



**Cost of Capital Navigator
Frequently Asked Questions:
Data/Functionality**

Question 1: What data is available in the Cost of Capital Navigator?

All of the essential valuation data previously published in the *Valuation Handbook – U.S. Guide to Cost of Capital* is available in the Cost of Capital Navigator. This includes all of the critical data from (i) the CRSP Deciles Size Study, and (ii) the Risk Premium Report Study from 1999 through 2019.¹

CRSP Deciles Size Study

All of the breakpoint data and size premium data from the CRSP Deciles Size Study for each year from 1999 to 2019 is in the Cost of Capital Navigator and available to the Analyst to use.

This includes all of the critical equity risk premia, risk-free rates, size premia, and industry risk premia that were published by Duff & Phelps in the *Valuation Handbook – U.S. Guide to Cost of Capital* since 2014, and previously published by Morningstar and Ibbotson from 1999 to 2013.²

Risk Premium Report Study

All of the breakpoint data and size premium and risk premium data from the Risk Premium Report Study for each year from 1999 to 2019 is in the Cost of Capital Navigator and available to the Analyst to use.

This includes all of the critical equity risk premia, risk-free rates, size premia, risk premia over the risk-free rate, high-financial-risk premia, and comparative risk study statistics published by Duff & Phelps in the *Valuation Handbook – U.S. Guide to Cost of Capital* since 2014, and previously published as the standalone *Risk Premium Report*.³ And yes, this includes the familiar 25 portfolios (from largest to smallest) that the Risk Premium

¹ There are two subscription levels: (i) the “Basic” annual subscription includes the two most recent years of valuation data, and (ii) the “Pro” annual subscription includes all years of data from 1999 to present. To learn more, see: FAQ – Subscriptions.

² The “CRSP Deciles Size Study” was published in the Ibbotson®/Morningstar *Stocks, Bonds, Bills, and Inflation® (SBBBI®) Valuation Yearbook* from 1999–2013, and in the Duff & Phelps *Valuation Handbook – U.S. Guide to Cost of Capital* from 2014–2017. Starting in 2018, the CRSP Deciles Size Study is available only through the Duff & Phelps Cost of Capital Navigator.

³ The Risk Premium Report Study was published as the Duff & Phelps *Risk Premium Report* from 2005 to 2013, as Standard & Poor’s *Corporate Value Consulting Risk Premium Report* for reports from 2002 to 2004 and as the PricewaterhouseCoopers *Risk Premium Reports* and *Price Waterhouse Risk Premium Reports* for years before 2002. Starting in 2018, the Risk Premium Report Study is available only through the Duff & Phelps Cost of Capital Navigator.

Report Study analyzes in the former “A”, “B”, “C”, and “D” exhibits. Exhibit 1 summarizes the valuation data that is available the Cost of Capital Navigator.

Exhibit 1: A Summary of the Valuation Data Available Cost of Capital Navigator in February 2019

CRSP Deciles Size Study

| Size Premia & Portfolio Breakpoints | Data Years Available |
|--|----------------------|
| CRSP Mid-Cap, Low-Cap, and Micro-Cap Stocks Size Groupings | 1999–2019 |
| CRSP Deciles 1 through 10 | 1999–2019 |
| CRSP Deciles 10a, 10b Split | 2001–2019* |
| CRSP Deciles 10w, 10x, 10y, 10z Split | 2010–2019** |
| Industry Statistics | |
| Industry Risk Premia Estimates | 2000–2019*** |
| Industry Full-information Betas | 2000–2019*** |

Risk Premium Report Study

"Size" Study

| | |
|--|-----------|
| Risk Premia Over the Risk-free Rate Data from Exhibits A-1 through A-8 | 1999–2019 |
|--|-----------|

| | |
|--|-----------|
| Size Premia Data from Exhibits B-1 through B-8 | 1999–2019 |
|--|-----------|

"Risk" Study

| | |
|--|-----------|
| Risk Premia Over the Risk-free Rate Exhibits D-1 through D-3 | 1999–2019 |
|--|-----------|

"High-Financial-Risk" Study

| | |
|--|-----------|
| High-Financial-Risk Size Premia and Risk Premia Data from Exhibits H-A, H-B, and H-C | 2010–2019 |
|--|-----------|

"Comparative Risk" Study

| | |
|--|-----------|
| Statistics about the companies used in the Risk Premium Report Study's "A", "B", and "D" Exhibits that can be used to further refine your cost of equity capital estimates | 1999–2019 |
|--|-----------|

Equity Risk Premia (ERP) and Risk-free Rate Data

| | |
|---|-----------|
| Historical 1926-present U.S. ERP | 1999–2019 |
| Supply-Side U.S. ERP | 2004–2019 |
| Long-term U.S. Government Bond Yields | 1999–2019 |
| Duff & Phelps Recommended U.S. ERP and Risk-free Rate | 1999–2019 |

Company Lists

Pure Play U.S. Companies by SIC Code
Full-Information Beta Company List

*Ibbotson Associates first split CRSP Decile 10 into 10a and 10b in 2000

**Ibbotson/Morningstar first split CRSP Decile 10 further into 10w, 10z, 10y, and 10x in 2010

***Ibbotson Associates first calculated full-information betas and published industry risk premia in 2000

Question 2: There are two “company lists” available in the Cost of Capital Navigator’s Resources section. What is the difference between these two lists? And how do I use them?

The two files found in the Resources section underneath the “Supplementary Data” header are the “Full-Information Beta Company List” and the “Pure Play U.S. Companies by SIC Code”.

The main difference between the two files is that the companies in the “Full-Information Beta Company List” file are not necessarily pure play companies, which is defined as a company that derives 75% or more of their overall revenue from a single industry. The “Pure Play U.S. Companies by SIC Code” is entirely pure play companies.

These lists are different, although they share a similar purpose. The goal of these lists is to assist analysts in finding comparable public companies with which to compare their subject company.

Question 3: Are the chapters from the *Valuation Handbook – U.S. Guide to Cost of Capital* available in the Cost of Capital Navigator for me to read?

YES.

Can you read about the latest research on the size effect in the Cost of Capital Navigator, or learn about the impact of monetary policy on risk-free rates, or get the latest thinking about the equity risk premium just like you could in the former hardcover books, and print it out to add to your valuation report as documentation if you want?

YES.

Can you read about the derivation of a particular data point (e.g., size premium, equity risk premium, industry risk premium, etc.) in the Cost of Capital Navigator, just like you could in the former hardcover books, and print it out to add to your valuation report as documentation if you want?

YES.

Content, Examples, FAQs, and Methodology are All Included: All of the great content, examples, frequently asked questions (FAQs), and methodology, from *each* of the *Valuation Handbooks – U.S. Guide to Cost of Capital* from 2014 forward, including all of the new content for 2019, will be available in the Cost of Capital Navigator, organized by chapter.⁴

Searchable: All of the content, examples, FAQs, and methodology are fully searchable. This makes it even easier to find the information you want in the Cost of Capital Navigator than in the former hardcover books.

Printable: All of the content, examples, FAQs, and methodology are printable by section. You can do that by simply clicking “print”, which is just as easy, if not easier, than scanning or copying individual pages from a hardcover book.

⁴ There are two subscription levels: (i) the “Basic” annual subscription includes the two most recent years of valuation data, and (ii) the “Pro” annual subscription includes all years of data from 1999 to present. To learn more, see: FAQ – Subscriptions.

Exhibit 2 illustrates how easy and convenient it is to access and read the content from the *Valuation Handbook – U.S. Guide to Cost of Capital* in the new Cost of Capital Navigator.

Exhibit 2: Accessing, Searching, and Reading the Content from the *Valuation Handbook – U.S. Guide to Cost of Capital* in the New Cost of Capital Navigator is Easy and Convenient

The screenshot displays the Duff & Phelps website interface. On the left is a navigation menu with a red header containing the logo. The menu items include Home, My Cost of Capital Estimates, Contact Us, Resources, Support, About Duff & Phelps, and a footer with Legal | Privacy | Cookies and Disclosures | Terms & Conditions. The main content area on the right features a dropdown menu for the '2018 Valuation Handbook – U.S. Guide to Cost of Capital', listing 11 chapters and two appendices.

| Navigation Menu | Main Content Area |
|----------------------------------|---|
| DUFF & PHELPS | ▼ 2018 Valuation Handbook – U.S. Guide to Cost of Capital |
| Home | Chapter 1: Cost of Capital Defined |
| My Cost of Capital Estimates | Chapter 2: Methods for Estimating the Cost of Equity Capital |
| Contact Us | Chapter 3: Basic Building Blocks of the Cost of Equity Capital – Risk-free Rate & Equity Risk Premium |
| Resources | Chapter 4: Basic Building Blocks of the Cost of Equity Capital – Size Premium |
| Support | Chapter 5: Basic Building Blocks of the Cost of Equity Capital – Industry Risk Premium and Beta |
| About Duff & Phelps | Chapter 6: Basic Building Blocks of the Cost of Equity Capital – Company-specific Risk Premium |
| Legal Privacy Cookies | Chapter 7: The CRSP Decile Studies and the Risk Premium Report Studies – A Comparison |
| Disclosures Terms & Conditions | Chapter 8: CRSP Deciles Size Study Examples (2017 Edition) |
| | Chapter 9: Risk Premium Report Exhibits – General Information |
| | Chapter 10: Risk Premium Report Study Exhibits – Examples (2017 Edition) |
| | Chapter 11: Real Estate |
| | ► Appendices |
| | Technical Questions About the Data |

Question 4: Will the size premia tables be available in the Cost of Capital Navigator?

YES.

The critical valuation data from the CRSP Deciles Size Study and the Risk Premium Report Study (as summarized in Exhibit 1) is already available in the Cost of Capital Navigator for Analysts to use, for all valuation dates from 1999 through 2019.⁵

Starting in 2019, the size premia tables will be available in the Cost of Capital Navigator.⁶ This includes full size CRSP Deciles Size Study and the Risk Premium Report Study. The addition of the full size premia tables, with a breadth of contextual information, will assist the Analyst when deciding inputs for their cost of capital calculations, and is easily viewable within the Cost of Capital Navigator in the Resources section.

You may also access size premia and/or risk premia by starting an estimate in the Cost of Capital Navigator.

For example, Exhibit 3a (next page) is a screenshot of the Cost of Capital Navigator being used to estimate cost of equity capital using the CRSP Deciles Size Study size premia to estimate cost of equity capital using the capital asset pricing model (CAPM).⁷

In Exhibit 3a, the Analyst has typed in a market capitalization (“market cap”) of \$100 million. The Cost of Capital Navigator displays all possible size premia available to the user for a \$100 million market cap as of the valuation date used in this example (3/31/16). For a \$100 million market cap as of 3/31/16, the size premia for “Micro-Cap”, Decile 10, and Decile 10 sub-deciles 10b and 10y are all valid choices available to the Analyst.

