Altman Z-Score: Not Just for Bankruptcy
From Z-Score to “Green Zone” Survivability

Dan Hauschild
8/19/2013

Football has its red zone and end zone, now business has the “Green Zone”. Executives, owners, and investors have a multitude of financial ratios at their disposal for measuring and evaluating continuing business success. The Z-Score is a single metric incorporating five critical measures of business performance. Now, from the Altman Z-Score are Green Zone speedometer charts and guidelines to assist in managing for business survivability - not just survival, but for business growth and profitability!
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Summary
The power and resilience of the Altman Z-Score has been demonstrated for over four decades. A major reason for the durability and relevance of the Z-Score is that it incorporates within a single measure five measures representing business Profitability, Liquidity, Efficiency, Productivity and Leverage or Coverage. The Altman Z-Score remains a robust and relevant tool for predicting bankruptcy one to two years in advance. Importantly, the trends for the ratios contributing to the calculation of Z-Score provide a means to evaluate current performance before the Z-Score computation indicates the business is in trouble.

In the present work, “Green Zone” guidelines are developed and illustrated in speedometer charts for each ratio. Green Zone trend charts subsequently present multi-year trends for several companies. Comparison of the Green Zone guidelines to real business experiences and previous work by other authors including the father of the Z-Score, Dr. Edward Altman, lends credence to the new guidelines.

Management, owners, and investors have a multitude of financial ratios at their disposal for measuring and evaluating continuing business operations. This author recommends the Z-Score as a periodic first look tool and prescribes the Green Zone guidelines to assist in managing for business survivability - not just survival, but for business growth and profitability!

Introduction
Bankruptcy, foreclosures, unemployment are all too familiar terms and headline news over the past several years. The economy is slowly recovering, but the loss of jobs and businesses will be with us for years to come. In this article, the focus is on survivability - not just to survive but also to thrive and grow. We look “under the hood” of the Altman Z-Score formulations for insight and survivability guidance. Speedometer charts display the “Green Zone” and boundaries of financial performance for the Altman Z-Score contributing ratios. Subsequently, trend charts compare survivability performance for four publicly traded companies.

From 2008 through 2012, U.S. Bankruptcy Courts processed 247,597 business bankruptcies, Figure 1. For each business bankruptcy there were 26.3 non-business bankruptcy filings or in total 6,522,928.

Over 69% of both business and non-business filings were for Chapter 7 liquidation of assets. That is, businesses were dissolved assets were sold and jobs were lost. Non-business Chapter 7 liquidation of assets primarily includes individuals and households.
Altman Z-Score: Not Just for Bankruptcy

People lost their jobs and, in many cases, their houses and means of supporting their families.

The reasons for bankruptcy are varied, but ultimately cash inflow was not sufficient to meet the cash outflow demands of creditors and lenders.

There are tools available, if not crystal balls, to help provide guidance to businesses. Altman Z-Score is one such tool that should be in every business management toolbox. We show that Z-Score is not just for predicting bankruptcy but also for navigating the performance pitfalls for existing businesses. It is a critical tool for emerging entrepreneurial ventures or those in the early stages of developing business plans and seeking financial support. It is also useful as a tool for due diligence in merger and acquisition endeavors.

We critically examine the Altman Z-Score for application to business survivability and growth, but first, a little background.

Background
Actually, the Altman Z-Score exists in three forms. The original version developed by Edward Altman in 1968 was for predicting bankruptcy potential in publicly held manufacturing businesses. The Z-Score formulation successfully predicted bankruptcy with 90% accuracy within one year of filing and 80% accuracy two years in advance. While this was an impressive accomplishment, there was criticism that the original Z-Score did not work very well with privately held companies. Dr. Altman then created two new forms of the bankruptcy prediction formula. These were identified as Z’ (Z prime) and Z” (Z double prime) although they are also referred to as Z (A) and Z (B). Z’ was developed for privately-held industrial companies and Z” developed for non-manufacturing and service companies.

