

Clean Surplus Accounting Models and Market-based Accounting Research: A Review

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Abstract—This paper reviews recent attempts to provide a rigorous theoretical basis for market-based accounting research based on the pioneering ideas of Ohlson. We argue that the Ohlson development can best be understood as an attempt to restate economic theories of income measurement in the light of advances in the economics of asset pricing under uncertainty. We contrast the Ohlson approach with other economic theories of financial reporting, and conclude that, while the Ohlson approach has made a significant contribution to understanding the theoretical basis of market-based accounting research, it remains to be seen whether the method can be extended beyond the simple linear models that have so far been developed.

1. Introduction

This paper reviews recent attempts to provide a rigorous theoretical basis for market-based accounting research based on the pioneering ideas of Ohlson (1989b, 1990 and 1995) and Feltham and Ohlson (1993 and 1995). In a recent appreciation of this work, Bernard (1995) asserts that the studies 'stand among the most important developments in capital markets research in the last several years'.

This paper, while not seeking to reverse Bernard's positive assessment, will attempt to position recent developments in clean surplus accounting models in a broader context. It is hoped that this will enable the reader to better appreciate the limitations of the approach as well as its considerable strengths. Section 2 explains the relation of Ohlson's work to other attempts to provide a theoretical foundation for financial accounting based on neo-classical economics. We argue that the Ohlson development can best be understood as an

attempt to restate economic theories of income measurement in the light of advances in the economics of asset pricing under uncertainty.

We also argue that the Ohlson development has important implications for market-based accounting research. As background for explaining these implications, Section 3 outlines a number of criticisms that have been levelled at market-based accounting research. This allows the reader to gain an appreciation of the specific limitations of market-based research that the Ohlson framework addresses. Sections 4 and 5 introduce the fundamental general features of clean surplus models and explain some of the potential advantages that may accrue from working within a clean surplus framework. Section 6 illustrates the central role of the information dynamics assumptions in constructing empirically-testable propositions from the general clean surplus framework. Section 7 identifies the advantages of the Ohlson approach that, at the time of writing, seem to be generally accepted. Section 8 discusses a more controversial claim for the approach. Section 9 outlines some potential limitations of the approach.

2. Economics-based approaches to financial reporting

Many of the earliest attempts to provide a theoretical framework for financial accounting based on economics were motivated by the idea that accounting income measures might be interpreted as objectively measurable proxies for the unobservable economic income concepts established by Fisher (1906) and, in particular, Hicks (1946).

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Whittington (1981) provides a useful review of the state of this literature in 1979.¹

For present purposes, one of the most interesting points he makes is the observation that, following the influential contributions of Solomons (1961) and Edwards and Bell (1961), the literature divided into two reasonably distinguishable strands. One strand continued to pursue the notion of accounting income serving as a practicable proxy for economic income. The other strand abandoned the notion of income as a fundamental measure and concentrated on the construction of practicable techniques that satisfied users' perceived needs, irrespective of their properties as fundamental measures of economic income. The first strand, which we refer to as the fundamental measurement approach to accounting, had, so far as the leading academic accounting journals are concerned, run into the sands at the time of Whittington's review. The work of Solomons (1961) heralded this decline, and the subsequent influential contributions of Barton (1974) and Beaver and Demski (1979) seriously questioned the logical validity of attempts to explain accounting income as a fundamental measure.

For present purposes this is an important point, because the work of Ohlson and his co-authors represents an attempt to move accounting theory back in the direction of the fundamental measurement perspective. We will therefore need to consider below whether this attempt offers anything new as a counter to the criticisms that caused the fundamental income measurement approach to lose its influence over academic accounting around 20 years ago.

A second, economics-based, approach to financial reporting began to emerge in the late 1960s following the publication of Ball and Brown (1968). This paper is generally acknowledged as the seminal work that spawned a whole generation of empirical research concerned with modelling the effects of financial reporting on capital markets in general and stock markets in particular. This research is generically referred to as market-based accounting research (MBAR for short).

A number of scholars have reflected on the reasons for the emergence of MBAR. Some of the key influences were:—

1. The emergence of positive economics in the US as the dominant research paradigm, and the need felt by American accounting scholars to gain academic respectability for their work. In particular, the influence of positivist ideas led to a questioning of the scientific integrity of income measurement theorists who sought to justify their preferred positions axiomatically with
2. The early success of research by financial economists on the informational efficiency of capital markets, enlivened by access to novel computer-based share price databases and econometric packages.
3. A growing recognition within accounting of the need for a more sophisticated understanding of the needs of users of accounting information.

In fact these three influences gave rise to two new economics-based approaches to financial reporting. On the one hand there was MBAR, which was positive in approach and which sought to test empirical propositions about accounting using real world share price and accounting data. On the other, there emerged a body of abstract theoretical research based on advanced mathematical economics. I refer to this second body of work as the information economics approach (see Walker, 1988).

During the first decade or so of the new economics of accounting, the fact that some scholars were producing empirical results from a weak theoretical base, while others were busy generating abstract theories remote from empirical testing, seemed reasonable for a newly developing line of inquiry. The hope was that, in the course of time, the two approaches would converge as MBAR became theoretically more sophisticated, and as the mathematical models reached a stage where mathematical propositions could be cast into empirically-testable form. Unfortunately, this convergence of the two approaches has not occurred. Moreover, the failure to converge is but symptomatic of a rift within economics between econometrics and mathematical economics (see Kreps, 1990:7).

I have reviewed elsewhere some of the problems involved in applying information economics to accounting (see Walker 1988, 1989). There are major questions about the empirical testability of such ideas (Walker, 1989), but for the present purposes the most serious problem with the information economics approach is the lack of a defensible mapping from the way information economists represent information (in terms of partitions defined over exogenously specified states of the world) and basic accounting concepts such as the balance sheet and the income statement (Walker, 1988). In particular, neo-classical economics has failed to develop a theory of income measurement in which there is an endogenous demand for some form of income measurement (see Beaver and Demski, 1979).

In the late 1970s, a third body of work emerged that sought to combine the empirical methods of positive economics with the insights of the property rights view of agency theory. This work,

¹ For an overview of economic theories of financial reporting see Bromwich (1992).

which I refer to as positive accounting theory (PAT for short), complemented developments in market-based accounting research by focusing on supply side influences on the market for corporate financial information.² This literature provides theoretical explanations, based on the costs of writing and enforcing contracts, of why heterogeneous accounting methods might arise naturally in economic equilibrium. It also provides evidence that the accounting choices made by corporate managers are broadly consistent with the costly contracting framework. Watts and Zimmerman (1986, 1990) review this work.