Of course, had the Analyst entered a different market cap and/or a different valuation date, the Cost of Capital Navigator would present the Analyst with different choices.

⁵ There are two subscription levels: (i) the “Basic” annual subscription includes the two most recent years of valuation data, and (ii) the “Pro” annual subscription includes all years of data from 1999 to present. To learn more, see: FAQ – Subscriptions.

⁶ This means that the breakpoints and size premia for the three CRSP “size groupings” (Mid-Cap, Low-Cap, and Micro-Cap Stocks), the 10 CRSP deciles, and the “10th decile split” (10a, and its upper and lower halves 10w and 10x, and 10b, and its upper and lower halves 10y and 10z) are all in the Cost of Capital Navigator and available for use for all years from 1999–2019. It also means that all of the size premia, breakpoints and risk premia over the risk-free rate for each of the 25 portfolios from each of the Risk Premium Report’s “A”, “B”, “C”, “D”, and “H” exhibits are all in the Cost of Capital Navigator and available for use for all years from 1999–2019.

⁷ The Cost of Capital Navigator can be used to estimate cost of equity capital using CAPM, as well as various Build-up models.

Note that the “breakpoints” (the market cap of the largest and smallest companies in a size grouping or Decile (or 10th decile split “sub-decile”) for each of the four valid choices are shown. This is done for a reason: to provide contextual information to the Analyst about the relative sizes of the companies that are in the various portfolios, so that the Analyst can better select which of them is most appropriate for his or her subject company.

Exhibit 3a: CRSP Deciles Size Study CAPM Example; Selecting a Size Premium
Valuation Date = 3/31/16

The screenshot shows a CAPM calculator interface. At the top, the equation $K_e = R_f + \beta \times RP_m +$ is displayed. A dropdown menu for "SIZE PREMIUM" is open, showing "5.60%" selected, with "Cancel" and "Save" buttons. Below this, a text input field for "Market Value of Common Equity (\$USD in Millions)" contains the value "100".

The main section is titled "CRSP Decile (Select a Size Premium)" and contains a table with the following data:

| Decile | Market Cap of Smallest Company (\$USD in millions) | Market Cap of Largest Company (\$USD in millions) | Size Premium (Return in Excess of CAPM) |
|--------|--|---|---|
| 8 | 448.502 | 844.475 | |
| 9 | 209.88 | 448.079 | |
| 10 | 1.963 | 209.406 | 5.60% |
| 10B | 1.963 | 108.598 | 8.76% |
| 10Y | 64.846 | 108.598 | 7.32% |

Below the table, there is a section for "Deciles Size Grouping" with the following data:

| Deciles Size Grouping | Market Cap of Smallest Company (\$USD in millions) | Market Cap of Largest Company (\$USD in millions) | Size Premium (Return in Excess of CAPM) |
|-----------------------|--|---|---|
| Micro Cap | 1.963 | 448.079 | 3.58% |

After selecting the Decile 10 size premia (5.60%), the Cost of Capital Navigator adds it to the CAPM equation, and automatically labels it underneath (“DECILE 10”) (see Exhibit 3b, next page). Of course, as the Analyst makes selections for the other inputs in the equation, those will be automatically labelled as well.

Exhibit 3b: The Cost of Capital Navigator Automatically Labels Each Input Based on the Analyst's Selection (CRSP Deciles Size Study, CAPM example).

The screenshot displays the Cost of Capital Navigator interface. At the top, the CAPM formula is shown with labels for each component: K_e (COST OF EQUITY CAPITAL), R_f (RISK-FREE RATE), β (BETA), RP_m (EQUITY RISK PREMIUM), and RP_s (SIZE PREMIUM). Below this, the formula is populated with values: K_e (COST OF EQUITY CAPITAL), R_f (RISK-FREE RATE), β (BETA), RP_m (EQUITY RISK PREMIUM), and 5.60% (DECILE 10). A red arrow points from the 5.60% (DECILE 10) label in the formula to a callout box showing 5.60% (DECILE 10).

Alternatively, in Exhibit 4a a screenshot of the Cost of Capital Navigator being used to estimate cost of equity capital using the Risk Premium Report Study size and the capital asset pricing model (CAPM).

In Exhibit 4a, a market cap of \$100 million is again entered. Since there is no “portfolio overlap” when using the Risk Premium Report Study, there is only a *single* valid choice (out of the 25 portfolios available) for a market cap of \$100 million as of the valuation date used in this example (3/31/16).

Exhibit 4a: Risk Premium Report Study CAPM Example; Selecting a Size Premium Valuation Date = 3/31/16

The screenshot displays the Cost of Capital Navigator interface. At the top, the CAPM formula is shown: $K_e = R_f + \beta \times RP_m +$ SIZE PREMIUM. Below this, the formula is populated with values: K_e , R_f , β , RP_m , and 6.41%. A callout box shows 6.41% and buttons for Cancel and Save. Below the formula, the Market Value of Common Equity is set to 100 million USD.

The “single valid choice” is portfolio 25 (size premia = 6.41%). After confirming this choice by clicking “save”, the Cost of Capital Navigator adds it to the CAPM equation, and automatically labels it underneath (“PORTFOLIO 25”).

Exhibit 4b: The Cost of Capital Navigator Automatically Labels Each Input Based on the Analyst’s Selection (Risk Premium Report Study, CAPM example).

The screenshot shows the Cost of Capital Navigator interface. At the top, the CAPM equation is displayed with labels for each input: K_e (COST OF EQUITY CAPITAL), R_f (RISK-FREE RATE), β (BETA), RP_m (EQUITY RISK PREMIUM), and RP_s (SIZE PREMIUM). Below this, the text "Market Value of Common Equity" is visible. The equation is repeated with the RP_s input set to 6.41%, which is labeled as "PORTFOLIO 25".

$$K_e = R_f + \beta \times RP_m + RP_s$$

Market Value of Common Equity

$$K_e = R_f + \beta \times RP_m + 6.41\%$$

PORTFOLIO 25

6.41%
PORTFOLIO 25

Question 5: I know the size premia and risk premia are accessible only by starting an estimate in the Cost of Capital Navigator, but where can I find additional information about the CRSP Deciles and the Risk Premium Report Study Portfolios?

Additional detail about the deciles in the CRSP Deciles Size Study and the portfolios in the Risk Premium Report Study (for both the Size Study and the Risk Study) can be found in the Resources section of the Cost of Capital Navigator, under “Supplementary Data”.

Here you can view the returns, standard deviation of returns, betas used in the calculation of the size premia, etc. for all 10 Deciles, the 10th Decile split, and the three size groupings available in the CRSP Deciles Size Study (example shown below) and for all 25 portfolios for each of the 8 size measures and each of the 3 risk measures available in the Risk Premium Report Study. For the Risk Premium Report Study, you can also view unlevered betas, risk characteristics of the portfolios (e.g., operating margin, coefficient of variation of operating margin, capital structures, and more) and all of the regression equations.

CRSP Deciles Size Study
Decile 10

| Data Year | Data Through | Market Capitalization of Smallest Company (in millions) | Market Capitalization of Largest Company (in millions) | Annual Arithmetic Mean Return | Annual Geometric Mean Return | Annual Standard Deviation of Returns | OLS Beta | Sum Beta |
|-----------|--------------|---|--|-------------------------------|------------------------------|--------------------------------------|----------|----------|
| 2018 | 12/31/17 | \$2.531 | – \$299.290 | 20.19% | 13.31% | 42.22% | 1.39 | 1.68 |
| 2017 | 12/31/16 | \$2.516 | – \$262.891 | 20.27% | 13.31% | 42.45% | 1.39 | 1.69 |

Sources of underlying data: 1.) CRSP U.S. Stock Database and CRSP U.S. Indices Database © 2018 Center for Research in Security Prices (CRSP[®]), University of Chicago Booth School of Business. 2.) Morningstar *Direct* database. Used with permission. All rights reserved. Calculations performed by Duff & Phelps, LLC.

Annual Arithmetic Mean Returns, Geometric Mean Returns, and Standard Deviation of Returns are calculated over the period 1926–Present.

OLS and Sum betas are estimated from monthly return data in excess of the 30-day U.S. Treasury bill total return, January 1926–Present.

Within the estimates portion of the Cost of Capital Navigator, under each of the size and risk measure equations in the Risk Premium Report Study, you can click the information icon to view sensitivity data regarding the portfolio you were mapped to based on your size/risk input and compare your portfolio to one portfolio “up” and one portfolio “down”.

The screenshot displays the 'Risk Premium Report Study' section of the Cost of Capital Navigator. The interface includes a navigation sidebar on the left with links for 'Home', 'My Cost of Capital Estimates', 'Contact Us', and 'Resources'. The main content area is divided into three tabs: 'CRSP Deciles Size Study', 'Risk Premium Report Study' (which is the active tab), and 'High-financial-risk Study'. Under the active tab, there are sub-sections for 'Size Study' (with 'CAPM + Size Premium' selected) and 'Risk Study'. Below these, there are 'Build-up 1', 'Build-up 2', and 'Build-up 3' options. A message states 'Mouse over any element of the equation to change inputs.' There are also buttons for 'Hide Key', 'Duplicate', and 'Rename', and a dropdown menu for 'SCENARIO 1'. A toggle switch for 'Would you like to use the Regression Equation Method?' is set to 'NO'. At the bottom, a green section titled 'Supplementary Sensitivity Data' contains a table with the following data:

| Portfolio | Avg. Debt/MVIC | Avg. Op. Margin | Avg. CV (Op. Margin) | Avg. CV (ROE) | Std. Dev. Of Returns | RPs |
|---------------|----------------|-----------------|----------------------|---------------|----------------------|-------|
| Portfolio: 21 | 23.88% | 8.84% | 24.06% | 39.87% | 21.92% | 3.65% |
| Portfolio: 22 | 24.36% | 8.68% | 25.28% | 40.73% | 24.12% | 3.85% |
| Portfolio: 23 | 23.95% | 8.07% | 26.55% | 44.45% | 22.60% | 4.06% |

Question 6: Can the Cost of Capital Navigator be used to estimate cost of equity capital for small companies?

YES.

The CRSP Deciles Size Study and the Risk Premium Report Study valuation data sets are both included in the new Cost of Capital Navigator. Both studies include size premia and other premia that can be used to develop cost of equity capital estimates for companies of all sizes, from very large companies to very small companies.

