The Performance Appraisal and Valuation of Cooperative Organisations: The Example of the New Zealand Dairy Board

Derek L Newman

January 1999

---

1 INTRODUCTION: THE NATURE OF COOPERATIVES

Cooperatives are businesses. The usual economic view of the objective of a business firm is, other things being equal, to maximise the utility of its stakeholders by the maximisation of their wealth. This occurs, risk constant, from an optimal combination of dividends paid and capital growth stemming from the reinvestment of retained earnings. While the cooperative business has the same objective as the corporate business, it accomplishes this objective in an entirely different way - it maximises the utility of its members by maximising in a more direct way their long-term consumable incomes by either maximising their revenues (in the case of a marketing cooperative) or minimising their expenditures (the supply cooperative). In other words, a fundamental difference between a corporation and a cooperative is the manner of returning profits to the firm's owners. In the case of the former, they are returned as a reward for the owners' investment of capital, whereas in the case of the latter they are returned on the basis of patronage as rebates or bonuses. This philosophical difference means that the cooperative rarely pays a dividend (applying the usually accepted meaning of the word) which causes difficulties when comparing the performance of cooperatives and corporations and has resulted in a number of analysts attempting to determine the notional dividends of cooperatives. The technical difficulties of that process are discussed below.

Corporations and cooperatives differ in the nature of their growth funding. A corporation retains a proportion of its net income while paying the balance out as a dividend. A cooperative achieves this same end by either retaining all of a targeted net income (the balance being distributed as rebates or bonuses which, in an accounting context, fall into the category of either sales revenue or cost of sales depending on the type of cooperative) or by retaining a proportion of its rebates or bonuses for a defined period of time before distribution (the revolving fund). In addition, while the acquisition of new equity for the corporation involves the sale of its shares to either or both old and new shareholders, in the case of the cooperative, new equity must be raised from existing members. Depending on how strongly the firm adheres to the principles of cooperative philosophy, the share issue will be in proportion to their patronage. Such issues are generally paid for by the cooperative retaining any rebates due to the member until such time as that person's obligation is fulfilled.

The final major difference, in the context of this paper, between the corporation and the cooperative lies with the private nature of the latter - its shares are not publicly listed and their values are not publicly determined. It follows that the value of the asset base of the cooperative cannot be readily observed.

It is not the purpose of this paper to outline all of the differences between corporations and cooperatives; they are well documented elsewhere. The differences which are noted here are relevant to the understanding of the nature of the dilemma facing the analyst of the cooperative.

2 THE CONTRIBUTION OF FINANCE THEORY TO THE APPRAISAL PROCESS

Before proceeding to further examine the particular problems with the appraisal of cooperatives and the development of an analytical model for that purpose, it is necessary to review the theory of finance with which such development must be congruent.

Finance theory (Modigliani and Miller, 1958[1], 1963[2]) indicates that the operating assets of a firm should provide a net operating income (NOI) which, in equilibrium, equates the product of the market value of the firm's assets and its weighted average cost of capital (WACC). As stated above, in the case of a cooperative, neither the relevant market values nor that NOI on which such computations would be based are directly observable.

The theory of finance also has much to say about the optimal level of both debt in the capital structure and the optimal level of the dividend. In essence, given the confusing role of dividend imputation, it is generally accepted that the post-tax WACC declines with increasing levels of indebtedness and then increases with the incipience of financial distress (Baxter, 1967[3]; Officer, 1994[4]). It is also generally accepted that the optimal level of the dividend remains a puzzle and that dividend policy is merely one way of sending a performance signal to investors (Brealey, 1983[5]). However, despite these confusions, there is no doubting that the firm should earn its WACC if its value is to be maintained and that the required return on equity is a combination of the dividend received by the investor together with the capital growth that accrues to the equityholders assuming that equity is publicly negotiable.

Thus it can be argued that, if the market value of operating assets and their associated WACC are known, the required NOI of the firm can be ascertained. This amount is then available for distribution to the various stakeholders in the firm (government - tax; debtholders - interest; equityholders - dividend and retained earnings for capital growth). It should be noted that, in these circumstances, the dividend is a passive residual, the critical figure is the NOI. If all net income is retained then the dividend must be zero. Net income should be retained where the marginal return on the retention exceeds the marginal WACC; i.e., the "investment" in retention is net present value creating and the value of the firm will rise or fall to the extent that retained earnings earn more or less respectively than the marginal cost of capital.

A common method of determining the WACC of a firm is to determine firstly its cost of equity utilising the capital asset pricing model (CAPM). This model requires that the systematic risk of equity or assets, represented respectively by the β coefficient of the equity or assets, is able to be determined. This coefficient represents the sensitivity of the returns of the equity (assets) to changes in the returns on the market portfolio and is a measure of the systematic risk of the equity (assets). Systematic risk is not total risk and is not related directly to the variability of cash flows in the firm, but rather to the variability of returns on investment. A wide range of assumptions underpins the CAPM, including those relating to perfectly competitive capital markets.

---

1 Modigliani, F., and Miller, M., The Cost of Capital, Corporation Finance and the Theory of Investment, American Economic Review, 48:261-297 (1958).

2 Modigliani, F., and Miller, M., Corporate Income Taxes and the Cost of Capital, American Economic Review, 53:433-443 (1963)

3 Baxter, N., Leverage, Risk of Ruin, and the Cost of Capital, Journal of Finance, September 1967, 395-403.

4 Officer, R. R., The Cost of Capital of a Company under and Imputation Tax System, Accounting and Finance, May 1994, 1-17.

