Methodology

"Data Through" Date

All cost of capital estimates and other statistics presented herein are calculated with the most recent monthly or fiscal year data through March 31, 2019.

County of Incorporation

All companies included in the analyses herein are incorporated in the U.S., in accordance with Standard & Poor's (S&P's) *Research Insight* database.

Company Type

All companies used in the analyses presented herein are publicly-held U.S. corporations.

Industry Identification by SIC Code

The *2019 Valuation Handbook – U.S. Industry Cost of Capital* is published with industries identified by Standard Industrial Classification (SIC) code.[7] The SIC is a system for classifying industries by 1-, 2-, 3-, and 4-digit codes (1-digit SIC codes are the broadest, *least* specific industry categories; 4-digit SIC codes are the narrowest, *most* specific industry categories).

The SIC codes can be grouped into progressively more specific industry levels: from division (1-digit SICs, the *least* specific (i.e., broadest) level), to major group (2-digit SICs), to industry group (3-digit SICs), and finally individual industry (4-digit SICs, the *most* specific (i.e., narrowest) level).

More specific (i.e., narrower) SICs "roll up" into less specific (i.e., broader) SICs. For example, in Exhibit 1, Division A: Agriculture, Forestry, and Fishing (i.e., those SICs beginning with "0") is a broader, less specific category than major group SIC 01 (Agricultural Production Crops), which in turn is less specific than industry group SIC 011 (Cash Grains). The most specific SIC shown in Exhibit 1 is the 4-digit SIC 0111 (Wheat), which represents the individual industry.

Only SIC descriptions listed on the United States Occupational Safety & Health Administration's (OSHA) website are presented here.

All industries that are "duplicative" are eliminated. For example, if SIC 131 and SIC 1311 were both comprised of the *same exact* companies, the broadest SIC (SIC 131) was kept, and the less broad SIC (SIC 1311) was discarded.

[7] All SIC naming conventions are from the U.S. Department of Labor Occupational Safety & Health Administration (OSHA) website. To learn more, visit https://www.osha.gov/.

Exhibit 1: Standard Industrial Classification Codes (SICs) Vary in Specificity

	SIC	SIC Description
Less Specific	0	Agriculture, Forestry, and Fishing
	01	Agricultural Production Crops
	011	Cash Grains
More Specific	0111	Wheat

Source: U.S. Department of Labor Occupational Safety & Health Administration (OSHA)

Minimum Number of Companies Required

An industry must have at least five (5) companies in order to be included in the analyses presented herein.

Data Sources

Company-level Data

The primary source of company-level data (income statement and balance sheet data, price data, shares outstanding, credit ratings, etc.) used in the calculation of the industry statistics presented herein is S&P's *Research Insight* database.[8]

Corporate Bond Yield and Credit Ratings

S&P and Bloomberg are the sources of U.S. corporate bond yield data (used as an input in the calculation of cost of debt). For companies that do not have an S&P credit rating, a long-term credit score from S&P Global Market Intelligence *Credit Analytics* is substituted. For companies without an S&P credit rating, *or* a credit score from S&P Global Market Intelligence *Credit Analytics*, an average credit rating for the most specific SIC code in which the company appears, and in which there are at least five companies with an S&P credit rating and credit score from S&P Global Market Intelligence *Credit Analytics*, is substituted. For example, if hypothetical Company ABC in SIC 3714 does not have a credit rating, the average credit rating for the other companies in SIC 3714 are used. If SIC 3714 does not have at least five other companies with credit ratings, then the calculation is performed using SIC 371 (up one level, and thus less specific), etc.

Beta Calculation Inputs

The market benchmark used in all beta calculations is the S&P 500 total return index. U.S. Treasury 30-day T-bill total returns are subtracted from the S&P 500 total return index returns, as well as

[8]

from the individual company (or portfolio) total returns in order to arrive at the "excess" returns utilized in the regression analyses used to calculate betas. To calculate debt betas – used as an input in the calculation of "asset" (i.e., unlevered) betas – the Bloomberg Barclays U.S. Corporate total return indices were used.[9]

Fama-French (F-F) 5-Factor Model Inputs

To calculate cost of equity capital estimates using the Fama-French (F-F) 5-factor model, we used data available from Dr. Kenneth French.[10,11,12] The following monthly information was used:

- **SMB (small minus big) returns:** The difference between the monthly returns on diversified portfolios comprised of "small" company stocks and "big" (i.e., large) company stocks, as measured by market capitalization.
- **HML (high minus low) returns:** The difference between the monthly returns on diversified portfolios comprised of "value" company stocks (high book-to-market) and "growth" company stocks (low book-to-market).
- **RMW (robust minus weak) returns:** The difference between the monthly returns on diversified portfolios comprised of company stocks with "robust" profitability and "weak" profitability.
- **CMA (conservative minus aggressive) returns:** The difference between the monthly returns on diversified portfolios comprised of company stocks of low and high investment firms, which Fama and French define as "conservative" and "aggressive", respectively.

The expected SMB risk premium used in the F-F 5-factor model cost of equity capital estimates presented herein is calculated as the average annual return difference between diversified portfolios comprised of "small" company stocks and "big" (i.e., large) company stocks, as measured by market capitalization, over the period 1964–2018 (3.48%).[13]

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9 Bloomberg Barclays Indices © 2019. On August 24, 2016, Bloomberg L.P. announced today that it has completed its acquisition of Barclays Risk Analytics and Index Solutions Ltd. ("BRAIS") from Barclays PLC. To learn more, visit: https://www.bloomberg.com/company/announcements/bloomberg-acquisition-barclays-brais/.

