TECHNICAL ANALYSIS
OF
PROFESSOR MYRON J GORDON'S
"COST OF CAPITAL TO A TELECOMMUNICATIONS UTILITY"

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BRIEFING

on

MYRON GORDON'S COST OF CAPITAL

- Introduction

Return on capital and investment behaviour

Prices charged by a PUC for services or products are controlled by the regulatory commission

Principle in setting prices:

> that they cover all the costs required to provide the services, including a return on the capital employed that is necessary to attract capital .

GLOSSARY OF SYMBOLS

p – price per unit of output

Q – quantity of output

e – variable cost per unit of output

F – fixed operating cost per period

H – depreciation on capital per period

B – outstanding debt per share of commom stock

c – coupon interest rate on outstanding debt

τ – corporate tax rate on income

E – book value of common equity, per share of C.S.

r – rate of return on common equity

N – number of shares of common stock

P – price per share of common stock

x – a utility's cost of capital

k – yield investors require on common stock

D_t – dividend the company is expected to pay in period t

b – retention rate

n – number of shares to be issued to raise I dollars

I – amount of external financing required

λ – fraction of normal price per share realized per share on new issue

g – expected growth rate of dividend

v – fraction of funds raised expected to accrue to existing shareholders

s – fraction of existing common equity to be raised from new sale of stock

$k_m - i$ – risk premium on a standard share

B_j – ratio of the risk on share j to the risk on a standard share

i – current interest rate

$\mathcal{L}$ – rate of increase in the number of shares

R – realized return to the investor

m – market portfolio of shares

F – risk free bond

ρ – value of k with no debt in the capital structure

$\hat{x}$ – weighted average of k and c

Z – gross cost to the consumers on account of the capital employed by the utility

z – gross cost to the consumers per dollar of capital employed

P_t^u – subscription or issue price of stock

Notes from "The Cost of Capital to a Public Utility"

Myron J. Gordon

Ch. I - Cost of capital in perfectly competitive capital markets

$$Z = (Pk + Li) / (P + L)$$

When current and coupon rates of interest are the same —

Traditional cost of capital is

$$Z = (Ek + Bc) / (E + B)$$

P: Market Value of common equity

L: Market Value of debt

E: Book value or historical cost of common equity

B: Book value or historical cost of debt

i: current yield on firm's debt

c: imbedded interest rate on debt

k: yield at which stock is selling

Ch. 2 - Perfectly competitive capital markets

Problem (A) - Objective of regulatory agency:
Allow the utility the lowest rate of return consistent with the investment in plant equipment by the utility that satisfies the demand for its output

(B) - Objective of the utility:
Maximize the market value of its outstanding common equity.

General model of share valuation

Value of share of stock may be represented as the present value of the future cash flow it is expected to provide

V_o = Present value of share

D_t = Dividend the share is expected to pay in period t

P_n = Price at which the share is expected to sell at the end of $t = n$

k = Discount rate that converts a cash flow during or at the end of period t to its present value.

...2

For an investor with a one period horizon

$$V_o = \frac{D_1 + P_1}{1 + k}$$

For an investor with an n period horizon

$$V_o = \sum_{t=1}^{n} \frac{D_t}{(1 + k)^t} + \frac{P_n}{(1 + k)^n}$$

For an investor with an infinite horizon

$$V_o = \sum_{t=1}^{\infty} \frac{D_t}{(1 + k)^t}$$

Alternatively, using "n period" formula and "infinite" f.

$$P_n = \frac{D_{n+1} + P_{n+1}}{1 + k}$$

Market averages assume $P_o = V_o$

With P_o known and with defensible estimates of D_t, the value of k for a share can be derived

$$k = \frac{D_1}{P_o} + \frac{P_1 - P_o}{P_o}$$

Realized yield = Dividend yield plus rate of growth in price.

Glossary of symbols

P = Price per share
E = Book value per share
N = # of shares outstanding
D = Dividends per share of stock
Y = EPS
L = Market value of debt on a per share basis
B = Book value of debt on a per share basis
i = current rate of interest
c = coupon or imbedded interest rate on outstanding debt
r = rate of return on common equity investment
π = Y/E = rate of return on common equity (or book value)
x = $(E\pi + Bc) / (E + B)$ = rate of return on total assets (at book values)
k = yield at which share is selling
ρ = value k would have if the firm had no debt in its capital structure
z = cost of capital

Ex Stationary firm

No investment and financing
earnings in every future period = current earnings
dividends in every future period = earnings
No debt in capital structure

$$P = \sum_{t=1}^{\infty} \frac{Y}{(1+k)^t} = \frac{Y}{\rho} = \frac{Ex}{\rho}$$

And price per share is the multiple of $1/\rho$ of the current EPS.

Stock financing - same company

loundering investment at cost I, and rate of return x = rate of return on existing capital

If the return investors require on a share is independent of the N of shares placed on the market, the N required is N = I/P

$$P = \frac{(NEx + Ix)/(N+n)}{\rho} = \frac{NEx + Ix}{p(N+I/\rho)} = \frac{NEx + I(x-\rho)}{n\rho}$$

if $x = \rho$, the investment will not change the price per share;
if $x < \rho$, P↑ and vice versa
Do not undertake if $x < \rho$

Debt financing:

Amount borrowed per share L=I/N

$$P = \frac{Ex + L\ (x-i)}{k}$$

k is used instead of ρ for the discount rate since the firm has debt in its capital structure. N does not change and EPS↑ from Y = Ex to Y = Ex + L(x-i) on the assumption that $x > i$

the MM position

Stock of a leyered corporation

$$k = \rho + (\rho - i)\ (L/P)$$

$$P = \frac{Ex + L(x-i)}{\rho + (\rho-i)(L/P)} = \frac{Ex + L(x-\rho)}{\rho}$$

Retention financing

Dividend drops from $D_1 = Y = Ex$ to $D_1 = Ex - bEx$ where $bEx = I/N$
Fraction of EPS retained is $b = I/NEx$
NEx = earnings on total common equity
Assuming no further investment contemplated, the D of every subsequent year is ↑ from Ex to Ex+xbEx Retention raises common equity per share by bEx and a return of x is expected on the investment.

$$P = \frac{Ex - bEx}{1+\rho} + \sum_{t=2}^{\infty} \frac{Ex + xbEx}{(1+\rho)^t}$$

$$= \frac{Ex}{\rho} = \frac{bEx\ (x-\rho)}{\rho(1+\rho)}$$

Continuous retention financing

no debt, return of x on investment

$$Y_1 = Y_o + xbY_o = Y_o(1+bx)$$

in period t

$$Y_t = Y_o(1+bx)^t$$

$$P = \sum_{t=1}^{\infty} \frac{(1-b)\ Y_o\ (1+b_x)^t}{(1+\rho)t}$$

Σ finite; pass if $\rho > bx$

$$\text{so } P = \frac{(1-b)Y}{\rho - bx}$$

Influence of retention financed investment on P, use derivative dP/db. Assumption in perfect capital markets ρ independent of b

$$dP = (x - \rho)\frac{Y}{(\rho - bx)^2} \qquad \frac{dP}{db} = 0 \text{ if } x = \rho$$

Thus, cost of retention capital remains ρ in the case of continuous retention and investment.

If dividend in $t = 1$ is $(1 - b)Y_1$, and expected to grow at rate bx indefinitely, the yield at which the share is selling is

$$\rho = \frac{(1 - b)Y}{P} + bx$$

Continuous debt financing

Retains and invests fraction b of income and also borrows and invests periodically to maintain debt - equity ratio

Ratio expected to maintain under purely competitive capital markets (PCCM) is L/P, based on market values of debt and common equity, rather than B and E, book values.

