Modeling earnings behavior

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by

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MODELLING EARNINGS BEHAVIOR

Earnings, especially future expected earnings, are considered important information by many in the economy. For example, investors use published earnings to predict future cash flows with a view to estimating their personal worth. Academic researchers require forecasts of earnings to evaluate the information content of earnings to test for things such as market efficiency. Government economists use accounting earnings as a lead indicator in forecasts of the economy's behavior. A deeper understanding of the forces that generate earnings might therefore be of value to many if it leads to improved predictions of future earnings, better economic forecasts, and better interpretations of fluctuations in earnings.

Unfortunately, our ability to understand the behavior of accounting earnings is hampered by the paucity of causal models of earnings. Virtually all the work to date has drawn on statistical analysis of autocorrelation patterns. Relatively few attempts have been made to explicate the underlying causal mechanisms.

The shortage of causal models is not necessarily a matter for concern particularly if our sole purpose is to arrive, as outsiders to the management of the earnings process, at a forecast of earnings. On the other hand, we seem to have reached a point in our empirical analysis where future improvements in predictive power might need to be based on a theory which identifies relevant variables and their theoretical means. Also, a causal model could be a very useful adjunct to the manager of the earnings process who is attempting to affect the firm's performance over time.

This paper seeks to extend an initial attempt by Van Breda (1981a) to build a model of accounting rates of return that reflects the interplay of economic forces and the dynamics of the accounting system. Competition is
hypothesized to drive all rates of profit to a risk-adjusted mean. This economic mean-reversion process is then mediated by the accounting system resulting in a simple model of accounting earnings.

The first section of this paper provides a very brief review of the relevant accounting literature. The second section reviews very briefly the rate equalization theorem of economics. In the third section, the impact of the accounting system on this theorem is discussed and a model of accounting earnings is established. This model is compared with the empirically-based models in the literature in the fourth and final section.

A Literature Survey

Given the importance of earnings predictions, it is not surprising that the topic drew the early attention of accounting researchers. One of the earliest papers in this area was due to Beaver (1970) who was specifically concerned with the behavior of accounting rates of return -- the subject of this paper. It was well known when this paper was written that market rates of return appeared to follow a generating process that could be described as mean-reverting. Symbolically this might be written as follows:

\[ \rho_t = \rho_e + u_t \]  

where \( \rho_t \) represents the observed economic rate of return, \( \rho_e \) is the expected equilibrium economic rate of return, and \( u_t \) is an iid random process with mean zero. In words, the market rate of return fluctuates about a mean that is largely a function of the security's risk class. Beaver postulated that:

... there is good reason to believe that accounting measurement rules permit, and in many cases, dictate that unexpected components in earnings be averaged over several subsequent periods. For example, consider a situation where there has been an unexpected change in the probability distributions of the future net cash flows associated with depreciable assets, such that the value of those assets has changed substantially. In the model described earlier, that change in asset value would be reflected in the unexpected component of the rate of return (and undeflated earnings). However, because
historical costs, not net present value, are used as a basis for recording depreciable assets and their expiration, only a portion of that change will be implicitly reported in the current period and the rest will be spread over the remaining useful life of those assets.

Effectively, this suggests that if \( r_t \) represents the observed accounting rate of return, \( u_t \) the iid random disturbance in period \( t \), and \( n \) is the number of prior periods over which the disturbances are averaged then:

\[
    r_t = \rho + 1/n \sum_{i=0}^{n-1} u_{t-i}
\]

Beaver tested his hypothesis empirically and concluded that the behavior of accounting rates of return was consistent with a moving average model.

Subsequent work was not wholly supportive of this position. Ball & Watts (1972), for instance, concluded that the accounting rate of return followed a martingale process like net income and earnings per share. Dopuch & Watts (1972) in their study of the effect of changes in accounting principles on streams of accounting earnings concluded from a Box-Jenkins analysis that accounting rates of return followed a first or second order auto-regressive process for the most part and that these processes were little affected by accounting changes. Their aim though was not to identify specific models but rather to detect changes in models so no tests of the predictive power of the different models they find are provided. Nevertheless on the face of it their results are in conflict with Beaver's results on the one hand and provide tentative support for firm-specific models, albeit of the auto-regressive type, on the other.