To summarise, during the late 1960s and throughout the 1970s many accounting academics, especially in the US, advocated neo-classical economics as a theoretical foundation for accounting. Three major bodies of work later became established, MBAR, information economics, and positive accounting theory. A common feature of these new approaches was a rejection of income measurement perspectives on financial reporting. In the following sections we argue that the Ohlson framework is best understood as an attempt to combine traditional notions of income measurement with advances in the economic theory of capital asset pricing. In assessing the potential fruitfulness of the Ohlson approach one needs to consider, in addition to the improved model specifications it may yield for market-based research, the extent to which the approach limits the potential for introducing the insights of information economics and PAT into a general model of financial accounting.

3. Limitations of market-based accounting research

Market-based accounting research has been the subject of attack on a number of levels.³

1. Questioning the methodological foundations of MBAR

It has been argued that the methodologies of the natural sciences are not appropriate to a subject like accounting (see, for example, Tinker et al., 1982; Whitley, 1988).

2. Questioning the theoretical foundations of MBAR

A number of philosophers and social scientists outside economics question the possibility of getting useful insights on a complex subject like ac-

counting from a theoretical approach that is based on highly unrealistic assumptions about human behaviour. In particular, many scholars have questioned the applicability of the strong rationality postulates of neo-classical economics in the context of accounting. The fundamental issue raised by this line of criticism is, if accounting is supposed to help people cope with complexity, then why base a theory of accounting on an assumption that people are perfectly rational?

3. Questioning econometric-based approaches to empirical research

Within the discipline of economics, opinion is divided on the usefulness of econometric studies as a basis for testing economic theory. This is especially so in the area of game theory and information economics, where many theorists in the field would seriously question the possibility of using econometrics to test their ideas. Laboratory studies and case studies tend to be viewed more favourably by such theorists (see Kreps, 1990, chapter 15).

4. Questioning the empirical performance of MBAR

The first two criticisms are criticisms from outside the discipline of market-based research. The critics do not like the rules of the game, and some believe it is a silly game to play. More recently, a number of skilled market-based researchers have questioned the success of MBAR even within the rules of the MBAR game. A paper by Lev (1989) was particularly devastating in this regard in pointing out that the goodness of fit achieved by attempts to model the relation between unexpected earnings and stock returns was consistently very poor by the usual standards of the econometrics. The Lev critique was influential in forcing market-based researchers to concentrate their efforts on discovering the reasons behind the poor performance of MBAR models. Possible reasons include:

i) Poor specification of the empirical model and/or poor research design, i.e. the researchers are in error.

ii) Firms may be faithfully applying GAAP, but the resultant earnings are anticipated by the market with access to superior information, i.e. the results follow from the nature of GAAP.

iii) Reported earnings may be unreliable indicators of firm performance because of widespread and deliberate misapplication of GAAP, i.e. the preparers and auditors are in error.

iv) Firms may be faithfully applying GAAP, but the market fails to respond rationally to the information, i.e. the stock market is informationally inefficient.

² This paper is not the first to stress the distinctions between MBAR and PAT. Mattessich (1995, chapter 9) also makes this distinction and provides further explanation of its importance in understanding the development of accounting thought.

³ Mattessich (1995) presents a useful summary of the philosophical criticisms of MBAR.

Note that these four explanations are not mutually exclusive; all four explanations could be partially correct.

5. Questioning the policy relevance of MBAR

One way of assessing the value of a body of research is to consider the usefulness of the findings of such research for policy makers. MBAR has been attacked in a number of quarters for its apparent failure to deliver policy-relevant results, though some of these criticisms may reflect more on the ignorance of policy makers about what empirical research can achieve rather than any failure of MBAR. In assessing its usefulness, the following points should be considered:

i) MBAR seeks to provide positive empirical evidence about how the world works. It cannot deliver direct policy advice because you can never derive a normative proposition from positive observation alone. Someone needs to specify what the objectives are; then MBAR may be able to help in advising how to achieve those objectives.

ii) MBAR has provided evidence that the stock market is quite sophisticated in its response to accounting information. The idea that the entire market responds to accounting numbers naïvely has been firmly rejected. However, there is still disagreement about the degree to which the market is fooled by creative accounting.

iii) MBAR has provided overwhelming evidence that the market responds to earnings information in a manner broadly consistent with the view that such information is useful for predicting future cash flows, i.e. earnings have predictive value. If policy makers care about the uses to which accounting is put, then the predictive value of earnings is one of the factors they should consider.

iv) MBAR is severely limited in its domain of application. It focuses exclusively on the predictive value of accounting information for investors in quoted companies. MBAR has little to say about other (e.g. stewardship) uses of accounting, and largely ignores the needs of other users apart from investors. Its relevance for unquoted firms is severely limited, though some have tried to apply valuation models based on small quoted companies to value small unquoted companies.

v) Public policy makers are not the only potential end users of MBAR. Companies like to know what factors drive their share price, and investment analysts and private investors are also interested in how the market responds to accounting information in general, and earnings in particular. Witness, for example, the recent explosion of interest in shareholder value analysis.

vi) It is difficult to address issues of traditional concern to accounting policy makers within the standard market-based empirical framework. Issues such as current cost accounting versus his-

torical cost accounting, accounting for goodwill, and accounting for R&D, are traditionally discussed within an income measurement framework. The theoretical starting point of MBAR was a rejection of the ideas of income measurement theorists in favour of an information perspective that seeks to treat earnings as simply one signal among a large number of other possible signals about future cash flows.

In understanding the contribution of Ohlson's work it is helpful to consider which of the above five forms of criticism is addressed by his theoretical framework. We argue below that the Ohlson framework can be viewed as an attempt to improve market-based accounting research by combining modern economic theories of rational capital markets with economic theories of income measurement. Thus the new framework does not address any of the first three forms of criticism. Hence the importance of the contribution needs to be judged by its potential to improve the empirical performance of MBAR models, and by its potential to increase the policy relevance of capital markets-based accounting research.

4. MBAR with measurement: motivating the Ohlson approach

4.1. Back to Basics

In many fields of scientific endeavour it is sometimes necessary to take two steps backwards before further progress is possible. The essential message of Ohlson's recent work is the need to return MBAR to basics. Ohlson argues that the abandonment of income measurement theory in the late 1960s was a fundamental error in the development of accounting research in general and in MBAR in particular. He advocates a new approach to market-based research that seeks to combine a measurement perspective with notions of arbitrage-free and informationally-efficient markets. This approach involves the following basic steps in theory construction:

1. Specify an accounting technology that translates economic events into accounting numbers.
2. Assuming informationally-efficient markets, specify a valuation model that translates economic events into stock market valuations.
3. From 1 and 2, derive the implied relation between accounting numbers and stock market valuation.

