Duff & Phelps, LLC

Risk Premium Report

2010

This is an excerpt of the Duff & Phelps *Risk Premium Report.* The *Report* is available in its entirety from our Distributors:

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Risk Premium Report 2010

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Exhibits

This report discusses market data presented in accompanying tables. **The following is a complete list of these tables which are available with the *Risk Premium Report 2008* from our Distributors.**

***Size Study**:*

Tables with data updated through December 31, 2009 accompany the discussion in Part I of this report:

Exhibits A-1 through A-8	Risk premiums for 25 company size-ranked portfolios (eight measures of size)
Exhibits B-1 through B-8	Premiums over CAPM for 25 company size-ranked portfolios (eight measures of size)

***Risk Study**:*

Tables with data updated through December 31, 2009 accompany the discussion in Part II of this report:

Exhibits C-1 through C-8	Relation between size and company risk for 25 size-ranked portfolios (eight measures of size)
Exhibits D-1 through D-3	Risk premiums for 25 company risk-ranked portfolios (three measures of risk)

Supplemental Exhibits:

Exhibit E	Size measures of companies comprising Portfolio 25

***High-Financial-Risk Companies Study**:*

Tables with data updated through December 31, 2009 accompany the discussion in Part III of this report:

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[1] The author thanks David Turney, CFA, of Duff & Phelps, LLC for his assistance in assembling the exhibits presented herein, Renee Frantz of Duff & Phelps, LLC for editing and quality control, and Paul Wittman of Wittco Software for his assistance in updating the software and processing the data. The author also thanks his former colleague and co-author, David King, for his insights and assistance in prior years.

Exhibit H-A	Risk premiums for *z-score* and *z"-score* ranked portfolios; this exhibit is for use in the build-up method and parallels the A exhibits
Exhibit H-B	Premiums over CAPM for *z-score* and *z"-score* ranked portfolios; this exhibit is for use in the CAPM and parallels the B exhibits
Exhibit H-C	Relation between *z-score* and *z"-score* ranked portfolios and risk characteristics of those portfolios; this exhibit parallels the C exhibits.
Exhibit H-E	Median size measures of companies comprising the *z-score* and *z"-score* ranked portfolios

Summary tables: Data presented in the above exhibits (not otherwise referenced in this report):

"Premiums over Long-Term Risk-free Rate" (3-page summary of exhibits A-1 through A-8 and D-1 through D-3)

"Premiums over CAPM" (2-page summary of exhibits B-1 through B-8)

Appendix A: Definitions of *Compustat* Data Items Used in the *Risk Premium Report*[2]

Introduction

The Duff & Phelps studies reported herein are designed to assist the analyst in estimating the cost of equity capital for a subject business for use in applying the build-up method or the Capital Asset Pricing Model (CAPM).

Part I- *Size Study*: We have previously presented historical equity risk premiums for 25 size-ranked portfolios using eight alternate measures of company "size". Part I of this report describes the latest update of the study that now includes historical data updated through the end of 2009.[3] Part I is an update of data that was first published in several articles and for which prior updates have been published.[4]

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[2] Source: Standard & Poor's Research Insight *Compustat North America Data Guide*

[3] 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.

[4] "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). Both articles are available at www.appraisers.org.

Part II- *Risk Study*: Part II of this report describes the latest update of the study that now includes historical data updated through the end of 2009 quantifying the relationship between rates of return, company size, and fundamental measures of company risk.[5]

Part III- *High-Financial-Risk Companies Study*: Part III of this report describes the latest revision of the study that now includes historical data updated through the end of 2009 quantifying the relationship between rates of return and risk for high-financial-risk companies.

Part I: Historical Risk Premiums and Company Size

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. We create a separate "high-financial-risk" database composed of companies that are losing money, have high leverage, or are in bankruptcy. We use eight alternate measures of company "size", including fundamental financial characteristics such as sales and book value. The data shows a clear inverse relationship between size and historical rates of return.

A number of considerations have motivated us to pursue lines of research into historical equity returns using a) alternative measures of company size; b) methods of filtering the data to remove the effects of high-financial-risk; and c) elimination of companies without a proven record of performance.

What is Size?

Traditionally, researchers have used market value of equity as a measure of "size" in conducting historical rate of return research. For instance, this is the basis of the "small stock" return series published in *Stocks, Bonds, Bills and Inflation Valuation Edition* (*SBBI*).[6] But there are various reasons for seeking alternative measures of size.

First, it has been pointed out in the financial literature that researchers may unwittingly introduce a bias when ranking companies by "market value."[7] Market value is not just a function of "size"; it is also a function of the discount rate. Therefore, some companies

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

[6] *Stocks, Bonds, Bills and Inflation Valuation Edition 2009,* Morningstar (formerly Ibbotson Associates) (2009).

[7] "A Critique of Size Related Anomalies," Jonathan Berk, *Review of Financial Studies*, vol. 8, no. 2 (1995).

will not be risky (high discount rate) because they are small, but instead will be "small" (low market value) because they are risky. Choosing a measure of size other than market value will help isolate the effects that are purely due to small size in the historical record.

Also, the market value of equity is an imperfect measure of the size of a company's operations. Companies with large sales or operating income may have a small market value of equity if they are highly leveraged.

The use of fundamental accounting measures (such as assets or net income) may have the practical applied benefit of removing the need to make a "guesstimate" of size for comparative purposes. For example, such data might eliminate certain circularities that may arise in applying size-based adjustments (where size is measured by market value of equity and one needs to know size to choose the adjustment) to a discount rate for determining the market value of a non-public business.[8]

Description of the Data

This study made use of the Center for Research in Security Prices (CRSP)[9] 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. Since we have excluded financial service companies, these results should not be used by an analyst estimating the cost of capital for a financial services company.

The *Compustat* database was established in 1963. In this study we calculated historical equity returns for the period 1963 through 2009 (the latest year) using CRSP returns. *Compustat* data (fundamental or accounting data) is available for some companies going back into the 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

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[8] For a complete discussion of the history of the size premium and criticisms of the size premium, see chapter thirteen in *Cost of Capital: Applications and Examples* 3rd ed. by Shannon Pratt and Roger Grabowski, Wiley (2008); or chapter fourteen in *Cost of Capital: Applications and Examples* 4th ed. by Shannon Pratt and Roger Grabowski, Wiley (2010).

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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; and
- Companies not listed on one of the stock exchanges (NYSE, AMEX or NASDAQ).

Companies that pass this screen 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 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; we refer to these companies as the "high-financial-risk" companies. We report on our analysis of these companies in Part III.

We sought in this manner to isolate the effects of high-financial-risk. Otherwise, the results 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 database is composed largely of companies whose financial condition is significantly inferior to the average, financially "healthy" public company.

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 database than in versions of this study published prior to 2000.

The exclusion of companies 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 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.

Altogether, we have either excluded or segregated certain types of companies on the basis of past financial performance or trading history. We adopted this approach in response to arguments that the inclusion of such companies might introduce a bias in favor of the size effect to the extent that such companies tend to have low market values. A critic unfamiliar with this history might question whether we are introducing a bias by excluding such companies. We have run alternate analyses in which no company is excluded or segregated on the basis of past history (that is, using all available non-financial companies) and the results are similar to those reported herein.

Ranking Companies by Size

For companies remaining in our base set, we formed portfolios of securities based upon relative size. Results for eight alternate measures of "size" are reported in the accompanying exhibits.

For each year, we formed portfolios by sorting all of the companies in the base set that traded on the NYSE. The size cutoffs (or "breakpoints") were chosen so as to divide the NYSE companies evenly into 25 groups. Once the breakpoints were chosen, companies from the AMEX (available after 1962) and companies quoted on the NASDAQ National Market System (available after 1972) were added to these portfolios. Since NASDAQ and AMEX companies are generally small relative to NYSE companies, their addition to the data set produces portfolios that are more heavily populated at the "small cap" end of the spectrum.[10]

[10] Some readers may ask why we use NYSE breakpoints rather than ranking the entire NYSE/AMEX/NASDAQ universe. The consistent use of NYSE breakpoints avoids an apples-to-

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.

The ranking of companies based on size 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 use the data known at the beginning of each year. For example, the market value of equity (sorting criteria in exhibit A-1 and B-1) for each company is known at the beginning of each calendar year.

Similarly, the book values of equity (sorting criteria for exhibits A-2 and B-2) for all companies with year-ends from January to September are known and we use the latest year-end book values in forming the portfolios. But the book value of common equity for a company with a calendar year-end is not known so we rank by size based on the prior year-end book value. Other sorting criteria based on fundamental (accounting) data (e.g., 5-year average net income, the sorting criteria for exhibits A-3 and B-3) are also based on what was known at the beginning of each year. 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.

Correcting for "Delisting Bias"

An article by Tyler Shumway provided evidence that the CRSP database omits delisting returns for a large number of companies.[11] 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.[12]

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oranges mixing of pre-1972 (pre-NASDAQ) ranking criteria with post-1972 ranking criteria. Otherwise, for example, one would end up lumping "average" NASDAQ companies (in recent years) into the portfolios that contain much larger "average" NYSE companies (in earlier years) when calculating average returns for the mid-sized portfolios over the full sample period. The only logical alternatives are either to adopt our approach or to exclude NASDAQ companies altogether.

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

[12] 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.

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 2009. 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).

To estimate historical risk premiums, we first calculated an average rate of return for each portfolio over our sample period. 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 exhibits we present summary data for companies ranked by various measures of size. The exhibits are as follows:

Measures of Equity Size

Exhibit A-1: *Market value of common equity* (common stock price times number of common shares outstanding).

Exhibit A-2: *Book value of common equity* (does not add back the deferred tax balance).

Exhibit A-3*: *5-year average net income* for previous five fiscal years (net income before extraordinary items).

Measures of Company Size

Exhibit A-4*: *Market value of invested capital* (MVIC) (market value of common equity plus carrying value of preferred stock plus long-term debt (including current portion) and notes payable).

Exhibit A-5*: *Total Assets* (as reported on the balance sheet).

Exhibit A-6*: *5-year average earnings before interest, income taxes, depreciation and amortization* (EBITDA) for the previous five fiscal years (operating income before depreciation plus non-operating income).

Exhibit A-7*: *Sales* (net).

Exhibit A-8*: *Number of employees* (number of employees, either at year-end or yearly average, including part-time and seasonal workers and employees of consolidated subsidiaries; excludes contract workers and unconsolidated subsidiaries).

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*.

***Available with the *Risk Premium Report* from our Distributors.**

The exhibits include the following statistics for 25 size-ranked portfolios:

- Average of the sorting criteria (e.g., average number of employees) for the latest year used in determining the size of the companies (i.e., the size criteria when the latest year's portfolios are formed). For example, the market value in exhibit A-1 is the market value of equity at the beginning of the latest year. The other size criteria are based on what was known at the beginning of the latest year when the portfolios are formed.
- The number of companies in each portfolio at the beginning of the latest year
- 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
- "Smoothed" average historical risk premium: the fitted premium from a regression with the average historical risk premium as dependent variable and the logarithm of the average sorting criteria as independent variable. (We present the coefficients and other statistics from this regression analysis in the top right hand corner of the exhibits.)
- Average carrying value of preferred stock plus long-term debt (including current portion) plus notes payable ("Debt") as a percent of MVIC since 1963

Each of exhibits A-1 through A-8 displays one line of data for each of the 25 size-ranked 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.

