#### DUFF & PHELPS

#### Developing the Cost of Equity Capital: Risk-free Rate and ERP during Periods of Economic Uncertainty

Organismo Italiano di Valutazione

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## **Cost of Capital Defined**

#### **Cost of Capital Defined**

**Cost of capital:** expected rate of return that market participants require in order to attract funds to a particular investment.

**Market:** the universe of investors who are reasonable candidates to fund a particular investment.

### Cost of Capital is Forward-Looking

Cost of Capital is always:

- Forward-looking (i.e., expectational), and therefore <u>not</u> <u>observable</u>.
- Represents investors' expectations. Analysts and would-be investors never actually observe the market's views as to expected returns at the time of their investment.

There are two elements to these expectations:

- 1. Risk-free rate:
  - The "real" rate of return-the amount (excluding inflation) investors expect to obtain in exchange for letting someone else use their money on a risk-free basis.
  - Expected inflation-the expected depreciation in purchasing power while the money is in use.
  - Maturity risk—risk that the investment's principal market value will rise or fall during the period to maturity as a function of changes in the general level of interest rates. Sometimes referred to as "horizon" risk or "interest rate" risk.
- 2. Risk-the uncertainty as to when and how much cash flow or other economic income will be received.

# Cost of Equity Capital has Two Primary Components



#### Cost of Capital is a Function of the Investment

As Ibbotson puts it: "The cost of capital is a function of the investment, not the investor."



Roger G. Ibbotson is chairman and CIO of Zebra Capital Management, LLC, an equity investment and hedge fund manager. He is founder, advisor and former chairman of Ibbotson Associates, now a Morningstar Company.

#### Cost of Capital is the Discount Rate

Cost of capital is the percentage return that equates expected economic income with present value.

- The terms cost of capital, discount rate, and required rate of return are often used interchangeably.
- Represents the total expected rate of return that the investor requires on the amount invested.
- Economic income represents total expected benefits, usually measured on expected cash flows
- Value is the market value of an asset, and not its book value, par value, or carrying value

#### **Present Value Formula**

The numerator:

 The expected amount of economic income (e.g., the net cash flow) to be received from the investment in each future period over the life of the investment.

The denominator:

– A function of the discount rate:

$$PV = \frac{NCF_1}{(1+k)} + \frac{NCF_2}{(1+k)^2} + \dots + \frac{NCF_n}{(1+k)^n}$$

where:

= Present value

= Net cash flow (or other measure of economic income) expected in each of the periods 1 through n, n being the final cash flow in the life of the

investment

 $NCF_1 \dots NCF_n$ 

= Cost of capital (discount rate)

k n

PV

## Relationship Between Discount Rate and Capitalization Rate

Discount rate is applied to all expected economic income to convert the expected economic income stream to a present value.

A capitalization rate is merely a divisor applied to one single element of the economic income stream to estimate a present value:

$$PV = \frac{NCF_1}{c}$$

where:

PV

NCF<sub>1</sub>

= Present value

- = Net cash flow expected in period 1 immediately following the valuation date
- = Capitalization rate

С

# Relationship Between Discount Rate and Capitalization Rate

Assuming stable long-term growth in cash flows from the subject investment, the capitalization rate equals the discount rate minus the expected long-term growth rate:

$$c = k - g$$

where:

c= Present valuek= Discount rate (cost of capital) for the subjectinvestment= Expected long-term growth rate in net cash flow

Critical assumptions in this formula is that the expected rate of increase (growth) in the cash flow from the investment is relatively constant over the long term.

#### Expected vs. Most Common Net Cash Flows

The net cash flows to be discounted or capitalized should be the "expected" value rather than the "most common" value.



#### How Risk Affects the Cost of Capital

- Risk is a major concern of investors.
- The risk premium results from the uncertainty of expected returns, and can vary widely from one prospective capital investment to another.
- We could say that the market abhors uncertainty and consequently requires a high rate of return to accept uncertainty.

- The present value of this series of contingent claims can be depicted in the following formula:
- If investors were risk neutral, the appropriate discount rate for estimating the present value of the expected cash flows would be the risk-free rate.
- But investors are not risk neutral; in the literature, investors are generally assumed to be risk averse.

$$PV = \sum_{1}^{n} \frac{E(CF)_{n}}{(1-k)^{n}}$$







- Calculating a measure of central tendency (e.g., expected value) by probability-weighting the expected cash flows does not eliminate the risk of the distributions.
- A common mistake is to calculate the probability adjusted cash flows and then discount at the risk-free rate under the false assumption that the calculation of the expected value removes risk.

#### How Risk Affects the Cost of Capital

Levered



### Cost of Capital Defined – How Risk is Priced is Still a Relative Unknown

Professor John Cochrane recently discussed the changes in our knowledge of estimating rates of return for equity over the last 40 years.\*

"Discount rates vary a lot more than we thought. Most of the puzzles and anomalies that we face amount to discount-rate variation we do not understand."

"We are really only beginning these tasks...(The) theories are in their infancy."

<sup>\*</sup>John C. Cochrane, University of Chicago Booth School of Business, "Discount Rates. American Finance Association Presidential Address, January 8, 2011 <a href="http://faculty.chicagobooth.edu.john.cochrane/research/papers">http://faculty.chicagobooth.edu.john.cochrane/research/papers</a>

### Cost of Capital Defined – How Risk is Priced is Still a Relative Unknown

Professor John Cochrane recently discussed the changes in our knowledge of estimating rates of return for equity over the last 40 years.\*

"In the beginning, there was chaos. Practitioners thought that one only needed to be clever to earn high returns. Then came the CAPM. Every clever strategy to deliver high average returns ended up delivering high market betas as well. Then anomalies erupted, and there was chaos again."

<sup>\*</sup>John C. Cochrane, University of Chicago Booth School of Business, "Discount Rates. American Finance Association Presidential Address, January 8, 2011 <a href="http://faculty.chicagobooth.edu.john.cochrane/research/papers">http://faculty.chicagobooth.edu.john.cochrane/research/papers</a>

## Questions in Today's Environment

## Questions in Today's Environment

Most commonly used methods of estimating cost of equity capital:

- Build-up (includes a size premium)
- Capital Asset Pricing Model (CAPM)
- Modified CAPM (includes a size premium)

Major issues particularly since 2008 financial crisis:

- What risk-free rate  $(R_f)$  should one use?
- What equity risk premium (*ERP*) should one use?
- Is "size" still a factor that impacts the cost of capital?

#### Questions in Today's Environment - Risk Free Rate



Common academic practice in empirical studies of rates of return in excess of risk-free rate use realized monthly returns on 90-day government bills (e.g., Treasury or "T" Bills) as risk-free rate.

Problems: (1) T-bill rates may not reflect market-determined investor return requirements due to central bank actions, and (2) more volatile than yields on longer maturities.

Risk-free rate should reflect (1) *investment horizon*, and/or (2) *planning horizon* (average life of projects that are to be assessed using cost of capital estimate).

Convention when valuing closely held businesses: use a yield on long-term government securities

Long-term is most relevant for business valuations

Risk-free Rate  $(R_f)$  – a rate of return that is available in the market on an investment that is free of default risk.

- Analysts typically use the yield to maturity on highly-rated sovereign debt (e.g., U.S. government securities) as of the valuation date
- Conceptually, reflects a return on the following components:



Financial crises are often accompanied by a "flight to quality". During these periods, nominal returns on "risk-free" securities may fall dramatically for reasons other than inflation expectations.

Most analysts would agree that the world economies have been confronted with uncommon crises recently.

"Standard" methods of estimating Cost of Equity Capital, Cost of Debt Capital and the Weighted Average Cost of Capital that worked in periods of stability fell apart

- in late 2008 and early 2009
- then again in mid-2010 and
- again in mid-2011.
- Company-specific risk adjustments are <u>not</u> substitutes or corrections for poorly estimated cost of capital components

## Questions in Today's Environment – Risk-Free Rate (R<sub>f</sub>) during "flights to quality"

Periods of U.S. risk-free rate normalization shown in gray.



Calculated by Duff & Phelps. Source of underlying data: Standard & Poor's Capital IQ database.

## Questions in Today's Environment – Risk-Free Rate (R<sub>f</sub>) during "flights to quality"

Periods of German risk-free rate normalization shown in gray.



Calculated by Duff & Phelps. Source of underlying data: Standard & Poor's Capital IQ database.

