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Volume 2 Selected Papers

Objectives of Financial Statements

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**American Institute of
Certified Public Accountants**

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A Test of the Feasibility of Preparing Discounted Cash Flow Accounting Statements

Joshua Ronen

This paper examines the feasibility of applying the discounted cash flow system of accounting to an actual firm. In particular, it attempts to provide some insight into the time and effort required to implement such a system. In this sense, valuable information will be gained relative to the cost of implementing the system.

Brief Description of the Discounted Cash Flow (DCF) Accounting System

The DCF system quantifies the firm's value (or wealth) by discounting its expected net cash flows over a specified time period. The total value of a firm would thus be communicated in the annual report as the present value of cash flows as of the report date; this value may be separated into specific assets and liabilities reflecting for each asset and liability the present value of their expected contributions to the cash flows of the firm. Nevertheless, a separate communication of their relative contributions to cash flows is considered useful for evaluating management performance in relation to the individual assets and liabilities. The discounted cash flow accounting system is most useful when the discounted value of *both* the firm and its individual assets and liabilities are communicated along with the exit values of the assets and the liabilities. An elaborate description of such a combined system is provided in the preceding conceptual paper, "Discounted Cash Flow Accounting," pages 143-160. The exit-value system (without DCF) has been investigated by another researcher in "A Test of the Feasibility of Preparing Exit-Value Accounting Statements"; the financial data presented in this paper, therefore, relates to discounted cash flows only.

Future cash flows are discounted at a rate which reflects average market risk. In this case average market risk was approximated by the average industrial rate of return for the period 1953-1970. This discount rate, though in a sense arbitrary, causes the discounted value to reflect the average market risk and thus to constitute a standard against which firms charac-

terized by different levels of risk can be compared. The discount rate is applied to expected cash flows over whatever time period the firm chooses for its own planning purposes. Clearly, the longer the period, the more the specific nature of the firm's particular operations is reflected in the resulting value. To approximate the expected flows beyond the firm's period, the exit value of the firm's assets less its liabilities is used as a surrogate for the present value of future flows expected beyond the period. These exit values constitute the market consensus of the expected flows attributable to the net assets.

As indicated, in addition to the total net value of the firm, management can estimate the net cash flows attributable to specific assets or groups of assets. The attributable flows are the net incremental cash flows which can be related to owning and operating the assets. They are measured as the difference in the cash flows generated by the firm *without* the particular asset or group of assets and the cash flows generated *with* the asset or the group of assets. For the purpose of discounting, cash flows estimated for one-year periods can be assumed to fall at the middle of each year. The availability of data and the specific assumptions made in the preparation of the DCF accounting statements for the test firm are described below.

Data Availability

The firm recently prepared forecasts of financial statements on an annual basis for a three-year period. Prior to December 1971, forecasts were not explicitly made with respect to either cash flows or any other accounting data. The forecasts, which are based on product lines and plants, were available for the years ending December 31, 1972, 1973, and 1974. They include the following: (1) projected results of operations (which include sales, gross profit, pre-tax income or loss, and net income or loss), (2) projected balance sheets and (3) projected source and application of funds for three years.

Preparation of Discounted Cash Flow Accounting Statements

The methods of forecasting the income statement and balance sheet items and the cash flows were as follows:

Income Statement Items. A moderate growth in sales was projected in order to determine the sales figure. No formal forecasting method was used. Rather, past sales were extrapolated in a rather simple and straightforward manner. The projections for 1972 were based on existing orders plus specific orders expected to be received during the year. Forecasts for 1973 and 1974 were made without reference to specific orders. The sales forecast reflected the differential rates of growth for different plants and departments. Gross profit and pre-tax income were based on fixed estimated percentages of sales: 55 per cent and 10 per cent, respectively. (Notice that the estimate for the pre-tax income was not derived from the gross profit previously estimated, but was based on the original sales estimate.) The 10 per cent

estimate of pre-tax income is admittedly on the conservative side. Also, no separate budgets for purchases and production were derived from the sales budget. Rather, as indicated, fixed percentages of gross profit and pre-tax income to sales were assumed.