Empirical work within this framework focuses on deriving and testing aspects of the implied relation 3. For illustrative purposes, let us suppose that relation 3 can be expressed as follows:

$$p_{it} = F(x_{it}, u_{it}; \theta_{it}).$$

Where p is the stock market price per share, $F(\dots)$ is a function of a vector of observable ac-

counting numbers, x , a vector of unobservable variables, u , and a vector of parameters, θ . The subscripts i and t stand for firm i and time period t . The purpose of the theoretical analysis is to produce a restricted form of $F(\dots)$ which offers some prospect of being empirically testable, i.e. which gives rise to at least one empirically-testable proposition. Examples of the kinds of proposition that might emerge from applications of this approach would be:

i) Identification of key accounting numbers likely to be most closely associated with market prices, e.g. 'market price depends principally on current earnings per share and book value per share'.

ii) Propositions about the functional form of F , e.g. ' F is linear in earnings and book value'.

iii) Propositions about how the estimated values of the model parameters might vary over time.

iv) Propositions about how the estimated values of the model parameters might be expected to vary across different types of firm.

Notice that all such propositions are joint hypotheses, in the sense that they depend for their validity on both step 1 and step 2 of the analysis. In particular, since step 2 relies on the assumption of informationally-efficient markets, it follows that any negative empirical evidence could be due either to some flaw in the representation of the accounting technology, or due to some type of informational inefficiency.

4.1.1. Early Examples

In a somewhat neglected paper, Easton (1985) examined the explanatory value of current earnings and current dividends for a proxy for the present value of future dividends. He found a significant positive association between current earnings and future dividends, and (controlling for current earnings) a negative association between current dividends and the present value of future dividends. Anticipating the subsequent work of Ohlson, he wrote:

'These results are consistent with the notion that accounting earnings reflect the dividend-paying ability of the firm and that these earnings may be either paid in the current period or reinvested' (p.75).

An early example of the 'MBAR with measurement' approach was the paper by Board and Walker (1990) which, in working paper form, predated Ohlson's work. Board and Walker used the empirical methods of MBAR to test one of the basic insights of income measurement theory, i.e. that historical cost accounting is likely to be less informative in economies where the rate of inflation is high and uncertain. If this insight is correct, and if the market knows this, then one expects to

see the market placing less reliance on historical cost earnings during periods of high inflation. Board and Walker tested this idea and found statistically significant results in support of their theory.

Another paper that anticipated the Ohlson approach was the paper by Kormendi and Lipe (1987). They noticed quite marked cross-firm differences in the time-series properties of reported earnings. Some firms had earnings numbers that evolved in a random walk-like manner, but other firms had earnings numbers that seemed highly transitory. Kormendi and Lipe predicted that the relation between stock market returns and a measure of unexpected earnings would be more pronounced for firms with random walk-like earnings than it would be for other firms. This prediction was strongly supported by their empirical evidence.

5. Clean surplus accounting and company valuation

Models within the general Feltham/Ohlson tradition have come to be recognised by two key features, i.e. the clean surplus accounting model, and linear information dynamics. Of these two features, the clean surplus valuation model is the most fundamental. When implementing the clean surplus valuation model it is necessary to make specific assumptions about how information evolves over time, but such assumptions can be made in a variety of ways. Moreover, while the assumption of linear information dynamics will typically make the clean surplus model easier to solve, we will see that there are a number of reasons to expect real world information dynamics to be non-linear.

The purpose of this section is to introduce the general clean surplus valuation model without making any specific assumptions about the information dynamics. The following section introduces three special cases of the general model, which all assume some form of linear information dynamics. The final section of this review outlines some of the reasons why the assumption of linear information dynamics may prove to be too restrictive.

The clean surplus valuation model is based on two main assumptions, described in the following two sub-sections.

5.1. Clean Surplus Accounting

The following accounting identity is assumed to hold:

$$y_t \equiv y_{t-1} + x_t - d_t \quad (1)$$

where y_t = book value at the end of period t ;

x_t = earnings in period t ;

d_t = dividends (net of capital contributions) paid at the end of period t with the initial condition $y_0 = -d_0$.

5.2. Present Value Valuation

$$p_t = \sum_{\tau=1}^{\infty} R_F^{-\tau} E_t(d_{t+\tau}) \quad (2)$$

where $R_F \equiv$ one plus the risk-free rate of interest.

In words, this equation states that the firm's ex-div market value at time t is equal to the present value of expected future dividends. Following Ohlson, we assume a risk-neutral economy and discount future dividends using the risk-free rate.⁴

From (1) and (2) one can derive the following basic implication:

$$p_t = y_t + \sum_{\tau=1}^{\infty} R_F^{-\tau} E_t[x_{t+\tau} - (R_F - 1)y_{t+\tau-1}] \quad (3)$$

The only assumptions required for (3) are clean surplus accounting and the dividend valuation model. Equation (3) states that the value of the firm will be equal to the book value of the firm plus the sum of the discounted abnormal earnings that the firm is expected to generate over its lifetime. Abnormal earnings are defined as the difference between earnings and opening book value, times the required rate of return. In management accounting, abnormal earnings is referred to as residual income.⁵

Bernard (1995) argues that one of the principal advantages of the clean surplus model stems from its performance in finite horizon approximations. Note that both equations (2) and (3) require forecasts out to infinity. How well do the models perform when they are truncated at some finite point? Bernard shows that (3) works much better when fitted to value line forecasts than (2). Specifically (3) explains 68% of cross-sectional variation in share price compared with 29% for model (2). This improvement in the statistical fit of (3) over (2) arises essentially because truncation of the dividend stream in (2) leaves out a large part of the value stream, since no estimate of the capital stock is incorporated to pick up the missing future dividends. In contrast, the truncated residual income series contains an embedded closing capital stock.⁶

The problem with Bernard's argument is that it does not provide any explanation as to why the

US accounting technology and economic environment leads to this result. Equation (3) holds for any set of earnings numbers that cause (3) to converge. In particular, equation (2) is a special case of (3), with book value defined to be equal to zero for all t . Thus there must be something special about reported earnings and book values to cause such impressive improvements in explanatory performance.

