Duff & Phelps, LLC
Risk Premium Report
High Financial Risk Portfolio Supplement
2009

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Risk Premium Report – High Financial Risk Portfolio Supplement 2009

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Biography

Mr. Grabowski, ASA, is a Managing Director of Duff & Phelps, LLC. Mr. King, CFA, is National Technical Director of Valuation Services of Mesirow Financial Consulting, LLC. They are co-authors of the annual Duff & Phelps' *Risk Premium Report*. We want to thank David Turney, CFA, for his assistance in assembling the exhibits presented herein. We also want to thank Paul Wittman of Wittco Software for his help updating the software we use to derive the data from the databases.

Exhibits

This report discusses market data presented in accompanying tables with data updated through December 31, 2008:

Exhibit H-A	Risk premiums vs. company "z-score" ranked portfolios This exhibit is for use in the Build-Up method and parallels the A exhibits in the *Risk Premium Report 2009.*
Exhibit H-B	Premiums over CAPM vs. company "z-score" ranked portfolios This exhibit is for use in the Capital Asset Pricing Model and parallels the B exhibits in the *Risk Premium Report 2009.*
Exhibit H-C	Relation between company "z-score" ranked portfolios and risk characteristics of those portfolios This exhibit parallels the C exhibits in the *Risk Premium Report 2009*. Note: we are not including exhibits that parallel the D exhibits in the *Risk Premium Report 2009*.
Exhibit H-E	Median size measures of companies comprising the "z-score" ranked portfolios

Introduction

We have previously presented historical equity risk premiums for 25 size-ranked portfolios using eight alternate measures of company "size". This supplemental report describes returns for those companies comprising the High Financial Risk Portfolio of companies based on historical data updated through the end of 2008.[1] As with our earlier research, this study made use of the database of the Center for Research in Security Prices ("CRSP") at the Graduate School of Business at the University of Chicago together with Standard & Poor's *Compustat* database.

This report presents supplemental data to the *Risk Premium Report 2009*, an update of data that we first published in several articles and for which we have published prior updates.[2]

Background

In the *Size Study* portion of the *Risk Premium Report* we sort companies by size, breaking the New York Stock Exchange ("NYSE") universe into 25 size-ranked portfolios and adding American Stock Exchange ("AMEX") and National Association of Securities Dealers Automated Quotations ("NASDAQ") listed companies. These portfolios are limited to companies with a track record of profitable performance. This supplemental report presents additional data concerning the companies comprising the "high financial risk" portfolio- companies that are losing money, have high leverage, or are in bankruptcy.

Description of the Data

This study made use of the CRSP database together with Standard & Poor's *Compustat* database. The population of companies considered in our study was taken from the intersection of the CRSP universe and the *Compustat* universe (that is to say, our study is limited to firms that are covered by both databases). We exclude from our data set: (1) American Depository Receipts ("ADRs"); (2) non-operating holding companies; and (3) financial service companies (SIC code = 6). We exclude financial service companies because (a) some of the financial data used in our study are difficult to apply to many companies in the financial sector (e.g., "sales" at a commercial bank); (b) financial institutions support a much higher ratio of debt to equity than is normal in other industries; and (c) companies in the financial services sector were poorly represented during the early years of the *Compustat* database.

The *Compustat* database was established in 1963. In this study we calculated historical equity returns for the period 1963 through 2008 (the latest year). *Compustat* data is available for some companies going back into the

[1] Published as the Standard & Poor's Corporate Value Consulting *Risk Premium Report* for Reports titled 2002 to 2004 and as the PricewaterhouseCoopers and Price Waterhouse *Risk Premium Report*s for years before 2002.

[2] "New Evidence on Size Effects and Equity Returns", *Business Valuation Review* (September 1996) (covering the period 1963-1994); "Size Effects and Equity Returns: An Update", *Business Valuation Review* (March 1997); "New Evidence on Equity Returns and Company Risk", *Business Valuation Review* (September 1999; revised March 2000). Articles are available at www.appraisers.org, go to "Business Valuation".

1950s, but this earlier data only consists of back histories for companies that were added to *Compustat* in 1963 or later. We begin with 1963 data in order to avoid the obvious "selection bias" that would otherwise result.

For each year covered in our study, we considered only financial data for the fiscal year ending no later than September of the previous year. For example, in allocating a company to a portfolio to calculate returns for calendar year 1995, we consider financial data through the latest fiscal year ending September 1994 or earlier (depending on when the company's fiscal year ended).