Balance Sheet Items. Most of the current assets were primarily projected with reference to sales. Based on past experience, accounts receivable were forecast at the level of 120 days of average daily sales. Similarly, inventory was determined to be 50 per cent of annual sales computed on a quarterly basis, i.e., the inventory at year-end was estimated at an amount equal to total sales of the past two quarters. This percentage is presumably based on a turnover ratio of two. For the other current assets a constant growth was projected at \$40,000 a year, based on historical increases.

For the fixed assets, no specific projections were made relative to particular assets. The forecasts were made only in the aggregate. According to the company's officers, no retirements were expected during the three-year horizon except for insignificant assets approximating \$25,000 in total. All expected increases are therefore new purchases of equipment (buildings were not expected to be increased). Thus, the expected equipment increases were \$100,000 in 1972, \$200,000 in 1973, and \$200,000 in 1974. Since information about the useful life of separate assets was not readily available it was not feasible to forecast increments in fixed assets by examining the retirement age of specific assets. The group depreciation procedure is employed by the test company. The annual group depreciation rate is 10 per cent for equipment and 2 per cent for buildings (on a straight-line basis). Other assets which traditionally include patents, capitalized research and development costs and goodwill, were written off in 1971. The forecast, consequently, does not include amounts for these elements of cost.

The projected accounts payable were determined to reflect an amount which approximates 45 days of the average daily direct costs (primarily raw materials), excluding labor, involved in the manufacture of products. This estimation procedure is also based on past experience. The current portion of long-term debt is determined by reference to the contracts. The bank debt was projected according to the estimated need to draw on an open credit line of \$2.5 million.

The Discounting Procedure. Since forecasts are available for only three years through December 31, 1974, surrogate figures are needed to approximate the cash flows after that date. As surrogates, estimates of the exit values of assets and liabilities as of December 31, 1974 (and as of December 31, 1973 for comparative purposes) were made. The estimates were based on the exit values as of December 31, 1971 as computed for the purpose of preparing the exit value accounting statements. Certain adjustments were

¹ No growth was expected in the buildings although at the time of preparation of the forecasts, the possible addition of a new building was discussed by management.

made as explained below. Since the methods of computing the exit values of assets and liabilities as of December 31, 1971 are discussed elsewhere in this volume, this paper only describes how these values were adjusted to arrive at an estimate for exit values as of December 31, 1974 (and December 31, 1973).

Estimated Exit Values. Exhibits 1, pages 205-206, and 2, pages 207-208, show the forecasted balance sheet items at both their book value according to historical cost accounting and their estimated exit values as of December 31, 1973 and December 31, 1974, respectively. As can be seen from the exhibits, the exit values of accounts receivable and other current assets were

Exhibit 1
Test-Firm
Forecasted Balance Sheets
at Historical Cost and Exit Value
as of December 31, 1973

	<i>Historical Cost</i> <u>(\$000)</u>	<i>Exit Value</i> <u>(\$000)</u>
Assets		
Current Assets:		
Cash	\$2,081	\$2,081
Accounts receivable	1,715	1,715
Inventory	2,384	2,393
Other	210	210
Total current assets	<u>6,390</u>	<u>6,399</u>
Fixed Assets:		
Land	\$100	
Building	\$1,022	
Less: Accumulated depreciation	<u>131</u>	<u>891</u>
Equipment	700	
Less: Accumulated depreciation	<u>249</u>	<u>451</u>
Total fixed assets	<u>1,442</u>	<u>1,236</u>
Total assets	<u><u>\$7,832</u></u>	<u><u>\$7,635</u></u>

* Figures reported are net of tax liability (refund) which would arise from sale:

Land and building	248
Equipment	(14)