Amount earned on common equity during $t = 1$ is no longer $E_o x$ but

$$Y_1 = xE_o + (x - c)B_o$$

$$Y_2 = Y_1 + xbY_1 + (x - i)\Delta B_o$$

Value of ΔB_o determined:

bY_1 = increase in common equity at book value
P_o/E_o market to book value ratio

the increase in common equity at market value is $bY_1(P_o/E_o)$ - If debt equity ratio is to be unchanged (at market value) ΔB_o must be the fraction L_o/P_o of bY_1 (P_o/E_o) Hence,

$$\Delta B_o = (L_o/P_o)\ bY_1\,(P_o/E_o) = bY_1(L_o/E_o)$$

And

$$Y_2 = Y_1 + xbY_1 + (x - i)\ bY_1(L_o/E_o)$$

$$= Y_1\ (1 + br_1)$$

where

$$r_1 = x + (x - i)\ (L_o/E_o)*$$

The debt/equity ratio at t=0 in this expression is the debt at market value and the equity at market value.

* The value of r in this equation is the added income to the common dividend by the increase in common equity in period one. = Return on common equity investment during period one

$$P_o = \sum_{t=1}^{\infty} \frac{(1 - b)Y_0(1 + br)^t}{(1 + k)^t}$$

$$= \frac{(1 - b)Y}{k - br}$$

where k is the yield on a share with a leverage rate of L/P.

The cost of retention capital under the perfect capital markets assumptions remains equal to ρ.

$$P = \frac{(1 - b)\ [Ex + L\ (x - i)]}{\rho + (L/P)\ (\rho - i) - bx - b\ (L/E)\ (x - i)}$$

$$= \frac{(1 - b)\ [Ex + L\ (x - i)] - L(\rho - i)}{\rho - bx - b\ (L/E)\ (x - i)}$$

And the derivative with respect to b is

$$\frac{dP}{db} = (x - \rho)\ \frac{[x + (L/E)\ (x - i)]\ (L + E)}{[\rho - bx - b\ (L/E)(x - i)]^2}$$

the right hand side is $x-\rho^*$ by a quantity that is positive if $x>i$. Hence, $d\rho/db = 0$ if $x = \rho$ and the cost of retention capital, when the firm maintains a leverage rate of L/P is equal to ρ.

Continuous new equity financing

W_t = total common equity at end of period t

W_t^* = total common equity at end of t that accrues to shareholders at t = 0

s = funds raised from the sale of stock as a fraction of existing common equity

Q_t = funds raised from sale of stock during t

v = fraction of Q_t that accrues to shareholders at the start of t

Hyp: Let total common equity at t = o be $W_o = NE_o$ and expected rate of growth in common equity due to sale of stock be s Common equity one period later is

$$W_1 = W_o + bNy_1 + sW_o$$

Since $NY_1 = rW_o$

$$W_1 = W_o + brWo + sW_o = W_o\ (1 + br + s)$$

And $W_n = W_o(1 + br + s)^n$

In each period, the total equity is raised by the fraction br due to retention and by s due to the sale of additional shares. At the end of t = n the total common equity will include the equity of the shareholders at t = o and the equity arising from the sale of shares from t = o through t = n. Interest is in expected equity and dividend at t = n on a share outstanding at t = o. Let Qn = sW_{n-1} be the funds raised from the sale of stock during n, and let v be the fraction of the funds provided during n that accrues to the shareholders at the start of n the right hand side is $x-\rho^*$ by a quantity that is positive if $x>i$. Hence, $d\rho/db = 0$ if $x = \rho$ and the cost of retention capital, when the firm maintains a leverage rate of L/P is equal to ρ.

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W_n^* = portion of total common equity at the end of t = n that belongs to the share outstanding at t = 0.

$$W_1^* = W_o + b_r W_o + vsW_o$$

$$W_n^* = W_o(1 + b_r + rs)^n \div \quad \text{2 sides by N and * by r}$$

$$\text{gives } Y_{n+1}^* = Y_1(1 + br + vs)^n$$

Earnings on a share at t = 0 are expected to grow at the rate br due to retention and at vs due to sale of additional stock

Stock value model becomes

$$P = \sum_{t=1}^{\infty} \frac{(1-b)Y\,[1 + br + vs]^{t-1}}{(1 + k)^t}$$

$$\text{if } k > br + Vs$$

$$P = \frac{(1 + b)Y}{k - br - Vs}$$

$$\left(v = 1 - \frac{E}{P}\right)$$

..... further derivation of v

If market for new shares is perfectly competitive, the number of shares given to new shareholders during t = n in return for Qn dollars must satisfy two conditions

1. New issue must be sold at the prevailing price per share at time of issue

2. Dividend expectation of new shareholder should have a present value of Qn, the $ he invests when discounted at the rate k.

With r the return earned on common equity investment, b retention rate and (1-v) Qn the book value of the common equity obtained by the new shareholders, the dividend in n + 1 is

$$D^*_{n+1} = (1 - b)r(1 - v)Qn$$

Once in the corporation, the new shares are identical to old shares. Dividends are expected to grow at br + vs...

Hence, both conditions are satisfied if ....

$$Q_n = \sum_{t=m+1}^{\infty} \frac{(1 - b)r\ (1 - v)Qn(1 + br + vs)^{t-n-1}}{(1 + k)^{t-n}}$$

$$= \frac{(1 - b)r\ (1 - v)\ Q_n}{k - br - vs}$$

$$(\div\ 2S \text{ by } Q_n) \Rightarrow \text{ And } v = \frac{r - k}{r - rb - s}$$

Finite horizon model

If we assume that the current value of g (continuous growth rate of share) is expected to prevail for n periods and that thereafter the dividend is expected to grow at a normal rate of $\check{g}$, the stock value model becomes

$$P = \sum_{t=1}^{n} \frac{(1 - b)Y(1 + g)^t}{(1 + k)^t} + \sum_{t=m+1}^{\infty} \frac{(1 - b)Y\ (1 + g)^n(1 + \check{g})^{t-n}}{(1 + k)^t}$$

$$= \sum_{t=1}^{n} \frac{(1-b)Y(1+g)^t}{(1+k)^t} + \frac{(1+b)Y\ (1+g)^n\ (1+\check{g})}{(1+k)^n(k-\check{g})}$$

produces a finite P with $k \leq g$ as long as $k > \check{g}$
With P known, the equation may be used to measure k since k is an implicit function of the other variables. Under this assumption re a share's dividend expectation, k is an average of g and $\check{g}$ plus the dividend yield.

Summary

Regardless of how investment is financed, the utility's cost of capital, Z, is equal to ρ, the yield at which its stock would sell in the absence of leverage.

When $x = \rho$, the price of stock is independent of its investment and financing decisions and the stockholder is indifferent as to the level of investment and its financing.

Hence, $x = \rho$ is the lowest rate of return the utility can be allowed to earn consistent with the investment decision that the public interest requires.

The level of x is significant to stockholders since ρ increases with x.

Weighted Average Cost of Capital

Customary

Weights being the relative amounts of each type of capital in the capital structure.

If the market values of the debt and equity are the weights, then

$$Z = \frac{L\rho + sP\rho + brP\rho\ (1 - \tau p) / (1 - \tau g)}{P + L}$$

Where L, sP and brP each divided by P + L are the fractions of capital raised by debt, stock financing, and retention, respectively.

The alternative solution is to take Z = to the cost of retention capital if earnings are adequate to support the investment rate, and to take Z = to ρ if stock financing and/or leverage on the retained earnings is required.

Solving for ρ ($\rho = \rho^{\tau} / (1 - \tau p)$ =

$$\rho = \frac{(1 - b)\ Ex}{P_o} + xb\ (1 - \tau q) / (1 - \tau p)$$

for share yield in the absence of leverage and stock financing.