The key to understanding why accounting book values might yield superior explanatory performance turns on the fact that reported book values reflect the rational investment choices of firms, and assessments by the firm (and its accountants) of capital expenditures that can be booked as assets. A fundamental feature of accruals-based accounting is that it classifies expenditures into revenue and capital. To the extent that the discounted present value of the expected future net cash flows generated by current capital expenditures are greater than or equal to the amount currently booked as 'capital expenditure', a truncated equation (3) based on earnings and book values will tend to produce a better statistical fit than the truncated dividend series. Note, though, that this superiority arises because the currently booked capital expenditures have positive net present value.

In other words, accounting numbers provide a better association with market values because, somehow, managers have been motivated to adopt investments with value. This point is important in evaluating the usefulness of the Ohlson framework relative to other frameworks that attempt to demonstrate an endogenous rationale for accruals-based financial reporting.

The Ohlson framework, in its current form, relies on an implicit assumption that managers' investment decisions are properly motivated. Other frameworks would question the legitimacy of assuming that managerial behaviour is determined independently of how the firm is accounted for. For example, advocates of an agency view of accounting would seek to model earnings as a measure of performance designed to induce appropriate managerial behaviour.

6. Clean surplus models with linear information dynamics

We have seen that (3) holds for any sequence of numbers that satisfy the clean surplus relation and for which the discounted sum of expected abnormal earnings converges. To convert (3) into testable hypotheses about the relation between share prices and accounting values, we need to introduce more structure into the model that specifies a link between observable variables and expected abnormal earnings. We also need to find some reasonable way of truncating the infinite sum at some finite time horizon.

⁴ For applied purposes the normal practice is to replace the risk-free rate with the required rate of return on equity.

⁵ Preinrich (1938) is generally credited with the first formal exposition of the model. The idea was further developed in Edwards and Bell (1961) and Peasnell (1982).

⁶ I am grateful to Ken Peasnell for clarifying this point. For further elucidation the reader should consult Peasnell (1982), especially p.364 (equation 5).

We refer to this additional structure as the information dynamics of the model. We illustrate the notion of information dynamics with three examples.

6.1. Example 1: A Random Walk Model for Earnings

Assume:

1. Earnings follow a random walk;
2. All earnings are distributed;
3. The market observes no information, other than accounting earnings, book value and net dividends.

This simple model underlies much of the MBAR literature (see Ball and Brown, 1968; Kothari, 1992; Kothari and Sloan, 1992; and Kothari and Zimmerman, 1993). If these assumptions hold, equation (3) implies the following valuation relation:

$$p_t = \frac{1}{(R_F - 1)} x_t \tag{4}$$

Given the assumptions of the random walk model, ex-div price is one over the cost of capital times earnings.

Implicit in this model are two other assumptions that do not generally hold. First, because dividends are restricted to equal earnings, the possibility of dividends providing information over and above earnings and book values is ruled out a priori. In other words, dividend signalling is impossible in this context. Second, since the random walk assumption implies that future earnings changes are unpredictable, the model implicitly rules out conservative accounting.

6.2. Example 2: Ohlson's Unbiased Accounting Model

The model developed in Ohlson (1995) assumes that abnormal earnings evolve as a simple autoregressive process:

$$\tilde{x}_{t+1}^a = \omega \tilde{x}_t^a + \tilde{v}_t + \tilde{\varepsilon}_{1,t+1} \tag{5}$$

$$\tilde{v}_{t+1} = \gamma \tilde{v}_t + \tilde{\varepsilon}_{2,t+1} \tag{6}$$

In this model, v_t represents information that is observed at the end of period t , and which is useful for predicting abnormal earnings for years $t+1$ onwards. The model also assumes that v_t is unrelated to current earnings and dividends. The two disturbance terms in (5) and (6) are assumed to be mean zero and serially uncorrelated, though they may be contemporaneously cross-related.

The random walk model of earnings is a special case of this model in which ω equals one, all earnings are distributed, and where γ and the variance of ε_{2t} both equal zero.

This model introduces two new ideas. The first is the notion of information that is observed by the market before it affects reported earnings. This is captured by the term v_t that is observed in period t but does not affect earnings until $t+1$. The second is the notion that abnormal earnings may converge to zero over time. Specifically, if one assumes that both ω and γ are less than one, abnormal earnings will converge to zero, which in turn implies that book values and market values will converge.

Ohlson (1995) shows that his model implies the following exact valuation relation:-

$$\tilde{p}_t = k(\varphi \tilde{x}_t - \tilde{d}_t) + (1 - k) \tilde{y}_t + a_2 \tilde{v}_t \tag{7}$$

where

r is the risk-free rate of interest

$$k = r \omega / (1 + r - \omega)$$

and

$$\varphi = (1 + r) / r$$

The value of the firm in general can be represented as a weighted sum of two accounting-based valuations plus the additional value implied by the information that is known about future earnings but is not yet reflected in earnings or book values. The first accounting valuation, which is weighted by k , is just a multiple of current earnings less the current dividend. The second accounting valuation, which is weighted by one minus k , is simply the book value of the firm. In the extreme case where k equals 1 (and $\omega = 1$) the formula places all the weight on the earnings-based valuation of the firm. In the opposite extreme case where k equals zero (and $\omega = 0$), all the weight is placed on the book valuation of the firm.

Equation (7) can also be equivalently expressed in terms of the abnormal earnings construct. We get:

$$p_t = \alpha_1 x_t^a + y_t + \alpha_2 v_t \tag{8}$$

where

$$\alpha_1 = \omega / (R_F - \omega),$$

and

$$\alpha_2 = R_F / (R_F - \omega) (R_F - \gamma)$$

In addition to deriving the closed form valuation formula, (7) (or equivalently (8)), Ohlson showed that his model implies the following important relationships between dividends and future earnings, and dividends and company value⁷:

⁷ These additional properties require two further assumptions in addition to those of the basic clean surplus model. These are: $\partial y / \partial d_t = -1$, and $\partial x_t / \partial d_t = 0$. In words these say that, ceteris paribus, one additional pound of current dividends reduces reported end of period book value by one pound, and one additional pound of current dividends has no effect on current reported earnings.



1. The payment of an additional pound of dividends at time point t reduces the expected earnings of period $t+1$ by $(R_F - 1)$ pounds.
2. The payment of an additional pound of dividends at time point t reduces the aggregate expected earnings for periods $t+1$ and $t+2$ (including any earnings generated by reinvesting any dividends expected at time point $t+1$) by $(R_F^2 - 1)$ pounds.
3. Consistent with Miller and Modigliani (1961), the model satisfies dividend payment irrelevancy, i.e. the payment of one additional pound of dividend reduces the market value of equity by one pound.

