CH-11 Examples – Using Risk Premium Report – Size Study Data

The following are examples of using the data in the Risk Premium Report- Size Study in estimating the size premia for use in the build-up method and the modified CAPM.

Using the Guideline Portfolio Method in the Build-up Method.

Estimation of the discount rate for a company using the build-up method as the sum of the risk-free rate as of the valuation date and the smoothed risk premium over the risk-free rate for the portfolio closest in size to the subject company. For instance, assuming that the spot risk-free rate as of the valuation date (December 31, 2019) is 2.2%, a simple build-up method estimate of cost of equity capital for a company with a market value of equity of $50 million (placing it in portfolio 25 in Exhibit 1110) would result in:

$E(R_i)$	=	$R_f + RP_{m+s(levered)}$ *for market value of equity capital = $50 million*
	=	*2.25% + 13.54%*
	=	*15.79%*

Using the Regression Equation Method in the Build-up Method.

Extrapolation of the smoothed risk premium for a company. The availability of the regression equation and the use of it in this manner become very useful when the size of the subject company is smaller than that of the smallest portfolio. The average company

size in portfolio 25 in Exhibit 1110 is $148 million.[1,2] For a company with a market value of equity of $50 million, the regression equation in Exhibit 11–10 allows estimation of the smoothed risk premium over the risk-free rate as follows:[3]

Smoothed Premium	=	*19.987% 2.968% * Log(Market Value in millions)*
	=	*19.987% 2.968% * Log(50)*
	=	*19.987% 2.968% * 1.70*
	=	*19.987% 5.05%*
	=	*14.94%*

Calculation of the cost of equity capital using the smoothed risk premium over the risk-free rate derived using the regression equation method (14.94%) is therefore:

$E(R_i)$	=	$R_f + RP_{m+s(levered)}$ *for market value of equity capital = $50 million*
	=	*2.25% + 14.94%*
	=	*17.19%*

Adjusting the Risk Premium Report – Size Study and Risk Study Data for Forward looking ERP

An ERP Adjustment should be incorporated into the size premia or risk premia whenever there is a difference between the forward-looking ERP as of the valuation date that the analyst has selected to use in their cost of equity capital calculations, and the historical (1963–present) ERP that was used as a *convention* in the calculations performed to create the Risk Premium Report exhibits. In other words, if a user's estimate of the ERP on a forward-looking basis is materially different from the historical ERP as measured over the time horizon 1963–present, it is reasonable to assume that the *other* historical portfolio

[1] The upper and lower bounds for each of the 25 portfolios is shown in Exhibit 1111; "Average size" is not shown. Average size (and additional statistics) about the Risk Premium Report Study portfolios are available in the Resources section of the Cost of Capital Navigator's U.S. Cost of Capital Module.

[2] The $50 million estimated market capitalization of the subject company used in this example is less than the average market capitalization of the companies in portfolio 25 ($148 million) used to calculate the "guideline portfolio method" size premium (6.2%) used in the previous example. One would therefore expect the more exact regression equation calculation to produce a size premium rate greater than 6.2%, given the inverse relationship between size and return.

[3] The asterisk (*) is used in Microsoft Exce® as the symbol for multiplication. The regression formulas associated with each of the Risk Premium Report Study portfolios are reported in the Cost of Capital Navigator's U.S. Cost of Capital Module using the Microsoft Excel asterisk as the symbol for multiplication, and so it is used here also.

returns reported here would differ on a forward-looking basis by a similar amount. The ERP Adjustment accounts for this difference.

The historical 1963–present ERP is used as the convention to use in the calculations for two straightforward reasons:

It would be quite impractical to recalculate and publish the Risk Premium Report data using *every* conceivable ERP that a valuation analyst might select. There is a wide diversity in practice among academics and valuation analysts regarding ERP estimates, and there is also a wide diversity of ERP estimates used by appraisers in valuation engagements. So, a *single* ERP is selected as a convention to calculate all of the size and risk premia, and the individual analyst adjusts accordingly, relative to their selected ERP as of the valuation date.

The 1963–present time horizon corresponds to when the accounting and returns data are available from both the CRSP and Compustat databases. The general rules of whether the ERP Adjustment should be considered are:

If you are using a "risk premium over the risk-free interest rate" (*RPm+s*) , then the ERP Adjustment should *always* be considered. This applies to the Size Study and the Risk Study (discussed below).

If you using a Risk Premium Report "size premium" (*RPs*) for the MCAPM, then the ERP Adjustment is *never* needed, regardless of what ERP you select in your cost of equity capital estimates.

Why Is the ERP Adjustment Necessary? The ERP adjustment is necessary when using risk premia over the risk-free rate because these premia measure risk in terms of the combined effect of *market* risk and *size*, the historical *market* risk premium used to calculate these premia is embedded in them. If the user selects an ERP for use in his or her cost of equity capital calculations that is *different* from the historical market risk premium that is *embedded* in these premia, it is reasonable to assume that the historical portfolio returns used in the exhibits would differ on a forward-looking basis by a similar differential, and an adjustment must therefore be made to account for this difference.

On the other hand, the Risk Premium Report's beta-adjusted size premia measure risk in terms of the effect of *size* risk only, and therefore do *not* have the historical 1963–present historical *market* risk premium embedded in them. Methods that utilize the Risk Premium Report's size premia (RP_s) therefore do not require an ERP adjustment in any case, regardless of the ERP that is selected for use in the cost of equity capital calculations.