For example, the *largest* company in the CRSP Decile 1 (comprised of the largest U.S. publicly-traded companies) is currently Apple, a very large company indeed, valued at hundreds of *billions* of dollars. Alternatively, the *smallest* company in CRSP Decile 10 (comprised of the smallest U.S. publicly-traded companies) typically has a market cap around \$1 to \$3 *million*. The CRSP Deciles Size Study also includes the 10th Decile “split” into 10a (and its upper and lower halves 10w and 10x) and 10b (and its upper and lower halves 10y and 10z).

The Risk Premium Report Study also calculates size premia and other premia based on market cap, *plus* an additional seven additional size measures, each of which run the gamut from very large companies (in Portfolio 1) to very small companies (in Portfolio 25). For example, in the data from the 2017 Risk Premium Report Study, the size of the companies in *each* of the eight size measures’ “portfolio 25s” (composed of the smallest U.S. publicly-traded companies) is shown in Exhibit 5 (next page). As can be seen, the size of the smallest companies as defined by each of the Risk Premium Report Study’s eight size measures, is indeed small.⁸

The Cost of Capital Navigator also employs the “regression equation method”, which allows the valuation Analyst to calculate a *custom* interpolated risk premium “in between” portfolios, and also to calculate custom interpolated smoothed risk premia for companies with size characteristics *less* than the average size in Portfolio 25, using specially calculated regression equations for each of the Risk Premium Report Study’s eight different size measures.

⁸ This Exhibit is included in the Resources section within the Cost of Capital Navigator. For more information on what content is included in the Cost of Capital Navigator, see: FAQ – Data/Functionality.

Exhibit 5: Size Characteristics of the Companies that Comprise Risk Premium Report Study Portfolio 25, by Percentile, as of December 31, 2016.

| Portfolio 25 | Market Value of Equity (in \$millions) | Book Value of Equity (in \$millions) | 5-Year Average Net Income (in \$millions) | Market Value of Invested Capital (in \$millions) |
|---------------------|---|---|--|---|
| Largest Company | \$291.526 | \$159.204 | \$11.274 | \$387.281 |
| 95th Percentile | 260.490 | 151.276 | 10.302 | 355.585 |
| 75th Percentile | 189.941 | 116.879 | 7.292 | 257.179 |
| 50th Percentile | 99.386 | 74.349 | 4.148 | 141.789 |
| 25th Percentile | 48.289 | 33.630 | 1.976 | 67.336 |
| 5th Percentile | 16.848 | 13.868 | 0.669 | 20.342 |
| Smallest Company | 4.784 | 4.756 | 0.054 | 8.190 |

| Portfolio 25 | Total Assets (in \$millions) | 5-Year Average EBITDA (in \$millions) | Sales (in \$millions) | Number of Employees |
|---------------------|---|--|----------------------------------|----------------------------|
| Largest Company | \$346.465 | \$39.386 | \$307.857 | 686 |
| 95th Percentile | 318.170 | 36.761 | 276.458 | 641 |
| 75th Percentile | 249.862 | 26.608 | 200.273 | 485 |
| 50th Percentile | 163.579 | 15.120 | 118.960 | 272 |
| 25th Percentile | 62.163 | 6.991 | 55.810 | 131 |
| 5th Percentile | 24.577 | 2.109 | 18.314 | 10 |
| Smallest Company | 9.283 | 1.130 | 2.619 | 1 |

Question 7: Are the Risk Premium Report Study's regression equations available in the Cost of Capital Navigator?

Yes, the Risk Premium Report Study's "regression equation method" is included in the Cost of Capital Navigator.

Why this is Important

The Risk Premium Report Study provides two ways for valuation Analysts to match their subject company's size characteristics with the appropriate smoothed premium to be used to estimate the cost of equity capital: the "guideline portfolio" method and the "regression equation" method.⁹

The guideline portfolio method entails using the size premium or risk premium over the risk-free rate that was calculated for the Risk Premium Report Study portfolio that the subject company falls in. But most of the time, the subject company's size characteristics do not exactly match the average size of the companies that were used to construct the Risk Premium Report Study portfolio that the subject company falls in.

That's where the regression equation method comes in. The regression equation method allows the valuation Analyst to calculate a *custom* interpolated risk premium "in between" portfolios, and also to calculate custom interpolated smoothed risk premia for companies with size characteristics *less* than the average size in Portfolio 25.

The regression equations can also be accessed in the Resources section of the Cost of Capital Navigator, under "Supplementary Risk Premium Report Study Data". The document is titled "Supplementary Data – Regression Equations".

⁹ The "regression equation method" *can* presently be used when developing cost of capital estimates using the Risk Premium Report Study but *cannot* be used when developing cost of capital estimates using with the CRSP Deciles Size Study data set. The Risk Premium Report Study provides *two* ways to match the subject company's size (or risk) characteristics to the appropriate size (or risk) premium (the "guideline portfolio method" and the "regression equation method"). The CRSP Deciles Size Premia Study provides a *single* way to match a subject company's market capitalization with the appropriate size premium: the "guideline portfolio" method.

Question 8: Can I use the Cost of Capital Navigator to develop unlevered and *custom* relevered estimates of cost of equity capital for my subject company?

YES.

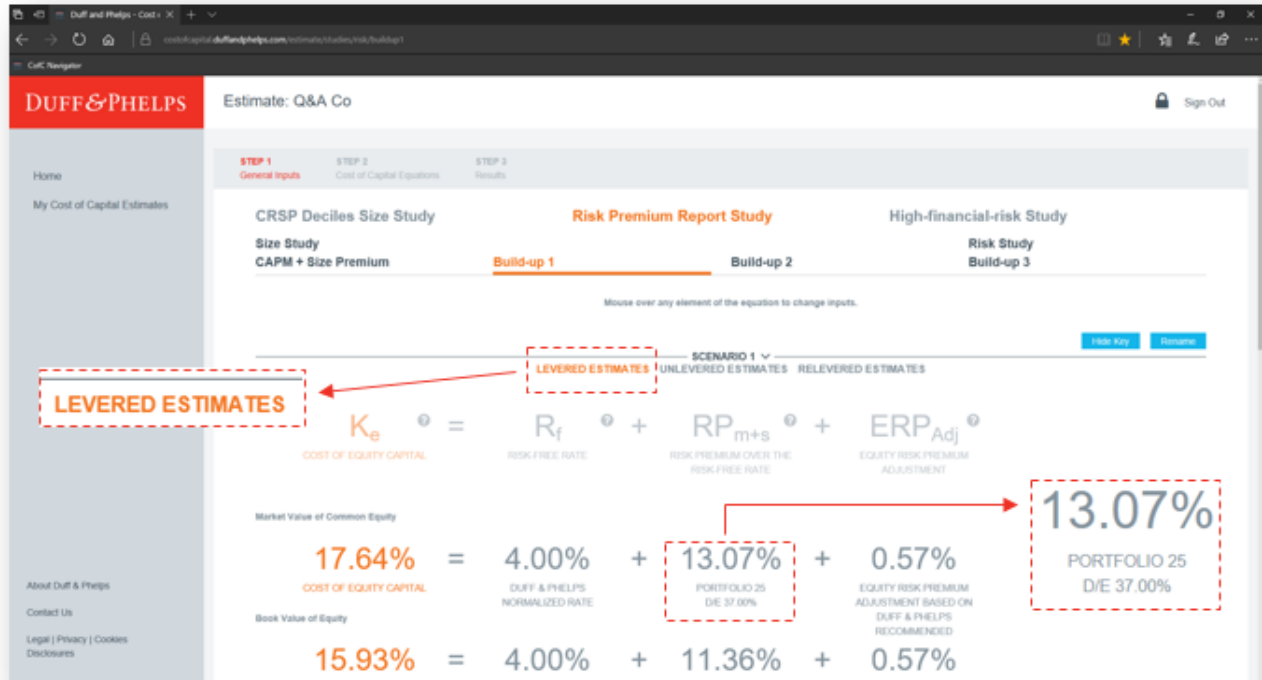
It is not unusual for a company to have a different capital structure (the mix of debt capital to equity capital) from its peer companies in the industry. Nor is it unusual for new management to change the existing capital structure of a company.

The Cost of Capital Navigator can “unlever” cost of equity capital estimates (unlevered cost of equity capital assumes a firm is financed 100% with equity and 0% debt), and then “relever” these same estimates to a *custom* capital structure.¹⁰

For example, the Cost of Capital Navigator was used to develop “levered” cost of equity capital estimates using the Risk Premium Report Study (next page). The labels under the risk premium over the risk-free rate are as follows: (i) the Risk Premium Report Study portfolio that the subject company falls into (Portfolio 25) for “Market Value of Common Equity” (i.e., market cap), and (ii) the average debt to equity ratio of companies in Portfolio 25 (37.00%).¹¹

¹⁰ Unlevering and re-levering cost of equity capital estimates in the Cost of Capital Navigator is currently provided only when using the Risk Premium Report Study to develop cost of equity capital estimates. The CRSP Deciles Size Premia Study currently does not provide this capability.

¹¹ All estimates of cost of equity capital developed using the Cost of Capital Navigator using the “off-the-shelf” size premia and other risk premia are “levered” estimates, with the embedded assumption that the capital structure of the subject company matches the average capital structure of the companies that comprise the Risk Premium Report Study portfolio that the subject company falls in. The same assumption holds when using the CRSP Deciles Size Study.



To “unlever” these estimates, all the Analyst needs to do is click “Unlevered Estimates” (see top image on the next page). Focusing on the first of the estimates, the cost of equity capital estimates are recalculated assuming that the average company in Portfolio 25 is financed 100% with equity and 0% debt, instead of a 37% debt-to-equity ratio.

Generally, as the percentage of leverage (debt) in a company’s capital structure *increases*, the cost of equity capital *increases* (and vice versa).

Focusing again on the first of the estimates, the cost of equity capital estimate has *decreased* from 17.64% to 16.03%, which makes intuitive sense, since the debt-to-equity ratio has *decreased* from 37% to 0%.

DUFF & PHELPS Estimate: Q&A Co

STEP 1 General Inputs | STEP 2 Cost of Capital Equations | STEP 3 Results

CRSP Deciles Size Study | Risk Premium Report Study | High-financial-risk Study

Size Study | CAPM + Size Premium | Build-up 1 | Build-up 2 | Risk Study | Build-up 3

Mouse over any element of the equation to change inputs.