Dr. Altman developed a fourth bankruptcy predictor, ZETA®, in 1977 that modifies and incorporates additional factors into the formula. ZETA® is said to predict the potential for bankruptcy with a high degree of accuracy up to five years in advance. However, the formula is proprietary and of limited availability to business management and owners.

Many have criticized the Z-Scores as being inadequate. Some critics claim different and purportedly better ways to predict bankruptcy. However, the Altman Z-Score has withstood the test of time and some 45 years after its first use is still relevant and widely used as a bankruptcy predictor. No one, to this author’s knowledge, has proposed Z-Score for survivability.

We are concerned with business survivability and growth using tools that anticipate potential problems.

The Altman Z-Score expressions are as follow:

\[
Z\text{-Score} = (X_1 \times 1.2) + (X_2 \times 1.4) + (X_3 \times 3.3) + (X_4 \times 0.6) + (X_5 \times 0.999) \] for public manufacturing businesses

\[
Z'\text{ Score} = (X_1 \times 0.717) + (X_2 \times 0.847) + (X_3 \times 3.107) + (X_4 \times 0.42) + (X_5 \times 0.998) \] for private industrial businesses

\[
Z''\text{ Score} = (X_1 \times 6.56) + (X_2 \times 3.26) + (X_3 \times 6.72) + (X_4 \times 1.05) \] for private non-manufacturing companies
Where:
\[
\begin{align*}
X_1 &= \text{Working Capital} / \text{Total Assets} \\
X_2 &= \text{Total Retained Earnings} / \text{Total Assets} \\
X_3 &= \text{E.B.I.T.} / \text{Total Assets} \\
X_4 &= \text{Market Value Equity} / \text{Total Debt for Public Companies or Owners’ Equity} / \text{Total Liabilities for Private Businesses} \\
X_5 &= \text{Net Revenue} / \text{Total Assets}
\end{align*}
\]

Note that the underlying ratios are fundamentally the same for each formula. Income statement and balance sheet information combine to calculate the ratios but vary as to which information originates from the balance sheet. Publicly traded businesses incorporate market equity to debt ratio while privately held enterprises use book value of equity to debt.

Although there are individual formulas for different business types, the original Z-Score expression receives the most press and common usage. Each score has a unique range of defined values for bankruptcy likelihood. The following table presents the Altman range of score predictors.

<table>
<thead>
<tr>
<th>Z-Score</th>
<th>Z’ Score</th>
<th>Z” Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 1.8 Bankruptcy Likely</td>
<td>&lt;1.23 Bankruptcy Likely</td>
<td>&lt;1.1 Bankruptcy Likely</td>
</tr>
<tr>
<td>&gt;=1.8 – 2.99 Zone of Uncertainty</td>
<td>&gt;=1.23 – &lt;2.9 Zone of Uncertainty</td>
<td>&gt;=1.1 – &lt;2.6 Zone of Uncertainty</td>
</tr>
<tr>
<td>&gt;=3.0 Bankruptcy Unlikely</td>
<td>&gt;=2.9 Bankruptcy Unlikely</td>
<td>&gt;=2.6 Bankruptcy Unlikely</td>
</tr>
</tbody>
</table>

**Who uses the Altman Z-Scores?**

The answer might surprise. Business creditors and lenders are the primary consumers of Z-Score information. Some business accountants also routinely look at the Z-Score for their business clients. Well-informed investors frequently use Z-Score to check on the financial strength and health of businesses considered for potential investments.

One perhaps surprising user of Z-Score is the U.S. Environmental Protection Agency (U.S. EPA). The U.S. EPA applied financial ratio analysis and Z-Score evaluation to companies and multi-facility firms in industries such as pharmaceutical, waste treatment, pulp and paper industries, and transportation equipment cleaning and industrial laundries. The U.S. EPA uses pre- and post-compliance Z-Score results to estimate financial impact caused by regulatory compliance investments.