More recently, Albrecht, Lookabill, & McKeown (1977) sought to provide additional evidence on the behavior of annual accounting earnings and examined the stochastic properties of accounting rates of return of 49 individual firms using the Box-Jenkins methodology. They then compared the predictive power of the models so identified with the predictive power of simple random walk
models. They concluded that with "respect to deflated annual earnings: (a) time-series properties for firms in all three industries (whether viewed on a cross-sectional or individual firm basis) were suggestive of a random walk process."

Lookabill (1976), on the other hand, was more supportive of Beaver's position. Like Beaver, he made use of a high-low analysis of the way earnings tend to revert to a mean and concluded that:

some form of moving average process (is) a reasonable description of the accounting earnings rates of return...(however) the observed moving average properties of the deflated accounting earnings series do not appear to have been caused by mean reversion in market betas...This leaves the explanation that the historical cost accounting system (as well as, perhaps, managerial manipulation) induces averaging into the accounting series.

It is this latter hypothesis that is the theme of this paper.

It is apparent from this brief description of the relevant accounting literature that we have as yet relatively little theory to support empirical research in this area. What theory we do have focuses on the smoothing of the unexpected portion of the economic return stream. The theory does not break the return stream into its components, for example, nor does it deal with the expected portion of the return stream in any detail. Furthermore, the overall implication of the work to date seems to be that accounting returns across all firms are driven by the same generating process.

In one of the very few papers that sets out to develop a structural model of earnings behavior Dharan (1981) notes that the absence of theory is not a criticism of the work to date given that its end-point is simply to predict future earnings. On the other hand, he points out, "the structural model does become important when the researcher needs a priori information on the possible model he may identify and on the problem he may encounter in estimation and forecasting." As yet we do not have such a model.
Hopwood & McKeown (1981) in their review of the literature also note the absence of theory and "feel that whenever possible economic theory should be brought to bear on system modelling." They rightly note, however, that theorizing cannot occur in a vacuum. There must be an interplay between theory and "identification based on available data." This view is shared by this paper which attempts to bring some basic economic theory to bear on the potential behavior of market rates of return in the first place and accounting rates of return by extension in the hope that the theory will permit of further empirical work which in turn will lead to yet more sophisticated models, and ultimately to better predictions.

The next section begins that development process by laying out the underlying economic theory that would support equation (1) in a stationary economy. The section that follows suggests that if we are to make further progress in our understanding of accounting rates we must break the series into its component parts. The effect of passing these several parts through the accounting system is then explored and a descriptive model of the resulting accounting return is derived. In the final section this model is compared with those in the literature.

**Rate Equalization**

Consider a private economy at a point in time, denoted the present, consisting of a fixed, finite number of consumers, a fixed, finite number of producers, and a fixed, finite number of commodities. The fixing of commodities and consumers is immaterial to the theory, but the fixing of the number of firms, in conjunction with decreasing returns, creates the possibility of pure profits or rent, which is the topic of this section and the main theme in this paper.
Assume further that at each period in the future, uncertainty may be captured by a set of mutually exclusive possible states to which the actors in the economy, more particularly the consumers, attach probabilities. The commodities are then characterized in terms of their physical properties, the date and location at which they will be available, and the state in which they obtain. Importantly, they are assumed to be infinitely divisible. Where this does not hold, discontinuities can occur, giving market power to individual participants and leading to the breakdown of perfect competition.

To each commodity so defined may be attached a parameter $p_{t,s,j}$ which denotes the present price an actor has to pay for delivery of one unit of commodity $j$ at the date, and in the state detailed in the contract. Markets are assumed to be complete except when stated otherwise.

Consumers are assumed to be Savage rational and to be noncolluding. They are assumed to be costlessly informed at all times of the prices of all commodities. Producers are also assumed to be noncolluding and to be costlessly informed of the prices of all commodities. Producers manage firms characterized by activity vectors

$$y = y_{t,s,j}$$

where $y_{t,s,j}$ = units produced of the $j$th commodity in time $t$ and state $s$. There are no externalities of production i.e., each input-output vector depends only on the firm's own technical possibilities. The set of feasible vectors for each firm forms a production set $\overline{Y}$, which is characterized by the following assumptions:

1) $0 \in \overline{Y}$
2) $\overline{Y} \cap (-\overline{Y}) \subset \{0\}$
3) $\overline{Y} \supset (-\overline{Y})$
4) $\overline{Y}$ is convex
where $\Omega$ = nonnegative orthant of the activity space. The last assumption includes both decreasing and constant returns to scale. Decreasing returns lead to the existence of positive pure profits or rent. This is a corollary of an earlier assumption that the number of firms is fixed, which implies an effective monopoly for firms. To escape this dilemma, it is customary to assume that constant returns to scale operate in the long-run when profits throughout the economy are driven to zero.

