VALUATION

Proper Application of the Duff & Phelps ERP Adjustment

By James P. Harrington

The *Duff & Phelps Risk Premium Report* provides financial and valuation professionals defensible cost of capital data for use in developing cost of equity capital (COE) estimates using both the buildup approach and the capital asset pricing model (CAPM).[1] The *Risk Premium Report* includes a *Size Study* (which analyzes the relationship between equity returns and eight measures of company size), a *Risk Study* (which analyzes the relationship between equity returns and accounting-based fundamental risk measures), and a *High-Financial-Risk Study* (which analyzes the relationship between equity returns and high financial risk, as measured by the Altman z-score).

Because the *Risk Premium Report* itself includes so much information, using it to its full potential can be somewhat daunting. This article discusses an issue for which some users of the *Report* have asked for clarification: the equity risk premium (ERP) adjustment. The ERP adjustment is an important, but oftentimes overlooked, adjustment to COE when using specific types of risk premia published in the *Report*.

1   The *Duff & Phelps Risk Premium Report* is an outgrowth from a series of articles by Roger Grabowski and David King. See Roger J. Grabowski and David King, "New Evidence on Size Effects and Equity Returns," *Business Valuation Review*, September 1996, revised March 2000; also Grabowski and King, "New Evidence on Equity Returns and Company Risk, *Business Valuation Review*, September 1999, revised March 2000.

THE ERP ADJUSTMENT

Some users of the *Risk Premium Report* may be unaware of the ERP adjustment, or may be implementing it improperly. The ERP adjustment is needed to account for the difference between the forward-looking ERP as of the valuation date that *Report* users have selected to use in their COE calculations, and the historical (1963–present) equity or overall market risk premium that was used as a convention to calculate the various risk premia published in the *Report*. The ERP adjustment itself is very easy to calculate, but it is a little trickier to understand when it is (and when it is not) needed. In this article, I will discuss the following:

- Calculating the ERP adjustment
- When the ERP adjustment is necessary
- Application of the ERP adjustment
- What's new in the *2011 Risk Premium Report*

In addition, Table 2 (page 35) in this article includes a summary of all of the COE estimation methods available in the *Report*, each method's respective equation, the source exhibit for each of the method's respective risk premia data, and whether an ERP adjustment is necessary.

CALCULATING THE ERP ADJUSTMENT

The ERP adjustment accounts for the difference between the ERP that a *Report* user has selected to use in his or her COE calculations and the historical (1963–present) market risk premium that was used to calculate the various risk premia published in the *Report*.

For example, the historical 1963–2010 market risk premium (4.4 percent) was used in the calculations needed to create the *2011 Risk Premium Report*. If the *Report* user concludes that the appropriate forward-looking ERP as of the end of 2010 equals 5.5 percent for his or her COE calculations, the ERP adjustment is simply the difference between the ERP selected by the user (5.5 percent) and the historical 1963–2010 market risk premium (4.4 percent):

> ERP Adjustment = ERP selected for use in user's COE estimates – Historical market risk premium (1963–2010)
>
> 1.1% = 5.5% – 4.4%

This implies that on a forward-looking basis as of the valuation date, investors expected to earn 1.1 percent more than they realized on average over the period 1963-2010. Technically, this adjustment should be added to the appropriate "risk premium over the risk-free rate" (more about that later), but simply adding it to your COE estimate yields the same answer, and is more straightforward.

Calculating the ERP adjustment is easy, but to calculate it you still need to know what "historical market risk pre-

TABLE 1:
HISTORICAL MARKET RISK PREMIUMS USED IN *REPORT* CALCULATIONS

Risk Premium *Report* Year	Historical Period Used in Calculations	Historical Market Risk Premium (percent)
2007	1963–2006	5.0
2008	1963–2007	4.9
2009	1963–2008	3.9
2010	1963–2009	4.3
2011	1963–2010	4.4

mium" was used in the calculations to create each year's *Report*. The historical market risk premiums that were used in the calculations to create the last five *Risk Premium Reports* (from 2007 to 2011) are shown in Table 1.[2]

For example, the 1963–2008 historical market risk premium (3.9 percent) was used in the calculations to create the 2009 *Report*. If you have selected 6.0 percent (for instance) as the ERP you wish to use in your COE calculations, the ERP adjustment is 2.1 percent (6.0 minus 3.9 percent).

WHEN THE ERP ADJUSTMENT IS NECESSARY

While calculating the ERP adjustment itself is easy, knowing when it is necessary (and when it is not necessary) may seem a little tricky at first, but is really pretty straightforward as well. The guidelines are as follows:

- If you are using one of the *Report's* "risk premia over the risk-free rate,"

an ERP adjustment is always needed.
- If you are using a "premium over CAPM," an ERP adjustment is *never* needed (regardless of what ERP you select to use in your COE estimates).

The *Risk Premium Report* develops two different types of risk premia: (a) risk premia over the risk-free rate, and (b) risk premia over CAPM. The difference between these two types of risk premia is the key factor in determining whether an ERP adjustment should be included in COE estimates.