The U.S. EPA also funded a “Recycling Industry Benchmarking and Performance Measurement” effort carried out by AMPros Corporation. Participating recycling businesses provided confidential financial and operational information. AMPros Corporation subsequently consolidated the business financial information via AMPros’ Profitizelt® software tools, and created numerous financial performance ratio benchmarks including Z-Score for survivability.

Feedback from several of the participants indicated they used the Benchmarking report to acquire funding support from the Small Business Administration, alter pricing strategies or to improve their operations. According to individual Z-Score results, 18% of the benchmark participants were in danger of bankruptcy while 45% were in an excellent performance category.
The makeup of Z Score = 8.0. Of course, were it not for the extended "X" ratios. Beginning at Z-Score 5.0 and particularly above Z-Score 8.0, market equity value (X4) drives the Z-Score off the chart. Very large scores are essentially meaningless. Therefore, for purposes of establishing meaningful guidelines for the Z-Score components, selected businesses had Z-Scores below 8.0.

It was apparent in Figure 2 that X3 (EBIT, Earnings Before Interest & Taxes) and X2 (Retained Earnings) were solid and consistently growing contributions to higher value Z-Scores. Of course, without sales, there is no business. X5 is a relatively constant ratio contribution up to Z-Score = 8.0.

The makeup of Z-Scores can vary considerably. Z-Score values come from an almost unlimited
combination of positive and/or negative contributing ratio values.

Healthy companies can have one or two negative or poor performance ratio contributions, and an apparently risky company can have some positive components. Ignored, the negative components do not self-correct. Without all ratios contributing positively, a business can quickly find itself in an unsustainable situation and fighting for survival.

**Speedometer Charts and Performance Guidelines**

The objective for the current Z-Score critical examination is its potential use in providing management guidance for business survivability. The data used for this effort included financial information from the North American Industrial Classification System (NAICS) and specifically from the manufacturing industrial segments, including classifications 32 – 33. In fact, the data used includes all of the 3xx industrial segments. Eighty-eight of the companies included in the Recycling Benchmark study with Z-Scores <=8.0 (Figure 2 above) were used for comparison to the NAICS results.

All data conformed to descriptive statistics analysis at the confidence level (95%). The guideline limits and results presented below are in the form of “speedometer” charts. Four color zones define each chart. Red is for values falling into the danger or distressed zone; yellow is the cautionary zone; green represents a nominal safe zone; finally, blue is the zone of superior performance although some caution
is warranted.

The speedometer chart limits for the Z-Score red, yellow and green color zones is set by the ranges defined by Dr. Altman with the exception that there appeared to be a logical break at Z-Score 5.0. The maximum Z-Score was 8.0 to avoid distortion by very high market equity contributions to scores above this limit.

Figures 3, 4, 5 & 6 provide a comparative view and link from the Benchmarking report Z-Score results to the present data set along with illustration of computed results for the Altman Z-Score, Z’ Score and Z” Score charts.

Figure 3 illustrates that the overall Z-Score for recycling companies was 5.46 (red arrow) while the target improvement goal for those poorly performing companies was to achieve a nominal 4.00 Z-Score (dark blue arrow). Note that as part of the Recycling Industry Benchmarking report, each company received confidential, individualized feedback and recommended actions to improve their business operations.

Figures four through six compare 88 public companies used as part of the Recycling Benchmark study to the results from the NAICS data. Over 1,800 financial data points contribute to the analysis and the guidelines presented in subsequent charts.

A red arrow represents the "88 companies" in each chart below and subsequent pages. The value represented by the red arrow is in the upper left corner of each chart. The blue arrow represents NAICS results. The corresponding value for the blue arrow is in the upper right corner of each chart.

Within each chart are range limits for the Z-Score results per Dr. Altman or as appropriate the “Green Zone” limit for the Z-Score contributing ratio.