For each year since 1963, we filtered the universe of companies to exclude the following:

- Companies lacking 5 years of publicly traded price history;
- Companies with sales below $1 million in any of the previous five fiscal years;
- Companies with a negative 5-year-average EBITDA (earnings before interest, taxes, depreciation and amortization) for the previous five fiscal years.

Companies that pass this test have been traded for several years, have been selling at least a minimal quantity of product, and have been able to achieve some degree of positive cash flow from operations. This screening was a response to the argument that the "small cap" universe may consist of a disproportionate number of high-tech companies, start-up companies, and recent initial public offerings, and that these unseasoned companies may be inherently riskier than companies with a track record of viable performance. The number of companies eliminated by these criteria varies from year to year over the sample period.

Once we eliminated the companies described above, we create a separate set of companies of "high financial risk" companies with any one of the following characteristics:

- Companies identified by *Compustat* as in bankruptcy or in liquidation;
- Companies with 5-year-average net income available to common equity for the previous five years less than zero (either in absolute terms or as a percentage of the book value of common equity);
- Companies with 5-year-average operating income for the previous five years (defined as sales minus (cost of goods sold plus selling, general and administrative expenses plus depreciation)) less than zero (either in absolute terms or as a percentage of net sales);
- Companies with negative book value of equity at any of the previous five fiscal year-ends;
- Companies with debt-to-total capital of more than 80% (with debt measured in book value terms and total capital measured as book value of debt plus market value of equity).

These companies were excluded from our base set and we analyze them separately in this supplemental report; we refer to these companies as the "high financial risk" portfolio. We sought in this manner to isolate the effects of high financial risk. Otherwise, the results of the *Size Study* might be biased for smaller companies to the extent that highly leveraged and financially distressed companies tend to have both high returns and low market values. It is possible to imagine financially distressed (or high risk) companies that lack any of the above characteristics. It is also easy to imagine companies which have one of these characteristics but which would not be considered financially distressed. Nevertheless, we are confident that the resulting "high financial risk" portfolio is

composed largely of companies whose financial condition is significantly inferior to the average, financially "healthy" public companies included in the base set used to develop the 25 portfolios.

The number of companies classified as "high financial risk" varied over the sample period. These companies represented approximately 25+% of the data set in recent years, but less than 5% in 1963. Certain technical changes in methodology have resulted in a greater number of companies falling into the "high financial risk" portfolio than in versions of this study published prior to 2000.

The exclusion of companies from the base set and inclusion in the high financial risk portfolio based on historical financial performance does not imply any unusual foresight on the part of hypothetical investors in these portfolios. In forming portfolios to calculate returns for a given year, we exclude companies from the base set and include them in to high financial risk portfolio on the basis of performance during previous years (e.g., average net income for the five prior fiscal years), rather than current or future years. For instance, to form portfolios for 1963, we take into account the average net income for the five fiscal years preceding September 1962. We repeat this procedure for each year from 1963 through the latest available year.

For the companies in the high financial risk portfolio, we formed portfolios of securities based upon relative risk as measured by Altman's z-score.[6] Altman's z-score was originally designed as a measure to predict the risk of failure up to two years prior to distress for a sample of manufacturing companies using financial data prepared according to the standards of the day. The accuracy of predicting the risk of failure diminished substantially as the lead time increased. The z-score resulted from a statistical analysis of company data using the statistical technique of multiple discriminant analysis.

Altman has since offered improvements on the original z-score, but the original z-score is still frequently calculated as a convenient metric that captures within a single statistic a number of disparate financial ratios measuring liquidity, profitability, leverage and asset turnover. We should caveat that these ratios are not strictly comparable across industries or across time, and that, for instance, one would expect large differences in asset turnover among a service company, an industrial company, or a retailer.

We used the following z-score model for publicly-traded companies in preparing the analyses presented in the accompanying exhibits:

$$z = 1.2\ x_1 + 1.4\ x_2 + 3.3\ x_3 + 0.6\ x_4 + 0.999\ x_5$$

where:

x_1 = working capital / total assets

x_2 = retained earnings / total assets

x_3 = earnings before interest and income taxes / total assets

x_4 = *market* value of common equity / book value of total liabilities

[6] E. I. Altman, "Financial Ratios, Discriminant Analysis and the Prediction of Corporate Bankruptcy," *The Journal of Finance*, Vol. 23, No. 4 (Sep., 1968), pp. 589-609; "Predicting Financial Distress of Companies: Revisiting the Z-Score and Zeta Models," July 2000; "Revisiting Credit Scoring Models in a Basel 2 Environment," May 2002.

x_5 = sales / total assets

z = overall index

The "zones of discrimination" are as follows:

z > 2.99 = "safe zone"

1.8 < z < 2.99 = "grey zone"

z < 1.80 = "distress zone"

For each year, we formed portfolios by sorting all of the companies in the high financial risk portfolio. We then calculated the z-score and divided the companies into three portfolios: those companies with z-score greater than 3.0; those companies with z-score between 1.8 and 2.99; and those companies with z-score less than 1.8. The portfolios were rebalanced annually: that is, the companies were re-ranked and sorted at the beginning of each year. Portfolio rates of return were calculated using an equal-weighted average of the companies in the portfolio.