Managers are assumed throughout to be profit maximizers, i.e., they are assumed to choose that vector $y^*$ such that for all $y \in \bar{Y}$

$$p \cdot y^* \geq p \cdot y$$

But given that the vector $p$ consists of prices to be paid now for future delivery, the vector product is no more than the net present value of the firm or production plan. If this is positive, pure profits are being earned and entrepreneurs will enter the industry until the marginal firm shows a net present value of zero. Investors will purchase the inframarginal firms so that they too will show a net present value of zero when the capitalized rents are imputed to costs. Effectively constant returns to scale will rule at this point, and the zero profit condition will have been obtained. In other words, in long-run equilibrium, we must have

$$p \cdot y = 0$$

This is a fundamental result of perfect competition.

It is convenient at this stage to assume that the commodities in production in period one, i.e. at the outset, are inputs, and the commodities in all other periods are outputs. Correcting the signs we can then write as an equilibrium condition

$$\sum j p_{1j} y_{1j} = \sum_t \sum_s \sum_j p_{tsj} y_{tsj} \quad \ldots(3)$$

But the right-hand side is no more than what is normally called the present
value of a production plan (expected present value here since it includes uncertainty) and the left-hand side is the "cost" of the project which we shall denote \( P_0 \). In other words, in capital budgeting parlance, in equilibrium, the cost of the project will equal its expected present value. This result will be used in the section that follows.

As a corollary to the zero-profit condition, there exists the rate equalization theorem. Stigler (1963) has claimed that this theorem is the most important in economics. In his words:

There is no more important proposition in economic theory than that, under competition, the rate of return on investment tends toward equality in all industries.

To illustrate this theorem we consider a production plan involving a single good so that

\[
P_0 = \sum_t \sum_s P_{tsj} y_{tsj}
\]

and define

\[
\bar{P}_{tsj} = \text{the price of commodity } j \text{ at time } t \text{ and state } s
\]

\[
P_{tsj} = \text{the discount rate between time } t, \text{ state } s, \text{ and the present appropriate to commodity } j = \left( \frac{\bar{P}_{tsj}}{P_{tsj}} \right) - 1
\]

Thus we can write (4) as

\[
P_0 = \sum_t \sum_s \bar{P}_{tsj} y_{tsj} (1+\bar{P}_{tsj})^{-1}
\]

\[
= \sum_t \sum_s q_{tsj} (1+\bar{P}_{tsj})^{-1}
\]

where \( q_{tsj} = \text{the quasi-rent obtained in period } t \text{ and state } s \). Following Arrow (1971), we now assume that the quasi-rents in each period (a) are independent of the quasi-rents of prior investments (b) are independent of the utility functions of individuals, and (c) have an objective probability distribution. We assume furthermore that we can partition the states of the world such that the quasi-rents for all states in the partition are constant. Then, where \( \pi_n \) is the objective probability of a given partition independent of \( t \), we may
rewrite our equation for $P_0$ as

$$P_0 = \frac{1}{1 + \rho_{tj}} \sum_{n=1}^{\infty} q_{nj}$$

$$= \sum_{t=1}^{\infty} (1 + \rho_{tj})^{-1} q_{tj}$$

where $q_{tj}$ = expected value of $q_{tsj}$ at time $t$.

We may rewrite this further as

$$P_0 = \frac{-q_{1j}}{1 + \rho_{1j}} + P_1 (1 + \rho_{1j})^{-1}$$

where $P_1$ is the cost of the project one period ahead, whence

$$\rho_{ij} = \frac{q_{1j}}{P_0} + \frac{P_1}{P_0} - 1$$

$$= \frac{q_{1j}}{P_0} + \frac{(P_1 - P_0)}{P_0} \cdots (5)$$

To see the force of (5) assume the existence of a money rate of interest $i_1$ in the first period. The owner of $1$ cash can earn the amount of $i_1$ interest in a single period. Alternatively, he can purchase $1/P_0$ of the production plan, earn quasi-rents of $q_{1j}/P_0$ in the period, and then dispose of the asset at a price $P_1/P_0$. In equilibrium these two courses of action must of course be equal i.e.,