The financial data used in the Benchmarking report and NAICS are contemporary and, at this writing, eight to nine years old. One might argue the data is too old and not relevant to today’s businesses. Before dismissing the suggested guidelines as being irrelevant, consider that Dr Altman developed the Z-Score originally in 1968 and subsequent versions in the 1970's. The Z-Score guidelines were accurate in predicting bankruptcy then and continue to do so now, some 45 years later. If the Z-Score limits and guidelines continue to be valid, then so must be the underlying ratios that contribute to the Z-Score result.

**The “Green Zone”**

One can argue the relative importance as to one ratio over another. Valid arguments can be that EBIT is the most important ratio factor or that Retained Earnings should be first. The argument might further expand, that without Sales there can be no EBIT, therefore no Retained Earnings, and ultimately no Equity. We make no assertion on relative importance except for the need and desire to achieve business financial performance that falls within the Green Zone for each Z-Score contributing ratio.

NOTE: Data for computing the Z-Score ratios come from both the Income Statement and Balance Sheet and represent a single point in time. To get a proper sense of performance whether historical or for Pro
Forma projections, one must look at the trend over at least three business cycles or operating periods. Subsequent sections of this document provide performance trends for several companies.

Interpret performance results by the ratio value and change over time. If performance initially was in the green zone but progresses into the yellow and nearing the red zone, then there is cause for taking management action in those operational areas that contribute to the deteriorating ratio value.

If performance ratios are all in the green zone, the company Z-Score will be in the green zone between 3.0 and 5.0. Alternatively, if all ratios are in the yellow zone, the company is in the zone of uncertainty and perhaps headed toward the red zone indicating business distress and potential bankruptcy. Management action to improve the red and/or yellow zone Z-Score contributing ratios is required to achieve a green or blue zone performance ranking.

A “safe” company may have a Z-Score between 3.0 and 5.0, but that does not mean the company is financially sound. It may have one or two contributing ratios in the yellow or even red zone. The ratios are indicators as to potential problems within the business that need further management attention. If all ratios are in the blue zone, the business may be the best in class that all others would like to emulate.

Figure 7 is Working Capital to Total Assets (X1). Note that the 88 public manufacturing companies have performance at the low end of the green zone but only slightly below the 0.23 value for NAICS 3XX performance result. The result from the 88 companies is in relatively close agreement and comparison with the NAICS working capital ratio results.

Guiding Principles:

X1 = Working Capital / Total Assets is the least significant contributor to Z-Score but closely parallels X3 influence. High or Low X1 values can be equally detrimental to supporting sales. Check for balance in Working Capital components including relationship to sales, Cost of Sales, debt, inventory, cash and accounts receivable. Often is a leading factor in cash flow sufficiency problems. Caution is advised for very high X1 values.

Target Green Zone ratios
- Z-Score = 0.181 – 0.314
- Z’ Score = 0.176 – 0.355
- Z” Score = 0.149 – 0.294

Some guiding principles are included alongside the speedometer chart. For X1, if it is has a negative value then action must be immediately taken to correct the working capital situation. A negative value indicates current assets are less than current liabilities. Put another way, there are not enough current assets available to meet the current obligations of the company and is a sign of financial weakness.

Next up is X2, Figure 8, Total Retained Earnings to Total Assets ratio. It is an indication of how management supports the business with cumulative earnings over time. Dividend practices and earnings payout directly affect this ratio. Corporate structure also has an impact as earnings may be treated differently under subchapter S versus “C” corporation or LLC or other proprietorship organizations and/or structures.
Dr. Altman asserts that the most important ratio over time is Total Retained Earnings / Total Assets. He may be right because it is one driver of business growth potential. However, keep in mind that you cannot have retained earnings without productive sales results and EBIT contribution from operations.

As with the X1 component, there is good correspondence between the 88 manufacturing company X2 ratio and NAICS results, 0.31 and 0.34 respectively. The interpretation is that the suggested Green Zone value range is reasonable.

Note that the Green Zone range of values for each form of the Altman Z-Score is also included with each financial measure guiding principles.