## Questions in Today's Environment – Risk-Free Rate (R<sub>f</sub>) during "flights to quality"



## Issues in Today's Global Environment – Risk-Free Rate (R<sub>f</sub>)

During and after the 2008 Financial Crisis, the common inputs we use to estimate cost of capital have the potential of producing *non-sensical* results.

Financial crises are often accompanied by a "flight to quality". During these periods, current yields may be considered *artificially* low, and perhaps for reasons *other* than investor actions based on economic fundamentals.

- Policies adopted by the Federal Reserve (and central banks of other major countries) increasing the money supply by purchasing mid-term and longer-term bonds
- Speculators anticipating government and central bank intervention

What do you do during periods in which risk-free rates appear to be abnormally low due to flight to quality issues (or other factors)

- Either normalize the risk-free rate
- Or adjust the equity risk premium.

Analysts could alternatively use the (lower) spot yield for the risk-free rate, and increase the ERP to account for higher risks. Both of these adjustments are in principal response to the same underlying concerns, and should result in broadly similar costs of capital.

However, normalizing the risk-free rate is likely a more direct (and more easily implemented) analysis than adjusting the ERP due to a temporary reduction in the yields on risk-free securities, while longer-term trends may be more appropriately reflected in the ERP.

#### Questions in Today's Environment - Equity Risk Premium

# ERP

## Questions in Today's Environment – ERP

Equity Risk Premium (ERP)

- Extra return that investors demand to compensate them for investing in a diversified portfolio of large common stocks rather than investing in risk-free securities
- One of the most important decisions the analyst must make in developing a discount rate

The equity risk premium can be defines as:

$$RP_m = R_m - R_f$$

where,

- $RP_m$  $R_m$  $R_f$
- is the equity risk premium (ERP)
  - is the expected return on stocks
  - is the rate of return expected on a risk-free security

### Questions in Today's Environment – ERP

There are two broad approaches to ERP estimation


Estimating the ERP is one of the most important decisions the analyst must make in developing a discount rate.

 For example, the effect of a decision that the appropriate ERP is 4% instead of 8% in the Capital Asset Pricing Model (CAPM) will generally have a greater impact on the concluded discount rate than alternative theories of the proper measure of other components, such as beta.

There is no one universally accepted methodology for estimating ERP. A wide variety of premiums are used in practice and recommended by academics and financial advisors.

While an analyst can observe premiums realized over time by referring to historical data (i.e., realized return approach or *ex post* approach), such realized premium data do not represent the ERP expected in prior periods, nor do they represent the <u>current ERP</u>. Rather, realized premiums may, at best, represent only a sample from prior periods of what may have then been the <u>expected ERP</u>.

Alternatively, you can derive implied forward-looking estimates for the ERP from data on the underlying expectations of growth in corporate earnings and dividends or from projections of specific analysts as to dividends and future stock prices (*ex ante* approach).

The goal of either approach is to estimate the true expected ERP as of the valuation date. Even then the expected ERP can be thought of in terms of a normal or unconditional ERP (i.e., the long-term average) and a conditional ERP based on current levels of the stock market and economy relative to the long-term average. We address issues involving the conditional ERP later.

### Questions in Today's Environment – ERP Historical (Ex Post) Approaches



### Questions in Today's Environment – ERP Arithmetic vs. Geometric Mean

Duff & Phelps calculated realized risk premiums for various investor horizons U.S. for 1926-2011:

	Arthmetic Avg. of Realized Risk Premium
1-year returns (1926-2011)	6.6%
2-year returns (1926-2011)	5.7%
3-year returns (1926-2011)	5.1%
4-year returns (1926-2011)	4.7%
5-year returns (1926-2011)	4.6%
Geometric 1926-2011	4.5%

Conclusion: ERP estimate based on realized historical risk premiums between arithmetic average of 1-year returns and the geometric average.

Source: Shannon Pratt and Roger Grabowski, Cost of Capital: Applications and Examples, 4th (John Wiley & Sons, 2010), pages 150-151. Update by Duff & Phelps

### Questions in Today's Environment – ERP WW II Interest Rate Bias

The years 1942 through 1951 reflected a period of artificial stability in U.S. government bond interest rates. During World War II, the U.S. Treasury decreed that interest rates had to be kept at artificially low levels in order to reduce government financing costs. This led to the Federal Reserve's April 1942 public commitment to maintain an interest rate ceiling on government debt, both long term and short term.

After World War II, the Fed continued maintaining an interest rate ceiling, due to the Treasury's pressure and, to a lesser extent, a fear of returning to the high unemployment levels of the Great Depression.

But postwar inflationary pressures caused the Treasury and the Fed to reach an accord announced March 4, 1951, freeing the Fed of its obligation of pegging interest rates.

### Questions in Today's Environment – ERP WW II Interest Rate Bias

The following table displays the income returns on long-term U.S. government bonds for the years 1942 through 1951 (the return used by Morningstar's *SBBI* in calculating the realized risk premiums) versus inflation:

Year	Income Return	Rate of Inflation
1942	2.46%	9.29%
1943	2.44%	3.16%
1944	2.46%	2.11%
1945	2.34%	2.25%
1946	2.04%	18.16%
1947	2.13%	9.01%
1948	2.40%	2.71%
1949	2.25%	-1.80%
1950	2.12%	5.79%
1951	2.38%	5.87%

Source: Compiled from data in Stocks, Bonds, Bills, and Inflation 2009 Yearbook. Copyright © 2009 Morningstar, Inc. All rights reserved. Used with permission. Derived based on CRSP® data, © 2009 Center for Research in Security Prices (CRSP®), University of Chicago Booth School of Business.

### Questions in Today's Environment – ERP WW II Interest Rate Bias

During these 10 years, long-term U.S. government income returns averaged 2.3%, while inflation averaged 5.7%, indicating that the realized risk premiums calculated for these years was biased high compared with a more normal risk-free rate benchmark.

To better understand the effect of the interest rate accord on the realized risk premiums, Grabowski recalculated the realized risk premiums for 1926 through 2011 after normalizing the income return on long-term U.S. government bonds for the years 1942 through 1951 to an amount at least equal to the annual rate of inflation as reported in the *SBBI Yearbook* (except 1949, when inflation was -1.8%). Making that adjustment lowered the realized risk premium from the published 6.62% to 6.22% for 1926–2011.

One can interpret the results as the realized risk premium data reported in the *SBBI Yearbook* is biased high by 40 basis points (0.40%). We will term this the WWII Interest Rate Agreement bias.

## Questions in Today's Environment – ERP Has the relationship between stocks and bonds changed?

#### Realized Equity Risk Premium over Long-Term U.S. Government Bond Returns Nominal (i.e., without inflation removed) 1956-2011 1926-1955 Realized Equity Risk Premium: Arithmetic Average 10.50% 4 50% Geometric Average 7.50% 3.00% Standard Deviations: Stock Market Annual Returns 25.30% 17.26% 2.40% Long-Term U.S. Government Bond Income Returns 0.50% Long-Term U.S. Government Total Returns 4 70% 11.40% Ratio of Equity to Bond Total Return Volatility 1.5 54

Source: Complied from data in Stocks, Bonds, and Inflation 2012 Yearbook. Copyright © 2012 Morningstar, Inc. All rights reserved. Used with permission. Derived based on CRSP® data, © 2012 Center for Research in Security Prices (CRSP®), University of Chicago Booth School of Business.

## Questions in Today's Environment – ERP Has the relationship between stocks and bonds changed?



Source: Morningstar EnCorr software.

## Questions in Today's Environment – ERP Has the relationship between stocks and bonds changed?



A series of studies sought to improve the estimate of the true ERP by removing the effects of any changes in underlying economics that caused the realized risk premiums to differ from the ERP investors expected.

For example, **Robert Arnott and Peter Bernstein** conclude that the long-run normal ERP is approximately 4.5% on an arithmetic average basis (for the period studied, 1926 to 2001).

Recent years, the long-run normal ERP is approximately 3.5% on an arithmetic average basis for 1926 to 2010 period.

