BEAR STEARNS

Discounted Cash Flow Methodology

Table of Contents

Section

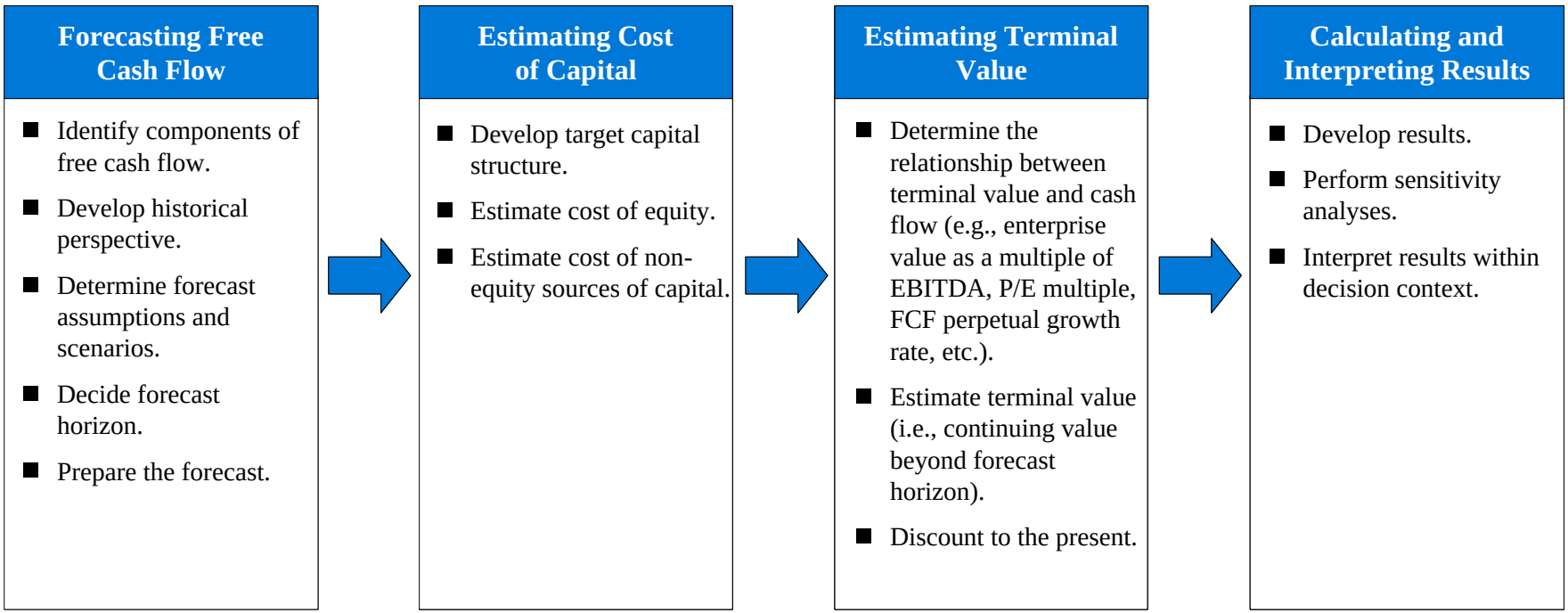
BEAR STEARNS

Section 1

Discounted Cash Flow Overview

Discounted Cash Flow Overview

The DCF approach values a business based on its future expected cash flows discounted at a rate that reflects the riskiness of the cash flows.



Advantages and Disadvantages of DCF

DCF is more flexible than other valuation approaches in considering the unique circumstances of a company, but it is also very sensitive to estimates of cash flow, terminal value and the discount rate.

Advantages	Disadvantages
■ Provides an objective framework for assessing a company's risk and cash flows to estimate value.	■ Extremely sensitive to cash flow projections which may be inherently difficult to predict, particularly as the projection horizon lengthens.
■ Requires users to think about key drivers of value.	■ Terminal value may be distorted by incorrect estimations of either cash flow or terminal multiples.
■ May be used when no "pure play" comparable companies are available.	■ Validity of the discount rate depends on assumptions for beta and the market risk premium.

Cash Flow Projections

Discounted cash flow analysis is extremely sensitive to cash flow projections.

- Use a realistic management case which has been thoroughly diligenced.
- Forecast favorable and unfavorable scenarios as sensitivity cases, and probability weight each scenario to achieve expected value.
- If practical, the forecast horizon should reflect the time it takes for the firm to reach a "steady state."
  - The forecast horizon should generally reflect the time it takes for a company to achieve stable growth, stable capital structure or an end to restructuring.
  - The forecast period should not extend beyond such time frame as the company can reasonably project.
- Since cash flows are generated over the course of each year (rather than at the end of each year), the cash flows during each year of the forecast should be discounted back from the mid-year to time zero for non-seasonal businesses.
  - Assumes that cash flows occur at the mid-point of each year and, consequently, cash flows in year 1 are discounted ½ year, cash flows in year 2 are discounted 1½ years, etc.
  - For certain industries characterized by greater seasonality, an end-of-year discounting convention (or other reasonable assumption) may be more appropriate.

Free Cash Flow Approach

An approach to calculate the unlevered value of the firm is to use after-tax, "debt-free," nominal Free Cash Flows to the Firm.

- The approach of measuring free cash flows to the unlevered firm permits us to ascertain the operating value of a firm independent of its capital structure.
- Provides a greater degree of analytical flexibility.
- The value of equity is calculated as the value of the firm's operations less the value of its net debt and other non-equity claims such as preferred stock and minority interests.
  - Under this approach, FCF to the Firm ("FCFF") are discounted at the Weighted Average Cost of Capital ("WACC").
  - The value of the debt can be estimated by the lesser of market value or book value.
  - In-the-money convertibles should not be included as debt for this calculation since they are assumed to have been converted.
- Alternatively, the DCF template is sufficiently flexible to calculate a company's equity value from the FCF to Common Equity ("FCFCE") after deducting after-tax debt service, preferred dividends and changes in debt, preferred stock and minority interest. Under this approach, FCFCE are discounted at the Cost of Equity ("K_E").
- In general, make sure the subject company's dividend policy is consistent with the discount rate and cash flow assumptions.
  - If the dividend payout ratio changes, operating performance (and cash flows) should also change.
  - If all free cash flows are assumed to be distributed to shareholders, make sure that retained earnings are not double-counted by reinvesting cash.