In exhibit E we present more detailed information about the size of the companies comprising each of the eight size-ranked 25th portfolio (the smallest companies) as of the latest year: the size of the 5th percentile of the companies included (i.e., 95% of the companies are larger than this size and 5% are smaller); the size of the 25th percentile of the companies included in the 25th portfolio; the size of the median (50th percentile) of the companies included in the 25th portfolio; the size of the 75th percentile of the companies included in the 25th portfolio; and the size of the 95th percentile of the companies included in the 25th portfolio. **Exhibit E is available with the *Risk Premium Report* from our Distributors.**

Some Observations on the Data

By whatever measure of size we use, the result is a clear inverse relationship between size and historical equity returns. However, when one sorts by a size measure other than market value, the relationship is slightly flattened (compare exhibits A-1 and A-4, which use market value, to the other exhibits). The average historical risk premiums for the smallest companies are generally lower when one sorts by criteria other than market value. The historical average Debt to MVIC ratio is approximately 30% for most size categories, regardless of the sorting criteria. This suggests that differences in leverage do not explain the small company effect in our sample. The leverage of the high-financial-risk companies is significantly greater than that of any of the 25 portfolios.

Premiums over CAPM

In the context of the CAPM, the greater betas of the smaller companies explain some but not all of the higher average returns in these size-ranked portfolios. 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 Portfolio 19 of companies ranked by Book Value of Equity from exhibit B-2:

A. Portfolio beta = 1.24

B. Average historical market risk premium = 4.25%
(historical large stock equity risk premium 1963 to latest year)

C. Indicated CAPM premium (A x B) = 5.27%

D. Arithmetic average long-term Treasury income return = 6.96%
(1963 to latest year)

E. Indicated CAPM return (C + D) = 12.23%

F. Arithmetic average historical equity return = 14.70%

G. Return in excess of CAPM (F - E) = 2.47%.

The return in excess of CAPM is often called the "size premium" or "beta-adjusted size premium". The size premium is an empirically observed correction to the CAPM. This return in excess of CAPM of 2.47% compares to a premium over the overall market of 3.49% (F minus D minus B). 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 B-1 through B-8 report calculations of premiums over CAPM for each portfolio for each of our eight measures of size (the same measures of size as used in exhibits A-1 through A-8). The exhibits report the following statistics:

- Average of the sorting criteria (e.g., average number of employees) for the latest year used in determining the size of the companies (i.e., the size criteria when the latest year's portfolios are formed). For example, the market value in exhibit B-1 is the market value of equity at the beginning of the latest year. The other size criteria are based on what was known at the beginning of the latest year when the portfolios are formed.
- 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"
- "Smoothed" Premium over CAPM: the fitted premium from a regression with the historical "Premium over CAPM" as dependent variable and the logarithm of the average sorting criteria as independent variable

Each of exhibits B-1 through B-8 displays one line of data for each of the 25 size-ranked 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.

Exhibits B-3 through B-8 are available with the *Risk Premium Report* from our Distributors.

Practical Application of the Data

This data can be used as an aid in formulating estimated required rates of return using objective measures of the "size" of a subject company. The historical risk premiums reported in exhibits A-1 through A-8 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 exhibits B-1 through B-8 can be used in the context of a CAPM analysis.

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) and a risk premium for small size to the risk-free rate, one can use the *Size Study* to develop a risk premium for the subject company which measures risk in terms of the total effect of market risk and size. The formula above then is modified to be:

$$E(R_i) = R_f + RP_{m+s} + RP_u$$

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+s} = ERP estimate plus risk premium for size

RP_u = Risk premium attributable to the specific company or to the industry (often called the company-specific risk premium)

A 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 exhibits A-1 through A-8. These premiums incorporate the "small company" or "small stock" effect.

One can match the sales or total assets of the subject company with the portfolios composed of companies of similar size. The smoothed 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 "smoothed" average risk premium is the most appropriate indicator for most of the portfolio groups. At the largest-size and smallest-size ends of the range, the average historical risk premiums tend to jump off of the smoothed line, particularly for the portfolios ranked by size as measured by market value (exhibits A-1 and A-4). For the largest companies (the first portfolio), the observed historical relationship flattens out and the smoothed premium may be an inappropriate indicator. For the smallest companies in

our range (portfolio 25), the smoothed average premium is likely the more appropriate indicator.

Sometimes one must estimate the required rate of return for a company that is significantly smaller than the average size of even the smallest of our 25 portfolios. In such cases, it may be appropriate to extrapolate the risk premium to smaller sizes using the slope and constant terms from the regression relationships that we use in deriving the "smoothed" premiums. In so doing, one must be careful to remember that the logarithmic relationship is base-10, and that the financial size data is in millions of dollars, such that the log of $10 million is log(10), not log(10,000,000).

Also, as a general rule one should be cautious about extrapolating a statistical relationship far beyond the range of the data used in the statistical analysis and we are most comfortable with extrapolations for companies with size characteristics that are within the range of companies comprising the 25th portfolio (as reported in exhibit E). In any extrapolation, one may find that the size of the subject company is equal to or greater than the smallest size of the companies included in the 25th portfolio (e.g., sales) and smaller when ranking by other size measures (e.g., 5-year average income). One can then include the size measure for sales, for example, and exclude the size measure for 5-year average net income. One should not use those size measures for which the subject company's size is equal to zero or negative.

A brief example will illustrate the use of the regression equations in estimating an equity risk premium. Assume a company has book value of $50 million. If we insert this figure into the regression relationship reported in exhibit A-2 ("Companies Ranked by Book

Value of Equity"), we obtain the following estimate of the risk premium:

Smoothed Premium = 15.190% - 2.296% * log (50) = 15.190% - 2.296% * (1.699) = 11.29%

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 A-1 through A-8 and exhibits C-1 through C-8), operating risks (the average un-levered portfolio sum beta and other risk metrics for the portfolios are displayed in exhibits C-1 through C-8) 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 4.25% over the period 1963-2009. 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 is

reasonable to assume that the other historical portfolio returns reported here would differ on a forward-looking basis by approximately a similar differential.[13]

For example, assume that your current estimate of the ERP were 5.5%.[14] The difference between the average historical risk premium since 1963 of 4.25% for Large Company stocks and the 5.5% ERP can be added to the average equity risk premium for the portfolio (observed or "smoothed") that matches to the size 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 B-1 through B-8) 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)

The premium over CAPM data presented in exhibits B-1 through B-8 can be used to make size 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

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[13] 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); chapter nine in *Cost of Capital: Applications and Examples* 3rd ed. by Shannon Pratt and Roger Grabowski, Wiley (2008); or chapter nine in *Cost of Capital: Applications and Examples* 4th ed. by Shannon Pratt and Roger Grabowski, Wiley (2010).

[14] See for example, chapter nine in *Cost of Capital: Applications and Examples* 4th ed. by Shannon Pratt and Roger Grabowski, Wiley (2010) or "Cost of Capital Estimation in the Current Distressed Environment," by Roger Grabowski, *The Journal of Applied Research in Accounting and Finance,* volume 4, issue 1 (2009) for a discussion of the appropriate risk-free rate and estimated equity risk premium during the crisis of 2008-2010.

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.

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	$120 million
Book Value of Equity	$100 million
5-year Average Net Income	$10 million
Market Value of Invested Capital	$180 million
Total Assets	$300 million
5-year Average EBITDA	$30 million
Sales	$250 million
Number of Employees	200

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 exhibits A-1 through A-8, and, for each of the eight size characteristics, locate the portfolio whose size is most similar to the subject company. For each guideline portfolio, the column labeled "Smoothed Average Risk Premium" gives an indicated historical risk premium over the risk-free rate. Example 1 shows the premiums indicated for our hypothetical company.

Example 1

Historical Risk Premiums (Market plus Size) over Risk-free Rate: Using Guideline Portfolios

	Company Size	Relevant Exhibit	Guideline Portfolio	Premium over Risk-free
Market Value of Equity	$120 mil.	A-1	25	12.1%
Book Value of Equity	$100 mil.	A-2	25	11.1%
5-year Average Net Income	$10 mil.	A-3	24	*%
Market Value of Invested Capital	$180 mil.	A-4	25	* %
Total Assets	$300 mil.	A-5	24	*%
5-year Average EBITDA	$30 mil.	A-6	24	*%
Sales	$250 mil.	A-7	24	*%
Number of Employees	200	A-8	25	*%
Mean premium over risk-free rate				10.9%
Median premium over risk-free rate				10.7%

***Exhibits A-3 through A-8 are available with the *Risk Premium Report* from our Distributors.**

These premiums 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 exhibits A-1 through A-8, we have used *SBBI* income return on long-term Treasury bonds as our measure of the historical risk-free rate (6.96% for 1963 through 2009). 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 4.25% over the period 1963-2009. If one's estimate of the ERP were materially different from the average historical risk premium since 1963, it is reasonable to assume that the other historical portfolio returns reported here would differ on a forward-looking basis by approximately a similar differential.

Assume that one's estimate of the ERP at the end of 2009 is equal to 5.5%. That difference (1.25% = 5.5% minus 4.25%) can be added to the average risk premium, RP_{m+s}, for the portfolio (observed or "smoothed") that matches to the size of the subject company to arrive at an adjusted "forward-looking" risk premium for the subject company (matching your forward-looking ERP estimate). Then this forward-looking risk premium can be added to the risk-free rate as of the valuation date to estimate an appropriate cost of equity capital for the subject company.

With a risk-free rate as of the valuation date of 4.5% (say)[15]. The above premiums would indicate the cost of equity capital ranging from 15.9% (4.5% risk-free rate plus 10.1% risk premium from plus 1.25% adjustment for ERP estimate) to 17.9% (4.5% risk-free rate plus 12.1% risk premium plus 1.25% adjustment for ERP estimate), with a median of 16.5% (4.5% risk-free rate plus 10.7% median risk premium plus 1.25% adjustment for ERP estimate). This estimate of the cost of equity capital is before consideration of RP_u, the risk premium attributable to the specific company or to the industry.

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.

As an alternative, one can estimate premiums using the regression equations that underlie the smoothed premium calculations. These equations are reported on exhibits A-1 through A-8. To estimate a premium, we multiply the logarithm of "size" by the slope coefficient, and add the constant term, as described above. In practice this approach generally produces results that are very similar to those of the guideline portfolio approach presented above (unless one is extrapolating to a company that is much smaller than the average size for the 25th portfolio). Example 2 illustrates this approach for our hypothetical company.

Example 2

Historical Risk Premiums (Market plus Size) over Risk-free Rate: Using Regression Equations

	Company Size	Relevant Exhibit	Constant term	Slope term	log(Size)	Premium over Risk-free
Market Value of Equity	$120 mil.	A-1	17.357%	-2.924%	2.079	11.3%
Book Value of Equity	$100 mil.	A-2	15.190%	-2.296%	2.000	10.6%
5-year Average Net Income	$10 mil.	A-3	*%	*%	1.000	*%
Market Value of Invested Capital	$180 mil.	A-4	*%	*%	2.255	*%
Total Assets	$300 mil.	A-5	*%	*%	2.477	*%
5-year Average EBITDA	$30 mil.	A-6	*%	*%	1.477	*%
Sales	$250 mil.	A-7	*%	*%	2.398	*%
Number of Employees	200	A-8	*%	*%	2.301	*%
Mean premium over risk-free rate						10.8%
Median premium over risk-free rate						10.6%

***Exhibits A-3 through A-8 are available with the *Risk Premium Report* from our Distributors.**

[15] See footnote 14.

