Original RScore Research

The following is not recommended for general information, but may be of interest to Academics or Accountants who wish to explore the original RScore research. This is a portion of the author's 1994 Ph.D. research theses; Indicators of Construction Business Financial Risks in the Closely Held Construction Company.

Abstract

The object of this study is to develop an improved method of measuring the financial risk and performance of construction companies in the United States. An assessment and analysis of the theories of construction accounting integrated with industry characteristics led to the development of the new theory and formula of Available Profit, the new concept and formula for Real Earnings Powers and the new financial performance measurement formula, the Financial Risk Factor Formula. The formula combines profitability, asset utilization, liquidity, and debt ratios to accurately measure the financial risk of the firm and establish financial performance trends. The formula can be used as part of a company evaluation process or as part of an ongoing self-assessment process.

Introduction

The primary purpose of this study is to develop an entirely new method of measuring construction company financial risk and performance in order to predict financial distress or failure earlier than current financial evaluation procedures.

A previous study of hundreds of construction industry business failures indicates that management errors and weaknesses are the primary cause—not inherent high financial risk. However, the ability to measure financial risk is critical to the control of financial risk. The accurate measurement of financial risk can provide early warning of financial difficulties or distress and potentially allow corrective action to be taken.

Studies indicate that corporate decisions and events that are common causes of construction company financial distress or failure precede the actual failure by two to three years and that modest changes in financial statement data and small changes in standard financial ratios do not appropriately announce deterioration in financial performance or possible increases in financial risk. The fast pace of the typical construction business and the fact that major projects can last for years make early detection of financial weaknesses difficult. This is especially true in a growing business, as growth tends to cover up poor performance.

This research focuses on the discovery of early warning indicators of deterioration of a construction company's financial performance well before normal financial reporting and standard financial ratios would display them. This is important because early detection of financial weaknesses would allow management time for appropriate defensive action to be taken and prevent business failures (assuming competent management). This study provides

construction company executives, entrepreneurs, and credit grantors with solid guidelines, organizational models, and a financial risk indicator to reduce business risks that previously have been accepted as inherent in the construction business or unavoidable.

Profit versus Value

Many contractors turn out to be watchers instead of managers of their financial affairs. They respond to things that happen, but do not have control over what is happening or going to happen because they do not have the appropriate financial information in the right place at the right time. Contractors need continuous analysis of historic financial data to have a rear-view perspective to plan by.

Analysis of financial statement data is conducted primarily to measure financial performance. However, there are conflicting views whether financial performance should be measured by profit or by an increase in the value of the firm. The ultimate measure of performance is not what is earned but how the earnings are valued by the investors. A firm's increase in value, not just its profits, is the true measure of company's performance. Therefore, it is necessary to measure the risk that the firm's value is put at in the pursuit of profit in order to measure its overall financial performance.

Financial Risk

Previous studies of business failures offer no early earning indicators of financial distress prior to failure. Bruno, Leidecker, and Harder (1987) studied why firms fail from a purely management viewpoint. They discuss the effect of assuming debt instruments too early but do not carry the point to a usual conclusion. Stiltner (1990) expresses belief that failures are recognizable and can be prevented if the symptoms are discovered early, but does not suggest how to detect the symptoms. These studies are consistent in that they offer no advanced indicators of pending financial difficulties.

The focus of this study is the measurement of financial risk and performance in the closely held construction company and to look for early warning indicators of financial distress. The approach adopted was to look for indicators exclusively within financial statement data because all construction enterprises keep financial records for government and credit purposes.

The risk formula, the subject of this study, is an original contribution that will enable contractors and credit grantors to evaluate a closely held construction company and accurately project the financial strength or weakness of the firm. The new concepts of available profit and real earning power provide a new approach to financial management of the construction enterprise. Uniquely, financial ratios are combined in a holistic manner that provides insight into interpretation of the financial activities of the construction operation. This allows better understanding of the impact of operational changes on the financial health of the company.

Methodology

The data utilized consists of 46 construction companies of various types and sizes that failed. Common ratios taken from financial statement data were tested for each of the three years prior to failure. The results were used to determine if they could predict financial difficulties or nonperformance at an early stage in its development.

This approach was adopted as a result of other research which indicated that the causes of construction business failures occurred two to three years before poor performance was noted in the financial reporting systems of the distressed companies.

Pilot Study

The financial statements of eleven financially distressed (failed) construction companies and eleven non-failed were examined in the pilot study. Financial statements for five years prior to failure were scrutinized. The standard ratios, statistically calculated to be most significant by Altman (1983), were tested for each of the years and none provided measurable indicators of financial distress. Several combinations of these ratios were experimented with including the Sustainable Growth Rate formula. The SGR formula, modified to account for the lack of dividend payment, appeared to have some promise but were subsequently found to be inconclusive.

