SHAREHOLDER VALUE: HOW GROWTH AND GEARING INTERACT TO INFLATE THE GAP BETWEEN ENTERPRISE VALUE AND CORPORATE CAPITAL EMPLOYED

Peter Harding – November 2011

Introduction

Shareholder value is optimised at that level of equity market capitalisation that embraces market value added at its maximum. Market value added (MVA) is the difference between the corporation's enterprise value and its capital employed: this is the same as the difference between its equity market capitalisation and its balance sheet equity on the assumption, adopted in the analysis which follows, that the corporation's debt always trades at face value – that is, there are no unanticipated changes in interest rates. MVA is generally dominated by the present value of the corporation's growth opportunities (PVGO): its other component is the present value of the excess returns – sometimes referred to as the 'economic profits' – that the stock market expects will be earned on its existing capital employed.

An earlier paper – Optimal payout policy under an integrated model of the financial decision calculus of the corporation (2008), hereafter referred to as 'OPP-I' – developed a framework in which it was shown that there are two rules to be followed in order to maximise market value added. These rules are widely rehearsed in the literature of corporate finance: firstly, the management should adopt that gearing ratio – herein the ratio of debt to enterprise value – that minimises the corporation's weighted average cost of capital (WACC): secondly, its capital expenditure each period should be set at that amount that brings its marginal efficiency of capital (MEC) down to the level where it is equal to the WACC. This latter rule is equivalent to saying that the corporation should undertake only those projects which have an internal rate of return in excess of the WACC, but, as a simplification, the MEC will be drawn as a continuous downward-sloping straight line in what follows. It slopes downwards to the right through the simple expedient of ranking the opportunities in descending rate of return order, and thus the marginal efficiency of capital acts as the corporation's demand curve for investment funds. Of course, in practice, such a ranking exercise is complicated by the need to allow for the riskiness of the cash flows to be anticipated from the various projects.

The model assumes that the MEC swings steadily to the right over time (from a fixed point on the y-axis). In this case, the corporation's accounting and stock market magnitudes – for instance, its capital employed and enterprise value - increase at a common, steady rate. At the same time, its accounting and stock market ratios – for instance, its return on capital employed and price to earnings ratio – remain constant through time. In arriving at these results, it is assumed that a modification of the constant growth dividend discount model may be used to value the corporation's equity. This modification involves replacing dividends with share buy-backs of the same value at each point in time. This approach avoids imposing the burden of an additional income tax liability on those stockholders who qualify to pay the higher rates – for example, the 40% and 50% rates in the UK (though these translate into rates of 25% and 36% (approximately in the latter case) on the net dividend). Fortunately the buy-back alternative does not prejudice the interests of other stockholders, for example, the gross funds – the pension funds and overseas investors - since they may satisfy their own individual requirements for income, if any, by selling shares in the marketplace. Theoretically, stockholders will enjoy capital appreciation equivalent to the dividends forgone as a result of the buy-back process, with the advantage that the tax rates on gains are significantly lower – 18% or 28% for higher rate payers: more importantly for the purposes of the present paper, no tax liability arises at all until such gains are actually realised.

In OPP-I, the model was calibrated over a range of growth rates. The resulting table – Table I-1 - shows enterprise value, and thus MVA, rising sharply with the increase in the growth rate, even though each of the corporations modelled has the same initial (period one) capital employed of $100m., and the same return on capital employed. This effect is accompanied by a significant reduction in the overall tax rate. This is measured as the ratio of the corporation tax paid to the total returns to the all corporation's stakeholders, most obviously the bondholders and the stockholders, but including also the taxman as well. Partially this reflects the impact of the tax shield which generates differences from company to company in the amounts of profit subject to corporation tax: all the companies in the table operate with at the same gearing ratio (debt to enterprise value, as noted earlier), and this then means that the faster-growing cases manifest higher levels of balance sheet gearing. This results in faster growing companies manifesting higher rates of return on equity, which in turn

generates larger capital appreciation for their stockholders over time. It is assumed that these gains are not realised and are thus free of tax, but there is also an effect whereby they partially avoid corporation tax as well.

In order that these relationships may be explored in more detail, the present paper repeats the exercise described in the previous paragraph. This appears as Table L2-2: the only change from OPP-I is to assume a 23% corporation tax rate, to anticipate the situation in the UK where this new rate will apply from April 2014. In the earlier paper, a corporation tax rate of 28% was applied. However, the analysis starts by trying to isolate the growth effect on the valuation of the corporation: thus Table L2-1 below sets up the accounts of a set of nine companies – growing at rates between zero and eight per cent per annum - that eschew the use of debt finance. The additional impact of the tax shield is then examined in the later table.

It is evident from the analysis – this is set out in detail in Table L2-3 below – that corporations that eschew recourse to debt finance fail to optimise shareholder value. A supplementary exercise then looks in detail at the corporation growing at 6% per annum, and shows how shareholder value may be enhanced through a debt for equity swap. This process is seen to have a substantial impact on the corporation's enterprise value, and thus on its market value added.

As an extension to the study, it so happens that the same analytical approach may be applied to examining the effect on the value of the company of a reduction in the rate of corporation tax: this exercise is set out in the appendix. As might be anticipated, a 5% reduction provides a substantial boost to the planned level of capital expenditure and the MVA, while interestingly there is also a small increase in balance sheet gearing. At one time, there was also the suggestion that any such reduction in the corporation tax rate should be accompanied by a provision to disallow interest payments as an expense in calculating taxable profits: this was seen as a deterrent to excessive risk taking in the wake of the financial crisis of 2008/9. The appendix then demonstrates that this additional change would substantially reduce the corporation's optimal gearing ratio, resulting in the need for an equity rights issue. The benefits of the tax reduction to the stockholders would be significantly impaired, though not

entirely eliminated. In the case studied, the changes still result in an increase in the planned volume of investment.

The All-Equity-Financed Corporation

In OPP-I, the equity cost of capital was assumed to be determined by the relationship:

$$r(d) = 0.10 + 0.01d$$

where d is the ratio of debt to enterprise value, and the ECC will generally be denoted by r. In the present case, the corporation arbitrarily selects a debt ratio of zero, which results in a WACC equal to the intercept in the above formula – 0.10, or 10%. It is this level that acts as the critical value for determining the scale of its capital expenditure programme each period. In Table L2-1 below, the ECC fails to make an appearance, but its presence is in fact implicit in the sum of the growth rate and the disbursement yield in each column. This result follows on from the use of the

TABLE L2-1	P&L ACCOUNTS FOR PERIOD ONE (ZERO GEARING)								
	GROWTH - PER CENT PER ANNUM								
	0	1	2	3	4	5	6	7	8
BALANCE SHEET (BEGINNING PERIOD) - $M									
CAPITAL EMPLOYED	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000
FINANCING - EQUITY	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000
PROFIT AND LOSS ACCOUNT - $M									
OPERATING PROFIT	13.994	13.994	13.994	13.994	13.994	13.994	13.994	13.994	13.994
CORPORATION TAX	3.219	3.219	3.219	3.219	3.219	3.219	3.219	3.219	3.219
NET PROFIT	10.775	10.775	10.775	10.775	10.775	10.775	10.775	10.775	10.775
RETAINED PROFIT	0.000	1.000	2.000	3.000	4.000	5.000	6.000	7.000	8.000
PAYOUT	10.775	9.775	8.775	7.775	6.775	5.775	4.775	3.775	2.775
ACCOUNTING RATIOS - %									
ROCE	10.775	10.775	10.775	10.775	10.775	10.775	10.775	10.775	10.775
RETURN ON EQUITY - NET	10.775	10.775	10.775	10.775	10.775	10.775	10.775	10.775	10.775
PAYOUT	100.000	90.719	81.439	72.158	62.877	53.596	44.316	35.035	25.754
STOCK MARKET STATISTICS									
EQUITY CAPITALISATION - $M	107.750	108.611	109.688	111.071	112.917	115.500	119.375	125.833	138.750
MVA - $M	7.750	8.611	9.688	11.071	12.917	15.500	19.375	25.833	38.750
P-E RATIO	10.000	10.080	10.180	10.308	10.480	10.719	11.079	11.678	12.877
YIELD (DISBURSEMENT) - %	10.000	9.000	8.000	7.000	6.000	5.000	4.000	3.000	2.000
OVERALL TAX RATE - %	23.000	22.859	22.686	22.467	22.181	21.793	21.236	20.368	18.829
PEG	INF.	10.080	5.090	3.436	2.620	2.144	1.846	1.668	1.610
MEC FUNCTION									
INTERCEPT (*100)	N/A	11.550	11.550	11.550	11.550	11.550	11.550	11.550	11.550
GRADIENT (*-100)	N/A	1.550	0.775	0.517	0.388	0.310	0.258	0.221	0.194

constant growth dividend discount model, which shows the market value of the corporation's equity will be equal to its prospective dividend divided by the difference between the ECC and the growth rate:

