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A RECONCILIATION OF SOME DEFINITIONS OF NET INCOME

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The Financial Accounting Standards Board distinguished an asset/liability approach to income measurement from a revenue/expense approach. It identified the revenue/expense approach with the notion of matching. Accrual accounting was contrasted with cash accounting and claimed to be consistent with either approach. The Hicksian definition of income was treated as a fundamental and completely general definition.

This article argues that there are three approaches to income measurement, not two. These are the asset/liability, the revenue/expense, and the matching approach. In other words, the revenue/expense approach should not be identified with the notion of matching. The Hicksian definition is shown to lean towards the asset/liability approach and in that sense not to be completely general. An alternative definition due to Irving Fisher is revived and demonstrated to be more closely related to the revenue/expense approach.

The Fisherian revenue/expense view is shown to be more closely related to accrual accounting. The Hicksian asset/liability view appears to relate to cash based accounting or to what is commonly referred to as economic income. In that sense, accrual accounting finds a better theoretical foundation in the revenue/expense approach than in the asset/liability approach. Finally, the link between the asset/liability and revenue/expense approaches is developed, demonstrating that the bottom line for both is identical, although the components differ.

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Accrual accounting is often presented as an alternative to what one might term economic accounting. The latter defines income after the manner of Sir John Hicks (1946) as the amount that might be consumed without impairing one's wealth, i.e., economic income is based upon a comparison of wealth at two points in time. The former defines income after the manner of Irving Fisher (1906) as the value of a flow of services.[1] This is calculated directly without reference to wealth.

An alternative formulation of the two approaches may be couched in terms of an asset/liability versus a revenue/expense approach to earnings measurement. The former defines earnings in terms of changes in assets and liabilities. The latter defines earnings in terms of revenues and expenses - without recourse to definitions of assets and liabilities.

This note seeks to reconcile the two views. It shows that under stable economic conditions the two approaches are identical if properly interpreted.[2] The apparent gulf between the two approaches is a function of technological changes causing obsolescence, unexpected inflation, and, in general, economic discontinuities and disequilibria. Which approach to choose at these points of change is probably more a matter of terminology than anything else.

<u>The Controversy</u>: The most recent analysis of the difference between the two approaches to earnings definition and measurement is to be found in the Financial Accounting Standards Board's Discussion Memorandum on a Conceptual Framework for Financial Accounting and Reporting (1976). The discussion there revolves around what the Board terms the revenue/expense view and the asset/liability view.

The asset/liability or balance sheet approach is close to what we have termed economic accounting. It defines earnings as the change in

assets and liabilities excluding capital withdrawals and contributions. In the words of the Board:

"From the perspective of the asset and liability view, revenues represent the sources of net assets in certain kinds of transactions and events during a period...Similarly, expenses represent the sacrifices of net assets in transactions and events that are expected to result in current revenues during a period...

Since assets and liabilities represent, respectively, economic resources of an enterprise and its obligations to transfer economic resources to others in the asset and liability view, earnings (revenues - expenses) for a period represent an increase in net economic resources during a period. Thus, earnings are precisely defined by definitions of assets and liabilities and changes in them without definitions of revenues and expenses."

In other words, to determine whether earnings had occurred, one should evaluate the assets and liabilities of the firm. For example, where companies self-insure themselves against catastrophes, and if assets and liabilities are measured in historical cost terms, no expense would be shown. The argument is that there has been no change in the assets and liabilities of the firm.[3]

A second example involves oil and gas accounting. A dry well, under this view, does not constitute an asset. The cost incurred in developing it should, therefore, be treated as an expense of the period. The result is, what is termed the successful efforts method of accounting, i.e., only the costs of successful exploration and development may be capitalized.[4]

In contrast to this approach, accountants have traditionally adopted a revenue/expense approach to earnings definition. This is similar,

although not identical, to what we have termed Fisherian income or accrual accounting, as generally defined. It defines earnings as the difference between revenues and expenses without recourse to definitions of assets and liabilities. It does this by a set of conventions that determine when revenue is to be realized and how costs and expenses are to be matched with this revenue. In the words of the Board:

"From the perspective of the revenue and expense view, revenues represent accomplishments of an enterprise in producing and distributing goods or rendering services during a period.[5] Similarly, expenses represent the resources used during the period to obtain current revenues... Earnings (revenues - expenses) are primarily an indicator of enterprise performance, or perhaps earning power, in the revenue and expense view and not necessarily an indicator of changes in an enterprise's economic resources and its obligations to transfer economic resources to other entities in the future."