5 Brealey, R. A., Does Dividend Policy Matter?, Midland Corporate Finance Journal, Spring 1983, 17-25

3 THE NATURE OF THE PROBLEM

Consider the following schematic income statement:

Sales Revenue
– Cost of Sales
Gross Profit
– Operating expenses
Net Operating Income

As noted above, while the corporation maximises the returns to its stakeholders, other things being equal, by maximising long-term NOI, the cooperative maximises its returns by minimising its NOI. The marketing cooperative will maximise the payout to its members by maximising its cost of sales while the supply cooperative will maximise its payout by minimising its sales revenue. Both have the effect of minimising the NOI. This feature causes problems when the analysts of cooperatives try to apply models developed for the appraisal of corporations. In addition, the minimisation of NOI by cooperatives has resulted in challenges to the efficiency (in a market context) of the operations of cooperative businesses. Hoeven and Prill[6] summarised the nature of the dilemma when, in relation to the valuation of a rural electric cooperative, they stated that "an asset based value, rather than one based on earnings or cash flows, is appropriate because the cooperative is a non-profit organisation".

It follows from the above discussion that the analytical functions of valuation and performance appraisal are inextricably linked in that, at least to a certain extent, both rely on the descriptive function

$$\text{Value} \times E(\text{ROA}) = E(\text{NOI}) \text{ or}$$

$$\text{Value} = \frac{E(\text{NOI})}{E(\text{ROA})} \text{ or}$$

$$\text{ROA} = \frac{\text{NOI}}{\text{Value}}$$

where: E(ROA) = expected return on assets
E(NOI) = expected net operating income

and the first two relationships relate to the valuation of the business while the third relationship relates to the appraisal of its performance.

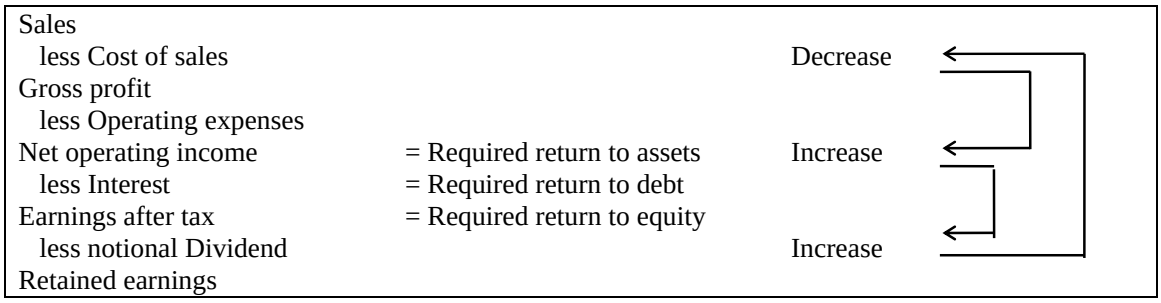
In effect, in a relationship containing three elements, even if the E(ROA) can be determined from the observation of the WACC of a proxy, the other two elements are unknown and the relationship cannot be resolved.

In a similar vein, where neither the market value of the firm (and thus by derivation, its equity) nor the relevant components of its income statement can be ascertained for effective comparison purposes, the comparative financial performance of the cooperative is difficult to judge.

Determination of a notional dividend plays a twofold role in the appraisal process. While it is arguable whether or not the level of the dividend directly affects the value of the firm, it does form a component of the equityholders' return on investment and, in the case of the cooperative, any increase in the level of a notional dividend must result in a decrease in the level of cost of sales (COS) for a

[6] Hoeven , J. A., and Prill, E. L., "Valuation of a Rural Electric Cooperative", Management Quarterly, 29:4, Winter 1988/89, pp. 20-24.

marketing cooperative or sales revenue (supply cooperative). In other words, the "true" COS (or sales) is the difference between the reported COS (or sales) and a notional dividend. Unfortunately for the analyst, the notional dividend is a component of the NOI which in turn is a function of the dividend calculation, and circular reasoning becomes a problem. In schematic form:



Assuming a constant level of retained earnings, any increase in the (notional) dividend in the above schematic must derive from an increase in NOI and in turn from a decrease in the cost of sales. In other words, we can ascertain neither the NOI nor the value of the firm unless either the cost of sales or the level of the notional dividend can be independently ascertained.

Calculating the value of the firm without being able to use the NOI (or any subsequent items such as net income) presents the analyst with a fundamental problem in that income based valuation models (supported by theory) rely on such figures for their basis. Appendix A contains a listing of the relationships that rely on the observation of NOI and that are relevant to the appraisal process being considered.

In summary, the following observations can be made concerning this process.

a) Economic rationality suggests that post-tax WACC = $\frac{NOI_{t+1}}{Assets}(1-\tau)$

where τ = tax

b) Return on assets = $\frac{NOI_{1+1}}{Assets_t} + \frac{Capital\,Growth_{1+1}}{Assets_t}$

c) Expected NOI = Average Assets (WACC - g)

$$= \text{Average Assets}\left(WACC - \frac{NOI_{t+1} - NOI_t}{NOI_t}\right)$$

where g = growth

d) Return on equity = $\frac{Dividend_{t+1}}{Equity_t} + \frac{Capital\,Growth_{t+1}}{Equity_t}$

e) Required return on equity = ke = $\rho + \frac{D}{E}(\rho - kd)[1-\tau(1-\gamma)]$

where ke = cost of equity
ρ = required return on the all-equity firm
D = debt
E = equity
kd = cost of debt

γ = imputation factor

f) Required return on assets = WACC = $ke\frac{E}{A} + kd\frac{D}{A}[1-\tau(1-\gamma)]$

g) Assuming that the market value (MV) of debt equals its book value (BV) and, assuming that MV assets < BV assets and, knowing that ke > kd

then: $\frac{D}{A_{BV}} > \frac{D}{A_{MV}}$ and $\frac{E}{A_{BV}} < \frac{E}{A_{MV}}$ because $\frac{E}{A_{MV}} = 1 - \frac{D}{A_{MV}}$

therefore: WACC computed at book values < WACC at market values due to the increased weighting of the higher cost component

i.e. $\rho_{MV} > WACC_{MV} > WACC_{BV} < \rho_{BV}$

h) If $\gamma = 1$, WACC = ρ and there is neither an optimal cost of capital nor an optimal capital structure but $WACC_{MV}$ is still > $WACC_{BV}$.

