Q: Please provide a copy of Dr. Cannon's paper entitled "The Capital Asset Pricing Model Approach to Estimating the Cost of Equity Capital" – QSB monograph (2003).

A: The requested document is attached.

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THE "CAPITAL ASSET PRICING MODEL" APPROACH TO ESTIMATING THE COST OF EQUITY CAPITAL

Q: What is the "Capital Asset Pricing Model"?

A: The Capital Asset Pricing Model, or CAPM for short, is a valuation and cost of capital model that is ultimately grounded in the belief that investors are, for the most part, risk averse and *must be offered the prospect of achieving proportionally higher investment returns* to be willing to assume greater investment risk. The theoretical foundations of the CAPM are very strong and have been extensively researched, and many investment advisory services and consulting firms have adopted the model and its conclusions as one of the tools in their arsenal of financial analysis techniques. The CAPM is essentially one very simple variation within the general class of risk premium approaches to determining the cost of equity capital which also includes the multi-factor arbitrage pricing model (APT).

The CAPM is a single factor model which focuses exclusively on the beta risk or market-related risk of individual securities (i.e., on that part of their total investment riskiness which can<u>not</u> be eliminated by careful portfolio diversification), on the grounds that when well-diversified investors (e.g., pension funds) add additional stocks to their portfolios, the total riskiness of their portfolios increases only by the amount of the beta or systematic riskiness of these added stocks. Therefore, *the only extra return that these investors really require*, in order to find it worthwhile to expand their portfolios in this manner, is the extra return required to compensate them for the additional beta risk they have taken on. Consequently, for these investors, in equilibrium, required rates of equity return (or the cost of equity capital, from the corporation's perspective), above and beyond the "riskfree rate of interest," are determined solely by (1) the beta riskiness of firms and (2) the extra return compensation, per unit of beta risk, that the average investor requires to be willing to invest in risky stock market securities (as opposed to investing in the "riskless asset" and earning the "riskfree rate of interest").

The cost-of-equity-capital (k_e) formula that makes up part of the overall CAPM is expressed as,

$$k_{ei} = r_F + \beta_i \; [E(r_M) - r_F] \qquad (1)$$

This note was prepared by Dr. William T. Cannon for class use.

where:

k_{ei} = the cost of equity capital associated with the shares of firm i;

r_F = the "riskfree rate of interest";

β_i = the *future* beta riskiness of the shares of firm i; and

$[E(r_M) - r_F]$ = the "market risk premium (MRP)," or the "market compensation per unit of beta risk", or the "market price for beta risk reduction", or the "equity risk premium (ERP) required for the market as a whole."

Q: Empirically speaking, how reliable and useful is the CAPM?

A: Recent research, based on U.S. securities data over long periods of time up through the 1990s, indicates that a number of variables other than beta risk have been more important in explaining periodic, *ex post* investment rates of return and stock market valuations. These results have called into question the usefulness and reliability of the CAPM as a *positive* model for explaining and predicting stock prices. The conceptual roles played by these other empirical factors – which are principally the firm's size, leverage ratio, earnings-to-price ratio, and the market-value-to-book-value ratio of its shares – are not well understood. Researchers speculate that these empirical factors may proxy aspects of risk which overlap only partially with those subsumed in the beta risk variable.

The weaknesses of the CAPM as a positive, predictive model do not, however, invalidate its use as a *normative* model for establishing required rates of return or investment hurdle rates in all circumstances. For investors who, for any given level of investment return, wish to minimize the variability of their portfolio returns from period to period – either for themselves or their client-beneficiaries – and who can and do diversify their investment portfolios fairly widely, beta risk *should be* a major consideration in evaluating the relative attractiveness of competing investment opportunities, and, properly applied, the CAPM can be a useful tool in this pursuit.

Q: What are the major problems associated with the CAPM approach, from a practical, implementation point of view?

A: There are really only three, all of which involve the need to forecast *future values* for the input variables when the historical data for these variables is often a poor guide to the future. With the beta coefficient, for example, while we may estimate historical values for this variable with a considerable amount of confidence, there is no guarantee that the firm's future beta riskiness will mirror its past performance, especially if the nature or policies of the firm are changing over time. And with the "market-average equity risk premium" or MRP variable, the historical values are very sensitive to the particular time period chosen. Consequently, it is impossible to be sure which, if any, of the historical values is most likely to represent future market conditions or requirements. Nevertheless, the application of experienced judgment within the framework of the model can reduce these problems to manageable proportions and make the CAPM a useful addition to one's arsenal of cost-of-equity estimation techniques.

Another problem area involves the choice of the variable or value to represent the "riskfree rate of interest". All three straight-forward empirical candidates to represent the riskfree rate – that is, the short-term treasury bill rate, the 5-10 year government bond yield, and the long-term government bond yield – are encumbered with at least some theoretical and practical deficiencies. Consequently, the choice or construction of the most appropriate empirical proxy for the riskfree rate depends, in the end, on the circumstances of the situation.

Q: What are the pros and cons of using the short-term treasury bill (T-bill) rate to represent the riskfree rate?

A: From the perspective of investors with short-term holding periods, the T-bill rate is the theoretically-preferred empirical proxy. Treasury bills are subject to no default risk and, because their *price* movements are confined within a very narrow range, T-bill investors experience virtually no capital value or price fluctuation risk. Unfortunately, however, T-bill *yields* may be quite volatile and are subject to considerable influence by the central bank in the short run. Indeed, T-bill yields are frequently manipulated as part of the government's exchange rate and economic stabilization policies. These factors may compromise the validity of the T-bill rate as an accurate reflection of the underlying level of the "riskfree rate".

Moreover, when estimating a stock's required return, we are often seeking a cost of equity to be applied to project or corporate cash flows projected over many years in the future. If this is the case, use of the currently-prevailing T-bill rate may not provide good results. The reason is that the currently-prevailing T-bill rate reflects the market's short-term inflation forecast, while we really want a cost of equity incorporating long-term inflation expectations. One approach to correcting for short-term fluctuations in the T-bill rate (and in the inflation rate) is to estimate the T-bill rate expected to prevail on average in the future by finding and using the future T-bill rates implicit in the prevailing zero-coupon government yield curve. This estimated average future T-bill rate can then be used as the riskfree rate in estimating the cost of equity capital in the longer run. Alternatively, for very sophisticated analyses, these year-by-year estimates of future T-bill rates can be employed to calculate different costs of equity for each year in the future.

Q: What are the benefits and deficiencies with using long-term government bond yields to proxy the riskfree rate?

A: Both the derivation and the logic of the CAPM require that the market risk premium (MRP) used in the model, and associated with the beta measure of risk, be one which focuses on the difference between the market returns on various risky securities (such as common stocks) and the "*riskfree* rate of return". Unfortunately, while investors in longer-term government bonds are free from default risk, they are generally exposed to considerable "capital value risk" (which is sometimes referred to as "maturity risk"). Long-term bond prices and rates of return fluctuate quite dramatically as interest rates in the economy change. Therefore, unless an investor plans to buy and hold a long-term government bond right up until its maturity, perhaps some 20 to 30 years into the future, there is a considerable risk that he/she will suffer a capital loss when he/she comes to sell the bond. As a consequence, longer-term government yields incorporate a "maturity risk premium" or "capital value risk premium" to compensate investors for this element of risk and are, therefore, at least suspect as a representation of the "riskfree rate". Indeed, various studies have shown that the investment returns on long-term Canadian government bonds have been about 60% as volatile as an investment in the Toronto Stock Exchange Composite Stock Index over the past 40 years. Of course, the problems noted above, while still present, are somewhat less with 5-to-10 year bond yields, as compared with 30-year bond yields.