Correcting for "Delisting Bias"

An article by Tyler Shumway provided evidence that the CRSP database omits delisting returns for a large number of companies.[8] These returns are missing for the month in which a company is delisted from an exchange. Shumway collected data for a large number of companies that had been delisted for performance reasons (such as bankruptcy or insufficient capital). He found that investors incurred an average loss of about 30% after delisting. He further showed that delisting for non-performance reasons (such as mergers or changes of exchange) tended to have a neutral impact in the month that the delisting occurred.

While CRSP has improved their database by reducing the number of companies for which it omits delisting returns, we have incorporated the Shumway evidence into our rate of return calculations. In calculating rates of return, we have imputed a 30% loss in the month of delisting in all cases in which the delisting return is missing and CRSP identified the reason for delisting as performance related, and also in all cases in which the reason for delisting was unknown.[9]

Measurement of Historical Risk Premiums

The accompanying exhibits report average historical risk premiums for the period 1963 (the year that the *Compustat* database was inaugurated) through 2008. A long-run average historical risk premium is often used as an indicator of the expected risk premium of a typical equity investor. Our measure of returns is based on dividend income plus capital appreciation and represents returns after corporate taxes (but before owner level taxes).

[8] "The Delisting Bias in CRSP Data," Tyler Shumway, *Journal of Finance* (March 1997).

[9] This approach is consistent with updates that we have published since 1998. More recent evidence suggests that the average "delisting" loss is less than Shumway's original estimate. See "CRSP Delisting Returns" (April 2001) prepared by the Center for Research in Security Prices at http://www.crsp.com/resources/files/crsp_white_paper_delist_returns.pdf.

To estimate historical risk premiums, we first calculated an average rate of return for each portfolio over our sample period. For those portfolios with zero companies in any year, that year's results are excluded in the averages. Then, we subtracted the average income return earned on long-term Treasury bonds over the same period (using *SBBI* data) to arrive at an average historical risk premium for investments in equity.

Presentation of the Results

In the accompanying exhibit, H-A, we present summary data for the high financial risk companies ranked by z-score. The exhibit includes the following statistics for three portfolios ranked by z-score:

- Beta calculated using the "sum beta" method applied to monthly returns for 1963 through the latest year (see *SBBI Valuation Edition 2008 Yearbook* pp. 117-122 for a description of the "sum beta" method)
- Standard deviation of annual historical equity returns
- Geometric average historical equity return since 1963
- Arithmetic average historical equity return since 1963
- Arithmetic average historical risk premium over long-term Treasuries (average return on equity in excess of long-term Treasury bonds) since 1963
- Average carrying value of preferred stock plus long-term debt (including current portion) plus notes payable ("Debt") as a percent of MVIC since 1963

For comparative purposes, we also report average returns from *SBBI* series for Large Companies, Small Companies, and Long-Term Government Bond Income Returns for the period 1963 through the latest year.

The definitions of the various market and accounting information follow the definitions of those fields as used by *Compustat*. We have included those definitions in Appendix A of the *Risk Premium Report 2009*.

Premiums over CAPM

In the context of the Capital Asset Pricing Model ("CAPM"), the greater betas of the smaller companies explain some but not all of the higher average returns in size-ranked portfolios. With regards to the high financial risk portfolio the return in excess of CAPM can be termed a "high financial risk premium" as this premium combines the beta-adjusted size premium plus the additional return required over that expected by beta due to the above average risk characteristics of the companies comprising the portfolio. This can be verified by calculating a "Return in Excess of CAPM" using a methodology similar to that used in *SBBI 2008 Yearbook* (pp. 129-142 in the *Classic Edition*, pp. 129-143 in the *Valuation Edition*). An example of this calculation will illustrate the method. The following example uses data for the portfolio of companies with "z scores" less than 1.8 ranked from exhibit H-B:

A. Portfolio beta = 1.70
B. Average historical market risk premium = 3.84%
(historical large stock equity risk premium)
C. Indicated CAPM premium (A x B) = 6.53%
D. Arithmetic average long-term Treasury income return = 7.04%

E. Indicated CAPM return (C + D) = 13.57%
F. Arithmetic average historical equity return = 21.41%
G. Return in excess of CAPM (F - E) = 7.84%.