One can adjust the observed premiums over the risk-free rate for differences in financial leverage between the average companies comprising the portfolio and the subject company. The company in the example has a Debt/MVIC = $60 /$180 = 33%, which is slightly more leverage than the average of the companies comprising portfolio 25 of exhibits A-1 (29.28%) and A-4 (24.75%).[16]

But assume that the subject company had no debt in its capital structure. For example, we can "un-lever" the average levered risk premium in exhibit A-1, portfolio 25, as follows:

Un-levered realized risk premium = {[(Levered realized risk premium * 100) + (W_d / W_e) β_d] / [1 + (W_d / W_e)]} / 100[17]

where:

W_d = Percent of debt capital in capital structure

W_e = Percent of equity capital in capital structure

The average Debt to Equity (W_d / W_e) ratio of the portfolio is based on the average Debt to MVIC for the portfolio since 1963. Because we have removed high-financial-risk companies from the 25 portfolios, we use an estimated average β_d = 0.2 for the portfolios 1 through 25 (an average estimated debt beta for the companies included in portfolios 1 through 25 over the years 1963 through 2009). A beta of debt capital greater than zero indicates debt capital is bearing risk of variability of operating net cash flow in that interest payments and principal repayments may not be made when owed which infers tax deductions on the interest expense may not be realized in the period in which the interest is paid.[18] Including preferred capital with debt capital in measuring the effect of leverage on the risk of equity capital is consistent with recent research.[19]

We report un-levered average realized risk premiums for each of the eight size measures in exhibits C-1 through C-8. The un-levered average realized risk premium for portfolio 25 in exhibit C-1 equals 10.0%. This compares to the average levered realized risk premium of 14.0% (not smoothed) reported in exhibit A-1 (and repeated in exhibit C-1).

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[16] Debt equals MVIC ($180 million) minus Market Value of Equity ($120 million).

[17] Derived from R.S. Harris and J. J. Pringle, "Risk-Adjusted Discount Rates – Extensions from the Average Risk Case," *Journal of Financial Research* (Fall 1985) 237-244. Also see: *Arzac, Enrique R., and Lawrence R. Glosten. "A Reconsideration of Tax Shield Valuation." European Financial Management (2005): 453-461.* For a more complete discussion see chapter eleven in *Cost of Capital: Applications and Examples* 4th ed. by Shannon Pratt and Roger Grabowski, Wiley (2010).

[18] For a more complete discussion see chapter eleven in *Cost of Capital: Applications and Examples* 4th ed. by Shannon Pratt and Roger Grabowski, Wiley (2010).

[19] C.S. Agnes Cheng, C.Z. Liu, K. Newberry, and K.J. Reichelt, "Should Preferred Stock be Classified as a Liability? Evidence from Implied Cost of Equity Capital," working paper (September 2007).

These un-levered realized risk premiums represent the rates of return on a debt-free basis; the un-levered realized risk premiums can be used for estimating required rates of return for companies with no debt. The un-levered realized risk premiums displayed in exhibits C-1 through C-8 are informative in that they generally indicate that the market views smaller companies' operations to be more risky than the operations of larger companies (i.e., un-levered risk premiums increase as size decreases).

Some users have inquired whether the *Size Study* 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 model is as follows:

$$E(R_i) = R_f + RP_m + RP_s + /- RP_i + RP_u$$

where:

$E(R_i)$ = Expected rate of return

R_f = Risk-free rate of return at the valuation date

RP_m = *ERP* estimate

RP_s = Size premium

RP_i = Industry risk premium

RP_u = Company-specific risk premium

The industry in which the company operates may have more or less risk than the average of other companies in the same size category. The *SBBI Valuation Edition Yearbook* since 2000 has published industry risk adjustment factors (*IRP*) derived from CAPM. The "industries" are based on Standard Industrial Classification (SIC) codes. The *IRP* have been adjusted quarterly since 2005. Each company's contribution to the adjustment shown is based on a "full-information beta." The *IRP* is calculated based upon each company's contribution to the full-information beta based on the segment sales reported in the company's 10-K for that SIC code. A listing of each company included in each industry is available to download for free from the Morningstar website, http://corporate.morningstar.com/ib/asp/detail.aspx?xmlfile=1431.xml.

The *SBBI* formula for the *IRP* is as follows:

$$IRP = (FI\text{-}beta \times RP_m) - RP_m$$

where:

IRP = Industry Risk Premium

FI-beta = Full-information beta for industry

RP_m = *ERP* estimate used in calculating *IRP*.

SBBI Valuation Edition Yearbook uses the long-term, historical risk premiums measured from 1926 through the most recent period. For example, as of the end of 2009 the historical risk premium equaled 6.66%. The historical risk premiums measured from 1963 through 2009 averaged 4.25%; this is the historical risk premium inherent in the *Risk Premium Report* calculations.

If one is going to use the *IRP* in conjunction with the data in exhibits in the *Risk Premium Report*, one needs to adjust them for the differences in the estimated equity premium.

For example, assume that the subject *SBBI IRP* equaled -2.19 percent.[20] Also assume that your current estimate of the ERP was 5.5% instead of the average historical risk premium for Large Company stocks of 6.66% for 1926-2009. The difference between the average historical risk premium since 1963 of 4.25% for Large Company stocks and the 5.5% ERP can be added to the average equity risk premium for the *Risk Premium Report* portfolio (observed or "smoothed" from exhibits A-1 to A-8) that matches the size of the subject company to arrive at an adjusted forward-looking risk premium for the subject company.

We can then determine an *IRP* for that SIC code consistent with the ERP of 5.5% and the *Risk Premium Report* data adjusted for the expected equity risk premium as follows:

New *IRP* = *SBBI IRP* x (New *ERP* estimate / *SBBI* historical risk premium estimate)

-1.81% = -2.19% x (5.5% / 6.66%)

One can adjust the *Risk Premium Report* data as follows:

Risk premium (Market plus Size Premium)	10.7% (median from Example 1)
Plus: Adjustment for *ERP* (5.5% - 4.25%)	1.25%
Equals: Adjusted risk premium	11.95%

Continuing with example 1 above, one can then use that *IRP* and the adjusted risk premium data from exhibits A-1 through A-8 as follows:

Risk-free rate	4.5%
Plus: Adjusted risk premium	11.95%
Plus: *IRP* adjusted	-1.81%

[20] SIC code 591, Drug Stores and Proprietary stores, *SBBI Valuation Edition 2009 Yearbook*, p 40. The *IRP* used in this example drawn from the *SBBI Valuation Edition 2009 Yearbook* and is consistent with the 6.5% historical risk premium used to calculate the *SBBI IRP* as of 2008. In writing this example, for illustrative purposes only we are assuming the same *IRP* as of 2009 and assuming it is consistent with the 6.66% historical risk premium through 2009.

Indicated cost of equity capital (before consideration of RP_u, if any)	14.64%

We caution the user that this adjustment may result in double counting of the beta effect. The risk premiums from exhibits A-1 to A-8 contain a beta risk based on size across all industries already and the *IRP*, even adjusted for differences in ERP, may cause some double counting. We present a preferable use of the *IRP* below.

CAPM

An alternative to the "build up" approach is the CAPM. One can adjust the indicated required return by adding a size premium. The size premium is an adjustment to the textbook CAPM derived from the empirical propensity of the CAPM to underestimate the rates of return for smaller companies. The higher betas of the small companies explain some but not all of the higher average historical equity returns in these portfolios. With this adjustment, the formula for required return becomes:

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

The size premium can be measured using the "Premiums over CAPM" presented in exhibits B-1 through B-8. To estimate this size 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. Again, the simplest approach is to find the "Smoothed Premium over CAPM" of the guideline portfolios whose size is most similar to the subject company (in a manner similar to example 1). Example 3 illustrates this approach for our hypothetical company.

Example 3

Historical Risk Premiums over CAPM: Using Guideline Portfolios

	Company Size	Relevant Exhibit	Guideline Portfolio	Premium over CAPM
Market Value of Equity	$120 mil.	B-1	25	6.4%
Book Value of Equity	$100 mil.	B-2	25	5.3%
5-year Average Net Income	$10 mil.	B-3	24	*%
Market Value of Invested Capital	$180 mil.	B-4	25	*%
Total Assets	$300 mil.	B-5	24	*%
5-year Average EBITDA	$30 mil.	B-6	24	*%
Sales	$250 mil.	B-7	24	*%
Number of Employees	200	B-8	25	*%
Mean premium over risk-free rate				5.4%
Median premium over risk-free rate				5.1%

***Exhibits B-3 through B-8 are available with the *Risk Premium Report* from our Distributors.**

If the indicated CAPM estimate before the size adjustment [$E(R_i) = R_f + B(RP_m)$] is 11.0% (say), then the above size premiums indicate a required rate of return on equity ranging from 15.7% to 17.4%, with an average of 16.4%. 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.

As an alternative, we can use the regression equations reported in exhibits B-1 through B-8 to estimate risk premiums over CAPM. Again, this is similar to the method presented in example 2 for determining premiums over the risk-free rate. Example 4 illustrates the results for our hypothetical company.

Example 4

Historical Risk Premiums over CAPM: Using Regression Equations

	Company Size	Relevant Exhibit	Constant term	Slope term	log(Size)	Premium over CAPM
Market Value of Equity	$120 mil.	B-1	10.361%	-2.233%	2.079	5.7%
Book Value of Equity	$100 mil.	B-2	7.959%	-1.477%	2.000	5.0%
5-year Average Net Income	$10 mil.	B-3	*%	*%	1.000	*%
Market Value of Invested Capital	$180 mil.	B-4	*%	*%	2.255	*%
Total Assets	$300 mil.	B-5	*%	*%	2.477	*%
5-year Average EBITDA	$30 mil.	B-6	*%	*%	1.477	*%
Sales	$250 mil.	B-7	*%	*%	2.398	*%
Number of Employees	200	B-8	*%	*%	2.301	*%
Mean premium over CAPM						5.3%
Median premium over CAPM						5.1%

***Exhibits B-3 through B-8 are available with the *Risk Premium Report* from our Distributors.**

One can un-lever the portfolio betas. For example, we "un-lever" the portfolio beta in exhibit A-1, portfolio 24, as follows:

Un-levered portfolio beta = [Levered portfolio beta + $(W_d / W_e)\ \beta_d$] / [1 + W_d / W_e] [21]

[21] R.S. Harris and J. J. Pringle, "Risk-Adjusted Discount Rates – Extensions from the Average Risk Case," *Journal of Financial Research* (Fall 1985) 237-244.

where the average Debt to Equity (W_d/W_e) ratio of the portfolio is based on the average Debt to MVIC for the portfolio since 1963. Because we have removed high-financial-risk companies from the 25 portfolios, we use an estimated average $\beta_d = 0.2$ for the portfolios 1 through 25 (an average estimated debt beta for the companies included in portfolios 1 through 25 over the years 1963 through 2009). A beta of debt capital greater than zero indicates debt capital is bearing risk of variability of operating net cash flow in that interest payments and principal repayments may not be made when owed which infers tax deductions on the interest expense may not be realized in the period in which the interest is paid.[22] Including preferred capital with debt capital in measuring the effect of leverage on the risk of equity capital is consistent with recent research.[23]

We report un-levered portfolio betas for each of the eight size measures in exhibits C-1 through C-8. The un-levered portfolio beta for portfolio 25 in exhibit C-1 equals 0.96. This compares to the levered portfolio beta of 1.27 reported in exhibit B-1 (and repeated in exhibit C-1).