Theory Development

Attempts to modify Altman's formula and the SGR formula, while unsuccessful, helped define the ratios that were most significant in determining the difference between financially sound, closely held construction companies and failed companies in the database. From this research the Available Profit Theory was discovered, which lead directly to the new formula for Real Earning Power.

After the pilot study, theory testing and validation were undertaken. Additional data was added and the Risk Factor formula was tested on a total of 46 failed and 53 no failed construction companies for three years prior to failure. A similar period was used for ongoing companies. The results were subjected to statistical tests and proved valid. Further validation was undertaken by calculating the Risk Factor for a year prior to the failure of 17 additional failed companies and for a corresponding year for 20 non-failed companies.

The Du Pont[1] (Block, 1989) calculation of return on equity and the standard earnings power formula were considered during the research, and modifying the ratio of earning power with the available profit element was a natural extension of the research. This led to the development of the modified ratio of Real Earnings Power.

The development of the available profit theory and real earning power concept led to the development of the financial Risk Factor formula. It was determined that an asset utilization ratio and debt ratio, properly combined with available profit and real earnings power, is the key. The broad ratios of sales to total assets and total liabilities to equity were applied to develop the final financial Risk Factor formula.

In the pilot study little change was noted in the standard and new ratios in years four and five prior to failure or in the new financial Risk Factor formula. It was determined that a three-year period prior to failure is the optimum length of time for meaningful comparison of financial data for construction companies. The three-year comparison was therefore selected for this study.

Data Selection Criteria

Data collection criteria for the financial statements used in the study were:
1. Audited financial statements by an independent outside accountant or accounting firm.
2. The statements prepared using the percentage of completion method of income recognition.
3. A minimum of three consecutive years of financial statements.
4. Financial statements from a recent time period ending in 1988 through 1992.

The data used was from closely held construction companies. Annual turnover for failed firms ranged from $1.6 million to $82.9 million in the most current year with an average of $13 million. Profit margins for failed companies ran from –6.2% to 2.5% with an average of –1.2%. Annual turnover for non-failed companies in the corresponding year ranged from $1.6 million to $50.7 million with an average of $11.5 million with profit margins of 2.9% to10.2% and an average of 2.4%.

A New Approach

The measurement of construction company financial performance and financial risk through the use of financial statement data is an important issue in the cyclical environment of the US construction industry. The large number of construction business failures is indicative of a tremendous need to integrate accounting theory financial analysis and accounting data into a cohesive and comprehensive performance measurement tool for practical use by managers.

A formula is needed that can provide a warning of any changes in the performance of closely held construction companies. A combination of ratios that crosses categories of standard ratios is needed to reduce or eliminate the impact of different accounting methods. A system that will measure accurately the performance of closely held construction companies, that is not too complicated or too labor intensive needs to be developed. Both financial and managerial organizational performance must be taken into consideration in an overall company evaluation. Organizational performance, for the purposes of this research, is defined as the ability of the company to produce its work at a profit. It is described by the firm's gross profit margin. Financial performance is the ability of the company to remain in business by utilizing its sources of funds. The efficient management and use of the firm's assets is impacted by both financial and operational performance. Sources of funds are used to acquire assets, a financial consideration, and the efficient use of those assets is a measure of operational performance; therefore, an overall company evaluation must address both.

Standard Ratios

Standard ratios are distinctly separated into the categories of profitability, asset utilization, liquidity, and debt utilization. Using these ratios to evaluate a company's performance is limited

to separate evaluations and does not provide an overall measure of performance or risk. The Du Pont Formula comes closest by combining the profit margin with return on assets, but still only provides a measurement of return on equity or investment. It does not indicate if the company is suffering financial difficulties. It is simply a calculation of the return generated on investment during the accounting period being studied.

Z and PAS Scores

The focal point of research of failure and predicting financial difficulty is Altman's (1977) ZETA Analysis. The scores were produced for manufacturers and retail companies and have not been effective in predicting financial distress in closely held construction companies. Professor Russell in a University of Wisconsin study (Russell, 1992) researched previous failure prediction work done by Altman and others and concluded, "A shortcoming of this research is that most of the models were developed for industries other than construction…Additionally, some of the models were not validated with data independent of the original data set, causing the validity and usefulness of the models to be suspect." In summary, the Du Pont formula, Z, and PAS scores have little to offer the construction financial analyst.

Compensating for Accounting Methods

Pratt (1981) reminds us, "within the framework of generally accepted accounting principles [sic] (GAAP) there is some latitude permitted in the preparation of financial statements." He goes on to say, "The financial analyst not only knows that the above is true but that it may be considered to be the understatement of the century". Rarely do two firms follow exactly the same set of accounting practices in keeping their books and preparing their financial statements, even within the broad confines of generally accelerated accounting principles [sic]."