i) To the extent that the quantum of tax paid is predetermined and that the WACC relies in its formulation on an assumed tax rate leading to a notional taxation charge, any difference between the two comprises (in the case of a cooperative) an additional return to the owners of a cooperative either as part of the implied dividend or as part of the additional benefit. If the former is assumed, while the computed NOI will related directly to the WACC required, the return to equity will be incorrect. Assuming the latter situation, the computed NOI will differ from that deriving from the relevant WACC although the return on equity will be correct. If the focus of the study is to determine the correct return to equity (as opposed to the valuation of the firm's assets), the latter method appears to be the more appropriate.

j) If comparable information exists, the computed dividend can be compared with that information to determine the effects of the various assumptions (including notably the inability to measure the firm's market value) by examining *inter alia*:

Dividend/Net income
Dividend payout ratio
Dividend/Sales
Dividend/NOI.

4 A PRAGMATIC APPROACH TO THE PROBLEM

For the purposes of valuation it would be possible to ascertain the notional NOI of the cooperative if we could observe the returns characteristics for comparable (proxy) firms and if we could estimate the cooperative's value. However, we are faced with what is effectively a circular reasoning problem. Without a value of the firm and a required rate of return on assets, we cannot estimate the NOI; without a NOI and a discount rate we cannot estimate the value of the firm. But, why is the NOI so difficult to measure? Ignoring taxes, the following examples demonstrate the nature of the problem.

Firm A is a marketing cooperative. It purchases its raw materials from its members and maximises the price that it pays for these materials, its cost of sales. This results in minimising the NOI and thus the net income. There is no dividend, it is a component of the cost of goods sold, i.e., the true cost of goods sold equals the reported cost of sales less a notional dividend.

Firm B is a supply cooperative. It purchases goods and sells them to its members in such a way as to maximise its value to its members by selling to them at the minimum possible sales price. This results in minimising its NOI and thus its net income. There is no dividend, it is a component of the sales, i.e., the true sales revenue equals the reported sales revenue plus a notional dividend.

What is known? In the case of Firm A, the marketing firm, the financial reports realistically disclose the sales, the operating costs and the interest. In the case of Firm B the supply cooperative, they show the cost of sales, the operating costs and the interest. Given this paucity of knowledge we need to be able to reconstruct the balance sheet and the income statement in such a way as to enable comparisons between the cooperative and regular corporations. In effect we need to fill in the gaps shown in the table below. The key to the resolution of this problem lies with the determination of either the (notional) dividend or the NOI.

Marketing		Supply
Given	Sales	X
X	Cost of sales	Given
X	Gross profit	X
Given	Operating expenses	Given
X	Net operating income	X
Given	Interest	Given
X	Net income	X
X	Dividend	X
Given	Retained	Given

The only way to determine the value of either or both of these items is to apply critical ratios determined from the observation of proxy firms to the cooperative under consideration. For example, for the cooperative for which the book value of assets approximates their market value, the NOI can be determined in a number of ways. If the NOI/Assets (at market value) of a number of proxy firms is known, the application of this ratio to the assets of the subject cooperative will result in an estimate of its NOI.

$$NOI_{cooperative} = NOI_{proxy}/Assets_{proxy} \times Assets_{cooperative}$$

The centre term in the above equation represents the weighted average cost of capital (WACC) of the proxy. Where the proxy is publicly listed, the required WACC can be derived using the beta of the proxy.

There are two problems with this approach. Firstly, the NOI/Assets performance ratio of the cooperative will equal that of the proxy by definition and thus comparative performance, at least in this respect, will be meaningless. Secondly, the assets of the proxy will be at market value while those of the cooperative will be at book value. If the market value of the cooperative cannot be approximated, the nature of the dilemma is increased markedly, and we are left with the need to estimate more directly the value of NOI or the dividend using comparative ratio analysis based largely on income statement relationships alone. The problem is the more industry norms are used to "fill in the blanks", the more likely it becomes that any further performance appraisal will merely indicate that performance of the firm is average. For the marketing cooperative, assuming equivalent efficiency levels between the cooperative and the proxy, the following relationships can be used in this process:

$$NOI = NOI_{proxy}/Sales_{proxy} \times Sales$$
$$NOI = NOI_{proxy}/Opg\ Exp_{proxy} \times Operating\ Expense$$
$$Gross\ profit = GP_{proxy}/Sales_{proxy} \times Sales$$
$$Gross\ profit = GP_{proxy}/Opg\ Exp_{proxy} \times Operating\ Expense$$
$$Cost\ of\ sales = COS_{proxy}/Sales_{proxy} \times Sales$$

For the supply cooperative, the following relationships are relevant:

NOI	=	NOI_{proxy}/COS_{proxy}	x COS
NOI	=	$NOI_{proxy}/Opg\ Exp_{proxy}$	x Operating Expense

Once these items have been estimated, the following relationships provide the balance of the items needed to complete the revised income statement:

EBT	=	NOI - Interest
Tax	=	actual Tax
EAT	=	EBT - Tax
Dividend	=	EAT - Retained Earnings

Independent corroboration of the notional dividend can also be gained by comparisons of the results of the following computations:

Dividend	=	$Dividend_{proxy}/EAT_{proxy}$	x EAT
	=	$Dividend_{proxy}/Sales_{proxy}$	x Sales
	=	$Dividend_{proxy}/EBT_{proxy}$	x EBT
	=	$Dividend_{proxy}/NOI_{proxy}$	x NOI

Except by fluke, these relationships will not deliver an income statement which "adds up"! Judgement is therefore required, a feature which makes such analysis difficult to program.