Source: Robert D. Arnott and Peter L. Bernstein, "What Risk Premiium is Normal?" *Financial Analysts Journal* (March-April 2002): 64-85, CFA Institute, "Rethinking the Equity Risk Premium", 2011 The Research Foundation of CFA Institute, Shannon Pratt and Roger Grabowski, *Cost of Capital 4th ed* (Wiley, 2010) and Duff & Phelps

**Eugene Fama and Kenneth French** examine the unconditional expected stock returns from fundamentals, estimated as the sum of the average dividend yield and the average growth rate of dividends or earnings derived from studying historical observed relationships from 1872 to 2000.

They conclude that investors (during the period they studied, 1951 to 2000) should have expected an ERP lower than the actual realized risk premium.

Their calculations indicate implied ERP of 2.6% (based on dividend growth rate fundamentals) or 3.6% (based on earnings growth rate fundamentals) (arithmetic average).

Source: Eugene F. Fama and Kenneth R. French, "The Equity Premium," Journal or Finance (April 2002): 637-659

#### **Dimson, Marsh and Staunton**

"Global Evidence on the Equity Risk Premium," *The Journal of Applied Corporate Finance* (Summer, 2003); "The Worldwide Equity Premium: A Smaller Puzzle," *Handbook of the Equity Risk Premium*, Rajnish Mehra, editor (Elsevier, 2008), Chapter 11, pp 467-514; *Credit Suisse Global Investment Returns Sourcebook 2012* (Credit Suisse/London Business School, 2012)

Observe larger equity returns earned in second half of 20<sup>th</sup> century compared to first half because:

- Corporate cash flows grew faster than investors anticipated due to rapid technological change and unprecedented growth in productivity and efficiency;
- Transaction and monitoring costs fell over the course of the century;
- During final two decades of century, inflation rates generally declined and real interest rates rose;
- Required rate of return reduced due to diminished business and investment risks.

Source: Credit Suisse Global Investment Returns Sourcebook 2012 (Credit Suisse/London Business School, 2012)

Convert historical realized premium to forward-looking projection

Assuming: (a) Observed increase in price/dividend ratio is attributable solely to long-term decrease in required risk premium (and decrease will not continue), real dividend growth will not continue; and (b) Future standard deviation of annual returns will approximate historical standard deviation of risk premiums over bonds,

Unconditional ERP estimated at the beginning of 2012:	
Arthmetic Avg. vs. Bonds	Unconditional ERP (long-term avg.)
U.S. Investors in U.S. Equities	5.0%-6.0%

"World" Index of Stocks (19 countries)\*

\* Denominated in \$U.S

Source: Credit Suisse Global Investment Returns Sourcebook 2012 (Credit Suisse/London Business School, 2012)

4.0%-4.5%

#### Ibbotson and Chen

"The Supply of Stock Market Returns," working paper (March 2002); *Financial Analysts Journal (Jan./ Feb. 2003); SBBI Valuation Yearbook 2012*, p 66.

SBBI Valuation Edition Yearbook reports updates to "supply side" estimate of equity risk premiums annually for U.S.:

	Realized	Supply Side
SBBI Valuation Yearbook (1926-2011)	6.62%	6.14%
Minus: Est. of WWII interest rate bias (1926-2011)	0.40%	0.40%
Equals: Adjusted arthemetic avg. ERP	6.22%	5.74%

Source: Pratt and Grabowski, Cost of Capital: Applications and Examples 4<sup>th</sup> ed. (John Wiley & Sons, 2010), Chapter 9; Update by Duff & Phelps LLC

#### Goetzmann and Ibbotson

"History and the Equity Risk Premium," Handbook of the Equity Risk Premium, Rajnish Mehra, editor (Elsevier, 2008), Chapter 12, pp 522-523.

Commenting on analyses that remove effects of price-to-earnings ratio inflation- so-called "supply side" forecasts of ERP:

"These forecast tend to give somewhat lower forecasts than historical risk premiums, primarily because part of the total return of the stock market have come from price-earnings ratio expansion. This expansion is not predicted to continue indefinitely, and should logically be removed from the expected risk premium."

Source: William N. Goetzmann and Roger G. Ibbotson, "History and the Equity Risk Premium ," Handbook of the Equity Risk Premium

Each of these studies attempts to improve the estimate of the true ERP by removing the effects of changes in underlying economics that caused the realized risk premiums to differ from the ERP investors expected. The greater than expected historical realized equity returns were caused by an unexpected increase in market multiples and a decline in discount rates relative to economic fundamentals.

### Questions in Today's Environment – ERP Changes In Economics That Caused Unexpectedly Large Realized Premiums

**McGrattan and Prescott** find that the value of the stock market relative to the GDP in 2000 was nearly twice as large as in 1962. They determined that the marginal income tax rate declined (the marginal tax rate on corporate distributions averaged 43% in the 1955 to 1962 period and averaged only 17% in the 1987 to 2000 period).

The regulatory environment also changed. Equity investments could generally not be held "tax deferred" in 1962. But by 2000, equity investment could be held "tax deferred" in defined benefit and contribution pension plans and in individual retirement accounts.

Source: Ellen R. McGrattan and Edward C. Prescott, "Is the Market Overvalued?" Federal Reserve Bank of Minneapolis Quarterly Review

## Questions in Today's Environment – ERP Forward-Looking (Ex Ante) Approaches



### Questions in Today's Environment – ERP Forward-Looking Estimates of Conditional ERP – "Bottom-up" ERP Estimates

**Bottom-up ERP estimates.** Uses expected growth in earnings or dividends to estimate a bottom-up rate of return for number of companies.

- Averaging of the implied rates of return (weighted by market value) for a large number of individual companies and then subtracting the government bond rate
- Attempts to directly measure investors' expectations concerning the overall market by using forecasts of the rate of return on publicly traded companies

## Questions in Today's Environment – ERP Forward-Looking Estimates of Conditional ERP – "Bottom-up" ERP Estimates

Implied ERP Estimates – Bottom-up Approach									
				As of Early 2012 versus Risk-free Rate					
	Period	Range	Mean	Actual	Normalized (1)				
Cost of Capital Yearbook	1994-2011	4.9% to 8.7%	6.8%	8.2%	6.6%				
Damodaran	1993-2011	2.05%-6.45%	4.0%	6.9%	5.4%				

Note: Converted to equivalent over a 20-year U.S. government bond yield.

(1) Using risk-free rate adjusted because actual interest rates lower than warranted due to flight to quality as discussed.

Source: Shannon Pratt and Roger Grabowski, Cost of Capital: Applications and Examples, 4th (John Wiley & Sons, 2010). Update by Duff & Phelps

## Questions in Today's Environment – ERP Forward-Looking Estimates of Conditional ERP – "Bottom-up" ERP Estimates are they accurate?

Studies have indicated that analysts' earnings forecasts (such as those reported by *I/B/E/S* and *First Call*) are biased high. These biases lead to high implied estimates of ERP. It is also possible that the implied ERP estimates may overstate expected returns because analyst earnings and cash flow forecasts are prone to error, with the error increasing for firms with high volatility of earnings.

Source: Ilia D. Dichev and Vicki Wei Tang, "Earnings Volatility and Earnings Predictability," *Journal of Accounting and Ecnonmics* (forthcoming): Dan Givoly, Carla Hayn and Reuven Lehavy, "The Quality of Analysts' Cash Flow Forecasts," Working Paper, December 2008

Questions in Today's Environment – ERP Forward-Looking Estimates of Conditional ERP – "Top Down"

**Top-down ERP estimates.** Uses the relationship across publicly traded companies over time between real stock returns, price/earnings ratios, earnings growth, and dividend yields.

- An estimate of the real rate of equity return is developed from current economic observations applied to the historic relationships
- Subtracting the current rate of interest provides an estimate of the expected ERP implied by the historical relationships

Forward-Looking Estimates of Conditional ERP – "Top Down"

#### Hassett

Estimates the implied ERP and estimated S&P 500 based on the current yield on long-term U.S. government bonds and the risk premium factor (RPF)

Risk premium factor (RPF) is empirically derived relationship between

- Risk-free Rate
- S&P 500 earnings
- Real interest rates
- Real GDP growth vs. S&P 500

Attributes a significant increase in price-to-earnings ratio for the market since the 1980s to the decline in the risk-free rate. Risk-free rates will cause an increase in the ERP and cause the price-to-earnings multiple for the market to contract.

Stephen D. Hassett, "The RPF Model for Calculating the Equity Risk Premium and Explaining the Value of the S&P with Two Variables," *Journal of Applied Corporate Finance* 22, 2 (Spring 2012): 118-130.