In itself, this definition is hardly controversial. The heart of the problem and the controversy is how to match expenses or costs with revenues. Or, in other words, how does one evaluate "good" matching? The generally accepted view appears to be that firms should report, as far as possible, their "normal" or "longrun" earnings. Matching should then be done in such a way as to not to distort this figure. For example, the Board quotes Bevis (1965) to the effect that:

"There is no doubt that, given a free choice between steadiness and fluctuation in the trend of aggregate corporate profits, the economic well-being of the nation would be better served by the former. Thus, in laying the groundwork for later examination of corporate financial accounting and reporting, it is pertinent to observe here that society

will welcome any contribution that the accounting discipline can make to the avoidance of artificial fluctuations in reported yearly net incomes of corporations."

To avoid these fluctuations, proponents of the revenue/expense view are in favor of recognizing self-insurance reserves and a periodic expense to build these reserves. The effect of a catastrophe is then spread out over all the years in which the company does business. In other words, self-insurance would be treated similarly to the purchase of insurance from others.

Using the same arguments, some proponents of matching would favor the full cost method of oil and gas accounting. The costs involved in finding a dry well would be capitalized and gradually amortized over a number of years. This, it is claimed, would avoid the artificial fluctuations in earnings inherent in the successful efforts method.

The problem here, obviously, is that an equally convincing argument can be made for the successful efforts method based on matching. The costs of each well should be matched with the revenue of that well. If the well be dry, then the costs should be expensed immediately to avoid spurious matching.

It is the possibility of two completely opposing accounting methods being vigorously supported by proponents of the same theoretical view of earnings, that has led the Board to espouse the asset/liability approach. The Exposure Draft (1977) that succeeded the Discussion Memorandum has these definitions:

"Revenues are gross increases in assets or gross decreases in liabilities (or a combination of both) from delivery or producing goods, rendering services, or other earning activities of an enterprise during a period.

Expenses are gross decreases in assets or gross increases in liabilities (or a combination of both) from delivery or producing goods, rendering services, and other earning activities and from an imposition of taxes by governmental units.

Gains are increases in net assets other than from revenues or investments by owners. Losses are decreases in net assets other than from expenses or withdrawals by owners.

Earnings = Revenues - Expenses + Gains - Losses (all pertaining to the same period)."

Hicksian vs. Fisherian income: Many feel that the Board's Discussion Memorandum was unconsciously biased towards the asset/liability view. A clean, but not necessarily operational, view of the asset/liability approach was contrasted with a set of rather messy operationalizations. of the revenue/expense approach. What was lacking, and the Board admitted it, was a clean, reasonably theoretically based argument for the revenue/expense view.[6]

This note sets out to provide that. In so doing, it shifts the argument to a distinction between Hicksian income and Fisherian income. It will be seen that these are closely related to the distinction between asset/liability income and revenue/expense income. It will also become apparent that when viewed in this light the controversy outlined above almost disappears. Instead the question becomes one of how to handle uncertainty, discontinuities and disequilibria.

The Hicksian definition of income is probably the most quoted definition in the accounting literature.[7] In Sir John's words:

"The purpose of income calculations in practical affairs is to give people an indication of the amount they can consume without impoverishing

themselves. Following out this idea, it would seem that we ought to define a man's income as the maximum value which he can consume during a week, and still expect to be as well off at the end of the week as he was at the beginning."

This is commonly taken to be a general definition of income. Yet, with its emphasis on "well-offness" as the fundamental or primary estimate, it clearly leans towards the asset/liability point of view. In other words, expected income is the difference between the wealth one expects to have at the end of the week and the wealth one has at the start of the week. In symbols we have

$$NI = (q + W_1) - W_o$$

where q = cash received during the week, i.e., the cash dividend

and W = wealth ex-dividend

This is commonly re-formulated as

$$NI = q + (W_1 - W_o)$$

where $W_1 - W_o$ = capital appreciation or (if negative) capital depreciation.

Typically, this is formulated in terms of a discounted cash flow model.[8] In other words, wealth is defined as the discounted value of the future cash stream. It is this discounted <u>cash</u> flow model that the Board appears to have in mind in its insistence time and again that the users of accounting information are primarily interested in future cash flows. For instance, we read:

"Potential users of financial information most directly concerned with a particular business enterprise are generally interested in its ability to obtain the cash it needs because their decisions relate to cash flows."