On the other hand, longer-term government bond yields have the relative advantages that (1) they are less susceptible to short-term economic policy distortions and (2) they tend to reflect inflation expectations over a longer time horizon – one that is more consistent with the anticipated cash flows from an investment project or an on-going corporation. Furthermore, the "duration" of longer-term bonds approximates the duration of the stock market index portfolio and, in this respect, the use of the longer-term government yield as the riskfree rate is more consistent with the beta coefficients and MRPs estimated relative to the "market portfolio".

Q: Is there any way to secure the conceptual advantages of using the longer-term government yield as a riskfree rate proxy while mitigating or circumventing its inherent, risk-related deficiency?

A: Yes, there is. What practitioners have attempted to do is to remove the "maturity/capital value risk premium" from the longer-term government yield to obtain a value which, in theory at least, contains no compensation for risk. The "maturity risk premium" is often approximated by the historical positive amount by which long-term bond yields/returns have exceeded short-term T-bill yields/returns, although other estimation procedures may be equally valid. In a nutshell, the approach involves subtracting the estimated "maturity risk premium" (often found as the average historical spread between the long-term government bond return and the T-bill return) from the currently-prevailing, long-term government bond rate. The resulting estimated riskfree rate incorporates the long-term inflation forecast inherent in the long-term government bond yield, rather than the short-term inflation forecast reflected in the currently-prevailing T-bill rate, and will be particularly appropriate for establishing investment hurdle rates for projects with cash flows anticipated to occur for many years into the future.

Q: What is a reasonable estimate for the "maturity risk premium" imbedded in long-term Government of Canada bonds?

A: Over the 1957-2002 period, the experienced maturity risk premium for long-term Canada bonds averaged 93 basis points (bps) or 0.93%. The corresponding figure for the U.S. over the 1900-2002 period was 114 bps. It is important to note, however, that the maturity risk premium tends to vary over the interest rate cycle – being lowest when rates in general are at their cyclical peaks and long-term bonds are least risky, and being highest when interest rates are near their cyclical lows – the point in the cycle when long-term bonds embody the greatest amount of investment risk. Consequently, it is reasonable to suppose that the maturity risk premium might fluctuate between 50 bp and 140 bp depending on the strength of the analyst's views as to the likely future direction of long Canada bond prices. The maturity risk premium imbedded in 5, 10, and 15-year Canada bonds will, of course, be smaller to the extent that the *durations* of these bonds are less than the duration of 30-year bonds.

Q: What is the "market risk premium" (MRP) or the "equity risk premium required by the market as a whole", and what is the best way to predict its value for the future?

A: The MRP is the difference between the expected *future* rate of return on the market portfolio and the expected future riskfree rate. Conceptually, this value represents the amount of return investors in general are willing to forego in order to reduce the risk associated with owning shares in a diversified group of corporations. As such, the willingness to sacrifice return will depend to some extent on investors' perceptions of the overall riskiness of owning corporate shares as opposed to, say, real estate, consumer durables, or even stores of food in the cellar. In times of war, social upheaval, or extreme economic uncertainty, stock market investors will generally be willing to sacrifice more to reduce investment risk than during periods of placid prosperity. So the MRP is very much a *forward-looking* concept whose value must be forecasted with each application of the CAPM, especially for short-term, stock-value-prediction purposes.

The starting point for estimating the future MRP is typically taken to be the historical difference between the average stock market return (as represented by the average return on some market index portfolio) and the average return on the instrument or constructed variable chosen to represent the riskfree rate. This difference varies widely from country to country and from one historical period to another, and has even been negative for periods as long as a decade. To overcome the bias that might otherwise accompany the choice of the historical reference period, practitioners have tended to focus on the average values for the longest available time periods. This approach is most defensible, of course, when the purpose of the cost-of-equity estimates is to set hurdle rates for long-lived projects whose lifetime is likely to span periods of both investor exuberance and investor caution/despair, both of which will be amply represented within long historical periods. (The Appendix at the end of this note provides an extensive review of the evidence with respect to *historical* MRPs in Canada, the U.S., and worldwide, as well as recent estimates of the *forward-looking* MRPs for the Canadian, U.S., and other developed-world equity markets.)

The MRPs experienced by investors owning Canadian stocks have tended to be lower than those associated with owning U.S. stocks since the Second World War. Some observers attribute this to differences in the way that investment returns have been taxed in the two countries and/or differences in federal government monetary and fiscal policy impacts. Whatever the historical explanations may be, they may or may not apply for the future. Also, the New York Stock Exchange (NYSE) is a closer approximation, than the Toronto Stock Exchange (TSE), to the theoretically-appropriate, world market portfolio. Consequently, for investors who are not constrained to investing only in TSE-listed shares, the prospective future U.S. or world MRP may be a more-appropriate basis for establishing equity return requirements. On this basis, and drawing from the collective results of the studies reviewed in the Appendix at the end of this note, a MRP (arithmetic-average basis) in the range of 3.5% to 4.5% in relation to T-bill yields or the yield on the *riskless* long-term asset (i.e., long Canada yields with the maturity risk premium subtracted off) may be a reasonable estimate under *normal* market conditions for Canadian and U.S. stocks. Depressed market conditions might call for an estimated value 2% to 3% higher than this, while under buoyant stock market conditions/expectations, the MRP might go as low as 1% to 2%.

Q: How should one estimate *historical* beta coefficients for the shares of publicly-traded firms?

A: One simply calculates the periodic (daily, weekly, monthly, or quarterly) rates of investment return – i.e., dividend income plus capital gains (or losses), as a percentage of the beginning-of-period stock prices – for the subject shares and regresses these returns over time against the corresponding periodic returns for the appropriate market portfolio or market value index. Ideally, the time period chosen for the regression should span both bull and bear market periods. Commercial investment advisory services tend to use 5-year or 7-year estimation periods. The longer the regression period extends into the past, however, the greater the likelihood that the firm's risk characteristics will have changed within the period and that the beta value estimated over the entire past period will no longer reliably reflect the share's current systematic riskiness or its sensitivity to general market fluctuations.

Q: How can one estimate the historical beta risk value for a firm whose shares have not been trading on a stock exchange, at least not for a sufficiently long time, or for a business organization which has operated as a wholely-owned division of a larger firm?

A: There is no cut-and-dried rule or approach to employ in this situation. One simply has to use his/her imagination tempered with a good deal of common sense. Comparisons with other firms in the same industry which are publicly traded is one possible approach. The average, financial-leverage-adjusted beta for these similar firms may be a reasonable estimate for the subject firm's beta. Regression analysis on the betas of the other firms in the subject firm's industry may allow the beta estimate to be further refined to reflect other factors such as size, product mix, location, profitability, ownership structure, and/or investment-trading liquidity.