In the *Size Study* results, these two different types of risk premia are summarized as follows:

Risk Premia Over the Risk-Free Rate (RP_{m+s}) represents the difference between the historical (observed) return of equities and the return of the risk-free rate.

- This difference is a measure of risk in terms of the total effect of market risk and size risk (the "m+s" in RP_{m+s}) in the case of the premia found in Exhibits A-1 through A-8.
- These RP_{m+s} risk premia can be add-

ed to a risk-free rate if you are using the buildup method.

Risk Premia Over CAPM (RP_s) represents the difference between historical (observed) return in excess of the risk-free rate and the excess return predicted by CAPM.

- This difference is a measure of risk in terms of the effect of size risk (the "s" in RP_s). These premia are found in Exhibits B-1 through B-8.
- These RP_s premia can be added as a size adjustment if you are using the CAPM, and are commonly referred to as Beta-adjusted size premia, or simply size premia.[3]

Why is the ERP adjustment necessary when using risk premia over the risk-free rate, and not necessary when using premia over CAPM (i.e., size premia)? The answer: Because the *Report's* risk premia over the risk-free rate measures risk in terms of the total effect of market risk and either size or company-specific (unsystematic) risk, the historical market risk premium used to calculate these premia is embedded in them. If the *Report* user selects an ERP for use in his or her COE calculations that is different from the historical market risk premium embedded in these premia, it is reasonable to assume that the historical portfolio returns used in *Report* 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 *Report's* premia over CAPM measure risk in terms of the effect of size risk only, and therefore do *not* have the historical 1963–

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2   The historical ERP employed in the calculations performed to create the *Risk Premium Report* is derived by subtracting the annual average income return of *SBBI* long-term government Treasury bonds from the average annual total return of the S&P 500 Index. Source: Morningstar EnCorr Analyzer software.

3   These premia can also be used in the *Risk Premium Report's* "Buildup 2" model, which adds the ERP and a *separate* size premium to the risk-free rate, and then accounts for market (Beta) risk by adding an adjusted IRP. This method, as well as all other COE calculation methods used in the *Report*, is summarized in Table 2 (page 35).

2010 historical market risk premium embedded in them. Methods that utilize the *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 COE calculations.

APPLICATION OF THE ERP ADJUSTMENT

The ERP adjustment is *not* proper in models which use a risk premium that does *not* include a measure of market risk. For example, an ERP adjustment is *not* necessary when using the CAPM method, or any other method which uses risk premia over CAPM as an input (risk premia over CAPM, or size premia, are denoted as RP_s in the *Report*).

When using the CAPM, for example, the risk premia over CAPM, or size premia (RP_s), found in the *Report's* Exhibits B-1 through B-8, can be added to account for the size risk otherwise not captured by smaller companies' Betas.

$$COE_{CAPM} = R_f + (\beta \times ERP) + RP_s$$

where:

COE_{CAPM} = *the cost of equity capital estimated using the CAPM method*
R_f = the risk-free rate
β = Beta
ERP = the equity risk premium selected by the *Report* user
RP_s = the premium over CAPM (Beta-adjusted size premium)

Because *Risk Premium Report* size premia (RP_s) are Beta-adjusted (adjusted to remove the portion of excess return that is attributable to Beta), only the size effect's contribution to excess return remains, no "embedded market risk premium" exists, and thus no ERP adjustment is necessary.

Some readers may wonder which ERP is being used in the CAPM equation

shown here: (a) the historical market risk premium used in the calculations to create the *Report*, or (b) another ERP. The answer is that it does not matter. The ERP that the *Report* user selects to use in his or her COE calculations is independent of whether an ERP adjustment is necessary in the first place. The historical market risk premium is either embedded or not embedded in the given risk premia; and in the case of the risk premia over CAPM (RP_s) used in the CAPM to account for size risk, it is *not* embedded, and never will be, regardless of the ERP the user independently selects for the CAPM calculation.

An ERP adjustment *is* necessary when using a buildup method which utilizes a risk premia over the risk-free rate. These premia *do* have the historical market risk premium used in the calculations to create the *Report* embedded in them. For example, the "Buildup 1" equation from the 2011 *Report* uses the risk premia over the risk-free rate from the Exhibits A-1 through A-8 as an input. The Buildup 1 equation is:

$$COE_{Buildup\,1} = R_f + RP_{m+s} + ERP\,Adjustment$$

where:

$COE_{Buildup\,1}$ = *the cost of equity capital estimated using the Buildup 1 method*
R_f = the risk-free rate
RP_{m+s} = the appropriate risk premium over the risk-free rate
$ERP\,Adjustment$ = the equity risk premium adjustment

For example, assume the following:

- The valuation date is December 31, 2010.
- The valuator is using the *2011 Risk Premium Report*.
- The valuator is using a long-term risk-free rate of 4.1 percent
- The risk premium over the risk-free

rate (RP_{m+s}) from the appropriate 2011 *Report* "A" exhibit is 10.0 percent.
- The valuator has selected 5.5 percent as the appropriate ERP to use in his or her COE calculations.