$$1 + i_1 = \frac{-q_{1j}}{P_0} + \frac{P_1}{P_0} \cdots (6)$$

$$i_1 = \frac{-q_{1j}}{P_0} + \frac{(P_1 - P_0)}{P_0}$$

But a comparison of (5) and (6) reveals that in equilibrium

$$i_1 = \rho_{ij}$$

But since this holds for one commodity $j$, it must hold for all commodities, i.e., in equilibrium

$$i_1 = \rho_{ij} \quad \text{for all } j$$

This expression states that in equilibrium, the ex ante discount rate on all assets or production plans will equal the money rate of interest. Equivalently, there will be a tendency for all rates to equalize over time. Or in other words, under the stated assumptions, if we allow inelasticities of supply to disappear, then in the long run, there will be a tendency for all rates
to equalize. This is a result that is absolutely fundamental to all that follows and as we have seen it depends crucially on the zero-profit condition for its fulfillment.

We can use this result to gain immediate insight into the generating process underlying accounting rates of return. Our argument above suggests that rates of profit will tend by arbitrage to an equilibrium rate. Then, if expectations are fulfilled, one can predict that the observed economic rate of \( \rho_t \) will equal \( \rho_e \) in equilibrium where \( \rho_e \) now represents the equilibrium return rate. If expectations are not fulfilled, we have (1) exactly.

This model begins to break down when changes in inflation and risk are allowed for. Now we no longer have an underlying constant mean to which to revert. Instead there will be an equilibrium value that varies according to the level of inflation and risk at that point. The model of observed economic profit that results is of the form:

\[
\rho_t = \rho_e^e + u_t
\]

where \( \rho_e^e \) is a function of expected risk and inflation.

We have still to allow for the fact that this arbitrage process is typically not instantaneous. (The exception is the money market.) The commonest cause of rates of profit diverging from an equilibrium rate is a rise or fall in demand. Increases in demand cause long-run demand curves to shift to the right and prices to rise accordingly. In the short run supply is fixed. In the longer run existing producers will expand their production in response to the higher prices, while new producers will enter the market. During this process while quantities are slowly adjusting, prices are assumed to adjust swiftly to clear the markets.
Clearly, such a process takes a finite amount of time. As a result, there will be a tendency only for observed rates of profit to equal equilibrium rates of profit. Graphing the path over time might yield a curve such as that in Figure 1, where economic rates appear on the ordinate and time is displayed on the abscissa.

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One can measure the relative distance the economic rate is expected to revert to the ultimate, expected mean at the end of the first period by forming the ratio

\[
\frac{\rho_t - \rho^e_{ot}}{\rho^e_t - \rho^e_{ot}}
\]

Denoting this ratio by lambda subscript "e" to denote its origin in economic theory and crossmultiplying one has

\[
\rho_t = \lambda_e \rho^e_t + (1 - \lambda_e) \rho^e_{ot}
\]

or allowing for measurement error

\[
\rho_t = \lambda_e \rho^e_t + (1 - \lambda_e) \rho^e_{ot} + u_t
\]

where \( \rho_t \) = the observed economic rate of return

\( \rho^e_{ot} \) = the economic rate that would obtain if no adjustment obtained

\( u_t \) = the error term assumed to be white noise

In this formulation, lambda represents the degree to which investment has taken place in a given period in response to a rise in demand -- or disinvestment in response to a fall in demand. Clearly, if lambda equals one, this process is complete and we have (7). On the other hand, if lambda is zero, no adjustment has taken place and the rate that results is \( \rho^e_{ot} \). This might be \( \rho_{t-1} \) but is more likely to be an expectation based on \( \rho_{t-1} \).
Linear Filters

The argument thus far has addressed the behavior of economic rates of return while our ultimate concern is with the accounting rate of return. It is well-known that in equilibrium economic rates are not equal to accounting rates. Numerous authors such as Livingstone & Salamon (1970), Solomon (1966), Stauffer (1971), and Van Breda (1981b) have documented the relationship between the two and in particular noted that it is only when the growth rate equals the interest rate that the two rates are equal.

The dynamics of the accounting rate of return, though, have been virtually ignored in the literature. This section explores this topic with a view to modelling earnings via the notion of linear filters which, for our present purposes, it is sufficient to conceive of as black boxes.

In general, we may conceive of the accounting system as a black box or linear filter into which economic events are fed and from which accounting returns emerge. More realistically, the accounting system may be visualized as a set of various filters in parallel and sequence. This corresponds with Manegold (1979) who argued that the stochastic behavior of earnings is a composite of the stochastic behaviors of its various components such as sales, cost of sales, and so forth.