In some cases, accounting data and simulations may be used to estimate beta. For example, in the statistical formula for beta set out below, firm i's accounting return on common equity ($ROCE_i$) may be used, in place of the investment return on the firm's shares (r_i), to estimate the firm's beta. That is,

$$\beta_i \equiv \left(\frac{SD(r_i)\, \rho(r_i, r_m)}{SD(r_m)} \right) \rightarrow \left(\frac{SD(ROCEi)\, \rho(ROCE_i, r_M)}{SD(r_M)} \right) = \beta_i \qquad (2a)$$

In a similar manner, an estimate of what the firm's or division's beta might be if it were financed entirely by equity – that is, if it were totally <u>un</u>levered – can be found by regressing its historical EBIT/Assets ratio against the corresponding periodic returns for the appropriate market index (M) over t = 1,2,…n, as shown below,

$$(EBIT_i / A_i)_t = a + \beta_{Ui} [r_{Mt}] \qquad (2b)$$

or by estimating the required inputs and plugging them into the following formula.

$$\beta_{Ui} \equiv \left(\frac{SD(EBIT_i/A_i)\, \rho(EBIT_i, r_m)}{SD(r_m)} \right) \qquad (2c)$$

Q: Suppose a firm has just completed a merger with another firm or made a significant acquisition. If we know, or have estimates of, the historical, pre-merger/pre-acquisition beta values for the aggressor firm and its target, is there any way to estimate the likely post-merger or post-acquisition beta value for the surviving firm?

A: Yes there is. If the merger or acquisition is consummated solely by means of an exchange of common shares for common shares or cash for common shares, with no change in the aggressor firm's actual or target financial leverage ratio, then the aggressor firm's post-merger or post-acquisition beta riskiness will simply be a weighted average of the pre-merger betas of the component parts. More precisely, if A is the aggressor firm, B is the target firm or assets, and S is the pre-merger market value of the common shares of the firms or assets, then

$$ß_{AB} = \left(\frac{S_A}{S_A + S_B}\right) ß_A + \left(\frac{S_B}{S_A + S_B}\right) ß_B \qquad (3)$$

where $ß_A$ and $ß_B$ are historical, pre-merger beta estimates and the weights are the respective market value fractions that the two components contribute to the merged entity.

Q: Many mergers and acquisitions, especially those paid for out of the proceeds of debt issues, do involve a significant change in the aggressor firm's subsequent actual and, possibly, target financial leverage ratio. Moreover, even in the absence of mergers and acquisitions, firms occasionally change their financial policies and adopt new target debt-to-capitalization ratios. Is there any way to adjust the beta estimate for a firm to reflect changes in its *target* financial leverage ratio?

A: Indeed there is. The presence of debt in a firm's capital structure has an impact on the risk borne by its shareholders. In the absence of debt, shareholders are subjected only to basic business or operating risks. This business risk is determined by factors such as the volatility of the firm's sales, its level of operating leverage, and its profitability. As compensation for incurring business risk, investors require a premium in excess of the return they could earn on a riskless security such as a treasury bill. Thus, in the absence of financial leverage, a stock's expected return can be thought of as the riskfree rate plus a premium for business risk.

The addition of debt to a firm's capital structure increases the risk borne by its shareholders. One source of additional risk is the effect of financial leverage on the volatility of shareholders' returns. The fixed obligations associated with debt magnify the relative variation in a firm's operating cash flows over time. The result is a more volatile stream of shareholder returns. For investors to hold the shares of firms with debt in their capital structures, they must be compensated for the additional risk generated by financial leverage. The additional risk premium associated with the presence of debt in a firm's capital structure is the financial risk premium.

Therefore, the expected return on a firm's stock can be thought of as the riskfree rate plus premiums for business risk and financial leverage risk.

Expected Return	=	Riskfree Rate	+	Business Risk Premium	+	Financial Leverage Risk Premium

In terms of the CAPM, the firm's combined business and financial risk are reflected in its *equity* beta risk coefficient. If a firm has no debt in its capital structure, the stock's risk premium consists solely of a business risk premium. The stock's beta therefore reflects only the systematic risk inherent in its basic business operations. With no financial leverage, this beta is its *unlevered* beta, β_u. This unlevered beta is the beta the stock would have if the firm had no debt in its capital structure, and is variously referred to as its *business-risk* beta, or *asset* beta, or *operational-risk* beta.

The presence of debt in a firm's capital structure results in the systematic riskiness inherent in its basic business operations being *amplified* by financial leverage. With financial leverage, the beta on a firm's stock reflects both business and financial risk. This beta is called a *levered* beta, β_L. The betas published by investment advisory services are invariably levered betas which reflect both the business and the financial risk experienced during the time period over which the beta was determined.

Under the assumptions of the CAPM, there is a simple relationship between levered and unlevered betas; that is,

$$\beta_L = \beta_U \; [1 + (1 - \tau)\, B/S] \qquad (4a)$$

or, alternatively,

$$\beta_U = \frac{\beta_L}{[1 + (1 - \tau)\, B/S]} \qquad (4b)$$

where β_L = the levered equity beta,
β_U = the unlevered (debt-free) equity beta,
τ = the corporate marginal tax rate, and
B/S = the debt-to-equity ratio for the firm or division, expressed in terms of <u>target market value</u> proportions.

Q: Can you give us an example of how to use this formula?

A: Certainly. Suppose Acme Widget's equity beta over the past 60 months has been calculated to be 1.00. Suppose further that during this past 5-year period, Acme has successfully strived to maintain a <u>market-value</u>, debt-to-capitalization ratio in the neighbourhood of 33.3% (i.e., B/(B+S) = 33.3%) – which is the same as a <u>market-value-based</u>, debt-to-equity ratio of 50% (i.e., B/S = 50%) – and the firm's marginal corporate tax rate has averaged 50% over the past 5 years and is expected to remain at this level in the future (i.e. τ = 50%). Acme's measured, historical beta of 1.00 is, of course, a levered beta and reflects the impact of the company's use of financial leverage over the past 5 years on the riskiness of the residual returns (after debt servicing) to its shareholders.

Now, suppose we wish to estimate the likely impact of Acme's increasing its target debt-to-equity ratio to 100% by issuing debt and using the proceeds to buy back some of its common shares. To estimate the beta value that would likely result from such a change in capital structure policy, we need a two-step procedure. The *first step* is to *unlever* Acme's beta using formula (4b), as follows,

$$\beta_U = \frac{\beta_L}{[1 + (1-\tau)\, B/S]} = \frac{1.00}{[1 + (1 - .5)\ (50\%)\,]} = 0.80$$

This result indicates that, in the absence of debt financing, Acme's unlevered equity beta would be 0.80.

The *second step* is to *re-lever* Acme's beta, on a pro forma basis, to that target debt or financial leverage ratio that the analyst wishes to examine. For a target debt-to-equity ratio of 100%, we can estimate Acme's resulting beta using formula (4a), as follows,

$$\beta_L = \beta_U\ [1 + (1-\tau)\, B/S] = (0.80)\,[1 + (1 - .5)\,(100\%)] = 1.20$$

The beta value that results is an estimate of the likely beta riskiness of Acme's shares if the firm were to adopt the more-leveraged, capital structure financing target.

Q: Are there any other methods one could use to examine the relationship between beta and financial leverage for, say, firm's in a particular industry?