LEVERED ESTIMATES | **SCENARIO 1 UNLEVERED ESTIMATES** | RELEVERED ESTIMATES

$$K_e = R_f + RP_{m+s} + ERP_{Adj}$$

Market Value of Common Equity

| | | | | | | |
|------------------------|---|-------------------------------|---|------------------------|---|---|
| 16.03% | = | 4.00% | + | 11.46% | + | 0.57% |
| COST OF EQUITY CAPITAL | | DUFF & PHELPS NORMALIZED RATE | | PORTFOLIO 25 DIE 0.00% | | EQUITY RISK PREMIUM ADJUSTMENT BASED ON DUFF & PHELPS RECOMMENDED |

Book Value of Equity

| | | | | | | |
|--------|---|-------|---|-------|---|-------|
| 14.51% | = | 4.00% | + | 9.94% | + | 0.57% |
|--------|---|-------|---|-------|---|-------|

SCENARIO 1 UNLEVERED ESTIMATES

To “relever” these estimates, all the Analyst needs to do is click “Relevered Estimates”:

DUFF & PHELPS Estimate: Q&A Co

STEP 1 General Inputs | STEP 2 Cost of Capital Equations | STEP 3 Results

CRSP Deciles Size Study | Risk Premium Report Study | High-financial-risk Study

Size Study | CAPM + Size Premium | Build-up 1 | Build-up 2 | Risk Study | Build-up 3

Mouse over any element of the equation to change inputs.

LEVERED ESTIMATES | UNLEVERED ESTIMATES | **RELEVERED ESTIMATES**

$$K_e = R_f + RP_{m+s} + ERP_{Adj}$$

Market Value of Common Equity

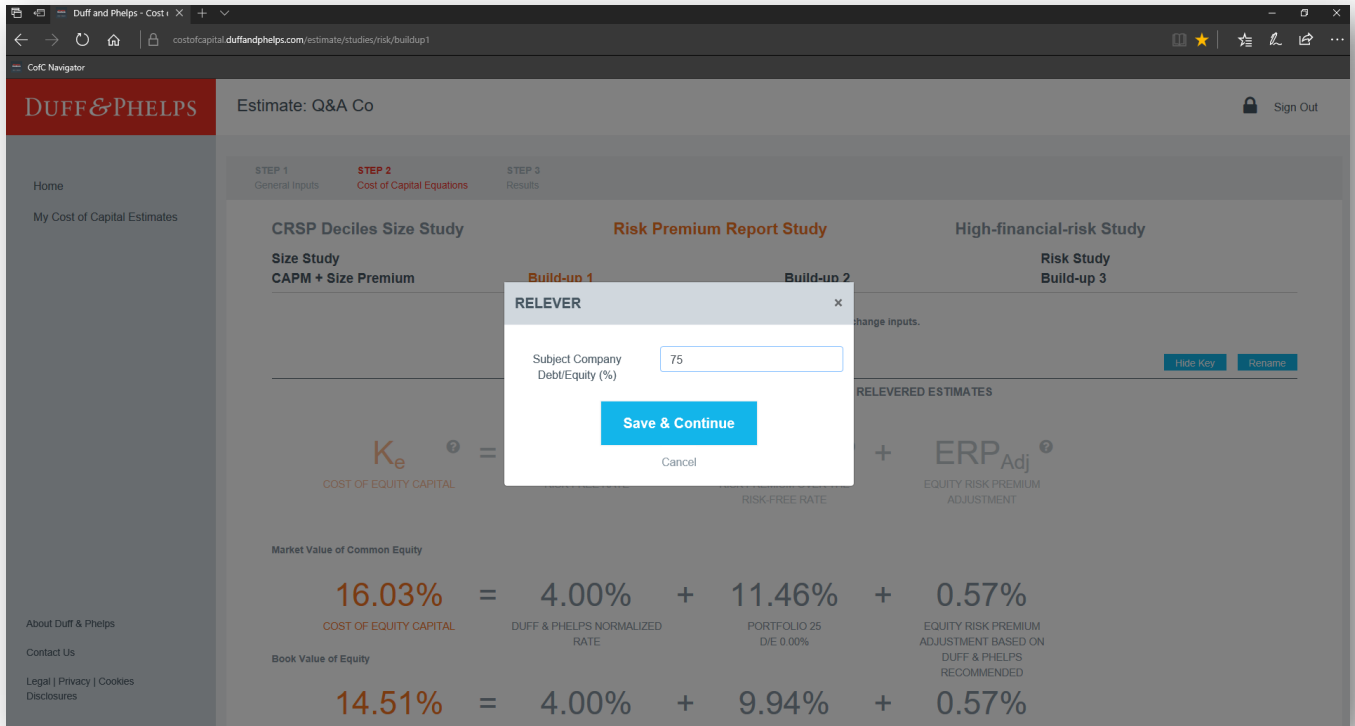
| | | | | | | |
|------------------------|---|-------------------------------|---|------------------------|---|---|
| 16.03% | = | 4.00% | + | 11.46% | + | 0.57% |
| COST OF EQUITY CAPITAL | | DUFF & PHELPS NORMALIZED RATE | | PORTFOLIO 25 DIE 0.00% | | EQUITY RISK PREMIUM ADJUSTMENT BASED ON DUFF & PHELPS RECOMMENDED |

Book Value of Equity

| | | | | | | |
|--------|---|-------|---|-------|---|-------|
| 14.51% | = | 4.00% | + | 9.94% | + | 0.57% |
|--------|---|-------|---|-------|---|-------|

RELEVERED ESTIMATES

Upon clicking on “Relevered Estimates”, a pop-up appears asking for a new debt-to-equity ratio. For this example, 75% is entered, which is significantly *higher* than the average debt-to-equity ratio of companies in the initial levered estimate for Portfolio 25 (37%).



Focusing again on the first of the estimates, the cost of equity capital estimate has *increased* from 16.03% to 19.22% (see image on next page), which makes intuitive sense, since the debt-to-equity ratio has *increased* from 0% to 75%.

The screenshot shows the Duff & Phelps Cost of Capital Navigator interface. The main content area displays the 'Risk Premium Report Study' under 'Build-up 1'. The interface shows the following components:

- Navigation:** STEP 1 (General Inputs), STEP 2 (Cost of Capital Equations - active), STEP 3 (Results).
- Study Selection:** CRSP Deciles Size Study, Risk Premium Report Study (selected), High-financial-risk Study.
- Equation:**

$$K_e = R_f + RP_{m+s} + ERP_{Adj}$$

Labels: COST OF EQUITY CAPITAL, RISK-FREE RATE, RISK PREMIUM OVER THE RISK-FREE RATE, EQUITY RISK PREMIUM ADJUSTMENT.
- Estimates:**
 - LEVERED ESTIMATES:** 17.76% = 4.00% + 13.19% + 0.57%
 - UNLEVERED ESTIMATES:** 16.03% = 4.00% + 12.03% + 0.57%
 - RELEVERED ESTIMATES:** 19.22% = 4.00% + 14.65% + 0.57%

To summarize:

- The initial “levered” cost of equity capital estimate was 17.64%, with a debt-to-equity ratio of 37% for Portfolio 25.
- The Analyst then clicked on “Unlevered Estimates”, and the Cost of Capital Navigator calculated a revised “unlevered” cost of equity capital estimate (16.03%) for Portfolio 25, assuming a debt-to-equity ratio of 0% for Portfolio 25.
- The Analyst then clicked on “Relevered Estimates”, and the Cost of Capital Navigator calculated a revised “relevered” cost of equity capital estimate (19.22%) for Portfolio 25, assuming a debt-to-equity ratio of 75% for Portfolio 25.

These estimates will be included in the results, and included in the comprehensive documentation that the Cost of Capital Navigator provides with each analysis.

Question 9: Can I use the Cost of Capital Navigator to develop custom high-financial-risk estimates of cost of equity capital for my subject company?

YES.

The Cost of Capital Navigator is primarily designed to be used to develop cost of equity capital estimates for the majority of companies that are fundamentally healthy, and for which a “going concern” assumption is appropriate.

However, in cases in which the individual Analyst has determined that the subject company is “high-financial-risk”, the Cost of Capital Navigator’s High-Financial-Risk Study provides the Analyst with the ability to estimate cost of equity capital for a subject company as if the subject company were high-financial-risk (i.e., “distressed”).

The Cost of Capital Navigator can be used to estimate high-financial-risk cost of equity capital estimates using both the CAPM and Build-up methods. The following example uses the CAPM method to estimate high-financial-risk cost of equity capital for “Q&A Co”.

To estimate high-financial-risk cost of equity capital using the CAPM method, the Analyst first clicks on “High-financial-risk Study” (“1” in the image on next page), and then clicks on “High-financial-risk Risk Premium over CAPM” (“2” in the image on next page).

High-financial-risk Study 1

2 RP_s
HIGH-FINANCIAL-RISK RISK
PREMIA OVER CAPM

Upon clicking “High-financial-risk Study”, and then clicking on the High-Financial-Risk Risk Premium over CAPM (in the equation), a pop-up appears asking for additional information about the subject company (see image below).

In this example, the Analyst had already entered Q&A Co.’s “Market Value of Equity” (i.e., market cap), “Book Value of Equity”, “Total Assets”, and “Current Year Sales” (i.e., revenues) in a previous step, and so the Cost of Capital Navigator remembers these previous entries, and carries them over to this step, where the Analyst now wants to see a high-financial-risk cost of equity capital estimate for Q&A Co.

$K_e = 4.00\% + 1.50 \times 5.50\% + RP_s$

HIGH-FINANCIAL-RISK RISK
PREMIA OVER CAPM
RP_s
Cancel
Save

In order to calculate this equation, please provide information for ALL fields below.

Z-Scores Inputs (\$USD in millions)

● Service or ○ Manufacturing

| | | | |
|------------------------|--|---------------------|--|
| Market Value of Equity | <input type="text" value="120"/> | Current Year Sales | <input type="text" value="250"/> |
| Book Value of Equity | <input type="text" value="100"/> | Current Assets | <input type="text" value="undefined"/> |
| Total Assets | <input type="text" value="300"/> | Current Liabilities | <input type="text" value="undefined"/> |
| Current Year EBIT | <input type="text" value="undefined"/> | Retained Earnings | <input type="text" value="undefined"/> |

Your Z-Score: _____

After entering the missing values (Current Year EBIT, Current Assets, Current Liabilities, and Retained Earnings), the Cost of Capital Navigator calculates a z-score for Q&A Co, and reports the results:

“Your Company has a z-Score = 0.40 as calculated using the Altman z-Score Model. z-Scores < 1.1 suggest your Company is distressed”.^{12,13}

¹² Altman z-Score is an accounting-data-based method designed to assess financial condition and developed originally for assessing the likelihood of bankruptcy. 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

¹³ Altman z-Score is a *single* way of gauging a company’s likelihood of bankruptcy. The decision to apply a high-financial-risk premium is ultimately dependent on the valuation Analyst’s professional judgment, based upon the Analyst’s detailed knowledge of the subject company.