The vastly different methods that construction companies use in their record keeping do not fully explain why standard financial ratios do not accurately portray a company's financial condition or predict pending financial distress. The relative significance of various ratios are different in each unique valuation situation. The analyst must apply judgment to each individual case to select and evaluate figures significant to the situation (Pratt, 1981). Current analytic tools used to interpret a construction company's financial statement do not always project or even relate to the firm's actual performance because they each concentrate on only one financial area without linkage.

Gross Profit Changes

Although total sales (volume) vary from year to year, gross profits as a percentage of sales should, theoretically, remain constant. Gross profit, the amount earned in the production of the work before general and administrative costs are deducted, is usually defined as a measure of a company's ability to do the work (performance). Gross profit is the measure of operational performance as opposed to financial performance, which is measured by net profit margin.

Gross profit is also affected by contract price. There is considerable variance in the amount a construction company marks up its work in the bid process or adjusts its fee in the negotiation

process, depending on competitive pressures at the time the contract is taken. The mark-up raises or lowers the anticipated profits before the work is started. Although many factors affect profits as the work is being produced, it is generally assumed that the larger the mark-up going into a contract the larger the profit coming out of the project at the completion of the work.

It is almost impossible to determine the amount of profit that is attributable to markup alone or to production efforts alone. The gross profit (or loss), for the purposes of this research, is therefore better described as: "the measure of a construction company's ability to get and produce the work."

Financial Performance

There is a significant difference between operational performance and financial performance. Operational performance (gross profit) relies primarily on the organization's skills, systems, and quality of people. These are supported and funded by the capital structure of the company, but function the same if the funding is borrowed or earned so are not directly affected by the capital structure. Operational performance cannot exist without the financial elements, and financial distress can hurt operational performance, but operational performance is independent of financial performance (except in the extreme mentioned below). For instance excellent organizational skills, systems, and people can produce profits that are then mismanaged and the financial performance of the firm deteriorates in spite of good operational performance.

Poor financial performance will affect good operational performance if working capital decreases for any reason such as owners taking too much money out of the company or over investment in assets. Working capital is a financial consideration and often a function of available credit. If it decreases dramatically, the work slows down. This happens because when capital is in short supply, the subcontractors and suppliers are not paid in a timely manner and do not perform as well. If accounts payable are extended as a method of financing (slow pay), it has the same effect—slowing the work.

Poor working capital or extending accounts payable is usually a result of diminishing gross profit. Profit is the only risk-free source of funds in the closely held company; other sources are forms of financing which affect risk. When poor operational performance impacts working capital which delays vendor payments, a negative cycle is created that continues to erode operational performance. If cash flow deteriorates to the point where labor cannot be timely paid, the work (operational performance) stops.

Financial performance (net profit), however, does "depend" on operational performance. Net profit is defined for this research as the operational performance of the organization adjusted by the first and variable general and administrative (G&A) costs of supporting the infrastructure to get and do the work. The fixed portion of general and administrative costs are costs that continue whether the company has any work or not. Variable G&A costs are generally categories of fixed costs that require expansion when sales volume, beyond the breakeven point for the company, is exceeded. G&A costs include the executive, accounting, marketing and human relations functions and the cost of capital.

Growth, Debt and Financial Risk

An immediate byproduct of growth is a decrease in working capital, which is usually overcome by increasing debt. Eiseman (1984) concludes that there are three scenarios for viewing debt. First he looks at debt with respect to asset growth. Initially, he evaluated the D/Eq ratio using total liabilities as the debt portion. He determined that "firms that grow at too rapid a rate find that internal financing is absorbed by asset expansion and no funds are available for term loan repayment. Loan liquidation can only occur if sales growth is less than the sustainable growth rate or if repayment occurs via refinancing."

In his second scenario debt growth is limited to the growth of the current liabilities (non-bank debt). The major non-bank liabilities that increase with sales are accounts payable and accruals. During growth, most closely held construction companies use a form of internal financing by extending the payment of accounts payable and minimizing accruals. This is often in combination with bank borrowing and tends to mask the "real" increase in debt and the increase in financial risk.

The third scenario allows current liabilities to grow only as fast as sales which lowers the SGR and term loan repayment prospects are improved.

Effects of Record Keeping on Ratios

A difficulty exists in the use of standard financial ratios as an accurate and timely measurement of company performance. A great deal of liberty exists in the manner and mechanisms which each construction enterprise is allowed in its financial record keeping. Financial reporting, while somewhat more standard, is still subject to some manipulation. Ratios are affected by legitimate internal changes in record keeping. Even if every standard ratio is cross checked performance may not be accurately projected or understood. Some people in control of financial reporting know which ratios certain credit grantors rely most strongly upon and adapt the record keeping accordingly.