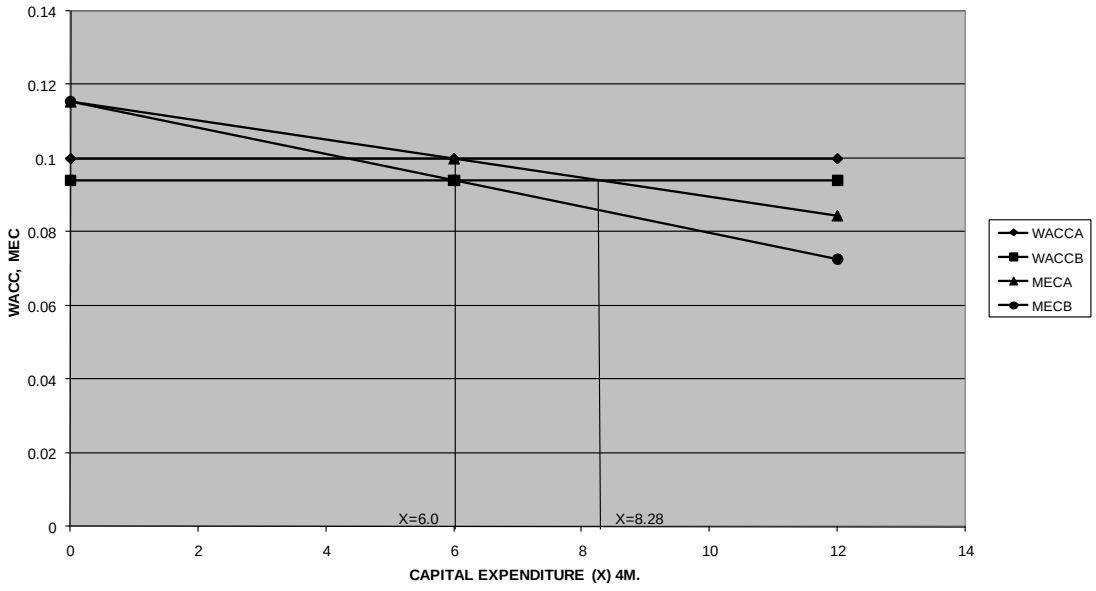
$$Q_0 = D_1/(r - g)$$

Rearranging this formula gives the sum stated, with D_1/Q_0 being the prospective dividend (or rather, disbursement) yield. At the end of period one, it is expected that the corporation growing at 6% per annum, for example, will be confronted by a linear marginal efficiency of capital curve with the parameters indicated in the last two rows of the table:

$$MEC_1 = 0.1155 - 0.00258X_1$$

where X_1 is the amount to be invested. Setting the MEC equal to the WACC (0.10 as explained earlier), the equation may be solved to give a period one optimal level of capital expenditure of $6m. These relationships are depicted as MECA and WACCA in Figure L2-1 below. The investment of $6m. appears in the table as retained

FIGURE L2-1



earnings in the case of 6% growth, and the process may be replicated in respect of the other columns to generate the various amounts to be invested by the different corporations tabulated. In each case, it is assumed that the MEC curves are moving steadily towards the right over time at the annual percentage rate indicated by the column headings, so that the accumulated capital employed at the beginning of period one may be obtained by calculating X_1/g. If growth is 6%, the formula returns capital employed of $100m. (=6/0.06). The model has been calibrated so that each of the corporations depicted has grown to the point where it has capital employed of $100m. at the beginning of period one.

Given the MEC curve above, it follows that the corporation will achieve a return on capital employed (ROCE) of 10.775%, as shown in Table L2-1. This is the simple average of the intercept in the MEC relationship and the WACC (=0.5*(0.1155+0.10)). The ROCE function itself will be linear also, with the same intercept as the MEC, but with half the gradient. These relationships are assumed to be net of corporation tax, and grossing up at the rate of 23% (dividing by 0.77) indicates the figure of $13.994m. shown for the operating profit in Table L2-1. This analysis is common for all cases in the table, and the profit and loss accounts follow immediately, including the allocations to retained earnings, as required to finance the various capital expenditure programmes. In the case of 6% growth, the cash available for the distribution will be $4.775m. at the end of period one, which, to give a prospective disbursement yield of 4%, implies an equity market capitalisation of $119.375m. at the beginning of the year. Of course, to avoid landing higher rate tax payers with an unnecessary income tax bill, it is assumed that the distributions will be made by buying back shares.

There are two further matters to be explained in relation to Table L2-1 at this stage. The first is that the intercept for the MEC functions relates to the figure of 0.108 used for the intercepts used in OPP-I, Table I-1. The figure of 0.108 needs firstly to be grossed up by dividing by 0.72 (=1-0.28) where, as was the case in the UK, the rate of corporation tax is 28%. This gives a grossed up intercept of 0.15. This then needs to be multiplied by 0.77 (=1-0.23) to give the value of 0.1155 shown in each column of the table. Of course, the gradients of the MECs are arbitrary, being selected to

conform with the aim of examining the various corporations in that year of their lives when they begin with capital employed of $100m. This degree of conformty permits various interesting financial comparisons may be made between them.

The second matter relates to the 'overall tax rate' row of the table, and in particular, to explaining why faster-growing corporations appear to enjoy lower tax rates. The overall tax rate is the ratio, as a percentage, of the corporation tax paid in each case, to the sum of the corporation tax paid (the same figure) and the total return to the stockholders. This latter figure may be obtained as the distributable cash plus the capital gain, which is the growth rate multiplied into the beginning period equity market capitalisation. This last figure is greater than the amount of retained earnings in each case because each dollar of retained earnings converts into a greater amount in terms of market capitalisation. This conversion factor is known as the MVA ratio.

Even in the case of zero growth, the MVA ratio exceeds unity. It will be seen in due course that the MVA ratio is necessary to the solution to the value of the corporation when it includes some debt in its capital structure. In the case of 6% growth, the MVA ratio works out at 1.19375: in the past, the corporation has invested a total of $100m. which is valued at $119.375m. in the marketplace at the beginning of period one. Thus, multiplying the MVA ratio into the $6m. investment gives $7.1625m., which with the distribution of $4.775m. makes $11.9375m., some 10% (the ECC again) of the initial equity market capitalisation. The overall tax rate – 21.236% - is then the $3.219m. corporation tax bill as a percentage on $15.156m. (=3.2185+11.9375).

Effectively, $1.1625m. of the capital appreciation accruing to the stockholders is free of all taxes (including corporation tax), so long as the gain on the shares is not realised by those among them who are liable to capital gains tax. A dollar invested back into the business is worth more than a dollar spent buying back the company's stock.

The Market Value Added Ratio

Across Table L2-1, market value added is shown as increasing from $7.75m. in the case of zero growth, to $38.75m. for growth of 8%. As already noted, each of the corporations in the table has the same $100m. capital employed.

In OPP-I, the following formula was derived for the enterprise value of the corporation:

$$V_0 = A_0 * (ROCE - g)/(WACC - g)$$

The formula reduces to the dividend discount model quoted earlier in the case of the equity financed companies detailed in Table L2-1. The first term in the numerator appears as the net profit - $10.775m. in all cases – while the second equals the amount retained for investment. The numerator is then the same as the payout, while the WACC reduces to the ECC.