Defining Free Cash Flow—Top-Down Approach

Earnings before interest and taxes (EBIT)	*Consolidated operating income related to the subject operations.*
Subtract adjusted taxes	*Calculated by multiplying the marginal tax rate by EBIT after adding back items which are not tax deductible such as non-deductible goodwill amortization.*
	Subtract (add) estimated increases in net deferred tax liabilities (assets) from taxes calculated directly above.
	If the company has NOLs or is not expected to be a taxpayer within the forecast horizon, there should be no cash tax expense.
Add depreciation and amortization	*Includes all depreciation and amortization subtracted from EBITDA to arrive at EBIT.*
Subtract (add) increases (decrease) in working capital	*Includes changes in accounts receivable, inventory, prepaid expenses, accounts payable, accrued liabilities, etc.*
	In some cases, it may be appropriate to include as working capital the minimum amount of cash necessary for operational purposes.
Subtract capital expenditures	*Going forward, should include one-time, non-recurring cash flows to the extent they are planned.*
Equals free cash flows to the unlevered firm (FCFF)	*Cash flows are available to both debt and equity holders.*
Subtract cash interest paid	*May differ from interest expense due to non-cash interest charges.*
Add interest tax shield	*Calculated by multiplying marginal tax rate by interest expense.*
Add (subtract) increases (decreases) in debt, preferred stock and minority interest	*Increases in non-common equity sources of capital, net of principal repayments, result in greater cash for common equity holders.*
Subtract preferred dividends	*Any cash payments to non-common equity claimholders results in less cash to common equity holders.*
Equals free cash flows to the common equity (FCFCE)	*Cash flows are available only to common equity holders. Assumes that all cash flows to the common equity are distributed (i.e., not reinvested) to ensure that retained earnings are not double-counted.*

Defining Free Cash Flow—Bottom-Up Approach

Net income	*Net income as reported.*
Add (subtract) non-cash expenses (income)	*Includes depreciation and amortization, deferred taxes, and other non-cash items but excludes non-cash interest expense.*
Subtract (add) increases (decreases) in working capital	*Includes changes in accounts receivable, inventory, prepaid expenses, accounts payable, accrued liabilities, etc.* *In some cases, it may be appropriate to include as working capital the minimum amount of cash necessary for operational purposes.*
Equals adjusted cash flows from operations	
Add interest expense	*Includes non-cash interest expense. As long as you assume that initial excess cash and all interim cash flows are distributed to shareholders (i.e., no cash other than minimum cash balances accumulates in the forecast period), it is appropriate to exclude interest income on excess cash balances from the free cash flow calculation.*
Subtract interest tax shield	*Calculated by multiplying the marginal tax rate by interest expense. If the company has NOLs or is not expected to be a taxpayer within the forecast horizon, there should be no interest tax shield.*
Subtract capital expenditures	*Going forward, should include one-time, non-recurring cash flows to the extent they are planned.*
Equals free cash flows to the unlevered firm (FCFF)	*Cash flows are available to both debt and equity holders.*
Subtract cash interest paid	*May differ from interest expense due to non-cash interest charges.*
Add interest tax shield	*Calculated by multiplying marginal tax rate by interest expense.*
Add (subtract) increases (decreases) in debt, preferred stock and minority interest	*Increases in non-common equity sources of capital, net of principal repayments, result in greater cash for common equity holders.*
Subtract preferred dividends	*Any cash payments to non-common equity claimholders results in less cash to common equity holders.*
Equals free cash flows to the common equity (FCFCE)	*Cash flows are available only to common equity holders. Assumes that all cash flows to the common equity are distributed (i.e., not reinvested) to ensure that retained earnings are not double-counted.*

Calculating the Discount Rate

Use a firm's after-tax, nominal WACC to discount the after-tax, nominal unlevered Free Cash Flows to the Firm.

- WACC is the weighted average of the debt and equity costs of capital (including preferred stock), using market value weights for capital structure components.

- The weighted average cost of capital is defined as:

$WACC = K_E (E/V) + K_D (1-T) (D/V) + K_P (P/V)$	K_E=cost of common equity capital. E/V=ratio of market value of common equity to total firm value. K_D=cost of debt capital. D/V=ratio of market value of debt to total firm value. T=corporate **marginal** tax rate. K_P=cost of preferred equity capital. P/V=ratio of market value of preferred equity to total firm value.

- In valuing an M&A target, use the WACC of the target company rather than the WACC of the acquiror.

- WACC does not take into account a dynamic capital structure; therefore, a constant capital structure (i.e., subject company or industry average leverage) should generally be assumed. For a firm with a rapidly changing capital structure (i.e., an LBO), it may be appropriate to use a different WACC in each year of the forecast as financial leverage changes.

- As long as you assume that initial excess cash and all interim cash flows are distributed to shareholders (i.e., no cash accumulates in the forecast period), it is appropriate to exclude cash from the WACC calculation.

Calculating the Cost of Equity Capital

The Capital Asset Pricing Model ("CAPM") may be used to estimate a company's cost of equity based on the risk-free rate plus a premium for equity risk.

- The cost of common equity is defined as:

$$K_E = R_F + \beta[R_M - R_F] + S$$

K_E	=	cost of common equity capital.
R_F	=	risk-free rate.
β	=	beta of the security.
$R_M - R_F$	=	"market risk premium," or the expected return on the market portfolio minus the risk-free rate.
S	=	small capitalization premium.

- The following assumptions for CAPM are reasonable:

Risk-Free Rate(1)	20-year US Treasury (or longest available government security for foreign markets).
Market Risk Premium(2)	7.8%.
Beta(3)	Use 5-year historical adjusted betas calculated using monthly observations. Bloomberg may be used as a source. BARRA predicted betas may be used as an alternative to historical betas if appropriate under the circumstances.(4)

- If you're evaluating a small to midcap situation (less than $4.144 billion in market capitalization), add a 0.6% to 2.6% premium to the cost of equity.(5) The cost of equity for small cap companies is generally underestimated to the extent that the S&P 500 (which includes only 500 of the largest NYSE stocks) is used as a basis for determining the market risk premium and beta in CAPM.

(1) The long-term risk free rate should be estimated by the interpolated 20 year US Treasury rate available on Bloomberg.
(2) Source: Ibbotson Associates: *Stocks, Bonds, Bills, and Inflation, 2001 Yearbook*.
(3) Historical betas should be adjusted to reflect convergence to 1.00 over time, i.e., (unadjusted beta * 2/3) + (1.00 * 1/3). A shorter period (2 years using weekly observations) may be more appropriate for companies in dynamic, high growth industries or for recently restructured companies.
(4) BARRA is a widely quoted source of predicted betas which are based on a multi-factor risk model.
(5) A small cap premium should be added to the subject company's cost of equity according to the following scale: 2.6% premium for a market cap of $192 million or below, 1.1% for a market cap between $192 million and $840 million and 0.6% for a market cap between $840 million and $4.144 billion. Source: Ibbotson Associates: *Stocks, Bonds, Bills, and Inflation, 2001 Yearbook.*

The Risk-Free Rate

Under the CAPM framework, the security that is used as a proxy for the risk-free rate should ideally have a beta of zero and a maturity which approximates the forecast horizon for the investment under consideration.