Because firms may keep their books or prepare their financial statements in different manners, the calculation of overall risk should include the broadest or most general ratios that can be taken from annual financial statements. For instance, using net profit instead of gross profit because companies may differ on where they apply certain overhead costs which affects gross profit. Net profit reflects all recorded and audited cost. After net profit is determined, an analyst will be concerned about the financial risk of the firm.

Discussion of Risk in the Construction Business

The fundamental principle underlying the sustainable growth formula is that an increase in sales causes an increase in working capital assets and fixed assets (Higgins, 1977). The increased assets are funded partially by debt and partially by retained earnings. If the firm's sales grow at the sustainable growth rate, sources of funds equal uses of funds. When sales grow faster than the sustained growth rate, asset expansion exceeds the normal growth of internal funds sources; a financial shortfall occurs, and external financing must be increased to meet the need.

For a closely held construction company to grow in a balanced way it should not exceed its sustainable growth rate or it may lose its ability to finance itself. Therefore, its equity base must grow proportionally with sales, or debt will increase too rapidly, causing credit difficulties. If profit margins shrink, as they have over the last several years for many construction firms, it has the same effect on the capital structure of a firm because less profit means less internal funding is available and more external financing is required just to maintain the balance. This balance can be measured by the debt to equity ratio or, in broader terms, by the total liabilities to total assets ratio. When the balance changes, one or more financial ratios will change as the financial condition of the enterprise shifts. Therefore, the risk of the company changes. If outside debt goes up with no corresponding increase in assets, losses are indicated that can be hidden through misuse of the percentage of completion method and the firm is at greater risk.

Even profitable growth can increase financial risk. Although every dollar of sales adds a few cents to profits, growth also requires significant new investment in receivables, inventories and fixed assets (Higgins, 1977). These need to be financed internally or externally or with new investment by the owner(s) of the company. In the closely held company the sale of stock is not usually an option. Financing is limited to profits, bank borrowing, or extending accounts payable unless the owner(s) is willing to add personal money to the capitalization of the company.

Internal financing in the manner described above and outside financing in the form of borrowing are reflected in the Total Liabilities to Total Assets ratio. As debt increases disproportionately to assets the portion of the enterprise financed by the contractor and the portion financed by others gets out of balance. In the extreme case, outside lenders and creditors such as banks and trade creditors, whose payment periods have been extended, can actually have more of a financial interest (investment) in the company than the contractor. The question is: is the financing sufficient in the long run, giving the company the ability to pay it back, or is the financing just the down payment on a much larger obligation taken on by the company unintentionally. To answer this and other financial measurement concerns a new method of measurement is required.

A New Measure of Risk

The financial risk of the closely held construction company will change as annual sales (turnover) change unless the relationship of profit margin, assets, liabilities and debt remain the same. Measuring the changes in these relationships provides a measurement of change in financial risk. Using performance, efficiency, and debt ratios the financial risk of a company can be measured. To do this the appropriate ratios must be selected. The efficiency ratio of sales to total assets can be misleading when used to interpret a construction company's financial risk. If assets are reduced and sales remain the same, the company's turnover or efficiency ratio (S/A) goes up, or gets better. However, when the assets that a company has to support its bank and bonding credit are reduced, the company is at greater financial risk. The same relationship exists when liabilities increase in the total liabilities to total assets ratio of a company over that which they were during successful or profitable years. A company may continue to be profitable when its liabilities increased relative to its assets, but its financial risk increases.

By combining the efficiency or turnover ratio of a company with its debt structure it can be determined if they are in balance. The sustainable growth loop for publicly traded companies shows the relationship of the ratios used in the SGR formula. The closely held construction company cannot easily sell shares and, therefore, has less flexibility than the publicly traded company. A contractor's sustainable size is determined by certain internal financial realities. The firm operates in a closed system and has different sustainable size constraints. The profit margin and capital output ratio of the publicly traded company are affected by industry characteristics. For established, stable industries, dominated by large companies, industry characteristics are assumed to set very close parameters for profit margins and necessary capital output ratios. The profit margin and capital output ratio for the closely held company vary dramatically and are more a result of company performance and explained below.