In our exhibits we report betas calculated using the "sum beta" method applied to monthly portfolio return data. This method yields higher beta estimates for smaller companies than would be obtained using ordinary least squares.

Exhibits H-B reports calculations of premiums over CAPM for each of three portfolios formed from the companies included in the high financial risk portfolio. The exhibit reports the following statistics:

- Beta estimate calculated using the "sum beta" method applied to monthly returns for 1963 through the latest year (see *SBBI Valuation Edition 2008 Yearbook*, pp. 117-122, for a description of the "sum beta" method)
- Arithmetic average historical equity return since 1963
- Arithmetic average historical risk premium over long-term Treasuries (average return on equity in excess of long-term Treasury bonds) since 1963
- Indicated CAPM premium, calculated as the beta of the portfolio multiplied by the average historical market risk premium since 1963 (measured as the difference between *SBBI* Large Stock total returns and *SBBI* income returns on long-term Treasury bonds)
- Premium over CAPM, calculated by subtracting the "Indicated CAPM Premium" from the "Arithmetic Risk Premium"

Exhibits H-B displays three lines of data for these portfolios formed from the companies excluded from the base set and included in the "high financial risk" portfolio of companies ("high financial risk portfolios").

For comparative purposes, we also report average returns from *SBBI* series for Large Companies, Small Companies, and Long-Term Government Bond Income Returns for the period 1963 through the latest year.

Practical Application of the Data

This data can be used as an aid in formulating estimated required rates of return using objective measures of characteristics of a subject company. The historical risk premiums reported in exhibit H-A have not been adjusted to remove beta risk and, therefore, they should not be multiplied by a CAPM beta or otherwise included in a CAPM analysis. The data reported in exhibit H-B can be used in the context of a CAPM analysis.

The traditional z-score was developed using data for publicly traded companies and one of the statistics utilizes stock price. This creates problems for application of the data to private companies. Altman developed a similar model using only the financial statement data for private companies. If the subject company is not publicly traded then the analyst can calculate the z-score for a private company (the z'-score) to compare with the data in the accompanying exhibits:

$$z' = 0.717\ x_1 + 0.847\ x_2 + 3.107\ x_3 + 0.420\ x_4 + 0.998\ x_5$$

where:

x_1 = working capital / total assets

x_2 = retained earnings / total assets

x_3 = earnings before interest and income taxes / total assets

x_4 = *book* value of common equity / book value of total liabilities

x_5 = sales / total assets

z' = overall index

The "zones of discrimination" are as follows:

z' > 2.90 = "safe zone"

1.23 < z' < 2.90 = "grey zone"

z' < 1.23 = "distress zone"

While the original companies used to develop the zones of discrimination for the z-score and the z'-score differed and are not strictly comparable, the returns reported in the accompanying exhibits can be useful to develop cost of equity estimates based on the relative zones of discrimination. In applying either the z-score or z'-score equations cited herein, one should express the ratios in terms of their decimal equivalents (e.g., x_1 = working capital / total assets = 0.083).

Build-Up Method

The equity cost of capital can be estimated by the build-up method as follows:

$$E(R_i) = R_f + RP_m + RP_s + RP_u$$

where:

$E(R_i)$ = Expected (market required) rate of return on security *i*

R_f = Rate of return available on a risk-free security as of the valuation date

RP_m = General equity risk premium (ERP) estimate for the "market"

RP_s = Risk premium for smaller size

RP_u = Risk premium attributable to the specific company or to the industry (*u* stands for unique or unsystematic risk often called the company-specific risk premium)

As an alternative to the above formula for the build-up method, $E(R_i) = R_f + RP_m + RP_s + RP_u$, where one adds a general equity risk premium for the "market" (equity risk premium), a risk premium for small size and a

risk premium attributable to the specific risk of the subject company to the risk-free rate, one can use exhibit H-A to develop a risk premium for the subject company which measures risk in terms of the total effect of market risk, size plus the additional return required due to the above average risk characteristics of the companies comprising the portfolio. This straightforward method of arriving at a discount rate using a "build-up" method uses the historical risk premiums over the long-term risk-free rate presented in exhibit H-A.