10 Source of Fama-French data: Dr. Kenneth French's website at: http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/index.html. Professor French's website provides various "sorts" of the 5-factor model's factors: (i) "2x2" sorts, (ii) "2x2x2x2" sorts, and (iii) "2x3" sorts. In the analyses presented herein, the 2x3 sorts are used, as is suggested in "A Five-Factor Asset Pricing Model", *The Journal of Financial Economics* 116 (2015) 1–22, page 19: "*In the end, precedent, flexibility in accommodating more or fewer factors, and the fact that they perform as well as the 2x2 and 2x2x2x2 factors in our tests of asset pricing models lead us back to the factors from the 2x3 sorts*". The authors confirmed in correspondence with Professor French that the 2x3 factor sorts are indeed the indicated choice.

11 Kenneth R. French is the co-author, together with Eugene Fama, of (i) the seminal paper introducing the 3-factor model: "The Cross-Section of Expected Stock Returns", *Journal of Finance*, 1992, and (ii) "A Five-Factor Asset Pricing Model", *The Journal of Financial Economics* 116 (2015): 1–22.

12 The Fama-French 3-Factor Model used in the *2014 Valuation Handbook – U.S. Industry Cost of Capital* was replaced with the Fama-French 5-Factor Model starting with the *2015 Valuation Handbook – U.S. Industry Cost of Capital.*

13 The Fama-French 3-Factor model utilizes data from July 1926–present. The Fama-French 5-Factor model utilizes data from July 1963–present.

The expected HML risk premium used in the F-F 5-factor model cost of equity capital estimates presented herein is calculated as the average annual return difference between diversified portfolios comprised of "value" company stocks (high book-to-market) and "growth" stocks portfolios (low book-to-market) over the period 1964–2018 (4.44%).

The expected RMW risk premium used in the F-F 5-factor model cost of equity capital estimates presented herein is calculated as the average annual return difference between diversified portfolios comprised of company stocks with "robust" profitability and "weak" profitability, over the period 1964–2018 (3.26%).

The expected CMA risk premium used in the F-F 5-factor model cost of equity capital estimates presented herein is calculated as the average annual return difference between diversified portfolios comprised of company stocks of low and high investment firms, which Fama and French define as "conservative" and "aggressive", respectively, over the period 1964–2018 (3.66%).

Growth Rates

Thomson Reuters *I/B/E/S* (Institutional Broker's Estimate System) *Consensus Estimates* database was the source used for analysts' estimates of future earnings growth. Most analysts define long-term growth as an estimated average rate of earnings growth for the next three to five years. The exact time frame will differ from broker to broker.[14] These growth rates are utilized in the 1-stage DCF model and in the first and second stages of the 3-stage DCF model. The *I/B/E/S* long-term growth rate estimates were retrieved from S&P's *Capital IQ* database.

The long-term growth rate (used as an input in the third stage of the 3-stage DCF model) is based upon average historical U.S. long-term real gross domestic product (GDP) adjusted for "dilution", plus the difference between the U.S. Treasury 20-year constant-maturity bond yield and the 20-year U.S. Treasury Inflation-Protected Securities (TIPS) (the so-called "breakeven inflation"). The sources used for this calculation are (i) the Bureau of Economic Analysis (BEA)[15], (ii) an estimate of dilution (due to a company's share issuances and repurchases, and to a larger degree by investors' dilution of current holdings to purchase shares in start-ups) is based on the work of Professor Bradford Cornell[16], and (iii) the Board of Governors of the Federal Reserve System's historical interest rate series (H.15).[17]

[14] As reported in S&P's *Capital IQ* database. Also, see "Methodology for Estimates – A Guide to Understanding Thomson Reuters Methodologies, Terms and Policies for I/B/E/S Estimates Databases", April 2014, by Thomson Reuters.

[15] The BEA is an agency of the U.S. Department of Commerce. Along with the U.S. Census Bureau, BEA is part of the Department's Economics and Statistics Administration. To learn more, visit: http://www.bea.gov/index.htm.

[16] Bradford Cornell, "Economic Growth and Equity Investing", *Financial Analysts Journal* 66, no. 1 (2010): pp. 54–64. To learn more, visit: http://www.hss.caltech.edu/~bcornell/.

[17] The H.15 release contains daily, weekly, monthly, and annual interest rates for selected U.S. Treasury and private money market and capital market instruments. To learn more, visit: http://www.federalreserve.gov/releases/h15/data.htm.

The expected long-term growth rate used as an input in the third stage of the 3-stage discounted cash flow model presented herein is calculated as of March 31, 2019 in the following fashion:

Long-term Growth Estimate = Long-term Real GDP (estimated) – Adjustment for Dilution + (U.S 20-year Government Bond Yield – U.S. 20-year TIPS yield)

3.13% = 3.22% – 2.00% + (2.63% – 0.72%) = 3.0% (rounded to the nearest 50 bps increment)

Company Tax Rates

Company tax rates (used as an input in the calculation of "asset" (i.e., unlevered) betas and the weighted average cost of capital (WACC)) were provided by John Graham, Professor of Finance, Fuqua School of Business, Duke University.[18] Professor Graham estimates firm-specific federal corporate income tax rates that account for the dynamics of the tax code and the probability that a firm will be taxable in a given year. His research has confirmed that tax rates calculated from financial statement data provide an accurate approximation to tax rates based on tax return data.[19]

Long-Term Risk-Free Rate and Long-Term Equity Risk Premium

There is no single universally accepted methodology for estimating the equity risk premium (ERP). A wide variety of premia are used in practice and recommended by academics and financial advisors. These differences are often due to differences in how ERP is estimated. The ERP is estimated relative to a risk-free rate. In estimating an ERP, valuation analysts should consider *not* simply using the long-term "historical" ERP. A likely better alternative is to examine approaches that are sensitive to the current economic conditions. Duff & Phelps employs a multi-step analysis to estimate the "conditional" ERP that takes into account a broad range of economic information and multiple ERP estimation methodologies to arrive at its recommendation, the steps of which are broadly outlined as follows:

- First, a reasonable *range* of normal or unconditional ERP is established.
- Second, based on current economic conditions, Duff & Phelps estimates *where* in the range the true ERP likely lies (e.g., top, bottom, or middle) by examining the current state of the economy (both by examining the level of stock prices indices as a forward indicator and examining economic forecasts), the implied volatility of the S&P 500 Index an indicator of perceived risk, corporate bond spreads, etc.