Publicly traded companies are managed with target debt and payout ratios. These are set in advance as financial policies. Closely held construction companies usually discern their debt to equity and liabilities to asset ratios after the fact as a result of their performance—profit margin and how they manage their financial resources. The outside financing that a closely held construction company will be able to obtain is limited by debt and performance ratios set by banks and bonding companies which effectively form industry credit granting standards. A company with too much debt can find itself cut off by its lenders, which can cause immediate failure if an alternate source of financing cannot be arranged rapidly. A combination of performance, efficiency, and debt ratios are used to determine if a company is approaching that point. Debt to Equity and Liabilities to Assets combined with the performance indicator of Net Profit Margin can gauge the direction in which the firm is heading.

Profit margins and capital payout ratios are internal characteristics of the construction company. Profit margin is a measure of performance. Capital payout ratio is a measure of efficiency and if capital is short debt increases. Neither of these is easily changed for the individual firm as both are a direct result of the current performance of the company. The capital payout ratio of a company is also directly affected by its annual turnover and, if a firm's resources are stretched, will affect profit margin.

The capital payout ratio can be altered by reducing or increasing turnover. If a company is in financial difficulty and is able to reduce its turnover and maintain profit margins, its capital payout ratio improves. The lower turnover, a more sustainable size for the company, may enable it to reduce debt, which is usually a problem for a company in financial difficulty. If under the same circumstances the company were to increase turnover and grow, its capital output and debt ratios would deteriorate. Even if profit margin is maintained, it is likely the company will not remain credit worthy because capital is stretched. This will make debt payback difficult or impossible, creating a possible business failure scenario. If a firm's primary source of financing is retained earnings, as with most closely held construction companies with limited credit, sales and assets can grow no faster than retained earnings plus the debt that retained earnings can support.

In summary, standard ratio analysis does not provide an accurate measurement tool because of the way certain financial manipulations can occur in construction accounting methods. Standard

accounting procedures have not been developed to compensate for this. Therefore, a new formula using ratios not open to internal manipulation is necessary.

New Formula

As noted previously, changes in one financial ratio inevitably change other ratios. The inter-dependence of various ratios can be traced and used to develop a financial measurement formula. To evaluate a closely held construction company several variables must be considered. The problems of different bookkeeping methods and treatment of work in progress suggest that gross ratios rather than ratios found internally should be used. The significant standard financial ratio categories are turnover, profit, and debt ratios. Ratios are selected from these categories that are least affected by internal bookkeeping methods. These are explained below.

Sales to Assets: the turnover ratio is a measure of operational efficiency. The higher the ratio the more efficient the utilization of assets. The ratio is a composite of receivables management, inventory management, fixed asset management and liquidity management (Van Horne, 1989). The ratio is the relative efficiency with which the firm utilizes its resources to generate output.

Net Profit to Sales: the net profit margin is a measure of operating efficiency after taking into account all costs and expenses. While both the sales to assets and net profit margin are affected by the external marketplace, they largely capture internal management efficiency (Van Horne, (1989)).

Total Liabilities to Equity: a debt ratio that tests long-term liquidity. This ratio is similar to debt to equity, but total liabilities (all debt) is used instead of long-term bank debt because the latter can be too easily reduced temporarily at year's end by the extension of accounts payable or the substitution of short-term borrowing. This ratio is applied here as a measure of the firm's ability to sustain itself over the long term. This is a broad ratio that ignores most internal manipulations or differences in bookkeeping methods because it captures all liabilities and equity is not easily manipulated.

The above financial ratios are combined to develop a financial risk management formula. The concepts underlying the interrelationships between the elements of the ratios and the ratios themselves follows below.

Within the profitability ratios the term "profit" seems to imply that a firm can use the funds generated by profits for whatever purpose it chooses. This is not the case because it takes money to run the business. Put another way, the business captures and uses funds to operate and without these it cannot operate. The amount of money required to run a business varies by company and industry. A closely held construction company can cease operations very quickly if it runs out of cash and credit is unavailable. Predicting the risk of running out of cash and credit has, to this point, been based primarily on standard working capital ratios.

Funds generated from profits are not totally available for other uses because a portion of them is required for the next year's operations, replacement of assets not covered by inflation, and

obsolescence and productivity improvements to remain competitive in an ever-changing industry. Some of the profits earned are needed just to deal with the timing of receipts and retirement of liabilities. Each company has its own liabilities to assets ratio that does not necessarily relate to similar firms or industry standards. The balance of liabilities to assets is a measure of long term liquidity of the firm and a certain portion of profits are needed to replenish assets and retire liabilities in the near term to maintain the balance. The replenishment will vary depending on the liabilities to asset ratio unique to each company which is simply the financial makeup of the company or its financial foundation. This concept, which is referred to as "available profit" was developed in this research. The amount of funds generated by profits that will remain, more or less permanently, within the financial structure of the company can be measured to determine the "available profit".