Use of these exhibits is a four-step process. One first matches the characteristics of the subject company to determine if the subject company better matches the characteristics of the base set of companies (the 25 portfolios) or to the high financial risk portfolios of companies (as described above). Second, assuming the subject company characteristics better matches the characteristics of the high financial risk portfolio of companies, one then calculates the z-score or z'-score for the subject company. Third, if the z-score or z'-score of the subject company indicates it is in the "grey zone" or "distress zone" one then matches the subject company with the companies included in the portfolio most comparable to the subject company (e.g., the high financial risk portfolio with z-score in the "grey zone" or in the "distress zone"). Fourth, the premiums of these portfolios can then be added to the yield on long-term Treasury bonds as of the valuation date to obtain benchmarks for the required rate of return.

The return data reported herein for the high financial risk portfolios has not been differentiated from any size effect. While the median size characteristics of the companies included in the three z-score portfolios is reported in exhibit H-E, the risk effect reported herein overlaps with the size effect documented in the *Size Study* portion of the *Risk Premium Report* for the base set of companies. The returns reported herein should be used instead of the returns reported in the *Size Study*, not added to those returns.

If the z-score or z'-score indicates that the subject company is in the "safe zone", one should consider whether the subject company is distressed or not. If one determines that it is not distressed (even though it matched the characteristics for exclusion from the base set of companies), the returns reported in the exhibits in the *Risk Premium Report* for the 25 portfolios may be more appropriate for the subject company than the returns reported herein. For example, the subject company may have debt-to-total capital of more than 80% (with debt measured in book value terms and total capital measured as book value of debt plus market value of equity) and not be distressed. More generally, an assessment that a company should be treated as "distressed" should be based on an evaluation of the company's current financial condition and circumstances. Such an assessment will generally involve more than a review of historical financial statistics and ratios.

Use of a portfolio's average historical rate of return to calculate a discount rate is based (in part) upon the implicit assumption that the risks of the subject company are quantitatively similar to the risks of the average company in the subject portfolio. If the risks of the subject company differ materially from the average company in the subject portfolio, then an appropriate discount rate may be lower (or higher) than a return derived from the average equity risk premium for a given portfolio. Material differences between the expected returns for a subject company and a given portfolio of stocks may arise due to differences in leverage (the average Debt/MVIC of the portfolios are displayed in exhibits H-A and H-C or other fundamental risk factors.

The risk premiums reported here are historical averages since 1963. We report the average historical risk premium over the same period for the *SBBI* Large Company stocks (essentially the *S&P 500*). This average was

3.84% over the period 1963-2008. If one's estimate of the equity risk premium for the *S&P 500* on a forward-looking basis ("*ERP*") were materially different from the average historical risk premium since 1963, it may be reasonable to assume that the other historical portfolio returns reported here would differ on a forward-looking basis by approximately a similar differential.[10] For example, assume that your current estimate of the *ERP* (i.e., the expected equity risk premium for the *S&P 500)* were 6.00%.[11] The difference between the average historical risk premium since 1963 of 3.84% for Large Company stocks and the 6.00% *ERP* can be added to the average equity risk premium for the z-score portfolio that matches to the z-score of the subject company to arrive at an adjusted forward-looking risk premium for the subject company. This forward-looking risk premium can then be added to the risk-free rate as of the valuation date to estimate an appropriate rate of return for the subject company. This reasoning does not apply to the premiums over CAPM (exhibits H-B) since those premia are based on relative returns over the reported period.

CAPM

The equity cost of capital can be estimated by the CAPM method as follows:

$$E(R_i) = R_f + B(RP_m) + RP_s + RP_u$$

where:

$E(R_i)$ = Expected rate of return on security *i*

R_f = Rate of return available on a risk-free security as of the valuation date

B = Beta

RP_m = General equity risk premium (*ERP*) estimate for the market (e.g., *S&P 500*)

RP_s = Risk premium for small size

RP_u = Risk premium attributable to the specific company (*u* stands for unique or unsystematic risk often called the company-specific risk premium)

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Use of these exhibits is a four-step process. One first matches the characteristics of the subject company to determine if the subject company better matches the characteristics of the base set of companies (the 25 portfolios) or to the high financial risk portfolios of companies (as described above). Second, assuming the subject company characteristics better matches the characteristics of the high financial risk portfolio of companies, one then calculates the z-score or z'-score for the subject company. Third, if the z-score or z'-score of the subject company indicates it is in the "grey zone" or "distress zone" one then matches the subject company with the companies included in the portfolio most comparable to the subject company (e.g., the high financial risk

[10] For a more complete discussion of the differences between historical realized risk premiums and forward-looking estimates, see "Equity Risk Premium**",** chapter one by Roger Grabowski and David King in *The Handbook of Business Valuation and Intellectual Property Analysis*, McGraw-Hill (2004) and chapter nine in *Cost of Capital: Applications and Examples* 3rd ed by Shannon Pratt and Roger Grabowski, Wiley (2008).