X3, EBIT / Total Assets ratio, Figure 9, is the most important contributing ratio in the opinion of this author. Negative values indicate profit loss before interest and taxes are considered. This adverse circumstance must be corrected.

Many companies experience a loss at some time or other so a single period result may not be detrimental, but a continuing trend of losses directly affects business long-term survivability. Creditors and lenders lose faith and make borrowing money more difficult. Retained earnings consumption and/or additional debt are required to sustain the business.

This one ratio (X3) has an immediate impact on all the other Z-Score contributing ratios. For survivability, the business practitioner must look at pricing strategies, expense and cost reduction
opportunities, reduced earnings payout and when possible to use debt leverage to fuel growth and improved operational performance.

Shoot for the X3 Green Zone, and many of the other Z-Score ratio contributions will follow along with improved results.

Note once again the good correspondence between the publicly owned manufacturing companies and the NAICS X3 ratios of 0.10 and 0.11 respectively.

X4, the Equity to Debt ratio, Figure 10, depends on the value used for the equity component. Public companies use the market equity value as reflected in its stock market trading value. Private companies tend to have a lower ratio and rely on owners’ equity; defined as Total Assets minus Total Liabilities. Some experts even suggest modifying the X4 coefficient depending on gross margin trends.

By definition, Total Assets = Total Liabilities + Total Equity. Total Liabilities may be very small resulting in very large values for X4, Total Equity / Total Debt. Negatives values for X4 indicate Total Liabilities exceed Total Assets, which is a very serious situation. Debt management and improved operational performance in the other four Z-Score ratios substantially influence this ratio.

The dichotomy between the public companies is apparent in Figure 10 where the green zone is occupied by the red arrow with a value of 2.17 versus the NAICS value of 0.58. Private companies typically have a lower ratio. Manage and improve the other Z-Score component ratios will tend to move this performance metric toward the green zone.

Guiding Principles:

X4 = Market Value Equity / Total Liabilities and tends to dominate for Z-Score over 5. Ultimately, equity is driven by profit retention and business growth using reasonable balance of debt and equity. High X4 values and Z-Score values over 4 indicate high equity and low debt position, potential exists to use debt to leverage growth. View high ratios with some caution especially for public companies as the market may over value and thereby over rate the company.

Target Green Zone ratios

- Z-Score = 1.022 – 2.784
- Z’ Score = 0.446 – 0.881
- Z” Score = 0.377 – 0.730

Businesses with high X4 values may be able to use debt to leverage additional investment in assets and stimulate future growth and profitability.

Andrew Thom of ABDQ, EICK & MEYERS, LLP, comments. “At a certain point a too high X4 value should begin to reflect negatively on a company because that means the company is either not returning profits to shareholders for personal reinvestment or the company is not using its retained profits to fuel its own growth and expansion through R/D and new ventures. While managing an improving Z-Score can be an excellent indicator of the overall health of a company, a targeted long-term Z-Score by management
could be used as a measuring stick to determine what level of profits to reinvest, what debt level should be taken on, and how much equity to return to shareholders.”

X5, Net Sales to Total Assets, Figure 11. This ratio is driven by numerous factors including competition and product pricing strategies as well as market demand for the business products. Commodity type products with a lot of competing companies tend to drive this ratio value down. Niche or market leading innovation products tend to demand higher prices that raise this Z-Score ratio. However, a very large ratio can mean the company is undercapitalized, or it might have highly productive assets that have also been highly depreciated. Automated versus labor intensive processes also have a direct impact on this productivity ratio. One is well advised to examine other financial ratios such as fixed asset utilization and other productivity ratios.

The NAICS X5 ratio values are superior to that of the public companies, 2.28 versus 1.56 respectively. The higher value NAICS green zone is the recommended target or goal values. High value but non-productive assets negatively affect this ratio. It may also be artificially high because of very productive but highly depreciated assets. It is good practice to consider the Deprecated Asset ratio in concert with the X5 ratio when evaluating ongoing performance as well as for developing Pro Forma financial statements and forecasts.