And again later:

"Investors and creditors need information to help them form rational expectations about those prospective cash receipts and assess the risk that the amounts or timing of the receipts may differ from expectations." This emphasis on cash runs all the way through the Exposure Draft and appears to be closely related to the Hicksian view of income as the change in wealth, where wealth is defined as the value of future cash flows. With this as the implicit, if not always explicit, theroretical foundation, it should come as no surprise that the Board adopted the asset/liability viewpoint.

There is, however, an alternative theoretical framework and one which was developed by the American economist Irving Fisher. In his 1906 masterpiece, The Nature of Capital and Income, he claimed purely and simply that:

"A flow of services through a period of time is called income."

He reiterated this view 18 years later in The American Economic Review:

"The amount of income in a period of time is the amount of such services rendered within that period."

Patently, this definition is closer to the spirit of the revenue/expense view than the Hicksian definition. It requires no a priori definitions of "well-offness" or wealth.[9] Revenues represent services delivered. Expenses represent disservices incurred. Net income for a period is the difference in these two service streams. In other words, as claimed earlier, the Hicksian definition is not the only possibility. There is, at least, one other and one which is clearly closer to the revenue/expense view.

The Fisherian definition is also closer to accrual accounting than the Hicksian definition in that it eschews all mention of cash. The emphasis is on services, that is on revenues and not on receipts.

Similarly, the emphasis is on disservices, that is on expenses and not on expenditures. The services/disservices approach is, in fact, the fundamental of all accounting. As such, the Fisherian approach may, almost, be equated with accrual accounting.

Be that last as it may, we have indeed two classes of definitions. The first we may broadly describe as economic accounting. This is the asset/liability, Hicksian, discounted cash flow approach. The second we may broadly describe as accrual accounting.[10] This is the revenue/expense, Fisherian, services approach. The next sections show how these two approaches are interlinked.

Economic income

Net income has been defined as the amount that could be spent or consumed without impairing initial capital. To develop this definition we make use of cash quasi-rents and the notion of present value. By way of example, consider the following case where the rate of interest is assumed to be 10%.

Assume we are in possession of an apple tree whose annual harvest will bring in $150 each year for two years. Assume that the laborer's annual wage bill is $50 payable at harvest time. Finally, assume that the tree is purchased for a cost equal to its value. We then have the following schedule.[11]

	0		1		2
a			150		150
-b			-50		-50
q			100		100
v	173.60		90.90		0
d		82.70		90.90	

where v is value and d is depreciation expense.[12] The "economic" balance sheets and income statements might then appear as follows.

	0	1	2
Cash	-	100	210
FA	173.60	90.90	-
Equity	173.60	190.90	210
	Revenue	150	150
	Expenses	(50)	(50)
	Interest	-	10
	Depreciation	(82.70)	(90.90)
		17.30	19.10

Note that the cash is re-invested at 10% to give additional income of $10. Note too that the final cash in hand equals the estimated terminal amount at the start, i.e.,

$$100 \times 1.1 + 100 = 210$$

It is also equal to the cash that a 10% savings account would have yielded, i.e.,

$$173.60 \times 1.21 = 210$$

In other words, the initially estimated terminal amount becomes the finally realized terminal amount.[13]

Now, typically people buy and sell on credit and the basic assumption of this example that revenue and expense are contemporaneous at the harvest time is not met. Far more typical is an example where the harvest is sold, but payment is not received until later - a year later say. If the seller is rational, he will charge the buyer interest and the credit price will be $165. In other words, we now have the schedule.

	0		1		2
a					315
-b			-50		-50
q			-50		265
v	173.60		240.90		0
d		-67.30		240.90	

It may be easily be confirmed that the initial value is unchanged by the change in quasi-rent stream. However, the value a year later shows an increase, i.e., capital appreciation has taken place. An "economic" balance sheet and income statement might appear as follows.

	0	1	2
Cash			265
FA	173.60	240.90	
Loan		50	55
Equity	173.60	190.90	210
	Revenue	-	315
	Expenses	(50)	(50)
	Interest	-	(5)
	Depreciation	67.30	(240.90)
		17.30	19.10

Note that a loan was entered into to finance the wage bill and that interest on this was $5. The second year's balance sheet is shown immediately prior to the repayment of the loan plus interest. More importantly, note that the annual income figure has not changed. The capital appreciation on the asset has more than compensated for the payment of the wage bill and the lack of revenue. Finally, note that the terminal value is $210, as before.