[11] See for example, "Problems with Cost of Capital Estimation in the Current Environment- Update" by Roger Grabowski, *Business Valuation Review* (Winter, 2008) for a discussion of the appropriate risk-free rate and estimated equity risk premium at the beginning of 2009. This article is also available on the Duff & Phelps' web site, www.duffandphelps.com. The average historical risk premium for Large Company stocks equals 6.50% for 1926-2008 (*SBBI Valuation Edition 2009 Yearbook*).

portfolio with z-score in the "grey zone" or in the "distress zone"). Fourth, the premiums of these portfolios can then be added to the yield on long-term Treasury bonds plus beta times the *ERP* as of the valuation date to obtain benchmarks for the required rate of return.

The premium over CAPM data presented in exhibit H-B can be used to make adjustments to a discount rate derived using the CAPM. When used in this manner, the premium over CAPM would be added to the CAPM calculation. That is, the premium should not be multiplied by beta, but instead should be added to the sum of the risk-free rate and the product of beta times the aggregate market risk premium. This is similar to the methodology recommended in *SBBI Valuation Edition 2008 Yearbook*, p. 60-61.

One can use exhibit H-B as the source for a combined risk premium for size and a risk premium attributable to the specific risk of the subject company due to the above average risk characteristics of the companies comprising the portfolio. The premiums over CAPM data reported herein have not been differentiated for any size effect. While the median size characteristics of the companies included in the three z-score portfolios is reported in exhibit H-E, the risk affect reported herein overlaps with the size affect documented in the *Size Study* portion of the *Risk Premium Report* for the base set of companies. The premiums over CAPM reported herein should be used instead of the premiums over CAPM reported in the *Size Study*, not added to those returns.

Again, if the z-score or z'-score indicates that the subject company is in the "safe zone", one should consider whether the subject company is distressed or not. If one determines that it is not distressed (even though it matched the characteristics for exclusion from the base set of companies), the premiums over CAPM reported in the exhibits in the *Risk Premium Report* for the 25 portfolios may be appropriate for the subject company than the premiums over CAPM reported herein. For example, the subject company may have debt-to-total capital of more than 80% (with debt measured in book value terms and total capital measured as book value of debt plus market value of equity) and not be distressed.

Estimating Required Rates of Returns: An Example

In this section we will show how the data reported here can be used to estimate the required return on equity or discount rate for a hypothetical company. Assume the subject company has the following characteristics:

Market Value of Equity	$80 million
Book Value of Equity	$100 million
Market Value of Invested Capital	$230 million
Total Assets	$300 million
5-year Average Net Income	-$3.0 million
Most recent year Net Income	-$10 million
5-year Average EBIT	-$2.0 million
Most recent year EBIT	-$5.0 million
Sales	$250 million

Number of Employees	200
Current Assets	$75 million
Current Liabilities	$50
Retained Earnings	$75

z-score = 1.2 x (25 / 300) + 1.4 x (75 / 300) + 3.3 x (-5.0 / 300) + 0.6 x (80 / 200) + .999 x (250 / 300)

= 1.2 x (0.0833) + 1.4 x (0.2500) + 3.3 x (-0.0167) + 0.6 x (0.4000) + .999 x (0.8333)

= 1.4675

Because the 5-year average Net Income = -$3.0 million and the 5-year average EBIT (operating income) = -$2.0 million, the subject company's characteristics better matches those companies included in the high financial risk portfolio.

Build-Up Method

If we are using a "build-up" method, we want to determine a premium over the risk-free rate. The simplest approach is to turn to exhibit H-A, locate the portfolio whose z-score is most similar to the subject company. Example 1 shows the premium indicated for our hypothetical company with a z-score in the "distress zone."

Example 1

Historical Risk Premiums (Market plus High Financial Risk) over Risk-free Rate: Using Guideline Portfolios		
	Relevant Exhibit	Premium over Risk-free
Z Score < 1.8	H-A	14.4%

This premium can be added to the risk-free rate to derive an indicated required return on equity. In deriving the average historical equity risk premiums reported in exhibit H-A, we have used *SBBI* income return on long-term Treasury bonds as our measure of the historical risk-free rate (7.04% for 1963 through 2008). Therefore, a 20-year Treasury bond yield is the most appropriate measure of the risk-free rate for use with our reported premiums. We report the average historical risk premium over the same period for the *SBBI* Large Company stocks (essentially the *S&P 500*) which was 3.84% over the period 1963-2008. If one's estimate of the equity risk premium for the *S&P 500* on a forward-looking basis ("*ERP*") were materially different from the average historical risk premium since 1963, it may be reasonable to assume that the other historical portfolio returns reported here would differ on a forward-looking basis by approximately a similar differential.