Use of Gordon's Models

A) Debt Financing

If a utility finances investment only by the sale of debt, it pays all earnings in dividends and these are not expected to grow; share price is

$$P = \sum_{t=1}^{\infty} \frac{D_t}{(1+k)^t} = \frac{D}{k} \qquad (111.1)$$

$D = EPS = 4.83$

$P_{(1975)} = 44.57$

$k = ?$

knowing $P_{(1975)}$ $\quad 44.57 = \frac{4.83}{k}$

Thus $k = .1084$

The equation may be written in terms of the common equity per share E, the debt per share B, the allowed return on assets x and the rate of interest on debt c as

$$\tilde{P} = \frac{(E+B)x - Bc}{k}$$

for 1975, the known values are

$P = 44.57$

$E = 2{,}011{,}807K/38{,}998K = 51.5874$

$B = 2{,}338{,}864K/38{,}998\ K = 59.9739$

$x = ?$

$c = 6.68\%$ or $.0668$ $k = .1084$

Thus $\quad 44.57 = \frac{(51.5874+59.9739)x - 59.9739 \times .0668}{.1084}$

$$1029.1633x = 81.5281$$
$$x = .0792$$

to set r=k, we set $x = \hat{x}$, making the substitution results in

$$Pk = (E+B)\frac{[Ek+Bc]}{E+B} - Bc$$

to prove....

$$44.57 \times .1084 = 51.5874 + 59.9739 \frac{(51.5874^* .1084 + 59.9739^* .0668)}{51.5874+59.9739} - 59.9739 ^*.0668$$

$$4.8314 = 111.5613 \frac{(5.592 + 4.0063)}{111.5613} - 4.0063$$

$$4.8314 \neq 5.5921$$

Contrary to Gordon's assumption, market value is not independent of the amount of debt in the capital structure. The derived market value requires solving for an estimate of P

[illegible] [illegible] is mis[illegible] Discuss

$$\hat{P}_k = 5.5921$$

$$\hat{P}.1084 = 5.5921$$

$$\hat{P} = 51.5874 = E$$

which is outside the actual market price range of Bell stock for 1975. (40.75 to 48.38)

for P = E, a change would be required in the controllable variable k; to yield in agreement with Gordon's hypothesis, k should be

$$44.57k = 51.5874$$

$$k = 1.1574$$

B) Retention Financing

E = Common equity per share

r = Allowed return

Er = Allowed earnings per share of commom

b = Fraction of earnings retained

D = (1-b)Er = dividend per share

According to Gordon, it can be shown that with b the retention rate and r the rate of return on common, the expected rate of growth in the dividend due to retention is br. The price per share then becomes

$$P = \sum_{t=1}^{\infty} \frac{Dt}{(1+k)^t}$$

$$= \sum_{t=1}^{\infty} \frac{(1-b)Er(1+br)^{t-1}}{(1+k)^t}$$

$$= \frac{(1-b)Er}{k-br} \qquad \text{III.4}$$

if $k > br$ which must be true for share price to be finite. Setting r = k, the share price P = E. Assuming the current book value per share to be independent of the retention rate, the current price is also independent of b. For proof, derive $\partial P/\partial b$ while assuming that k and r are independent of b

$$\frac{\partial P}{\partial b} = (r-k)\frac{Er}{(k-br)^2} \qquad \text{III.5}$$

The change in price with the retention rate is = 0 when $r = k$ and + if $r > k$ and - if $r < k$

In Bell's case:

$$P = 44.57$$
$$r_{1975} = ?$$
$$b_{1975} = 30\% \text{ or } .3$$
$$D_{1975} = 3.44 \qquad E = 51.5874$$

$$\text{if } D = (1-b)Er$$
$$3.44 = .7 * 51.5874 * r$$
$$36.1112r = 3.44$$
$$r = .0953$$

Thus, expected rate of growth in the dividend, due to retention = br = .0286

Solving for k using P

eq 111.4 $$44.57 = \frac{(1-.3) * .0953 * 51.5874}{k - .0286}$$

$$= \frac{3.4414}{k - .0286}$$

$$44.57k = 3.4414 + 1.2737$$

$$k = .1058$$

In this case, $r < k$ (.0953 .1058) and the Δ in price with the retention rate should be < 0

Example; if we set r at .09 and k at .10 so that $r < k$, the effect of change is (from $\tilde{P}_{1975}$)

from 111.4 $$\hat{P} = \frac{(1-.3)\ 51.5874 * .09}{.10 - .3 * .09}$$

$$= 3.25/.0730$$

$$= 44.52$$

Thus, for a Δ of .01 in r:k in favour of k, P varies -0.05

C) Stock Financing

If a stock issue at the present time is the only issue expected, the price per share may be written:

$$P = \frac{NEr + Ir}{(N+n)k} \qquad 111.5$$

N = # of shares currently outstanding

n = # of shares that will be issued to raise I$. If new shares can be issued at a price of P to provide the new stockholders a return of k on their investment, I = np and

$$P = \frac{NEr + Ir}{(N+I/P)k}$$

$$= \frac{NEr + I(r-k)}{Nk} \qquad 111.6$$

when r = k, Eq. 111.6 reduces to P = E

$$\left.\begin{array}{l}\text{if } r > k \rightarrow P\uparrow \\ \text{if } r < k \rightarrow P\downarrow\end{array}\right. \text{ as I is}\uparrow$$

Commonly, a new issue of stock can only be floated to net the corporation a price per share below that at which the stock ordinarily sells - Because:

1. The issue is sold to an investment banker at a price below that at which the investment banker puts the issue on the market

2. The issue may be marketed at a price slightly below the normal price. Let λ be the fraction of the normal price per share that the utility realize on a new issue. Then n = I/λP and Eq 111.6 becomes

$$P = \frac{NEr + I(r - k/\lambda)}{Nk} \qquad 111.7$$

For example, if Bell's recent issue of 70m preferred stock had been in common, the elements of Eq 111.7 would be*

$N = 38{,}998^{K}$

$E = 51.5874$

$r_{1975} = 280{,}808K/2{,}011{,}807k = .1396$

$I = 70M$

$k = .1084$

λ = (underwriting cost 3%) = .97

Eq 111.7

$$P = \frac{(38998^{EEX3} * 51.5874 * .1396) + (75^{EEX6} * .1396/.97)}{38998\ EEX3 * .1084}$$

P = 80.95 non-sequitur

* Using as a base e.o.y. data 1975

Measurement of share yield investors require hypotheses:

A) Utility should be allowed a return on capital equal to its cost of capital

B) Return on capital = cost of capital if the allowed return on common is equal to or above the yield at which the common stock is selling

The problem raised consists in the measurement of the yield at which the common stock of a utility is selling at any point in time

A) Intrinsic Yield

The common approach to measuring yield is based upon the relation between yield and price. If price P is known and dividend D is known, k, the yield at which the share is selling, may be inferred.