Testing the Limits
Now that we have Green Zones defined for all the Z-Score component ratios, a question remains. Are these data relevant to today’s business environment? One can easily test it by going on line and looking up publicly-owned company financial data at sites such as Morningstar or Market Watch then plug their data into the Z-Score computation as well as compare the trend for each ratio to the associated Green Zone guidelines provided above. Of course, data from privately held companies is not generally available to the public.

If you don’t know which Z-Score formula to use for any given company including your own, calculate all three Z-Scores and compare the trends over time. But also keep in mind that the Green Zone guideline values do not depend on which Z-Score formula is used for bankruptcy prediction. We are interested in
survivability and growth, so the recommendation is to focus on managing the “naked” Z-Score contributing ratios to achieve results that will be positive and sustainable.

Let’s do a quick test on the Green Zone recommendations referencing a recent article in The Motley Fool by Timothy Green, March 18, 2013. In this article Mr Green posits the question “Are These Companies On the Path to Bankruptcy?” He uses the original form of the Z-Score computation to compare three companies, Advance Micro Devices (AMD), Radio Shack and Groupon. His financial data was sourced from Morningstar.

Two of the companies are examined below, AMD and Radio Shack, since Groupon has only two year’s of operation. Only the Z-Score contributing ratio portion of Mr Green’s article is reproduced here for the two companies in question. In addition, a column is added that includes a brief comment on the year to year trend.

In the first table, and without delving further into AMD operations, it is apparent from the Z-Score contributing ratios that it is performing predominantly in the yellow to red zones. Both X5, Sales on Total Assets and X3, EBIT to Total Assets need significant improvement. The Z-Score is indicating that AMD is performing similar to companies that have gone bankrupt. Survivability is questionable although it has good products that are in demand by the cost conscious consumer.

<table>
<thead>
<tr>
<th>AMD Ratio</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>Comment on Trend and Performance Zone</th>
</tr>
</thead>
<tbody>
<tr>
<td>X1</td>
<td>0.02</td>
<td>0.23</td>
<td>0.39</td>
<td>0.29</td>
<td>0.22</td>
<td>Trending down but okay for now</td>
</tr>
<tr>
<td>X2</td>
<td>(0.81)</td>
<td>(0.65)</td>
<td>(1.10)</td>
<td>(1.00)</td>
<td>(1.54)</td>
<td>Solid Red performance trending lower – not good</td>
</tr>
<tr>
<td>X3</td>
<td>(0.25)</td>
<td>0.07</td>
<td>0.17</td>
<td>0.07</td>
<td>(0.26)</td>
<td>Yellow trending toward Red performance – not good</td>
</tr>
<tr>
<td>X4</td>
<td>0.17</td>
<td>0.60</td>
<td>1.45</td>
<td>1.48</td>
<td>0.56</td>
<td>Trending yellow performance – not good</td>
</tr>
<tr>
<td>X5</td>
<td>0.76</td>
<td>0.60</td>
<td>1.31</td>
<td>1.33</td>
<td>1.36</td>
<td>Trending yellow performance – needs improvement</td>
</tr>
<tr>
<td>Z-Score</td>
<td>(1.09)</td>
<td>0.55</td>
<td>1.66</td>
<td>1.40</td>
<td>(1.08)</td>
<td>Solidly in Red Zone – not good</td>
</tr>
</tbody>
</table>

Radio Shack five-year performance data is presented in the next table along with some trend comments. The basic multi-year performance trend appears to be superior to AMD but is trending lower. The comparison between AMD and Radio Shack as presented may not be appropriate using the Z-Score.