In the case of 6% growth, the factor post-multiplying the capital employed, A_0, works out at 1.19375 (=(0.10775-0.06)/(0.10-0.06)): this is the MVA ratio. If, as should normally be the case, the ROCE exceeds the WACC, the ratio will increase as the growth rate increases, as demonstrated by the rising line of the companies' equity market capitalisations in Table L2-1. There is an obvious discontinuity when the growth rate equals the WACC, as the denominator becomes zero. This indicates the limitations of the constant growth dividend discount model: usually it will be appropriate to switch to an analytical mode which envisages declining growth over time. The three-stage DDM, for instance, assumes a high, unsustainable growth rate initially, followed by a period of deceleration, which in turn gives way to a long-term growth rate below the WACC. In this way, the present value of the cash flow, that is, the dividends/buy-backs, may be made to converge to a meaningful value for the corporation.

The Debt-Financed Corporation

This section introduces debt onto the corporation's balance sheet. The approach is similar to that adopted in the earlier section: in Table L2-2 overleaf, the accounts of 9 corporations growing at rates between zero per cent and 8% are set out.

TABLE L2-2	P&L ACCOUNTS FOR PERIOD ONE (DEBT/ENTERPRISE VALUE = 22.233%)								
	GROWTH - PER CENT PER ANNUM								
	0	1	2	3	4	5	6	7	8
BALANCE SHEET (BEGINNING PERIOD) - $M									
CAPITAL EMPLOYED	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000
FINANCING									
EQUITY	75.241	74.940	74.559	74.058	73.373	72.377	70.796	67.904	60.913
DEBT	24.759	25.060	25.441	25.942	26.627	27.623	29.204	32.096	39.087
PROFIT AND LOSS ACCOUNT - $M									
OPERATING PROFIT	13.611	13.611	13.611	13.611	13.611	13.611	13.611	13.611	13.611
INTEREST	2.113	2.139	2.172	2.214	2.273	2.358	2.493	2.740	3.336
PROFIT BEFORE TAX	11.498	11.472	11.439	11.397	11.338	11.253	11.118	10.871	10.275
CORPORATION TAX	2.644	2.639	2.631	2.621	2.608	2.588	2.557	2.500	2.363
NET PROFIT	8.853	8.833	8.808	8.775	8.730	8.665	8.561	8.371	7.911
RETAINED PROFIT	0.000	0.749	1.491	2.222	2.935	3.619	4.248	4.753	4.873
PAYOUT	8.853	8.084	7.317	6.554	5.795	5.046	4.313	3.618	3.038
ACCOUNTING RATIOS - %									
ROCE	10.480	10.480	10.480	10.480	10.480	10.480	10.480	10.480	10.480
RETURN ON EQUITY - NET	11.766	11.787	11.814	11.849	11.899	11.972	12.093	12.328	12.988
PAYOUT	100.000	91.516	83.071	74.682	66.383	58.236	50.383	43.217	38.405
INTEREST COVER	644.042	636.321	626.780	614.687	598.862	577.262	546.020	496.826	407.965
STOCK MARKET STATISTICS									
EQUITY CAPITALISATION - $M	86.606	87.657	88.991	90.742	93.140	96.625	102.154	112.269	136.722
ENTERPRISE VALUE - $M	111.365	112.716	114.432	116.684	119.767	124.248	131.358	144.364	175.809
MVA - $M	11.365	12.716	14.432	16.684	19.767	24.248	31.358	44.364	75.809
P-E RATIO	9.783	9.923	10.103	10.340	10.668	11.151	11.932	13.412	17.281
YIELD (DISBURSEMENT) - %	10.222	9.222	8.222	7.222	6.222	5.222	4.222	3.222	2.222
OVERALL TAX RATE - %	19.429	19.206	18.929	18.575	18.107	17.460	16.506	14.958	12.011
PEG	INF.	9.923	5.052	3.447	2.667	2.230	1.989	1.916	2.160
MEC FUNCTION									
INTERCEPT (*100)	NA	11.550	11.550	11.550	11.550	11.550	11.550	11.550	11.550
GRADIENT (*-100)	NA	2.139	1.070	0.713	0.535	0.428	0.357	0.306	0.267

The ECC remains the same upward sloping function of the gearing ratio:

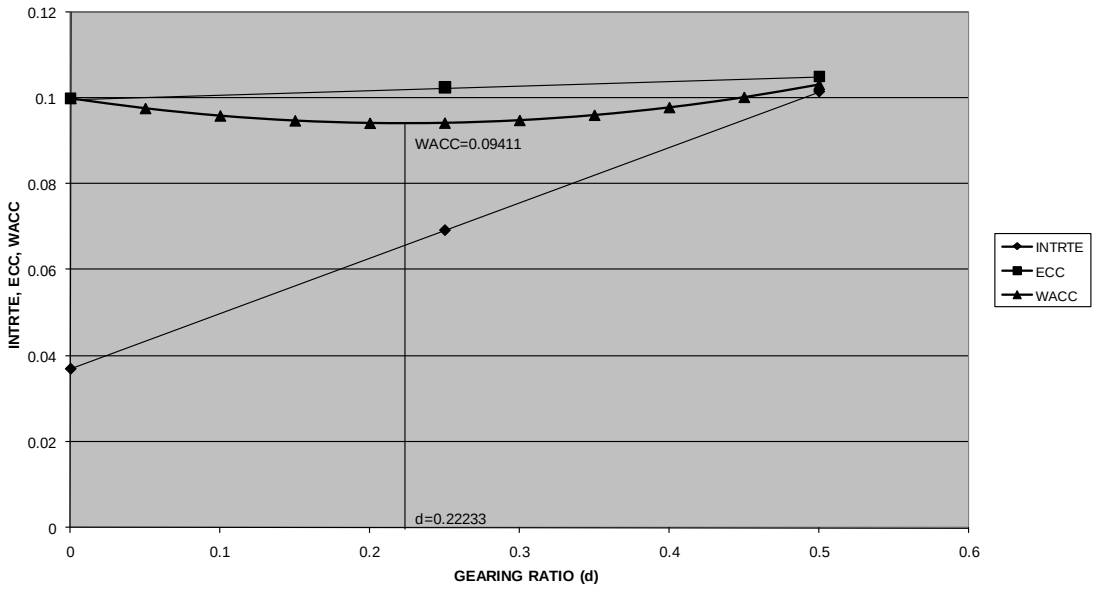
$$r(d) = 0.10 + 0.01d$$

This is the upper upward-sloping straight line in Figure L2-2 overleaf. The interest rate, INTRTE (n(d) below), that the corporation is required to pay is also dependent on the level of the debt ratio the corporation chooses. At the gross level, the interest rate function is taken to be linear, with an intercept of 0.048056 and a gradient of 0.167778. In OPP-I, this interest rate function resulted in an optimal gearing ratio of 25%, giving a gross interest rate of 9% exactly. In the earlier exercise, the net of corporation tax factor was 0.72: under the new corporation tax regime, the factor will become 0.77, resulting in the equation:

$$n(d) = 0.037003 + 0.129189d$$

as the net of tax interest rate. This is the lower of the two upward-sloping straight lines in Figure L2-2.

FIGURE L2-2



In order to minimise the WACC, it is necessary to equate the marginal cost of debt (MCD) with respect to the gearing ratio with a lowered marginal cost of equity (MCE-). The MCD is an upward-sloping straight line with the same intercept as the interest rate function, but double the gradient:

$$MCD = 0.037003 + 0.258378d$$

The MCE is similarly an upward-sloping straight line with the same intercept as the ECC and double the gradient. However, it is necessary to reduce the intercept by the value of the gradient (0.01) in order to reflect the fact that the equity proportion of the financing mix is falling as the gearing ratio increases:

$$MCE- = 0.090 + 0.020d$$

By setting the MCD equal to the MCE-, it is possible to locate the intersection of these lines, and thus the optimal value of the gearing ratio. In this case, d emerges with a value of 0.222325 (about 22.23%), and plugging this value into the ECC and interest rate functions above indicates an ECC of 10.2223% and an interest rate of 6.5725%. This latter figure equates to an interest rate of 8.5357% after grossing up at

a corporation tax rate of 23%. The minimising value of the weighted average cost of capital is then:

$$\text{WACC} = 0.222325 * 0.065725 + (1 - 0.222325) * 0.10222325 = 0.094109$$

that is, 9.4109%. As before, this becomes the cut-off for determining the level of capital expenditure each year. Under the 6% growth column in Table L2-2, the MEC curve is shown to have an intercept of 0.1155 (as before) and a (negative) gradient of 0.00357. This latter figure has been calibrated so that this line passes through the WACC to indicate an optimal level of capital expenditure of $6m. at the end of period one. These relationships are depicted in the earlier Figure L2-1 as MECB and WACCB. The ROCE will be most easily calculated as the simple average of the WACC and the intercept, in this case 10.480% (=0.5*(0.1155+0.094109)). This figure is common to all the cases in Table L2-2. It is immediately worth pointing out that both the WACC and the ROCE are now lower than they were in the all-equity cases in Table L2-1 – 10% and 10.775% respectively.