Exhibit 1—continued

	<i>Historical Cost</i> (\$000)	<i>Exit Value</i> (\$000)
	<u> </u>	<u> </u>
Liabilities and Stockholders' Equity		
Current Liabilities		
Accounts payable	\$ 690	\$ 690
Accrued expenses	170	170
Accrued taxes	50	50
Current portion of long-term notes payable	150	150
Total current liabilities	<u>1,060</u>	<u>1,060</u>
Long-term Liabilities:		
Notes payable	<u>242</u>	<u>242</u>
Stockholders' (Residual) Equity:		
Preferred stock	1,500	
Common stock	390	
Additional paid-in capital	2,397	
Retained earnings	2,243	
Net exit value (assets less liabilities)		6,333
	<u>6,530</u>	<u>6,333</u>
Total liabilities and stockholders' equity	<u><u>\$7,832</u></u>	<u><u>\$7,635</u></u>

assumed to be identical to their conventional book values. The inventory at historical cost was adjusted to its estimated exit value by applying to it the ratio of the estimated exit value to the historical cost of inventory as of December 31, 1971 (as computed and shown in the separate paper on the exit value method).² The exit values of land and buildings were assumed to be (both at December 31, 1973 and December 31, 1974) identical to the exit value as of December 31, 1971, that is, \$1,200,000 less the tax liability that will be incurred if the land and buildings are sold at the corresponding balance sheet dates for \$1,200,000. Note that it was assumed that no additional buildings will be acquired although, as indicated earlier, such an acquisition may take place. (See footnote 1 above.)

In estimating the exit value of equipment as of December 31, 1973, and 1974, it was assumed that (1) gross equipment purchases during 1972, 1973, and 1974 are composed of the same proportions of different kinds of equipment as the stock of equipment as of December 31, 1971; (2) no equipment will be retired during the forecast horizon; and (3) the exit value of equipment

² The company's personnel do not expect either the inventory's composition in terms of product lines or its cost and market-value relationships to change significantly in the future.

as of the forecasted balance sheet dates bears the same ratio to their costs as their estimated exit value bears to gross costs as of December 31, 1971, with appropriate adjustments for age.

Liabilities, both current and long-term, were assumed to have the same exit value as their conventional book value. The difference between the exit value of the assets and the exit value of the liabilities constitutes the net exit value of the firm's assets.

Computation of the Discounted Value. Exhibit 3, page 209, shows the discounting procedure. This Exhibit shows the net cash inflows forecasted for fiscal years 1971, 1972, 1973, and 1974. As indicated, the net cash inflow for any year was assumed to fall on June 30 of that year (at the year's mid-

Exhibit 2
Test-Firm
Forecasted Balance Sheets
at Historical Cost and Exit Value
as of December 31, 1974

	<i>Historical Cost</i> (<i>\$000</i>)	<i>Exit Value</i> (<i>\$000</i>)
Assets		
Current Assets:		
Cash	\$2,375	\$2,375
Accounts receivable	1,715	1,715
Tax refund	335	335
Inventory	2,384	2,393
Other	230	230
Total current assets	7,039	7,048
Fixed Assets:		
Land and building		
Land	\$100	
Building	\$1,022	
Less: Accumulated depreciation	151	871
Equipment	900	971
Less: Accumulated depreciation	324	374*
Total fixed assets	1,547	1,302
Total assets	\$8,586	\$8,350

* Figures reported are net of tax liability (refund) which would arise from sale:

Land and building	272
Equipment	(2)

Exhibit 2—continued

	<i>Historical Cost</i> <u>(\$000)</u>	<i>Exit Value</i> <u>(\$000)</u>
Liabilities and Stockholders' Equity		
Current Liabilities:		
Accounts payable	\$ 690	\$ 690
Accrued expenses	230	230
Current portion of long-term notes payable	369	369
Total current liabilities	<u>1,289</u>	<u>1,289</u>
Long-term Liabilities:		
Notes payable	<u>986</u>	<u>986</u>
Stockholders' (Residual) Equity:		
Preferred stock	1,500	
Common stock	390	
Additional paid-in capital	2,397	
Retained earnings	2,024	
Net exit value (assets less liabilities)		6,075
	<u>6,311</u>	<u>6,075</u>
Total liabilities and stockholders' equity	<u><u>\$8,586</u></u>	<u><u>\$8,350</u></u>