<table>
<thead>
<tr>
<th>Radio Shack Ratio</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>Comment on Trend and Performance Zone</th>
</tr>
</thead>
<tbody>
<tr>
<td>X1</td>
<td>0.51</td>
<td>0.56</td>
<td>0.40</td>
<td>0.53</td>
<td>0.44</td>
<td>Trending toward Green from solid Blue performance</td>
</tr>
<tr>
<td>X2</td>
<td>0.94</td>
<td>0.96</td>
<td>0.69</td>
<td>0.70</td>
<td>0.59</td>
<td>Trending toward Green from solid Blue performance</td>
</tr>
<tr>
<td>X3</td>
<td>0.14</td>
<td>0.15</td>
<td>0.17</td>
<td>0.07</td>
<td>(0.03)</td>
<td>Trending solid Green into Red Zone – not good</td>
</tr>
<tr>
<td>X4</td>
<td>1.01</td>
<td>1.78</td>
<td>1.40</td>
<td>0.52</td>
<td>0.19</td>
<td>Trending solid Green in Yellow Zone – not good</td>
</tr>
<tr>
<td>X5</td>
<td>1.85</td>
<td>1.76</td>
<td>2.06</td>
<td>2.01</td>
<td>1.85</td>
<td>Green Zone but low end</td>
</tr>
<tr>
<td>Z-Score</td>
<td>4.84</td>
<td>5.34</td>
<td>4.91</td>
<td>4.17</td>
<td>3.23</td>
<td>Trending from high end Green to Low end of Zone</td>
</tr>
<tr>
<td>Z” Score</td>
<td>3.87</td>
<td>4.18</td>
<td>4.04</td>
<td>3.41</td>
<td>2.65</td>
<td>Trending from solid Green to Yellow cautionary Zone</td>
</tr>
</tbody>
</table>

AMD is a publicly held manufacturing company while Radio Shack is a publicly held non-manufacturing company. The Z” Score may be more appropriately applied to Radio Shack instead of the original Altman Z-Score bankruptcy predictor formula.

Intel Corporation, a direct competitor of AMD, was added to The Motley Fool mix of companies to test the Green Zone guidelines. Financial data for Intel was also obtained from Morningstar online.
Speedometer charts are not suitable for comparing multiple period trend information; therefore, a different type of chart is employed that reproduce the speedometer chart colored performance zones. One notable difference is that the vertical axis, range of performance values, was expanded to accommodate the range of business performance exhibited by AMD, Radio Shack and Intel. Expanding the vertical axis compresses the middle zones, but this merely amplifies when a company such as AMD is really in a distressed situation.

Examining the grouping of performance ratios charts, Figures 12 through 17, conveys the story. All three companies have been trending down over the past couple years, but Radio Shack and Intel have
generally been riding along in the blue and green zones. AMD has been lagging behind though trying hard, unsuccessfully, to get up into the green zone. The Z-Score indicates that AMD is in a distressed situation. The zones of performance show that AMD is experiencing red zone performance in two critical areas, earnings on assets employed and retained earnings. Sales are in the cautionary performance zone while working capital seems to be in the green zone, but the trend is negative.

To follow up on The Motley Fool question but focused on survivability rather than bankruptcy, how would you apply the Green Zone trends and guidelines? If you were AMD’s CEO, where would you focus your improvement actions? Would you strive for the Green Zone? Could the Green Zone guidelines have been helpful several years ago?

What opportunity for improvement is indicated for Intel? It is a strong company with desirable market position and products. However, the sales on assets is in distress and needs improvement to offset the decline in market equity.

Still not convinced that the Green Zone guidelines presented in the speedometer and trend line charts could contribute to business survivability? Test the limits with one more group of trend charts and more real company performance information.

An on-line article written by the CI Staff of Computerized Investing, “The Altman Z-Score”, states “The biggest calamity that can befall equity investors is corporate bankruptcy, which wipes out the equity of a firm and knocks the stock’s investment value down to zero.” In this article, the Altman Z-Score is applied to analyze a company that went bankrupt. Border’s Group, parent to former Border’s Book Stores and other brand name subsidiaries, filed for bankruptcy in February 2011 and later that year for liquidation. The prior five-years of financial information is presented by the CI Staff to illustrate Border’s performance trend prior to filing bankruptcy.