After clicking “Save & Continue”, a high-financial-risk cost of equity capital estimate for the subject company, Q&A Co, is calculated (30.02%) (see images on next page).

30.02% = 4.00% + 1.50 × 5.50% + **17.77%** HIGH FINANCIAL-RISK RISK PREMIA OVER CAPM
17.77%
Cancel
Save

In order to calculate this equation, please provide information for ALL fields below.

Z-Scores Inputs (\$USD in millions)

Service or Manufacturing

| | |
|---|--|
| Market Value of Equity <input type="text" value="120"/> | Current Year Sales <input type="text" value="250"/> |
| Book Value of Equity <input type="text" value="100"/> | Current Assets <input type="text" value="75"/> |
| Total Assets <input type="text" value="300"/> | Current Liabilities <input type="text" value="100"/> |
| Current Year EBIT <input type="text" value="-10"/> | Retained Earnings <input type="text" value="50"/> |

Your Z-Score: 0.40

Your Company has a z-Score = 0.40 as calculated using the Altman z-Score Model. z-Scores = 1.1 suggest your Company is distressed. High-financial-risk premia are calculated only if your company is in the "distress zone" (z-Scores < 1.1).

Previous
Save & Continue
Finish Now

DUFF & PHELPS Estimate: Q&A Co Sign Out

STEP 1 General Inputs | **STEP 2 Cost of Capital Equations** | STEP 3 Results

CRSP Deciles Size Study | Risk Premium Report Study | **High-financial-risk Study**

High Financial Risk Study
CAPM + HFR Size Premium | Build-up HFR

Mouse over any element of the equation to change inputs. Hide Key

$$K_e = R_f + \beta \times RP_m + RP_s$$

COST OF EQUITY CAPITAL RISK-FREE RATE BETA EQUITY RISK PREMIUM HIGH-FINANCIAL-RISK RISK PREMIA OVER CAPM

SCENARIO 1 Rename

30.02% = 4.00% + 1.50 × 5.50% + **17.77%** Duplicate

COST OF EQUITY CAPITAL DUFF & PHELPS NORMALIZED RATE CUSTOM DUFF & PHELPS RECOMMENDED DISTRESS ZONE

Previous
Save & Continue
Finish Now

Can I still include a high-financial-risk estimate in my analysis (for comparative purposes) if my company is *not* distressed according to the Altman z-Score Model?

YES.

If the result of the z-Score calculation suggests that the subject company is *not* distressed, the Cost of Capital Navigator reports that information to the Analyst. Say the calculation result was a z-Score of 1.88, which suggests that the subject company is not distressed. The Cost of Capital Navigator reports that information to the user as follows:

“Your Company has a z-Score = 1.88 as calculated using the Altman z-Score Model. z-Scores > 1.1 suggest your Company is not distressed. High-financial-risk premia are calculated only if your company is in the “distress zone” (z-Scores < 1.1).

You should likely calculate cost of equity using other equations in the Cost of Capital Navigator. However, if you would you like to include an estimate(s) as if your company were in the “distress zone” for comparison purposes, please proceed by selecting “yes”.”

Below this message, the Analyst is given the option of still including a high-financial-risk estimate in his or her results:

Would you like to continue as if your company were in the "distress zone"?

Yes or No

Question 10: Do I have to use *both* the CRSP Deciles Size Study and the Risk Premium Report Study?

NO.

The Cost of Capital Navigator provides the Analyst with many choices for estimating cost of equity capital.

For example, the Analyst can choose to use *only* the CRSP Deciles Size Study to estimate the cost of capital or can choose to use *only* the Risk Premium Report Study or can choose to use *both*.

Moreover, within each of those valuation data sets (the CRSP Deciles Size Study; the Risk Premium Report Study) the Analyst can choose to use the capital asset pricing model (CAPM), or various “Build-up” methods.

The reason Duff & Phelps’ Cost of Capital Navigator provides multiple valuation data sets (and multiple cost of equity capital estimation methods within those valuation data sets) is straightforward: there is no consensus among academics and practitioners as to the best method or model to use in estimating the cost of equity; there is no “perfect method” that works in all conditions.

In other words, the Analyst can choose to use as few (or as many) different valuation data sets and cost of equity capital estimation method as he or she wants to. However, the Cost of Capital Navigator provides the Analyst with the ability to efficiently calculate cost of equity capital estimates using (i) two different data sets and (ii) multiple methods, which can act to reduce the “error” in the estimate that might result from relying on only a single valuation data set or method.

Question 11: Do I have to use all eight measures of size in the Risk Premium Report Study, or can I skip some of them?¹⁴

YES, you can skip some of them.

However, for the best results, we suggest using as many of the eight size measures that are available for the subject company, but it is not necessary to use them all. To produce a result, the minimum is one.

¹⁴ The Risk Premium Report Study provides the Analyst with size premia and “risk premia over the risk-free rate” based on market cap and seven additional measures of size. The eight measures of size are: (i) market capitalization, (ii) book value of equity, (iii) 5-year average net income, (iv) market value of invested capital (MVIC), (v) total assets, (vi) 5-year average EBITDA, (vii) sales, and (viii) number of employees.

Question 12: Can I add a measure of company-specific risk to my estimates?

YES, coming in 2019.

The “company-specific risk premium” in this question refers to adding a premium (sometimes called an “alpha”) to an estimate with the intention of capturing risks *not already captured* by the usual elements included in a cost of equity capital estimate (e.g., risk-free rate, beta, ERP, size premium, etc.).

Duff & Phelps is in the early stages of investigating the addition of company specific risk data (and potential calculation) *within* the Cost of Capital Navigator.

Question 13: How does the Cost of Capital Navigator determine which industries and which betas are available to the user?

The Cost of Capital Navigator contains industry betas from two different sources:

- Full-information betas that were previously published in Appendix 3a in the *Valuation Handbook – U.S. Guide to Cost of Capital* and are now available exclusively in the Cost of Capital Navigator.
- Vasicek-Adjusted betas, Sum betas, and High-Financial-Risk (HFR) Sum betas come from the *Valuation Handbook – U.S. Industry Cost of Capital* analysis.¹⁵

If an industry is included in either of these analyses within the two most recent quarters as of your valuation date, this industry will be available for you to select for use in your cost of capital estimate. Looking back two quarters broadens the amount of industries available to the user for selection, while ensuring the analyst is using relevant data.

NOTE: The Full-information beta analysis and the *U.S. Industry Cost of Capital* analysis employ different screening criteria, so it is possible that certain industries may be included in one study but not in the other. Therefore, it is possible that the full-information beta for your industry will be available to use, but not the Vasicek-adjusted, sum, or HFR sum betas, and vice versa.

To view the full list of industries available as of your valuation date and the betas available for each industry, view the “Industries and Betas Available by Val Date” in the Resources section. To view the list of companies used in each beta calculation, and for more information on the screening criteria, view the Full-Information Beta Company List and the Pure Play U.S. Companies by SIC Code in the Resources section in the Cost of Capital Navigator.

To arrive at a list of companies to calculate our industry betas, we employ two separate screening processes for the two lists found in the Cost of Capital Navigator. The file “Pure Play U.S. Companies by SIC Code” is called “pure play” because each company included operates almost entirely in one industry. Pure play companies are defined here as those companies that derive at least 75% of their overall revenue from a single SIC code. The Full-Information Beta Company List is much more broad, because every industry a company falls in is included, regardless of the revenue size in that industry. For example, General Electric is in SIC 372 (Aircraft and Parts) as well as SIC 49 (Electric, Gas, and Sanitary Services), as well as many more industries.

¹⁵ The *Valuation Handbook – U.S. Industry Cost of Capital* provides cost of equity capital and weighted average cost of capital (WACC) estimates for each of the U.S. industries covered in the book, plus capital structure, valuation (trading) multiples, sales, market capitalization, capital structure, several levered and unlevered beta estimates, financial and profitability ratios, equity returns, aggregate forward-looking earnings-per-share (EPS) growth rates, and more. In 2019, all data from the *Valuation Handbook – U.S. Industry Cost of Capital* will be transitioned over to the Cost of Capital Navigator.

Question 14: What if my subject company's industry is not available in the Cost of Capital Navigator, or what if I do not want to enter an industry?

The Cost of Capital Navigator provides the Analyst with a full pallet of choices, from which ERP to use, to which valuation data set(s) and methods for estimating cost of equity capital to use, to which size measures to include in their analysis (and what those size measures' values are), to whether to unlever and then re-lever their cost of capital estimates using a custom capital structure, etc. Of course, the Analyst can *also* choose to not identify the "industry" in which the subject company operates.

If the Analyst does not identify the "industry" in which the subject company operates (or if the subject company's industry is not be available in the Cost of Capital Navigator as of the given valuation date), the Cost of Capital Navigator (i) will not be able to retrieve an industry beta to use in creating an industry risk premium for use within certain Build-up methods of calculating cost of equity capital, and (ii) will not be able to provide a comparison of industry composite cost of equity capital to the Analyst's cost of equity capital results for the subject company.^{16,17}

Of course, like many of the other input entry fields in the Cost of Capital Navigator that provide the Analyst with "off-the-shelf" values that the Analyst can choose from, the Analyst can type in a *custom* value for a beta (calculated outside of the Cost of Capital Navigator by the Analyst) and the Cost of Capital Navigator will automatically calculate the appropriate industry risk premium based upon the typed-in custom beta, and use it in the analysis.¹⁸

¹⁶ The industry composite cost of equity capital estimate comes from the *Valuation Handbook – U.S. Industry Cost of Capital*.

¹⁷ In the results section of the Cost of Capital Navigator, the summary provides a comparison of the subject company's cost of equity capital to the cost of equity capital for the industry in which the subject company operates if that information is available. As of the initial launch in late February 2018, this industry information includes only the "SIC Composite", which is a snapshot of the industry as a whole. Future functionality may allow a toggle for "Industry Median" "Industry Large Composite", "Industry Small Composite", and "Industry High Financial Risk Composite".

¹⁸ Duff & Phelps calculates hundreds of industry betas quarterly. To learn more, see: FAQ – Data/Functionality.

Question 15: I noticed that the full-information beta and the Vasicek-adjusted beta are available for use in the CRSP Deciles Size Study but not in the Risk Premium Report Study, and that the sum beta is available only in the Risk Premium Report Study. Why is that?