point). These net cash inflows are then discounted for the period indicated to their present value at December 31, 1971. The discount rate applied was 12 per cent (the average rate of return earned on industrial stock traded on the New York and the American Stock Exchanges for the period 1953 through 1970.) To the discounted value of these net cash inflows is added the present value of the net exit value of the firm's assets. When we add to these resulting figures the net cash balances as of December 31, 1970, and December 31, 1971, respectively, we obtain the total discounted cash value of the firm.

No separate cash inflow estimates were obtained for land, buildings, and equipment. The net cash inflow attributable to current assets and liabilities are probably identical to their exit values. (See the balance sheet in Exhibit 4, page 210.) The reason that separate estimates were not obtained for land, buildings, and equipment was not the infeasibility of obtaining such estimates. The firm's personnel were capable of making these estimates; time constraints precluded them from doing so while this empirical investigation was being undertaken.

Discussion and Conclusion

While the forecasts prepared by the firm were not based on complex mathematical models, they reflect the best estimates of the future cash flows.

To that extent the resulting discounted value reflects management's expectations with respect to the firm's future performance. While the forecasting horizon only extends to three years, the results are different from either the conventional valuation or the exit valuation. Of particular interest is the comparison of the discounted cash value of the firm with either the net exit value of its assets or the conventional book value of its equity. The DCF value for December 31, 1970 of \$4.975 million is significantly less than either the conventional net asset value of \$6.262 million or the net exit value of \$5.789 million. (See the exit-value empirical paper contained in this volume.) The discounted cash flow approach suggests that, had the same forecasts been available as of December 31, 1970, the firm may have been better off to sell its assets and cease operations or to take an alternative course of action. For December 31, 1971, the DCF value (\$4.921 million) exceeds both the conventional net asset value (\$4.529 million) and the net exit value (\$4.593 million), indicating that the firm should continue its operations.

Note that there is no inconsistency in the different indications for the two dates. Given that the firm has already incurred a large loss for 1971, it is no longer better off by ceasing its operations at the end of that year since the exit value has decreased (reflecting the loss) to an extent that makes the continuation of operations the better option. The important thing is that, overall, the firm may have been better off if the forecasts had been available as of December 31, 1970, and a decision had been made to cease operations or to pursue an alternative course of action. This result can be explained in a different way by looking at the changes in the DCF value of the firm during

Exhibit 3
Test-Firm
Computation of Discounted Cash Flows
as of December 31, 1970 and 1971

<i>Year</i>	<i>Net Cash Inflow</i>	<i>Present Value as of December 31, 1970</i>		<i>Present Value as of December 31, 1971</i>	
	<u>(\$000)</u>	<u>Years</u>	<u>(\$000)</u>	<u>Years</u>	<u>(\$000)</u>
1971	\$1,922	½	\$1,816		
1972	40	1½	34	½	\$ 38
1973	83	2½	63	1½	70
1974	294			2½	221
Total discounted cash flows			1,913		
Add: Cash as of Balance Sheet date			36	1,958	
Present value of net exit values (assets, excluding cash, less liabilities):					
as of December 31, 1973 (\$4,252)			3,026		
as of December 31, 1974 (\$3,700)				2,634	
Total discounted value of the firm			\$4,975	\$4,921	

1971, as reflected in the income statement (Exhibit 5, opposite). The firm incurred a net decrease of \$54,000 in its DCF value (\$4.975 million—\$4.921 million). But the loss is really greater than that since normally the firm would expect to earn 12 per cent (the discount rate) on its initial value of \$4.975 million or \$597,000 to reach a total value as of December 31, 1971 of \$5.572 million. Compared with the DCF value of \$4.921 million, a net loss of \$651,000 is indicated. It must be noted that for December 31, 1970 the horizon was assumed to extend only through 1973, i.e., a constant three-year horizon was assumed. Thus, actual cash flows of 1971 were assumed to be accurately forecasted as of December 31, 1970. On the other hand, the projection for 1974 was assumed not to be known until December 31,