A: As indicated earlier, an analyst might reasonably employ regression analyses on a collection of the firms in a given industry, as long as reliable estimates for the historical betas and the companies' effective target leverage ratios over the corresponding period were available. More specifically, an analyst might use cross-firm data, for all firms i (with suitable available data inputs) within a particular industry, to specify the regression equation

$$\beta_i = a + b\left(\frac{B}{B + S}\right)_i \qquad (5)$$

Implicit in this procedure is the somewhat unrealistic assumption that all the firms in the industry will have the same level of systematic business risk and, therefore, differences in their observed equity betas will be attributable only to differences in the level of financial leverage employed.

A more sophisticated set of regression analyses might include other explanatory variables – such as corporate size, growth rate, cost structure, profitability, etc. – to sort out more finely the relationship between beta and financial leverage and its other determinants. Employing such a model, however, requires the analyst to adjust all input variable values (e.g., the prospective interest coverage ratio) to reflect the impact of pro forma or simulated changes in financial leverage.

Q: One of the most difficult problems with estimating the beta and cost of equity for an individual business unit is that a sufficient number of good comparables can rarely be found because most companies have multiple lines of business and different percentages of their assets in each. Is there any way to address this problem?

A: One way around this problem is to recognize that the business risk (that is, the *un*levered beta) of a multi-division company is a weighted average of the risks of each line of business, as illustrated in Exhibit 1 on the next page. Note also that business risk, on the asset side of the balance sheet, equals the weighted average of all risks on the liability side. This is a demonstration of the principle of the conservation of risk.

In the United States and Canada, at least, it is possible to use line-of-business data to estimate the percentages of assets that companies have tied up in their separate lines of business. If you have data on two firms – company 1 and company 2 – each with two lines of business (A and B), and you know the company unlevered betas as well as the asset weights (w), then you can construct two equations with two unknowns (i.e., β_{UA} and β_{UB}) as follows:

$$\beta_{U1} = w_{A1} \cdot \beta_{UA} + w_{B1} \cdot \beta_{UB}$$
$$\beta_{U2} = w_{A2} \cdot \beta_{UA} + w_{B2} \cdot \beta_{UB}$$

It is then easy to solve for the unlevered line-of-business betas, β_{UA} and β_{UB}

If there are more companies than lines of business, the unlevered business-unit betas can be estimated by running a linear regression of the unlevered company betas against the weights for the lines of business, being careful to suppress the constant term. The coefficients from the regression are unbiased estimates of the business-unit betas.

Exhibit 2 illustrates data for some U.S. forest products companies. Regression results based on these data indicate the following:

Unlevered beta for U.S. forest products = 1.08

Unlevered beta for U.S. paper products = 0.88

The unlevered beta represents an estimate of the operating risk of the business unit. Next, the actual tax rate and leverage of the business unit, along with the estimated unlevered beta, can be used to compute an estimate of its levered beta. The levered beta of a business unit can then be used to compute its cost of equity capital.

Q: What can you say in conclusion about the practical usefulness of the CAPM as a model for estimating the cost of equity capital for a firm and/or the division of a firm?

A: The CAPM is just one of many theoretical models whose usefulness and reliability is, in the final analysis, an empirical question. The beta coefficient is nothing more than an imperfectly-measured, numerical proxy for the relative systematic riskiness of a firm's shares. Whether it is this systematic risk or some other form of risk that matters most to shareholders as they establish and assess market values depends on their own situations and the characteristics of the capital market environment in which the shares are traded. Consequently, it is essential that financial analysts seek out empirical and/or structural evidence, in the situation they are examining, to buttress any assertions they make regarding the usefulness of the CAPM in practical corporate finance applications.

Exhibit 1

COMPANY RISK AS A WEIGHTED AVERAGE OF ITS BUSINESS-UNIT RISKS

Assets

Business unit (i)	Market value weight	Unlevered beta	Contribution to asset risk
A	w_A	β_A	$w_A\beta_A$
B	w_B	β_B	$w_B\beta_B$
•	•	•	•
•	•	•	•
•	•	•	•
Z	w_Z	β_Z	$w_Z\beta_Z$
		Asset risk* =	$\sum w_i\beta_i$

Liabilities

Source of capital (j)	Market value weight	beta	Contribution to liability risk
Debt	w_B	β_B	$w_B\beta_B$
Preferred	w_P	β_P	$w_P\beta_P$
Common	w_e	β_e	$w_e\beta_e$
		Liability risk* =	$\sum w_j\beta_j$

* Asset risk = liability risk

Exhibit 2

FOREST PRODUCTS COMPANY DATA

Company	Levered beta	Unlevered beta	Market debt/equity	Asset weights: Forest	Asset weights: Paper
Champion Int'l	1.23	0.86	70.4%	0.15	0.85
Chesapeake Corp.	0.88	0.59	82.5	0.06	0.94
Great Northern Nek.	1.21	1.10	16.9	0.04	0.96
Louisiana-Pacific	1.32	0.98	57.9	0.79	0.21
Pope and Talbot	1.18	1.06	18.9	0.51	0.49
Longview Fibre	1.16	1.01	24.6	0.26	0.74
Temple Inland	1.16	0.99	28.4	0.19	0.81

APPENDIX

CANADIAN, U.S., AND INTERNATIONAL EVIDENCE WITH RESPECT TO HISTORICAL AND FORWARD-LOOKING EQUITY MARKET RISK PREMIUMS

Q: *Is it better to use arithmetic means/averages or geometric means/averages to measure historical returns when one is attempting to use these figures for projecting future MRPs?*

A: Arithmetic means always exceed the geometric means for the corresponding time-series data, and the difference grows greater as the period-to-period variability in the underlying returns data increases. The divergence between the arithmetic and geometric average values can be quite significant and can result in wide differences in the resulting cost-of-equity estimates. Unfortunately, academics and practitioners are about evenly divided with respect to the appropriateness of the two calculation procedures.

While academics argue over which form of averaging is more appropriate for various purposes, the truth is that both averages provide information that its useful to, and used by, investors some of the time. If one is predicting security returns or MRPs for a single forward period based entirely on historical data, then the arithmetic average is the superior figure to focus on. This single-period focus is also the one called for, in theory, for employing the single-period CAPM. The arithmetic mean is the rate of return which, when compounded over multiple periods, provides the mean of the probability distribution of ending wealth values, given an initial investment stake. This makes the arithmetic mean the appropriate (cost of capital) discount rate for evaluating investment projects based on expected future values or cash inflows.

On the other hand, seasoned investors with multi-period investment horizons, will often look to the long-run compound (geometric) average returns they have experienced with different asset classes to form their views as to what they can reasonably expect in the future. The geometric mean is also the one used to calculate annualized performance figures for mutual funds, pension funds, and market indices – the information that investors are being bombarded with daily. And, while there is a theoretical preference for arithmetic averages, geometric averages are intuitively more appealing for longer-term applications, especially, if as appears to be true, there is any long-term negative autocorrelation in stock returns. Cost-of-equity estimates based on the lower geometric average figures also appear more consistent with observed market valuations.

Q: What is the *historical* evidence with respect to the Canadian market risk premium?

A: The Fixed Income Research department of Scotia Capital Markets annually publishes a document entitled "Investment Returns" wherein their analysts provide historical data from which average experienced MRPs relative to T-bill returns can be calculated. The relevant time series of investment return figures are reproduced in Schedule 1 at the end of this Appendix. For the 1957-2002 period – which is the longest period available from the Scotia Capital data – the experienced MRP relative to T-bills averaged 2.05% p.a., based on geometric means, and 3.22% p.a., based on arithmetic means.