Available profit is defined in this research as: the portion of profits that can be taken out of the company or applied to expansion of the business without materially affecting the financial foundation of the firm in its existing operations. The measurement is accomplished by reducing the total profits by the proportional amount of liabilities in the liability to asset ratio or the total liabilities divided by total liabilities plus assets. The formula, developed in this research for "Available Profit (AP)", is:

$$AP = (I - NP/S - (10\ (TL/(TL + TA))\ (NP/S)))$$

NP/S is Profit/Sales
(TL is Total Liabilities; TA is Total Assets)

One minus net profit to sales is used to deal with companies with negative profit (Loss) to create a positive number in this element of the formula. Sales to total assets and total liabilities to assets is generally a number greater than one. Therefore, the decimal place for the profit element is moved one place to the right to create an appropriate relationship with the other elements in the formula

The measurement of financial risk includes the earning power of a company. As described earlier, the earning power ratio is profit margin times sales to asset ratio. When "available profit" is substituted in the above, a different earning power, referred to as the "Real Earning Power (REP)" of the company, can be determined by multiplying the Available Profit by the asset turnover ratio of Sales to Assets (S/A). The formula is:

REP = (AP) (S/TA) where AP is Available Profit and S/TA is Sales/Total Assets

To determine the overall financial risk of a company its debt structure must be considered. Combining the firm's debt ratio of Total Liabilities to Equity with Real Earnings Power represent the financial risk of the company at the present time—referred to as, the financial "Risk Factor." The financial well-being of the company or risk is determined using the company's own financial performance, turnover rate and debt structure. The entire formula is:

$$R = (I - NP/S - (\ 10\ (TL/(TL + TA))\ (NP/S)))\ (S/TA)\ (TL/E)$$

R = Available Profit X Real Earning Power x Debt Structure

R is Risk Factor TL/E is Total Liability/Equity

This research has produced a new formula that takes into consideration the performance, capital requirements and total debt of the individual company. The formulas for Available Profit and real Earnings Power are not used independently and are presented here to demonstrate the theory development.

Table 1: Failed Firms
Risk Factors for Failed Firms: Original Data

Year 1	Year 2	Year 3			Year 1	Year 2	Year 3	
5.19	6.66	1.98		High	938.15	39.93	42.16	High
26.48	13.67	16.89			1.06			
7.18	2.61	1.64			144.19	8.28	5.68	
19.03	15.36	15.01			6.03	5.13	3.81	
8.30	12.16	7.92			4.84	2.84	2.22	
5.37	6.08	7.69			9.86	2.13	2.64	
66.26	11.62	15.01			2.10	2.61	2.31	
10.48	5.06	4.52			8.47	4.56	10.46	
8.22	7.32	7.05			4.36	1.70	1.20	
24.91	54.50	21.89			17.11	11.22	10.21	
11.99	8.62	11.14			0.48	1.32	0.67	
11.86	13.41	14.32		Low	72.11	17.94	26.95	
23.29	7.56	11.44			15.09	15.25		
9.24	5.73	3.53			10.73	19.71		
44.92	5.20	6.21			7.98	20.94	12.22	
47.37	12.90	6.25			20.25	22.02	13.02	
154.38	0.96	0.66	Low		3.62	3.74	4.41	
7.68	2.11	5.19			22.24	15.61	13.36	
4.58	0.84	1.75			4.05	7.21	5.82	
6.27	11.45	1.70			31.98	5.51	5.01	
12.66	13.31	14.03			3.54	2.8	1.81	
44.24	17.93	10.13			8.15	1.51	1.35	

39.63	13.98	12.86			14.07	4.04	2.72	
				Averages				
			Year 1		42.39			
			Year 2		10.33			
			Year 3		8.53			

Risk Factor Scores

The "Risk Factor" scores (R Factor) were calculated for 46 failed contractors for the three years prior to failure. The results, presented in Table 1, were positive numbers from 0.48 to 938, with an average score of 42.39 three years prior to failure, 10.33 two years prior to failure, and 8.53 one year prior to failure.

The Risk Factor scores were calculated for 53 non-failed (successful) companies for the corresponding three-year period. The numbers were again positive, but much lower. They ranged from 0.01 to 24.49 with an average of 4.32. The scores for each of the three years presented in Table 2 averaged 4.37, 4.41, 4.18.

In 35 of the cases, 76% of the sample, the Risk Factor score was higher the year prior to failure than in either two or three years prior to failure. The R Factor scores for the 46 failed firms are shown in Table 1.

In the third year prior to failure the scores ranged from a low of 0.66 to a high of 42.16 with an average score of 8.53. In the second year prior to failure the R Factor scores ranged from a low of 0.84 to a high of 54.5 and an average of 10.33. In the year immediately prior to failure the scores ranged from a low of 0.48 to a high of 938 and an average of 42.39.