Un-levered betas are often called "asset betas" in the literature as they represent the risk of the operations of the business with the risk of financial leverage removed. The un-levered betas displayed in exhibits C-1 through C-8 are informative in that they generally indicate that the market views smaller companies' operations to be more risky than the operations of larger companies (i.e., un-levered betas increase as size decreases). While the un-levered portfolio betas are informative, they would not generally be appropriate to use in estimating the beta of a subject company. The most widely used convention for estimating the beta appropriate for a subject company is to use data for a recent period (i.e., look-back period of last 60 months returns when available) on rates of return for the subject company's common stock and the rates of return on a market index (e.g., the *S&P 500*) if the subject company's common stock is publicly traded. If the common stock of the subject company is not publicly traded, then one may use the rates of return on common stock of guideline public companies and the rates of return on a market index to estimate a proxy beta for the subject company.

Some users have inquired whether the *Size Study* 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. Continuing with the discussion above on the *SBBI IRP,* first one needs to adjust them for the differences in the estimated equity premium as we calculated above.

Assume that the appropriate size premium derived from exhibits B-1 through B-8 for the subject company is 5.1% (from example 3 above). One can then use the premium over CAPM from exhibits B-1 through B-8 in conjunction with the *IRP* as follows:

Risk-free rate	4.5%
Plus: *ERP* estimate	5.5%

[22] For a more complete discussion see chapter eleven in *Cost of Capital: Applications and Examples* 4th ed. by Shannon Pratt and Roger Grabowski, Wiley (2010).

[23] C.S. Agnes Cheng, C.Z. Liu, K. Newberry, and K.J. Reichelt, "Should Preferred Stock be Classified as a Liability? Evidence from Implied Cost of Equity Capital," working paper (September 2007).

Plus: *IRP* adjusted	-1.81%
Equals: Industry CAPM	8.19%
Plus: Size premium	5.1%
Indicated cost of equity capital (before consideration of RP_u, if any)	13.29%

This use of the *IRP* eliminates any double counting of beta risk that made be included in the size premiums in Exhibits A-1 through A-8.

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.[24]

One may use the data from exhibits B-1 through B-8 to adjust the risk premium for the size effect by adding the "Premium over CAPM" to the local country discount rate estimated before the size premium. One caveat is that the size premium data presented herein is based on U.S. returns in excess of CAPM while research on the size effect indicates that the size effect may differ country to country.[25]

Changes from Previously Published Versions of this Study (Part I)

Readers may be interested in the difference between the data presented herein and analogous data published in articles that appeared in 1996 and 1997 (cited above), a 1995 article ("The Size Effect and Equity Returns" *Business Valuation Review*, June 1995), as well as annual updates published on the Morningstar (formerly Ibbotson Associates) website since 1998:

- The 1995 article reported 30-year historical averages. We currently report averages since 1963.
- The 1995 article looked only at the market value of equity as a measure of size. We currently look at eight alternate measures of size.
- The current report includes Total Assets as one of the measures of size. This replaces a Book Value of Invested Capital measure that appeared in the 1996 and 1997 articles.

[24] 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).

[25] See for example, Mathijs A. Van Dijk, "Is Size Dead? A Review of the Size Effect in Equity Returns," working paper (May 2006).

- The current report excludes newly listed companies, places many companies into a separate high-financial-risk database, includes AMEX and NASDAQ companies, and includes only companies covered by *Compustat*. The 1995 article used all operating NYSE companies found in the CRSP database.
- The 1995 article used market-weighted averaging to calculate the portfolio rates of return. The current report uses equal-weighted averaging.
- The 1995 article used natural logarithms, while the current report uses base-10 logarithms. This makes no difference in the calculation of the "smoothed" premiums, but we have found that base-10 logs are easier to explain than natural logs.
- The 1995 and 1996 articles included financial companies. The current report excludes financial companies (though in our currently published versions of prior years' reports we exclude financial companies).
- The current report corrects for possible "delisting bias" in the CRSP database. The 1995, 1996, and 1997 articles did not make this adjustment (though in our currently published versions of prior years' reports we include this correction).
- The current report includes tables showing "Premiums over CAPM". Versions of this study before 2000 did not include these tables (though our currently published versions of prior years' reports include these data).
- Certain revisions in methodology (made for technical reasons) expanded the number of companies categorized as high-financial-risk relative to versions published before 2000 (though our currently published versions of prior years' reports incorporate this changed methodology).
- The current report changes the method of using financial data such that no data is considered for fiscal years ending less than three months before the formation of portfolios. Versions of this study prior to 2001 allowed use of financial data through the previous month end (though our currently published versions of prior years' reports incorporate this changed methodology).
- The current report uses the "sum beta" method applied to monthly returns to estimate portfolio betas. Versions before 2003 estimated betas using ordinary least squares with annual data (though our currently published versions of prior years' reports incorporate the "sum beta" methodology).
- The current report includes un-levered average risk premiums and sum betas for each portfolio. Versions of this study prior to 2005 as originally published did not include this data (though our currently published versions of prior years' reports include these data). The Reports through 2007 used an un-levering formula commonly referred to as the Hamada formula. The current report uses the un-levering formula commonly referred to as the Harris-Pringle formula. See chapter eleven in *Cost of Capital: Applications and Examples* 4th ed. by Shannon Pratt and Roger Grabowski, Wiley (2010).

- The current report incorporates various corrections and other changes that have affected the CRSP and *Compustat* databases since the data in the earlier articles was generated. We now use CRSP as the source for all stock prices and number of shares outstanding.
- The current report is the result of a complete reprogramming of the software used in the analyses and may result in differences from prior versions.
- The current report includes data on the size of companies comprising the eight size-ranked portfolios 25.

Part II: Historical Risk Premiums and 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.[26] 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. Part II of this report presents an update of this research. This study made use of the CRSP database together with the *Compustat* database.

A variety of academic studies have examined the relationship between financial statement data and various aspects of business risk.[27] Research has shown that measures of earnings volatility can be useful in explaining credit ratings, predicting bankruptcy, and explaining the CAPM beta.

Part II of this report examines three separate measures of risk:

- Operating margin (the lower the operating margin, the greater the risk);
- Coefficient of variation in operating margin (the greater the coefficient of variation, the greater the risk);
- Coefficient of variation in return on equity (the greater the coefficient of variation, the greater the risk).

Coefficient of variation is the standard deviation divided by the mean. It measures volatility relative to the average value of the variable under consideration. This normalizes for differences in the magnitude of the subject variables.

In Part II we present two varieties of data.

First, we display the relationship between measures of company size and the above-mentioned measures of company risk. We do so by presenting average risk measures for each of the size-ranked portfolios of companies that were used in exhibits A-1 through A-8 (as described in Part I of this report).

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

[27] 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.

Second, we document the relationship between these risk measures and historical rates of return. The results reported herein suggest a positive relationship; that is, the greater the risk as measured by historical accounting information, the greater the rate of return earned by equity investors.

We sort companies by the measure of risk, breaking the NYSE universe into 25 risk-ranked portfolios and adding AMEX and NASDAQ companies. These portfolios are limited to companies with a track record of profitable performance (we create a separate "high-financial-risk" portfolio composed of companies that are losing money, have high leverage, or are in bankruptcy). We use three alternate measures of company "risk", all based on fundamental financial characteristics. The data shows a clear relationship between risk and historical rates of return.

Size and Risk

Traditionally, valuation professionals have used company "size" as a factor in determining discount rates for smaller companies. Small companies are believed to have higher required rates of return than large companies because small companies inherently are more risky. The historical data (as published in *SBBI* and our previous articles and data reported herein) verifies that small companies have, in fact, earned higher rates of return over long-run periods. Does the evidence support the claim that smaller companies inherently have greater risk? Our previous articles and reports have demonstrated that small companies exhibit greater risk as measured by two stock market-based indicators: beta and price volatility. The present study goes further by demonstrating that as company size decreases measures of risk calculated from financial statement data increase.[28]

It has been pointed out in the financial literature that researchers may be mixing a "size" effect with a "risk" effect when measuring company size by "market value".[29] Market value is not just a function of "size"; it is also a function of the discount rate. Therefore, some companies will not be risky (high discount rate) because they are small, but instead will be "small" (low market value) because they are risky. This motivated us to consider alternative measures of "size" in our previous articles and reports, where we looked at measures unrelated to market values such as Total Assets and Number of Employees. Part II of this report goes further in documenting indicators of risk in portfolios of stocks of small companies. It also goes beyond size and investigates the relation between equity returns and fundamental risk measures.

Is "size" correlated with market and fundamental risk measures?

Exhibits C-1 through C-8 display fundamental risk measures for portfolios formed by ranking public companies by "size". These exhibits report statistics for the same size-ranked portfolios as we described in Part I of this report.

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[28] A similar point was made by Barry Goodman in a presentation at the October 1997 American Society of Appraisers' *Advanced Business Valuation Conference* in San Francisco.

[29] "A Critique of Size Related Anomalies," Jonathan Berk, *Review of Financial Studies*, vol. 8, no. 2 (1995).

Exhibit C-1 displays 25 portfolios with size measured by Market Value of Equity. The exhibit shows, for each portfolio, the average historical equity risk premium since 1963 (this repeats information reported in exhibit A-1). Also shown are five measures of risk corresponding to each portfolio:

- Beta (calculated using the "sum beta" method applied to monthly returns for 1963 through the latest year);
- Un-levered sum beta;
- Average operating margin (since 1963);
- Average coefficient of variation of operating margin (since 1963); and
- Average coefficient of variation of return on book equity (since 1963).

We see that beta (both levered and un-levered) of the portfolios decrease (as expected) as market value of equity increases.[30] We see that average operating margin increases as market value of equity increases. We see that average coefficient of variation of operating margin and average coefficient of variation of return on book equity decrease as market value of equity increases. Also, we see that generally the three fundamental measures of risk display increasing risk as size decreases, as the historical unlevered risk premium increases and as the unlevered beta increases.[31]

Exhibits C-2 through C-6 display similar results for five other measures of size:

- Exhibit C-2: Size as measured by Book Value of Equity;
- Exhibit C-3: Size as measured by 5-year-average Net Income for previous five fiscal years;
- Exhibit C-4: Size as measured by Market Value of Invested Capital;
- Exhibit C-5: Size as measured by Total Assets;
- Exhibit C-6: Size as measured by 5-year-average EBITDA for previous five fiscal years.

Exhibit C-7 indicates that there is little differentiation in operating margin as size as measured by sales changes. The coefficient of variation of operating margin and return on book equity both indicate increasing risk as size decreases, as in the other exhibits.

Exhibit C-8 indicates that there is little differentiation in operating margin as size as measured by number of employees changes. The coefficient of variation of operating margin and return on book equity both indicate increasing risk as size decreases, as in the other exhibits.