Ibbotson Associates – which is noted for its annual examination of U.S. nominal and real security returns – has recently begun publishing its own estimates of Canadian (market) equity risk premia over past time periods. The Ibbotson data estimates, which go back to 1936, are set out in Schedule 2 and focus exclusively on experienced MRPs relative to long-term Canada bonds. For the full 1936-2002 period, the Ibbotson data show that the MRP (relative to long Canadas) averaged 3.37% (geometric mean) or 4.74% (arithmetic mean).

Mercer Investment Consulting – which advises a wide range of Canadian pension funds and other institutional investors – has compiled historical Canadian data back to1924, in the case of equities and long Canada bonds, and to 1934 in the case of T-bills (the Canadian government only began issuing T-bills in 1934). These figures and the associated MRPs are reproduced in Schedule 3. The historical average MRPs for various long-run time periods, based on the Mercer's data, are shown at the bottom right hand side of this schedule. For the 1924-2002 period (the longest available), the average MRP based on long Canadas is 3.64% using geometric means and 4.77% using arithmetic averaging. With respect to the MRPs relative to T-bill returns, the averages for the longest period (1934-2002) are 5.13% and 6.35%, respectfully, based on geometric and arithmetic means.

Finally, Dimson, Marsh, and Staunton ("DMS") – two professors and a research director at the London Business School - recently concluded a monumental study of long-run security returns and MRPs for 16 major countries and markets around the world, including Canada. Their data/estimates for Canada go back to 1900, and cover the 101-year period from 1900 through 2000. These data are set out in Schedule 4 and have been updated to include the corresponding returns for 2001 and 2002. Based on the updated DMS data, the average MRPs relative to long Canadas are 4.15% and 5.08%, respectively, based on geometric and arithmetic means; the corresponding average MRPs relative to T-bills are 4.34% and 5.66%. (The DMS study is referenced at the bottom of Schedule 4.)

Besides obvious differences in the available time periods for analysis, there are subtle differences in the data sources for each of the above studies and in the nature of the Canada bond and T-bill returns used to calculate the annual MRPs that are used for averaging. The table below provides a summary assessment of the collective results of these studies.

Canadian Historical MRPs:	Geometric Average	Arithmetic Average
	(% p.a.)	(% p.a.)
Relative to Long-Term Canadas	3.75	4.85
Relative to Canadian T-Bills	4.35	5.50

Q: What do market participants estimate the *forward-looking* Canadian MRP to be, from the perspective of 2003?

A: Forward-looking MRPs are often estimated by advisors to pension funds and other institutional investors to assist their clients in establishing affordable pension benefits (or, alternatively, required employee and employer contributions to achieve a certain level of benefits) and in formulating long-run asset allocation policy targets. Mercer Investment

Consulting provides these forecasts to its clients on a periodic basis. As of September 2002, Mercer Investment Consulting estimated that the long-run Canadian MRP versus the yield on a riskless long-term asset lay in the range of 1.75% to 2.75%, or a mid-point of 2.25%. During 2003, other pension fund managers/advisors were forecasting the forward-looking Canadian MRP versus long Canadas to be 3%, while still others were forecasting that the real rate of return on Canadian equities (a proxy for the MRP relative to T-bills) would average only 3.5% annually over the 2003-2013 period.

Another source of information for gauging the forward-looking Canadian MRP is to look at the consensus economic forecasts distributed by the Watson Wyatt Investment Consulting Practice (another major pension consulting firm with worldwide operations and clientele) in their "Canadian Survey of Economic Expectations" publication. This publication provides short-term, mid-term, and long-term (to the 2008-2017 period) consensus forecasts of financial market and macroeconomic variables based on the surveyed projections of 41 of Canada's leading business economists and portfolio managers. In the 2003 Survey, these participants forecasted the long-term total return on Canadian equities going forward to be 7.9% (based on the median response). Their corresponding forecast for Canadian 10-year bonds was a 5.5% yield over the long-term future – implying an expectation of a 2.4% future MRP relative to 10-year Canadas, and therefore a somewhat *lower* MRP relative to 30-year Canada bonds.

To the extent that one gives credence to the foregoing evidence, it appears that the *forward-looking*, long-run Canadian MRP relative to long Canada bond yields lies in the range of 2.25% to 3.0%, while the corresponding MRP relative to T-bills (or the long Canada yield with the maturity risk premium backed out) lies in the range of 3.25% to 3.75%.

Q: What is the evidence with respect to *historical* MRPs in the U.S. equity markets?

A: There are numerous historical studies of long run security returns and MRPs for the U.S. markets. For the 1926-2002 period, Ibbotson Associates find the following average MRPs:

1926-2002 Period:	Geometric Average (% p.a.)	Arithmetic Average (% p.a.)
MRP Relative to Long US Bonds	4.7	6.4
MRP Relative to U.S. T-Bills	6.4	8.4

For the period from 1900 through 2002, the Dimson, Marsh, and Staunton study of U.S. security returns produces the following array of historical MRPs (see Schedule 5):

1900-2002 Period:	Geometric Average (% p.a.)	Arithmetic Average (% p.a.)
MRP Relative to Long US Bonds	4.58	6.23
MRP Relative to U.S. T-Bills	5.42	7.37

Finally, Jeremy J. Siegel, in the third edition of his well-known investment book Stocks For the Long Run (McGraw-Hill, 2002), provides long run average U.S. security returns and MRPs for both the 1802-2001 and 1871-2001 periods. Based on the tables on pages 13 and 15 of his book, Siegel's returns data reveal the following long run experienced MRPs:

1802-2001 Period:	Geometric Average	Arithmetic Average
	(% p.a.)	(% p.a.)
MRP Relative to Long US Bonds	3.4	4.6
MRP Relative to U.S. T-Bills	4.0	5.4

1871-2001 Period:	Geometric Average	Arithmetic Average
	(% p.a.)	(% p.a.)
MRP Relative to Long US Bonds	4.1	5.5
MRP Relative to U.S. T-Bills	5.2	6.8

It is evident from the set of 4 tables above that the farther one goes back with the U.S. securities data, the smaller the average experienced MRPs will be. Consequently, the somewhat arbitrary choice of time period will dictate one's conclusions regarding average MRPs. Simply averaging the results in the 4 tables gives the following summary assessment of U.S. *historical* MRPs.

U.S. Historical MRPs:	Geometric Average	Arithmetic Average
	(% p.a.)	(% p.a.)
Relative to Long US Bonds	4.19	5.68
Relative to US T-Bills	5.25	6.99

Q: What are the recent *forward-looking* estimates of the U.S. MRP?

A: On page 124 of his recent book (referenced above), Jeremy Siegel predicts that the future MRP (relative to long-term bonds) in the U.S. "is likely to be in the range of 2 to 3 percent, about one-half the level that has prevailed over the past 70 years."

On page 191 of Stocks, Bonds, Bills, and Inflation: 2003 Yearbook published by Ibbotson Associates in 2003, Roger G. Ibbotson and Peng Chen report their estimation of the forward-looking U.S. MRP (versus long bonds) to be 3.41% (geometric average), based on the supply-side earnings model they developed in their January/February 2003 Financial Analysts

Journal article entitled "Stock Market Returns in the Long Run: Participating in the Real Economy."