The R Factor scores for the non-failed contractors averaged 4.37 in year three, 4.41 in year two and 4.18 in year one, with an overall average of 4.32. There is no significance to years one, two or three. Therefore, they constitute a cross section of ongoing construction companies. They are the test group to determine if the average, ongoing closely held Construction Company has a different R Factor score than companies that have encountered financial distress and failed.

Table 2: Non Failed Firms
Risk Factors for Non Failed Firms; Original data

	Year 1	Year 2	Year 3		Year 1	Year 2	Year 3	

	1.13	0.44	2.21		5.77	3.85	3.49	
	1.47	1.34	0.17		4.69	3.71	3.05	
	2.39	2.96	2.36		5.70	3.59	3.00	
	2.67	3.00	3.93		1.57	0.35	0.80	
	3.35	3.30	2.28		4.46	2.97	2.26	
	0.15	0.17	0.12		4.06	4.83	3.37	
	0.64	3.38	0.76		6.67	8.69	11.31	
	6.70	13.34	15.75		12.66	10.12	10.77	
	2.24	4.68	3.90		5.95	6.93	6.95	
	3.91	4.82	6.32		3.33	2.29	2.22	
	3.50	1.93	3.23		1.58	4.09	1.87	
	11.12	11.18	11.96		1.16	1.32	0.70	
	2.44	2.10	1.35		1.80	4.01	0.00	Low
	2.27	6.23	5.00	High	24.49	25.34	23.12	High
						`		
	0.36	0.62	0.58		2.24	1.34	1.13	
Low	0.02	0.06	0.03		12.93	7.92	6.00	
	5.29	6.51	6.24		9.65	10.21	10.38	
	0.23	0.01	0.02		1.44	1.59	1.63	
	3.02	3.79	4.06		1.61	4.45	5.43	
	2.07	3.79	6.63		3.53	1.80	2.40	
	0.21	0.31	0.49		6.75	3.89	2.16	
	5.70	4.15	3.56		10.14	10.78	12.53	
	1.83	2.11	1.01		5.84	9.94	12.22	
	2.76	4.98	6.16		6.89	3.18	3.80	
	5.79	4.58	5.21		0.63	0.61	0.50	
	1.19	1.63	1.21		2.49	3.76	3.92	
	1.00	0.90	2.05					
				Averages				
			Year 1		4.18			

			Year 2		4.41			
			Year 3		4.37			

Discussion
The new formula provides a clear indicator of financial risk in a closely held construction company. It is a measure of financial distress.

The Risk Factor scores for companies known to have failed were consistently higher than the scores for the non-failed companies. The highest Risk Factor score for the control group of non-failed companies was 25.34, but the average was 4.32 while the failed companies averaged 42.39 in the year prior to failure and 8.53 three years prior to failure. In the year prior to failure only 4 of the 46 (9%) failed companies tested scored lower than 4.0, and only 5 (11%) scored lower than the average for non-failed companies of 4.32. Of the 53 non-failed companies tested for three years only 6 (11%) had a Risk Factor Score higher than 7.

The results establish that scores below 5 indicate a low risk of failure and he absence of financial distress within the company. Scores higher than 7 indicate that the company's financial resources are stretched compared with its current operating efficiency and the firm is at financial risk. The higher the score the higher the risk. Any score over 9 is considered high risk. Of the136 companies tested only 8 companies (5.8%), with a score higher than 9 did not fail and only two companies with a score higher than 13(1.4%) survived. Risk Factor scores between 5 and 7 are considered moderate financial risk.

The Risk Factor formula was developed in the pilot study and tested on 46 failed and 53 non-failed firms for which there was three years of data. It was then tested on 17 failed and 20 non-failed firms for which one year of data was available and the results were similar.

Trend Analysis
The raw scores of the Risk Factor are significant in themselves and can be used in the current year for evaluation purposes. The trend over two or three years is also a valuable indicator of the financial well-being or distress of a construction company and whether its financial risk is improving or deteriorating. A multi-year trend analysis strengthens the prediction or projections concerning the relative financial strength or risk that can be gained about a closely held construction company.

The failed companies tested had an average increase of 21% in their R Factor scores from year three to year two prior to failure. They had an average increase of 310 from year two to year one prior to failure.

Thirty-three (72%) of the failed companies tested had lower scores in years two or three prior to failure than in the year prior to failure. Whether a company's R Factor score is in the low risk

category, under 5; moderate risk, 5 to 7; or higher risk category, over 7; a calculation of the previous year's score will establish whether the company's financial risk is improving, constant or deteriorating. If, for instance, a company had an R Factor score of 6.5, and the prior year's score was 7 or 8, the financial risk is moderate, but the trend is improving. However, if the same company had the same score of 5.5, but the prior year's score was 4 or 5, the company still has a moderate financial risk but the situation is worsening. A look at the score three years back provides a longer trend and can give the evaluator an added sense of where the company is headed.