Accrual accounting

There are at least two things here that probably would offend the average accountant. Firstly, revenues have been confused with receipts and expenses with expenditure. In other words, the $50 wage bill should either be deferred a year to be matched with the receipt, or the receipt

of $165 should be recognized a year earlier when the harvest was delivered. There would be no disagreement today that the amount recognized should be the present value of $150.

The second item to offend would be the capital appreciation. For decades now, we have recognized depreciation, but no appreciation. It would be unusual for a fixed asset to use an interest rate method of depreciating an asset, but given our growing familiarity with bond accounting, it is not completely unheard of. In other words, the original $82.70 and $90.90 are within the realm of GAAP, whereas the appreciation of $67.30 is most definitely not.

Using the rules of accrual accounting, i.e., revenue recognition at the time of delivery and cost matching, we have the following balance sheets and income statement for our second example. Note that we have assumed our original depreciation schedule.[14]

	0	1	2
Cash			265
Receivables		150	
FA	173.60	90.90	
Loan		50	55
Equity	173.60	190.90	210
	Revenue	150	150
	Expense	(50)	(50)
	Interest income		15
	Interest expense		(10)
	Depreciation	(82.70)	(90.90)
		17.30	19.10

Note first that annual income is unchanged, i.e., accrual accounting does not *per se* give rise to different income numbers. Note also that a receivable has been created in year one, reflecting the present value of the expected receipt of $165. Its actual receipt is used to clear the receivable and to generate interest income.

Most importantly, it will be seen that the sum of the receivables

and the depreciated fixed asset at the end of the first year is $240.90. This is the value of the asset in the corresponding economic income example. In other words, the capital appreciation of $67.30, that apparently makes the economic approach unpalatable, turns out to be an increase in receivables of $150, less the original depreciation of the fixed asset of $82.70. It appears, therefore, that far from failing to recognize appreciation, the accrual system of the accountant with its system of receivables and payables is designed to do just that.

Capital appreciation

This last point is important enough to warrant further examination. An examination of the three balance sheets reveals that the equity or net worth situation in each is identical. In other words, the accrual system is as effective as the economic system in estimating the value of the firm.

A re-examination of the last two balance sheets reveals that the only difference between them is that the accrual system splits the value of the fixed asset of $240.90 into a receivable of $150 and a fixed asset value of $90.90. In other words, the accrual system might be construed as superior to the economic system in that it provides the same information and more.

It also enables us to highlight the essence of accrual accounting. This lies in the distinction between real transactions and monetary transactions. The economic system recognizes only monetary transactions. This is not surprising since the origin of the economic model is a static one-period world where production is instantaneous and sales are contemporaneous. It would be truer, therefore, to say that the economic model is primarily concerned with situations where the real transaction and the

monetary transaction are identical. This was the case in our first example

The accountant goes a step further and distinguishes the real transaction, i.e., the delivery of goods from the monetary transaction, i.e., the payment for those goods. This is the heart of the accrual rules for recognizing a sale when goods are delivered and matching the cost of those goods and the expenses associated with the sale. These are the real events - the services and disservices.

Having done that, i.e., recognized the real events or service flow, it turns out that given our assumptions, all capital appreciation results from a lag between the occurrence of a real event and the receipt of cash. That this is so can be seen from the above numerical examples. It is a fairly trivial matter to demonstrate this analytically as is done in the Appendix. A further confirmation of this point may be found in the example that follows.

This assumes that wages are paid in cash at the start of the first year. Rationally, the firm should deduct 10% interest in doing so and show the following schedule.

	0		1		2
a					315
-b	-86.70				
v	260.30		286.30		
d		-26.00		286.30	

Again, we find a capital appreciation figure - this time of $26. The discounted future cash flow of $260.30 differs from the cost of the asset, namely, $173.60 by the amount of prepaid wages of $86.70. An economic

balance sheet and income statement would appear as follows.

	0	1	2
Cash			315
Fixed Asset	260.30	286.30	
Loan	86.70	95.40	105
Equity	173.60	190.90	210
	Receipts		315
	Expenditures		
	Interest expense	(8.70)	(9.60)
	Depreciation	26.00	(286.30)
		17.30	19.10

By contrast, a system of accrual accounts would appear as follows.