The basic stock formula is

$$P = \sum_{t=1}^{\infty} \frac{D_t}{(1+k)^t} \qquad \text{II.2}$$

The growth rate of the dividend is g, the expression for P becomes

$$P = \sum_{t=1}^{\infty} \frac{D(1+g)^{t-1}}{(1+k)^t} = \frac{D}{k-g} \qquad \text{IV.1}$$

Using as a base, the dividend history for the period 1965-1975, the expected dividend for 1975* would be \$3, for 1976, 3.08 etc. for an annual growth rate $g = .0267$

Under the reasonable assumption that k>g (in fact), we may solve for k

$$k = \frac{D}{P} + g \qquad \text{IV.2}$$

Using market data from 1975

$P\uparrow = 48.38$
$P = 44.57$
$P\downarrow = 40.75$

the range of k would be

$$k\downarrow = \frac{3.12}{48.38} + .0267 = .0912$$

$$k = \frac{3.12}{44.57} + .0267 = .0967 \qquad k\uparrow = \frac{3.12}{40.75} + .0267 = .1033$$

---

* OLSQ $y = mx+b$ $b = 2.17$ $m = .0753$ $r^2 = .826$

Gordon states that the expected rates of growth in dividends, earnings and share price are all equal and may be used to obtain an estimate of g; however, historical data contradicts this hypothesis which would have: g =

$$\sum_{t=o}^{t=n} \frac{D_t - D_{t-1}}{D_t} = \sum_{t=o}^{t=n} \frac{EPS_t - EPS_{t-1}}{EPS_t} = \sum_{t=o}^{t=n} \frac{P_t - P_{t-1}}{P_t}$$

Refer to appendix for additional data page 22

Substituting k into Eq IV.2

$$.0967 = \frac{3.44}{44.57} + g$$

$$g = .0195$$

B) Intrinsic Growth Rate

The utility is expected to raise funds from the sale of stock equal to the fraction s of the existing common equity, and if the fraction v of the funds raised is expected to accrue to the existing shareholders, the dividend to the existing shareholders is expected to grow at the rate vs due to the sale of stock. The intrinsic rate of growth in the dividend is therefore given by

$$g = br + vs \qquad \text{IV.3}$$

Bell data 1975

$b = .2878$

$r = .0953$

$v = 1 - E/P\lambda = 1 - 51.5874/46*1 = -0.12$

$s* = .06$

We assume P to be the price at which new shares will be sold; warrants presently outstanding permit acquisition at 46.00. And no underwriting cost is involved, thus $\lambda = 1$

Eq IV.3 $g = .3* .0953 + -.12*.06$

$g = .0358$

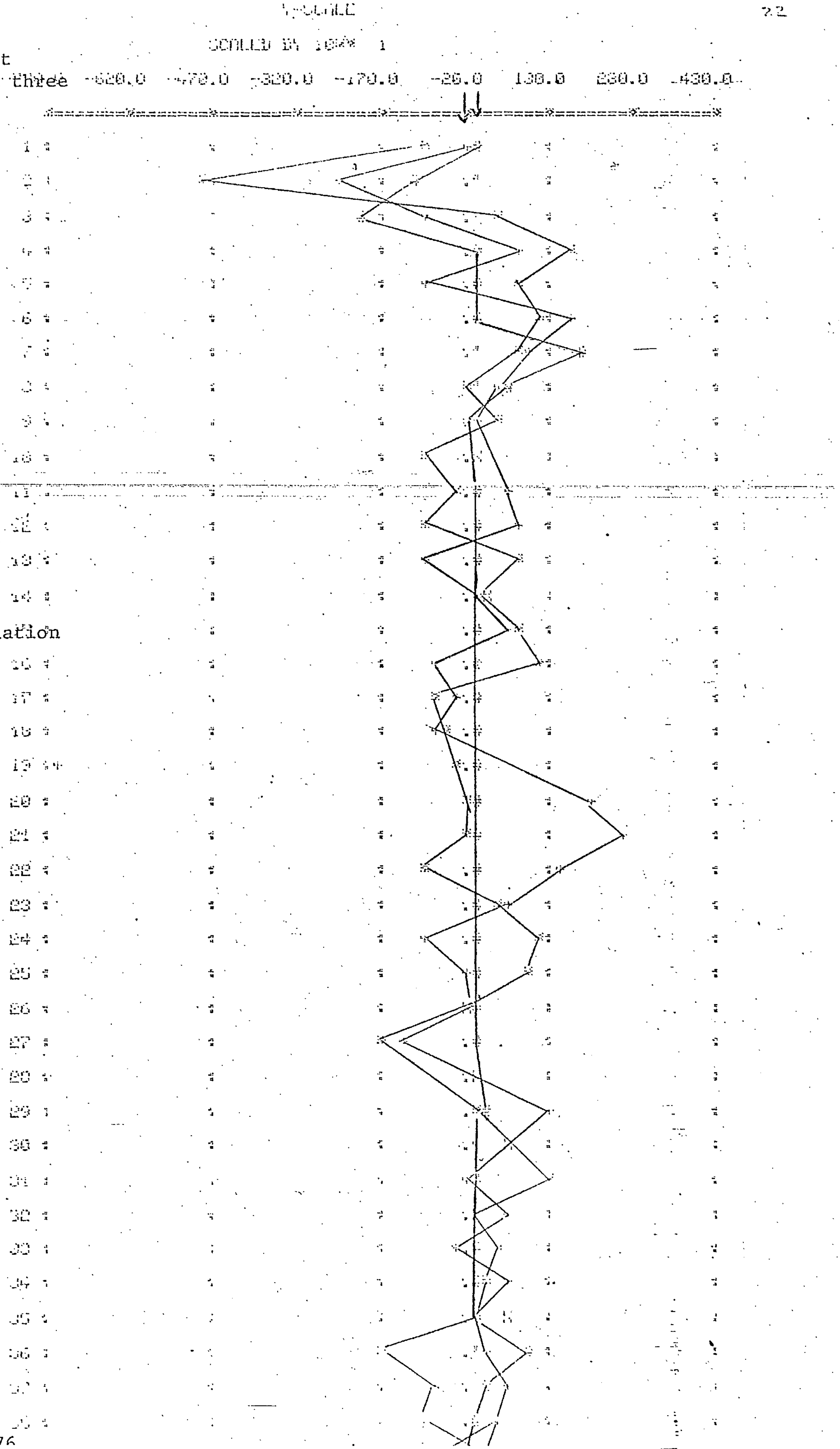
this figure is substantially different from the intrinsic yield (.0195) obtained from Eq. IV.2

* Existing common equity, end of 1975: 2,011,807,000

Excercise of warrants yields 46* 2,625,000 = 120,750,000

Fraction = 6%

Multiserial time plot
Percentage change in three
Values (1930-1972)



Mult R 0.3426
R^2 0.1174

%ch Price
Series 1
Symbols * mean .

%ch EPS
Series 2
Symbols ÷ mean ,

%ch Dividend
Series 3
Symbols # mean !

s.d. of residuals
5.1672
1st order autocorrelation
.327 vs 0.154
given random model
4th order -0.372
5th order --0.273

Dvar Div.

Market to book value relation P. 18-B

Theory:

When the return on common is equal to the yield investors require on common, the price of the stock is equal to its book value. That is when $r = k$, we have $P = E$. It follows that when we observe that $P=E$, we can be satisfied that $r = k$, and we need not trouble ourselves with the task of measuring k.

It is also true that when $P>E$, we may infer that $r>k$, and that the allowed rate of return should be reduced to make $r= k$. The reverse is true when $P<E$.

Although the market to book value relation is a simple and powerful guide to regulatory policy, it does not render the measurement of k unnecessary for two reasons:

1. $P>E$ means that r should be reduced, but not by how much. If $P>E$ by 20%, it does not follow that r is 120% of k and should be reduced proportionately to realize $r=k$.

2. A policy of $r=k$ is correct only if the utility is not expected to engage in stock financing. Should stock financing be a necessary or desirable source of funds, a return on capital equal to the cost of capital requires $r>k$ and $P>E$. Specifically, we should have $r=k/\lambda$ and the estimation of k and λ is preferred to juggling with r on the basis of the relation between P and E.

The use of Beta to measure share yield P. 20-C

The yield investors require on a share may be represented as equal to the interest rate on a risk free bond plus a risk premium

let k_m-i be the risk premium on a standard share
βj be the ratio of the risk on share j to the risk on a standard share

The yield investors require on a share may be written:

$$k_j = i + \beta j(k_m-i) \qquad \text{IV.6}$$

For estimating β_j, Gordon suggests that common practice is to run the time serves regression

$$R_jt - R_{Ft} = \alpha j + \beta_j(R_m-R_{Ft}) \qquad \text{IV.7}$$

where $Rj_t = [Djt + P_{jt}]/P_{j,\ t-1}$ = the realized return relative on share j in period t

D_{jt} = dividend during t

P_{jt} = price of a share at the end of t

R_{mt} = the realized return relative on a market portfolio of shares

R_{Ft} = the realized return relative on a risk free band

The regression is run over n prior periods to obtain estimates of β_j and αj, the latter being the average excess return realized on the share over the n periods.