Dimson, et al (DMS), on pages 191 and 192 of Triumph of the Optimists: 101 Years of Global Investment Returns, peg the prospective U.S. MRP (relative to T-bills) at 4.1%, on a geometric mean basis, and 5.4% on an arithmetic mean basis. They arrive at their forward-looking estimates for the twenty-first century by adjusting (downward) the historical MRP for two factors – namely, (a) the impact of past equity cash flows (i.e., dividends) that exceeded expectations, and (b) the gain, historically, that accompanied the fall in required risk premiums during the 1900-2000 period.

In his book titled The Equity Risk Premium: The Long-Run Future of the Stock Market, published by John Wiley & Sons, Inc. in 1999, Bradford Cornell discusses a wide variety of approaches adopted by various analysts to estimate the likely U.S. MRP in future years. Using his own approach – an application of the standard DCF model using a combination of IBES forecasts for companies and long-run forecasts for the U.S. economy – Cornell arrives at forward-looking MRPs of 4.27% over long bonds and 5.51% over T-bills. He also discusses how the phenomenon of *survival bias* has likely caused the historically-measured U.S. MRPs to overstate the true MRP over past time periods. Cornell summarizes his view of the impact of survival bias, on page 69 of his book, as follows:

"Survival bias is a significant problem for estimating the long-run future risk premium. In the period since 1926, during which Ibbotson data were accumulated, the United States led a charmed financial life. There were no market interruptions and no bouts of hyperinflation. As a result, American data during that interval are not representative of the behavior of equities in general in the past and are unlikely to be representative of the behavior of American equity markets in the future."

In their April 2002, Journal of Finance paper, entitled "The Equity Premium", Eugene F. Fama and Kenneth R. French – two very highly regarded U.S. academics – re-examine the estimation of the U.S. MRP over the second half of the twentieth century. Using dividend and earnings growth rates, respectively, to measure the expected rate of capital gain, these authors re-estimate the MRP over the 1951-2000 period to have been 2.55% and 4.32%, respectively, relative to the short-term riskless asset (which they use commercial paper to proxy). They conclude that the high average equity returns experienced over the 1951-2000 period were due to the unexpected decline in equity discount rates that produced larger-than-expected capital gains – in other words, the average U.S. stock return over the latter half of the twentieth century was a lot higher than investors had expected.

Robert D. Arnott and Peter L. Bernstein, respectively Chairman of First Quadrant, L.P. and President of Peter L. Bernstein, Inc., have also weighed into the debate about future MRPs with their article entitled "What Risk Premium Is "Normal"?", published in the March/April 2002 issue of Financial Analysts Journal. Their conclusion regarding future MRPs is evident from the following quote, which is taken from the start of their article.

"We are in an industry that thrives on the expedient of forecasting the future by extrapolating the past. As a consequence, investors have grown accustomed to the idea that stocks "normally" produce an 8% real return and a 5% risk premium over bonds, compounded annually over many decades. Why? Because long-term historical returns have been in this range, with impressive consistency. Because investors see these same long-term historical numbers, year after year, these expectations are now embedded into the collective psyche of the investment community. Both figures are unrealistic from current market levels. Few have acknowledged that an important part of the lofty real returns of the past has stemmed from rising valuation levels and from high dividend yields which have since diminished. As this article will demonstrate, the long-term forward-looking risk premium is nowhere near the 5% of the past; indeed, it may well be near-zero today, perhaps even negative. Similarly, the long-term forward-looking real return from stocks is nowhere near history's 8%. Our argument will show that, barring unprecedented economic growth or unprecedented growth in earnings as a percentage of the economy, real stock returns will probably be roughly 2 - 4%, similar to bonds."

Various pension fund managers and consultants have also shared their forecasts for the forward-looking U.S. MRP. In a paper titled "Understanding the Equity Risk Premium," dated May 2002, Mercer Investment Consulting analysts Martin Den Heyer, Julie Dubois, and Jean Michel estimate that the MRP for the U.S. S&P 500 Stock Index versus 10-year U.S. Treasury bonds will lie in the range of 1.7% to 2.6% for future years. Wellington Management Company, LLP, in a White Paper dated October 2002 and titled "The Equity Risk Premium, Part II: Capital Market Expectations," forecasts that U.S. equities will outperform bonds by roughly 300 basis points, on an annualized basis, over the next 5 years – a MRP which they acknowledge is below the 4.4% historical MRP relative to bonds.

Q: What then do academics and practitioners generally estimate the *forward-looking* U.S. MRP to be, from the perspective of 2003?

A: There is virtually universal agreement among academics and practitioners that the historical MRPs achieved by U.S. equities over the period from 1926 to the present *overstate* the required MRPs going forward. Based on the analyses and conclusions of the studies referenced above as well as discussions with numerous pension fund managers and investment professionals, the generally-prevailing belief is that the forward-looking MRP for U.S. equities relative to long-term bonds lies in the range of 2.5% to 3.2%, while the corresponding MRP relative to the riskless asset lies in the range of 3.5% to 4.2%. However, as these studies were all completed and published prior to the 2003 passage of President Bush's $350 billion (US) tax package, with its significant reduction in the tax rates on dividends and capital gains, the now-more-favorable tax treatment of the investment income on stocks relative to fixed-income securities may serve to reduce U.S. MRPs even further in the future.

Q: What evidence is available about MRPs in equity markets outside of Canada and the U.S.?

A: Dimson et al (DMS), in their book <u>Triumph of the Optimists: 101 Years of Global Investment Returns</u>, provide average real return figures for world equities excluding U.S. equities, and corresponding figures for world ex-U.S. bonds, over the 1900-2000 period, as well as long-run U.S. T-bill yield and U.S. inflation averages. Based on these data and world ex-U.S. returns for 2001 and 2002, the historical average MRPs for non-U.S. equities for the 1900-2002 period are shown in Schedule 6 and in the following table.

World Ex-U.S. Historical MRPs:	Geometric Average (% p.a.)	Arithmetic Average (% p.a.)
Relative to World Ex-US Bonds	4.16	4.76
Relative to US T-Bills	3.90	5.57

Dimson et al also provide *forward-looking* MRP projections (relative to T-bill returns) for the United Kingdom and for their 16-country World Index (including the U.S.), as shown below:

MRPs Relative to T-Bill Returns:	Prospective Geometric Mean MRP (% p.a.)	Prospective Arithmetic Mean MRP (% p.a.)
For the United Kingdom	2.4	3.7
For 16-Country World Index (including the U.S.)	3.0	4.0

Schedule 1

COMPARATIVE RATES OF TOTAL INVESTMENT RETURN AND EXPERIENCED MARKET EQUITY RISK PREMIUMS
(Percentage Rates of Return from December to December)