It is then a straightforward matter to solve the 6% column. The MVA ratio noted above works out at 1.31358 (=(0.104804-0.06)/((0.094109-0.06)), which immediately establishes the enterprise value of the company shown in the table – some $131.358m. The amounts of debt and equity on the balance sheet follow from the gearing ratio, as does the interest charge for period one (computed at the gross rate of interest calculated previously). This has to be deducted from the operating profit - $13.611m. - which is the ROCE divided by the tax factor, times beginning period capital employed (=100*0.104804/0.77). Pre-tax profits suffer corporation tax at 23% to leave earnings of $8.561m.

The company needs to finance an investment of some $6m. at the end of period one, 29.204% (this figure is obtained as the ratio of debt to capital employed from the balance sheet) of which will be financed by additional borrowing ($1.752m.): thus the company will need to retain $4.248m. This leaves $4.313m. to be distributed, some 50.383% of earnings, as shown in the table. It may be seen that the distribution amounts to some 4.222% of the corporation's equity market capitalisation. Adding on

a capital gain of 6% gives a total return of 10.222%, equal to the ECC of course. This proves that the accounts are in balance.

The other columns in the table may be completed by following the same procedure: the common feature is that the growth rate and the disbursement yield sum to the figure of 10.222% in each case.

In Table L2-2, even the zero growth company now has an overall tax rate – 19.429% - below the nominal rate of corporation tax: this is due to the impact of the tax shield. Thereafter, it may be seen that the rate declines from 19.206% for the 1% growth case, to only 12.011% for the corporation growing at 8%. The following section analyses these results in more detail. In the meantime, it is relevant to note that, at a growth rate of 9%, the results begin to look decidedly unsafe: a distribution yield of 1.222% is pushing into the area where it is necessary to abandon the constant growth model in favour of the multi-phase DDM described in the earlier section.

The MVA Ratio again: Equity Version

In the previous section, the MVA ratio was evaluated as the means of establishing the enterprise value of the corporation, some \$131.358m. in the case of 6% growth. Now, however, tracking down the 'dividend' in the numerator of the formula is more complicated. The second term remains the same – \$6m., though retentions are no longer commensurate with the level of capital expenditure – but the first term amounts to some \$10.480m. This is the sum of the net profit shown in Table L2-2 - \$8.561m. – plus the interest payment - \$1.919m. - as reduced by netting off the tax shield. Of course, the bondholders receive the full \$2.493m. shown in the P&L, but against this the company will be looking to extend its borrowings by \$1.752m. to part-finance its investment programme at the end of period one.

Working through the accounts it is possible to establish a value for return on equity: this is the ratio of net profit (earnings) to balance sheet equity. Then in each case, the market value of the corporation's equity conforms to the formula:

$$Q_0 = A_{q0}(ROE - g)/(ECC - g)$$

where A_{q0} is that portion of the corporation's capital employed which has been financed over the years by the stockholders through retained earnings. This is seen from Table L2-2 to be \$70.796m. in the case of 6% growth, and the value of the post-multiplying MVA ratio is 1.443 (=(0.12093-0.06)/(0.10222-0.06)). This version of the MVA plays a crucial part in explaining the additional shareholder value created by the geared corporations on behalf of their stockholders. Again, it is a simple matter to identify the numerator of the expression for Q_0 with the distribution.

Inflation of the Value of the Corporation's Capital Employed

It should be clear from the tables presented in the previous sections of this paper that the 'inflation' referred to here is a rather good thing. They show simulated accounts and related stockmarket data which breathe value into the gap between what the stockholders pay to acquire the company's assets, and what they will be valued at in the marketplace. Nor is the gap necessarily trivial: the enterprise value of \$100m. of capital employed varies across the two tables, according to the different assumptions concerning growth and gearing, between \$107.750m. and \$175.809m. The present section seeks to analyse in detail how this effect is achieved, and why in particular shareholder value is enhanced by the judicious use of debt financing.

Table L2-3 overleaf is in two parts. In the upper part, the value of the Table L2-1 corporations which eschew the use of gearing is analysed. Below that, a similar exercise is carried out on the debt-financed corporations whose characteristics are laid out in Table L2-2. The common theme is the degree to which a dollar of earnings invested in capital employed has a greater value than a dollar distributed to the stockholders. There are three factors which remain common to all the cases. Firstly, the intercept of the MECs is 0.1155: this means that the highest rate of return on investment on any capital expenditure project will be 11.55% (15% before corporation tax at 23%). Secondly, the accounts of each company have been engineered to catch it at that point in time where it has just made its year zero investment to bring its capital employed up to a level of \$100m.: however, there is no sense of a time line in the analysis (the years one are not necessarily synchronised), and the level of capital employed may be interpreted as an index so that certain variables, for instance, balance sheet debt, turn out as percentages, making the various

comparisons easier. Thirdly, all companies are faced with the same ECC function: the all-equity financed stocks then trade to offer a return of 10%, while those using gearing in Table L2-2 are bid onto a prospective risk-adjusted total return of 10.222% - tax-free buy-back plus tax-free capital gain. Of course, in spite of the higher cost of equity, the indebted companies enjoy an overall lower cost of capital, and it is this that permits them to operate advantageously at a lower ROCE.

TABLE L2-3	STAKEHOLDER RECEIPTS/OVERALL TAX RATE								
		GROWTH - PER CENT PER ANNUM							
		0	1	2	3	4	5	6	7	8
DEBT/ENTERPRISE VALUE = ZERO PER CENT									
	MVA RATIO - EQUITY VERSION	1.078	1.086	1.097	1.111	1.129	1.155	1.194	1.258	1.388
	INVESTMENT/RETENTIONS $M.	0.000	1.000	2.000	3.000	4.000	5.000	6.000	7.000	8.000
STAKEHOLDER RECEIPTS $M.										
	CAPITAL GAIN	0.000	1.086	2.194	3.332	4.517	5.775	7.163	8.808	11.100
	PAYOUT	10.775	9.775	8.775	7.775	6.775	5.775	4.775	3.775	2.775
	STOCKHOLDERS - TOTAL	10.775	10.861	10.969	11.107	11.292	11.550	11.938	12.583	13.875
	INTEREST	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	CORPORATION TAX	3.219	3.219	3.219	3.219	3.219	3.219	3.219	3.219	3.219
	GRAND TOTAL	13.994	14.080	14.187	14.326	14.510	14.769	15.156	15.802	17.094
	OVERALL TAX RATE %	23.000	22.859	22.686	22.467	22.181	21.793	21.236	20.368	18.829
DEBT/ENTERPRISE VALUE = 22.233%										
	MVA RATIO - EQUITY VERSION	1.151	1.170	1.194	1.225	1.269	1.335	1.443	1.653	2.245
	INVESTMENT/RETENTIONS $M.	0.000	0.749	1.491	2.222	2.935	3.619	4.248	4.753	4.873
STAKEHOLDER RECEIPTS $M.										
	CAPITAL GAIN	0.000	0.877	1.780	2.722	3.726	4.831	6.129	7.859	10.938
	PAYOUT	8.853	8.084	7.317	6.554	5.795	5.046	4.313	3.618	3.038
	STOCKHOLDERS - TOTAL	8.853	8.961	9.097	9.276	9.521	9.877	10.442	11.476	13.976
	INTEREST	2.113	2.139	2.172	2.214	2.273	2.358	2.493	2.740	3.336
	CORPORATION TAX	2.644	2.639	2.631	2.621	2.608	2.588	2.557	2.500	2.363
	GRAND TOTAL	13.611	13.738	13.900	14.111	14.402	14.823	15.492	16.716	19.676
	OVERALL TAX RATE %	19.429	19.206	18.929	18.575	18.107	17.460	16.506	14.958	12.011