[18] Dr. Graham is the D. Richard Mead professor of finance at the Fuqua School of Business at Duke University. He has been co-editor of *The Journal of Finance*, associate editor of *The Journal of Finance*, *The Review of Financial Studies*, *Finance Research Letters*, and *Financial Management*, and has served on the board of directors of the American Finance Association, the Western Finance Association, and the Financial Management Association, three of the largest academic finance professional organizations. Graham is currently President-elect of the Financial Management Association and has been President of the Western Finance Association, is a Fellow of the Financial Management Association, and is a research associate of the National Bureau of Economic Research. Graham has published more than 50 articles and book chapters on corporate taxes, cost of capital, capital structure, financial reporting, and payout policy. His research has won numerous best paper awards. Since 1997 Graham has been the director of the Global Business Outlook (http://www.cfosurvey.org), a quarterly CFO survey that assesses the business climate and topical economic issues around the world.

[19] John R. Graham and Lilian Mills, "Using Tax Return Data to Simulate Corporate Marginal Tax Rates", *Journal of Accounting and Economics* 46 (2008): 366–380. (SSRN-id959245).

- Finally, other indicators are examined that may provide a more quantitative view of where we are within the range of reasonable long-term estimates for the U.S. ERP.[20]

In most circumstances we would prefer to use the "spot" yield on U. S. government bonds available in the market as a proxy for the U.S. risk-free rate. However, during times of flight to quality and/or high levels of central bank intervention, those lower observed yields imply a lower cost of capital (all other factors held the same) – just the opposite of what one would expect in times of relative economy-wide distress – so a "normalization" adjustment may be considered appropriate. By "normalization" we mean estimating a rate that more likely reflects the sustainable average return of long-term risk-free rates. *If spot yield-to-maturity were used at these times, without any other adjustments, one would arrive at an overall discount rate that is likely inappropriately low vis-à-vis the risks currently facing investors.*

After considering all of the evidence, the long-term risk-free rate (R_f) and long-term equity risk premium (ERP) used in all cost of capital calculations presented herein is the Duff & Phelps recommended ERP (5.5%) as of March 31, 2019, used in conjunction with a normalized risk-free rate (3.5%). This implies a "base" U.S. cost of equity capital of 9.0% (3.5% + 5.5%). The Duff & Phelps recommended ERP should be used with the risk-free rate that it was developed in relation to.[21]

For a detailed discussion of the equity risk premium and risk-free rate, visit the "Resources" section in the Cost of Capital Navigator, Chapter 3, "Basic Building Blocks of the Cost of Equity Capital – Risk-free Rate and Equity Risk Premium".

[20] These additional indicators may include a variation of Professor Aswath Damodaran's "implied ERP model", and/or a variation of the "default spread model" (and/or others). (i) In Damodaran's implied ERP model, a discount rate is first solved for that equates the current S&P 500 index level with estimates of cash distributions (dividends and stock buybacks) in future years, and then a risk-free rate is subtracted from the back-solved discount rate. Dr. Damodaran is Professor of Finance at the Stern School of Business at New York University. To learn more, visit http://pages.stern.nyu.edu/~adamodar/. (ii) The default spread model is based on the premise that the long-term average ERP (the unconditional ERP) is constant and deviations from that average over an economic cycle can be measured by reference to deviations from the long-term average of the default spread (e.g., Baa – Aaa). See Ravi Jagannathan and Zhenyu Wang, "The Conditional CAPM and the Cross-Section of Expected Returns", *The Journal of Finance* 51, no. 1 (March 1996): 3–53. See also Edwin J. Elton, and Martin J. Gruber, Deepak Agrawal, and Christopher Mann, "Is There a Risk Premium in Corporate Bonds?", Working Paper, http://citeseerx.ist.psu.edu/viewdoc/summary?doi=10.1.1.201.2928. See also, Michael Dobner and Joseph Lindsey, "The Default Spread Model: A Practical Method for Measuring Conditional Equity Risk Premium", *Business Valuation Review* 31–32, no. 4 (Fall 2013): pp. 171–178.

[21] To ensure that you are always using the most up-to-date recommendation, visit www.DuffandPhelps.com/CostofCapital and download the document "View Historical Equity Risk Premium Recommendations".

Size Premia and Risk Premia Over the Risk-free Rate

The source of the size premia and risk premia over the risk-free rate (used as inputs in the calculation of cost of equity capital estimates presented herein) is the online Duff & Phelps Cost of Capital Navigator.[22] For a detailed discussion of the derivation of the size premia and risk premia over the risk-free rate used herein, see Chapter 7, "The CRSP Deciles Size Premia Studies and the Risk Premium Report Studies – A Comparison" in the "Resources" section of the Cost of Capital Navigator.

Company Screening Process

The company screening process for the analyses presented herein mimics the screening process employed in the Risk Premium Report Study in the Cost of Capital Navigator. The result is a smaller set of "healthy" companies, but this is by design: the set of companies remaining after this screening process (i) are "seasoned" companies in that they have been traded for several years, (ii) have been selling at least a minimal quantity of product or services, and (iii) have been able to achieve a degree of positive cash flow from operations. "High-financial-risk" companies are identified and analyzed separately.