In cases where the ERP Adjustment is not applied in applying the data in the build-up method, the net effect is that the historical 1963–current year ERP used in the calculations to create the Risk Premium Report – Size Study data is *embedded* in the analyst's cost of equity capital estimate. This may (or may not) be the ERP that the analyst wishes to use as of his or her valuation date.

For example, the ERP used as a convention in the calculations to create the Risk Premium Report exhibits was the historical 1963–2019 market risk premium (5.50%). If the user estimates cost of equity capital using the build-up method (which requires an ERP Adjustment), the ERP embedded in their estimate is 5.50% even though it is not "visible" in the equation. If in the same valuation engagement the analyst has estimated cost of equity capital using MCAPM and selects say, the supply-side ERP (6.17% as of December 31,

2019) to use in the MCAPM equation, then *two different ERPs* have effectively been used in the *same* engagement (5.50% in the case of the build-up method estimate, and 6.17% in the case of the MCAPM estimate). The way to bring them back into harmony is simply to always apply the ERP Adjustment as explained below to the build-up method estimate.

Calculating the ERP Adjustment for Use with the Build-up Method using the Risk Premium Report – Size Study and the Risk Study.

The ERP Adjustment is calculated as the simple difference between the ERP the analyst has selected for use in his or her cost of equity capital estimates *minus* the historical 1963–present ERP. Exhibit A11–1 displays the historical ERP used as a convention in the calculations of the Risk Premium Report data. For example, the historical ERP for 1963–2019 was 5.50%. The ERP adjustment for Risk Premium Report data as of 2019 is therefore calculated as follows:

ERP Adjustment =
ERP selected by the analyst minus Historical ERP (1963–2019)
or
ERP Adjustment = ERP selected by the analyst minus 5.5%

For example, if you selected the supply-side ERP of 6.17% to use in your year-end 2019 cost of capital estimates, then the ERP adjustment would be 0.67% (6.17%–5.5%).

The historical ERP used as a convention to calculate the premia in the Risk Premium Report for the year-end 2020 was 5.5% and for year-end 2019 was 5.1%. Prior years' data are available in the *U.S. Cost of Capital Module*.

Using the Guideline Portfolio Method in the MCAPM.

Estimation of a discount rate for a company using the size premium (RP_s) for the portfolio closest in size to the subject company. Again, assuming that a spot risk-free rate as of the valuation date (December 31, 2019) of 2.25%, and using the historical 1926–2019 ERP (7.15%) and a beta of 1.2, a cost of equity capital estimate within the framework of the modified CAPM for a company with a market value of equity of $50 million would result in:[4]

$E(R_i)$	=	R_f + (Beta x ERP) + RP_s for market value of equity capital = $50 million
	=	2.25% + (1.2 x 7.15) + 6.2%
	=	2.25% + (1.2 x 7.15) + 6.2%
	=	2.25% + (8.58%) + 6.2%
	=	17.03%

[4] The "textbook" CAPM formula is $E(R_i) = R_f + (Beta\ x\ ERP)$. "Modified" CAPM adds a size premium to reflect the size effect and can be written as $E(R_i) = R_f + (Beta\ x\ ERP) + RP_s$.

Using the Regression Equation Method in the MCAPM.

Extrapolation of the smoothed size premium for a company. The availability of the regression equation and the use of it in this manner become very useful when the size of the subject company is smaller than that of the smallest portfolio. The average company size (as measured by market value of equity) in portfolio 25 in Exhibit 11–11 is $148 million.[5,6] For a company with a market value of equity of $50 million, the regression equation in Exhibit 11–11 allows estimation of the smoothed risk premium over the risk-free rate as follows:[7]

Smoothed Premium	=	*10.882% 2.128% * Log(Market Value in millions)*
	=	*10.882% 2.128% * Log(50)*
	=	*10.882% 2.128% * 1.70*
	=	*10.882% 3.62%*
	=	*7.20%*

Calculation of the cost of equity capital using the smoothed size premium derived using the regression equation method (7.2%) is therefore:

$E(R_i)$	=	R_f + (Beta x ERP) + RP_s for market value of equity capital - $50 million
	=	2.25% + (1.2 x 7.15) + 7.20%
	=	2.25% + (8.58%) + 7.20%
	=	18.03%

[5] The upper and lower bounds for each of the 25 portfolios is shown in Exhibit 11–11; "Average size" is not shown. Average size (and additional statistics) about the Risk Premium Report Study portfolios are available in the Resources section of the Cost of Capital Navigator's U.S. Cost of Capital Module.

[6] The $50 million estimated market capitalization of the subject company used in this example is *less* than the average market capitalization of the companies in portfolio 25 ($148 million) used to calculate the "guideline portfolio method" size premium (6.2%) used in the previous example. One would therefore expect the more exact regression equation calculation to produce a size premium rate *greater* than 6.2%, given the inverse relationship between size and return.

[7] The asterisk (*) is used in Microsoft Excel as the symbol for multiplication. The regression formulas associated with each of the Risk Premium Report Study portfolios are reported in the Cost of Capital Navigator's U.S. Cost of Capital Module using the Microsoft Excel asterisk as the symbol for multiplication, and so it is used here also.