The MVA ratio acts as the driver of value, and, as noted above, the ratio exceeds unity because the ROCE exceeds the WACC: this variable appears as the first row of Table L2-3. It is the factor that converts a dollar of invested capital into market value. In the case of zero gearing, the 6% growth corporation turns an equity investment of $6m at the end of period one into $7.1625m. (=6*1.19375) of market capitalisation. This calculation might just as easily be arrived at as the growth rate multiplied by the initial market capitalisation (=0.06* 119.375). Of course, the $6m. investment will be net of corporation tax, but the remainder of the gain, some $1.1625m., is free of all taxes so long as stockholders refrain from realising taxable capital gains. The

stockholders also receive in respect of year one a distribution of $4.775m., giving them a total return of $11.938m.: this represents 10%, the ECC, on the beginning-year value of their investment. If, for tax reasons, the corporation buys in shares in the amount of $4.775m., it will have to pay the 'cum dividend' price. And ongoing stockholders benefit because the 'cum dividend' price holds after the buy-back, since there will be fewer shares in issue. Effectively, ongoing shareholders use their 'dividend cash' to buy out the ownership interest of those that respond to the buy-back.

Table L2-3 then treats the revenue as a stakeholder in the company. The table shows in the case of 6% growth a total return of $15.156m., comprising a buy-back of $4.775m., capital appreciation of $7.1625m. as calculated above, and a corporation tax payment of $3.219m., a figure which is common to all growth rates. This total return exceeds that of the zero growth case, $13.994m., by $1.1625m., being the market uplift factor on the $6m. of capital expenditure. The table then shows how such tax free capital appreciation depresses the share of the tax collector in the total as the growth rate increases along the columns. With no growth, the tax rate works out at the nominal corporation tax rate of 23%: for the corporation growing at 8%, the overall tax rate falls below the 19% level. This has a formidable impact on the equity market capitalisation, as is demonstrated in Table L2-1: an extra $31m. of shareholder value is created in the case of 8% growth as compared with the case of stasis. Here the free-of-all-taxes capital gain has risen to $3.1m., some 38.75% of the equity investment (retentions) of $8m.

The same analytical pattern is adopted in the lower half of the table. It is clear that the bondholders now have to be included in the list of stakeholders, and their involvement means that there is no longer a one to one correspondence between the growth rate and the retentions that the corporation invests on behalf of the stockholders. Even so, the capital gain may be obtained by multiplying the growth rate by the initial equity market capitalisation to give the figure of $6.129m. in the case of 6% growth (=0.06*102.154). This figure is also the product of the amount of equity invested, of course equal to retained profit, times an MVA ratio of 1.443, as calculated in the previous section. The 'tax-free gain' in this case works out at

$1.881m. (=6.129-4.248): the comparable figure at the top of the table amounts to only $1.163m.

Table L2-2 then shows how the increasing return on equity with growth along the columns is reinforced by rising interest payments to the bondholders. The tax shield effect depresses profit before tax and thus the tax payable. Now the overall tax rate along the columns falls from 19.429% to only 12.011% in the case of 8% growth: here the tax-free gain rises to some $6.065m. (=10.938-4.873), easily outstripping the interest payment of $3.336m. which is also assumed to be received free of tax. In the case of 6% growth, the total return to both the stockholders and the bondholders amounts to $12.935m. (=10.442+2.493), compared to only $11.938m. in the all-equity-financed case. The contrast in shareholder value between the two groups of companies seems all the more remarkable when it is recalled that the equity-financed corporations enjoy a greater return on capital employed than those using gearing: 13.994% versus 13.611% at the operating profit level.

Under New Management: an Exercise in Enhancing Shareholder Value

Looking at the difference between the enterprise value of the equity-financed corporation – for instance, the case of 6% growth - in Table L2-1, and that of the equivalent 'debt-financed' company in Table L2-2 raises the question of how big an increase in shareholder value would result if the former were put under the management of a new team with a brief to gear up to the optimal degree. Table L2-4 repeats, as cases AA and BB, the 6% growth columns from Tables L2-1 and L2-2 respectively. Column AA*, to be explained below, provides the answer: the critical variable is market value added, which increases by some $22.711m., from $19.375m. to $42.086m. It is worth pointing out that equity market capitalisation on its own, which in fact shows a fall as a result of the transition, is not a meaningful measure of shareholder value.

Corporation BB is included in the table not only because it illustrates the opportunity to improve the financing of case AA, but also because its financial ratios provide some of the values that will be required. Thus case AA* will face the same cost of capital as BB, and will thus earn the same return on capital employed on its future

investments. The first step is to analyse the equity market capitalisation of BB into its components, in particular isolating the present value of its growth opportunities.

TABLE L2-4	P&L ACCOUNTS FOR PERIOD ONE			
CASE	AA	BB	AA*	
BALANCE SHEET (BEGINNING PERIOD) - $M				
CAPITAL EMPLOYED	100.000	100.000	100.000	
FINANCING				
EQUITY	100.000	70.796	68.411	
DEBT	0.000	29.204	31.589	
PROFIT AND LOSS ACCOUNT - $M				
OPERATING PROFIT	13.994	13.611	13.994	
INTEREST	0.000	2.493	2.696	
PROFIT BEFORE TAX	13.994	11.118	11.297	
CORPORATION TAX	3.219	2.557	2.598	
NET PROFIT	10.775	8.561	8.699	
RETAINED PROFIT	6.000	4.248	5.862	
PAYOUT	4.775	4.313	2.837	
ACCOUNTING RATIOS - %				
ROCE	10.775	10.480	10.480	
RETURN ON EQUITY - NET	10.775	12.093	12.716	
PAYOUT	44.316	50.383	32.608	
INTEREST COVER	N/A	546.020	518.979	
STOCK MARKET STATISTICS				
EQUITY CAPITALISATION - $M	119.375	102.154	110.497	
ENTERPRISE VALUE - $M	119.375	131.358	142.086	
MVA - $M	19.375	31.358	42.086	
P-E RATIO	11.079	11.932	12.703	
YIELD (DISBURSEMENT) - %	4.000	4.222	2.567	
OVERALL TAX RATE - %	21.236	16.506	15.662	
GEARING RATIO %	0.000	22.232	22.232	
MEC FUNCTION				
INTERCEPT (*100)	11.550	11.550	11.550	
GRADIENT (*-100)	0.258	0.357	0.258	

The PVGO was discussed at length in an earlier paper which appeared as Lemma 1 (2009). BB's PVGO may be obtained as the difference between its equity market capitalisation and the PV of its current earnings:

$$PVGO = 102.154 - 8.561/0.10222$$

where the discount rate is 10.222%, the ECC, and thus the sum in the table of the growth rate and the disbursement yield as usual. This results in a PVGO of \$18.405m. This is the larger component of the MVA: the balance, \$12.952m. is the difference between the present value of the current earnings (\$83.748m. = 8.561/0.10222) and the balance sheet value of the equity (\$70.796m.). This breakdown was explained in Lemma 1.

The second step is to calculate a factor to be applied to the case BB value of the PVGO just calculated that reflects the different positionings of the MEC curves of companies AA and BB. These were set out graphically in Figure L2-1 as MECA and MECB. As may be seen at the foot of Table L2-4, the equity-financed corporation AA has grown to the point where its MEC is given by the relationship:

$$MEC = 0.1155 - 0.00258X_1$$

Now with a WACC of 9.4109% (WACCB in the figure) a period one investment of \$8.280m. is indicated. This is some 38% greater than the \$6m. period one investment previously calculated for both AA and BB. From this it is possible to conclude that AA* will have a PVGO of some \$25.401m. (=1.38*18.405) at the beginning of period one. Previously, AA's PVGO amounted to only \$11.625m. (=119.375-10.775/0.1).