One method of supporting these figures is to roughly estimate the value of the firm, using either comparative ratios or replacement cost less notional depreciation as a guide to market value. Under these circumstances, a proxy-indicated WACC can be applied to the value to independently corroborate the estimated NOI. Possible ratios which might shed light on the value of the firm include the following.

Marketing Cooperative		Proxy	Subject
V_t	=	$Assets_t/Sales_{t+1}$	x $Sales_{t+1}$
	=	$Assets_t/Debt_t$	x $Debt_t$
	=	$Assets_t/Opg\ Exps_{t+1}$	x $Opg\ Exps_{t+1}$
	=	$Equity_t/Sales_{t+1}$	x $Sales_{t+1}$ + Debt

Supply Cooperative		Proxy	Subject
V_t	=	$Assets_t/COS_{t+1}$	x COS_{t+1}
	=	$Assets_t/Debt_t$	x $Debt_t$
	=	$Assets_t/Opg\ Exps_{t+1}$	x $Opg\ Exps_{t+1}$
	=	$Equity_t/Opg\ Exps_{t+1}$	x $Opg\ Exps_{t+1}$ + Debt

In addition to the ratios listed above, the market:book ratios of proxies may provide some guidance to the value of the cooperative.

It is critical, as in all analyses of this type, that like be compared with like. The operating assets of a firm can be defined as the market values of its long-term assets, its net working capital and its intangibles. This amount must equal the values of equity and interest-bearing debt.
Where the beta (β) of a cooperative's (unlevered) assets can be determined, the application of the CAPM (assuming that the risk-free rate, the relevant tax rate and the market risk premium can be computed or observed) will result in the derivation of the cost of its unlevered equity, ρ. The relationship between ρ and the WACC of a firm depends *inter alia* on its debt ratio (which requires in

turn the observation of the relevant market values of its sources of finance), on the relevant tax rate and on the extent to which abstractions from the firm by way of dividends are imputed for taxation purposes (in countries which operate an imputation regime).

Once the WACC has been computed, and assuming that in equilibrium the NOI equals the product of the WACC and the market value of operating assets, the NOI can be determined. This assumption is necessary because the CAPM is a essentially a predictive model; the product of the WACC and the firm's existing operating assets provides the expected NOI for the next period given the single period nature of the CAPM.

The CAPM is also a single period static equilibrium model. The required return derived from the use of such a model must be recognised in this context. If a firm achieves its computed WACC, its value is maintained, i.e., it does not grow. To the extent that the assets (or equity) of the firm are (is) growing, the predictive WACC should be reduced accordingly. Indeed the perpetual growth model of Gordon (1959)[7] indicates that the capitalisation rate should equal the required rate of return less the growth rate in the relevant income stream. It follows that if

$$\text{Value} = \frac{\text{CashFlow}}{r - g}$$

where: r = the required rate of return and
g = the growth rate in the cashflow)

then r - g = cashflow/value, or alternatively, expected cashflow = value(r-g) indicating that, in the case of the computations relating to a cooperative, the expected NOI should equate not the value times WACC but rather the value times WACC less the expected long term growth rate in NOI.

Once the value of the firm has been approximated, further corroboration of the figures in the revised income statement can take place. In many cases, these indicators are more theoretically supportable due in particular to the large number of theorised relationships between the NOI (and net income) and assets and equity respectively.

$$NOI_{cooperative} = NOI_{proxy}/Assets_{proxy} \times Assets_{cooperative}$$
$$Sales_{cooperative} = Sales_{proxy}/Assets_{proxy} \times Assets_{cooperative}$$
$$GP_{cooperative} = GP_{proxy}/Assets_{proxy} \times Assets_{cooperative}$$
$$NI_{cooperative} = NI_{proxy}/Equity_{proxy} \times Equity_{cooperative}$$
$$Dividend_{cooperative} = Dividend_{proxy}/Equity_{proxy} \times Equity_{cooperative}$$

[7] Gordon, M., Dividends, Earnings and Stock Prices, Review of Economics and Statistics, May 1959, 99-105.

5 APPLICATION TO THE NEW ZEALAND DAIRY BOARD

5.1 Justification

It is undeniable that the milk payout of the New Zealand Dairy Board (NZDB) includes elements of both a return for milk supplied and a return on stakeholders' investment in the Board and that the division of this single payment into its two components is problematic. Nevertheless, there is a large number of reasons why it is desirable to divide the milk payout into the two components.

1. Any valuation of the NZDB requires an estimate of the cost of goods sold. A component of this cost is the true cost of the milk purchased.

2. If the performance of the NZDB is to be examined and compared with the performance of other like businesses, then realistic estimations of the structure of its income statement and balance sheet are required.

3. With respect to the dividend *per se*, two arguments have been put forward as reasons why the dividend should be identified. The first of these arguments relates to efficient resource allocation, in particular the over-valuation of dairy farm assets. The second perspective relates to industry signals; it has been argued that as long as the dividend and the true milk pay out are bundled together, farmers do not receive the correct signals relating to the value of their product.

5.2 Previous Work

A number of recent articles have shed some light on the performance appraisal of the NZDB and the problems associated with that appraisal. They include the 1996 document prepared by Tasman Asia Pacific and ACIL, the 1996 Draft Document of Federated Farmers of New Zealand, the 1995 Ireland and Wallace document prepared for the New Zealand Dairy Board, the Sullivan and Scrimgeour paper in 1995, and the Ireland and Wallace 1994 paper prepared for the New Zealand Business Roundtable. These documents have the common thread of attempting to determine the performance of components of the dairy industry in New Zealand by estimating value added.

The approaches generally used in these analyses were to compute the required rate of return on the assumed (unobservable) values of the operating assets of the NZDB (or the particular industry component under consideration) by applying the relevant weighted average cost of capital (WACC) to the operating assets which generate business income and then to adjust the capital charge so determined to compute an implied dividend. Finally, an implied dividend was deducted from the actual milk payout to provide an implied milk payout.