- The long-term rate (i.e., 20 years) most clearly matches the time frame of most investment or acquisition decisions.
- The long-term rate extends beyond the forecast horizon to account for the terminal value.
- Long-term inflation expectations embodied in the long-term rate are less volatile than the short-term inflation expectations reflected in yields of shorter-term bonds.
- The long-term rate is subject to fewer random disturbances compared to shorter-term rates.
- Although the long-term rate reflects greater price risk than bonds of a shorter duration, long-term treasuries are exposed to relatively low reinvestment risk.
- A potential problem with using the long-term yield, however, is that evidence suggests that long-term Treasury bonds are not risk-free as they have an estimated historical beta of approximately 0.10.[(1)]

(1) Based on the regression of the monthly returns of the Treasury Bond maturing on August 15, 2021 against those of the S&P 500 from December 29, 1995 through December 29, 2000.

Calculating the Equity Beta

Beta should be calculated using historical adjusted betas based on a longer time frame (5 years using monthly observations) for more stable, mature companies and a shorter period (2 years using weekly observations) for dynamic, high growth industries or for recently restructured companies. BARRA predicted betas may be used as an alternative to historical betas if this is appropriate under the circumstances.

- For public companies that are being valued using DCF methodology:
  - Starting point is the subject company's observed historical beta and/or predicted beta.
  - As appropriate, the subject company's beta should be cross-checked versus the betas for comparable, publicly traded companies.
- For companies that are not public, have short operational histories, restructured operations, or leverage that departs significantly from the industry average, it may be appropriate to use an industry average beta(1) rather than an individual company beta if good comparable companies are available.
- Additionally, when using DCF for sum-of-the-parts analysis, industry average betas may be appropriate for the separate business units.
- For historical betas, always use the "adjusted" beta, which corrects for the convergence of most stocks to 1.00 over time, and, consequently, is a better predictor of future price movements.
- Use the S&P 500 (the default setting on Bloomberg) as the market proxy in beta calculations for US stocks. The definition of the market for beta calculations should be the same as that used to calculate the market risk premium.
- BARRA predicted betas can be obtained through the Investment Banking Information Center.

(1) The industry average beta can be calculated by taking the market capitalization weighted average unlevered beta for a group of comparable, publicly traded companies.

The Equity Beta

Although the formula for calculating beta is well-defined,[(1)] there are several issues to consider in calculating beta.

Predicted vs. Historical	■ Predicted betas based on a multi-factor risk model (i.e., BARRA betas) may be used. Alternatively, historical betas may be used to the extent that past performance is an effective predictor of future performance (i.e., the company's performance is relatively stable).
Historical Time Frame	■ A longer time frame (5 years) smoothes out irregularities in the market which may be present over shorter periods of time. ■ A shorter period (2 years) may be more appropriate for companies in dynamic, high growth industries or for recently restructured companies.
Frequency of Observations	■ Practical data constraints influence the frequency of observations used to calculate historical betas. Bloomberg, for example, considers a maximum of 244 data points for monthly data and 399 data points for weekly data, permitting calculations of ten-year historical betas using monthly data and seven-year historical betas using weekly data. The default calculation is based on approximately 103 weekly data points, which represents slightly under two years of data.
Individual Beta vs. Industry Average	■ For public companies that are being valued using DCF methodology: • Starting point is the subject company's observed historical beta and/or predicted beta. • As appropriate, the subject company's beta should be cross-checked versus the betas for comparable, publicly traded companies. ■ For companies that are not public, have short operational histories, limited market exposure, restructured operations, or leverage that departs significantly from the industry average, it may be appropriate to use an industry average beta rather than an individual company beta. ■ When using DCF for sum-of-the-parts analysis, industry average betas are also appropriate for the separate business units.

(1) Beta is equal to the covariance of the security and the market divided by the variance of the market.

The Equity Beta (cont.)

Adjusted vs. Unadjusted Betas	■ Unadjusted historical betas are calculated according to the strict mathematical definition, but empirically they have not accurately predicted future price movements as they tend to be too high. ■ Most sources adjust the historical beta toward 1.00 since the beta of most stocks converges to 1.00 over time. The adjustment formula is: Adjusted Beta = (Unadjusted beta * 2/3) + (1.00 * 1/3).
Proxy for the Market	■ The return on the market should theoretically reflect a weighted index of all possible investments available to an investor (common stocks, preferred stocks, bonds, commodities, real estate, etc.), both domestically and internationally. ■ The most widely used index is the S&P 500, largely because it has been used frequently to calculate market risk premia. The most notable example is Ibbotson Associates' calculation of the market risk premium since 1926.

The Equity Beta (cont.)

Most sources publish 5-year historical adjusted betas which are calculated using monthly observations. The exception is BARRA, which publishes monthly predictions of beta based on an analysis of industry and firm-specific risk factors.

US Equity Betas

	Historical vs. Predicted	Time Frame	Frequency of Observations	Adjusted vs. Unadjusted	Market Proxy
BARRA	Predicted	Current[1]	Monthly	NA	S&P 500
Merrill Lynch	Historical	5 years	Monthly	Adjusted	S&P 500
S&P	Historical	5 years	Monthly	Unadjusted	S&P 500
Value Line	Historical	5 years	Weekly	Adjusted	NYSE

Global Equity Betas

	Historical vs. Predicted	Time Frame	Frequency of Observations	Adjusted vs. Unadjusted	Market Proxy[7]
BARRA (MSCI version)[2]	Predicted	Current[5]	Monthly	NA	MSCI Local, Developed World & EM Indices
BARRA (*FT* version)[3]	Predicted	Current[6]	Monthly	NA	*FT* Local, Developed World & EM Indices
London Business School[4]	Historical	5 years	Monthly	Adjusted	*FT* Actuaries All Share Index

In addition to the sources listed above, Bloomberg and IDD may be used to calculate historical betas adjusted for stock splits, dividends and convergence toward 1.00.