### Questions in Today's Environment – ERP Forward-Looking Estimates of Conditional ERP – "Top Down"

		Hassett In	nplied ERP	]		Hassett In	nplied ERP
Estimate as of	S&P 500	vs. Actual Risk-Free Rate	vs. Normalized Risk-Free Rate	Estimate as of	S&P 500	vs. Actual Risk-Free Rate	vs. Normalized Risk-Free Rate
December 31, 2008	903.25	7.03%	5.56%	January 31, 2011	1286.12	5.69%	5.69%
January 30, 2009	825.88	6.26%	5.69%	February 28, 2011	1327.22	5.75%	5.75%
February 27, 2009	735.09	6.19%	5.69%	March 31, 2011	1325.83	5.84%	5.84%
March 31, 2009	797.87	6.64%	5.69%	April 29, 2011	1363.61	5.60%	5.60%
April 30, 2009	872.81	6.10%	5.69%	May 31, 2011	1345.20	5.67%	5.59%
May 29, 2009	919.14	5.79%	5.79%	June 30, 2011	1320.64	5.37%	5.37%
June 30, 2009	919.32	5.98%	5.98%	July 29, 2011	1292.28	5.93%	5.59%
July 31, 2009	987.48	5.94%	5.94%	August 31, 2011	1218.89	6.45%	5.59%
August 31, 2009	1020.62	5.80%	5.80%	September 30, 2011	1131.42	6.93%	5.59%
September 30, 2009	1057.08	5.69%	5.69%	October 31 2011	1253.30	6 71%	5.59%
October 30, 2009	1036.19	5.77%	5.77%	November 30, 2011	1246.06	6.88%	5 50%
November 30, 2009	1095.63	5.41%	5.41%	December 30, 2011	1257.60	7 110/	5.50%
December 31, 2009	1115.10	6.49%	6.49%	Jonuory 21, 2012	1207.00	7.11/0	5.59 /0
January 29, 2010	1073.87	6.14%	6.14%	January 51, 2012	1312.41	7.08%	5.57%
February 26, 2010	1104.49	6.09%	6.09%	February 29, 2012	1365.68	6.88%	5.57%
March 31, 2010	1169.43	6.49%	6.49%	March 30, 2012	1408.47	6.66%	5.57%
April 30, 2010	1186.69	6.32%	6.32%	April 30, 2012	1397.91	6.96%	5.57%
May 28, 2010	1089.41	5.68%	5.68%	May 31, 2012	1310.33	7.38%	5.57%
June 30, 2010	1030.71	6.46%	6.22%	June 30, 2012	1362.16	7.32%	5.57%
July 30, 2010	1101.60	6.45%	6.22%	July 31, 2012	1379.32	7.51%	5.57%
August 31, 2010	1049.33	6.95%	6.22%	August 31, 2012	1406.58	7.39%	5.57%
September 30, 2010	1141.20	6.81%	6.22%	September 30, 2012	1440.67	7.31%	5.57%
October 29, 2010	1183.26	6.55%	6.22%				
November 30, 2010	1180.55	6.42%	6.22%	]			
December 31, 2010	1257.64	5.58%	5.58%	]			

Stephen D. Hassett, "The RPF Model for Calculating the Equity Risk Premium and Explaining the Value of the S&P with Two Variables," *Journal of Applied Corporate Finance* 22, 2 (Spring 2012): 118-130. Update by Duff and Phelps

Forward-Looking Estimates of Conditional ERP – "Top Down" Survey

**Survey ERP estimates.** Relies on opinions of investors and financial professionals through surveys of their views on the prospects of the overall market and the return expected in excess of a risk-free benchmark.

Limitations:

- Result are extremely volatile
- Tend to be short term

### Questions in Today's Environment – ERP Forward-Looking Estimates of Conditional ERP – "Top Down" Survey

#### **Pablo Fernandez**

"US Market Risk Premium used in 2012 by Professors, Analysts, Managers of Companies, and Managers of Financial Companies: a survey used for 82 countries with 7,192 answers" (June, 2012)

 ERP estimated at beginning of 2012 by Analysts and Companies 5.0% – 6.0% (averages)

\* FINCO = Managers of financial companies

Source: Pablo Fernandez, Javier Aguirreamalloa, and Luis Corres, "Market Risk Premium Used In 82 Countries In 2012: A Survey With 7,192 Answers", IESE Business School – University of Navarra, working paper, June 2012.

Forward-Looking Estimates of Conditional ERP – "Top Down" Survey Average European Countries Market Risk Premium (%) by Profession

### **Pablo Fernandez**

	Professors	Analysts	Companies	FINCO*		Professors	Analysts	Companies	FINCO*
Austria	5.2	6.2	5.6	4.9	Netherlands	5.1	5.9	4.8	5.4
Belgium	6.1	5.9	6.2	5.9	Norway	5.7	6.5	5.3	5.6
Czech Republic	6.4	7.1	6.6	6.4	Poland	7.0	6.3	6.1	6.6
Finland	6.0	5.5	6.4	6.4	Portugal	8.1	6.0	7.4	8.6
France	5.7	6.2	5.7	6.0	Spain	5.7	5.6	6.3	5.9
Germany	5.7	5.5	5.1	5.2	Sweden	5.9	6.0	5.4	5.9
Greece	11.2	7.0	11.8	12.8	Switzerland	5.1	5.7	5.1	5.0
Italy	5.8	5.9	5.4	5.1	United Kingdom	5.6	5.4	5.3	5.8

\* FINCO = Managers of financial companies

Source: Pablo Fernandez, Javier Aguirreamalloa, and Luis Corres, "Market Risk Premium Used In 82 Countries In 2012: A Survey With 7,192 Answers", IESE Business School – University of Navarra, working paper, June 2012.

## Questions in Today's Environment – ERP Forward-Looking Estimates of Conditional ERP – "Top Down" Survey

Average Non-European Countries Market Risk Premium (%) by Profession

#### Pablo Fernandez

					-				
	Professors	Analysts	Companies	FINCO*		Professors	Analysts	Companies	FINCO*
Argentina	10.9	10.4	11.9	10.6	Japan	4.8	5.6	5.0	6.4
Australia	5.8	5.9	6.8	5.9	Mexico	9.2	6.7	7.5	7.1
Brazil	7.4	7.4	8.1	8.5	New Zealand	6.1	6.0	6.5	6.5
Canada	5.4	5.9	5.4	5.1	Peru	7.4	7.7	9.5	7.7
Chile	6.2	5.9	5.8	6.4	South Africa	7.1	6.8	6.1	6.3
China	7.3	7.7	10.0	9.5	South Korea	5.6	7.2	8.1	7.5
Colombia	7.8	6.4	10.1	7.6	Taiwan	7.9	7.3	8.0	7.5
Egypt	11.4	7.5	8.2	13.5	Turkey	10.1	7.5	8.4	8.8
India	7.8	7.6	8.3	8.6	United States	5.6	5.0	5.5	5.6

\* FINCO = Managers of financial companies

Source: Pablo Fernandez, Javier Aguirreamalloa, and Luis Corres, "Market Risk Premium Used In 82 Countries In 2012: A Survey With 7,192 Answers", IESE Business School – University of Navarra, working paper, June 2012.

Forward-Looking Estimates of Conditional ERP – "Top Down" Survey

#### **Graham and Harvey**

"Expectations of Equity Risk Premia, Volatility and Asymmetry from a Corporate Finance Perspective," working paper (July 2003); "The Equity Risk Premium in 2010," working paper (August 2010); updated quarterly by *Duke CFO Outlook Survey* (www.cfosurvey.org).

Estimate expected risk premium on multi-year survey of CFOs.

Followed up with continuing quarterly surveys:

- Survey attracts about 400 respondents (10% from companies with less than \$10 million in revenue; 50% from companies with less than \$500 million in revenue; 40% are private companies)
- Ask for 1-year and 10-year risk premia (expected return on S&P 500; premium calculated over 10-year Treasury bond)

Source: "The Equity Risk Premium in 2010," working paper (August 2010); updated quarterly by Duke CFO Outlook Survey (www.cfosurvey.org).

Forward-Looking Estimates of Conditional ERP – "Top Down" Survey 10-year forecasted S&P 500 returns over and above the 10-year bond yield

#### **Graham and Harvey**



Source: "The Equity Risk Premium in 2010," working paper (August 2010); updated quarterly by Duke CFO Outlook Survey (www.cfosurvey.org).