In general, these approaches have:

a) assumed a constant WACC (i.e., equals ρ) thereby ignoring the possibility of an optimal capital structure;
b) assumed that the required NOI is based on closing assets rather than opening or average assets for the period;
c) assumed the relevant β is that of the all-equity publicly listed (overseas) firm without considering the extant relationships within the New Zealand dairy industry;
d) ignored the argument that the CAPM may not be the relevant pricing model given the absence of market values and the assumptions underpinning the model with the result that a market based model is applied to a private firm for which the required parameters are unknown;
e) ignored the change in value during the period as being a component of the required return;
f) ignored the difference between the notional taxation computed and the actual taxation paid;
g) ignored growth by assuming that the growth rates of comparable firms equate the growth rate of the NZDB in all respects rather than imposing the actual growth rate of NZDB on the model;

h) excluded the UK butter premium, despite arguments to the contrary that this can be regarded in a market context as just another source of income to the NZDB. There is little theoretical justification in adding it to the pre-tax capital charge because it is not a charge on capital. The commercial reality is that if the NZDB was a private firm the dividend decision would not be affected by the source of the firm's revenue. In the view of New Zealand Federated Farmers an increase in the premium should result in an increase in the required return on investment and thereby directly in an increase in the dividend. If the premium was capitalised into the operating capital, presumably at WACC, then it would be a relevant charge. However, it should be noted that in this case, the increment in value which can be regarded as part of the return on investment, would equal the premium.

5.3 Methodology

The following schematic describes how a notional income statement needs to be determined for a marketing cooperative such as the NZDB (assuming a residual dividend policy):

	Sales	- given
less	Cost of sales	- computed
less	Operating costs	- given
equals	NOI	- computed
less	Interest	- given
less	Change in value	- given
less	Tax paid	- given or computed
less	Retained earnings	- given
equals	Dividend	- computed

Because the implied milk payout is the difference between the actual milk payout and the implied dividend, where the latter derives from the NOI which in turn is a function of the dividend calculation, circular reasoning becomes a problem and it is necessary at some point to step outside the NZDB itself and apply an industry-derived relationship to break the circularity.

One small but significant decision has a considerable bearing on the NOI computation outlined above. Models derived from the theory of finance rely on a notional tax computation to provide post-tax figures. Due to the specifications of the financial accounting process and the revenue regulations, the computed tax rarely equates to the actual tax. Thus a decision is required whether to use the actual taxation paid figures as in the firm's financial statements or the notional tax figures calculated by the model and necessary to maintain the correct relationships between the elements comprising the pro forma statements used in the analysis. The differences can be observed by comparing Table B4 and Table B5 in Appendix B.

This study began with the financial statements of the NZDB (which were somewhat inadequate for the purpose due to restricted disclosures) and the parameters noted in table B1 of Appendix B. At this point the objective was to remain as close as possible to previous work to retain comparability. The financial statements of three multinational groups, Hershey Foods, Heinz and Nestlé were also analysed to provide a set of relationships which could then be used to attempt to break the circular reasoning problem described above.

Of particular relevance to the application of the CAPM to the NZDB, is the question of the relevant systematic risk. The NZDB is effectively a cooperative which has the ability to self determine its level of profitability as measured by its NOI. Taken as an independent notion, this could indicate a β of zero. Alternatively, its β could be regarded (and was in the literature surveyed) as being the β of comparable listed firms without all of the rights associated with the NZDB's operations and its cooperative nature. On the other hand, its β could be regarded as being derived from the underlying

activity which it supports, notably dairying. A study by Anderson, Newman and Seed (1992)[8] demonstrated (by use of the arbitrage pricing model) that the systematic risk of production agriculture may be close to zero. This would suggest that the systematic risk of the NZDB is also closer to zero than to that of otherwise comparable firms such as Hershey Foods, Heinz or Nestlé and accordingly its β should reflect this lower risk.

5.4 Results

The appendices demonstrate the results of applying an alternative approach to resolving the NZDB dividend dilemma. The two critical parameters on which the computations are based include the relevant values of β (the systematic risk of the firm) and γ (the dividend imputation factor). Appendix A contains a listing and explanation of critical relationships utilised in the analysis. Appendix B presents an application of the model to the NZDB based on $\beta = 0.7$ and $\gamma = 0.6$. Appendix C provides a comparison of the dividends suggested by the authors critiqued and those prescribed by the model.

The results are limited in two respects. Firstly, it was not possible to distil all of the information from the financial statements which would have been ideal. Secondly, a notable deficiency in the applied model is that, as with previous attempts to derive the NZDB dividend, the growth element in the computed return and in the value of the firm was ignored. Nevertheless, the following comments are pertinent at this stage.

Table B1 indicates the parameters utilised. Table B2 reports the NZDB financials used in the analyses and indicates the difficulty faced when the operating expenses could not be separated from the cost of sales. Table B3 reports a number of critical relationships which were used in further stages of the analysis. The computation of the NOI was carried out by applying an estimated WACC to the annual average book values of NZDB assets. Tables B4 and B5 exhibit the pro forma financial statements determined using respectively a notional tax calculation and the actual tax. The critical ratios resulting from these computations were then compared with those of Hershey Foods, Heinz and Nestlé, although in some instances it was not possible to ascertain comparable figures. Table B6 exhibits common size statements for the 4 firms and demonstrates effectively that the NZDB dividend computed is above average.