(1) BARRA uses the current characteristics of a firm and a risk model that is based on monthly data from January 1973 onward to calculate its betas.
(2) Morgan Stanley Capital International version; applies to companies in multiple countries.
(3) *Financial Times* version; applies to companies in multiple countries.
(4) Applies only to companies listed on UK stock exchanges.
(5) Based on similar methodology to US betas, except risk model is based on monthly data from January 1988 onward.
(6) Based on similar methodology to US betas, except risk model is based on monthly data from December 1987 onward.
(7) BARRA calculates both global and local predicted betas in its global equity models.

Levering and Unlevering Equity Betas

The impact of a unique capital structure on a company's beta may be neutralized by unlevering its beta and relevering to the industry average or current capital structure.

- The formula for levering an unlevered beta is as follows:

$\beta_L = \beta_U * [1 + D/E * (1 - T)]$

$\beta_U = \beta_L / [1 + D/E * (1 - T)]$

β_L	=	levered beta.
β_U	=	unlevered beta.
D	=	market value of debt.[(1)]
E	=	market value of equity.[(2)]
T	=	**marginal** corporate tax rate.

- If the subject company's beta is being used, it can be unlevered and relevered with an industry average capital structure if its current capital structure departs significantly from the industry average.

- The capital structure assumption used to relever the subject company's beta should be the same as that used to determine the subject company's WACC.

(1) Include the value of preferred stock and minority interest in the value of debt for purposes of unlevering/relevering beta, but do not tax-effect.
(2) Market value of equity should include all in-the-money net options and all other in-the-money common stock equivalents.

The Market Risk Premium

The market risk premium is an estimate of the excess returns an investor can expect to receive as compensation for bearing equity risk (i.e., investing in the market portfolio rather than a risk-free instrument).

- The market risk premium is calculated by taking an average of data points over many years in order to incorporate a large sample of events and mitigate measurement error.

- The market risk premium should be based on the same proxy for the market that is used to calculate the equity beta and on a Treasury security with the same duration as that used to calculate the risk-free rate.

The Market Risk Premium (cont.)

The appropriate time frame over which to calculate the market risk premium is a matter of debate.

- Ibbotson Associates calculates risk premiums over several time periods, the longest of which is from 1926 to date.
  - A long horizon is frequently used because a shorter period potentially underestimates the amount of change that can occur over a long future period and includes a smaller sample of unusual events.
  - The time frame from 1926 to the present includes periods of high and low returns, volatile and steady markets, war and peace, inflation and deflation, and prosperity and depression.
- The counterargument is that a shorter, more recent time frame is more relevant to circumstances today and is, therefore, a better predictor of the future.
  - Events influencing the market during the 1920s, 1930s, and 1940s are unlikely to repeat themselves.
  - In recent years, information used to evaluate equity is better, investors are more sophisticated, and the market is more efficient and more carefully regulated. Investors should therefore require a smaller premium for investing in equities today than they did in the earlier part of the century.

The Market Risk Premium (cont.)

Another controversial matter is whether the market risk premium should be calculated using an arithmetic or geometric mean.

Arithmetic Mean	Geometric Mean
■ Assumes annual returns are independent of one another (i.e., stock market returns follow a random walk).(1)	■ Assumes this year's return is dependent on last year's return.
■ Ibbotson Associates, whose widely publicized work on risk premiums has influenced a great deal of the empirical research to date, supports the use of arithmetic means. Leading academics such as Brealey & Myers are also proponents of the arithmetic mean.	■ Supported by empirical research by Fama and French (1988), Lo and MacKinley (1988), and Parteba and Summers (1988) which supports autocorrelation in returns.
■ May be more intuitive in explaining investors' expected average returns.(2)	■ May have more intuitive appeal in depicting the way investors calculate their earnings.(3)
■ Arithmetic means are additive like CAPM itself.	■ Geometric means are non-linear.

(1) To illustrate, suppose a stock today is priced at $10 and that the stock in two years could be at $5, $10, or $15. Assume that after year 1, the stock goes up to $15. Consider also the possible values of the stock in year 2. Given that the stock is now at $15, do the original three possible values of the stock still have merit, or is it more likely that the stock will be at, say, a new range of $10, $15, and $20? Proponents of geometric means would say that the new distribution of $10, $15, and $20 is more likely given the stock's historical performance (i.e., rise in price to $15). Proponents of arithmetic means would disagree, saying that despite the increase of the stock price to $15, the original distribution of $5, $10, and $15 is still just as likely as the new distribution of $10, $15, and $20.

(2) Consider a stock priced at $25. Assume that the investor expects his returns to be either 30% or -10% each year. The investor's expected average return, calculated using the arithmetic mean, is an intuitive 10%, while the geometric mean of the returns yields 8.2%.

(3) For example, assume an investor expects a stock over the next three years to go from $25 today to $50 in year 1, to $100 in year 2, and back to $25 in year 3. The annual return each year would be 100% in year 1 ($25 to $50), 100% in year 2 ($50 to $100), and -75% in year 3 ($100 to $25). The arithmetic mean over three years is 41.67%, while the geometric mean is 0.00%.

The Market Risk Premium (cont.)

Ibbotson Associates provides data that allow the following equity risk premia to be calculated over several time periods, using different Treasury rates and under different mean assumptions. [(1)]

United States

	Treasury Rate					
	Long-Term (20 years)		Intermediate-Term (5 years)		Short-Term (30 days)	
Time Period	Arithmetic Mean	Geometric Mean	Arithmetic Mean	Geometric Mean	Arithmetic Mean	Geometric Mean
1926–2000	**7.8%**	5.9%	8.2%	6.3%	9.1%	7.2%
1931–2000	7.7	5.9	8.2	6.4	9.2	7.4
1941–2000	8.3	7.1	8.7	7.5	9.6	8.4
1951–2000	7.6	6.3	7.8	6.6	8.7	7.5
1961–2000	5.8	4.7	6.1	4.9	7.0	5.9
1971–2000	6.3	5.1	6.7	5.5	7.7	6.5
1981–2000	8.1	7.3	8.6	7.8	9.8	9.1
1986–2000	9.5	8.6	10.1	9.3	11.4	10.6
1991–2000	11.6	10.7	12.3	11.4	13.6	12.7
1996–2000	13.2	12.2	13.6	12.6	14.2	13.2

(1) Source: Ibbotson Associates: *Stocks, Bonds, Bills, and Inflation, 2001 Yearbook*. Stock market returns are those of the S&P 500. Returns on the risk-free asset are based on the income returns of the 20-year Treasury bond and 5-year Treasury bond for long-term and intermediate-term premia, respectively. For short-term premia, the return is based on the yield of the 30-day Treasury bill.

The Market Risk Premium (cont.)