Forward-Looking Estimates of Conditional ERP – "Top Down" Survey Equity risk premium and the implied volatility on the S&P 500 index option (VIX)

#### **Graham and Harvey**



Source: "The Equity Risk Premium in 2010," working paper (August 2010); updated quarterly by Duke CFO Outlook Survey (www.cfosurvey.org).

### Questions in Today's Environment – ERP Long-term unconditional ERP estimate

Based on the studies and the data presented, we conclude that a reasonable long-term estimate of the average or *unconditional* U.S. ERP is 3.5% to 6.0%.

Consistent with 1926-2010 *SBBI Valuation Yearbook* supply side U.S. ERP estimate minus WWII interest rate bias = 5.5%.





#### Long-term unconditional ERP estimate

The evidence presented [that the long-run *ERP* is between 3.5% and 6%] represents a long-term average or unconditional estimate of the *ERP*. Consistent with 1926-2012 *SBBI Valuation Yearbook* supply side U.S. ERP estimate minus WWII interest rate bias = 5.56%. That is, what is a reasonable range of *ERP* that can be expected over an entire business cycle?

#### Where in this range is the current ERP?

Research has shown that *ERP* is cyclical during the business cycle.
We use the term "conditional *ERP*" to mean the *ERP* that reflects current market conditions.



Long-term versus the short-term relationships of unconditional ERP estimate

In scenario A, we see the long-term trend in the returns in large company stocks. This is equivalent to the long-term ERP estimate over time. We all know that the stock market goes through cycles. Stocks get bid up at times faster than the long-term average. In scenario A, we see a depiction of one of those upward cycles when the returns increase faster than the long-term average ("above average").
**Unconditional versus Conditional ERP** 



Long-term versus the short-term relationships of unconditional ERP estimate

Assume we are estimating the conditional ERP at the valuation date (indicated by the vertical line). The conditional ERP will be lower than the average for some time in order for the average over the long-run to return to the average (that is, because it was above the average for a period, it will be below average to get back to the average). These above average returns occurred during the "tech boom"; assume our valuation date were at the peak of the tech boom, the conditional ERP at that point would be less than the average.



Long-term versus the short-term relationships of unconditional ERP estimate

Similarly in scenario B we see a decline from the long-term average (e.g., last half of 2008). Assume we are estimating the conditional ERP at the valuation data (indicated by the vertical line). The conditional ERP will be greater than the average for some time in order for the average over the long-run to return to the average (that is, because it was below the average for a period, i.e., losses during 2008, it will be above average to get back to the average).

#### Questions in Today's Environment – ERP Conditional Estimate of ERP and The Recession of 2008-2011

The crisis of 2008 - 2009 and the resulting recession of 2008-2011 have not been ordinary times. If one simply added an estimate of the ERP taken from commonly used sources used during normal economic times to the spot yield on 20-year U.S. government bonds on December 31, 2008, one would have arrived at an estimate of the cost of equity capital that was too low.

As of December 2007, for example, the yield on 20-year U.S. government bonds equaled 4.5%, and the *SBBI* realized risk premium for 1926–2007 was 7.1%.

But at December 2008, the yield on 20-year U.S. government bonds was 3.0%, and the *SBBI* realized risk premium for 1926–2008 was 6.5%.

#### Questions in Today's Environment – ERP Conditional Estimate of ERP and The Recession of 2008-2011

So just at the time that the risk in the economy increased to maybe the highest point, the base cost of equity capital using realized risk premiums decreased from 11.6% (4.5% plus 7.1%) to 9.5% (3.0% plus 6.5%).

Assume one obtains the estimate of *ERP* from the *SBBI Valuation Yearbook*. We get the following *base* cost of equity capital:



Source : 2012 SBBI Yearbook (Morningstar, Chicago, 2012)

#### Questions in Today's Environment – ERP Conditional Estimate of ERP, the Crisis of 2008-2009 and the Post-Crisis Recession

During the post-crisis recovery period we have witnessed a second "flight to quality" in 2010 which began with the euro-sovereign crisis

Interest rates on T-bills and T-bonds were also kept abnormally low due to the 2<sup>nd</sup> quantitative easement program of the Federal Reserve Bank ("QE2")

In 2011 we witnessed a third "flight to quality" which accompanied a return of the euro-sovereign crisis

The result is one must either

- estimate a normalized risk-free rate or
- estimate a constantly changing conditional ERP

#### Questions in Today's Environment – ERP Using Implied Cost of Equity to Estimate Conditional ERP

Simplest form:  $E(R_i) = k_e = D_1/P_o + g$  (single stage or single g)

Steps in estimating return: 1. Estimate  $D_1$  and estimate g; 2. Solve  $k_e$  for observed  $P_o$  for subject stock or market index (e.g., S&P 500)

Extensions:

Two-Stage:  $g_1$  for n years (faster growth) and  $g_2$  thereafter (perpetual growth)

Three-Stage:  $g_1$  for  $n_1$  years;  $g_2$  for years  $(n_1 + 1)$  to  $n_2$  and  $g_3$  for years  $n_2$  and thereafter (perpetual growth)

Morningstar *Cost of Capital Quarterly* reports on single-stage and three-stage DCF for companies using:

 $g_1$  = analyst forecasts for company

 $g_2$  = analyst forecasts for industry growth

 $g_3$  = growth rate for economy

#### Questions in Today's Environment – ERP Using Implied Cost of Equity to Estimate Conditional ERP

Estimating ERP:

One can use either

a "top down" estimate of the expected return for the market as a whole or

a "bottom up" estimate by aggregating company estimates (Damodaran's approach)

to estimate cost of equity capital; then subtract risk-free rate.

#### Questions in Today's Environment – ERP Damodaran Implied Conditional ERP Estimates

#### **Professor Damodaran**

- Calculates implied ERP estimates for the S&P 500 (US) and publishes his estimates on his website.
- He uses a two-stage model, projecting expected distributions (dividends and stock buybacks) based on an average of analyst estimates for earnings growth for individual firms comprising the S&P 500 for the first five years and the riskfree rate thereafter (since 1985).
- He solves for the discount rate, which equates the expected distributions to the current level of the S&P 500.

To learn more: Information and data available at http://pages.stern.nyu.edu/~adamodar/

Implied Conditional U.S. ERP Estimates Benchmarked vs actual and normalized 20-year U.S. government bond yields Arithmetic Avg. Equivalent

		20-year Risk-Free Rate		Hassett Implied ERP		Damodaran Implied ERP	
Estimate as of	S&P 500	Actual	Normalized	vs. Actual Risk-Free Rate	vs. Normalized Risk-Free Rate	vs. Actual Risk-Free Rate	vs. Normalized Risk-Free Rate
December 31, 2008	903.25	3.03%	4.50%	7.03%	5.56%	7.00%	5.52%
January 30, 2009	825.88	3.94%	4.50%	6.26%	5.69%	7.28%	6.72%
February 27, 2009	735.09	4.01%	4.50%	6.19%	5.69%	8.17%	7.68%
March 31, 2009	797.87	3.55%	4.50%	6.64%	5.69%	7.65%	6.70%
April 30, 2009	872.81	4.10%	4.50%	6.10%	5.69%	6.86%	6.46%
May 29, 2009	919.14	4.32%	4.32%	5.79%	5.79%	6.56%	6.56%
June 30, 2009	919.32	4.29%	4.29%	5.98%	5.98%	6.58%	6.58%
July 31, 2009	987.48	4.30%	4.30%	5.94%	5.94%	6.16%	6.16%
August 31, 2009	1020.62	4.15%	4.15%	5.80%	5.80%	6.03%	6.03%
September 30, 2009	1057.08	4.03%	4.03%	5.69%	5.69%	5.61%	5.61%
October 30, 2009	1036.19	4.20%	4.20%	5.77%	5.77%	5.66%	5.66%
November 30, 2009	1095.63	4.06%	4.06%	5.41%	5.41%	5.36%	5.36%
December 31, 2009	1115.10	4.58%	4.58%	6.49%	6.49%	5.11%	5.11%
January 29, 2010	1073.87	4.41%	4.41%	6.14%	6.14%	5.29%	5.29%
February 26, 2010	1104.49	4.41%	4.41%	6.09%	6.09%	5.15%	5.15%
March 31, 2010	1169.43	4.58%	4.58%	6.49%	6.49%	4.93%	4.93%
April 30, 2010	1186.69	4.37%	4.37%	6.32%	6.32%	5.36%	5.36%
May 28, 2010	1089.41	4.07%	4.07%	5.68%	5.68%	5.54%	5.54%
June 30, 2010	1030.71	3.76%	4.00%	6.46%	6.22%	5.81%	5.57%
July 30, 2010	1101.60	3.77%	4.00%	6.45%	6.22%	5.46%	5.22%
August 31, 2010	1049.33	3.27%	4.00%	6.95%	6.22%	5.80%	5.07%
September 30, 2010	1141.20	3.41%	4.00%	6.81%	6.22%	5.94%	5.34%
October 29, 2010	1183.26	3.67%	4.00%	6.55%	6.22%	5.57%	5.24%
November 30, 2010	1180.55	3.80%	4.00%	6.42%	6.22%	5.59%	5.39%
December 31, 2010	1257.64	4.14%	4.14%	5.58%	5.58%	5.87%	5.87%