The results of the company screening process outlined in the following sections resulted in 1,904 companies in the main set of "healthy" companies, and 333 companies in the "high-financial-risk" set of companies.

Pre-screens

The company screening process begins with companies found in the predefined S&P's *Research Insight* database set that contains "publicly held U.S. corporations that trade common stock and wholly-owned subsidiaries that issue preferred stock or public debt".[23] In the next step, the following types of firms are excluded from the analysis:[24]

- American depositary receipts (ADRs)
- Non-operating holding companies
- Unseasoned companies
- High-financial-risk companies

[22] The data previously published in (i) the Morningstar/Ibbotson *SBBI Valuation Yearbook* and (ii) the Duff & Phelps *Risk Premium Report* were published in the *Valuation Handbook – U.S. Guide to Cost of Capital* from 2014–2017, and were renamed the "CRSP Deciles Size Study" and the "Risk Premium Report Study", respectively. Starting in 2018, the essential valuation data previously published in the *Valuation Handbook – U.S. Guide to Cost of Capital* will be available exclusively in the new online Cost of Capital Navigator platform. To learn more about the new online Duff & Phelps Cost of Capital Navigator platform, visit: dpcostofcapital.com.

[23] In S&P's *Research Insight* database terminology, this is the "$C" set.

[24] Financial service companies (companies in finance, insurance, or real estate; specifically, those companies in SIC code 6) are *excluded* in the Risk Premium Report Study screening process. Because companies in SIC code 6 are excluded from the calculation of Risk Premium Report Study size premia and risk premia, cost of equity capital and WACC calculations are *not* presented for those SICs that begin with 6 for the "Risk Premium Report "CAPM + Size Premia" or "Build-up 1" models.

Unseasoned Companies

The small-cap universe may consist of a disproportionate number of start-up companies and recent initial public offerings. These "unseasoned" companies may be inherently riskier than companies with a track record of viable performance. For this reason, the universe of companies is screened to exclude companies with any of the following characteristics:

- 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.[25]
- Companies not listed on one of the major US stock exchanges (NYSE, NYSE MKT, or NASDAQ).[26]

High-Financial-Risk Companies

After eliminating companies with the characteristics described above, the remaining companies are screened again to identify those considered to be in the "high-financial-risk" category. These companies have any of the following characteristics:

- Companies that are identified in S&P's *Research Insight* database as in bankruptcy or in liquidation.
- Companies with a negative "5-year average net income available to common equity" for the previous five years. Net income to common equity, as we have defined it in this book, is net income for the corporation minus dividends on preferred stock. While accounting rules define net income as after-tax earnings before payment of dividends (both on preferred and common equity capital), preferred capital is senior to common equity in the hierarchy of risk within the capital structure. Therefore, we subtract preferred dividends, the return on preferred equity, in arriving at the return on common equity and net income on common equity.
- Companies with negative book value of equity at any one of the company's previous five fiscal year-ends.

[25] Starting with the *2017 Valuation Handbook – U.S. Industry Cost of Capital*, this screening step has been modified for companies in Division H: Finance, Insurance, and Real Estate (major groups between SICs beginning with "60" and "67"). For companies in SICs that begin with "60" (Depository Institutions), "61" (Non-depository Credit Institutions), and "62" (Security and Commodity Brokers, Dealers, Exchanges, and Services), a proxy for EBITDA is now calculated as follows: pre-tax income minus special items plus depreciation and amortization plus interest expense on long-term debt. For companies in SICs that begin with "63" (Insurance Carriers), "64" (Insurance Agents, Brokers, and Service), "65" (Real Estate), and "67" (Holding and other Investment Offices), a proxy for EBITDA is now calculated as follows: pre-tax income minus special items plus depreciation and amortization plus total interest expense. For more information, refer to Appendix D: Definitions of Standard & Poor's *Compustat* Data Items Used in Calculations.

[26] The "NYSE MKT" is the former American Stock Exchange, or AMEX.

- Companies with a negative "5-year-average operating income" (defined as net sales minus cost of goods sold; selling, general and administrative expenses; and depreciation) for the previous five years.[27]

- Companies with a debt-to-total capital ratio exceeding 80% (debt is measured in book value terms, and total capital is measured as book value of debt plus market value of equity) which fall in SICs in any of the following divisions.[28]

  - **Division A:** Agriculture, Forestry, and Fishing (Major groups between "01" and "09")
  - **Division B:** Mining (Major groups between "10" and "14")
  - **Division C:** Construction (Major groups between "15" and "17")
  - **Division D:** Manufacturing (Major groups between "20" and "39")
  - **Division E:** Transportation, Communications, Electric, Gas, and Sanitary Services (Major groups between "40" and "49")
  - **Division F:** Wholesale Trade (Major groups between "50" and "51")
  - **Division G:** Retail Trade (Major groups between "52" and "59")
  - **Division I:** Services (Major groups between "70" and "89")

- Companies that fall in SICs of the following division are screened in a slightly modified fashion:

  - **Division H:** Finance, Insurance, and Real Estate (Major groups between "60" and "67")

  The same "80% debt-to-total-capital ratio" rule is applied to companies in SICs that begin with "62" (Security and Commodity Brokers, Dealers, Exchanges, and Services), "63" (Insurance Carriers), "64" (Insurance Agents, Brokers, and Service), and "67" (Holding and Other Investment Offices). Companies in these SICs, *and* with debt-to-total-capital ratios exceeding 80%, are identified and placed in the "high-financial-risk" category. Companies in SICs 62, 63, 64, and 67 tend to hold less debt than depository institutions, credit institutions, or real estate companies, and

[27] Starting with the *2017 Valuation Handbook – U.S. Industry Cost of Capital*, this screening step has been modified for companies in Division H: Finance, Insurance, and Real Estate (major groups between SICs starting with "60" and "67"). For companies in SICs that begin with "60" (Depository Institutions), "61" (Non-depository Credit Institutions), and "62" (Security and Commodity Brokers, Dealers, Exchanges, and Services), a proxy for operating income is now calculated as follows: pre-tax income minus special items plus interest expense on long-term debt. For companies in SICs that begin with "63" (Insurance Carriers), "64" (Insurance Agents, Brokers, and Service), "65" (Real Estate), and "67" (Holding and other Investment Offices), a proxy for operating income is now calculated as follows: pre-tax income minus special items plus total interest expense. For more information, refer to Appendix D: Definitions of Standard & Poor's *Compustat* Data Items Used in Calculations.