One course of action to estimate k_m is to use an average of R_{mt} over n prior periods. If we have accurate estimates of kj and βj for one or more other shares, they may be used to estimate k_m by means of the expression.

$$k_m = i + \frac{1}{\beta j} [kj-i] \qquad \text{IV.8}$$

The resulting value of k_m along with the value of βj for the share of interest are employed in Eq. IV.5 to estimate k_j for that share

Eq. IV.5 $\quad k = \frac{D}{P} + br + s[1-E/\lambda P]$

Cost of Common Stock - (Pre tax) Non-Consolidated

End of 1975

Average number of common shares outstanding 38,998,000. Dividends per share 3.44

*Common equity @ 31.12.75 (000's)

Common @ 25 par	974,950.
Premium	441,213
Retained earnings	595,644.
Equity	2,011,807 or 51.59 per share

$$\frac{\Sigma \text{ Dividend payments 1975}}{\Sigma \text{ Equity 1975}} = \frac{135418}{2011807} = 6.73\%$$

Yield: $\frac{\text{E.P.S. 1975}}{\text{B.V.S. 1975}} = \frac{4.83^*}{51.59} = 9.36\%$

Net yield to investor: $\frac{Dt}{\overline{P}} = \frac{3.44}{44.57} \doteq 7.72\%$

$P.E._{1975} = 9.23$ - Capitalization ratio .1084

* from application to CRTC re issue of 75 m. preferred stock 9/76 p.29

* exclusive of extraordinary items.

Cost of preferred stock (Pre Tax) Non-Consolidated

End of 1975

Preferred Stock Dividends (000's)

3.20 series	2,705
3.34 series	4,132
4.23 series	8,459
2.28 series	5,900
2.25 series	3,649
Preferred Dividends	24,845

Preferred equity 331,307

Average rate on preferred = 24845/331307 = 7.5%

Historical Rates

Year	Dividends	Equity	Rate(%)
1970	5,706	93,997	6.07
1971	9,350	197,997	4.72
1972	13,079	197,991	6.61
1973	14,020	248,988	5.63
1974	17,594	332,002	5.30
1975	24,845	331,307	7.5

Cost of Debt (Pre Tax) Non-Consolidated

End of 1975

Total debt outstanding end of 1975 (000's)

Long Term Debt	2,294,023
Notes Payable	44,841
TOTAL	2,338,864

Interest Charges 156,218

Average ratio on debt 156,218/2,338,864 = 6.68%

Bell Canada (Unconsolidated)

Value of Capital

E.C. 1975

Book Value Approach		%
Preferred Shares	331,307	7.08
Common Stock	2,011,807	42.97
Debt	2,338,864	49.95
TOTAL	4,681,978	100

Market Value Approach				%
Preferred shares	Avg. Mkt Val	#O.S.		
Series A(3.20)	44.5	845	37,602	0.85
Series B(3.34)	44.5	1,237	55,046	1.24
Series C(2.25)	26.38	1,622	42,788	.96
(4.23)	49.44	2,000	98,880	2.23
(2.28)	25.50	5,000	127,500	2.87
Preferred Equity			361,816*	8.15
Common Stock	44.57	38,998	1,738,140*	39.16
Debt			2,338,864	52.69
TOTAL			4,438,820	100

Cost of Components

Preferred Stock:	7.5%
Common Stock:	6.73%
Debt:	6.68%

Series	Σ Dividends	Rate
3.20	2,705	7.19
3.34	4,132	7.51
2.25	3,649	8.53
4.23	8,459	8.55
2.28	5,900	8.44(1)
Common	135,418	7.79
Debt		6.68

*Rounded (1) Annualized

Explicit Cost of Components - Tax Adjusted

End of 1975

	Book Value Approach			Market Value Approach		
	Cost	Weight	Composite	Cost	Weight	Composite
Preferred Stock	7.5%	.0708	.5310	7.19	.0085	.0611
Series 3.20				7.51	.0124	.0931
3.34				8.53	.0096	.0819
2.25				8.55	.0223	.1907
4.23				8.44	.0287	.2422
2.28						
Common Stock	6.73	.4297	2.8919	7.79	.3916	3.0506
Debt	6.68	.4995	3.3367	6.68	.5269	3.5197
Weighted Average Cost of Debt		1.	6.7595		1	7.2393

Implications of Underwriting Costs

Assumptions: Bell's Internal Rate of Return
11% for 1975, 10 3/4% for 1976*

Issue 70 M @ $20 D = 1.80 @ 9%

Commission 3% = 2.1 M

Continuous interest cost:

Net proceeds = 67,900,000 @ 9% (on 70M) end of year = 9.2784%

Opportunity cost of

2.1 M over 20 yrs @ 10 3/4% yield = 225,750

N.P.V.	1,827,513.75
Add NPV of Comm.	2,100,000.00
TOTAL Opportunity Cost	3,927,513.75

N.P.V. of opportunity cost as a % of net proceeds: 5.78%

Total N.P.V. to Bell Canada

Investment 75 M: Net IRR = 10 3/4% (67.9M) − 9.2784% (75M) = 1.4716%

Net Investment 67.9 M

NCF per year = GCF 67.9* 10 3/4% − 75m * 9% =
7,299,250 − 6,750,000 = 549,250 * 20 yrs.

N.P.V. of project assuming IRR of 10 3/4%, I of 70 m and annual N.C.F. of 549,250 exclusive of taxes:

− 63,453,657.

Bell's IRR must be significantly higher than 10.75% as implied.

* See p.33, Application to CRTC re preferred stock 9/76.

VII- Corporate income tax and the cost of capital

The burden of a corporate income tax is different for a public utility than for a non-regulated business enterprise:

A) A business enterprise is presumed to make output and price decisions which maximize its profit before interest and taxes (EBIT). Hence, EBIT is independent of capital structure and the income tax paid, and taxation reduces earnings on common stock. However, since interest is a tax allowed expense, debt financing reduces the tax charge and raises the after-tax earnings on the total capital.

For example, assuming for simplicity the MM position that the cost of equity and debt capital with no tax is $\hat{x}$. If we now let $\hat{x}$ be the after tax cost of equity capital, the pre-tax cost of equity capital is $\hat{x}/(1 - \tau)$, but the pre-tax cost of debt capital is only $\hat{x}$.

Ex.: $\left.\begin{array}{ll}\text{Cost of equity (pre-tax)} & = 10\% \\ \text{Cost of debt (pre-tax)} & = 9\%\end{array}\right\} \hat{x}$

$\text{Tax rate } (\tau) = 45\%$

Assuming \$ Debt = \$ Equity $\rightarrow \hat{x} = 9.5\%$

Pre-tax cost of equity $= .1/(1 - .45) = .18$ *or* 18%
Pre-tax cost of debt capital $= .09$ *or* 9%

The common stockholders gain the difference between $\hat{x}/(1 - \tau)$ and $\hat{x}$ (9%) times the cost of an investment by financing it with debt instead of by the sale of stock or retained earnings.

B) A public utility differs in that the price of its products are set by the regulatory agency to provide it with $\hat{x}$ on the total capital after taxes. The income tax falls on the consumers; it is implied that a dollar of debt financing raises the charges to consumers by the current interest rate i <u>plus</u> any change in k that takes place (k follows i), while a dollar of equity financing raises the charges to consumers by $k/(1 - \tau)$ <u>less</u> any reduction in k that takes place.