Ibbotson Associates also provides data that allow the following small-cap stock premia to be calculated. [(1)]

United States: Arithmetic Mean Returns

	Equity Market Capitalization		
Time Period	$840M–$4.144B Mid-Cap Premia	$192M–$840M Low-Cap Premia	< $192M Micro-Cap Premia
1926–2000	**0.6%**	**1.1%**	**2.6%**
1931–2000	1.2	2.3	4.1
1941–2000	1.0	1.8	3.6
1951–2000	0.7	1.1	1.6
1961–2000	1.0	1.7	2.1
1971–2000	0.8	1.2	0.2
1981–2000	(1.0)	(1.6)	(2.9)
1986–2000	(1.6)	(2.8)	(4.0)
1991–2000	(0.4)	0.5	2.5
1996–2000	(4.6)	(4.6)	(5.6)

In summary, it is appropriate to use a market risk premium of 7.8% and small-cap premia of 0.6% for mid-cap stocks, 1.1% for low-cap stocks, and 2.6% for micro-cap stocks.

(1) Source: Ibbotson Associates: *Stocks, Bonds, Bills, and Inflation, 2001 Yearbook*. Small stock risk premia are calculated by comparing the actual equity risk premia of the S&P 500 to the expected equity risk premia for each group of small-cap stocks (β_s x $ERP_{S\&P}$) for the specified time periods.

The Market Risk Premium (cont.)

Ibbotson Associates also provides data that allow long-term risk premia to be calculated for the following countries.

Arithmetic Mean Returns[(1)]

	United States	Canada	United Kingdom	France	Germany	Japan	Australia
In US Dollars							
1970–1999	6.7%	2.9%	7.0%	7.9%	8.5%	13.0%	1.8%
1980–1999	10.0	2.4	8.0	9.5	11.3	11.7	3.2
1985–1999	11.9	4.7	10.4	16.3	17.0	12.5	4.8
1990–1999	12.0	3.8	6.7	7.6	7.5	(0.9)	1.5
1995–1999	22.3	15.4	13.4	18.6	16.4	4.0	2.4
In Local Currency							
1970–1999	6.7%	4.0%	8.5%	8.2%	6.3%	7.1%	3.5%
1980–1999	10.0	3.2	9.5	11.9	11.5	5.7	5.6
1985–1999	11.9	5.0	7.9	13.8	13.3	4.1	6.4
1990–1999	12.0	5.6	6.9	10.0	10.1	(5.2)	3.2
1995–1999	22.3	15.4	12.7	23.8	22.4	2.7	5.3

These data must be considered in conjunction with the following points:

- Data is available for fewer years for non-US economies, which leads to higher standard errors and less reliable results.
- Bear Stearns' London office has indicated its belief that many European investment banking firms tend to use a market risk premium of 4.5%–6.0%. Further research is being done on this topic and will be included in the next version of this presentation.

(1) Source: Ibbotson Associates*: International Equity Risk Premia Report, 2000 Edition*. Stock market returns are those given by Morgan Stanley Capital International (MSCI) indices for all countries except the United States, which is based on the returns of the S&P 500. Returns on the risk-free asset are based on the income return on each country's long-term government bond.

Checking the CAPM Result

Because the market risk premium used in CAPM is based on the historical relationship between the return on the market portfolio (R_M) and the return on US Treasuries (R_F), it may be useful to check these inputs and the resulting cost of equity calculation with projected rates of return.

- Return on the market (R_M) in CAPM can be checked by using Value Line or another source of projected return on the market.
  - Value Line provides weekly median dividend yields and projected 3 to 5 year capital appreciation for the 1,700 stocks in its data base. Using the dividend discount model,(1) you can impute a projected return on the market by adding Value Line estimates of the dividend yield (in percent) to the annual capital appreciation (in percent).
  - Expected market risk premium (R_M-R_F) can be determined by subtracting the current yield on 20-year Treasuries from the projected return on the market.
- The cost of equity for public companies can be checked directly.(2)
  - Review recent analysts' reports for 3 to 5 year company projections and calculate the rate of return based on the dividend discount model.
  - If the Company is in Value Line's data base, consider Value Line's estimate of the Company's projected annual return over the next 3 to 5 years.
- While it is unlikely that the cost of equity from CAPM would coincide exactly with the projected rates of return for the market or the subject company using the dividend discount model, major differences in results should be explained.

(1) Based on the dividend discount model $K_E = D/P + g$, where K_E = cost of equity, D = annual dividend, P = stock price, and g = annual growth in dividends.
(2) If betas of comparable companies are used to estimate the subject company's beta, the cost of equity for the subject company can be checked by calculating the comparable company average rate of return based on the dividend discount model.

Calculating the Cost of Debt Capital

A company's cost of debt capital is generally calculated as a blended average of yields (weighted by market values) for all tranches of publicly traded debt and a blended average of coupons (weighted by book values) for non-traded debt.

- There are generally three principal categories of debt which may be valued separately.
  - Non-convertible, long-term debt without embedded options(1) (including capital leases and industrial revenue bonds).
  - Convertible debt, which can be treated as equity if the convertible is in-the-money and as straight debt if the convertible is out-of-the-money.(2)
  - Short-term debt which should be measured in terms of its average balance since it often varies significantly over the year.(3)
- In certain sectors in which off-balance sheet financing is prevalent (i.e., retailing and airlines), it may be appropriate to include operating leases in debt since they have similar economics to capital leases.(4) "Capitalizing" operating leases requires adjustments to income to exclude operating lease expense and replace it with additional interest expense and depreciation on the capitalized lease asset.(5)
- In evaluating a company with a rapidly improving or deteriorating credit profile, it may be distortive to use book values as a proxy for market values.

(1) The value of non-convertible debt for purposes of calculating WACC should be market value if publicly traded and book value if not traded.
(2) Treat out-of-the-money convertible debt as straight debt with no equity component. The cost of debt should be the straight debt rate (i.e., a higher rate than that on the convertible debt since no credit is given for the equity component). The value of debt can be estimated as the present value of expected cash flows from the convertible (assuming no conversion) discounted at the comparable straight debt rate.
(3) Since some portion of short-term debt will be continuously rolled over (i.e., permanent financing), it may be appropriate to use a long-term straight debt rate for that portion.
(4) By "capitalizing" operating leases, the user implicitly assumes that the stream of lease payments would be sufficient to acquire the asset.
(5) Depreciation expense can be estimated by assuming the present value of the operating lease payments is the value of the asset and applying a reasonable depreciation method. Interest expense can be estimated by using the "effective interest method." Principal payments on a capitalized lease flow through the cash flow statement.

Calculating the Cost of Other Non-Equity Capital

A company's WACC should include the after-tax cost of all other non-common equity sources of capital.