At the third step, it is then possible to set up a pair of simultaneous equations which permit the market value of AA* to be computed. The present value of the current earnings is given by:

$$Q_{e0} = (13.994 - 0.08357 * B_0) * (1 - 0.23)/0.10222325$$

where B_0 is now used to denote the debt finance to be raised and the parameters are, in order, the operating profit of AA, the grossed up interest rate payable on the corporation's debt, the rate of corporation tax, and the ECC. The same two variables appear as the unknowns in the formula for the corporation's gearing ratio (debt to enterprise value):

$$d = B_0/(B_0 + Q_{e0} + 25.401) = 0.222325$$

where the parameters are the PVGO calculated at step two and the gearing ratio. Substituting for Q_{e0} in the second equation results in a solution of \$31.589m. for B_0. The balance sheet at the top of column AA* follows immediately, as there will be no change in the aggregate value of AA's assets at the beginning of period one. AA*'s equity market capitalisation and market value added may also be computed at this stage.

The fourth step is to compute the values of the variables appearing in the profit and loss account. The P&L sets out with the same operating profit as AA, whereupon interest payable and the profit before tax may be calculated, to give a net profit (earnings) of \$8.699m. But there is a problem with the appropriation account: the breakdown of earnings between retentions and the amount to be applied to the share buy-back requires a knowledge of the amount of debt finance to be raised at the end of period one. This may be obtained by solving a pair of equations similar to those solved at step three above.

Shifting forward by one period, the equation for the present value of the future earnings may be written as:

$$Q_{e1} = (15.183 - 0.08357 * B_1) * (1 - 0.23)/0.10222325$$

The only parameter that has changed is the operating profit. Operating profit in period two will be greater to the extent that it will include the return on the investment made at the end of period one. This is the product of the ROCE and the amount invested, grossed up for corporation tax (=0.10480*8.280/0.77). This works out at \$1.189m., which added to the previous year's operating profit (\$13.994m.), amounts to the figure of \$15.183m. as shown. The ratio of debt to enterprise value is then:

$$d = B_1/(B_1 + Q_{e1} + 26.925) = 0.222325$$

where the parameter in the denominator, the PVGO, has been increased by 6% to reflect the fact that AA* will want to increase its level of investment by this percentage at the end of period two, due to the ongoing rightward shift in AA's MEC curve.

This time, substituting the first equation into the second returns a value of $34.008m. for the company's optimal level of the debt, B_1, at the beginning of period two, and the appropriation account follows immediately. AA* will increase its debt by $2.418m. at the end of period one, leaving some $5.862m. of the $8.280m. investment to be financed by retained earnings. This results in a payout/buy-back of some $2.837m.

The only other troublesome figure in column AA* is the overall tax rate. The tax rate is the percentage ratio of the corporation tax paid - $2.598m. – to the sum of the tax - $2.598m. again – the gross interest paid - $2.696m. – the payout - $2.837m. – and the capital gain for the year. This last item works out at $8.459m., being the difference between the equity market capitalisation at the beginning of period one as shown in column AA* – some $110.497m. – and the equivalent figure a year later – some $118.956m. This last figure is obtained from the value of B_1 calculated earlier – some $34.008m. – by dividing by the optimal gearing ratio – 0.222325: this gives the enterprise value at the beginning of period two - $152.963m. – from which the value of B_1 may be deducted to give the figure quoted – some $118.956m. The overall tax rate then emerges with a value of 15.662%, as shown in column AA*.

As noted, the company will want to raise $31.589m. on the debt market at the beginning of period one, and the whole of this amount can then be paid out through a share repurchase programme. When the appointment of the new management and its brief are announced, the value of the company's equity will immediately rise from $119.375m. to its new enterprise value, $142.086m. If the company has 100m. shares in issue, it will repurchase 22.232m. (=100*31.589/142.086) of these at a price of $1.42086 each, leaving 77.768m. in issue. Stockholders thus receive a windfall of some $31.589m., but at the same time the value of their equity will have dropped from $119.375m. to $110.497m., leaving them a net $22.711m. better off: this is equivalent to the increase in the corporation's market value added (=42.086-19.375). There will be more to say about the buy-back process in the next section of the study.

In the meantime, it is appropriate to review the extent to which Company BB provides a model for AA*. Obviously AA* has a higher balance sheet gearing ratio than BB.

It has already been calculated that it will borrow $2.418m. at the end of period one to help finance its optimal level of investment of $8.280m. Thus its debt will rise to $34.008m. against a rise in total assets to $108.280m. Balance sheet gearing will then work out at 31.407%. This is a small step towards the target value of 29.204% shown in column BB, and illustrates how the accounting and market valuation ratios of BB act as asymptotes for the corresponding ratios of AA*. As time goes on, AA* will increasingly 'forget' the discontinuity caused by the financial upheaval of moving to its optimal gearing ratio. This means that its payout ratio will rise substantially, and its MVA ratio will fall. The rate of growth of its assets will fall back towards 6%: this compares with an optimal addition to assets at the end of period one amounting to 8.28%.

A Note on the Stock Repurchase Process

Buy-backs have become common over the past twenty or so years as legal and regulatory changes have been implemented. In the previous section, the arithmetic of the process of buying in the stock that effects the debt-for-equity swap as corporation AA in Table L2-4 transforms itself into AA* was set out. In OPP-I, the process of buying back stock to implement the corporation's annual distribution was illustrated. The purpose of the present section is to investigate the accounting and measurement problems that attend stock repurchase schemes in the light of these examples. The desirability of buy-backs is driven by the tax system. Those investors who suffer income tax on their dividends should prefer buy-backs as a means of effecting corporate distributions while other investors, most obviously the gross funds, should be indifferent between the alternative distribution methods. This latter proposition is based on the assumption that a cash dividend foregone in favour of a buy-back will automatically be translated into an equivalent capital gain. Obviously, in volatile markets, this will only happen by chance in the short run, but over a longer time scale the persistent reinvestment of 'dividends' may be expected to generate substantial capital appreciation.

In the UK – similar rules apply in the US and other major economies - those who pay the higher rates of income tax, 40% and 50%, will suffer an additional income tax charge on any cash dividends received. In the former case, $90 of net dividends is treated as $100 gross: this suffers tax at the rate of 32.5%, to leave a net $67.5. This

is equivalent to charging tax at 25% on the net dividend. A similar calculation applies to the 50% income rate, which is mapped into a 42.5% rate on the grossed up dividend, giving a 36.11% charge on the net. For higher rate payers, capital gains are to be preferred to income for a number of reasons. Firstly, there is a tax-free threshold, currently £10,600 for the 2011/12 tax year: secondly, the gains tax rates are lower - 18% and 28% respectively for higher rate payers: and thirdly, the tax is only levied on realised gains, and thus may effectively be deferred throughout the lifetime of an individual saver. It is for these reasons that the earlier analysis is carried out ignoring personal taxes: corporate managements are assumed to effect their distributions by repurchasing their shares in the marketplace, thus avoiding the income tax charge: and stockholders are assumed thereafter to refrain from realising their investment profits, thus avoiding capital gains tax. As a result, the stock price rises over the year – the total rise is equal to the equity cost of capital - as the 'dividend cash' builds up: when the buy-back takes place, there is no ex-dividend event, so that the 'cum dividend' price holds on the shares remaining in issue. Effectively, ongoing shareholders will have applied their share of the 'dividend cash' to buying out the ownership interest in the corporation of those stockholders who respond to the buy-back by disposing of their shares. The economics of the corporation – its enterprise value, its capital expenditure, its profitability – will not be affected. All that differs between the two approaches is the number of shares remaining in issue after the distribution.

It is convenient to reconsider buy-backs as an alternative to a cash dividend by looking at the case of company BB in Table L2-4: this is the case of constant growth at 6% from Table L2-2. The company's accounting and stock market magnitudes grow at a common rate determined by the rightward swing in its MEC curve over time: its accounting and stock market ratios remain constant over time. The economic situation of the company thus obviously excludes the possibility that earnings per share could grow at a different rate. But this does appear to be case where the company makes its annual distribution by buying back its own shares.