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[30] In the research on "size" as reported in Part I of this report, we have determined that, in the context of the CAPM, the higher betas of the small companies explain some but not all of the higher average historical equity returns in these portfolios.

[31] Were one to calculate the respective correlations, those statistics would relate average portfolio statistics (e.g. average size vs. average risk) rather than correlation statistics across individual companies. At the individual company level, the correlations are much lower.

Exhibits C-1 to C-8 are available with the *Risk Premium Report* from our Distributors.

Why not just use measures of "size" as the measure of risk?

First, certain measures of size (such as market value of equity) may be imperfect measures of the risk of a company's *operations*. For example, a company with a large and stable operating margin may have a small and unstable market value of equity if it is highly leveraged. In this case the risk of the underlying operations is low while the risk to equity is high.

Second, while small size may indicate greater risk, some small companies have been able to maintain near economic monopolies by holding a geographic or market niche such that their riskiness is less than indicated by size. Alternatively, while larger "size" (as measured by sales, for example) may indicate less risk, some companies may be more risky than the average of companies with similar sales. For example, assume the subject company was expecting to emerge from reorganization following bankruptcy. The risk premium appropriate for this company may be more accurately imputed from the pro-forma operating profit (after removing non-recurring expenses incurred during the bankruptcy) than from its size as measured by sales (i.e., the subject company may be more risky than companies with similar sales volume).

Use of fundamental accounting measures of risk allows one to directly assess the riskiness of the subject company. For example, if one observes that the appropriate equity risk premium for the subject company when measuring risk by one or more fundamental risk measures is greater than the equity risk premium based on size measures, this may be a measure of the "investment specific risk" appropriate for the subject company.[32]

Description of the Data

In the empirical work presented in Part II, we use the same underlying data set as was used in forming the size-based portfolios that we describe in Part I. As in Part I, this study made use of the CRSP database, together with the *Compustat* database. The reader can refer to Part I for a description of our methodology for excluding certain classes of companies based on corporate status, industry, trading history, and financial performance. Also, Part I includes a description of the criteria used in separating certain companies into a high-financial-risk database based on indicators of poor earnings, bankruptcy, or high leverage.

As described in Part I, our data set excludes or segregates certain companies based on past financial performance or trading history. We have run alternate analyses in which no company is excluded or segregated on the basis of past history (that is, using all available non-financial companies), and the results are similar to those reported here.

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[32] *Valuing a Business*, 4th ed., Pratt et al, McGraw-Hill (2000), p 181.

Ranking Companies by Risk

For companies remaining in our base set, we formed portfolios of securities based upon relative risk. Results for the three alternate measures of "risk" are reported in the accompanying exhibits.

For each year, we formed portfolios by sorting all of the companies in the base set that traded on the NYSE. The risk cutoffs (or "breakpoints") were chosen so as to divide the NYSE companies evenly into 25 groups. Once the breakpoints were chosen, companies from the AMEX (available after 1962) and companies quoted on the NASDAQ National Market System (available after 1972) were added to these portfolios.

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 return of the companies in the portfolio. As described in Part I, our calculation of rates of return includes a correction for the "delisting bias" in the CRSP database.

Measurement of the Historical Risk Premiums

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

To estimate historical risk premiums, we first calculated an average rate of return for each portfolio over our sample period. 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.

Presentation of the Results

In the accompanying exhibits we present summary data for companies ranked by various measures of risk. The exhibits are as follows:

Exhibit D-1: *Operating Margin* (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. Note that this composite ratio is usually very close to a simple average of the annual ratios of operating income to sales, except in extreme cases generally involving companies with high growth rates.

Companies were re-ranked annually: for example, for the year 2001 we sorted companies into portfolios according to their mean operating margins for years 1996-2000, and then calculated the market return for 2001. (More precisely, in this example the statistics would be calculated for the most recent five fiscal years ending on or before September 2000.)

Exhibit D-2*: *Coefficient of Variation of Operating Margin* calculated as the standard deviation of operating margin over the prior five years divided by the average operating margin for the same years, where operating margin is operating income as defined above divided by sales. Note that for calculating this coefficient, average operating margin is a simple average of the annual ratios of operating income to sales rather than the composite ratio used in exhibit D-1.

Companies were re-ranked annually: for example, for the year 2001 we sorted companies into portfolios according to their coefficient of variation for the years 1996-2000, and then calculated the market return for 2001. (More precisely, in this example the statistics would be calculated for the most recent five fiscal years ending on or before September 2000.)

Exhibit D-3*: *Coefficient of Variation of Return on Book Value of Equity* calculated as the standard deviation of return on book equity for the prior five years divided by the mean return on book equity for the same years (where return on book equity is net income before extraordinary items minus preferred dividends divided by book value of common equity).

Companies were re-ranked annually: for example, for the year 2001 we sorted companies into portfolios according to their coefficient of variation for the years 1996-2000, and then calculated the market return for 2001. (More precisely, in this example the statistics would be calculated for the most recent five fiscal years ending on or before September 2000.)

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*.

***Available with the *Risk Premium Report* from our Distributors.**

These exhibits include the following statistics:

- The median of the sorting criteria for the latest year (e.g., the median average operating margin for the latest five years before 2009). Note: The reported average risk statistics in exhibits D-1, D-2, and D-3 are not the same numbers as reported in exhibits C-1 through C-8. In exhibits C-1 through C-8, the reported statistics are calculated for portfolios of companies grouped according to size and are averages since 1963. In exhibits D-1, D-2, and D-3, the reported statistics are calculated for portfolios grouped according to risk, independent of the "size" of the companies, and are not averages since 1963.
- Log (base-10) of the median of the sorting criteria
- The number of companies in each portfolio in the latest year
- Beta relative to the *S&P 500* 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 historical annual equity returns
- Geometric average historical equity return since 1963
- Arithmetic average historical return since 1963
- Arithmetic average historical risk premium over long-term Treasuries since 1963
- "Smoothed" average historical risk premium: the fitted premium from a regression with the historical risk premium as dependent variable and the logarithm of the average sorting criteria as independent variable
- Average Debt as a percent of the MVIC since 1963

Each exhibit shows one line of data for each of the 25 risk-ranked 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.

By each measure of risk that we use, the result is a clear relationship between risk and historical equity returns. The portfolios of companies with higher risk have yielded higher rates of return.

The historical average Debt/MVIC ratio does not appear to be strongly correlated with either the level or the volatility of the operating margin (exhibits D-1 and D-2). This suggests that leverage does not explain the greater returns of the riskier portfolios. As expected, the leverage in the high-financial-risk portfolios are significantly greater than that of any of the other portfolios. The Debt/MVIC ratio may have moderate correlation with the volatility of return on book equity (exhibit D-3). Higher leverage may accordingly explain some of the higher returns exhibited by the riskier portfolios (by this measure of risk).

In our sample, the companies that are riskier according to accounting information (operating margins and coefficients of variation) have also exhibited greater risk according to stock market-based risk statistics (betas and standard deviations of annual returns).

Practical Application of the Data

The data presented here can be used as an aid in formulating estimated required rates of return using objective measures of the "risk" of a subject company.

A straightforward method of arriving at a benchmark discount rate would be a simple build-up method, using the data to estimate a total equity risk premium:

$$E(R_i) = R_f + RP_{m+s+u}$$

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+s+u} = Risk premium for the "market" plus risk premium for size plus company-specific risk premium attributable to the specific company

One could match, say, the operating margin of the subject company with the portfolio composed of stocks with a similar average operating margin. The smoothed premium for this portfolio can then be added to the yield on long-term Treasury bonds as of the valuation date, resulting in a benchmark required rate of return. The "smoothed" average risk premium is a more appropriate indicator than the actual historical observation for most of the portfolio groups.

Examples 6 and 7 illustrate the application of this method for a hypothetical company.

Example 5

Coefficient of Variation of Operating Margin:

(Standard Deviation of Operating Margin)/(Average Operating Margin)

		2009	2008	2007	2006	2005
Net Sales		$900	$800	$850	$750	$900
Operating Income		$150	$120	$130	$ 80	$140
Operating Margin		16.7%	15.0%	15.3%	10.7%	15.6%
Standard Deviation of Op. Margin	2.3%					
Average Operating Margin	14.6%					
Coefficient of Variation	15.8%					

Coefficient of Variation of Return on Book Value of Equity:

(Standard Deviation of ROE)/(Average of ROE)

		2009	2008	2007	2006	2005
Book Value		$820	$710	$630	$540	$500
Net Income before extraordinary items		$110	$ 80	$ 90	$ 40	$100
Return on Book Equity (ROE)		13.4%	11.3%	14.3%	7.4%	20.0%
Standard Deviation of ROE	4.6%					
Average ROE	13.3%					
Coefficient of Variation	34.7%					

Example 5 shows, for a hypothetical company, the calculation of the mean (average) and standard deviation over the last five fiscal years of operating margin and return on book value of equity (ROE). The ratio of the standard deviation to the mean is the coefficient of

variation. These risk metrics can be used in conjunction with exhibits D-1 through D-3 to estimate a premium over the risk-free rate. Example 6 illustrates the procedure.[33]

Example 6

Historical Risk Premiums over Risk-free Rate: Using Guideline Portfolios				
	Company Indicator	Relevant Exhibit	Guideline Portfolio	Premium over Risk-free
Operating Margin	14.6%	D-1	8	8.0%
CV(Operating Margin)	15.8%	D-2	*	*%
CV(ROE)	34.7%	D-3	*	*%
Mean risk premium over risk-free rate				8.6%
Median risk premium over risk-free rate				8.8%

*** Exhibits D-2 and D-3 are available with the *Risk Premium Report* from our Distributors.**

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 4.25% over the period 1963-2009. This is the market risk premium, RP_m, inherent in the *Risk Study* exhibits for use in the build-up method as of that date. The risk premiums displayed in the *Size Study* exhibits for the build-up method equals RP_{m+s+u}, equals RP_m plus RP_s plus RP_u. If one's estimate of the 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.

Assume that your estimate of the ERP at the end of 2009 is equal to 5.5% rather than the realized risk premium for the market since 1963 of 4.25%. That is, your forward-looking ERP is greater than the historical risk premium since 1963. That difference (1.25% = 5.5% minus 4.25%) can be added to the average risk premium, RP_{m+s+u}, for the portfolio (observed or "smoothed") that matches to the risk of the subject company to arrive at an adjusted "forward-looking" risk premium for the subject company (matching your forward-looking ERP estimate). Then this forward-looking risk premium can be added to the risk-free rate as of the valuation date to estimate an appropriate cost of equity capital for the subject company.

[33] For simplicity, in example 6 we use the average of the operating margins over five years (14.6%), rather than a composite ratio of average operating income divided by average sales (the actual ranking criteria in exhibit D-1). Readers may verify that the composite ratio is similar (14.5%), indicating an identical guideline equity risk premium over the risk-free rate.

Let us use the data from Example 6 to estimate the cost of equity capital. Assume a risk-free rate as of the valuation date of 4.5%. The *Risk Study* would indicate the cost of equity capital ranging from 13.8% (4.5% risk-free rate plus 8.0% risk premium plus 1.25% adjustment for the difference between the estimated ERP of 5.5% and the realized risk premium of 4.25% for the period 1963 through 2009) to 14.8% (4.5% risk-free rate plus 9.0% risk premium plus 1.25% adjustment for ERP estimate).