Exhibit 4
Test-Firm
Comparative Discounted Cash Flow
Balance Sheet

	<i>December 31, 1970</i>	<i>December 31, 1971</i>
	(\$000)	(\$000)
	<hr/>	<hr/>
<i>Assets:</i>		
Current Assets:		
Cash	\$ 36	\$1,958
Accounts receivable	3,584	1,761
Tax refund	—	1,296
Inventory	2,549	3,097
Prepaid Expense	*	*
Fixed Assets:		
Land and building	*	*
Equipment	*	*
Other	*	*
<i>Liabilities and Stockholders' Equity:</i>		
Current Liabilities:		
Accounts payable	1,103	1,361
Taxes	268	—
Current portion of long-term debt	—	37
Short-term note payable	—	2,750
Other	175	31
Long-term Liability:		
Note payable	—	759
Total Discounted Value of the Firm	<u>\$4,975</u>	<u>\$4,921</u>

* As explained in the text, no separate estimates were obtained for the incremental cash flows attributable to these assets; the total DCF value of the firm need not equal the sum of DCF value of individual assets less liabilities had these DCF values been obtainable.

Exhibit 5
Test-Firm
Income Statement
Change in the Value of the Firm

	<u>(\$000)</u>
Imputed return on the DCF value of the Firm ¹	\$597
Opportunity Cost ²	(116)
Revision of expectations ³	<u>535</u>
Net loss	<u>(\$ 54)</u>

¹ This is the discount rate of 12 percent applied to the DCF value of the firm as of December 31, 1970 (\$4,975).

² This is imputed interest on \$1,922 for one half year (\$112) and on \$36 (beginning cash balance) for 1 year (\$4); it reflects the interest-equivalent earnings foregone as a result of not having reinvested the year's cash flows at the market rate of return.

³ This is the difference between \$5.572 million, the DCF value of the firm that would have resulted from the passage of one year and the receipt of cash inflows during 1971 had there been no changes in expectations, and \$4.921 million, the DCF computed as of December 31, 1971, less the opportunity cost of \$116—the earnings foregone for 1971. In this case, the revision of expectations results from the addition, as of December 31, 1971, of one year (1974) to the horizon. See also the explanation included in the foregoing analysis.

1971. In this sense, the addition of the projections for 1974 into the DCF value for December 31, 1971 (and moving the expected net exit value one year further to December 31, 1974), constitutes, by construction, a revision of expectations by the firm's management.

The market value of the stock as of December 31, 1970 (the average January 2 quote was applied) amounted to \$17.752 million, much above the DCF value, indicating higher expectations by the market as compared to the firm's expectations.³ And, indeed, as of December 31, 1971, the market value of the stock declined to \$10.870 million, significantly closing the gap.

The researcher's time and involvement approximated 40 hours.⁴ Since the forecasts were already available, only minimal time was required on the part of the firm's personnel. It is believed that estimates of cash flows attributable to specific assets or groups of assets could be obtained at a relatively small amount of time and cost, especially if the system were to be widely and systematically applied by many firms.

As to auditing discounted cash flow statements, it should be noted that only the methods of forecasting need to be assessed and evaluated by the auditor. Auditors should clearly have no responsibility in relation to the cash flow estimates. Such cash flow estimates should reflect management's ex-

³ Note that the firm's expectations extend to only a three-year horizon. The market's horizon may be longer.

⁴ The exit values as of December 31, 1971 were already estimated by another researcher, and time to compute them is not included in this estimate.

pectations to be validated and assessed as a result of comparison with actual cash flows. The auditor's function would be restricted to expressing an opinion on the forecasting methods and whether the same methods were applied in internal and external reports. The difficulties that can be encountered in auditing predictions of future exit values are somewhat similar to those encountered in estimating present exit values; the latter are discussed in the "Exit Value" empirical paper, pages 213-228, contained in this volume.