[28] Companies in Division J: Public Administration (Major groups between "91" and "99") are not included in the analysis presented herein.

therefore may be more similar to a non-financial company with respect to capital structure.

For companies in SICs that begin with "60" (Depository Institutions), "61" (Non-depository Credit Institutions), and "65" (Real Estate), a two-step process is applied:

In the first step, the threshold of debt-to-total-capital for being assigned to the "high-financial-risk" company set is increased from 80% to 95%. Given the nature of their business, companies in SICs 60, 61, and 65 tend to hold larger amounts of debt than (i) non-financial companies or (ii) companies in SICs 62, 63, 64, and 67.

In the second step, those companies that (i) were identified in the first step as having a debt-to-total-capital exceeding 95%, *and* (ii) which had been "bailed out" in the U.S. Treasury Department's Capital Purchase Program (CPP) during the 2008 Financial Crisis were identified.[29] These companies are *not* assigned to the "high-financial-risk" company set, but are returned to the main set of companies analyzed herein. This is done because it may not be unusual for companies that received these CPP funds to still have debt-to-total-capital ratios exceeding 95%, even though they may no longer be perceived to be in distress.

Identifying "Pure Play" Companies

The final step in the company screening process is identifying those companies that have at least 75% of their revenue derived from a single business segment (i.e., pure play companies). SIC codes are assigned by Standard & Poor's based on the activities of each segment as described in the company's 10-K and Annual Report.[30]

Companies that do *not* meet the 75% threshold (i.e., less than 75% of sales derived from a single SIC) are discarded from both the main "healthy" company set and the "high-financial-risk" set, and are *not* included in any further analysis. Companies that *do* meet the 75% threshold (i.e., greater than or equal to 75% of sales derived from a single SIC) are *included* in the analysis presented in this book. The 75% threshold is applied at the 4-, 3-, 2-, and 1-digit level, in turn, as we broaden the SIC level (i.e., we move from an individual industry into an industry group, major group, and division).

The "75% rule" ensures that *each* company in *each* level of industry analyzed in the *2019 Valuation Handbook – U.S. Industry Cost of Capital* is more or less a "pure play" participant in the industry being analyzed. Including "conglomerates" (i.e., companies that participate in many industry segments, with no clear industry segment dominating) would likely dilute the specificity of our analysis, which is designed to be (to the degree possible) a *targeted* industry analysis.

[29] The CPP was one of the various programs introduced within the broader Troubled Asset Recovery Program (TARP), which in turn was created in October 2008 to address the then ongoing financial crisis. The CPP program consisted primarily in U.S. government purchases of preferred stock in troubled banks. For more details on the various TARP programs, see the Congressional Research Service report entitled "Troubled Asset Relief Program (TARP): Implementation and Status", June 27, 2013. For a list of the financial institutions that used the CPP, visit CNN Money at http://money.cnn.com/news/specials/storysupplement/bankbailout/.

[30] Source: S&P's *Research Insight* database.

You may notice that companies may be included in *several* different (though related) industries, or you may also identify companies that are *not* included in an industry in which the company *does* participate. To demonstrate how this can occur, and to aid in understanding how the company sets are identified for each industry, consider the two hypothetical companies shown in Exhibit 2. Company 1 and Company 2 *both* derive 100% of their revenue from the same 4-digit SIC codes, but end up being included in the analysis for *different* sets of industries.

At the 4-digit SIC level, Company 1 will be included in the industry analysis for SIC 1382 (it derives 83% of its revenue from SIC 1382 and thus satisfies the 75% threshold). At the 3-digit SIC level, Company 1 will be included in the industry analysis for SIC 138 (again, it derives 83% of its revenue from SIC 138 and thus satisfies the 75% threshold). At the 2-digit SIC level, Company 1 derives 100% of its revenues from a single industry (SIC 13); at the 1-digit SIC level, Company 1 derives 100% of its revenues from a single industry (SIC 1), and will thus also be included in the industry analysis for both of those SIC levels.

The final result for Company 1 is summarized as follows: Company 1 will appear in the industry analysis for SICs 1382, 138, 13, and 1.

Exhibit 2: The "75% Rule" for Identifying "Pure Play" Companies in SICs

Company 1

SIC	SIC Description	Revenues
1311	Crude Petroleum and Natural Gas	$ 5
1321	Natural Gas Liquids	$ 12
1382	Oil and Gas Field Exploration Services	$ 83
	Total Revenues	$ 100

Company 2

SIC	SIC Description	Revenues
1311	Crude Petroleum and Natural Gas	$ 33
1321	Natural Gas Liquids	$ 33
1382	Oil and Gas Field Exploration Services	$ 34
	Total Revenues	$ 100

Look now to Company 2 in Exhibit 2. At the 4-digit level, Company 2 will *not* be included in the industry analysis for SICs 1311, 1321, or 1382 (the company does not derive at least 75% of its revenue from any one of these SICs, and thus does not satisfy the 75% threshold in any instance). Nor does Company 2 meet the 75% threshold at the 3-digit SIC level, and thus will not be included in the analysis for SICs 131, 132, or 138. However, at the 2-digit and 1-digit SIC level, Company 2

derives 100% of its revenue from SIC 13 and SIC 1, respectively, and thus will be included in the industry analysis for both SIC 13 and SIC 1.