Table B7 shows the comparisons of critical ratios and demonstrates that the computed NZDB dividend is higher than would be indicated by the other three corporations. With respect to the dividend payout ratio, while the NZDB figures generally exceed the equivalent figures of the comparable firms, this feature can be regarded as a dividend decision rather than an investment or financing decision. With respect to the dividend/sales ratio and dividend/NOI ratios, to the extent that comparison of the dividends indicated by comparable firms and the implied dividend of the NZDB exhibit material differences, some adjustment appears to be indicated. This adjustment could be based on the notion that if the WACC = NOI/assets in the long term, then comparison of these elements would lead to a measure of over or under performance which should average zero in the long term. The dividend indicated by the analysis of comparable firms could then be multiplied by a correction factor to ensure that this is so and would result in the computation of an estimated dividend. The ratio of the estimated and implied dividends would show the extent to which two seemingly appropriate methodologies conflict.

Appendix C reports the estimations of three other analysts and compares these with the highest, lowest and preferred computations of the model using different mixes of β and γ. While the figures vary between analysts and the dividend estimated by the model is generally lower than those estimated by other researchers, the pattern is not totally consistent.

---

[8] Newman, D. L., Anderson, G. A., and Seed, P. G., Risk in Agriculture: An Arbitrage Pricing Theory Approach, MAF Policy Technical Paper, 92/8, 1992.

5.5 A Comment on Dividends and Farm Values

While many comments have been made in many fora that the "unbundling" of the milk payout will result in the price of dairy farm assets falling, it can be argued that the mere division of the milk payout into its two components would not in any way change the income of the farmer (which would include a dividend and a reduced milk payout) and thus would not change the farmer's view of the value of the farm asset unless the farmer recognises the market value of the capital invested off-farm and the need to earn an appropriate return on that capital.

6 CONCLUSIONS

To appraise the performance of a cooperative requires the effective determination of a notional NOI derived from increasing the sales revenue of a supply cooperative or reducing the cost of sales of a marketing cooperative. This determination is problematic in that without the application of at least one industry norm such as a gross margin, a circular reasoning problem arises. There is a large number of industry derived relationships which can be applied to this process. A notional dividend can be computed from the notional NOI.

Because there is no market determined value for the cooperative, many of the relationships prescribed by the theory of finance cannot be directly applied, or if they are applied, are dependent on the accuracy of the valuation for their efficacy. Similarly, the effective application of pricing models such as the CAPM which depend on market determined parameters is difficult.

With respect to the application of such a model to the New Zealand Dairy Board, three multinational corporations were used to provide comparative data and a set of parameters produced which were congruent with the theory of finance. To overcome the circularity problem, the book values of assets were assumed to approximate their market values. While the financial reports analysed were in some ways inadequate for the purpose to which they were being applied, the results indicate that previous studies overvalued the imputed dividend, in some cases by a considerable amount. If capital growth had been considered in the model, given that the required rate of return can be considered as the sum of the dividend and capital growth, the dividend estimated by the model may have been lower still.

APPENDIX A

In the absence of taxes, theory tells us that the following relationships hold:

$$ROA = WACC = ko = NOI_{t+1}/V_t = ke_L \frac{E}{A} + kd \frac{D}{A}$$

$$V_t = NOI_{t+1}/ko$$

$$ROE = [Dividend_{t+1} + \Delta Equity]/Equity_t$$

$$E_t = [Dividend_{t+1} + \Delta Equity]/ke_L$$
$$= Dividend_{t+1}/[ke - g] = Dividend_{t+1}/[ke(1-b)]$$

$$D_t = Interest_{t+1}/kd$$

where:

ROA	=	return on assets = WACC = ko
ke_L	=	cost of levered equity
kd	=	cost of debt = interest(1- τ)/average debt for the period
V_t	=	value of the firm at time t
ROE	=	Return on equity

With the inclusion of taxes (and adding further complication, imputation) the above relationships can be extended to the following:

$$ROA = ko = NOI_{t+1}(1-\tau)/V_t = ke_L \frac{E}{A} + kd \frac{D}{A}[1-\tau]$$

where: τ = relevant tax rate

$$ROE = ke_L = (NOI_{t+1} - Interest_{t+1})(1-\tau)/Equity_t$$
$$= EAT_{t+1}/Equity_t$$
$$= [Dividend_{t+1}/(1-b)]/Equity_t$$
$$= Dividend_{t+1}/Equity_t + g$$
$$= [Dividend_{t+1} + \Delta Equity]/Equity_t$$

With dividend imputation, these relationships can be further adjusted:

$$ROA = ko = NOI_{t+1}[1-\tau(1-\gamma)]/V_t = ke_L \frac{E}{A} + kd \frac{D}{A}[1-\tau(1-\gamma)]$$

where: γ = proportion of tax collected to which imputation credits apply

$$ROE = ke_L = [NOI_{t+1} - Interest_{t+1}][1-\tau(1-\gamma)]/Equity_t$$
$$= EBT_{t+1}[1-\tau(1-\gamma)]/Equity_t$$
$$= EAT_{t+1}[1+\tau\gamma/(1-\tau)]/Equity_t$$
$$= [Dividend_{t+1}/(1-b)][1+\tau\gamma/(1-\tau)]/Equity_t$$

All of these relationships are based on the notion that the relevant capitalisable cash flow can, in the long-term be derived from the NOI of the firm.

APPENDIX B

Table B1 Parameters Used

Parameters	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
Risk Free Rate	10.3%	15.7%	13.2%	12.3%	12.0%	8.9%	7.4%	6.2%	7.7%	9.1%
Market Risk Premium	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%
βu	**0.7**	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7
Co Tax	31.9%	28.0%	28.0%	33.0%	33.0%	33.0%	33.0%	33.0%	33.0%	33.0%
γ	**0.6**	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
ρ	13.3%	17.6%	15.8%	14.5%	14.3%	12.3%	11.3%	10.5%	11.5%	12.4%
Effective tax factor = t(1-γ)	12.8%	11.2%	11.2%	13.2%	13.2%	13.2%	13.2%	13.2%	13.2%	13.2%