The Z-Score contributing ratios are incorporated into the Green Zone trend charts, Figures 18 through 23, for comparison to the Intel Corporation multi-year performance presented in the previous chart group.

Z-Score was originally developed to aid in predicting the potential bankruptcy. When the score drops to 1.81 or below, the company is said to be highly stressed and bankruptcy is likely. Figure 23 clearly shows the Z-Score trend was in the Yellow cautionary zone and bordering on the Red zone for several years before Border’s Group filed bankruptcy.

Was there any indication that something was wrong before they went off the cliff that might have helped them survive? The answer is unequivocally YES!

Refer to Figures 18 through 23. Examine the contributing ratios trends for working capital, retained earnings and EBIT. All ratios were in the red zone and trending downward for five years before bankruptcy. The low equity to debt ratio indicates the company was increasingly dependent on debt and/or consuming retained earnings to maintain operations. What if the management team took
corrective action based on the Z-Score contributing ratio trends? Is it possible the company could have survived?

One more test of Green Zone guidelines is included by comparison to Dr. Altman’s data published in July 2000, “Predicting Financial Distress of Companies: Revisiting the Z-Score and ZETA® Models.” One stated conclusion was that the Z-Score was still robust despite being developed over 30 years earlier. In addition, Dr. Altman examined 53 bankrupt and 58 nonbankrupt company financials for additional contributing ratio measures and for applicability to his ZETA® credit risk model.
Appendix A of the Altman article, presents several measures, along with associated statistics, including the Z-Score contributing ratio mean value for both failed and non failed companies. These ratio mean values are plotted on the relevant trend chart, Figures 18 through 23. Compare these published ratios to the Green Zone guidelines presented in this article.

Overall, the ratio mean values from Dr Altman’s article fall into Green Zone for non-bankrupt companies and Yellow or Red Zone for the failed and bankrupt businesses. The “failed” mean value for the Z-Score in the present guideline development was 1.602 versus 1.838 reported in the Dr Altman’s July 2000 article. Similarly, the “non failed” Z-Score mean was 3.881 in the present work versus 3.785 in the July 2000 article.

**Conclusion**

The power and resilience of the Altman Z-Score has been demonstrated for over four decades. A major reason for the durability and relevance of the Z-Score is that it incorporates within a single measure five measures representing business Profitability, Liquidity, Efficiency, Productivity and Leverage or Coverage. Each measure individually and collectively yields insight to business performance and expectations for sustainable growth and in fact survivability over time. The Altman Z-Score puts everything under one measure which predicts potential bankruptcy. AMPros Corporation looked under the hood of the Z-Score and the contributing ratio values. A range of operating values, color coded by performance zone, was developed for business management and investment guidance.

We conclude that the recommended “Green Zone” performance metric values are relevant and should be adopted as part of the tool set for evaluating business performance, improvement and survivability.

Lori Tapani, Co-President and Co-Owner, Wyoming Machine states that “monitoring and making adjustments to business operations based on these Green Zone metrics can help with growth, profitability and prosperity over the long haul – much more than pure survival.”

Are the Z-Score and contributing ratios the only financial ratios needed? Absolutely not, but utilizing these results and guidelines is a good place to evaluate business survivability and focus for action. Use the guidelines for establishing goals in forecasting budgets or developing business plans and proforma financial statements. The guidelines provide some additional benchmarks for due diligence in business mergers and acquisitions. In particular, these guidelines are helpful to those striving for financial investments and funding whether needed for a start up or to expand an existing business.

The Green Zone is business’ End Zone.

Questions and comments may be directed to dan@amproscorp.com or through LinkedIn®.

**About the Author:**

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Disclaimer: The advice and guidelines presented are based on business and market information and do not constitute legal or accounting advice or counsel. AMPros Corporation has no control over the actions of those applying these guidelines and assume no responsibility for such actions. Other factors may come into play such as management’s misstatement of company financial conditions or fraud which would distort the results from application of the suggested guidelines. In other words, garbage in; garbage out.

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Other Reading:

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