The final result for Company 2 is summarized as follows: Company 2 will appear in the industry analysis for SICs 13 and 1 only.

Medians and Industry Composites

Statistics are presented in five ways for each industry: (i) the Median, (ii) the SIC Composite, (iii) the Large Composite, (iv) the Small Composite, and (v) High-Financial-Risk companies.[31] This is done in an effort to enrich the analysis by examining each industry's company set from different perspectives.

The Median, the SIC Composite, the Large Composite, and the Small Composite are calculated using the presumably "healthy" companies for each industry that (i) survived the company screening process, and (ii) were not placed in the high-financial-risk category.

The High-Financial-Risk statistics for each industry are calculated separately and reported on a separate line. The High-Financial-Risk statistics can be thought of as a "composite" of all *high-financial-risk* companies for each industry. For any given SIC, there must be at least five High-Financial-Risk companies in order for the SIC's High-Financial-Risk statistics to be calculated. In other words, even if the SIC itself has at least five companies in the main "Healthy" set of companies, if there are not at least 5 High-Financial-Risk companies, the High-Financial-Risk statistics will not be reported.

Median

A median is different than a simple average. A median's proximate definition is the *middle* value (i.e., the 50th percentile) of a set of values ranked from highest to lowest. As such, the median can be thought of as the "typical" observation. When compared to a simple average, the median can have the effect of dampening the effect of outliers (i.e., extreme values that are not "typical").

In this book, the median is calculated by first calculating the given statistic for each *individual* company in the industry's company set, and then identifying the median (i.e., middle value). For example, to calculate the median value of say, debt-to-equity for Industry ABC, the calculation of the debt-to-equity ratio for *each* of the individual companies in Industry ABC is first calculated, the results are ranked from highest to lowest, and then the middle value is identified.[32,33]

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[31] Depending on data availability; some industries (or individual statistics within industries) may not have sufficient data available to calculate meaningful values.

[32] When the total number of observations is *odd*, the middle value is the single middle observation (there are an equal number of observations above and below this single observation). When the total number of observation is *even*, however, there is no single "middle" observation, and so the median is calculated as the average of the two middle observations.

[33] Medians in this book are all calculated in this fashion, with the exception of price to earnings (P/E), price to book (P/B), and price to sales (P/S), which are calculated by first calculating the *inverse* of each company's respective ratio, identifying the median, and then taking the inverse of this median result. See the Morningstar methodology paper entitled "Average Price Ratios" (August 31, 2005).

SIC Composite

The SIC Composite is calculated in order to give the analyst a sense of the characteristics of the industry *as a whole*. The SIC Composite includes all companies identified in the screening process as "healthy", and having at least 75% of their revenues derived from a single SIC code.

Large Composite

The Large Composite is calculated in order to give the analyst a sense of the characteristics of the *largest* companies in the specific industry. The Large Composite includes all companies identified in the screening process as "healthy", and having at least 75% of their revenues derived from a single SIC code.

Small Composite

The Small Composite is calculated in order to give the analyst a sense of the characteristics of the *smallest* companies in the specific industry. The Small Composite includes all companies identified in the screening process as "healthy", and having at least 75% of their revenues derived from a single SIC code.

Identification of the Companies that Comprise the Large and Small Composites

For industries that have fewer than 15 companies, the Large and Small Composites are not calculated due to the limited size of the sample. For industries that have 15 companies or more, the Large Composite and the Small Composite are identified as either (i) the largest five and the smallest five companies in terms of reported net sales amount (in U.S. dollars) for the most recent fiscal year, or (ii) the largest and smallest 10% (rounded down to the nearest integer), whichever is greater, as summarized in Exhibit 3. **Note:** This methodology was revised starting with the *2018 Valuation Handbook – U.S. Industry Cost of Capital* . For more information, refer to the section "New in the *2019 Valuation Handbook – U.S. Industry Cost of Capital*" in the introduction.

Exhibit 3: Identification of Large and Small Composites

No. Companies	Large Composite	Small Composite
5–14 companies	Not Calculated	Not Calculated
15–49 companies	5 largest companies in terms of Sales	5 smallest companies in terms of Sales
50+ companies	Largest 10% of companies in terms of Sales (rounded *down* to nearest integer)	Smallest 10% of companies in terms of Sales (rounded *down* to nearest integer)

For example, if an industry is comprised of 64 companies, the Large Composite and Small Composite will each have 6 companies in them (10% of 64 companies is 6.4; this is then rounded down to the "nearest integer", which is 6).

Companies in the Large Composite and Small Composite are identified using the *most recent* fiscal year's sales data (in U.S. dollars); these companies are used in all calculations across all time periods, even if they are not necessarily the largest and smallest companies in prior periods (e.g., this could arise when computing 5-year averages).

Composites Are Aggregates

The main difference between the calculation of the median and "composite" values in the analysis presented herein is that the median calculation is performed at the *individual* company level, and the calculations done for the SIC Composite, Large Composite, Small Composite, or a composite of all high-financial-risk companies are performed on an *aggregate* basis.

"Aggregation" is employed to calculate the statistics for all composites to give the analyst a sense of the characteristics of all of the companies in the given composite (SIC Composite, Large Composite, Small Composite, or a composite of all high-financial-risk companies) if they were "rolled up" into a single entity. Alternatively, the analyst can look to the Median to get a sense of the "typical" company in the industry.