Over the course of period one, BB's equity market capitalisation will rise from $102.154m. to $112.596m. as the cash from its trading operations builds up on its balance sheet: this is a 10.222% increase, equal to the ECC. If BB starts period one

with 100m. shares in issue, it will then, at the end of the year, buy back some 3.830m. (=100*4.313/112.596) shares, at a price of $1.12596 per share. The amount of money distributed in this way amounts to the $4.313m. shown as its payout in the P&L account. Dividing net profits by the revised number of shares in issue gives earnings per share for period one of 8.902 (=8.561/(100-3.830)) cents per share. This compares with 8.076 (=8.561/(100*1.06)) cents per share earned in year zero, where net profits of $8.561m was predicted in the accounts for period one: the change works out at 10.222% (=100*(8.902/8.076-1)) as anticipated. Thus, it is necessary to scale up the historic earnings figure by the ratio of the previous number of shares in issue to the revised (=100/96.170) to adjust the advance in earnings per share back to 6% to reflect the underlying economic progress being achieved by the company. If all companies, for instance, as detailed in Table L2-2, make their distributions via the stock repurchase route, all will achieve EPS growth equivalent to the ECC in the absence of an appropriate adjustment. This is clearly at variance with the individual underlying economic performance of each.

The transformation of AA above into AA* in Table L2-4 illustrates a different story. In the previous section, it was calculated that AA* will want to raise $31.589m. in new debt finance, and spend the proceeds buying in 22.232m. shares at $1.4209 each out of the 100m. initially in issue. It is then a straightforward matter to calculate that AA* will be expected to earn 11.186 (=8.699/(100-22.232)) cents per share in year one, where a net profit of $8.699m. is predicted in Table L2-4: this compares with AA's historic earnings of 10.165 cents per share (=10.775/1.06), an increase of 10.044%. This seems a reasonable assessment of the economic progress being achieved by AA* over period one. Not only will AA* be operating in period one with an asset base some 6% greater than that of AA in period zero, but the more efficient capital structure means that the net profit of AA* will be only some 14.423% lower than that of AA - $8.699m. versus $10.165m. (=10.775/1.06) - compared with the 22.232% reduction in the number of shares in issue calculated earlier.

It might appear from these two examples that it should be a relatively straightforward matter to distinguish between revenue items and capital transactions and to make the necessary adjustments to the rate of growth in earnings per share only in the case of the former. In practice, investment analysts have great difficulty in tracking the

source of the funds used to finance share buy-backs. Part of the problem stems from the fact that many companies, particularly in the UK, pay a cash dividend while simultaneously repurchasing shares, especially in the periods of economic plenty. The aim seems to be to promote the picture of a steadily growing cash dividend, while at the same time siphoning off superfluous funds when these build up to excessive levels. It is thus not always clear to what extent the cash being used for the buy-back represents uninvested retentions from previous years, which it could be argued should be adjusted for, and to what extent it represents a change in the corporation's stance in relation to its financial structure.

It is important to be reminded that, if all companies in the market make their distributions via the buy-back route, their stock prices will each rise at an annual rate equal to the equity cost of capital – in the cases in Table L2-4 this is 10.222% - in spite of their individual growth rates. Companies in different risk classes will be bid onto correspondingly different ECCs, but the divergence between the underlying growth of a corporation, as driven by the rightward shift in the MEC, and its rate of share price increase will persist. Market capitalisations are not affected because the faster rate of share price appreciation will be exactly offset by the reducing number of shares in issue over time.

Conclusion

The purpose of the present paper has been to explain how the rate of growth and the level of gearing combine to breathe shareholder value into the book cost of the corporation's assets.

Even in the case of the all-equity-financed corporation, there is a positive relationship between growth and market value added. In the tables, it is possible to identify three distinct sources of annual return. The first and most obvious would be the annual amount of cash available for distribution: the second is the annual amount of capital expenditure, which should translate into an equivalent gain in the market value of the corporation: the third is the uplift on the capital spend which reflects the fact that the corporation is able to invest at a return on capital employed in excess of its weighted average cost of capital. The first two of these elements will have suffered corporation tax: the third will be 'received' free of all taxes. Of course, if the corporation makes

its annual distribution by buying in its shares, then, for ongoing stockholders, the whole of this return is generated in the form of capital appreciation. Departing shareholders sell at the same 'cum dividend' price and receive the whole of the distribution: effectively, ongoing stockholders buy out the ownership interest of those departing, but without suffering any diminution in the values of their holdings due to leakage through income tax payments – assuming of course, they do not realise them in the form of taxable capital gains.

This analysis shows that a dollar appropriated for the cash distribution is worth less than a dollar retained for investment in the business. So long as stockholders refrain from realising their gains, the uplift on the corporation's capital expenditure due to the ROCE/WACC spread are free of all three taxes – corporation tax, income tax and capital gains tax. Growth has its effect because faster growing companies will manifest lower optimal payout ratios. As a result of the opportunity to avoid tax, the share of the tax authorities in the corporation's surplus will decline with growth.

This effect is reinforced when the corporation is prepared to engage in an element of debt financing. If growth drives an increase in enterprise value, this supports an increase in balance sheet gearing. Return on equity then becomes an increasing function of the growth rate, with an enhanced impact on the uplift on the corporation's capital expenditure. This acts further to depress the share of the tax authorities in the total of the stakeholder benefits, as does the increasing size of the tax shield. Growth, gearing and the corporation tax regime thus interact in a type of virtuous circle to generate shareholder value. The analysis shows that the book cost of the corporation's assets will be a poor guide to their value in the stock market.

In passing, the analysis has sought to explain the mechanics of the share repurchase process and to show when adjustments to the historic earnings figures are applicable, and when not. The paper also demonstrates, in the Appendix, the possible impact of reducing the UK corporation tax rate by 5% to 23% on the optimal level of gearing and on the market value added. The macro-economic implications of the change appear highly significant: in the case modelled, capital investment leaps by about a third, and remains at a higher level than it would have been thereafter.

Appendix

The earlier discussion on the change of management at the equity-financed corporation growing at 6% provides a paradigm for assessing the impact of a change – in this case a reduction - in the rate of corporation tax on the value of the company: and for investigating what happens if such a change were to be accompanied by the ending of the rule whereby interest is allowable as an expense in relation to the calculation of taxable profits. In opposition, the new UK government was contemplating such a move as a way of discouraging ('excessive') risk-taking. This possibility has not so far been followed up, and under the present law the corporation tax rate is in the process of being reduced from 28% to 23% in steps over four years, starting with a 2% step in April 2011. No allowance will be made for the staggering of the change in the analysis below. Rather it is assumed that the change – the full 5% reduction - is announced before trading begins in the corporation's stock on the first day of period one, and that the change takes effect immediately. This does not introduce as large a distortion into the analysis as may at first sight appear, when it is remembered that even the investment made at the end of period one will benefit from the 23% rate only three years later.

Table L2-A1 overleaf sets out the accounts and related data of three corporations, the first two of which are growing at 6% per annum. Case CC is copied from Table I-1 in OPP-I.: the problem is to estimate how its enterprise value will change when the tax rate change is announced. Company BB, as before drawn from Table L2-2 above, provides the basis for calculating the PVGO for the new situation: in the section, 'Under New Management', it was calculated that the PVGO of BB works out at $18.405m. This needs to be scaled up according to the factor describing the new level of capital expenditure by Company CC compared with the $6m. level underlying the existing calculations.

TABLE L2-A1	P&L ACCOUNTS FOR PERIOD ONE			
CASE	CC	BB	CC*	
BALANCE SHEET (BEGINNING PERIOD) - $M				
CAPITAL EMPLOYED	100.000	100.000	100.000	
FINANCING				
EQUITY	69.359	70.796	68.648	
DEBT	30.641	29.204	31.352	
PROFIT AND LOSS ACCOUNT - $M				
OPERATING PROFIT	13.964	13.611	13.964	
INTEREST	2.758	2.493	2.676	
PROFIT BEFORE TAX	11.206	11.118	11.288	
CORPORATION TAX	3.138	2.557	2.596	
NET PROFIT	8.068	8.561	8.692	
RETAINED PROFIT	4.162	4.248	5.687	
PAYOUT	3.907	4.313	3.005	
ACCOUNTING RATIOS - %				
ROCE	10.054	10.480	10.480	
RETURN ON EQUITY - NET	11.633	12.093	12.661	
PAYOUT	48.420	50.383	34.570	
INTEREST COVER	506.356	546.020	521.808	
STOCK MARKET STATISTICS				
EQUITY CAPITALISATION - $M	91.922	102.154	109.666	
ENTERPRISE VALUE - $M	122.562	131.358	141.018	
MVA - $M	22.562	31.358	41.018	
P-E RATIO	11.393	11.932	12.617	
YIELD (DISBURSEMENT) - %	4.250	4.222	2.740	
OVERALL TAX RATE - %	20.484	16.506	15.751	
GEARING RATIO %	25.000	22.232	22.232	
MEC FUNCTION				
INTERCEPT (*100)	10.800	11.550	11.550	
GRADIENT (*-100)	0.249	0.357	0.266	

Scaling up for corporation tax, as before, the parameters of the MEC function shown at the foot of the column CC – the ratio is 0.77/0.72 - and setting it equal to the case BB value of the WACC (WACCB in Figure L2-1 above) results in:

$$\text{MEC} = 0.1155 - 0.0022629X_1 = 0.094109$$

Solving at the second equality for X_1 indicates a period one capital expenditure of \$8.033m. resulting in a scaling up factor of 1.339 (compared with \$6m. for case BB).