The consequences of the debt equity decision on the pre-tax cost of capital to the consumer is expressed through the gross cost of capital without the depreciation term.

$$\hat{\jmath} = \frac{Bc + Ek/(1 - \tau)}{B + E} \qquad \text{VII-1}$$

...2

The value of k as a function of the firm's leverage rate is

$$k = \rho + \alpha\, B/E \qquad \text{V-2}$$

ρ = value of k with no debt in the capital structure

$\alpha < \rho - i$

Substituting for k in VII-1

$$\hat{z} = \frac{Bc + (E\rho + \alpha B)/(1-\tau)}{B + E}$$

The consequence of a change in the leverage rate for the value of $\hat{z}$ is expressed by $\partial\hat{z}/\partial B$

For a change in debt $c = i$, and with $B + E$

constant $\partial E/\partial B = -1$

$$\frac{\partial \hat{z}}{\partial B} = \frac{i - (\rho-\alpha)/(1-\tau)}{B+E} \qquad \text{VII-3}$$

Since $\alpha < \rho - i$, the above is negative and the cost of capital falls as leverage rises.

Evaluating Eq. VII -3

Bell 1975 data $i = .0668$

$\rho = .1$ (Assumption)

$\alpha = .03$

$\tau = .45$

$$\frac{\partial\hat{z}}{\partial B} \quad \frac{.0668 - (.1 - .03)/.55}{59.9739+51.5874} = -\ .000542$$

$$\text{or } -\frac{0.06}{B+E}$$

With no tax, we would have

$$\frac{\partial\hat{z}}{\partial B} = \frac{-\ 0.0032}{B+E} \text{ or } -\ .000029$$

Consequently, with no corporate income tax, a one per cent rise in the debt asset ratio reduces the cost of capital by .32% per cent, but with a 45% tax rate, a one per cent rise in the debt asset ratio reduces the cost of capital by 6% of its amount.

Another way of considering the issue is to compare the revenue requirements on an additional dollar of capital financed by equity with the same dollar of capital financed by debt. For the revenue requirement under the existing capital structures, Eq. VII.2 is rewritten

$$\hat{\zeta}\,(B+E) = Bc(E\rho + \alpha B)/(1-\tau)$$

Assuming once again that \$ Equity = \$ Debt (Ratio 1:1), the revenue requirement increase due to an additional dollar of debt financed capital is

$$\frac{\partial[\hat{\zeta}(B+E)]}{\partial B} = i + \alpha/(1-\tau) = .0668 + .03/.55 = .12$$

The revenue requirement is greater than the 6.68% interest rate because the higher leverage rate raises the required yield on the common stock.

For an additional dollar of equity financed capital, the revenue requirement is

$$\frac{\partial(\hat{\zeta}(B+E)}{\partial E} = \rho/(1-\tau) = .1/.55 = .18$$

Thus, the cost of equity capital to the consumer is substantially higher than that of debt capital.

Note – Eq. VII.3 is valid only up to the leverage rate at which i remains constant. Beyond some leverage rate, the i a utility pays rises with leverage, the absolute value of $\partial\hat{\zeta}/\partial B$ falls below its Eq. VII.3 value, and at a high enough leverage rate $\partial\hat{\zeta}/\partial B$ turns positive.

Accelerated depreciation and taxation

The government prescribes the procedures a firm may follow in computing depreciation for tax purposes. The depreciation charge that results may be, and usually is, larger than the depreciation charge that results from the practices the company follows in preparing its own annual reports and in the calculation prescribed by the regulatory agency.

In this case, the tax actually paid to the government is less than it would be if the tax allowed depreciation had been the same as the company's own deprecaition charge.

For example, in 1975, Bell Canada's book depreciation was approximately 338.26 million; this represents 5.9% on average gross depreciable fixed assets of 5,767 million. This amount (338.26M) is less than CCA on Bell's depreciable assets for 1975, since Bell's internal accounting provides for longer life on many assets, thus a lower rate. The rate on Bell's books, if used for tax purposes, would result in a substantially lesser claim for depreciation expenses and a higher tax payout.

Deferred taxes for 1975 were of 78.4 m and this amount represents the difference between the CCA and internal depreciation. Income taxes claimed (income statement) were of 174.24 m; this implies that actual taxes paid were 95.84m or an effective rate of 25% on EBT (387.3m) and of 18% on EBIT of 543.5m.(1)

The accelerated depreciation (CCA) for tax purposes makes the effective tax rate on corporate income less than the nominal tax rate. It would seem reasonable for the corporation to record the actual income tax levied and compute income after taxes to the common equity on the basis of the actual income tax levied. Instead, common practice is to compute the tax on a straight line (i.e. true) depreciation and show a smaller net income to common. This excess of the CCA over the tax actually levied is treated as a liability for deferred taxes on the assumption that it will have to be paid at some later date, when the straight line depreciation charge will be above the CCA charge.

The implications are that the government, and consumers, is therefore only lending the company the difference. This loan carries a zero interest rate; it may be payable in future if two conditions occur simultaneously.

(1) CCA claimed = 338.26M + 78.4 m = 416.66 m or average of 7.22% of current depreciable assets

A) When the company contracts in size

B) When and if, the company has no taxable earnings

In the case of the federally regulated carriers, the probabilities of occurrence are extremely remote. As of the end of 1975, cumulative deferred taxes for Bell Canada (parent company):

Effect of deferred taxes as a source of capital on the cost of capital

Book Value Approach - Using 30/06/76 data (1)

Source	Cost	Amount (000's)	Weight	Composite A	Composite B
Common Equity	0.0712 (2)	2,079,582	.388	2.7627	3.1173
Preferred Stock	0.075 (3)	331,307	.0618	.4636	.5231
Long Debt Debt	0.0724	2,294,023	.428	3.099	3.4968
Notes Payable	0.098	44,841	.0084	.082	.0925
Deferred Taxes	0.0	609,702	.1138	0.0	N/A
		5,359,455	1	6.4073	7.2298

By including deferred taxes as an element of capitalization, which in the long run it is, the effective cost is reduced to 6.4% (Composite A) from 7.2298 (Composite B). The difference of 0.8225% on total capitalization (including the deferred tax component) represents a savings of some 44 million dollars per year based on 6/76 data.

Rate of Return data, using earned return on common equity, yields the following rates:

Source	Cost	Amount (000's)	Composite A	Composite B
Earning on Common	10.18 (4)	2,079,582	3.95	4.46
Preferred Stock	7.5	331,307	.46	.52
Long Term Debt	7.24	2,294,023	3.1	3.5
Notes Payable	9.8	44,841	.08	.09
Deferred Taxes	0.0	609,702	0	N/A
			7.59	8.57

(1) Source - Non Consolidated balance sheet - Application to the CRTC re preferred stock 9/76 p.28.

(2) Auge. C.S. 0/S 39,873,000, E = 52.16 (non consolidated) Cost: D = 3.72 r = 7.12%

(3) Using 12/75 data, change to 6/76 not significant

(4) Six months to 30 June 105,821,000 on 2,079,582,000 X 2 (annualized)

As a consequence, it may be claimed that the effect of "deferred taxation" is to reduce the company's cost of capital by .32 to .98 of 1%; however, there are a number of more complex issues (which are presently under consideration by the cost inquiry committee) affecting the deferred taxes issue, one of these being a potentially close crossover point between ELG and CCA depreciation allowances for certain telecommunications utilities. The examples given serve only to evidence the current effect of deferred taxes on the capital structure of the utility.

Pre-tax Costing

An application of the MM position on capital costing may assist in clarifying in the cost issues further.