6.3. Example 3: Cash Flow Information Dynamics and Conservative Accounting

In the early development of his clean surplus valuation framework, Ohlson was strongly resistant to the idea of working with cash flows as a valuation attribute (see Ohlson, 1990).

However, rejection of cash flows as a valuation attribute does not rule out the possibility of representing the information dynamics of the firm in cash flow terms. Feltham and Ohlson (1993) work with the following cash flow information dynamics:

$$cr_{t+1} = \gamma cr_t + \kappa ci_t + v_{1t} + \varepsilon_{1t+1} \tag{9a}$$

$$ci_{t+1} = \omega ci_t + v_{2t} + \varepsilon_{2t+1}, \tag{9b}$$

where ci represents capital expenditure and cr represents operating cash flows. The ε_1 and ε_2 terms represent current period shocks, and the v terms represent shocks that are observed by the market before the current period. The model contains three key parameters: γ represents the degree of persistence in operating cash flows; ω represents the tendency for capital expenditure to grow over time; and κ represents the effect of capital expenditure on cash flows, i.e. a profitability parameter. In this model, the present value of the expected cash flows generated by one pound of investment will be $\kappa/(R_F - \gamma)$, i.e. the present value of the declining perpetuity $\kappa\gamma^{t-1}$ ($t = 1, \dots$).

Two new valuation effects arise in this model that are not considered in Example 2. The first is the effect of the firm's depreciation policy on the book value of past capital expenditures. In particular, the model allows for the possibility of conservative accounting. The second is the possibility that profitable capital expenditures may be anticipated by the market before they are formally recorded in the accounts. These new logical possibilities feed through into the valuation model that Feltham and Ohlson derive for this specification of the information dynamics:

$$V_t = k[\varphi ox_t - c_t] + (I - k) oa_t + \alpha_2 oa_{t-1} + \alpha_3 ci_t + z_t \tag{10}$$

where ox represents operating income, c is net cash flow, oa is book value of operating assets, and z is a collection of terms involving v_1 , v_2 , and ε_1 . This equation is similar to equation (7) except we now have two new terms that affect company valuation, i.e. a term involving lagged book value and a term involving current capital expenditure. The first of these terms arises only if the rate of accounting depreciation differs from the rate at which operating cash flows decline. This term will be strictly positive if and only if accounting is conservative, i.e. if the accounting rate of depreciation exceeds the rate at which operating cash flows decline. The second new term reflects the net present value of recently implemented projects plus the present value of any future positive NPV investment opportunities anticipated by the market.

6.4. Section Summary

By working with models with linear information dynamics we are able to produce accounting-based valuation models based on observable data. These models are substantially more general than a simple random walk in earnings, and allow one to produce a logically consistent representation of several fundamental characteristics of financial reporting systems, such as:

- i) the importance of the persistence of abnormal earnings in determining the relative weighting of earnings and book value in accounting-based valuation models (see equation (7));
- ii) the effect on market valuation of events observed by the market before they are reflected in the published accounts;
- iii) the possibility that the market may impound the NPV of new projects into price either during or before the year the actual capital expenditure is reported in the accounts;⁸
- iv) given clean surplus accounting, the effect of conservatism on accounting-based valuation models is captured by a term that represents the undervaluation of opening net assets.

7. Advantages of the Ohlson approach

In my view, the principal advantages of the Ohlson approach are:

- i) The approach has served to refocus attention on fundamental valuation issues, and has revived interest in models that attempt to explain firm valuation directly rather than correlating earnings surprises with returns. Penman (1992) provides a powerful argument for a change of emphasis away

⁸ Clubb (1996) considers the implications of this model for the effects of capital expenditure news on stock returns.



from excessive attention on returns/earnings models to fundamental valuation models. In particular, Penman's attempt to derive fundamental measures of value, independent of current market price, has opened up the possibility of a new approach to assessing the informational efficiency of stock markets which we discuss in Section 8. However, while one may accept that a change of emphasis from returns models to price models is desirable, one must also be careful to ensure that the swing against returns-based approaches is not allowed to go too far.

In general, the choice of research design should depend on the issue at hand. There are bound to be some issues where a returns-based approach will be indispensable, e.g. understanding the motivation for certain types of voluntary disclosures. Moreover, there are other issues where return/earnings models and valuation models produce complementary information (see, for example, Kothari and Zimmerman, 1993). In thinking about such research design issues, I find it helpful to think in terms of long-run versus short-run effects.

Valuation models provide indications of the long-run valuation relations. Returns studies help one to explain short-run deviations from the long-run relation. Time series econometricians have devised a general methodology (cointegration analysis) which combines short-run dynamics relative to a long-run equilibrium into an error-correction model. MBAR studies that combine levels and returns regressions are primitive forms of cointegration analysis. The essential message of the cointegration literature is that short-run and long-run effects need to be modelled jointly.⁹

ii) The approach forces the researcher to account explicitly for the impact of retained earnings on future earnings. If a firm retains a large proportion of its earnings, then future earnings will be expected to be higher by virtue of the extra income generated by accumulated retention. The full implications of this point for empirical researchers are explained in Easton, Harris and Ohlson (1992). More generally, the clean surplus model clearly articulates logically distinct roles for earnings and dividends, and also explains why, and how, book values might sensibly enter into an accounting-based valuation model. Specifically, the approach shows why price, in general, does not equal the present value of expected earnings. This fundamental insight is important if MBAR is ever to be used to address income measurement issues. Three papers that illustrate the value of the Ohlson insight here are Ohlson (1989a), Ohlson and Penman (1992) and Green et al. (1995).

Ohlson (1989a) reconsidered the ungarbled earnings construct of Beaver, Lambert and Morse

(1980) (BLM). He showed that the assumptions of the BLM model impose an implicit restriction on the relation between their ungarbled earnings and dividends. Specifically, the model forces expected dividends to be a constant proportion of expected ungarbled earnings. Ohlson concludes that the BLM ungarbled earnings construct '...is limited because of the absence of a useful distinction between ungarbled earnings and dividends'.

Ohlson and Penman (1992) identified specific line items (e.g. depreciation) that are likely to be problematic in accounting terms, and hypothesised that the strength of the relation between returns and earnings will be negatively related to the importance of these items as a fraction of earnings. The paper's empirical results were strongly supportive of the hypothesis. These results suggest that at least part of the Lev critique is explained by poor earnings numbers rather than poor research.