Why the Formula Works
The R Factor formula answers three questions:
1. Is the construction company's performance adequate considering its capital structure?
2. Is the company's Earning Power providing enough funds to maintain its Assets to Liabilities balance?
3. Is there adequate equity in the company's capital/debt structure to deliver the capital or credit necessary to underwrite operations and ensure against unforeseen losses?

Available Profit is a new theory and new term resulting from this research and is the first element in the Risk Factor formula. The following is an explanation of the concepts behind Available Profit.

The Concepts behind the Formula
A construction enterprise does not have the luxury to withdraw from its operations all of the profit that it earns in any given year because some is required to run the business. The portion that must remain in the business, to maintain the company's assets to liability balance, will vary between individual firms, but is approximated by subtracting from Net Profit Margin the proportion that liabilities represent in the Liabilities to Assets ratio. Simply put, if a firm's Liabilities to Assets are 1 to3, one-third of the profits must remain in the operation to support ongoing business. If more than that is taken out of the company or used for other than normal business activity, other funds will have to replace those taken. For the closely held company, that inevitably means borrowing. Borrowing increases liabilities with a resultant change in the Liabilities to Assets ratio. The amount of investment in the company held by outsiders goes up while the investment of the owners of the company goes down. The company is at greater financial risk because it is less self-sustaining. There is a difference between Net Profit and Available Net Profit.

Real Earnings power of a closely held construction company is an extension of the standard Earning Power ratio. A company's earning power can be calculated by multiplying its Net Profit Margin by its turnover ratio of Sales to Assets. The turnover ratio is a measure of the relative efficiency with which a firm uses its resources to generate outcome (funds). For a closely held construction company all of the Profit Margin is not available to apply to earning power in the short run. When Available Net Profit is used in the earning power formula the closely held construction company's "Real Earnings Power" is calculated.

Real Earnings Power combined with the company's capital structure determine its financial well-being. If there is too much debt in the capital structure, outsiders are too heavily invested in the company compared to equity holders. In which case, reserves may be limited or nonexistent

because there is a real cost of debt and few business people substitute debt if internal funding is available. The Debt to Equity ratio describes the amount of debt in the capital structure of the company and a measure of the prudence of the debt management of the firm. However, the total liabilities of the company represents what it owes to others or its "total debt."

A measurement of the financial risk or relative financial strength of a closely held construction company is achieved by combining in a logical manner its Real Earnings power with its ratio of total debt to equity represented by Total Liabilities to Equity. The financial Risk Factor formula utilizes Net Profit Margin Total Liabilities to Total Assets the Turnover Ratio and Total Liabilities to Equity in calculating the financial risk of a closely held construction company. The formula combines measurement of performance (NP/S) long term liquidity (TL/TA) resource utilization efficiency (S/A) and debt management (TL/E).

General Conclusion
The finical Risk Factor formula gives a numerical and accurate measurement of financial risk and provides an accurate measurement of financial strength or weaknesses which can provide early warning of financial distress and reduce the failure rate in the US construction industry. The following findings and conclusions are original contributions on this subject:
- Existing financial measurement tools such as standard financial ratios do not provide an easy-to-use accurate measurement of financial risk for the closely held construction company.
- Existing business failure formulas such as Z and PAS scores are not suitable for use with closely held construction companies.
- Development of the new theory and formula of Available Profit will provide a better insight into actual financial performance than the existing ratio of Profit Margin.
- Development of the new Real Earning Power theory and formula is a more accurate measurement than the currently used existing financial ratio of Earning Power.
- The financial Risk Factor formula provides an easy to use, accurate financial risk and relative financial strength measurement tool for the closely held construction.
- A multi-year trend evaluation, using the financial Risk Factor scores of closely held construction company will provide a quick and accurate trend of financial performance and financial risk.
- The Risk Factor formula can be used as a self-evaluation tool for closely held construction companies or as an external tool for credit grantors.

The new theories of Available Profit and Real Earning power open new avenues for research into the internal financial dynamics and realties of the construction enterprise which, when explored, could lead to different applications of the new theories and financial Risk Factor formula. A better understanding of the uniqueness of the construction business could lead to a complete rethinking of the closely held construction company and the approach to the financial management of it.

Better control of financial risk will lead to reduced failures. A reduction in the extremely high failure rate in the US construction industry will lead to a reduction in the cost of construction of the built environment, which will have a positive effect on industrial and social progress.