With a risk-free rate as of the valuation date of 4.5% (say), the above premium would indicate a required rate of return on equity of 18.9%. If one's estimate of the equity risk premium on a forward-looking basis were 6.0% (say), then the above premiums would indicate a required rate of return on equity of 21.1%, approximately 2.2% (6.0% minus 3.84%) greater.

These estimated required rates of return on equity are derived from rates of return for publicly-traded securities. If the equity of the subject company is not publicly-traded, these required rates of return will need to be adjusted either directly or through application of a discount for lack of ready marketability for the relative liquidity of shares in publicly traded stock and the shares of the subject company.

Some users have inquired whether the data in the *Risk Premium Report* can be used in conjunction with the industry risk premium data as published in the *SBBI Valuation Edition Yearbook* which presents an expanded alternative build-up model that includes a separate variable for the industry risk premium. This is discussed in the *Risk Premium Report 2009.*

CAPM

An alternative to the "build up" approach is the CAPM. One can adjust the indicated required return by adding a high financial risk premium. The premiums can be measured using the "Premiums over CAPM" presented in exhibit H-B represents a “high financial risk premium” (a combined risk premium for size and the specific risk of the subject company due to the above average risk characteristics of the companies comprising the portfolio). To estimate this premium, we can turn to the exhibits and follow a procedure similar to what we used above when we determined premiums over the risk-free rate. Example 2 illustrates this approach for our hypothetical company with a z-score in the “distress zone.”

Example 2

Historical Risk Premiums over CAPM: Using Guideline Portfolios		
	Relevant Exhibit	Premium over CAPM
Z Score < 1.8	H-B	7.8%

If the indicated CAPM estimate before the size and risk adjustment [$E(R_i) = R_f + B(RP_m)$] is 15.0% (say), then the above high financial risk premium indicates a required rate of return on equity of 22.8%. Again, these estimated required rates of return on equity are derived from rates of return for publicly-traded securities. If the equity of the subject company is not publicly-traded, these required rates of return will need to be adjusted either directly or through application of a discount for lack of ready marketability for the relative liquidity of shares in publicly traded stock and the shares of the subject company.

Some users have inquired whether the data in the *Risk Premium Report* can be used in conjunction with the *SBBI IRP* as published in the *SBBI Valuation Edition Yearbook* to estimate an industry size adjusted CAPM cost of capital. This is discussed in the *Risk Premium Report 2009.*

Some users have asked if this data can be used in estimating the cost of capital in other countries. First, all returns contained in the *Risk Premium Report* are expressed in terms of U.S. dollar returns and are measured in terms of U.S. historical returns, not global historical returns (e.g., the global CAPM based on a global *ERP* estimate). If

expected cash flows are expressed in local dollar terms, one can convert all expected cash flows into U.S. dollars by using the forward exchange rates in each future period. Alternatively, one can convert all return data to the local currency equivalent. There are several models to accomplish this return conversion and we refer the user to the references.[22]

Additional information on Company Risk

Background

We previously published the results of research correlating historical equity returns (and historical risk premiums) directly with measures of company risk derived from accounting information.[24] These may also be called "fundamental" measures of company risk to distinguish these risk measures from a stock market-based measure of equity risk such as beta. A variety of academic studies have examined the relationship between financial statement data and various aspects of business risk.[25] Research has shown that measures of earnings volatility can be useful in explaining credit ratings, predicting bankruptcy, and explaining the CAPM beta.

We also examine one measure of risk based on fundamental financial characteristics:

- Operating margin (the lower the operating margin, the greater the risk) defined as (operating income divided by sales; operating income is defined as sales minus (cost of goods sold plus selling, general, and administrative expenses plus depreciation)) calculated as the mean operating income for the five prior years divided by the mean sales for the five prior years.

While in Part II of the *Risk Premium Report 2009* we also examines two other measures of risk (coefficient of variation in operating margin and coefficient of variation in return on equity), we are unable to present comparable data because the denominators of these ratios are often negative for companies in the High Financial Risk portfolio as a result of either negative earnings or negative book value of equity, frequently resulting in meaningless statistics.