Green et al. (1995) use the Ohlson framework to explain how R&D should influence the value of the firm in an efficient market. The authors show that the market places a substantial value on R&D (about three to five times current R&D expenditure).

iii) The clean surplus approach has helped to provide a more coherent theoretical framework for traditional market-based studies. Ohlson (1991) and Ohlson and Shroff (1992) explained why the deflated earnings variable could yield improved statistical performance over the deflated first difference of earnings.

Ohlson's basic insight was substantiated by empirical research (see Easton and Harris, 1991 and Strong and Walker, 1993). Moreover, by combining the basic insight of Ohlson with panel data econometric methods, one can produce returns/earnings models with much better statistical performance (see Strong and Walker, 1993).

Following Ohlson (1991), a number of papers have been concerned with improving our understanding of the way in which reported earnings evolve over time, the ability of the market to observe the various contributors to this evolution, and the implications of this improved understanding for the empirical specification of price-earnings relations.¹⁰

A particularly interesting example of such work is Ramakrishnan and Thomas (1991). This paper introduces a simple structural model of reported earnings. The model represents reported earnings

¹⁰ Subsequent theoretical work by Kothari (1992) and empirical work by Kothari and Sloan (1992) and Donnelly and Walker (1995) has shown how the deflated earnings yield variable can yield superior statistical performance in a context where the market has access to information that allows it to generate predictions of future earnings better than predictions based on the past time-series of earnings alone.

⁹ Charemza and Deadman (1992) contains a user-friendly introduction to cointegration.



as a noisy form of price-relevant earnings. The evolution of price-relevant earnings is assumed to be driven by a predictable component (due to the effect of retained earnings), and a mixture of permanent and transitory random shocks. The authors also consider the following earnings-based prediction of end of year share price and dividend:

$$E(p_t + d_t) = (1 - k)[R/(R - 1)X_t] + k[p_{t-1} + X_t] \quad (11)$$

Here, the researcher's objective is to forecast end of period price plus dividend, given only price at the start of the year and earnings for the year. A pure earnings-based forecast would be given by $(R/(R - 1))$ times earnings for the year. A price-based forecast would be last year's price plus this year's earnings. The authors assume that the best forecast available to the researcher will be some weighted combination of these two alternative forecasts, and use k to represent the weight placed on the price-based forecast. The authors go on to show that, holding the first-order serial correlation of excess reported earnings¹¹ constant, the optimum value of k will vary across firms in ways that can be predicted from the following parameters:

a) The ratio of the variance of the forecast errors from model (11) to the variance of excess reported earnings;

(b) The second-order serial correlation of excess reported earnings.

The first of these parameters reflects the ability of the market to distinguish between permanent and transitory shocks to price-relevant earnings. The second parameter reflects the market's ability to extract any price-relevant noise from reported earnings. The authors report statistical evidence, based on estimated values of the relevant parameters for around 600 companies, which suggests that a significant proportion of the cross-sectional variation in k is explained by non-earnings information and price-irrelevant shocks.

In relation to the Lev critique of MBAR, this new work has shown that part of the explanation for the poor performance of the early returns/earnings models was due to poor empirical specifications that failed to represent adequately either the different types of shocks which drive reported earnings or the market's ability to observe value-relevant information that is not available to the researcher.

iv) The revival of interest in the clean surplus approach has led to a renewed focus on profitability analysis as a framework for the fundamental valuation of equities. For the 20 years following Ball and Brown, market-based accounting research paid little heed to a fundamental feature of economic life, i.e. the market forces tend to drive

abnormal economic profits to zero. The clean surplus approach indicates that the firm's market value will equal its book value plus the discounted present value of expected abnormal profits. Further analysis of this model has served to highlight the fact there are only two basic reasons why predictable abnormal profits can occur: (a) predictable 'errors' due to conservative (or aggressive) accounting practices; or (b) predictable future abnormal economic profits arising from current or future investments. If competitive forces are strong then, for most firms, it will be reasonable to assume that abnormal economic profits will be close to zero beyond some finite time horizon. Under these circumstances the equity valuation task can be structured as follows:

- Determine whether the firm's accounting practices have been conservative or aggressive and, where necessary, adjust the reported book value per share accordingly;¹²
- Consider the firm's market circumstances with a view to choosing a finite horizon for which it is reasonable to assume that abnormal profits beyond the horizon will be negligible;
- Forecast abnormal profits per share up to the time horizon;¹³
- Input the information from the previous three steps into equation (3), to provide the estimated current value per share.

Three papers that elucidate the strengths and potential weaknesses of this approach to valuation are Bernard (1993), O'Hanlon (1996) and Ou and Penman (1993). For present purposes, the paper by O'Hanlon is especially interesting because it highlights a conceptual difficulty implicit in the model of Feltham and Ohlson (1993). O'Hanlon points out that the Feltham and Ohlson model permits the existence of a persistently growing stream of positive NPV projects. This is problematic because economic intuition suggests that competition should eliminate the availability of positive NPV opportunities within a finite time horizon. O'Hanlon attempts to circumvent this difficulty by assuming that part of the payoff on investment projects accrues in the form of new positive NPV investment opportunities. His analysis shows that the Feltham and Ohlson model needs to be set within the context of capital budgeting procedures that ignore sunk costs, and accounting depreciation procedures which typically over-depreciate expenditure on growth options.

¹² Here, the book value should also be adjusted for the cumulative effect of any previous deviations from clean surplus accounting practices, e.g. due to the (current UK) practice of writing off acquired goodwill against reserves.

¹³ Here, the object of the forecast should be the abnormal profits the firm is expected to report under unbiased clean surplus accounting practices.

¹¹ Excess earnings is defined as the first difference of abnormal earnings.

8. Using the Ohlson framework to test information efficiency

Event study methods are traditionally used in MBAR to address the quality of the stock market's response to new information. MBAR has shown that share prices respond quite strongly to earnings announcements. However, there is some evidence, notably the post-earnings-announcement-drift (PAD) literature, which suggests the market takes time to fully adjust to the new information. PAD is a market pricing anomaly that has been identified by traditional MBAR methods (see, for example, Bernard and Thomas, 1989). However, there are some researchers who believe that the market makes systematic valuation errors that may take several years to correct. Traditional event study methods may not be powerful enough to detect such mispricing. One potential advantage of the Ohlson approach may be to provide a theoretical framework for modelling medium to long-term mispricing. This potential advantage has not, so far as I am aware, been claimed by Ohlson himself. It has, however, been claimed by Penman (1992), Bernard (1993) and Brennan (1995).