•*Risk Premium Factor Valuation Model for Calculating the Equity Risk Premium and Estimating the S&P 500 Market Values* by Stephen D. Hassett for "top-down" estimate of ERP and •www.damodaran.com for "bottom-up" estimate of ERP and

•Duff & Phelps calculations

Source: Shannon Pratt and Roger Grabowski, Cost of Capital 4th ed (Wiley, 2010) and Duff & Phelps

Implied Conditional U.S. ERP Estimates Benchmarked vs actual and normalized 20-year U.S. government bond yields Arithmetic Avg. Equivalent

	20-year Risk-Free Rate		Hassett Implied ERP		Damodaran Implied ERP		
Estimate as of	S&P 500	Actual	Normalized	vs. Actual Risk-Free Rate	vs. Normalized Risk-Free Rate	vs. Actual Risk-Free Rate	vs. Normalized Risk-Free Rate
January 31, 2011	1286.12	4.32%	4.32%	5.69%	5.69%	5.66%	5.66%
February 28, 2011	1327.22	4.26%	4.26%	5.75%	5.75%	5.56%	5.56%
March 31, 2011	1325.83	4.29%	4.29%	5.84%	5.84%	5.98%	5.98%
April 29, 2011	1363.61	4.16%	4.16%	5.60%	5.60%	5.81%	5.81%
May 31, 2011	1345.20	3.91%	4.00%	5.67%	5.59%	5.90%	5.81%
June 30, 2011	1320.64	4.04%	4.04%	5.37%	5.37%	6.35%	6.35%
July 29, 2011	1292.28	3.66%	4.00%	5.93%	5.59%	6.57%	6.23%
August 31, 2011	1218.89	3.14%	4.00%	6.45%	5.59%	6.98%	6.11%
September 30, 2011	1131.42	2.65%	4.00%	6.93%	5.59%	8.40%	7.05%
October 31, 2011	1253.30	2.88%	4.00%	6.71%	5.59%	7.27%	6.15%
November 30, 2011	1246.96	2.71%	4.00%	6.88%	5.59%	7.38%	6.08%
December 30, 2011	1257.60	2.48%	4.00%	7.11%	5.59%	6.92%	5.39%
January 31, 2012	1312.41	2.49%	4.00%	7.08%	5.57%	6.59%	5.09%
February 29, 2012	1365.68	2.69%	4.00%	6.88%	5.57%	6.28%	4.98%
March 30, 2012	1408.47	2.90%	4.00%	6.66%	5.57%	6.76%	5.67%
April 30, 2012	1397.91	2.61%	4.00%	6.96%	5.57%	6.88%	5.49%
May 31, 2012	1310.33	2.19%	4.00%	7.38%	5.57%	7.42%	5.61%
June 30, 2012	1362.16	2.25%	4.00%	7.32%	5.57%	6.81%	5.06%
July 31, 2012	1379.32	2.06%	4.00%	7.51%	5.57%	6.81%	4.87%
August 31, 2012	1406.58	2.18%	4.00%	7.39%	5.57%	6.62%	4.80%
September 30, 2012	1440.67	2.26%	4.00%	7.31%	5.57%	6.79%	5.05%

•Risk Premium Factor Valuation Model for Calculating the Equity Risk Premium and Estimating the S&P 500 Market Values by Stephen D. Hassett for "top-down" estimate of ERP and

•www.damodaran.com for "bottom-up" estimate of ERP and

•Duff & Phelps calculations

Source: Shannon Pratt and Roger Grabowski, Cost of Capital 4th ed (Wiley, 2010) and Duff & Phelps

Comparing Damodoran's Implied Conditional U.S. ERP Estimates Benchmarked vs. actual and normalized 20-year U.S. government bond yields (arithmetic average equivalent)



•www.damodaran.com for "bottom-up" estimate of ERP
•Duff & Phelps calculations
Source: Shannon Pratt and Roger Grabowski, *Cost of Capital 4th ed* (Wiley, 2010) and Duff & Phelps

#### Questions in Today's Environment – ERP Implied Conditional ERP Estimates

Should one use actual risk-free rates or normalized risk-free rates?

- In any period in which the risk-free rate is temporarily reduced due to the flight-to-quality, one must re-estimate the ERP
- Requires monthly adjustment to the ERP estimate
- Assumes implied ERP model is accurate
- Assumes inputs are updated in a timely fashion (analysts tend to update estimates with a lag)
- Are we assuming a precision that is unjustified?
- Given that we are valuing entire businesses, do the values of the subject businesses change monthly with such precision?

#### Questions in Today's Environment – ERP Implied Conditional ERP Estimate

Given the fact that volumes have been relatively low in the U.S. stock market as the overall market has advanced,

- Uncertainty in the U.S. economic recovery (jobless and slow),
- Difficulty for smaller companies to obtain commercial and industrial loans from banks;
- Troubled sovereign debt in Greece, Ireland, Portugal, Spain and Italy, and
- Heavy reliance of the China recovery on construction of apartments and buildings that are unoccupied,

What conditional ERP is reasonable at beginning of 2012? Today?

#### The Duff & Phelps Recommended Equity Risk Premium

# ERP

Methodology

There is no single universally accepted method for estimating the equity risk premium (ERP).

Each ERP model has strengths / weaknesses

None of the ERP models can stand alone

Multiple ERP models should be used

A two-dimensional process

What is a reasonable range of unconditional ERP that can be expected over an entire business cycle? *"What is the range?"* 

Research has shown that ERP is cyclical during the business cycle. We use the term *conditional ERP* to mean the ERP that reflects current market conditions.

"Where are we in the range?"

Step 1: What is a reasonable range of ERP over an entire business cycle?

The objective is to establish a *reasonable range* for a normal or unconditional ERP that can be expected over an entire business cycle.

Based on the analysis of academic and financial literature and various empirical studies, we have concluded that a reasonable long-term estimate of the normal or unconditional ERP for the U.S. is in the range of 3.5% to 6.0%.



Step 2: Where in the range are we?

The objective is to determine *where within the unconditional ERP range* should the *conditional* ERP be, based on current economic conditions.



Research has shown that ERP is cyclical during the business cycle.

The ERP is cyclical



Research has shown that ERP is cyclical during the business cycle.

The ERP is cyclical



Research has shown that ERP is cyclical during the business cycle.



**Current Recommendation** 

On January 15, 2012 Duff & Phelps lowered the recommended U.S. ERP from 6.0% to <u>5.5%</u>, where it remains today (Oct. 2012).



Reasons for ERP Change to 5.5%

Duff & Phelps regularly reviews fluctuations in global economic and financial conditions that warrant periodic reassessments of ERP.

General economic conditions. For example, Duff & Phelps decreased its U.S. ERP estimate from 6.0% to 5.5% as of January 15, 2012, citing two broad areas of :

- Slow but moderate growth expected in 2012
- Economic stability suggested by financial market conditions and equity volatility declining

More quantitative measures are also monitored, including:

- Damodaran Model

Damodaran Model (implied ERP estimate)



IMPORTANT!

Please note that the Duff & Phelps Recommended ERP as of the important valuation date December 31, 2011 was 6.0%.

Also remember that the Duff & Phelps ERP is necessarily developed in <u>conjunction</u> with a risk-free rate (either "spot" or "normalized").