- The cost of non-convertible preferred stock can be estimated by the dividend yield and the value can be estimated by market value.
  - For non-traded preferred stock, the value may be estimated by the liquidation or redemption value (not book value).
  - Convertible preferred can be treated as common equity if the convertible is in-the-money and as straight preferred if the convertible is out-of-the-money.(1)
- Minority interests should be valued based on the market value of the subsidiary if the subsidiary is public.
  - For significant, non-traded minority interests, value may be estimated by using comparable companies analysis to derive equivalent trading value and then multiplying by the percentage minority interest. If comparable companies do not exist, minority interest should be estimated using a reasonable approach.
  - The discount rate for the minority interest should be the WACC of the company in which the minority interest is held.
- The value of all outstanding options and warrants should be included in the calculation of WACC.
  - The value of options is calculated by assuming all exercisable in-the-money options are exercised and the proceeds are used to retire common stock at the current stock price.
  - If the DCF is performed to value an acquisition target, assume all options become vested and exercisable.

(1) Treat out-of-the-money convertible preferred as straight preferred with no common equity component. The cost of the convertible preferred should be the straight preferred dividend yield (i.e., a higher dividend than that on the convertible preferred since no credit is given for the common equity component). The value of the preferred can be estimated as the present value of expected cash flows from the convertible (assuming no conversion) discounted at the comparable straight preferred dividend yield. If the subject company has no straight preferred, a reasonable estimate can be obtained by using a weighted average of the yields on the straight preferred of comparable companies.

Calculating the Terminal Value—Exit Multiples

Terminal value should be calculated using one or more of several methods, including comparable company multiples (e.g., EBITDA, EBIT and unlevered net income) and should be checked with the perpetuity growth method. The type of multiples used (i.e., public market versus private market[(1)]) will depend on the objectives of the DCF analysis (i.e., IPO versus M&A deal).

- The terminal value should generally reflect a public market valuation when valuing a company for an IPO.
- The terminal value should also reflect a public market valuation when valuing a company for a strategic acquisition in which the buyer does not plan to sell the target in the foreseeable future and for which synergies are explicitly included in the forecast.
- When valuing an acquisition target for a buyer that is expected to "flip" the acquired company, it may be appropriate to use a private market value for terminal value if synergies are not included in the cash flow projections. Note that private market multiples usually reflect synergy value, trophy value, the impact of defensive posturing, etc., and this value should not be double-counted through the explicit inclusion of synergies in the forecast.
- The terminal value multiple should reflect long-term growth expectations beyond the forecast horizon and should be applied to a normalized level of cash flow. The terminal value multiple may be less than the current EBITDA multiple to the extent that the company is in a high-growth industry or the current multiples are inflated due to short-term fads in the marketplace.
- Certain industry exceptions may exist for which it may be more appropriate to use multiples of revenue, EBIT or net income as the basis for calculating terminal value.

(1) A private market multiple refers to an "acquisition" multiple.

Calculating the Terminal Value—Perpetuity Growth Method

The perpetuity growth method should be used to check the reasonableness of the exit multiple assumption for the terminal value.

- The formula for a growing perpetuity[1] is:

$$\text{Terminal Value} = \frac{X}{r - g}$$

X = free cash flow in the first period of the perpetual stream.
r = discount rate in perpetuity (i.e., WACC).
g = perpetual growth rate.

- A practical limitation to the growing perpetuity formula is that it requires knowledge of the first free cash flow beyond the forecast horizon. If it is assumed that the free cash flow in the final year of the forecast horizon grows at the perpetual growth rate, then the growing perpetuity formula can be rewritten as follows:

$$\text{Perpetual Growth Rate} = \frac{(TV * r) - FCF}{TV + FCF}$$

TV = terminal value.
r = discount rate in perpetuity (i.e., WACC).
FCF = free cash flow in the final year of the projection period.

- For modeling purposes, this rewritten formula allows the user to calculate the implied perpetual growth rate in a data table using the iterate function.

- Above and beyond this, the user should normalize free cash flow[2] for purposes of calculating the perpetual growth rate, such that D&A and CapEx are equal.

(1) Source: Brealey & Myers, *Principles of Corporate Finance, Sixth Edition.*
(2) Normalized free cash flow is calculated as EBIT plus Non-Deductible Goodwill Amortization less Adjusted Taxes less increase in Working Capital. If the Company does not pay cash taxes during the projection period due to NOLs, Normalized free cash flow should include full Adjusted Taxes (thereby excluding the NOL tax benefit), unless the Company is sheltered from income taxes indefinitely.

Application of DCF to Foreign Investments

DCF is a useful tool in global analysis as long as assumptions are consistent and the market is properly defined.

- Forecast all cash flow in terms of the currency where it originates, including inflation expectations.
  - Inflation predictions may be based on the term structure of interest rates.
  - Risk is greater (and discount rate should be higher) in a market characterized by price controls which prevent local prices from keeping pace with inflation.
- Currency exchange rates may be predicted based on implied forward foreign exchange rates or, alternatively, a comparison of long-term nominal risk-free rates to determine the currency depreciation rate.
- As a general matter, all foreign cash flows should be assumed to be available for distribution and included in discounted cash flows. However, under certain circumstances, there may be a cash cost to repatriation of foreign earnings.
  - If dividends are paid (i.e., not reinvested in the firm), a withholding tax may apply to distributions outside the country.
  - Under certain circumstances, taxes paid due to foreign withholding taxes may be credited as a reduction to US federal income taxes.

Application of DCF to Foreign Investments (cont.)

- Calculate a foreign currency discount rate which reflects local political risk, foreign investment risk and currency exchange risk.
  - Use the country's long-term Treasury bond to approximate the risk-free rate.
  - Use one of the sources listed on page 13 for comparable company betas.
  - Calculate the market risk premium using the same definition of the market that was used to calculate beta and the same long-term Treasury bond that was used to estimate the risk-free rate.
  - The local stock market may be used as the market proxy if a long enough time series exists and it is sufficiently liquid or, alternatively, it may be appropriate to use a global index. The international market risk premium data provided on page 20 is based on returns on Morgan Stanley Capital International (MSCI) country-specific equity indices against long-term income returns on each country's long-term government bond.
  - A point of reference to estimate discount rates is to refer to venture capitalists' required rates of return on similar investments.
- It may be appropriate to use other valuation methodologies in conjunction with DCF to value foreign companies since US betas are not applicable in foreign markets, and DCF values in foreign currencies may not be directly convertible to values in US dollars.