In the 2011 *Report*, the 1963–2010 historical market risk premium (4.4 percent) was used as a convention to calculate risk premia over the risk-free rate, but the *Report* user wishes to use a 5.5 percent ERP in the COE calculations. The 10 percent risk premium over the risk-free rate (RP_{m+s}) must therefore be adjusted by 1.1 percent, which represents the difference between the user's selected ERP (5.5 percent) and the historical market risk premium (4.4 percent) embedded in the 10% RP_{m+s}.

The base cost of equity capital in this example is 14.1 percent (4.1 + 10.0 percent). The ERP adjustment (1.1 percent) can be added to the Buildup 1 equation, resulting in a COE estimate of 15.2 percent, as follows:

$$COE_{Buildup\,1} = R_f + RP_{m+s} + ERP\,Adjustment$$

$$15.2\% = 4.1\% + 10.0\% + 1.1\%$$

Table 2 has a complete listing of the methods available in the *Risk Premium Report* to calculate the COE, and the equations for each. This table is very useful in that it provides a complete list of the methods available in the *Report* to estimate COE, identifies which of the methods require an ERP adjustment (and which methods do not), and also provides the source of the various premia used in each of the models.[4]

One final note: What if an ERP adjustment is *not* made to the methods in Table

4 The *Risk Premium Report* provides two ways for users to match their subject company's size (or risk) characteristics with the appropriate smoothed premia: the "guideline portfolio" method, and the "regression equation" method. The equations shown in Table 2 are valid for both methods. For more information, see pages 15-18 of the *2011 Risk Premium Report*.

TABLE 2: ALL COE ESTIMATION METHODS AVAILABLE IN THE *RISK PREMIUM REPORT*

Report Study	Method	Equation	Source of Premium
Size Study	Buildup 1	COEsubject company = Rf + RPm+s + ERP Adjustment	"A" Exhibits
Size Study	Buildup 1-Unlevered	COEsubject company = Rf + RPm+s, unlevered + ERP Adjustment	"C" Exhibits
Size Study	CAPM	COEsubject company = Rf + (ß*ERP) + RPs	"B" Exhibits
Size Study	Buildup 2	COEsubject company = Rf + ERP + RPs + IRPAdj	"B" Exhibits
Risk Study	Buildup 3	COEsubject company = Rf + RPm+u + ERP Adjustment	"D" Exhibits
Risk Study	Buildup 3-Unlevered	COEsubject company = Rf + RPm+u, unlevered + ERP Adjustment	"D" Exhibits
High-Financial-Risk Study	Buildup 1-High-Financial-Risk	COEsubject company = Rf + RPm+s, high-financial-risk + ERP Adjustment	"H" Exhibits
High-Financial-Risk Study	CAPM-High-Financial-Risk	COEsubject company = Rf + (ß*ERP) + RPs, high-financial-risk	"H" Exhibits

2 that indicate that the adjustment is necessary? In cases where the ERP adjustment is not applied (as indicated in Table 2), the net effect is that the historical 1963-present market risk premium used in the calculations to create the *Report* is embedded in your COE estimate. In other words, the valuator is adopting that historical market risk premium as the forward-looking ERP.

For example, the ERP used as a convention in the calculations to create the *2011 Risk Premium Report* was the historical 1963–2010 market risk premium (4.4%). If the *Report* user estimates COE using the "Buildup 1" method, which requires an ERP adjustment (see Table 2), the ERP embedded in his or her estimate is 4.4 percent *even though it is not "visible" in the equation*. If in the same valuation engagement the *Report* user then estimates COE using CAPM and selects a 5.5 percent ERP to use in the CAPM equation, the two models are now *not* in harmony: two different ERPs have effectively been used in the same engagement. The way to bring them back into harmony is simply to always apply the ERP adjustment as indicated in Table 2.

WHAT'S NEW IN THE 2011 *REPORT*

Several new features are available with the *2011 Duff & Phelps Risk Premium Report,* including an update to the methodology used to unlever the *Report's* risk premia, a rewrite of the *Report* that includes more examples, and a redesign.[5] These changes are important in themselves, but the most significant enhancement in 2011 is the development of the web-based Duff & Phelps Risk Premium Calculator.

The web-based Risk Premium Calculator (introduced in 2011) employs the methodology and data published in the *Risk Premium Report.* Using user inputs for the subject company, the Calculator automatically estimates levered and unlevered COE for a subject company depending on its size and risk characteristics for any valuation date from January 1, 1996, to present

5 The 2011 *Report* includes data through December 2010. For more information about the updated unlevering methodology used in the 2011 *Report,* including updated unlevered premia for Exhibits C-1 through C-8 in the prior 2010 *Report,* download a free PDF copy of "Methodology Update: Unlevered Risk Premia" (March 2011) at www.duffandphelps.com/CostofCapital.

(using all of the methods shown in Table 2), automatically calculates the ERP adjustment for any given valuation date, and automatically makes the ERP adjustment to the appropriate models, as needed. Using the Calculator is like sitting next to me with the subject company data, as we are selecting the appropriate inputs from the *Report* exhibits and calculating the COE. VE

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