Year	S&P/TSX and T.S.E. "300" Composite Stock Index		Canadian 91-Day Treasury Bills		Experienced Market-Average Equity Risk Premiums[a]		Scotia Capital Long-Term Bond Value Index[b]
	%		%		%		%
1957	-20.58		3.83		-24.41		7.94
1958	31.25		2.51		28.74		1.92
1959	4.59		4.62		-0.03		-5.07
1960	1.78		3.31		-1.53		12.19
1961	32.75		2.89		29.86		9.16
1962	-7.09		4.22		-11.31		5.03
1963	15.60		3.63		11.97		4.58
1964	25.43		3.79		21.64		6.16
1965	6.68		3.92		2.76		0.05
1966	-7.07		5.03		-12.10		-1.05
1967	18.09		4.59		13.50		-0.48
1968	22.45		6.44		16.01		2.14
1969	-0.81		7.09		-7.90		-2.86
1970	-3.57		6.70		-10.27		16.39
1971	8.01		3.81		4.20		14.84
1972	27.38		3.55		23.83		8.11
1973	0.27		5.11		-4.84		1.97
1974	-25.93		7.85		-33.78		-4.53
1975	18.48		7.41		11.07		8.02
1976	11.02		9.27		1.75		23.64
1977	10.71		7.66		3.05		9.04
1978	29.72		8.34		21.38		4.10
1979	44.77		11.41		33.36		-2.83
1980	30.13		14.97		15.16		2.18
1981	-10.25		18.41		-28.66		-2.09
1982	5.54		15.42		-9.88		45.82
1983	35.49		9.62		25.87		9.61
1984	-2.39		11.59		-13.98		16.90
1985	25.07		9.88		15.19		26.68
1986	8.95		9.33		-0.38		17.21
1987	5.88		8.48		-2.60		1.78
1988	11.08		9.41		1.67		11.30
1989	21.37		12.36		9.01		15.17
1990	-14.80		13.48		-28.28		4.32
1991	12.02		9.83		2.19		25.30
1992	-1.43		7.08		-8.51		11.57
1993	32.55		5.51		27.04		22.09
1994	-0.18		5.35		-5.53		-7.39
1995	14.53		7.57		6.96		26.34
1996	28.35		5.02		23.33		14.18
1997	14.98		3.20		11.78		18.46
1998	-1.58		4.74		-6.32		12.85
1999	31.71		4.66		27.05		-5.98
2000	7.41		5.49		1.92		12.97
2001	-12.57		4.72		-17.29		6.06
2002	-12.44		2.52		-14.96		11.05
	Arith Mean	Geom Mean	Arith Mean	Geom Mean	Arith Mean	Geom Mean	Geom Mean
1957-02	10.29	9.06	7.07	7.01	3.22	2.05	8.55
1962-02	10.33	9.19	7.52	7.46	2.81	1.73	8.98
1967-02	10.83	9.64	7.99	7.93	2.84	1.71	9.85
1972-02	11.16	9.85	8.36	8.29	2.80	1.56	10.54
1977-02	12.10	10.92	8.69	8.62	3.41	2.30	11.22

[a] Column 1 minus column 2.
[b] Includes provincials and corporates, as well as Canada bonds.
Source: Scotia Capital, Fixed Income Research department, various annual "Investment Returns" publications.

Schedule 2

CANADIAN EQUITY RISK PREMIA, IN CANADIAN DOLLARS, OVER TIME*

Year	Market ERP %	Year	Market ERP %	Year	Market ERP %
1936	22.4	1958	27.3	1980	18.5
1937	-18.8	1959	-0.2	1981	-23.4
1938	6.0	1960	-3.5	1982	-9.5
1939	-2.9	1961	27.6	1983	23.8
1940	-22.3	1962	-12.1	1984	-14.6
1941	-1.4	1963	10.5	1985	13.6
1942	10.9	1964	20.3	1986	-0.9
1943	16.6	1965	1.5	1987	-3.6
1944	10.5	1966	-12.6	1988	0.8
1945	33.1	1967	12.3	1989	11.2
1946	-4.4	1968	15.8	1990	-24.9
1947	-2.3	1969	-8.2	1991	1.8
1948	9.6	1970	-11.8	1992	-10.3
1949	19.7	1971	1.0	1993	24.3
1950	45.6	1972	20.5	1994	-7.9
1951	21.2	1973	-7.0	1995	5.7
1952	-3.7	1974	-34.1	1996	20.9
1953	-1.4	1975	9.6	1997	8.4
1954	35.3	1976	1.6	1998	-7.2
1955	24.6	1977	2.1	1999	26.3
1956	10.1	1978	20.8	2000	1.3
1957	-24.7	1979	35.0	2001	-18.3
				2002	-18.2

Time Period	Arithmetic Average	Geometric Average
1936-2002	4.74%	3.37%
1947-2002	4.79%	3.39%
1957-2002	2.38%	1.06%

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* The equity risk premiums are the differences, annually, between the total investment returns on TSE stocks and the *income return* on Government of Canada long-term bonds.

Source: Ibbotson Associates, "Canadian Risk Premium over Time Report."

Schedule 3

COMPARATIVE RATES OF TOTAL REAL INVESTMENT RETURN AND VARIOUS EXPERIENCED MARKET EQUITY RISK PREMIUMS

Year	Real Canadian Common Stock Returns %	Real 91-Day T-Bill Returns %	Real Canadian Long Bond Returns %	Market Risk Premium (MRP) Based on T-Bills %	Market Risk Premium (MRP) Based on Long Cda Bonds %
1924	13.31	n.a.	9.84	n.a.	3.47
1925	25.26	n.a.	2.33	n.a.	22.93
1926	26.70	n.a.	7.32	n.a.	19.39
1927	46.27	n.a.	11.20	n.a.	35.07
1928	31.70	n.a.	-0.37	n.a.	32.07
1929	-13.96	n.a.	-0.40	n.a.	-13.56
1930	-26.30	n.a.	16.54	n.a.	-42.84
1931	-25.11	n.a.	6.15	n.a.	-31.27
1932	-5.92	n.a.	21.41	n.a.	-27.33
1933	55.20	n.a.	9.90	n.a.	45.30
1934	18.86	-0.53	18.26	19.39	0.60
1935	27.66	-1.13	-1.46	28.79	29.12
1936	23.95	-0.24	9.87	24.18	14.07
1937	-19.45	-3.62	-4.86	-15.83	-14.59
1938	11.53	2.83	7.95	8.70	3.58
1939	-1.97	-1.47	-5.06	-0.50	3.09
1940	-23.26	-4.41	3.15	-18.85	-26.41
1941	-3.95	-5.22	-2.19	1.26	-1.76
1942	10.79	-2.27	0.19	13.07	10.60
1943	17.47	-1.36	1.98	18.83	15.50
1944	15.59	2.26	5.08	13.32	10.50
1945	33.55	-1.48	3.25	35.03	30.31
1946	-6.64	-4.85	0.48	-1.79	-7.13
1947	-12.58	-12.52	-10.12	-0.06	-2.46
1948	2.79	-7.96	-10.52	10.74	13.30
1949	21.77	-0.21	4.13	21.98	17.64
1950	39.76	-5.34	-5.96	45.09	45.71
1951	12.37	-8.71	-12.25	21.08	24.62
1952	0.76	2.25	3.21	-1.49	-2.44
1953	2.15	1.65	3.64	0.50	-1.49
1954	39.05	1.53	9.99	37.52	29.06
1955	27.04	0.85	-0.93	26.19	27.97
1956	9.97	-0.05	-6.40	10.02	16.36
1957	-21.93	2.10	4.10	-24.02	-26.03
1958	27.64	-0.64	-8.28	28.29	35.92
1959	3.45	3.63	-5.47	-0.18	8.92
1960	0.15	1.87	5.38	-1.72	-5.23
1961	32.75	2.89	9.78	29.85	22.97
1962	-8.56	2.40	1.42	-10.96	-9.98
1963	13.22	1.53	2.11	11.69	11.11
1964	22.90	1.70	4.81	21.20	18.09
1965	3.54	0.97	-2.01	2.58	5.55
1966	-10.15	1.65	-1.82	-11.80	-8.33
1967	13.77	0.79	-5.77	12.98	19.55
1968	17.61	2.27	-4.72	15.34	22.33