The pre-tax cost of equity capital is $\hat{x}_{eq}/(1 - \tau)$, since dividends paid to stockholders are not tax deductible; in this case, the cost of debt is $\hat{x}_d$ and that of deferred taxes remains $\hat{x}_{dtx} = 0$

The pre-tax cost of equity, both common and preferred, assuming a 45% tax rate is derived as follows:

Common	2,079,582 @	.0712	Component	=	.0614
Preferred	331,307 @	.075	Component	=	.0103
	2,410,889		Weighted Cost	=	.0717

The pre-tax cost is equal to .0717/.55 = .1304

Substituting into the composite cost table

Source	Cost	%ofΣ(A)	%ofΣ(B)	$\hat{x}$(A)	$\hat{x}$(B)
Equity	.1304	44.98	50.76	.0587	.0662
Debt	.0729	43.64	49.24	.0318	.0359
Deferred Taxes	0.0	11.38	N/A	0.0	N/A
		100	100	9.05%	10.21%

In this example, the spread in costing has been substantially increased through inclusion of tax effects; the advantage is now of 1.16% on total capitalization.

We should now consider the pre-tax gross yield required to meet capital costs without considering deferred taxes since the rate of return as regulated does not provide for a yield on the total infusion of funds, this would amount to having the consumers provide a portion of the capital (11.38% at end of 1975) and, in addition, pay the stockholders a return of $\hat{x}$ on this contributed capital.

Pre-tax rate of return as of December 31st, 1975.

	% Capital Structure	Rate	Weighted Cost
Cost of Debt	49.24	.0729	3.59
Earned Return on Common Equity	50.76	.2118	10.75
	Pre-tax rate of return on capital		14.34%

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(1) N.I. Applicable to common @ 12/75 = 280,808, common equity = 2,410,889 (000's)

Return = 11.65% and pre-tax cost = 11.65/.55 = 21.18

LEVERAGE EFFECTS ON CORPORATE EARNINGS

Leverage Concepts

1. Operating leverage is not a financial concept per se. It concerns the effect of a firm's cost structure on its earnings before interest and taxes (EBIT). Operating leverage can be defined as the use of assets with fixed costs (as against assets whose costs vary with output). The greater the proportion of fixed to total costs the greater the use of operating leverage. The "degree of operating leverage" (DO_L) measires the sensitiveity of the relationship between changes in output and EBIT.

It is defined as the % change in EBIT divided by the % change in output.

For example, using Bell Canada data with operating costs as a proxy for output:

(Millions)

	1974	1975	%Δ
Operating Costs (Output)	723.1	837.5	15.82
EBIT(2)	717.	828.5	
Less Depreciation	287.6	338.3	
	429.4	490.2	14.16

$$DO_L = 14.16/15.82 = .895 \text{ for } 74, 75$$

The other two concepts - Trading on the equity and Leverage - are financial in nature. These concepts refer generally to the fact that if a firm uses funds with a limited, explicit cost ("levered funds") lower than the return earned with these funds, then the return on common stock equity will be higher than otherwise would be true. Use of levered funds magnifies the effect of a change in return on assets on the return to common-stock equity

When the return on assets is greater than the cost of levered funds, the effect on return to common equity is favourable, the greater the use of levered funds and/or the lower their cost, the larger is the corresponding

(1) From: Dr. John A. Haslem, Arizona Review, Vol. 19, March 1970 pp. 7-11

(2) Operating profit before depreciation, interest and taxes

favourable effect on the return to common stockholders. Of course, the opposite holds true if the use of levered funds is unfavourable.

2. Trading in the equity is defined as "the use of fixed (or limited) charge securities in the capitalization of a company,(3) measured by the ratio of (1) the rate of return on -1- the existing common stock equity to -2- the rate of return on the entire capitalization as it would have been if there only common stock outstanding". The concept is also known as "balance sheet leverage" since it involves alternative capital structure proportions.

Algebraically, the before-tax ratio of trading on the equity (ex. preferred stock) is defined as

$$\frac{1}{S} \cdot \frac{Y - F}{F}$$

where S equals the proportion of common stock in the firm's total capitalization (long term funds); Y equals net operating income; and F equals the interest charges on debt

The use of trading on the equity involves a relationship between alternative capital structures and earnings per share (EPS) Analogons to that between alternative cost structures and EBIT.

3. Leverage is defined as "the effect on changes in earnings under conditions where the capitalization is not altered, created by use of fixed (or limited) charge securities in the capitalization of a company measured by the ratio of -1- the rate of growth in earnings available to common equity to -2- the rate of growth of earnings before interest and taxes. The concept is also called "income-statement leverage" since it involves changes in earnings (with a given capital structure). The degree of financial leverage (DF_L) is algebraically stated (ex preferred stock) as

$$\frac{Y}{Y-F}$$

(3) Pearson Hunt, "A Proposal for Precise Definitions of 'Trading on the Equity' and 'Leverage'," Journal of Finance, XVI (September 1961), pp.377-386

The use of levered funds means more variability in the EPS associated with changes in EBIT.

Graphical Estimation of Earnings

Steps:

A) Plot total revenue and total operating expenses for years 1965-1975 against sales volume.

B) The line representing the relationship between total operating expenses and sales volume (or proxy) is fitted by inspection to the plotted points. If drawn properly (!), the cost line should approximate a line computed by LSQ. While acknowledging the assumptions and limitations of linear cost-revenue analysis, linearity is assumed for its simplicity and probable appropriateness in the short run for relatively small changes in output (volume).

C) A line representing the $ difference (EBIT) between the values on the revenue and cost lines is drawn in part (b). This line shows the estimated relationship between EBIT and volume (EBIT line). Part (b) serves a transitory role between the use of operating leverage reflected in part (d) and the financial leverage concepts illustrated in part (c).

D) The relationship between EBIT and EPS (EPS line) is drawn for the 1975 capital structure as Eq.1 in part (c). This line is drawn from the EPS that would result from any two levels of EBIT[4]. Thus, derivation of Eq.1 allows the effect of changes in total revenue as evidenced by EBIT to be reflected in EPS for the particular capital structure. In other words, for a given capital structure, the EPS that result from increases or decreases in total revenue and EBIT can be estimated by movement along Eq. 1.

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(4) EBIT
Interest
Income Taxes
Net Income After Taxes
EPS

E) The relationship between EBIT and EPS with the 1975 capital structure is shown by Eq. 2 in part (a). Eq.(2) shows that the estimate of Bell's 1975 EPS using the EBIT line with actual revenue is >$6. The difference between this estimate and the Eq.1 estimate is explained by any change in the capital structure.