Table B2 NZDB Financials

$	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
Sales	2384	2943	3984	4527	4338	5057	5054	4977	5019	5314
Payout	1846	1197	1650	1910	1266	1888	1960	2003	2058	2685
Other COS	382	1511	2084	2384	2933	2888	2877	2824	2780	2478
GP	156	235	250	233	139	281	217	150	181	151
Operating Expenses	0	0	0	0	0	0	0	0	0	0
NOI	156	235	250	233	139	281	217	150	181	151
Interest	86	109	186	196	197	123	116	105	87	86
EBT	70	126	64	37	-58	158	101	45	94	65
Tax	31	5	15	8	-3	63	59	29	71	36
Net income	39	121	49	29	-55	95	42	16	23	29
Dividend	0	0	0	0	0	0	0	0	0	0
Retained Earnings	39	121	49	29	-55	95	42	16	23	29
Closing Debt	794	987	1356	1827	1297	1275	1349	1212	935	1444
Closing Equity (BV)	1290	1372	1425	1417	1366	1478	1510	1504	1471	1458
Closing Assets (BV)	2084	2359	2781	3244	2662	2753	2859	2715	2406	2902
Average Debt	794	891	1172	1591	1562	1286	1312	1280	1073	1190
Average Equity (BV)	1290	1331	1398	1421	1391	1422	1494	1507	1487	1464
Average Assets (BV)	2084	2359	2570	3013	2953	2708	2806	2787	2561	2654

Table B3 Derived Relationships (NZDB)

	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
NOI/Av Assets =	7%	10%	10%	8%	5%	10%	8%	5%	7%	6%
Int/Av Debt =	11%	12%	16%	12%	13%	10%	9%	8%	8%	7%
EBT/Av Equity =	5%	9%	5%	3%	-4%	11%	7%	3%	6%	4%
NI/Av Equity =	3%	9%	4%	2%	-4%	7%	3%	1%	2%	2%
Ki	11%	12%	16%	12%	13%	10%	9%	8%	8%	7%
Kd	9.4%	10.9%	14.1%	10.7%	11.0%	8.3%	7.7%	7.1%	7.0%	6.3%
Ke @ average BVs	15.4%	21.6%	17.1%	18.3%	17.6%	15.4%	14.0%	12.9%	14.2%	16.7%
Pre-tax Ke	17.6%	24.3%	19.2%	21.1%	20.3%	17.7%	16.1%	14.9%	16.4%	19.3%
WACC @ average BVs	13.1%	16.3%	15.7%	14.3%	14.1%	12.0%	11.0%	10.3%	11.2%	12.0%
Pre-tax WACC @ average BVs	15.0%	18.3%	17.7%	16.4%	16.2%	13.8%	12.7%	11.8%	12.9%	13.9%

Table B4 NOI Computation on average asset values - Tax computed - No growth

$	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
Sales	2384	2943	3984	4527	4338	5057	5054	4977	5019	5314
Payout	1689	999	1445	1648	925	1794	1820	1824	1908	2468
Other COS	382	1511	2084	2384	2933	2888	2877	2824	2780	2478
GP	313	433	455	495	480	375	357	329	331	368
Operating Expenses	0	0	0	0	0	0	0	0	0	0
NOI	313	433	455	495	480	375	357	329	331	368
Interest	86	109	186	196	197	123	116	105	87	86
EBT	227	324	269	299	283	252	241	224	244	282
Notional Tax	29	36	30	40	37	33	32	30	32	37
Net income	198	288	239	260	245	219	209	195	212	245
Dividend	159	167	190	231	300	124	167	179	189	216
Retained Earnings	39	121	49	29	-55	95	42	16	23	29
Original Payout	1846	1197	1650	1910	1266	1888	1960	2003	2058	2685
Computed Payout	1689	999	1445	1648	925	1794	1820	1824	1908	2468
Reduction in Payout	157	198	205	262	341	94	140	179	150	217
Dividend	159	167	190	231	300	124	167	179	189	216
Difference	-2	31	15	32	40	-30	-27	1	-39	1
Tax computed	29	36	30	40	37	33	32	30	32	37
Actual tax	31	5	15	8	-3	63	59	29	71	36
Tax difference	-2	31	15	32	40	-30	-27	1	-39	1
NI/Average Equity	15.4%	21.6%	17.1%	18.3%	17.6%	15.4%	14.0%	12.9%	14.2%	16.7%
Ke estimated	15.4%	21.6%	17.1%	18.3%	17.6%	15.4%	14.0%	12.9%	14.2%	16.7%
EBT/Average Equity	17.6%	24.3%	19.2%	21.1%	20.3%	17.7%	16.1%	14.9%	16.4%	19.3%
Pre-tax Ke estimated	17.6%	24.3%	19.2%	21.1%	20.3%	17.7%	16.1%	14.9%	16.4%	19.3%
NOI/Average Assets	15.0%	18.3%	17.7%	16.4%	16.2%	13.8%	12.7%	11.8%	12.9%	13.9%
WACC estimated	15.0%	18.3%	17.7%	16.4%	16.2%	13.8%	12.7%	11.8%	12.9%	13.9%

NOTE: Under these circumstances, all of the stakeholders receive their required returns on investment.
BUT: The total payment to the government has "increased" to the detriment of the equityholders. The (payout + dividend) is reduced by the difference between the notional tax calculated and the actual tax paid.
GIVEN: The historical nature of the financial reports, the actual tax paid is the relevant figure for inclusion in the analysis.
IF: equityholders are receiving their return already, this must accrue to the milk payout.
IF: difference accrues to the milk payout, the computed NOI is reduced and thus the ROA so that ROA is not equal to WACC.
In justification, the focus is on the returns to the equityholders and on the computation of the implied payout and dividend.