Aggregation is arguably a superior technique when discussing "industry" statistics to that of employing simple averages or some other non-aggregative technique. Aggregation also has the effect of *dampening* the effect of outliers (i.e., extreme values that are not "typical") on the analysis. Examples of how this aggregation technique is applied are provided in the following sections.

"Latest" and "5-Year" Averages

In most cases, the financial statistics presented herein are calculated over two different periods: (i) Latest and (ii) 5-Year Average. The "Latest" calculation is as of the "data through" date of this book (March 31, 2019), whereas the "5-Year Average" is the average statistic for the most recent 5-year period.[34] The Latest calculation can be thought of as a "snapshot" analysis of the industry's characteristics as of "now" (i.e., as of March 31, 2019), and the 5-Year Average calculation can be thought of as an "over time" analysis (i.e., over the last 5 years). Again, the Median calculation can be thought of as the "typical" observation in the sample.

The hypothetical data in Exhibit 4 will be used to demonstrate the aggregation methodology employed to calculate the Median, Latest, and 5-Year Average financial statistics presented herein. In all of these examples, calculation of a simple debt-to-equity ratio is performed for illustration purposes. In these examples, a generic "composite" is calculated, although these *same* steps are

[34] Some data points used as inputs in the analyses presented herein are "annual" in nature, and some data points are "monthly" in nature. When "annual" in nature, the "Latest" statistics are calculated using the most recent fiscal year's data, while the "5-Year Average" statistics are calculated using the most recent five (or in some cases, six) years' fiscal data. When "monthly" in nature, the "Latest" statistics are calculated using the most recent month's data as of the "data through" date of this book (March 31, 2019), while the "5-Year Average" statistics are calculated using the most recent 60 months (or in some cases, 72 months).

followed for the SIC Composite, the Large Composite, the Small Composite, or a composite of all high-financial-risk companies.

Exhibit 4: Hypothetical Debt and Equity Data for Calculation Examples of Median, Latest, and 5-Year Average Debt-to-Equity Statistics

	A Year [-4] Total Debt	B Year [-3] Total Debt	C Year [-2] Total Debt	D Year [-1] Total Debt	E Year [0] Total Debt
Company 1	1	2	3	4	5
Company 2	6	7	8	9	10
Company 3	11	12	13	14	15

	F Year [-4] Total Equity	G Year [-3] Total Equity	H Year [-2] Total Equity	I Year [-1] Total Equity	J Year [0] Total Equity
Company 1	12	23	35	45	57
Company 2	9	21	32	44	54
Company 3	8	18	30	41	53

Calculating "Latest" Medians

To calculate the "Latest" Median debt-to-equity industry statistic, the debt-to-equity ratio of each *individual* company is first calculated as of the most recent (i.e., "Latest") period, and then the median is identified. The "Latest" total debt is in Column E of Exhibit 4 (i.e., "Year [0]" or the most recent fiscal year), and the "Latest" total equity is in Column J.

As shown in Exhibit 5, "Latest" debt-to-equity ratios for Company 1, Company 2, and Company 3 are 0.09, 0.19, and 0.28, respectively. The median (i.e., middle value) is 0.19.

Exhibit 5: Calculation Example of "Latest" Median Debt-to-Equity Statistic

	E Year [0] Total Debt
Company 1	5
Company 2	10
Company 3	15

	Debt-to-Equity (Latest)
Company 1	5 ÷ 57 = 0.09
Company 2	10 ÷ 54 = 0.19 ←
Company 3	15 ÷ 53 = 0.28

	J Year [0] Total Equity
Company 1	57
Company 2	54
Company 3	53

Calculating "5-Year Average" Medians

To calculate the "5-Year Average" Median debt-to-equity statistic, the debt-to-equity ratio of each *individual* company is calculated by aggregating the most recent 5-years' debt, and dividing it by the aggregate of the most recent 5-years' equity, and then identifying the median.

Based on the procedure just described, the 5-Year Average debt-to-equity ratios for Company 1, Company 2, and Company 3 are 0.09, 0.25, and 0.43, respectively (see Exhibit 6). The median (i.e., middle value) is 0.25. Note that this differs from computing a straight 5-year arithmetic average of each company's debt-to-equity ratio over the last five years, and then taking a median. Such a calculation would have resulted in a median of 0.33 and would have given a greater weight to outlier observations.

Exhibit 6: Calculation Example of "5-Year Average" Median Debt-to-Equity Statistic

	A Year [-4] Total Debt	B Year [-3] Total Debt	C Year [-2] Total Debt	D Year [-1] Total Debt	E Year [0] Total Debt	5-Year Aggregate Debt
Company 1	1	2	3	4	5	1 + 2 + 3 + 4 + 5 = 15
Company 2	6	7	8	9	10	6 + 7 + 8 + 9 + 10 = 40
Company 3	11	12	13	14	15	11 + 12 + 13 + 14 + 15 = 65

	F Year [-4] Total Equity	G Year [-3] Total Equity	H Year [-2] Total Equity	I Year [-1] Total Equity	J Year [0] Total Equity	5-Year Aggregate Equity
Company 1	12	23	35	45	57	12 + 23 + 35 + 45 + 57 = 172
Company 2	9	21	32	44	54	9 + 21 + 32 + 44 + 54 = 160
Company 3	8	18	30	41	53	8 + 18 + 30 + 41 + 53 = 150

	5-Year Aggregate Debt
Company 1	15
Company 2	40
Company 3	65

	5-Year Average Debt-to-Equity
Company 1	15 ÷ 172 = 0.09
Company 2	40 ÷ 160 = 0.25
Company 3	65 ÷ 150 = 0.43