	0	1	2
Cash			315
Receivables		150	
Prepaid wages	86.70	45.40	
Fixed asset	173.60	90.90	
Loan	86.70	95.40	105
Equity	173.60	190.90	210
	Revenue	150	150
	Expense	(41.30)	(45.40)
	Interest expense	(8.70)	(4.60)
	Interest income		15
	Depreciation	(82.70)	(90.90)
		17.30	19.10

As before, several things are worth noting. Firstly, it is apparent that the initial economic value of $260.30 is the cost of the fixed asset of $173.60, plus the value of the monetary asset, prepaid wages, of $86.70. Secondly, the appreciation of $26 consists of fixed asset depreciation of $82.70, less the increase in the monetary asset, accounts receivable, of $150, plus the decrease in the monetary asset, prepaid wages, of $41.30. Thus, the capital appreciation in the economic system is recognized in the accrual system as the net increase in monetary assets.

From all of this, a rule begins to emerge for the calculation of capital appreciation. But first, we need to define and distinguish cash

based depreciation or appreciation and services based depreciation. The first defines an asset in terms of future cash flows. Discounting these gives the value of the asset at any point in time. The difference between any two values is the depreciation or appreciation that has occurred. For example, with the cash flow stream (0, 315) the value at the start was $260.30 and the value a year later was $286.30, yielding appreciation of $26.00.

Services based depreciation, on the other hand, defines an asset in terms of the value of future service flows. Regardless of the cash pattern, this was in all our examples (100, 100). The services based value was $173.60 at the start and $90.90 a year later yielding a services based depreciation of $82.90. Under our assumptions, this will always be positive, i.e., services based appreciation will not occur.[15]

The rules that now emerge are three in number and simple in form. They serve to establish the link between the asset/liability or economic approach and the revenue/expense or accrual approach. They are simply:

I: Economic depreciation is based on the pattern of future cash flows. It may be positive or negative, i.e., economic appreciation is possible.

II: Accrual depreciation is based on the pattern of future service flows. In general, this will always be positive.

III: Economic depreciation equals accrual depreciation less the increase in net monetary assets, such as accounts receivable, plus the increase in net monetary liabilities, such as accounts payable.

<u>Income - economic and accrual</u>: With this result in hand, it is simple to establish the link between economic and accrual income. The two are identical in total, as we have already demonstrated. They differ only in presentation. For instance, the first year's income statements in our

second and third examples read:

	Accrual	Economic	Economic
Revenue/receipts	150		
Expense/expenditure	(50)	(50)	(8.70)
Depreciation/appreciation	(82.70)	67.30	26.00
	17.30	17.30	17.30

It is apparent that the economic income statement recognizes only cash flows, i.e., receipts and expenditures and adjusts for the balance in a cash based depreciation account. On the other hand, accrual accounting is based on the flow of services, independently of the flow of cash. To be consistent, depreciation is based on the flow of services. When this is done, the two methods yield the identical net income figures. Restating this more formally, we have:

Economic net income = Receipts - Expenditures - Cash based depreciation (or appreciation)

Accrual net income = Revenue - Expenses - Services based depreciation

The net income figure is in each case the same. The net value of services is balanced by the services based depreciation figure, while the net cash flow is balanced by the cash based depreciation figure.

Given that the two approaches yield the same bottom line, it would seem that much of the debate on income alternatives really revolves around how the components are to be presented. If, for instance, accounts receivable are to be recognized, the related capital appreciation must be excluded from the value of other assets. If accounts receivable are not to be recognized, then capital appreciation must be included with the value of other assets.

Problems arise only when people are unwilling to follow either approach through to its logical conclusion. For example, the current practice of recognizing cash dividends or investments as income, but not the price changes, is wholly illogical. On the other hand, the use of the effective

rate method for bond accounting is clear recognition that the cash coupon is not the relevant expense.

It should be noted that this last can be justified in two ways. The asset/liability view would calculate the value of the bond at the start and end of a period to deduce the interest income or expense of that period. The revenue/expense view would start with the coupon payment or receipt and deduce the depreciation to arrive at the interest income or expense. The net figure either way is identical.

Given that they do produce the same net income figure, it should be possible to arrive at the same conclusions on issues such as self-insurance and oil and gas accounting. And indeed, one does. In the case of self-insurance, there is neither a flow of services out of the firm nor a flow of services into the firm. Self-insurance expense should not, therefore, be recognized. By the same token, a dry well involves a flow of disservices in the period in which it is being drilled, but no concomitant flow of services into the firm. The net result is for the income statement to reflect the successful efforts method.