Duff & Phelps' ERP recommendations and accompanying risk-free rates for all periods from 2008 through present are presented in the table on the next slide. The ERP estimate is measured relative to a 20-year U.S. Treasury yield (either "spot" or "normalized"), and so should be used in conjunction with the risk-free rate indicated.

# The Duff & Phelps Recommended ERP and Corresponding Risk-Free Rates

Current ERP Guidance ✓ January 15, 2012 – UNTIL FURTHER NOTICE	5.5%	4.0% Normalized 20-year Treasury yield *
Change in Guidance September 30, 2011 – January 14, 2012	6.0%	4.0% Normalized 20-year Treasury yield *
July 2011 – September 29, 2011	5.5%	4.0% Normalized 20-year Treasury yield *
June 1, 2011 – June 30, 2011	5.5%	Spot 20-year Treasury Yield
May 1, 2011 – May 31, 2011	5.5%	4.0% Normalized 20-year Treasury yield *
December 1, 2010 – April 30, 2011	5.5%	Spot 20-year Treasury Yield
June 1, 2010 – November 30, 2010	5.5%	4.0% Normalized 20-year Treasury yield *
<i>Change in Guidance</i> December 1, 2009 – May 31, 2010	5.5%	Spot 20-year Treasury Yield
June 1, 2009 – November 30, 2009	6.0%	Spot 20-year Treasury Yield
November 1, 2008 - May 31, 2009	6.0%	4.5% Normalized 20-year Treasury yield *
Change in Guidance October 27, 2008 – October 31, 2008	6.0%	Spot 20-year Treasury Yield
January 1, 2008 – October 26, 2008	5.0%	Spot 20-year Treasury Yield

Duff & Phelps

Recommended ERP

Risk Free Rate

\* Normalized in this context means that in months where the risk-free rate is deemed to be abnormally low, a proxy for a longer-term sustainable risk-free rate is used.

#### Equity Risk Premium (ERP) Summary

Estimating the ERP is one of the most important issues when you estimate the cost of capital of a subject business or project. You need to consider a variety of alternative sources, including examining realized returns over various periods and employing forward-looking estimates such as those implied from projections of future prices, dividends, and earnings.

#### Equity Risk Premium (ERP) Summary

Some practitioners express dismay over the necessity of considering a forward ERP since that would require changing their current cookbook practice of relying exclusively on the post-1925 historical arithmetic average of one-year realized premiums reported in the *SBBI Yearbook* as their estimate of the ERP.

Our reply is that valuation is a forward-looking concept, not an exercise in mechanical application of formulas. Correct valuation requires applying value drivers reflected in today's market pricing. You need to mimic the market. In our experience, you often cannot match current market pricing for equities using the post-1925 historical arithmetic average of one-year realized premiums as the basis for developing discount rates. The entire valuation process is based on applying reasoned judgment to the evidence derived from economic, financial, and other information and arriving at a well-reasoned opinion of value. Estimating the ERP is no different.

## The Size Effect

#### History of the Size Effect

The size effect is based on the empirical observation that companies of smaller size are associated with greater risk and, therefore, have greater cost of capital.

The size effect is not without controversy. For example, it is not clear whether this is due to size itself, or another factor closely related to size.

## Criticisms of the Size Effect \*

Size effect is...

- Due to differences in liquidity, not size
- Really the "January effect"
- Caused by "delisting return bias"
- Function of measuring average annual returns as an arithmetic average instead of a geometric average
- Cue to "bid-asked bounce"
- Due to poor analyst coverage causing returns to be impacted by unexpected events
- "Comes and goes"
- Disappeared after 1980

<sup>\*</sup> To learn more, see Shannon Pratt and Roger Grabowski, *Cost of Capital: Applications and Examples* 4th ed. (New York; John Wiley & Sons, 2010), Chapter 13 "Size Effect", and Chapter 14 "Criticisms of the Size Effect".

#### History of the Size Effect

Size of a company is one of the most important risk elements to consider when developing cost of equity estimates (COE).

Traditionally, researchers use market value of equity as a measure of size.

Center for Research in Security Prices (CRSP) created "deciles" of U.S. companies sorted by market capitalization.

Fama and French created their "Small minus Big" (SMB) series.

#### CRSP NYSE Deciles 1 – 10

Terminal Index Values of CRSP NYSE Deciles 1 – 10 Index (Year-end 1925 = \$1) January 1926 – December 1975



Calculated by Duff & Phelps based on CRSP® standard market-cap weighted NYSE decile returns. ©2012 Center for Research in Security Prices (CRSP®), University of Chicago Booth School of Business. Source: Morningstar EnCorr software.

#### The Size Effect Over Longer Time Periods

Large-cap Stocks (CRSP Decile 1) vs. Small-cap Stocks (CRSP Decile 10) Index (Year-end 1925 = \$1) January 1926 – December 2011



Calculated by Duff & Phelps based on CRSP® standard market-cap weighted NYSE decile returns. ©2012 Center for Research in Security Prices (CRSP®), University of Chicago Booth School of Business. Source: Morningstar EnCorr software.
#### The Size Effect Over Recent Time Periods Alternative Measures of Size – Market Capitalization Security Market Line (SML) vs. Size Study Portfolios 1-25 1963-2011, 1990-2011



Calculated by Duff & Phelps based on CRSP® standard market-cap weighted NYSE decile returns. ©2012 Center for Research in Security Prices (CRSP®), University of Chicago Booth School of Business. Source: Morningstar EnCorr software.

In the last 40 years, many researchers have investigated the size effect and reached a variety of conclusions. One recent study concluded:

"The justification for a size premium in cost of capital estimates seems weak given empirical research on public firms."\*

This analysis presented a statistical examination of the *average* monthly returns of Fama-French's "small minus big" (SMB)

<sup>\*</sup> Michael Crain, "The State of Affairs on Size Premiums", AICPA National Business Valuation Conference, November 7, 2011.

However, average monthly return may not be the proper measure to examine the size effect

Actual performance of an investment over a period is what is important to an investor.

For example, say you invested \$1 and experienced a 10 percent gain in the first year, and a 10 percent loss in the second year. While your "average" return is 0 percent ((10% + (-10%) / 2)), the actual *performance* of your \$1 investment over the 2-year period is a *loss* of -1 percent: in year 1, your investment increased to \$1.10, in year 2, your investment decreased to \$0.99. You have less "money in your pocket", even though your average return (0%) suggests that nothing has changed.

Performance of the Fama-French SMB Return Series; Variable Start Dates from January 1982 Forward; Fixed end date of December 2011





VARIABLE start month (from Jan '82 to present); FIXED end month (Dec. '11)

Source: Fama-French "small minus big" (SMB) series. Professor Ken French's website at http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/

Difference in Return Over Period for All Possible Combinations of Start and End Dates CRSP NYSE/AMEX/NASDAQ Decile 10 (Small Stocks) Minus CRSP NYSE/AMEX/NASDAQ Decile 1 (Large Stocks)

1926-2011



Calculated by Duff & Phelps based on CRSP® standard market-cap weighted NYSE decile returns. ©2012 Center for Research in Security Prices (CRSP®), University of Chicago Booth School of Business. Source: Morningstar EnCorr software.

"It is not known whether size [as measured by market capitalization-ed.] per se is responsible for the effect or whether size is just a proxy for one more true unknown factors correlated with size."

- Rolf W. Banz

Research on returns as related to "size" is abundant, but over time a growing body of work investigating the impact of "liquidity" on returns has emerged.

 Early as 1986, Amihud and Mendelson noted that "...market-observed average returns are increasing function of the spread..." (i.e., less liquid stocks out perform more liquid stocks)

#### **Abbot and Pratt**

Suggest that the "...difference between mean returns on size sorted portfolios is smaller than the difference between mean returns on liquidity sorted portfolios"

• Implying that between size and liquidity, "... liquidity may be the dominant factor in asset pricing."

#### Ibbotson, Chen, and Hu

Suggest typical measures of liquidity employed in the literature are each "... highly correlated with company size."

- Identify two main sources of greater returns of less liquid stocks:
  - Liquidity versus Illiquidity
  - Premium for any characteristics investors demand
- Less liquid stocks get lower valuations, which allows investors to buy stocks at a discount

Source: Chen, Zhiwu, Ibbotson, Roger G. and Hu, Wendy, Liquidity as an Investment Style (September 10, 2010). Yale SOM Working Paper. Available at SSRN

#### The Size Effect Summary

- The data suggest that the size premium changes over time, but is a persistent effect over longer periods
- Holding period returns are likely a better gauge of past performance than is a comparison of average returns
- The relationship between "small" and "large" has changed over time, and is likely less in more recent periods than in prior periods.