Other Exceptions to the General Application of DCF

While the preceding valuation guidelines generally apply to most situations, it may be appropriate to use different assumptions for companies with rapidly changing capital structures, start-up companies or highly regulated firms.

- To value a firm with a rapidly changing capital structure (i.e., an LBO), it will generally be appropriate to use a different WACC during different phases of the forecast period as financial leverage changes.
  - In general, a company should be evaluated based on a forward looking capital structure.
  - If the WACC assumption is based on a dramatic change in capital structure, it may be appropriate to factor in transaction costs.
- Alternatively, adjusted net present value can be applied to address a changing capital structure without having to adjust the company's WACC each year (see p. 29).
- To the extent that lack of marketability/liquidity or minority position is not accounted for in either cost of capital or in the cash flows, it may be appropriate to discount the resulting valuation.
- Regulated industries (e.g., utilities) may require adjustments to cost of capital estimates due to rate setting.

Adjusted Net Present Value

The adjusted net present value takes into consideration changes to the capital structure without having to adjust the company's WACC each year.

- Traditional DCF analysis using WACC assumes a constant capital structure measured by the ratio of debt to equity.

- When a company's capital structure changes over time (i.e., an LBO), it is inconsistent to apply the same WACC to period cash flows.
  - By definition, changes in the capital structure would change the company's WACC year to year.
  - All else equal, WACC is affected by the tax shield associated with debt financing.
  - Therefore, the value of the firm is equal to the value of the entity if all equity financed plus the value of the tax shield.

Enterprise value = (value of the firm if all equity financed) + (value of the tax shield)

- Step 1: Discount unlevered free cash flows at the company's **cost of equity**.

- Step 2: Calculate the tax shield.
  - Estimate tax shield by multiplying interest expense by the company's marginal tax rate.
  - Discount the tax shield at the company's after-tax cost of debt.

Valuing Non-Cash Generating and Non-Operating Assets

When appropriate, significant non-cash generating assets (e.g., real estate) and non-operating assets may need to be valued separately and added to the DCF value of a company's core assets.

- The value of non-cash generating assets may be based on appraisals or a liquidation approach.
  - Asset appraisals may be obtained from company management or independent appraisers.
  - Negotiations regarding planned sales of the assets should be considered.
  - Book values of non-cash generating assets may be available in company financials.
- The value of the assets should not already be included in the value of the operations. If the non-cash generating assets are characteristic of the industry, the value of the assets may already be incorporated into the stock prices of selected comparable companies which may have been used as the basis for estimating the terminal value multiple.
- To the extent that non-operating income is significant and is derived from activities which have a different risk profile from the operations being valued, these non-operating assets should be valued separately.

Example of Discounted Cash Flow Analysis

DCF Sensitivity Analysis[1][2]

($ in millions, except per share data)

Enterprise Value

WACC	EBITDA Exit Multiple to Calculate Terminal Value				
	6.0x	6.5x	7.0x	7.5x	8.0x
8.0%	$996.1	$1,069.8	$1,143.5	$1,217.3	$1,291.0
8.5	976.7	**1,048.9**	**1,121.1**	**1,193.3**	1,265.5
9.0	957.8	**1,028.5**	**1,099.2**	**1,169.9**	1,240.7
9.5	939.3	**1,008.6**	**1,077.9**	**1,147.2**	1,216.4
10.0	921.3	989.2	1,057.1	1,124.9	1,192.8

Equity Value Per Share

WACC	EBITDA Exit Multiple to Calculate Terminal Value				
	6.0x	6.5x	7.0x	7.5x	8.0x
8.0%	$17.65	$19.50	$21.34	$23.18	$25.02
8.5	17.17	**18.97**	**20.78**	**22.58**	24.39
9.0	16.69	**18.46**	**20.23**	**22.00**	23.77
9.5	16.23	**17.97**	**19.70**	**21.43**	23.16
10.0	15.78	17.48	19.18	20.87	22.57

Implied Perpetual Growth Rate of Terminal Year Unlevered FCF

WACC	EBITDA Exit Multiple to Calculate Terminal Value				
	6.0x	6.5x	7.0x	7.5x	8.0x
8.0%	2.8%	3.1%	3.5%	3.8%	4.0%
8.5	3.2	**3.6**	**4.0**	**4.2**	4.5
9.0	3.7	**4.1**	**4.4**	**4.7**	5.0
9.5	4.2	**4.6**	**4.9**	**5.2**	5.5
10.0	4.7	5.1	5.4	5.7	6.0

Enterprise Value/2001 EBITDA[3]

WACC	EBITDA Exit Multiple to Calculate Terminal Value				
	6.0x	6.5x	7.0x	7.5x	8.0x
8.0%	6.4x	6.8x	7.3x	7.8x	8.3x
8.5	6.2	**6.7**	**7.2**	**7.6**	8.1
9.0	6.1	**6.6**	**7.0**	**7.5**	7.9
9.5	6.0	**6.4**	**6.9**	**7.3**	7.8
10.0	5.9	6.3	6.8	7.2	7.6

Equity Value Per Share Sensitivity[4]

EBITDA % of Plan	EBITDA Exit Multiple to Calculate Terminal Value				
	6.0x	6.5x	7.0x	7.5x	8.0x
120.0%	$23.07	$25.19	$27.31	$29.44	$31.56
110.0	19.88	**21.83**	**23.77**	**25.72**	27.66
100.0	16.69	**18.46**	**20.23**	**22.00**	23.77
90.0	13.51	**15.10**	**16.69**	**18.28**	19.87
80.0	10.32	11.73	13.15	14.56	15.98

(1) All values represent the Subject Company stand-alone case and assume no synergies as of June 30, 2001.
(2) The range from high to low for the WACC and EBITDA Exit Multiple should be carefully reviewed by the user to determine the appropriate increments.
(3) Based on annualized 2001 EBITDA.
(4) Assumes a 9.0% discount rate.

Example of Discounted Cash Flow Analysis (cont.)

