40
	1982	.63	.29
	1981	.71	.34
SHORT-HAUL:			
	1985	.69	.70
	1984	.63	.72
	1983	.61	.71
	1982	.65	.71
	1981	.84	.75
REVENUES < -$25M:			
	1985	.71	.67
	1984	.70	.78
	1983	.71	.71
	1982	.76	.67
	1981	.93	.71
REVENUES -$25-50M:			
	1985	.58	.65
	1984	.61	.56
	1983	.74	.93
	1982	.69	.92
	1981	.90	1.02
REVENUES -$50-100M:			
	1985	.85	.76
	1984	.70	.81
	1983	.68	.67
	1982	.52	.72
	1981	.67	.64
REVENUES ->$100M:			
	1985	.75	.57
	1984	.75	.43
	1983	.65	.38
	1982	.63	.29
	1981	.74	.37

The financial condition of carriers grouped according to revenue size is shown in Table 2. Overall the strongest group of carriers in 1985 were those carriers in the $50 to $100 million annual revenue class. The very large and the very small carriers followed and the carriers in the $25 to less than $50 million revenue bracket were the most financially weak. There is of course variability in the financial strength within each group. This is particularly true for the large carrier group where the average C score is 18 points above the median C score. This suggests that some very large carriers accounted for the bulk of the financial viability in this group. The financial strength of both small carrier groups (less than $50 million) have declined over the 5-year period while the larger carriers have increased in strength.

The financial condition of carriers grouped according to type of geographic market (lenght of haul) is also shown in Table 2. Long haul carriers are defined as those carriers with an average length of haul exceeding 500 miles. There is a sharp contrast in the fortunes of the carriers in each group over time. The long haul carrier group showed increasing financial strength since 1981 while the short haul carriers moved in the opposite direction. This certainly reflects the economics of the two markets. The long haul sector has become increasingly concentrated as the least efficient have left the market. The remaining carriers consolidated and strengthened their positions as there are some economies of scale and capital requirements in this sector. Entry is substantially easier in the short haul market preventing a similar retrenchment by the carriers in that competitive arena. The short haul market is also characterized as one in which non union competition is strong.

VI. FINANCIAL CONDITION OF CANADIAN TRUCKING

Firm specific data for Canadian carriers were not available for this research. Thus estimates comparable to those in Table 1 cannot be made (the percentage of the Canadian trucking industry which is in financial distress). However, aggregate statistics of selected segments of the Canadian trucking industry are available from Statistics Canada publications and weighted average C scores can be computed that are similar to the scores shown in Table 2.[7] The C score model has not been validated on a Canadian carrier sample. Further, the financial accounts used by Statistics Canada are not completely matched with the financial accounts used by U.S. carriers in their reports to the ICC. However the inherent financial structure and basic balance sheet accounting practices should not differ simply because one trucking company is domiciled in one country or the other. The C score computations are thus useful for identifying relative financial performance and caution must be used in interpreting Canadian - U.S. comparisons.

The results of these computations are shown in Tables 3 and 4. Statistics Canada provides detailed statistics on intercity general freight carriers for

TABLE 3
Weighted Average C-Scores General Freight
Canadian and U.S. Trucking Industry
(1984)

Population	WTD-AVG C Score
Canadian Carriers	
All General Freight	.21
Group 1 - Extensive Utilization of Owner Operators.	.14
Group 2 - Moderate Utilization of Owner Operators.	.15
Group 3 - Company Drivers	.54
U.S. General Freight	.65

1984. These carriers were defined as for-hire carriers earning $2 million or more annually and generating more than 50 percent of their revenues from general freight shipments carried over distances of 25 kilometres and more by Statistics Canada. These carriers were subdivided into three groups:

Group One Carriers spend 30 percent or more of their operating expenses to purchase the services of broker operators.

Group Two Carriers spend less than 30 percent of their operating expenses to purchase the services of broker operators but do utilize them.

Group Three Carriers rely completely on company drivers and do not purchase any services of broker operators.

The C scores shown in Table 3 indicate that group three general freight carriers, those which do not rely on broker operators at all, are in the best financial condition. The figures indicate that each segment is not financially distressed as a whole but of course, individual carriers may be well above or well below the average. However the Canadian general freight sector's financial condition is well below that of the U.S. general freight carrier segment as indicated by a weighted C score which is three times higher. However the group three Canadian general freight carriers perform relatively well compared to their U.S. counterparts.

TABLE 4
Weighted Average C-Scores
Canadian and U.S. Trucking Industry
by Geographic Segments (1984)

Population		WTD-AVG C Score
Canadian		
	All Canada	.19
	Newfoundland	.36
	P.E.I	.43
	Nova Scotia	.04
	New Brunswick	.42
	Quebec	.25
	Ontario	.18
	Manitoba	.21
	Saskatchewan	.05
	Alberta	.22
	British Columbia	.11
	Yukon	-.47
	N.W.T.	.17
U.S.		
	All U.S.	.63
	Class I	.63
	Class II	.62

The C scores of carriers by geographic domicile were computed for all Canadian motor carriers regardless of principal commodity transported. Again C scores were computed for U.S. carriers for comparison and these scores are displayed in Table 4.

The overall C score for all Canadian carriers is heavily weighted to the performance by Ontario domiciled carriers who earned over 40 percent of industry revenues. The financial condition of carriers in the Yukon, Nova Scotia and Saskatchewan was quite poor. With the exception of Nova Scotia, the Maritime provinces are the domicile of the most financially strong carriers in the country. Even Quebec's trucking industry exhibits an above average financial index. However none of the provinces or the all Canadian average is close to the financial strength of the U.S. carrier industry as measured by an average C score of .63 which is more than three times the Canadian average and 50 percent better than the best provincial segment domiciled in P.E.I. On the whole, the performance of carriers in the eastern portions of Canada were above the all Canadian average while the performance of carriers in the western and northern portions of the country were below.

VII. CONTINUING RESEARCH AND POTENTIAL APPLICATION OF THE C SCORE MODEL

In this paper an early version of the C score model was used to monitor trends in the trucking industry or for specific industry segments. The relative stability of the industry may be assessed by examining the distribution of C scores as was demonstrated by the analysis of the General Freight segment of U.S. trucking. Comparisons between the financial condition scores of the U.S. and Canadian trucking industries suggest that Canadian motor carriers are in worse financial condition than its neighbors (and potentially competitors) to the south. Comparisons within Canada suggest that carriers domiciled in the eastern provinces are generally better off financially than carriers in the west and far north. Finally, within the general freight segment of Canadian trucking, it appears that carriers which rely on company drivers as opposed to broker operators are the most financially stable.

Validation tests (not reported here) indicate that the model predicts two to four years into the future with a slight decline in accuracy. Thus it can be used as an early warning system in assessing the future financial condition of the trucking industry over a medium time horizon. Obviously predictions about the financial prospects of individual carriers can be made but this is best accomplished in a comparative and historical context. A carrier's financial performance is best evaluated relative to its peer group and what it has accomplished before.

The long term goal of the research that developed the C model is to identify and validate the linkages between deregulation, financial condition and safety. Academic and industry literature suggests that the linkage between motor carrier deregulation and motor carrier safety is the financial condition of the motor carrier. Decreased profitability of the industry and individual carriers result in poor financial conditions which provide an incentive for carriers to reduce expenditures on maintenance, to defer the replacement of unsafe equipment, reduce safety programs or encourage unsafe driving practices. The objective measurement of carrier financial distress is the first step in this process. The next steps are to test the hypothesized relationships between safety and financial condition, and between regulation and financial condition. The effect of deregulation can be deduced from these two results.

ENDNOTES

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