The Cost of Capital Navigator is designed to help the user be internally consistent in their cost of capital assumptions. One of the ways the Cost of Capital Navigator does this is by offering the user “off-the-shelf” industry betas that are consistent with the methodology used in the CRSP Deciles Size Study and in the Risk Premium Report’s Size Study:

- Size premia in the CRSP Deciles Size Study are developed using OLS Betas as inputs. Therefore, the full-information beta and the Vasicek-adjusted beta are available for use in the CRSP Deciles Size Study (both are modified versions of OLS Betas), but the sum beta is not available.
- Size Premia in the Risk Premium Report are developed using sum betas as inputs. Therefore, the sum beta is available in the Risk Premium Report Study (and the HFR Sum beta in the High-financial-risk study) but not the full-information beta or the Vasicek-adjusted beta.

Mismatching the type of beta used in the CAPM Method (or to develop industry risk premia in the Build-up method) with the type of beta used to develop size premia can cause the user to overestimate or underestimate risk. For more information, see Chapter 4: Basic Building Blocks of the Cost of Equity Capital – Size Premium of the *Valuation Handbook – U.S. Guide to Cost of Capital* in the Resources section of the Cost of Capital Navigator.

Question 16: In the Cost of Capital Navigator, why does the industry risk premium change when the equity risk premium (ERP) is changed?

Industry risk premia (RP_i) in the Cost of Capital Navigator are industry betas that have been adjusted so that they can be added as a simple “up or down” adjustment in the build-up method.¹⁹

Transforming an industry beta into an industry risk premium is accomplished as follows:

$$\text{Industry Risk Premium} = (\text{Industry beta} \times \text{ERP}) - \text{ERP}$$

If the industry beta is, say, 1.2, then using an equity risk premium (ERP) of, say, 7.0% produces an industry risk premium of 1.4%:

$$1.4\% = (1.2 \times 7.0\%) - 7.0\%$$

Alternatively, if the industry beta is again, say, 1.2, then using an equity risk premium (ERP) of, say, 5.0% produces an industry risk premium of 1.0%:

$$1.0\% = (1.2 \times 5.0\%) - 5.0\%$$

So, when the ERP is changed, the industry risk premium will necessarily change as well.

The Cost of Capital Navigator automatically retrieves industry betas as of valuation date for the industry in which the subject company operates (if available), and then automatically *transforms* the industry beta that was selected in the manner shown above into an industry risk premium for use in the Build-up method *based upon the ERP that the Analyst has selected*.

¹⁹ Full-information betas in the former *Valuation Handbook – U.S. Guide to Cost of Capital* and in the new Cost of Capital Navigator are based upon Paul D. Kaplan, and James D. Peterson. “Full-Information Industry Betas”, *Financial Management*, Summer 1998.

Question 17: Does the Cost of Capital Navigator provide comprehensive documentation?

YES.

The Cost of Capital Navigator provides comprehensive documentation of results, inputs, equity risk premium and beta assumptions, and methods used to estimate cost of equity capital.

In the examples discussed below, the Analyst decided to create two scenarios: one in which the “spot” risk-free rate and long-term “historical” ERP were used, and one in which the Duff & Phelps recommended ERP and “normalized” risk-free rate were used. The Cost of Capital Navigator provides the Analyst with the ability to easily create scenarios using different data sets, inputs, or assumptions to (i) perform sensitivity analysis and/or (ii) triangulate results. From within the summary page the results of these scenarios can be examined, modified, kept, or *excluded* from the overall analysis, and these changes are reflected instantaneously in the overall results.

Documentation of Summary Results

The overall summary includes the average and median estimate for the Analyst’s “levered”, “unlevered”, “re-levered”, and “high financial risk” estimates (if applicable) for hypothetical subject company “Q&A Co.” in Exhibit 6a, (next page). Q&A Co.’s cost of equity capital estimate (levered) falls in a range of 15.2% to 19.0%, with an average and median estimate of 17.0% and 17.2%, respectively.

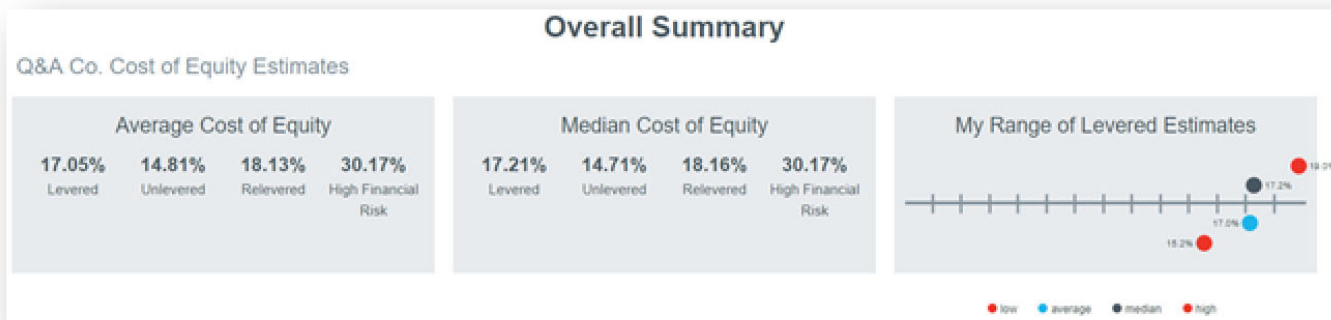
In Exhibit 6a, the base levered cost of equity capital estimates were also (i) unlevered (i.e., re-calculated assuming a capital structure of 100% equity and 0% debt), and then relevered at a custom capital structure, and (ii) calculated as if Q&A Co. is in a state of distress (i.e., “High-financial-risk”).

Data Through Dates

The Cost of Capital Navigator keeps track of the “data through” dates for each individual data point (risk-free rate, beta, equity risk premium, etc.) used when calculating cost of equity capital. That is to say, the “data through” date corresponds to the period of time over which the inputs to calculate the data can be found. Found in the summary page, the Navigator provides the “data through” date (the period over which the data was

calculated) as well as the frequency with which the data is updated (daily, quarterly, or annually).

Exhibit 6a: Overall Summary of Cost of Equity Capital Estimates for Q&A Co.



The overall summary can also provide a comparison of the subject company’s cost of equity capital to the cost of equity capital for the industry in which the subject company operates (if that information is available). As of the initial launch in February 2018, this industry information includes only the “Industry Composite”, which is a snapshot of the industry as a whole (not shown in Exhibit 6a). A toggle for “Industry Median” “Industry Large Composite”, “Industry Small Composite”, and “Industry High-financial-risk Composite” is scheduled to be added at a later date.

Documentation of Inputs

Documentation of all of the size measures and other inputs that were used in a cost of equity capital estimate for subject company Q&A Co. is shown in Exhibit 6b.

Exhibit 6b: Documentation of Size Measure and Other Inputs Used to Estimate Cost of Equity Capital for Hypothetical Company Q&A Co.

| General Inputs | CRSP Deciles Size Study |
|--|---|
| Valuation Date: 03/31/2016 | CRSP Decile Size Premium: 5.60% (Decile 10) |
| Home Country: United States | Size Group Size Premium: n/a |
| Investee Country: United States | |
| Industry: 3533 - Oil and Gas Field Machinery and Equipment | |
| | Risk Premium Report Study |
| | Average Risk Premium over CAPM: 5.31% |
| | Median Risk Premium over CAPM: 5.30% |
| | Average Risk Premium over the Risk-Free Rate: 11.89% |
| | Median Risk Premium over the Risk-Free Rate: 11.94% |
| | Average Risk Study Premium (RPM+c): 8.96% |
| | Median Risk Study Premium (RPM+c): 9.14% |
| | |
| | High Financial Risk Study |
| | Z-Score: 0.95 (Distressed) |
| | Risk Premium over the Risk-Free rate: 17.77% |
| | Risk Premium over CAPM: 17.77% |
| Size Measures | |
| <small>(\$USD in millions, except for Number of Employees)</small> | |
| Market Value of Common Equity: \$100m | |
| Book Value of Equity: \$100m | |
| 5-Year Average Net Income: \$10m | |
| Market Value of Invested Capital: \$180m | |
| Total Assets: \$300m | |
| 5-Year Average EBITDA: \$30m | |
| Net Sales: \$250m | |
| Number of Employees: 200 | |
| Risk Measures | |
| Average Operating Margin: 14.64% | |
| Coefficient of Variation of Operating Margin: 15.76% | |
| Coefficient of Variation of Return on Equity: 34.67% | |

Documentation of Equity Risk Premium and Beta Assumptions

Documentation of all of the equity risk premium and beta assumptions that were used in a cost of equity capital estimate for subject company Q&A Co. is shown in Exhibit 6c.

Exhibit 6c: Documentation of Equity Risk Premium and Beta Assumptions Used to Estimate Cost of Equity Capital for Hypothetical Company Q&A Co.

| <u>Assumptions</u> ✓ |
|--|
| Scenario 1 |
| Equity Risk Premium (ERP): 6.9% - Historical Long-term (1926–Present) |
| CRSP Beta: 1.1 - SIC 36 Full-information Beta |
| RPR Beta: 1.28 - SIC 36 Median Sum Beta |
| HFR Beta: n/a |
| Risk-free Rate: 2.2% - Spot 20-year Treasury Yield |

Documentation of Sources

Documentation of the sources and data through dates of each data point used in a cost of equity capital estimate for subject company Q&A Co. is shown in Exhibit 6d.

Exhibit 6d: Documentation of Data Sources and Data Through Dates Used to Estimate Cost of Equity Capital for Hypothetical Company Q&A Co.