This work is especially interesting because it offers the prospect of providing an explanation for a well-documented capital market anomaly that has come to be known as the market-to-book effect. A number of highly respected researchers have found that the cross-section of expected returns tend to be negatively correlated with the ratio of stock price to book value per share (see, for example, Fama and French, 1992). Moreover, market-to-book contributes additional explanatory value for the cross-section of expected returns over and above market betas, a finding that challenges the validity of the CAPM. There are a number of possible explanations for such findings:

(i) The CAPM benchmark model was misspecified by the researchers possibly due to one or more of the following errors: incorrect choice of market index (Roll and Ross, 1994); failure to allow for time-varying betas and/or market risk premia (Jaganathan and Wang, 1996); survivorship bias due to data limitations (Kothari et al., 1995).

(ii) The market-to-book ratio captures some other risk factor, that cannot be captured by the CAPM.

(iii) The market-to-book effect reflects some form of long-lived mispricing of equities.

Bernard (1993) seeks to demonstrate that the clean surplus framework 'provides a new vehicle for tackling the debate'. The novel feature of Bernard's approach is his attempt to use the clean surplus framework to make testable predictions about the cross-sectional variance of market-to-book ratios conditional on the cross-sectional variance of accounting rates of return. His argument makes

use of the following version of the clean surplus model:

$$\frac{P_t}{y_t} = \sum_{\tau=1}^{\infty} (1+r)^{-\tau} E_t [(ROE_{t+\tau} - r) \frac{y_{t+\tau-1}}{y_t}] \quad (12)$$

where

$$ROE_t = \frac{x_t}{y_{t-1}}$$

Equation (12) is derived from (3) by dividing through by y_t and rearranging terms. It represents market-to-book in terms of future abnormal accounting rates of return weighted by the projected growth ratios of future book values. To exploit this equation empirically, Bernard makes the following key assumption:

'Assuming that ex post observations of those fundamentals, when averaged over large samples, are good proxies for their expected values, the formula permits an assessment of whether observed price/book ratios are too variable.'

If this assumption is correct, then one can replace the expected values on the right-hand side of (12) by their realised values. This will then leave two further problems in implementing the model. First, one needs to impose some sort of finite terminal value assumption to deal with the fact that (12) involves an infinite summation. Second, one needs to assume an appropriate value for the discount rate. Bernard assumes a constant discount rate for all firms, zero growth beyond year 15, and a constant accounting rate of return equal to the average of years 11 to 15 for years 16 onwards. Given these assumptions, he calculates what the value of market to book should have been if the market's expectations had been equal to the realised values. This exercise produced a predicted range of market-to-book ratios that was appreciably smaller than the range of the actual distribution (the actual distribution had a range roughly between 50% and 100% of the estimated range).

Bernard's preliminary findings in this area are interesting but also difficult to interpret. The apparently high level of variation in market-to-book ratios could be due to mispricing but it could also be due to errors caused by deviations from the assumptions needed to implement the model. Bernard presents some evidence that suggests that the anomaly can be partly explained by cross-firm differences in discount rates and differences in accounting conservatism, but he also provides arguments and evidence suggesting that such factors cannot account for the high range of market-to-book ratios he observes. At this stage it would be

foolish to claim that the clean surplus approach has delivered compelling evidence of mispricing. Nevertheless, the approach has provided a new way of thinking about the market-to-book puzzle.

9. Limitations of the Ohlson approach

9.1. Practical Problems

There are practical problems in implementing the Ohlson approach given that, at least in the UK, we have substantial deviations from clean surplus earnings. However, these practical problems are not destructive of the approach. Indeed, I suspect that some of the most interesting applications of the Ohlson model may come from identifying the effects of deviations from clean surplus earnings on accounting-based valuation models.

A good example of the kind of work I have in mind is O'Hanlon and Pope (1996). This paper uses the original accounts of 158 companies for a 20-year period to identify reported earnings and clean surplus earnings. Then, following Easton, Harris and Ohlson (1992), they examine the relations between stock returns and their two measures of earnings aggregated over time intervals of 1, 2, 5, 10 and 20 years. The authors argue that, in the long run, the market should discover the value relevance of any dirty surplus components of clean surplus earnings. Thus, if the dirty surplus items are value-relevant, the explanatory value of aggregate clean surplus earnings for long interval stock returns should be higher than the corresponding explanatory value of aggregate reported earnings. In fact, the authors find that aggregate reported earnings has higher explanatory value for stock returns over all five of the returns intervals they consider. The authors argue that such evidence questions the wisdom of recent regulatory efforts to discourage dirty surplus income reporting.

9.2. Aggregation Issue

Stark (1997) presents a simple extension of Ohlson's (1989) model which allows him to focus on the implications of partitioning clean surplus earnings into two additive components. He shows that special cases of his model arise where total clean surplus earnings is a valuation sufficient statistic for the two components. However, in general, total clean surplus earnings will not be a valuation sufficient statistic for its components. Moreover, there are other special cases of the model in which one of the two components will be valuation irrelevant. Stark concludes that the assumptions of linear information dynamics and dividend payment irrelevancy are not sufficient to imply a fundamental valuation role for clean surplus earnings.

9.3. Problems with the Measurement Perspective

Potentially the most destructive criticism of the Ohlson approach is that it does not explain why firms bother to report earnings and book values in the first place. Ever since Beaver and Demski's (1979) seminal paper, this line of criticism is one that has dogged all approaches to financial accounting based on notions of income measurement. However, it may be that this line of criticism applies with particular force to the clean surplus framework. Black (1980), for example, has argued that deviations from clean surplus accounting occur because this makes reported earnings a more valuable signal. Black's arguments are not rigorously formulated. However, Black's view of earnings is radically different from Ohlson's. The Ohlson models assume that accounting numbers reflect an underlying reality that is directly observed by the market. Black assumes that earnings *increase* the market's data set. In other words, share prices are better informed *because* earnings are reported.¹⁴

Having noted the 'Black' problem I should, in fairness to Ohlson, mention the possibility that the Ohlson approach may offer a new perspective on the Beaver and Demski conundrum. Specifically, it may be that attempts to rationalise income measurement have been shooting at the wrong target. Perhaps what we really want to know is why do we have financial reporting systems that supply measures of income (earnings) *and* value (book value)?¹⁵ Perhaps one cannot hope to explain the basic features of the financial reporting system unless one starts from the proposition that capitalist owners value measures of return on capital. Viewed in this light, the question raised by Beaver and Demski (1979), which focused on income in isolation of capital, may simply have been ill-formulated.