Exhibit H-C displays one fundamental risk measure, operating margin, for portfolios formed by ranking public companies by z-score. These exhibits report statistics for the same z-score ranked portfolios as we described in Part I of this report.

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[22] Thomas J. O'Brien, "The US Dollar Global CAPM and a Firm's Cost of Capital in Different Currencies," working paper (July 2005); "The Global CAPM and a Firm's Cost of Capital in Different Currencies," *Journal of Applied Corporate Finance* (Fall 1999).

[24] "New Evidence on Equity Returns and Company Risk", *Business Valuation Review* (September 1999; revised March 2000). These articles are available at www.appraisers.org.

[25] A survey of the academic research can be found in *The Analysis and Use of Financial Statements*, 3rd edition, White et al., Wiley (2003), chapter 18.

Exhibit H-C displays data for the three z-score ranked portfolios with two measures of risk corresponding to each portfolio:

- Beta (calculated using the "sum beta" method applied to monthly returns for 1963 through the latest year); and
- Average operating margin (since 1963).

The definitions of the various market and accounting information follow the definitions of those fields as used by *Compustat*. We have included those definitions in Appendix A of the *Risk Premium Report 2009*.

Changes from Previously Published Versions of this Study

Please see the *Risk Premium Report 2009* for the history of changes made to arrive at the underlying data bases and return calculations. This is the first time we are publishing any breakdown of the companies that we classify in the high financial risk portfolio.

Companies Ranked by Z Score **Equity Risk Premiums** **Exhibit H-A**

Historical Equity Risk Premium: Average Since 1963
High Financial Risk Company Data for Year Ending December 31, 2008

Portfolio Rank by Z Score	Beta (SumBeta) Since '63	Standard Deviation of Returns	Geometric Average Return	Arithmetic Average Return	Arithmetic Average Risk Premium	Average Debt/ MVIC
3.0 +	1.58	35.40%	11.86%	17.29%	10.25%	23.03%
1.8 to 2.99	1.57	34.46%	13.15%	18.22%	11.18%	44.16%
< 1.8	1.70	43.29%	14.44%	21.41%	14.37%	58.07%

Large Stocks (Ibbotson SBBI data)	9.39%	10.88%	3.84%
Small Stocks (Ibbotson SBBI data)	13.07%	15.96%	8.92%
Long-Term Treasury Income (Ibbotson SBBI data)	7.01%	7.04%	

Companies Ranked by Z Score **Premiums over CAPM** **Exhibit H-B**

Historical Equity Risk Premium: Average Since 1963
High Financial Risk Company Data for Year Ending December 31, 2008

Portfolio Rank by Z Score	Beta (SumBeta) Since '63	Arithmetic Average Return	Arithmetic Average Risk Premium	Indicated CAPM Premium	Premium over CAPM
3.0 +	1.58	17.29%	10.25%	6.05%	4.20%
1.8 to 2.99	1.57	18.22%	11.18%	6.04%	5.14%
< 1.8	1.70	21.41%	14.37%	6.52%	7.84%

Large Stocks (Ibbotson SBBI data)	10.88%	3.84%
Small Stocks (Ibbotson SBBI data)	15.96%	8.92%
Long-Term Treasury Income (Ibbotson	7.04%	

Exhibit H-C

Companies Ranked by Market Value of Equity: Comparative Risk Characteristics

High Financial Risk Company Data for Year Ending December 31, 2008

Portfolio Rank by Z Score	Portfolio Statistics for 1963-2008				
	Arithmetic Average Risk Premium	Average Debt to MVIC	Average Debt to Market Value of Equity	Beta (SumBeta) Since '63	Average Operating Margin
3.0 +	10.3%	23.03%	29.9%	1.58	1.0%
1.8 to 2.99	11.2%	44.16%	79.1%	1.57	2.0%
< 1.8	14.4%	58.07%	138.5%	1.70	2.4%

Companies Ranked by Sorting Criteria

Exhibit H-E

High Financial Risk Company Data for Year Ending December 31, 2008
Portfolio Details ($mils.)

Portfolio by Z Score	Number as of 2008	Portfolio Median							
		Market Value of Equity	Book Value of Equity	5-Year Average Net Income	Market Value of Invested Capital	Total Assets	5-Year Average EBITDA	Sales	Number of Employees
3.0 +	229	343.452	122.327	(0.498)	361.241	197.893	9.276	196.345	651
1.8 to 2.99	129	400.965	140.112	(3.776)	653.705	498.565	31.776	418.884	1,599
< 1.8	216	337.355	70.909	(15.295)	736.961	703.060	49.955	359.535	1,590