Projected Cash Flows[1]

($ in millions, except per share data)

	Years Ending December 31,					
	2001E[2]	2002E	2003E	2004E	2005E	CAGR (01–05)
Revenue	$202.5	$428.6	$453.8	$481.4	$509.7	5.9%
Annual Growth	*NM*	*5.8%*	*5.9%*	*6.1%*	*5.9%*	
EBITDA	78.2	164.5	173.7	185.8	196.8	5.9
Annual Growth	*NM*	*5.2%*	*5.6%*	*7.0%*	*5.9%*	
Margin	*38.6%*	*38.4*	*38.3*	*38.6*	*38.6*	
EBIT	$25.3	$56.0	$60.3	$84.2	$99.9	18.6
Annual Growth	*NM*	*10.7%*	*7.7%*	*39.6%*	*18.6%*	
Margin	*12.5%*	*13.1*	*13.3*	*17.5*	*19.6*	
Adjusted Taxes[3]	(8.9)	(19.6)	(21.1)	(29.5)	(35.0)	
Unlevered Net Income	$16.4	$36.4	$39.2	$54.7	$64.9	18.5
Annual Growth	*NM*	*10.7%*	*7.7%*	*39.6%*	*18.6%*	
Margin	*8.1%*	*8.5*	*8.6*	*11.4*	*12.7*	
Plus: Depreciation and Amortization Expense	52.9	108.5	113.4	101.6	96.9	
Less: Capital Expenditures	(56.9)	(121.5)	(120.3)	(122.3)	(124.3)	
Increase in Working Capital	(0.9)	(1.0)	(1.1)	(1.2)	(1.2)	
Free Cash Flow to the Unlevered Firm (FCFF)	$11.5	$22.4	$31.2	$32.8	$36.3	12.0
Annual Growth		*(3.0%)*	*39.3%*	*5.2%*	*10.7%*	

Present Value of Equity @ 6/30/01

PV of 2001 Free Cash Flow Stub[2]	$11.3	1.0%
PV of 2002–2005 Free Cash Flows[2]	97.9	8.9
PV of Terminal Value[2]	990.0	90.1
Enterprise Value	$1,099.2	100.0%
Less: Total Debt @ FMV	(300.0)	
Preferred Stock @ FMV	0.0	
Minority Interests @ FMV	0.0	
Plus: Cash and Equivalents @ FMV	10.0	
Non-Cash Generating Assets @ FMV	0.0	
Equity Value	$809.2	
Net Fully Diluted Shares (millions)	40.0	
Per Share Value	$20.23	

DCF Assumptions

Weighted Average Cost of Capital	9.0%
Terminal EBITDA Multiple	7.0x
EBITDA—% of Plan Achieved	100.0%
Implied Perp. Growth Rate of Free Cash Flows[4]	4.4
Tax Rate	35.0

(1) Source: Subject Company Management.

(2) Assumes 183 days remain in 2001E (Valuation as of 6/30/01); mid-period convention for annual cash flows; and the terminal value cash flow occurs at 12/31/05. Terminal value equals present value of 2006 EBITDA of $208.4 million * 7.0x Terminal Forward EBITDA Multiple.

(3) Calculated by multiplying the marginal tax rate by EBIT after adding back items which are not tax deductible such as non-deductible goodwill amortization. Subtract (add) estimated increases in net deferred tax liabilities (assets). If the company has NOLs or is not expected to be a taxpayer within the forecast horizon, there should be no cash taxes.

(4) Implied perpetual growth rate of FCFF = [(2006 EBITDA)*(Terminal EBITDA Multiple)*(WACC) - (2005 Normalized Free Cash Flow)]/[(2006 EBITDA)*(Terminal EBITDA Multiple)+(2005 Normalized Free Cash Flow)]. Normalized free cash flow is calculated as EBIT plus Non-Deductible Goodwill Amortization less Adjusted Taxes less increase in Working Capital. If the Company does not pay cash taxes during the projection period due to NOLs, Normalized free cash flow should include full Adjusted Taxes (thereby excluding the NOL tax benefit), unless the Company is sheltered from income taxes indefinitely.

Example Weighted Average Cost of Capital Calculation

Assumptions

Tax Rate for Comparable Companies	40.0%
Tax Rate for Subject Company	35.0
Risk-free Rate of Return (Rf)[1]	5.5
Market Risk Premium (Rm - Rf)[2]	7.8
Mid-Cap Premium[2]	0.6
Subject Company Assumed D/(D+E)	30.0
Subject Company Cost of Debt (Kd)	7.5

Beta Calculation

($ in millions)

Company	Predicted Levered Beta[3]	Market Value of Debt	Market Value of Equity[4]	Leverage Ratio (Debt/Equity)	Unlevered Beta[5]
CenturyTel	0.780	$3,503.9	$3,937.3	89.0%	0.508
Citizens Communications	0.678	5,786.9	4,460.8	129.7	0.381
Commonwealth Telephone	0.519	321.2	735.6	43.7	0.411
Average for Comps					**0.433[6]**
Subject Company	**0.605**	**$300.0**	**$700.0**	**42.9%**	**0.473**

BSC Selected Unlevered Beta	0.473[7]
Subject Company Leverage Ratio (D/E)	42.9%
Subject Company Tax Rate	35.0%
Subject Company Levered Beta[8]	**0.605**

WACC

Market Risk Premium (Rm - Rf)[2]	7.8%
Multiplied by: Subject Company Levered Beta	0.605
Adjusted Market Risk Premium	4.7%
Add: Risk-free Rate of Return (Rf)[1]	5.5
Add: Mid-cap Premium[2]	0.6
Cost of Equity	**10.8%**
Multiply by: Subject Company E/(D+E)	70.0
Cost of Equity Portion	7.6
Subject Company Cost of Debt (Kd)	7.5
Subject Company Tax Rate	35.0
After-tax Cost of Debt	**4.9%**
Multiply by: Subject Company D/(D+E)	30.0
Weighted Avg. Cost of Debt Portion	1.5
WACC	**9.0%**

WACC Sensitivity Analysis

	WACC				
Assumed D/(D+E)	Pre-Tax Cost of Debt				
	7.00%	7.25%	7.50%	7.75%	8.00%
0.0%	9.8	9.8	9.8	9.8	9.8
15.0	9.4	9.4	9.4	9.4	9.5
30.0	8.9	9.0	9.0	9.1	9.1
45.0	8.5	8.6	8.7	8.7	8.8
60.0	8.1	8.2	8.3	8.4	8.5

(1) Source: Bloomberg. Equal to the interpolated yield on the 20-year US Treasury Bill as of April 24, 2001.
(2) Source: Ibbotson Associates: *Stocks, Bonds, Bills and Inflation, 2001 Yearbook.*
(3) Source: BARRA.
(4) Equity values based on April 24, 2001 closing prices.
(5) Unlevered Beta = Levered Beta/ [1 + ((D/E) * (1 - T))].
(6) Average Unlevered Beta Based on Weighted Average Total Market Capitalization. Total Market Capitalization = Total Market Value of Debt + Total Market Value of Equity.
(7) Based on the Unlevered Beta of the Subject Company, which is consistent with the industry average Unlevered Beta.
(8) Levered Beta = Unlevered Beta * [1 + ((D/E) * (1 - T))].