	5-Year Aggregate Equity
Company 1	172
Company 2	160
Company 3	150

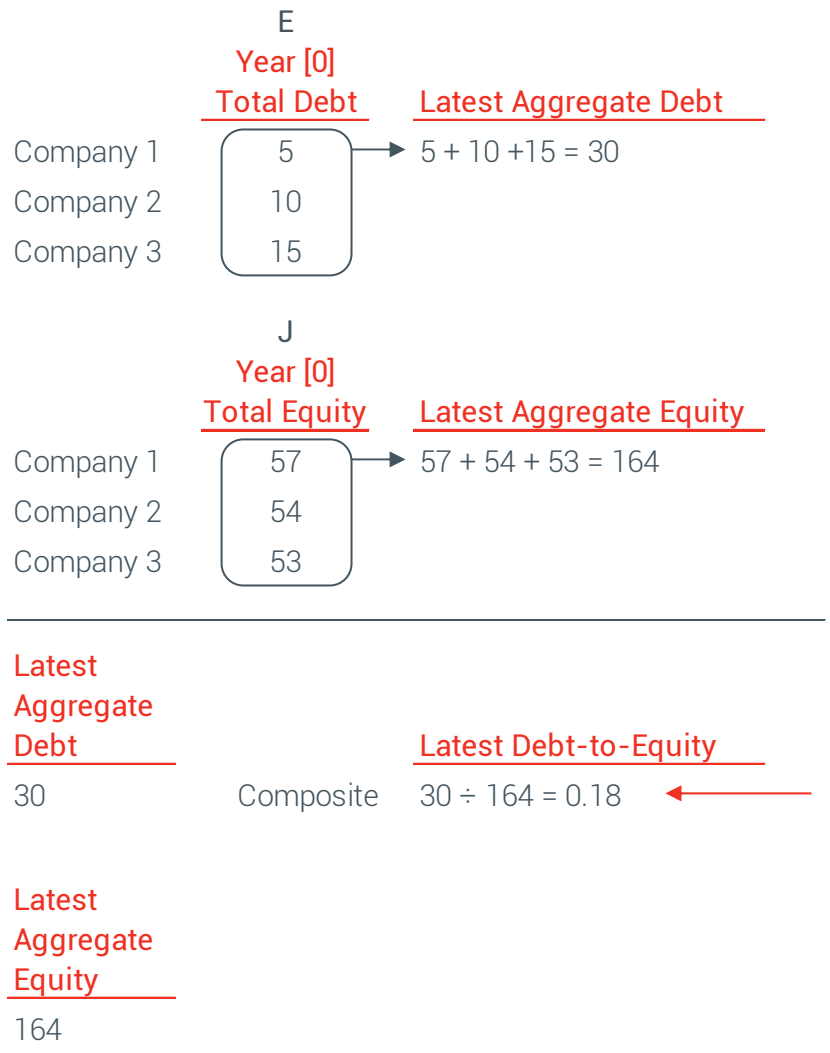
Calculating "Latest" Composites

To calculate the "Latest" SIC Composite, Large Composite, Small Composite, or a composite of all high-financial-risk Companies' debt-to-equity statistic, the most recent (i.e., "Latest") period's *aggregate* debt is divided by the most recent period's *aggregate* equity. The "Latest" total debt is in Column E of Exhibit 4 (i.e., "Year [0]" or the most recent fiscal year) and the "Latest" total equity is in Column J.

In Exhibit 7, the "Latest" aggregate total debt (for all companies in the industry) is 30, and the "Latest" aggregate total equity is 164. The "Latest" debt-to-equity ratio is therefore 0.18 (30 ÷ 164).

This *same* aggregation technique is used in the calculation of all "composite" statistics: the SIC Composite, the Large Composite, the Small Composite, and a composite of all high-financial-risk companies. The only item that will vary across these various composites is the number (and identity) of companies included in the set being aggregated.

Exhibit 7: Calculation Example of "Latest" Composite Debt-to-Equity Statistic



Calculating "5-Year Average" Composites

To calculate the "5-Year Average" Composite debt-to-equity statistic, the aggregate debt amount is first computed by summing the debt of all companies included in the Composite over the most recent 5 years. The same procedure is employed to arrive at an aggregate equity amount over the most recent 5 years. The "5-Year Average" Composite debt-to-equity statistic is then obtained by dividing the *aggregate* of the most recent 5-years' debt by the *aggregate* of the most recent 5 years' equity.

Based on the procedure just described, the 5-Year Average aggregate debt for Company 1, Company 2, and Company 3 is 120, while the 5-Year Average aggregate equity is 482. The "5-Year Average" Composite debt-to-equity is 0.25 (120 ÷ 482), as shown in Exhibit 8.

Exhibit 8: Calculation Example of "5-Year Average" Composite Debt-to-Equity Statistic

	A Year [-4] Total Debt	B Year [-3] Total Debt	C Year [-2] Total Debt	D Year [-1] Total Debt	E Year [0] Total Debt	5-Year Aggregate Debt
Company 1	1	2	3	4	5	1 + 2 + 3 + 4 + 5
Company 2	6	7	8	9	10	+ 6 + 7 + 8 + 9 + 10
Company 3	11	12	13	14	15	+ 11 + 12 + 13 + 14 + 15 = 120

	F Year [-4] Total Equity	G Year [-3] Total Equity	H Year [-2] Total Equity	I Year [-1] Total Equity	J Year [0] Total Equity	5-Year Aggregate Equity
Company 1	12	23	35	45	57	12 + 23 + 35 + 45 + 57
Company 2	9	21	32	44	54	+ 9 + 21 + 32 + 44 + 54
Company 3	8	18	30	41	53	+ 8 + 18 + 30 + 41 + 53 = 482

5-Year Aggregate Debt		5-Year Average Debt-to-Equity
120	Composite	120 ÷ 482 = 0.25

5-Year Aggregate Equity
482