This gives us a median cost of equity capital estimate of 14.6% (4.5% risk-free rate plus 8.8% median risk premium plus 1.25% adjustment for ERP estimate). This result is before consideration of and further estimate of any additional RP_u, the risk premium attributable to other specific company factors.

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.

As an alternative, we can use the regression equations reported in exhibits D-1 through D-3 to estimate premiums over the risk-free rate (remember that the operating margin, coefficient of variation of operating margin and coefficient of variation of return on book value of equity are converted to logs (base-10) before multiplying by the regression coefficients).

Practical application of this data should not be conducted in isolation from other considerations about the subject company, its industry, or the general economic environment. For instance, a wholesale distributor might have thin operating margins compared to the average company on the NYSE, yet those margins might exhibit unusually low variation due to a particularly strong position in a stable market niche. Alternatively, a company's variation of operating income (calculated in the manner used in our study) might be uncharacteristically high due to an unusual event several years in the past. Appropriate knowledge of the company and its industry would give useful guidance in reconciling the historical equity risk premiums reported here and the historical equity risk premiums reported in Part I for portfolios of companies ranked by size. Size can be an important consideration in determining an appropriate discount rate.

The 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 premium for a given portfolio. The data reported in exhibits C-1 through C-8 (where risk statistics are reported for each size category) may be helpful in making such a determination.

For example, assume that the size of the subject company based on the 5-year average net income equals $40 million, placing it in the 20th portfolio of exhibits A-3 and B-3. The average operating margin for companies in the 20th portfolio equals 9.1% (see exhibit C-3, portfolio 20). If one uses the 9.2% risk premium (exhibit A-3, portfolio 20) in developing

the required rate of return on equity for the subject company using the build-up method, one is assuming that the subject company has risk characteristics similar to the average company included in the portfolio 20.

Now if one examines exhibit D-1 we find that companies with operating margins of approximately 9.1% are included in companies ranked in the 15th portfolio of exhibit D-1. We can examine the relative operating margins to estimate an appropriate company-specific risk premium (positive or negative) that adjusts for the differences in the subject company and the typical company with a 5-year average net income equal to $40 million.

Changes from Previously Published Versions of this Study (Part II)

- Versions of our study published after 1999 have included the three separate measures of risk described in Part II of this report and presented in exhibits C-1 through C-8 and exhibits D-1 through D-3 (our currently published versions of prior years' reports include these data).
- Various changes in methodology over the last several years have affected the underlying database, and these are summarized at the end of Part I.
- In the current version of exhibits D-1 through D-3, we report medians of the sorting criteria for the most recent year, while versions before 2003 reported the average of the medians for all years since 1963 (though our currently published versions of prior years' reports incorporate this change).
- The current report incorporates various corrections and other changes that have affected the CRSP and *Compustat* databases since the data in the earlier articles was generated. We now use CRSP as the source for all stock prices and number of shares outstanding.
- The current report is the result of a complete reprogramming of the software used in the analyses and may result in differences from prior versions.

Part III: Historical Risk Premiums and High Financial Risk

Background

We previously published the results of research correlating historical equity returns (and historical risk premiums) directly with measures of company size based on eight size measures and risk based on three risk measures derived from accounting information. We had reported the results for a high-financial-risk database of companies. Part III of this report presents an update of this research. This study made use of the CRSP database together with the *Compustat* database.

We create a separate set of 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 dataset (used in Parts I and II of this report) and we analyze them separately in Part III. We refer to these companies as the "high-financial-risk" companies. 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 database of high-financial-risk companies 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 study 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 the 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 non-service industry high-financial-risk companies, we formed portfolios of securities based upon relative risk as measured by Altman's z-score.[34] 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 an industrial company or a retailer. As such, we are not using the z-score as a predictor of bankruptcy. Rather we are using the z-score as a measure of distress in order to rank the high-financial risk companies based on the relative levels of distress.

We used the following z-score model for publicly-traded companies excluding service industry 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:

z = Overall index

x_1 = Net 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

x_5 = Sales / total assets

The "zones of discrimination" are as follows:

- $z > 2.99$ = "safe zone"
- $1.8 < z < 2.99$ = "gray zone"
- $z < 1.80$ = "distress zone"

For each year, we formed portfolios by sorting all of the non-service industry 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

[34] 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.

sorted at the beginning of each year. Portfolio rates of return were calculated using an equal-weighted average of the companies in the portfolio.

For service industry high-financial-risk companies, we formed portfolios of securities based upon relative risk as measured by Altman's z"-score.[35] We used the following z"-score model for publicly-traded companies excluding service industry companies in preparing the analyses presented in the accompanying exhibits:

$z'' = 6.56\,x_1 + 3.26\,x_2 + 6.72\,x_3 + 1.05\,x_4$

where:

z'' = Overall index

x_1 = Net 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

The "zones of discrimination" are as follows:

- $z'' > 2.60$ = "safe zone"
- $1.1 < z'' < 2.60$ = "gray zone"
- $z'' < 1.1$ = "distress zone"

Again, we are not using the z"-score as a predictor of bankruptcy. Rather we are using the z"-score as a measure of distress in order to rank the high-financial risk companies based on the relative levels of distress.

Correcting for "Delisting Bias"

We corrected for delisting bias using the same methodology discussed in Part I.

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 2009. 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).

To estimate historical risk premiums, we first calculated an average rate of return for each portfolio over our sample period. For those portfolios with less than six companies in any year, that year's results are excluded in the averages. Then, we subtracted the

[35] Service industry companies are those SIC codes: 7200, 7300, 7500, 7600, 8000, 8100, 8200, 8300, 8400, 8700.

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.

Exhibit H-A and Appendix A are available with the *Risk Premium Report* from our Distributors.

Premiums over CAPM

In the context of the 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 high-financial-risk companies 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 = 1.62

B. Average historical market risk premium = 4.25%
(historical large stock equity premium 1963 to the latest year)

C. Indicated CAPM premium (A x B) = 6.89%

D. Arithmetic average long-term Treasury income return = 6.96%

E. Indicated CAPM return (C + D) = 13.85%

F. Arithmetic average historical equity return = 21.22%

G. Return in excess of CAPM (F - E) = 7.38%.

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 six portfolios formed from the companies included in the high-financial-risk portfolio - three portfolios present data for non-service industry companies and three portfolios present data for service industry companies. 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"

Exhibit 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 portfolios of companies.

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.

Exhibit H-B is available with the *Risk Premium Report* from our Distributors.

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 non-public companies. Altman developed a similar model using only the financial statement data for non-public companies. If the subject company is not publicly traded and not in the service industry, then the analyst can calculate the z-score for non-public companies (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).

If the subject company is in the service industry, one can calculate the z"-score for the subject company directly.

Build-Up Method

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 exhibit H-A in the build-up method 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 companies included in Exhibits A-1 to A-8 (the 25 portfolios) or the characteristics of the high-financial-risk portfolios of companies as described above (e.g., companies with 5-year-average net income available to common equity for the previous five years less than zero).
- Second, assuming the subject company characteristics better matches the characteristics of the high-financial-risk companies, one then calculates the z-score (for publicly-traded, non-service industry subject company), z'-score (for non-public, non-service industry subject company), or z"-score (for a service industry subject company).
- Third, if the z-score, z'-score or z"-score of the subject company indicates it is in the "gray 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 "gray zone" or in the "distress zone").
- Fourth, the appropriate premium of the portfolio in exhibit H-A 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 non-service industry portfolios and the three service industry portfolios are 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, 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 the cost of equity capital 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 4.25% over the period 1963-2009. If one's estimate of the ERP were materially different from the average historical risk premium since 1963, it is reasonable to assume that the other historical portfolio returns reported here would differ on a forward-looking basis by approximately a similar differential.

For example, assume that your current estimate of the ERP were 5.5%. The difference between the average historical risk premium since 1963 of 4.25% for Large Company stocks and the 5.5% *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 (exhibit H-B) since those premia are based on relative returns over the reported period.

CAPM

Use of Exhibit H-B in the CAPM 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 companies included in Exhibits B-1 to B-8 (the 25 portfolios) or the characteristics of the high-financial-risk portfolios of companies as described above (e.g., companies with 5-year-average net income available to common equity for the previous five years less than zero).
- Second, assuming the subject company characteristics better matches the characteristics of the high-financial-risk companies, one then calculates the z-score (for publicly-traded, non-service industry subject company), z'-score (for non-public, non-service industry subject company), or z"-score (for a service industry subject company).
- Third, if the z-score, z'-score or z"-score of the subject company indicates it is in the "gray 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 "gray zone" or in the "distress zone").
- Fourth, the appropriate premium of the portfolio from exhibit H-B 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, 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 more 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 non-service industry 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 Rate
z-score < 1.8	H-A	14.26%

With a risk-free rate as of the valuation date of 4.5%, for example, the premiums would indicate the cost of equity capital of approximately 18.8% (4.5% plus 14.3%). If one's estimate of the ERP were 5.5%, then the above premiums would indicate a required rate of return on equity of 20.0%, approximately 1.25% (5.5% minus 4.25%) greater (4.5% risk-free rate plus 14.3% risk premium from Exhibit H-A plus 1.25% adjustment for ERP estimate).

These estimated required rates of return on equity are derived from rates of return for stocks of public companies. If the equity of the subject company is not public, this cost of equity capital estimate should be adjusted either directly or through application of a discount for lack of ready marketability for the relative liquidity of shares in public stock and the shares of the subject company.

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	7.36%

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 22.4%. 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.

Additional information on Company Risk

Part II displays the results of research correlating historical equity returns (and historical risk premiums) directly with measures of company risk derived from accounting information. 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.

In conjunction with the study of the high-financial-risk companies, we 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 we also examine 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 high-financial-risk companies 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 for non-service industry companies and for service industry companies.

Exhibits H-C reports data for each of six portfolios formed from the companies included in the high-financial-risk portfolio- three portfolios present data for non-service industry companies and three portfolios present data for service industry companies. The exhibit reports the following statistics for 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).

Exhibit H-C is available with the *Risk Premium Report* from our Distributors.

Exhibit H-E presents the median size measures of companies comprising the six z-score ranked portfolios. **Exhibit H-E is available with the *Risk Premium Report* from our Distributors.**

Changes from Previously Published Versions of this Study (Part III)

- In reports before 2008 we presented data on the high-financial-risk companies as a single portfolio.
- We first published the data on high-financial-risk companies ranked by z-score as a *Supplemental Report* to the *Risk Premium Report 2009*. We also published characteristics of the companies comprising the high-financial-risk portfolios.
- This is the first time we are publishing data for high-financial-risk service industry companies separated from all other high-financial-risk companies. We also exclude from the averages and the returns for any years in which the portfolio of high-financial-risk companies is fewer than 6 companies.