Finally, it should be noted that neo-classical economics, because it is based on assumptions of perfect rationality, has nothing to say about how ordinary human beings achieve 'rational' outcomes. An important practical feature of accounting in general, and income measurement in particular, is that it provides 'adequate' small-dimensional representations of multi-dimensional economic problems. Viewed in this light, the essential message of Ohlson, and his followers, is that a two-dimensional representation of the firm (i.e. in terms of earnings and book values) is demonstrably superior to a single dimensional representation (i.e., in terms of earnings only).

¹⁴ The event study evidence on the market reaction to earnings news seems to support this view.

¹⁵ A similar view is expressed by Brennan (1995), who writes: 'Therefore, in order to have a valuation model in which accounting earnings play a role, it is necessary to consider the balance sheet as well as the income statement.'

9.4. *The Assumption that Accounting and Disclosure Choices are Exogenous*

We have seen that MBAR is not the only way in which economics has impinged on accounting thought. Positive accounting theory has focused on issues of accounting choice, and information economics has shed light on a number of issues including financial disclosure choice. In broad brush terms these literatures have shown:

a) that accounting choice may not be independent of firm performance. For example, firms going through a bad patch may try to massage their reported profits upwards; and

b) that disclosure choices may also be related to current performance and/or the company's need to access funds for expansion.

The Ohlson and Feltham/Ohlson models assume that the information environment and the level of conservatism is exogenously given and constant over time. The models also rule out the possibility of financial decisions signalling new information to the market. Biases will arise in the estimation of the Ohlson models if firms' choices of accounting and disclosure/signalling are correlated either with share price performance or (uncreative¹⁶) accounting performance.

Lundholm (1995) shows, using simple theoretical examples, that the linear information dynamics assumed in Feltham/Ohlson (1995) cannot represent asymmetric accounting recognition criteria, such as the lower-of-cost-or-market value. Consistent with Lundholm's theory, Basu (1995) presents empirical evidence, for US firms, which shows that bad news tends to be recognised sooner in reported earnings than good news.

9.5. *No 'Births, Marriages, or Deaths'*

We have seen that the testable versions of the approach have assumed linear Markovian information dynamics. An implicit feature of this class of time-series models is that they have no beginning and no end. Firms are not born and they never die; they are also never taken over ('married').

Many firms come to market when they need finance to expand. Real options theory shows that many investment projects have a significant option to wait, and that projects are only introduced when they have a significantly positive NPV (see Dixit and Pindyck, 1994). If a significant proportion of newly-quoted companies comes to market when they are looking to finance positive NPV projects, the performance of the Ohlson model will depend on how recently firms went public. Tech-

nically speaking, the Markovian feature of the information dynamics assumption will be violated.

Black (1993) has presented evidence that suggests a change in the local valuation relationships when a firm becomes very unprofitable. In this region, the value of the shares is heavily influenced by the abandonment option implicitly available to limited liability shareholders. For such firms, the going concern principle, the conventional basis on which accounts are prepared, may be highly suspect, and a valuation based on the realisable values of the firm's assets may be more realistic. It may be possible to generalise the Ohlson framework to cope with this situation but, bearing in mind the options characteristics of the factors involved, it is doubtful if it will be possible to preserve linearity. Indeed, the recent papers of Dichev and Burgstahler (1996) and Hayn (1995) both present evidence of a non-linearity in the relation of prices and earnings. In particular, it would appear that the estimated earnings response coefficient of loss-making firms are not significantly greater than zero, while the ERCs of high profitability firms are roughly consistent with the theoretical value implied by assuming a random walk for earnings, i.e. 7 or more.

Firms may also be taken over. Moreover, for many firms their current value will impound a value related to the probability of being taken over. Again, the possibility of being taken over needs somehow to be factored into the Ohlson analysis. At the very least we need to allow for the possibility of survivorship bias in assessing the statistical performance of Ohlson models.

Specifically, one needs to take account of the fact that takeover premia tend to rise sharply in the 12 months leading up to a takeover.

It remains to be seen whether the Ohlson framework can be expanded to allow for life-cycle considerations in an empirically manageable way.

9.6. *The Convergence of Abnormal Profits Assumption*

O'Hanlon (1994) has questioned one particular feature of the information dynamics assumption, i.e. the idea that abnormal earnings follow a stationary stochastic process. He has produced plausible examples under which abnormal earnings cannot be made stationary even by differencing. O'Hanlon considers the implications of replacing the assumption of stationary abnormal earnings with an assumption that the accounting rate of return converges to some long-run value.

The problem with the approaches of Ohlson and O'Hanlon is that they are based on imperfect representations of the idea that, in the long run, competitive forces ensure that new projects earn normal economic returns. Perhaps a more promising approach would be to attempt to combine the cash

¹⁶ Uncreative here means the performance that would have been reported if the firm had not engaged in creative accounting.

flow information dynamics of Feltham and Ohlson with the idea that the net present values of capital expenditures revert to zero over time. Alternatively, one might refine O'Hanlon's idea of working with accounting rates of return, by abandoning historical cost based accounting rates of return and working with deprival value based accounting rates of return (see Edwards, Kay and Mayer, 1987).

The analysis of Edwards et al., which is conducted entirely within a clean surplus framework, indicates that accounting rates of returns based on deprival value based book values should quickly converge to the costs of capital, given competitive product and factor markets. Moreover, the authors show how an ex post analysis of deprival value based accounting rates of return and stock market returns can contribute to an assessment of the extent to which a firm enjoys a sustainable competitive advantage.

10. Concluding remarks

The ideas of Ohlson and his co-researchers have provoked considerable controversy in academic accounting circles. Indeed, it is probably true to say that market-based accounting researchers had never experienced such a fundamental split in their ranks until the Ohlson framework started to gain influence. Ohlson himself encountered considerable resistance to his ideas from the established US journals and chose eventually to publish his seminal papers in *Contemporary Accounting Research*.

Part of the purpose of this review has been to attempt to take some of the heat out of this controversy. All mathematical models require simplifying assumptions designed to capture the essential features of a complex world, and the Ohlson models are no exception. The ultimate test of the Ohlson framework must be its empirical fruitfulness, and we have already seen that the Ohlson approach has led to MBAR models with superior statistical performance. However, the final section of this paper has raised a number of issues suggesting that it may not be possible to represent fundamental aspects of firm behaviour within the confines of clean surplus models based on linear information dynamics. The ultimate judgment on the Ohlson framework will turn on whether it can be generalised sufficiently to capture the essential aspects of these issues in an empirically-manageable form.

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