It should be noted that the Fisherian, or services, approach to income does not use the term matching. Fisher himself rejected the notion of matching explicitly, since even in his day many, apparently, wanted a smooth earnings stream to be reported. In other words, we have in reality three approaches to income - the asset/liability, the revenue/expense, and the "matching" approaches. The first two yield identical bottom lines. It is the last which is different.

Stating this last another way, it was really irrelevant whether the Board chose an asset/liability or a revenue/expense viewpoint. It may be argued that the latter is much more closely related to accrual accounting and to the Board's ultimate goal. It may also be argued that the Board

has overstressed cash flows and failed to develop a solid foundation for service flow measurement. However, the important thing is that the Board has rejected, and explicitly rejected, the notion of matching. To quote them in a footnote:

"The process described in this paragraph is commonly known as the 'matching of costs and revenues'... Since the term 'matching' has a variety of related meanings, it is not used in this Statement."

Unfortunately, it appears that the baby has been thrown out with the bathwater. The Board, perhaps understandably, seems to have equated the revenue/expense or Fisherian approach with the notion of matching, particularly "smoothed" matching. The two are not identical as we have seen. The true services view leads to an income figure which fluctuates precisely to the same degree as does the asset/liability based income figure.

The misfortune is that the Board has rejected the approach that is, in fact, most closely linked to accrual accounting which they continue to espouse. This has been stressed several times and should be readily apparent from the two definitions above - the one using receipts and expenditures, the other using revenues and expenses. It is equally apparent from the Board's own definition of periodic earnings measurement as "a process of relating to periods the benefits from and the sacrifices for earning activities" which is virtually identical to the Fisherian services flow definition. The Board, however, has to introduce it as a sequitur to cash flows - it is actually a non-sequitur - and has, by its rejection of the appropriate theory, no sound foundation for its introduction.

A recognition that accrual accounting, the revenue/expense approach, properly defined, and Fisher's definition of net income, are intimately related would enable the Board to put the Objectives of Financial Reporting on a sound footing. And a recognition that the revenue/expense and

asset/liability view yield identical income numbers, under the assumption made here, would highlight the fact that it is smoothing that the Board really rejects.

Conclusion: The Financial Accounting Standards Board described two approaches to income definition - an asset/liability and a revenue/expense approach. It contrasted these as opposing methods and decided to adopt the former.

This note has argued several things. Firstly, it has demonstrated that the two approaches lead to identical income numbers. A choice based on the bottom-line is irrelevant. Secondly, it has suggested that the Board has mistaken a theoretically sound revenue/expense approach for the operational view that earnings should be smoothed by a process of matching revenues with expenses. Both Hicksians and Fisherians would reject the third alternative. Thirdly, it has suggested that the Board, in mistaking the revenue/expense approach for the matching approach, has adopted the less desirable asset/liability view as its underpinning. The revenue/expense approach, properly defined, would almost certainly yield a more sound foundation for accounting practice.

Appendix:

Assume a world of stable prices, certainty and equilibrium such that the market rate of interest is equal to the internal rate of return on all assets. Alternatively, assume that prices equal discounted cash flows. Let r be the rate of interest and $v = (1 + r)^{-1}$. Assume further that the stream of benefits generated by the asset is a constant denoted $q = \alpha_j - \beta_j$. Distinguish further between benefits and cash. The former is the present value of the service rendered by the asset less the present value of the disservices incurred. The latter is the cash received or paid denoted $a_i - b_i$. Allow first that the benefits and cash flow are contemporaneous, i.e.,

$$p_o = \sum_{i=1}^{n} (a_i - b_i) v^i$$

$$= \sum_{j=1}^{n} (\alpha_j - \beta_j) v^j \qquad \ldots (1)$$

Given that $p_1 = \sum_{i=2}^{n} (a_i - b_i) v^{i-1}$

$$= \sum_{j=2}^{n} (\alpha_j - \beta_j) v^{j-1} \qquad \ldots (2)$$

it is simple to demonstrate that net income defined as

$$NI_1 = (a_1 - b_1) + (p_1 - p_o) = (\alpha_1 - \beta_1) + (p_1 - p_o)$$

$$= rp_o \qquad \ldots (3)$$

and that depreciation is defined as

$$d_1 = p_o - p_1$$

$$= (a_1 - b_1) - rp_o$$

$$= (\alpha_1 - \beta_1) - rp_o$$

The flow of benefits is assumed to be a fixed given. The flow of cash can, however, be freely altered. Assume, for instance, that both the payment of a_1 and the receipt of b_1 are deferred (m - 1) periods. The

cash flow is then

$$0;\ a_2 - b_2;\ \ldots;\ a_{m-1} + a_1 v^{-m+1} - b_{m-1} - b_1 v^{-m+1};\ \ldots;\ a_n - b_n$$