Table B5 NOI Computation - Tax held to book value

$	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	MEAN
Sales	2384	2943	3984	4527	4338	5057	5054	4977	5019	5314	4360
Payout	1689	999	1445	1648	925	1794	1820	1824	1908	2468	1652
Other COS	382	1511	2084	2384	2933	2888	2877	2824	2780	2478	2314
GP	313	433	455	495	480	375	357	329	331	368	394
Operating Expenses	0	0	0	0	0	0	0	0	0	0	0
NOI	313	433	455	495	480	375	357	329	331	368	394
Interest	86	109	186	196	197	123	116	105	87	86	129
EBT	227	324	269	299	283	252	241	224	244	282	264
Tax	31	5	15	8	-3	63	59	29	71	36	31
Net income	196	319	254	291	286	189	182	195	173	246	233
Dividend	157	198	205	262	341	94	140	179	150	217	194
Retained Earnings	39	121	49	29	-55	95	42	16	23	29	39
Original Payout	1846	1197	1650	1910	1266	1888	1960	2003	2058	2685	
Computed Payout	1689	999	1445	1648	925	1794	1820	1824	1908	2468	
Reduction in Payout	157	198	205	262	341	94	140	179	150	217	
Dividend	157	198	205	262	341	94	140	179	150	217	
Difference	0	0	0	0	0	0	0	0	0	0	
NI/Average Equity	15.2%	24.0%	18.2%	20.5%	20.5%	13.3%	12.2%	13.0%	11.6%	16.8%	
Ke estimated	15.4%	21.6%	17.1%	18.3%	17.6%	15.4%	14.0%	12.9%	14.2%	16.7%	
EBT/Average Equity	17.6%	24.3%	19.2%	21.1%	20.3%	17.7%	16.1%	14.9%	16.4%	19.3%	
Pre-tax Ke estimated	17.6%	24.3%	19.2%	21.1%	20.3%	17.7%	16.1%	14.9%	16.4%	19.3%	
NOI/Assets	15.0%	18.3%	17.7%	16.4%	16.2%	13.8%	12.7%	11.8%	12.9%	13.9%	
WACC estimated	15.0%	18.3%	17.7%	16.4%	16.2%	13.8%	12.7%	11.8%	12.9%	13.9%	

Table B6 Financial Statements Structures

	Hershey	Heinz	Nestle	NZDB	$
Group Revenue	100%	100%	100%	100%	100
Estimated Payout				38%	38
Other Costs of Sales	59%	62%	52%	53%	53
Gross Profit	41%	38%	48%	9%	9
Admin	28%	24%	39%	0%	0
NOI	13%	14%	8%	9%	9
Interest	1%	2%	0%	3%	3
EBT	12%	12%	8%	6%	6
Tax	5%	4%	3%	1%	1
EAT	7%	8%	5%	5%	5
Estimated Dividend	3%	4%	2%	4%	4
Retention	4%	4%	4%	1%	1
	$				**$**
Debt	13				28
Equity	153				32
Assets	166				59
NOI/Assets	8%				18%
EBT/Equity	8%				23%
Interest/Debt	8%				12%

Table B7 Industry Comparisons (10 year means)

	Hersheys	Heinz	Nestle	Mean	NZDB ex Table A4
Sales/Assets	60%			60%	169%
COS/Sales	59%	62%	52%	60%	64%
GP/Sales	41%	38%	48%	40%	36%
NOI/Sales	13%	14%	8%	12%	10%
EBT/Sales	12%	12%	8%	11%	6%
Dividend/Sales	3%	4%	2%	3%	5%
Dividend/NOI	22%	27%	20%	23%	49%
Dividend/Net Income	41%	49%	32%	41%	83%
Div/Equity	2%			2%	14%

APPENDIX C

DIVIDEND COMPARISONS AMONGST RESEARCHERS AND MODEL SIMULATIONS ($)

	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
Sullivan & Scrimgeour			166	341	319	169	225			
Ireland & Wallace (1994)						213				
NZ Fed Farmers (1996)	437	322	401	489	492	342	423	446	444	576
Model (lowest)	65	96	87	124	205	-22	23	66	43	106
Model (highest)	229	278	294	372	448	177	220	254	225	296
Model (preferred)	157	198	205	262	341	94	140	179	150	217

β	γ	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
0.7	1	121	156	156	205	284	51	99	141	112	178
0.7	0.8	138	176	180	233	312	71	118	159	130	197
0.7	0.6	157	198	205	262	341	94	140	179	150	217
0.7	0.4	178	222	232	295	373	118	163	201	172	240
0.7	0.2	202	248	262	331	408	146	190	226	196	266
0.7	0	229	278	294	372	448	177	220	254	225	296
0.6	1	102	136	133	178	258	27	74	116	89	154
0.6	0.8	119	155	156	205	284	46	92	133	106	172
0.6	0.6	137	176	180	233	312	67	112	152	125	191
0.6	0.4	157	199	206	265	343	91	135	173	145	213
0.6	0.2	179	225	235	299	377	117	160	196	169	237
0.6	0	205	253	266	338	415	147	188	222	195	265
0.5	1	84	116	110	151	231	2	48	91	66	130
0.5	0.8	99	135	132	177	257	21	66	107	82	147
0.5	0.6	116	155	155	204	284	41	85	125	100	165
0.5	0.4	135	177	181	234	313	63	106	144	119	186
0.5	0.2	156	201	208	268	346	88	130	166	141	209
0.5	0	181	228	238	305	382	116	156	190	166	235
0.4	1	65	96	87	124	205	-22	23	66	43	106
0.4	0.8	80	114	108	149	229	-4	40	81	58	122
0.4	0.6	96	133	131	175	255	15	58	98	75	139
0.4	0.4	114	154	155	204	284	36	78	116	93	158
0.4	0.2	134	178	181	236	315	59	100	136	113	180
0.4	0	156	204	210	271	350	85	124	158	136	205

Note:
For a given level of γ, as β decreases, the dividend decreases (because required ROE decreases)
For a given level of β, as γ increases, the dividend decreases (because effective tax rate and thus required ROE decreases)