Thus the PVGO of Case CC as it transforms itself into CC* under the new tax regime works out at $24.642m. (=18.405*1.339). Corresponding to the earlier calculations, the simultaneous equations to be solved are:

$$d = B_0/(B_0 + Q_{e0} + 24.64174) = 0.222325$$

and:

$$Q_{e0} = (13.964 - 0.085357B_0)(1 - 0.23)/0.10222325$$

where the figure of $24.642m. has been introduced for the PVGO in the first, and the figure of $13.964m. from column CC has been introduced as the ongoing operating profit in the second.

Here the appropriate level of debt, B_0, works out at $31.352m., leading immediately to a revised enterprise value of $141.018m. and an equity market capitalisation of $109.666m. The market value added of Case CC increases from $22.562m. to $41.018m. as it becomes CC*: the difference is $18.456m. The increase in the EMC is $17.744m.: in addition, the stockholders benefit from a special distribution (buy-back) in the amount of $0.711m. to be financed by additional borrowing. These last two amounts sum to the same figure - $18.456m. Although the direct effect of reducing the rate of corporation tax is to lower the optimal gearing ratio – from 25% to 22.2325% - the improvement in the company's prospects and thereafter enterprise value due to the tax change actually supports a slightly higher level of balance sheet gearing – at least initially. Although balance sheet gearing has increased in the short run, its long-term equilibrium level will be 29.204%. As the initial conditions caused by the perturbation fade into history, case CC* will increasingly take on the characteristics of Corporation BB, implying a substantial increase in the payout ratio.

As in the earlier exercise, it is necessary to establish CC*'s optimal level of debt at the beginning of period two before the period one net profit can be correctly appropriated between retentions and the distribution. In passing, it is also worth noting that a substantial investment stimulus is generated by a 5% reduction in the rate of corporation tax: CC* is expected to invest about one third more in period one than it would do at the higher rate, and thereafter to maintain a higher level of capital

expenditure than would otherwise have been the case. As noted earlier, Table L2-A2 then takes the analysis one tax change further on, to the situation where interest is no longer allowable as an expense in relation to the computation of the corporation's taxable profits.

TABLE L2-A2	P&L ACCOUNTS FOR PERIOD ONE			
CASE	CC	DD	CC**
BALANCE SHEET (BEGINNING PERIOD) - $M			
CAPITAL EMPLOYED	100.000	100.000	100.000
FINANCING			
EQUITY	69.359	83.442	82.612
DEBT	30.641	16.558	17.388
PROFIT AND LOSS ACCOUNT - $M			
OPERATING PROFIT	13.964	13.812	13.964
INTEREST	2.758	1.165	1.223
PROFIT BEFORE TAX	11.206		
CORPORATION TAX	3.138	3.177	3.212
NET PROFIT	8.068	9.471	9.529
RETAINED PROFIT	4.162	5.006	5.731
PAYOUT	3.907	4.464	3.798
ACCOUNTING RATIOS - %			
ROCE	10.054	10.636	10.752
RETURN ON EQUITY - NET	11.633	11.350	11.535
PAYOUT	48.420	47.137	39.857
INTEREST COVER	506.356	1185.619	1141.415
STOCK MARKET STATISTICS			
EQUITY CAPITALISATION - $M	91.922	108.014	113.427
ENTERPRISE VALUE - $M	122.562	124.572	130.816
MVA - $M	22.562	24.572	30.816
P-E RATIO	11.393	11.405	11.904
YIELD (DISBURSEMENT) - %	4.250	4.133	3.348
OVERALL TAX RATE - %	20.484	20.782	20.526
GEARING RATIO %	25.000	13.292	13.292
MEC FUNCTION			
INTERCEPT (*100)	10.800	11.550	11.550
GRADIENT (*-100)	0.249	0.305	0.266

The approach remains the same: CC is transformed into CC**, which in turn is based on DD. DD has been calculated to take on the characteristics, for instance, balance

sheet debt ratio and payout ratio that CC** will assume in the long run. In the cases of DD and CC**, the interest rate function becomes:

$$n(d) = 0.048056 + 0.167778d$$

where the intercept and gradient have been scaled up by the factor, 1/(1-0.28) from their original values in OPP-I of 0.0346 and 0.1208. The usual derivatives may be used to establish that both companies will operate with an optimal gearing ratio of 13.2923%. Plugging this value into the interest rate function indicates an interest rate of 7.0357% (now both gross and net) and an ECC of 10.132923%, for a WACC of 9.7212%. The simple average of this last figure and the intercept on the MEC (11.550% shown in column DD) works out at 10.636%: this is the new ROCE, of course. The enterprise value is then obtained from the familiar equation:

$$EV = 100 * (0.10636 - 0.06)/(0.097212 - 0.06) = 124.572$$

Thus, DD has an enterprise value of \$124.572m. at the beginning of its period one and its accounts follow immediately, including its debt, \$16.558m. (=0.132923*124.572), and thus the long-term target level of balance sheet gearing for case CC** - 16.558%. It may be noted that the parameters of DD's MEC have been calibrated to solve the accounts for a \$6m. level capital expenditure at the end of period one as usual. By difference, DD has an equity market capitalisation of \$108.104m., and by difference again, its PVGO will be \$14.550m. (=108.104-9.471/0.1013292) where the ratio subtracted is the capitalised value of the future earnings of the assets owned by DD at the beginning of period one.

To generate the data in column CC**, it is first necessary to scale up the parameters of CC's MEC for the change in the tax rate. Multiplying through by 0.77/0.72 gives the values at the foot of column CC** – 0.1155 and 0.00266 – the same as for CC* in Table L2-A1. Setting the MEC equal to the WACC and solving the resulting equation:

$$MEC = 0.1155 - 0.00266X_1 = 0.097212$$

indicates an optimal level of capital expenditure of $6.868m. at the end of period one. This is 1.145 times the $6.0m. to be invested by DD, and applied to DD's PVGO, gives CC** a PVGO of $16.654m.

This last is the parameter appearing in the denominator of the intermediate expression below: the other is the gearing ratio.

$$d = B_0/(B_0 + Q_{e0} + 16.654) = 0.132923$$

The second equation may then be written:

$$Q_{e0} = (13.964 * (1 - 0.23) - 0.070357B_0)/0.10132923$$

where the complement of the new corporation tax rate is now applied directly to the operating profit reflecting the harsher treatment of the company's interest payments. As before, these equations may be solved to give an optimal debt level at the beginning of period one of $17.008m. This is just over half the level of debt that Corporation CC has already, which indicates the need for a rights issue in the amount of $13.633m. The EMC of the corporation should increase by $19.021m. (=110.943-91.922), indicating an uplift equal to the increase in the MVA – some $5.389m. (=27.951-22.562). As usual, it will be necessary to solve for the level of debt at the beginning of period two before the appropriation of the net profit for period one may be carried out. As already noted, CC**'s balance sheet gearing ratio and other ratios will be asymptotic to those of Company DD.

The situation of CC** may also be contrasted with that of CC* in Table L2-A1. The disallowance of interest means that CC** will invest only about 15% more than CC in period one. This compares with an increase of about a third in the case of CC*, implying a substantial reduction in the stimulus to the overall economy. Of course these estimates and comparisons are very tenuous, being based on a host of assumptions and relationships which will have varying degrees of relevance to the economic realities.

References

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