Year	Real Canadian Common Stock Returns %	Real 91-Day T-Bill Returns %	Real Canadian Long Bond Returns %	Market Risk Premium (MRP) Based on T-Bills %	Market Risk Premium (MRP) Based on Long Cda Bonds %
1969	-5.37	2.48	-6.52	-7.86	1.14
1970	-4.76	5.26	20.47	-10.02	-25.23
1971	2.90	-1.11	6.28	4.01	-3.38
1972	21.18	-1.46	-3.81	22.64	24.99
1973	-8.31	-3.58	-7.00	-4.73	-1.31
1974	-34.06	-3.66	-12.48	-30.40	-21.58
1975	8.25	-1.74	-6.06	9.99	14.31
1976	4.89	3.39	12.45	1.50	-7.56
1977	1.13	-1.47	-3.20	2.60	4.33
1978	19.65	0.47	-6.57	19.18	26.22
1979	31.90	2.53	-11.28	29.37	43.18
1980	17.12	2.36	-8.15	14.77	25.27
1981	-19.99	7.30	-13.55	-27.29	-6.44
1982	-3.39	5.51	30.89	-8.89	-34.27
1983	29.53	5.03	4.78	24.50	24.75
1984	-5.86	7.96	11.00	-13.82	-16.86
1985	19.82	5.17	20.01	14.65	-0.19
1986	4.57	5.08	12.80	-0.51	-8.24
1987	1.66	4.13	-3.55	-2.47	5.21
1988	6.82	5.55	6.21	1.27	0.61
1989	15.34	7.30	10.52	8.04	4.83
1990	-18.83	8.58	-1.55	-27.41	-17.28
1991	7.93	5.58	19.89	2.35	-11.96
1992	-3.49	4.28	10.72	-7.77	-14.20
1993	30.35	3.53	20.84	26.82	9.51
1994	-0.37	5.12	-10.64	-5.49	10.26
1995	12.56	5.59	24.11	6.97	-11.55
1996	25.58	2.24	11.83	23.34	13.75
1997	14.12	2.53	16.58	11.59	-2.46
1998	-2.58	3.75	12.98	-6.33	-15.56
1999	28.41	2.19	-9.48	26.21	37.89
2000	4.05	2.33	10.08	1.72	-6.04
2001	-13.18	3.42	3.21	-16.60	-16.39
2002	-15.72	-1.33	6.88	-14.39	-22.60
Geometric Means:					
1924-02	6.53	n.a.	2.89	n.a.	3.64
1934-02	6.15	1.02	2.14	5.13	4.01
1948-02	6.42	1.93	2.26	4.49	4.16
1957-02	4.57	2.69	3.11	1.88	1.46
Arithmetic Means:					
1924-02	8.11	n.a.	3.34	n.a.	4.77
1934-02	7.44	1.09	2.60	6.35	4.84
1948-02	7.67	1.99	2.78	5.68	4.89
1957-02	5.79	2.73	3.66	3.06	2.13

Source: Mercer Investment Consulting

Schedule 4

CANADIAN LONG-RUN SECURITY RETURNS AND EQUITY RISK PREMIA

BASED ON DATA FROM 1900 ONWARDS

	Nominal Canadian Dollar Returns On:		
	Canadian Equities	Gov't of Cda 91-Day T-Bills	Gov't of Cda Long-Term Bonds
	%	%	%
1900-2000:			
Geometric Mean	9.7	4.9	5.0
Arithmetic Mean	11.0	4.9	5.4
2001 Returns	-12.57	4.72	6.06
2002 Returns	-12.44	2.52	11.05
1900-2002:			
Geometric Mean	9.22	4.88	5.07
Arithmetic Mean	10.54	4.88	5.46

1900-2002 Equity Risk Premia	Arithmetic Mean	Geometric Mean
Equities versus T-Bills	5.66	4.34
Equities versus Long Canada Bonds	5.08	4.15

Sources: Elroy Dimson, Paul Marsh, and Mike Staunton, Triumph of the Optimists: 101 Years of Global Investment Returns, Princeton, NJ; Princeton University Press, 2002; Dr. Cannon's calculations.

Schedule 5

U.S. LONG-RUN SECURITY RETURNS AND EQUITY RISK PREMIA

BASED ON DATA FROM 1900 ONWARDS

	Nominal U.S. Dollar Returns On:		
	U.S. Equities	U.S. T-Bills	Long-Term U.S. Treasury Bonds
	%	%	%
1900-2000:			
Geometric Mean	10.1	4.1	4.8
Arithmetic Mean	12.0	4.1	5.1
2001 Returns	-11.88	3.83	3.70
2002 Returns	-22.10	1.65	17.84
1900-2002:			
Geometric Mean	9.49	4.07	4.91
Arithmetic Mean	11.44	4.07	5.21

1900-2002 Equity Risk Premia	Arithmetic Mean	Geometric Mean
Equities versus US T-Bills	7.37	5.42
Equities versus LT Treasury Bonds	6.23	4.58

Sources: Elroy Dimson, Paul Marsh, and Mike Staunton, Triumph of the Optimists: 101 Years of Global Investment Returns, Princeton, NJ; Princeton University Press, 2002; Dr. Cannon's calculations.

Schedule 6

WORLD EX-US LONG-RUN SECURITY RETURNS AND EQUITY RISK PREMIA

BASED ON DATA FROM 1900 ONWARDS

	Nominal U.S. Dollar Denominated Returns On:		
	World Ex-US Equities	U.S. T-Bills	Long-Term World Ex-US Bonds
	%	%	%
1900-2000:			
Geometric Mean	8.57	4.1	3.72
Arithmetic Mean	10.2	4.1	4.8
2001 Returns	-21.21*	3.83	20.11**
2002 Returns	-15.66*	1.65	-2.37**
1900-2002:			
Geometric Mean	7.97	4.07	3.81
Arithmetic Mean	9.64	4.07	4.88

1900-2002 Equity Risk Premia	Arithmetic Mean	Geometric Mean
World Ex-US Equities versus US T-Bills	5.57	3.90
World Ex-US Equities versus LT World Bonds	4.76	4.16

Sources: Elroy Dimson, Paul Marsh, and Mike Staunton, Triumph of the Optimists: 101 Years of Global Investment Returns, Princeton, NJ; Princeton University Press, 2002; Dr. Cannon's calculations.

* Based on MSCI EAFE Index, in U.S. dollar terms, as found on page 221 of Ibbotson Associates' Stocks, Bonds, Bills, and Inflation: 2003 Yearbook.

** Based on J.P. Morgan's Non-US Government Bond Index as reported weekly in Barron's financial newspaper.