Clearly, this has no effect on the initial value p_o. It does, however, affect the value a year later since

$$p_1^1 = \sum_{j=2}^{n} (a_j^1 - b_j^1) v^{j-1}$$

$$= (a_2 - b_2)v + (a_3 - b_3)v^2 + \ldots + [a_{m-1} + a_1 v^{-m+1} - b_{m-1} - \ldots b_1 v^{-m+1}]v^{m-1} + \ldots + (a_n - b_n)v^{n-1}$$

$$= p_1 + (a_1 - b_1)$$

Thus, depreciation is

$$d_1^1 = p_o - p_1^1$$

$$= d_1 - (a_1 - b_1)$$

whilst net income is

$$NI_1^1 = (p_1^1 - p_o)$$

$$= (a_1 - b_1) + (p_1 - p_o)$$

$$= NI_1$$

These results are simple to interpret. The net income under the deferred cash system is identical to that under the cash on delivery system. It is, however, made up differently, i.e.,

$$\text{Net Income} = \text{Net cash receipts} - \text{depreciation}$$

$$= (a_1 - b_1) - [(a_1 - b_1) - rp_o]$$

$$= 0 \qquad - [(a_1 - b_1) - rp_o - (a_1 - b_1)]$$

$$= rp_o$$

The economic depreciation figure, actually appreciation in this case, differs from the accrual depreciation figure by an amount of $(a_1 - b_1)$ which is the net receivable recognized in the accrual system.

Finally, it should be noted that accrual depreciation will occur whenever $(\alpha_i - \beta_i)$ exceeds rp_{i-1}. But by assumption $(\alpha_i - \beta_i)$ is a constant q so that the condition reduces to $q > rq \sum_{i=1}^{t} v^i$ for all t. Equivalently, $r \sum_{i=1}^{t} v^i < 1$ for all t , or $(1 - v^t) < 1$. This is patently true. Thus, with constant benefits only depreciation can occur.

Footnotes:

1. It is common to refer to a flow of goods and services. However, goods are themselves services so that the expression is redundant.

2. The basic assumption made here is that the flow of services is constant over time. Inflation, obsolescence and disequilibria are ignored.

3. On a historical cost basis, this is irrefutable. However, on a value basis, this is not necessarily true - it requires assumptions like independent risks. One might also claim that what was saved was a windfall gain and that, therefore, an expense did indeed occur.

4. The fact that the FASB adopted the successful efforts method has been taken as an indication that the Board has already opted for the asset/liability approach to income.

5. See the comments in Footnote 1 above on the redundancy of this formulation.

6. The Board, of course, equated the revenue/expense view with matching and in the view of this author was actually complaining about the lack of theoretical substance in the notion of matching.

7. Alexander (1950) restated this as "...the amount the corporation can distribute to the owners of equity in the corporation and be as well off at the end of the year as at the beginning."

8. As stated, this is typical, though, of course, not essential. Examples include Bruns (1971) and Jaedicke and Sprouse (1965). The appendix follows this tradition.

9. Fisher distinguishes between actual income and ideal or standard income. The latter does require a definition of wealth. The former does not. For more details, see Van Breda (1978).

10. This is a mite unfair to proponents of the asset/liability approach who would maintain that accrual accounting flows from the asset/liability view. If, however, one associates this view with its usual formulation in terms of discounted cash flows, the distinction is a proper one.

11. Note that here, as elsewhere, we have assumed perfect markets, certainty and uniform service flows. Relaxing these conditions introduces technical problems but does not affect the substance of the issue being addressed.

12. The formulae used here are $NI = rv$ and $d = q - rv$ where r is the interest rate and v is the asset value at the start of the year.

13. This relation was developed by Edwards and Bell (1967).

14. The reason for this is apparent later where we distinguish between services based and cash based depreciation.

15. This is proved in the appendix. A sufficient condition is a uniform services flow.

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