Companies Ranked by Market Value of Equity **Exhibit A-1**

Historical Equity Risk Premium: Average Since 1963
Data for Year Ending December 31, 2009

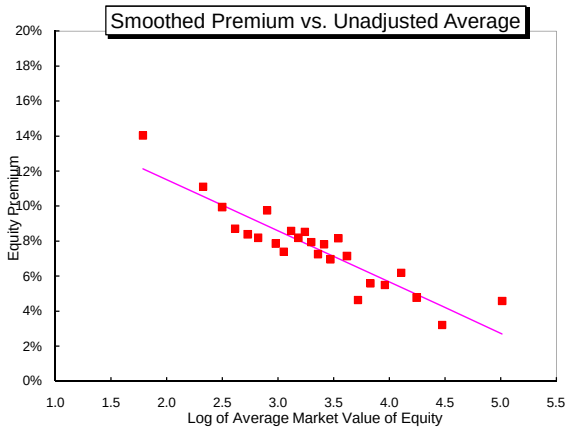
Portfolio Rank by Size	Average Mkt Value ($mils.)	Log of Average Mkt Value	Number as of 2009	Beta (SumBeta) Since '63	Standard Deviation of Returns	Geometric Average Return	Arithmetic Average Return	Arithmetic Average Risk Premium	*Smoothed* Average Risk *Premium*	Average Debt/ MVIC
1	103,041	5.01	38	0.84	17.39%	9.01%	11.53%	4.57%	*2.70%*	14.89%
2	29,763	4.47	34	0.94	18.60%	7.58%	10.16%	3.20%	*4.28%*	20.21%
3	17,592	4.25	37	0.90	17.35%	9.15%	11.73%	4.77%	*4.94%*	23.07%
4	12,761	4.11	39	0.95	18.00%	10.36%	13.15%	6.19%	*5.35%*	23.98%
5	9,104	3.96	36	0.97	18.58%	9.64%	12.45%	5.49%	*5.78%*	24.74%
6	6,756	3.83	35	1.01	18.59%	9.72%	12.55%	5.59%	*6.16%*	24.15%
7	5,218	3.72	37	1.00	18.58%	8.88%	11.59%	4.63%	*6.49%*	25.60%
8	4,160	3.62	41	1.08	20.45%	10.80%	14.11%	7.15%	*6.78%*	23.60%
9	3,481	3.54	35	1.10	19.73%	11.85%	15.12%	8.16%	*7.00%*	24.49%
10	2,965	3.47	39	1.06	20.34%	10.72%	13.93%	6.97%	*7.21%*	23.97%
11	2,594	3.41	35	1.10	21.75%	11.24%	14.78%	7.82%	*7.38%*	23.63%
12	2,281	3.36	35	1.15	21.71%	10.66%	14.22%	7.26%	*7.54%*	24.09%
13	1,992	3.30	47	1.04	20.03%	11.68%	14.90%	7.94%	*7.71%*	24.22%
14	1,741	3.24	43	1.11	23.59%	11.51%	15.49%	8.53%	*7.88%*	24.81%
15	1,523	3.18	43	1.14	20.23%	11.85%	15.15%	8.19%	*8.05%*	23.62%
16	1,311	3.12	41	1.15	21.14%	12.06%	15.54%	8.58%	*8.24%*	24.71%
17	1,127	3.05	56	1.19	21.55%	10.84%	14.35%	7.39%	*8.43%*	23.97%
18	954	2.98	51	1.21	22.42%	11.24%	14.82%	7.86%	*8.65%*	24.24%
19	799	2.90	62	1.22	23.91%	12.35%	16.71%	9.75%	*8.87%*	24.46%
20	664	2.82	61	1.22	23.08%	11.35%	15.15%	8.19%	*9.11%*	25.40%
21	534	2.73	78	1.21	21.96%	11.69%	15.35%	8.39%	*9.38%*	25.91%
22	411	2.61	74	1.23	23.85%	11.50%	15.66%	8.70%	*9.71%*	26.23%
23	315	2.50	76	1.27	24.49%	12.62%	16.91%	9.95%	*10.05%*	26.30%
24	212	2.33	143	1.26	24.26%	13.66%	18.06%	11.10%	*10.55%*	26.81%
25	61	1.79	311	1.27	29.16%	15.18%	20.99%	14.03%	*12.14%*	29.28%
Large Stocks (Ibbotson SBBI data)						9.73%	11.21%	4.25%		
Small Stocks (Ibbotson SBBI data)						13.37%	16.22%	9.26%		
Long-Term Treasury Income (Ibbotson SBBI data)						6.94%	6.96%			

Equity Risk Premium Study: Data through December 31, 2009
Data Smoothing with Regression Analysis
Dependent Variable: Average Premium
Independent Variable: Log of Average Market Value of Equity

Regression Output:

Constant	17.357%
Std Err of Y Est	0.954%
R Squared	83%
No. of Observations	25
Degrees of Freedom	23
X Coefficient(s)	-2.924%
Std Err of Coef.	0.273%
t-Statistic	-10.71

*Smoothed Premium = 17.357% - 2.924% * Log(Market Value)*



Companies Ranked by Book Value of Equity **Exhibit A-2**

Historical Equity Risk Premium: Average Since 1963
Data for Year Ending December 31, 2009

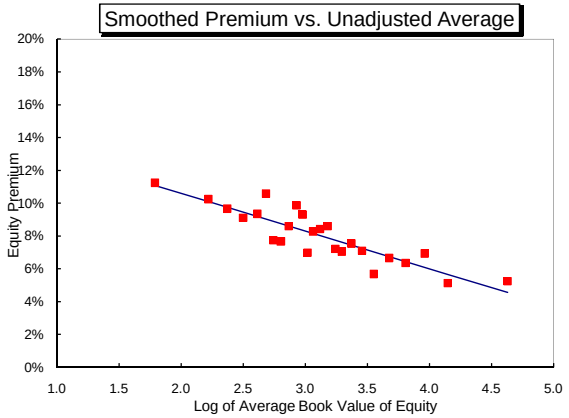
Portfolio Rank by Size	Average Book Val. ($mils.)	Log of Average Book Val.	Number as of 2009	Beta (SumBeta) Since '63	Standard Deviation of Returns	Geometric Average Return	Arithmetic Average Return	Arithmetic Average Risk Premium	*Smoothed* Average Risk *Premium*	Average Debt/ MVIC
1	42,549	4.63	35	0.82	16.78%	9.69%	12.21%	5.25%	*4.56%*	25.13%
2	14,057	4.15	34	0.85	17.51%	9.50%	12.09%	5.13%	*5.66%*	28.88%
3	9,158	3.96	34	0.91	17.50%	11.06%	13.89%	6.93%	*6.09%*	30.01%
4	6,435	3.81	34	0.92	17.56%	10.60%	13.31%	6.35%	*6.44%*	30.24%
5	4,734	3.68	35	1.02	20.12%	10.41%	13.62%	6.66%	*6.75%*	27.77%
6	3,566	3.55	33	1.00	18.17%	9.92%	12.65%	5.69%	*7.03%*	27.33%
7	2,862	3.46	36	1.06	22.42%	10.48%	14.06%	7.10%	*7.25%*	26.13%
8	2,352	3.37	35	1.09	20.44%	11.17%	14.50%	7.54%	*7.45%*	26.30%
9	1,973	3.30	34	1.08	20.70%	10.71%	14.01%	7.05%	*7.62%*	25.36%
10	1,748	3.24	36	1.05	20.34%	10.97%	14.17%	7.21%	*7.74%*	25.89%
11	1,513	3.18	40	1.10	21.22%	12.00%	15.56%	8.60%	*7.89%*	26.94%
12	1,313	3.12	36	1.10	22.41%	11.78%	15.39%	8.43%	*8.03%*	26.32%
13	1,155	3.06	38	1.06	20.62%	11.81%	15.24%	8.28%	*8.16%*	25.81%
14	1,045	3.02	40	1.11	20.38%	10.62%	13.94%	6.98%	*8.26%*	24.96%
15	952	2.98	41	1.12	20.43%	12.73%	16.26%	9.30%	*8.35%*	24.81%
16	850	2.93	45	1.22	23.26%	12.74%	16.83%	9.87%	*8.46%*	25.18%
17	736	2.87	51	1.15	20.34%	12.11%	15.56%	8.60%	*8.61%*	23.96%
18	635	2.80	48	1.20	22.69%	10.96%	14.64%	7.68%	*8.75%*	24.37%
19	554	2.74	52	1.24	21.64%	11.15%	14.70%	7.74%	*8.89%*	25.70%
20	483	2.68	49	1.22	23.27%	13.15%	17.54%	10.58%	*9.03%*	25.03%
21	411	2.61	86	1.20	21.70%	12.56%	16.31%	9.35%	*9.19%*	25.06%
22	316	2.50	79	1.22	23.52%	11.94%	16.07%	9.11%	*9.45%*	24.61%
23	235	2.37	96	1.23	23.87%	12.51%	16.62%	9.66%	*9.74%*	25.71%
24	166	2.22	117	1.27	26.28%	12.48%	17.21%	10.25%	*10.09%*	24.75%
25	62	1.79	363	1.26	26.81%	13.33%	18.20%	11.24%	*11.08%*	25.13%
Large Stocks (Ibbotson SBBI data)						9.73%	11.21%	4.25%		
Small Stocks (Ibbotson SBBI data)						13.37%	16.22%	9.26%		
Long-Term Treasury Income (Ibbotson SBBI data)						6.94%	6.96%			

Equity Risk Premium Study: Data through December 31, 2009
Data Smoothing with Regression Analysis
Dependent Variable: Average Premium
Independent Variable: Log of Average Book Value of Equity

Regression Output:

Constant	15.190%
Std Err of Y Est	0.787%
R Squared	78%
No. of Observations	25
Degrees of Freedom	23
X Coefficient(s)	-2.296%
Std Err of Coef.	0.254%
t-Statistic	-9.04

*Smoothed Premium = 15.190% - 2.296% * Log(Book Value)*



Companies Ranked by Market Value of Equity **Premium over CAPM** **Exhibit B-1**

Historical Equity Risk Premium: Average Since 1963
Data for Year Ending December 31, 2009

Portfolio Rank by Size	Average Mkt Value ($mils.)	Log of Size	Beta (SumBeta) Since '63	Arithmetic Average Return	Arithmetic Average Risk Premium	Indicated CAPM Premium	Premium over CAPM	Smoothed Premium over CAPM
1	103,041	5.01	0.84	11.53%	4.57%	3.58%	0.99%	-0.83%
2	29,763	4.47	0.94	10.16%	3.20%	4.01%	-0.80%	0.37%
3	17,592	4.25	0.90	11.73%	4.77%	3.84%	0.92%	0.88%
4	12,761	4.11	0.95	13.15%	6.19%	4.05%	2.14%	1.19%
5	9,104	3.96	0.97	12.45%	5.49%	4.13%	1.36%	1.52%
6	6,756	3.83	1.01	12.55%	5.59%	4.31%	1.28%	1.81%
7	5,218	3.72	1.00	11.59%	4.63%	4.26%	0.36%	2.06%
8	4,160	3.62	1.08	14.11%	7.15%	4.57%	2.58%	2.28%
9	3,481	3.54	1.10	15.12%	8.16%	4.66%	3.50%	2.45%
10	2,965	3.47	1.06	13.93%	6.97%	4.53%	2.44%	2.61%
11	2,594	3.41	1.10	14.78%	7.82%	4.67%	3.14%	2.74%
12	2,281	3.36	1.15	14.22%	7.26%	4.88%	2.37%	2.86%
13	1,992	3.30	1.04	14.90%	7.94%	4.41%	3.53%	2.99%
14	1,741	3.24	1.11	15.49%	8.53%	4.72%	3.81%	3.12%
15	1,523	3.18	1.14	15.15%	8.19%	4.85%	3.34%	3.25%
16	1,311	3.12	1.15	15.54%	8.58%	4.90%	3.68%	3.40%
17	1,127	3.05	1.19	14.35%	7.39%	5.05%	2.34%	3.55%
18	954	2.98	1.21	14.82%	7.86%	5.13%	2.73%	3.71%
19	799	2.90	1.22	16.71%	9.75%	5.17%	4.58%	3.88%
20	664	2.82	1.22	15.15%	8.19%	5.19%	3.00%	4.06%
21	534	2.73	1.21	15.35%	8.39%	5.13%	3.26%	4.27%
22	411	2.61	1.23	15.66%	8.70%	5.22%	3.48%	4.52%
23	315	2.50	1.27	16.91%	9.95%	5.38%	4.57%	4.78%
24	212	2.33	1.26	18.06%	11.10%	5.35%	5.75%	5.17%
25	61	1.79	1.27	20.99%	14.03%	5.40%	8.63%	6.37%