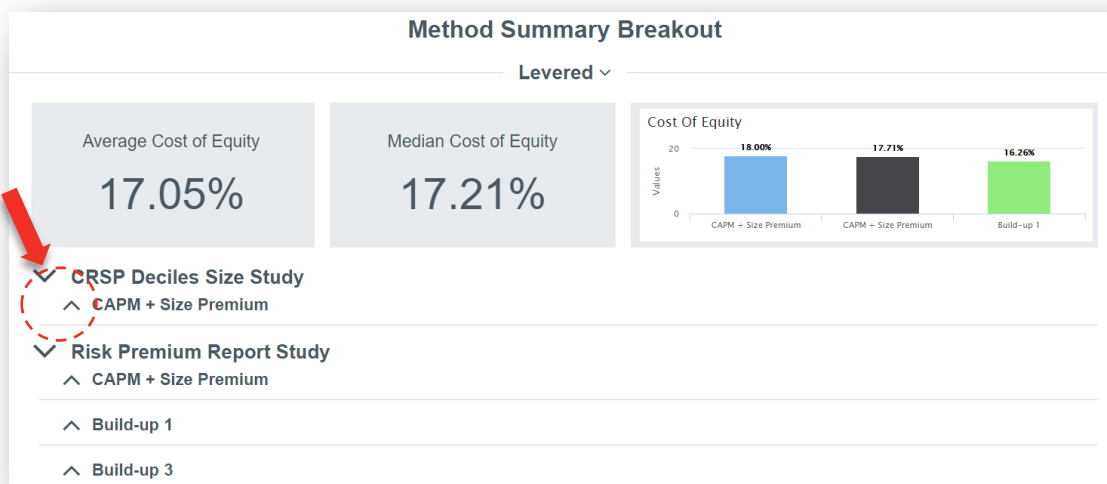
| *Sources |
|--|
| <u>Duff & Phelps Cost of Capital Navigator</u> |
| Crsp Deciles Size Study Size Premium: Annual Data as of 12/31/2017 |
| Risk Premium Report Study Risk Premium Over Capm: Annual Data as of 12/31/2017 |
| Equity Risk Premia Historical Long-term (1926–Present): Annual Data as of 12/31/2017 |
| Risk Free Rate Spot 20-year Treasury Yield: Federal Reserve: Daily Data as of 9/30/2018 |
| Beta SIC 492 Full-information Beta: Quarterly Data as of 9/30/2018 |
| <u>Valuation Handbook – U.S. Industry Cost of Capital</u> |
| Beta SIC 492 Median Sum Beta: Quarterly Data as of 9/30/2018 |
| Industry Benchmarks Average and Median Cost of Equity for SIC 492: Quarterly Data as of 9/30/2018 |

Documentation of Methods Used to Estimate Cost of Equity Capital

The methods used by the Analyst to estimate cost of equity capital are documented by the Cost of Capital Navigator. In the example shown here, levered cost of equity capital was estimated using just four different methods (see Exhibit 6e):

- **The CRSP Deciles Size Study**
 - CAPM + size premium based on market cap
- **The Risk Premium Report Study**
 - CAPM + size premium based on up to eight size measures, including market cap
 - “Build-up 1”, which includes a risk-free rate + a “risk premium over the risk-free rate” based on up to eight size measures, including market cap
 - “Build-up 3”, which includes a risk-free rate + a “risk premium over the risk-free rate” based on up to three fundamental accounting based measures of risk²⁰

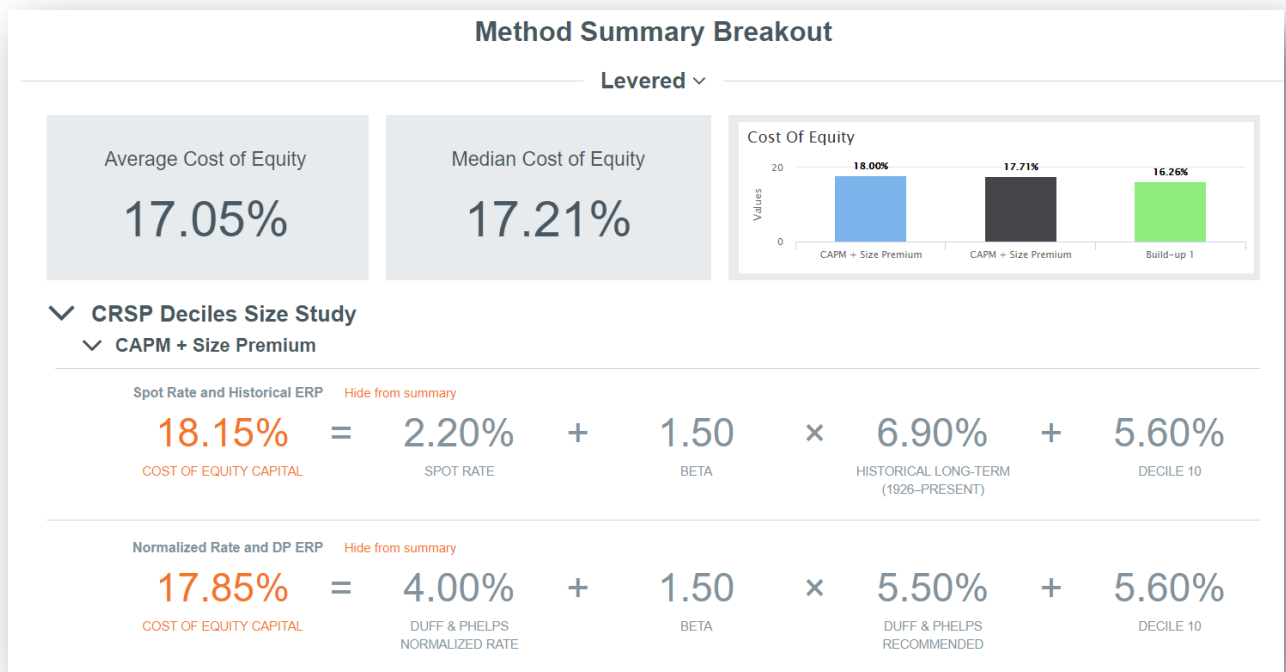
Exhibit 6e: Documentation of All of the Methods Used to Estimate Cost of Equity Capital for Hypothetical Company Q&A Co.



²⁰ The three “fundamental accounting based measures of risk” are (i) operating margin, (ii) coefficient of variation of operating margin, and (iii) coefficient of variation of return of return on equity.

The Analyst can click on the “^” and “v” toggles to open and close the details of each method. From within this “detail” view, the results of these scenarios can be examined, kept, or *excluded* from the overall analysis (by clicking “Hide from summary”), and these changes are reflected instantaneously in the overall results (see Exhibit 6f).

Exhibit 6f: Documentation of All of the Methods Used to Estimate Cost of Equity Capital for Hypothetical Company Q&A Co., with the CRSP Deciles Size Study “CAPM + Size Premium” “Toggled Open” to Reveal this Method’s Details



New Enhanced Outputs

In 2019, the Cost of Capital Navigator introduces “Enhanced Outputs” that provide robust and comprehensive documentation of the user’s cost of capital assumptions, sources, analysis, and results. The enhanced reports will be available as an export to PDF and Excel.

| ABC Widgets | | CRSP Deciles Size Study | | |
|---|--|---|---|---------------------------------|
| Cost of Capital Estimates (Scenario 1) | | | | |
| Estimate Name | Industry | Valuation Date | Date Last Updated | |
| ABC Widgets | SIC 13: Oil And Gas Extraction | March 31, 2016 | June 2, 2016 | |
| Build-Up Method Cost of Equity Capital Estimate | | | | |
| Build-Up Model Equation: $k_e = (\text{Risk-free Rate}) + (\text{Equity Risk Premium}) + (\text{Industry Risk Premium}) + (\text{Size Premium})$ $k_e = R_f + RP_m + RP_i + RP_s$ | | | | |
| For more information on the inputs below, see the CRSP Inputs documentation at the end of this section. | | | | |
| Subject Co. Value of Market Value of Equity (\$USD in millions) | Selected CRSP Decile | Market Capitalization of Smallest Company (\$USD in millions) | Market Capitalization of Largest Company (\$USD in millions) | Size Premium (RP _s) |
| \$300.0 | Decile 9 | \$209.880 | \$448.079 | 2.54% |
| Cost of Equity Capital Estimate (k _e) | Risk-free Rate (R _f) | Equity Risk Premium (RP _m) | Industry Risk Premium (RP _i) | Size Premium (RP _s) |
| ABC Widgets | = 2.20% Spot 20-year Treasury Yield | + 8.90% Historical Long-term (1926–2015) ERP | + 1.24% Based on SIC 13 Full-information Beta and the Historical Long-term (1926–2015) ERP | + 2.54% See Above |
| Cost of Equity Capital Estimate (k _e) | | | | |
| = 12.88% | | | | |

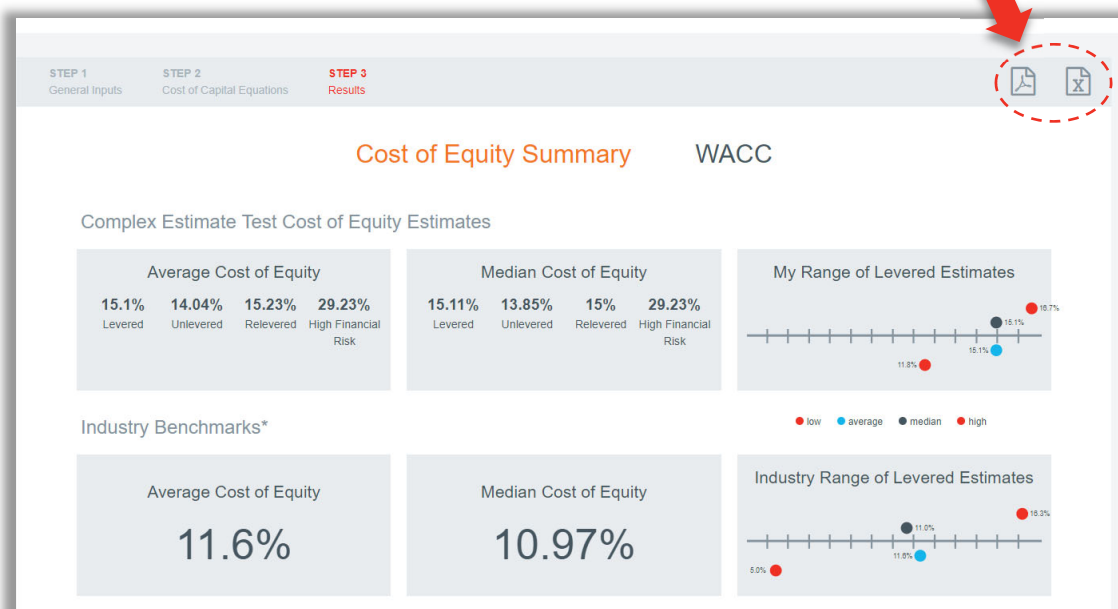
Question 18: Can I export my Cost of Capital Navigator results and documentation to PDF and Excel?

YES.

All of the results discussed previously can be exported to (i) PDF, and (ii) Excel:

- Documentation of Summary Results
- Documentation of Inputs
- Documentation of Equity Risk Premium and Beta Assumptions
- Documentation of Sources
- Documentation of Methods Used to Estimate Cost of Equity Capital

The export to Excel is a report of the inputs and results which the Analyst can use directly, or copy and paste them into another Excel spreadsheet that may contain his or her other work on the given valuation. However, as of 2019 the Cost of Capital Navigator includes new “Enhanced Outputs” that contain robust and comprehensive documentation of the user’s cost of capital assumptions, sources analysis, and results. These enhanced reports can also be exported to both Excel and PDF.