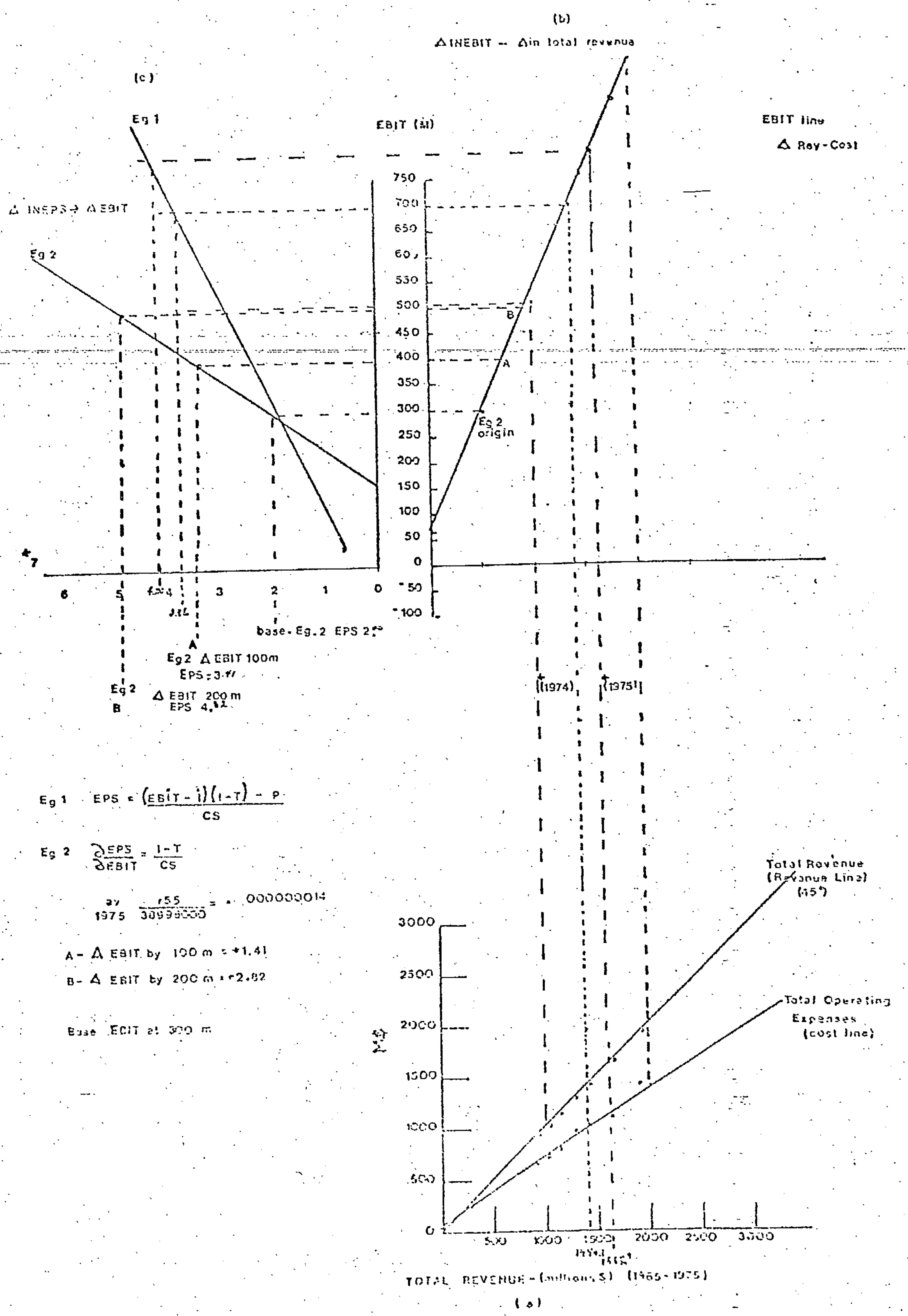
F) The intersection of Eqs. 1 and 2 represents the indifference level of EBIT(=EPS) between the two capital structures. The more highly levered capital structure will cause higher EPS above this level and vice-versa below it.

Briefly, on the EBIT-EPS relationship:

(1) for a change in EBIT, movement along a line representing the relationship between EBIT and EPS for a particular capital structure illustrates leverage

(2) with a given EBIT, comparison of EPS among lines representing the EBIT-EPS relationships for various capital structures illustrates "trading on the equity".

TOTAL REVENUE -- EBIT -- EPS Graph



Eq 1 $\quad EPS = \dfrac{(EBIT - i)(1-T) - P}{CS}$

Eq 2 $\quad \dfrac{\partial EPS}{\partial EBIT} = \dfrac{1-T}{CS}$

ay 1975 $\quad \dfrac{.55}{38998000} = .00000014$

A - Δ EBIT by 100 m = +1.41

B - Δ EBIT by 200 m = +2.82

Base EBIT at 300 m

Effect on EBIT and EPS of changes in Bell's Capital Structure

Assumptions:
1) Apparent tax rate of 45%
2) Ex. preferred stock
3) Capital Structure end of 1975 (Rounded)

Debt	50%	2,375	
Equity	50%	2,375	40 M C.S.
		4,750	

4) Preferred equity included in common
Calculations used to show alternative results only

	A-50% Debt Eq. 2,375 (40M-C.S.)	B-60% Debt Eq. 1,900 (32M-C.S.)	C-70% Debt Eq.1,425 (24M-C.S.)
	Dt 2,375	Dt 2,850	Dt 3,325
EBIT (incl.depr.)	490.1	490.1	490.1
Interest @ 7.77%	184.65	221.58	258.51
EBT	305.45	268.52	231.59
Taxes	137.45	120.83	104.22
Earnings	168	147.69	127.37
E.P.S.	4.20	4.62	5.31

DATA FOR TOTAL REVENUE-EBIT-EPS GRAPH

Bell Canada (non-consolidated)

$ Millions

Years Ended Dec. 31	1970	1971	1972	1973	1974	1975
Operating Revenues	936.6	1018.8	1125.4	1275.2	1440.1	1665.9
Total Operating Expenses	623.9	691.9	766.4	876.0	1010.7	1175.6
INTEREST COSTS	77.5	87.2	98.7	113.2	127.6	156.2
ACTUAL E.P.S.		3.22	3.54	3.75	3.86	4.20
C.S. O/S (000's)		36,680	36,808	36,931	37,128	38,998

VI Cost of Depreciation in Addition to Other Capital Charges

Gross charge to the consumer per dollar of capital employed

$$\mathfrak{z} = \frac{Z}{N(B+E)} = \frac{H + NB_c + NE_r/(1-\tau)}{N(B+E)} \qquad \text{VI.2}$$

this expression may be called the allowed gross return on the capital employed. Substituting r for k (assuming r = k) we have an expression for what the gross return should be

$$\hat{\mathfrak{z}} = \frac{(H/N)+B_c+ k/(1-\tau)}{B+E} \qquad \text{VI.2(b)}$$

where H is the depreciation on capital per period.

Using V1.2 for Bell Canada for 1975

$$\mathfrak{z} = \overset{H}{338.26\text{ M}} \overset{+}{+} (\overset{N}{38.998\text{ M}} \overset{*}{*} \overset{B}{59.9739} \overset{*}{*} \overset{c}{.0668})$$

$$+ (\overset{N}{38.998\text{ M}} \overset{*}{*} \overset{E}{51.5874} \overset{*}{*} \overset{r}{.0953})/(1 - \overset{\tau}{.45})$$

$$/\overset{N}{38.998\text{M}} \overset{*}{\ } (\overset{B}{59.9739} + \overset{E}{51.5874})$$

$$Z = 843{,}087{,}004$$

$$N(B+E) = 4{,}350{,}667{,}577$$

$$\mathfrak{z} = \simeq .19378$$

in VI.2(b)

$$\hat{\mathfrak{z}} = \frac{338.26\text{M}/38.998\text{M} + (59.9739 * .0668)+(51.5874*.1084)^{(1)}/(1 -.45)}{59.9739 + 51.5874}$$

$$\simeq .20480$$

$$N(B+E) = 4{,}350{,}667{,}577.$$

from Eq. 111.1

Using data obtained from the LOM study[1]

EPS @ 31/12/75 = 6.20

H = 338 M p.37

N = 39,763,689 p.45

B = 2160.9M/N = 54.3435 p.40[2]

c = 7.5379% p.41

E = 2030.9M/N = 51.0748 p.44

r = 10% p.39

τ = 45% p.46

Using formula VI.2

Z = 338M +(39.7M*54.3*.07)+(39.7m*51.0742*.1)/.55

/39.7m*(54.3+51.07)

= .20758

Z = 870,140,624

N(B+E) = 4,191,796,638

Consequently, empirical tests situate the allowed gross return on capital employed at approximately 20%. In other words, the consumer is charged $.20 per annum for each $1 of capital employed.

Substituting LOM data into VI.2(b) in order to obtain $\hat{z}$, the gross return should be (substituting k =.1084 for r = .09765

$\hat{z}$ = .1958 or ≃ 20% also

At this point, k is slightly larger than r, and in theory, could be increased slightly until r = k, all other conditions being the same.

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(1) Loewen, Ondaatie, McCutcheon & Co. Ltd. dated 22/06/76 - Analyst John L. Drolet

(2) Appears to be exclusive of notes