Large Stocks (Ibbotson SBBI data)	11.21%	4.25%
Small Stocks (Ibbotson SBBI data)	16.22%	9.26%
Long-Term Treasury Income (Ibbotson SBBI data)	6.96%	

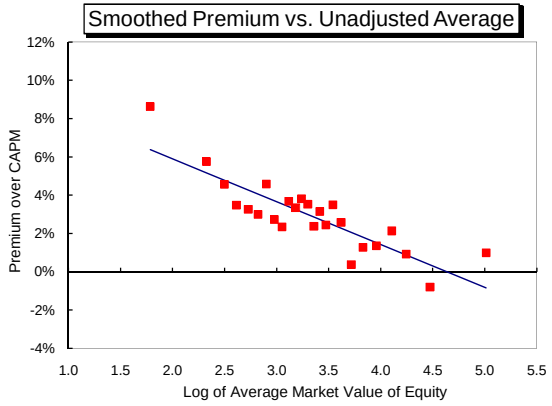
Equity Risk Premium Study: Data through December 31, 2009
Data Smoothing with Regression Analysis
Dependent Variable: Premium over CAPM
Independent Variable: Log of Average Market Value of Equity

Regression Output:

Constant	10.361%
Std Err of Y Est	0.997%
R Squared	73%
No. of Observations	25
Degrees of Freedom	23

X Coefficient(s)	-2.233%
Std Err of Coef.	0.285%
t-Statistic	-7.82

*Smoothed Premium = 10.361% - 2.233% * Log(Market Value)*



Companies Ranked by Book Value of Equity **Premium over CAPM** **Exhibit B-2**

Historical Equity Risk Premium: Average Since 1963
Data for Year Ending December 31, 2009

Portfolio Rank by Size	Average Book Val. ($mils.)	Log of Size	Beta (SumBeta) Since '63	Arithmetic Average Return	Arithmetic Average Risk Premium	Indicated CAPM Premium	Premium over CAPM	Smoothed Premium over CAPM
1	42,549	4.63	0.82	12.21%	5.25%	3.47%	1.78%	1.12%
2	14,057	4.15	0.85	12.09%	5.13%	3.60%	1.52%	1.83%
3	9,158	3.96	0.91	13.89%	6.93%	3.87%	3.06%	2.11%
4	6,435	3.81	0.92	13.31%	6.35%	3.90%	2.46%	2.33%
5	4,734	3.68	1.02	13.62%	6.66%	4.33%	2.33%	2.53%
6	3,566	3.55	1.00	12.65%	5.69%	4.27%	1.42%	2.71%
7	2,862	3.46	1.06	14.06%	7.10%	4.51%	2.60%	2.85%
8	2,352	3.37	1.09	14.50%	7.54%	4.63%	2.91%	2.98%
9	1,973	3.30	1.08	14.01%	7.05%	4.59%	2.46%	3.09%
10	1,748	3.24	1.05	14.17%	7.21%	4.48%	2.74%	3.17%
11	1,513	3.18	1.10	15.56%	8.60%	4.66%	3.94%	3.26%
12	1,313	3.12	1.10	15.39%	8.43%	4.66%	3.77%	3.35%
13	1,155	3.06	1.06	15.24%	8.28%	4.52%	3.76%	3.44%
14	1,045	3.02	1.11	13.94%	6.98%	4.73%	2.24%	3.50%
15	952	2.98	1.12	16.26%	9.30%	4.74%	4.55%	3.56%
16	850	2.93	1.22	16.83%	9.87%	5.17%	4.70%	3.63%
17	736	2.87	1.15	15.56%	8.60%	4.88%	3.73%	3.72%
18	635	2.80	1.20	14.64%	7.68%	5.09%	2.58%	3.82%
19	554	2.74	1.24	14.70%	7.74%	5.27%	2.47%	3.91%
20	483	2.68	1.22	17.54%	10.58%	5.17%	5.41%	3.99%
21	411	2.61	1.20	16.31%	9.35%	5.11%	4.23%	4.10%
22	316	2.50	1.22	16.07%	9.11%	5.20%	3.92%	4.27%
23	235	2.37	1.23	16.62%	9.66%	5.21%	4.45%	4.46%
24	166	2.22	1.27	17.21%	10.25%	5.41%	4.83%	4.68%
25	62	1.79	1.26	18.20%	11.24%	5.36%	5.88%	5.31%

Large Stocks (Ibbotson SBBI data)	11.21%	4.25%
Small Stocks (Ibbotson SBBI data)	16.22%	9.26%
Long-Term Treasury Income (Ibbotson SBBI data)	6.96%	

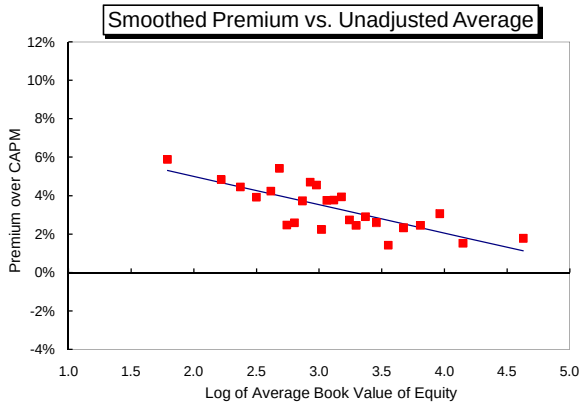
Equity Risk Premium Study: Data through December 31, 2009
Data Smoothing with Regression Analysis
Dependent Variable: Premium over CAPM
Independent Variable: Log of Average Book Value of Equity

Regression Output:

Constant	7.959%
Std Err of Y Est	0.790%
R Squared	59%
No. of Observations	25
Degrees of Freedom	23

X Coefficient(s)	-1.477%
Std Err of Coef.	0.255%
t-Statistic	-5.79

*Smoothed Premium = 7.959% - 1.477% * Log(Book Value)*



Companies Ranked by Operating Margin **Exhibit D-1**

Historical Equity Risk Premium: Average Since 1963
Data for Year Ending December 31, 2009

Portfolio Rank	Median Operating Margin	Log of Median Op Margin	Number as of 2009	Beta (SumBeta) Since '63	Standard Deviation of Returns	Geometric Average Return	Arithmetic Average Return	Arithmetic Average Risk Premium	*Smoothed* Average Risk *Premium*	Average Debt/ MVIC
1	39.9%	-0.40	55	0.87	18.15%	11.35%	14.26%	7.30%	*5.38%*	25.69%
2	30.5%	-0.52	58	0.80	18.28%	9.49%	12.22%	5.26%	*6.11%*	28.59%
3	25.5%	-0.59	56	0.86	18.74%	10.76%	13.71%	6.75%	*6.59%*	26.49%
4	21.6%	-0.67	66	0.92	17.46%	11.37%	14.36%	7.40%	*7.03%*	23.34%
5	18.8%	-0.73	53	1.00	19.15%	10.69%	13.72%	6.76%	*7.41%*	20.76%
6	17.5%	-0.76	55	1.06	18.39%	11.24%	14.16%	7.20%	*7.60%*	18.03%
7	16.2%	-0.79	58	1.10	20.89%	11.28%	14.69%	7.73%	*7.80%*	18.72%
8	15.0%	-0.82	54	1.09	20.31%	11.30%	14.58%	7.62%	*8.01%*	20.03%
9	13.7%	-0.86	58	1.14	20.84%	12.02%	15.47%	8.51%	*8.26%*	20.40%
10	12.8%	-0.89	55	1.13	21.34%	11.93%	15.43%	8.47%	*8.44%*	21.46%
11	12.0%	-0.92	55	1.20	22.26%	10.81%	14.32%	7.36%	*8.62%*	21.51%
12	11.1%	-0.96	49	1.17	20.81%	10.32%	13.58%	6.62%	*8.83%*	22.94%
13	10.6%	-0.98	51	1.19	22.18%	11.14%	14.76%	7.80%	*8.96%*	22.57%
14	10.0%	-1.00	58	1.20	23.80%	11.59%	15.65%	8.69%	*9.10%*	23.18%
15	9.3%	-1.03	52	1.21	23.04%	12.46%	16.39%	9.43%	*9.29%*	24.32%
16	8.8%	-1.05	54	1.17	23.46%	13.13%	17.21%	10.25%	*9.44%*	25.27%
17	8.3%	-1.08	53	1.24	25.20%	13.63%	18.38%	11.42%	*9.60%*	26.22%
18	7.8%	-1.11	56	1.24	25.01%	12.35%	16.68%	9.72%	*9.77%*	25.74%
19	7.2%	-1.14	66	1.28	25.10%	12.72%	17.18%	10.22%	*9.99%*	28.17%
20	6.5%	-1.18	63	1.23	24.98%	13.12%	17.55%	10.59%	*10.24%*	29.11%
21	5.8%	-1.23	72	1.24	25.02%	15.26%	20.04%	13.08%	*10.56%*	29.40%
22	5.1%	-1.29	63	1.21	25.01%	12.95%	17.37%	10.41%	*10.92%*	30.32%
23	4.3%	-1.37	77	1.29	27.11%	13.41%	18.40%	11.44%	*11.40%*	31.61%
24	3.4%	-1.47	84	1.29	26.47%	13.45%	18.47%	11.51%	*12.02%*	31.92%
25	2.0%	-1.69	106	1.28	29.68%	14.41%	20.17%	13.21%	*13.38%*	31.00%
Large Stocks (Ibbotson SBBI data)						9.73%	11.21%	4.25%		
Small Stocks (Ibbotson SBBI data)						13.37%	16.22%	9.26%		
Long-Term Treasury Income (Ibbotson SBBI data)						6.94%	6.96%			

Equity Risk Premium Study: Data through December 31, 2009
Data Smoothing with Regression Analysis
Dependent Variable: Average Premium
Independent Variable: Log of Median Operating Margin

Regression Output:

Constant		2.908%
Std Err of Y Est		1.030%
R Squared		77%
No. of Observations		25
Degrees of Freedom		23
X Coefficient(s)	-6.196%	
Std Err of Coef.	0.700%	
t-Statistic	-8.85	

*Smoothed Premium = 2.908% - 6.196% * Log(Operating Margin)*