To learn more, see Shannon Pratt and Roger Grabowski, *Cost of Capital: Applications and Examples* 4th ed. (New York; John Wiley & Sons, 2010), Chapter 13 "Size Effect", and Chapter 14 "Criticisms of the Size Effect".

#### DUFF & PHELPS

#### Thank You!

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Appendix A: The Duff & Phelps Risk Premium Report & Online Risk Premium Calculator

#### History of the Risk Premium Report

DUFF&PHELPS

Published annually since 1996

...17 years and counting!

#### Inside 4 6 11 26 81 How the Portfolio Using the The Size The Risk Introduction Study 2012 Report is Methodology 2012 Report Study Organized 100 113 120 129 131 137 The High-FAO Data Exhibits Using the Appendices. Glossary Financial-Risk "C" Exhibits (Risk Premia) Słudy

**Risk Premium** 

Report 2012

#### Who Should Use the Duff & Phelps Risk Premium Report

1 Professional Valuation Practitioner









#### History of the Duff & Phelps Risk Premium Report

Why it is important to use more than a SINGLE measure of size

- Bias may be introduced when ranking companies by market value
- Market capitalization may be an imperfect measure of the risk of a company's operations
- Eliminates "circularity issue"
- It is generally better to approach things from multiple directions if at all possible

### Duff & Phelps Risk Premium Report and Calculator

The *Report* includes:

- The Size Study
- The Risk Study
- The High-Financial Risk Study

# Duff & Phelps Risk Premium Report and Calculator

	<u>SBBI Yearbook</u>	Duff & Phelps Risk Premium Report
Time horizon over which data is analyzed	1926–present year	1963-present year
Size Study	Yes	Yes
Risk Study	No	Yes
Size Measures used	Market Cap	Market Cap + 7 alternative size measures
Risk Measures used	NA	Operating Margin, CV Operating Margin, CV ROE
Can be used to estimate COE using buildup model	Yes	Yes
Can be used to estimate COE using CAPM model	Yes	Yes
Number of portfolios	9 Deciles + 10w, 10x, 10y, 1-z	25
Regression Formulas available for estimating "exact" interpolated premia between portfolios, or for estimating premia for very small companies.	No	Yes

# Duff & Phelps Risk Premium Report and Calculator

	<u>SBBI Yearbook</u>	Duff & Phelps Risk Premium Report
Portfolio overlap*	Yes	No
Publishes unlevered premia (in addition to levered premia)	No	Yes
Exclusion of financial companies	No	Yes
Exclusion of high-financial-risk	No	Yes
Analysis of high-financial-risk	No	Yes
Publishes specific information about the companies that comprise the portfolios	No	Yes
Web-based version	No	Yes

\* Portfolio overlap refers to whether a subject company can be be properly placed in multiple size groupings.

#### The Duff & Phelps Risk Premium – Size Study As Size Decreases, Returns (and Risk) Tend to Increase



#### The Duff & Phelps Risk Premium – Size Study Reasons for Using Additional Measures of Size

### Market cap is not always available

Low market cap does not necessarily mean "small"

#### Removes the "circularity" problem

#### It's just good practice

The 2012 Duff & Phelps Risk Premium Report is available for purchase through Business Valuation Resources, ValuSource, and Morningstar. For purchasing information please visit <a href="https://www.DuffandPhelps.com/CostofCapital">www.DuffandPhelps.com/CostofCapital</a>

#### The Duff & Phelps Risk Premium – Risk Study As Risk Increases, Returns (and Risk) Tend to Increase



The 2012 Duff & Phelps Risk Premium Report is available for purchase through Business Valuation Resources, ValuSource, and Morningstar. For purchasing information please visit www.DuffandPhelps.com/CostofCapital

### Duff & Phelps Risk Premium Report – Using the Report Example: CAPM, the eight "B" Exhibits

#### B-1: Market Value

B-2: Book Value

B-3: Net Income





The "B" Exhibits are where you find Size Premia for use in the CAPM model.

**B-5: Total Assets** 

#### B-6: EBITDA



**B-8: Employees** 



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#### New in the 2012 Risk Premium Report



The 2012 Duff & Phelps Risk Premium Report is available for purchase through Business Valuation Resources, ValuSource, and Morningstar. For purchasing information please visit <u>www.DuffandPhelps.com/CostofCapital</u>

#### New in the 2012 Risk Premium Report



The 2012 Duff & Phelps Risk Premium Report is available for purchase through Business Valuation Resources, ValuSource, and Morningstar. For purchasing information please visit <u>www.DuffandPhelps.com/CostofCapital</u>

#### The Duff & Phelps Risk Premium Calculator Four Simple Goals



The 2012 Duff & Phelps Risk Premium Report is available for purchase through Business Valuation Resources, ValuSource, and Morningstar. For purchasing information please visit www.DuffandPhelps.com/CostofCapital



The 2012 Duff & Phelps Risk Premium Report is available for purchase through Business Valuation Resources, ValuSource, and Morningstar. For purchasing information please visit <u>www.DuffandPhelps.com/CostofCapital</u>

Executive Summary (in Microsoft Word Format) Fully customizable to suit individual needs **Full Audit Trail** Detailed Data Sourcing NAME AND A DESCRIPTION OF A DESCRIPTIONO Summary of User Inputs used in calculations Concluded range of COE estimates analysis (both from *Size Study* and *Risk*) Study)

Support and Detail Workbook (in Microsoft Excel Format) Full Audit Trail (summary of all inputs and calculations) Automatic mapping of subject company's size measures Detailed explanation of "company-specific" risk adjustment Includes a table of content, section divider tabs, ready for print

The 2012 Duff & Phelps Risk Premium Report is available for purchase through Business Valuation Resources, ValuSource, and Morningstar. For purchasing information please visit www.DuffandPhelps.com/CostofCapital





Executive Summary Cost of Equity Capital Summary Size Study

- Buildup 1
- Buildup 2
- Capital Asset Pricing Model (CAPM)

**Risk Study** 

– Buildup 3

Summary Table of User Inputs Summary Table of All COE Models Conclusion of Cost of Equity Capital Range



The 2012 Duff & Phelps Risk Premium Report is available for purchase through Business Valuation Resources, ValuSource, and Morningstar. For purchasing information please visit <u>www.DuffandPhelps.com/CostofCapital</u>

Support and Detail Workbook Summary of User Inputs – Size and Risk Studies Cost of Equity Capital Estimates – Size Study

- Summary of all Size Study Models
- Buildup 1 Model
- Buildup 2 Model
- CAPM Model
- Unlevered Model
- Cost of Equity Capital Estimates Risk Study
  - Buildup 3 Model
  - Company-Specific Risk: Indication of Direction

Exhibits Summary

- Exhibits A (Risk Premia Over Risk-Free Rate)
- Exhibits B (Risk Premia Over CAPM)
- Exhibits C (Comparative Risk Characteristics)
- Exhibits D (Company-specific Risk)

#### High Financial Risk Study

- Survey Question to indicate high financial risk
- Altman z-Score Testing
- Exhibit H (High-Financial-Risk Premia Over Risk Free-Rate)



The 2012 Duff & Phelps Risk Premium Report is available for purchase through Business Valuation Resources, ValuSource, and Morningstar. For purchasing information please visit <u>www.DuffandPhelps.com/CostofCapital</u>

#### Duff & Phelps Risk Premium Report & Calculator™ General Information

The Duff & Phelps Risk Premium Report and accompanying online Risk Premium Calculator are available from our Distributors:

> Business Valuation Resources (BVR) www.bvresources.com/DP 1-(888)-287-8258



Morningstar www.global.morningstar.com/RiskPremiaReports 1-(888)-298-3647

M RNINGSTAR\*

ValuSource www.valusource.com/RPP 1-(800)-825-8763



The *Duff & Phelps Risk Premium Report* is intended to be used as a companion publication to the web-based *Duff & Phelps Risk Premium Calculator*.

Note: The web-based *Duff & Phelps Risk Premium Calculator* is available through Business Valuation Resource (BVR) and ValuSource.

#### DUFF & PHELPS

### Thank You!

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