Question 19: How do I archive an estimate?

To delete/archive an estimate, you can go to “My Cost of Capital Estimates” located on the left gray area. Click on “Select” next to your estimate name for the drop down menu to appear which contains the “Archive” button.

After archiving an estimate, the user will have 90 days to contact Cost of Capital Navigator Support to un-archive.

The screenshot displays the Duff & Phelps user interface. At the top left is the Duff & Phelps logo. The user's name, Zachary Rodheim, and email address, Zachary.Rodheim@DuffandPhelps.com, are shown at the top right. A 'Sign Out' button is also present. On the left side, there is a navigation menu with options: Home, My Cost of Capital Estimates, Contact Us, and Resources. The main content area is titled 'My Cost of Capital Estimates' and contains a table with the following data:

| | Modified | Cost of Capital Estimate Name | All Actions |
|---|----------|-------------------------------|-----------------------------|
| ▼ | 10/5/18 | 2121 | Select |
| ▼ | 9/27/18 | Packaging Inc | Edit Rename Duplicate |
| ▼ | 9/25/18 | Walker | Archive Share |
| ▼ | 9/10/18 | Screen Shots Inc | |
| ▼ | 9/7/18 | Screen Shots Inc1 | |
| ▼ | 8/31/18 | TEST | Select |
| ▼ | 8/31/18 | CARBON | Select |

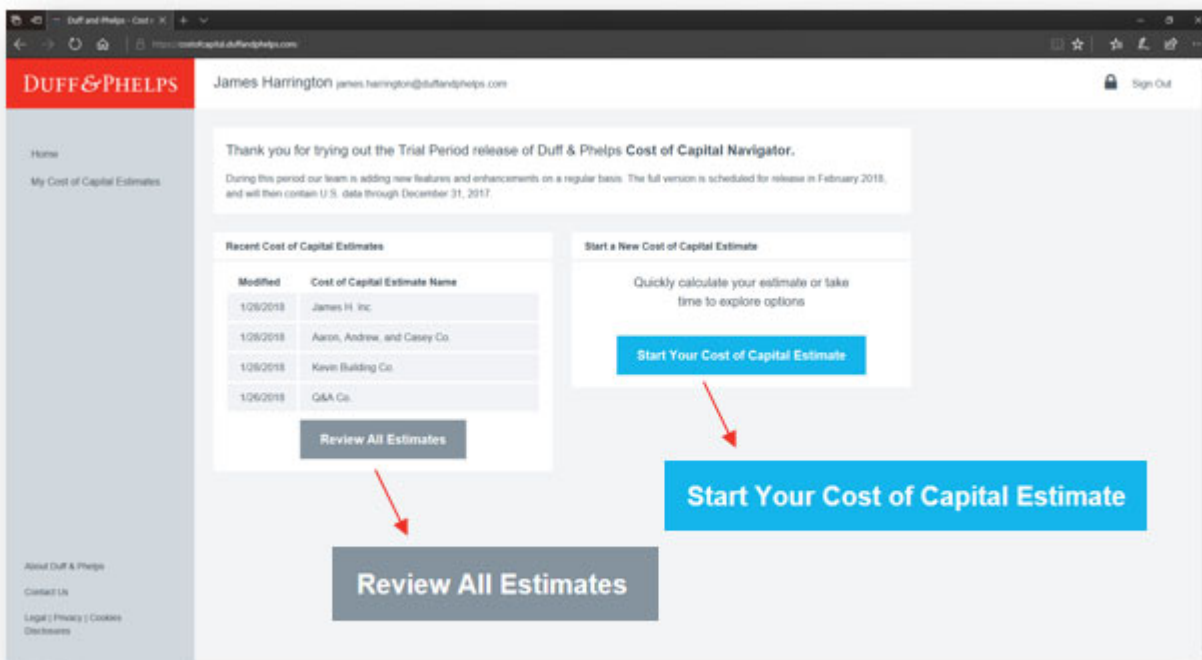
A red arrow points to the 'Archive' option in the dropdown menu for the 'Screen Shots Inc' estimate.

Question 20: Can I save my estimates in the Cost of Capital Navigator and go back to them later to review or modify them?

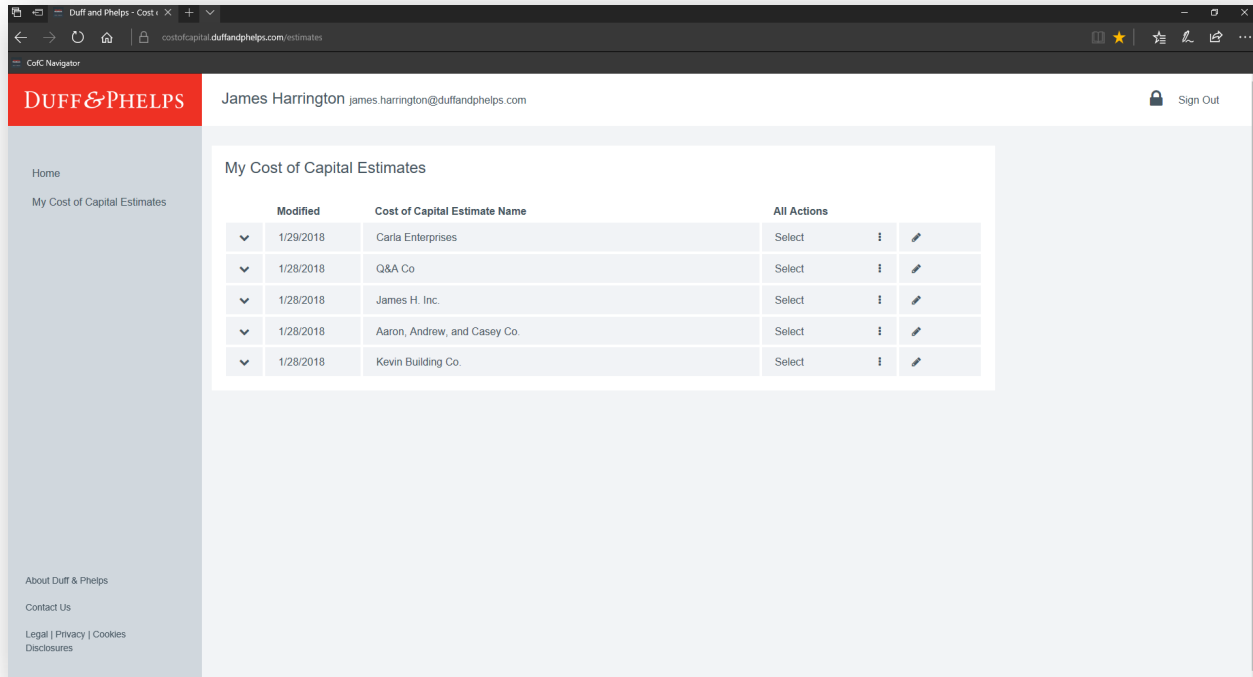
YES.

The ability to save estimates in the Cost of Capital Navigator and go back to them later to review, modify, or update them was a feature that many Analysts requested.

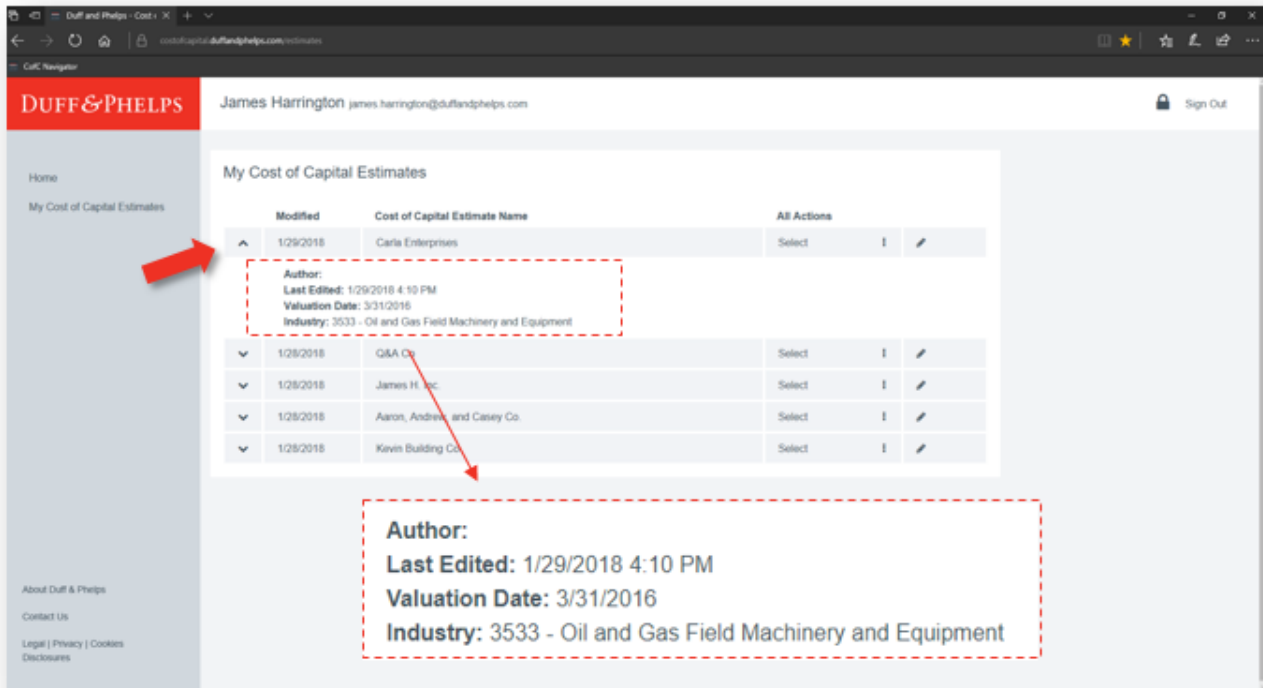
After logging in, you can review and modify previous estimates, or start a new estimate:



After clicking “Review All Estimates”, the Cost of Capital Navigator displays all the previous estimates saved by the Analyst. There is no limit to the number of estimates that can be saved.



By clicking on the toggle on the left, the Analyst can view high-level information about each estimate:



By clicking on the toggle on the right, the Analyst can (i) “Edit” an estimate (i.e., go back into the estimate and review, modify, or update it), (ii) “Rename” an estimate, (iii) duplicate an estimate, or (iv) archive an estimate.