Thus far, in the literature, as noted earlier, all our earnings models have essentially been of the form of a single filter. The suggestion here and in Manegold is that if we are to progress in our explanation of accounting rates of return, it is necessary to distinguish the various filters that make up the accounting system, since each will have different response function.

To see this last, consider again a change in demand for a product. Following the argument above, product prices will rise. Accounting revenues will rise almost immediately in most circumstances. The response function of the
filter described by the revenue realization process to a sudden step in prices is graphed in Figure 2.

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Insert Figure 2

---

Compare this with the response of total net book value of the firm's assets. As new entrants enter the market so factor prices tend to increase in line with output prices. In particular, asset prices will rise until normal economic returns are being earned.

But, this process only affects net book value on the margin. It is only as assets are replaced that the new and higher costs enter the net book value account. The response function of net book value to a sudden step in prices is graphed in Figure 3.

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Insert Figure 3

---

Note first how this response function differs from that of revenue. This confirms our contention that it is vital that we analyze the various subfilters that make up the accounting system. Their response functions do, in fact, differ.

Note second that in combining these two filters we, in effect, create a joint filter. In particular, if we assume, as seems reasonable, that variable costs will respond as did revenue, then the accounting return, which is essentially the quotient of the income and net book value filters already described, will have a response function as in Figure 4.

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Insert Figure 4

---

A mean reversion process in accounting rates emerges that has nothing to do with economic rates of return, but everything to do with the set of accounting
filters. What has emerged, therefore, is an accounting dynamic in addition to the economic dynamic. This is a fundamental result that is potentially of considerable importance to our understanding of the behavior of accounting rates of return.

It should be noted at this point that we are quite close here to Beaver's original insight. He suggested essentially that unexpected economic events would be smoothed. We have gone further and shown how fluctuations in expected demand will be transmitted through the multiple filters that constitute the accounting system.

The process that we have just described can be captured by an extension of equation (8) above. Rewriting it in terms of accounting rates of return we have

\[ r_t = \lambda \mu_t + (1 - \lambda) r_{0t}^e + u_t \]

where

- \( r_t \) = the observed accounting rate of return
- \( r_{0t}^e \) = the economic rate that would obtain if no adjustment obtained
- \( \mu_t \) = the expected equilibrium at time t
- \( u_t \) = the error term assumed to be white noise

This equation has a similar interpretation to that of (8). Now, however, lambda represents the degree of reversion of the accounting rate of return in any one period. Where no reversion occurs, lambda will be zero and the observed rate is denoted \( r_{0t}^e \), signifying that it is an expectation and not necessarily \( r_{t-1} \). If reversion is complete, the observed rate will be the equilibrium rate \( \mu_t \) plus the error term \( u_t \).

We do, however, need to take one further fact into consideration once we start building adjustment models involving accounting rates of return. The parameter, lambda, can also be negative. To see why it is easiest to turn to Figure 5. We assume here that due to a rise in demand the accounting return (like the economic return) is above the long-run equilibrium value of the
accounting rate of return. A shift to the right indicates a positive lambda and a decrease in the observed accounting return.

Economic returns and accounting returns differ for several reasons. One is their response time. An economic return is essentially based on expected benefits. Any new information about these benefits is discounted into the return at the time of disclosure. The economic rate does not respond to the subsequent unfolding of the disclosed events. By contrast, the accounting rate responds to the events themselves and by and large not to the prior disclosure of those events.

One effect of this response to events is that if prices continue to rise so will the accounting rate. This is true even if the rise in prices is wholly expected when the economic rate will remain fixed. The net result is that the observed accounting rate could rise still further above the equilibrium rate. The ensuing lambda would then be negative. Given the prevalence of inflation, such a result should not be unexpected.

To complete the model, we need to add an explanation of the equilibrium rate \( \mu_t \) in (9). As noted earlier, it is a well-known fact that even in equilibrium accounting rates do not equal economic rates. For any given firm, therefore, \( \mu_t \) will be a function of \( \rho_t \) with the intervening variables being growth rates, inflation rates, and book life. Details of this transformation may be found in Van Breda (1981b). For our present purposes, it is sufficient to denote the transformation by \( f(\cdot) \).

The resulting model of accounting rates is then captured by equation (10).

\[
\begin{align*}
    r_t &= \lambda f(\rho_t^e, g, x, b) + (1-\lambda) r_{ot}^e + u_t \\
\end{align*}
\]
At this point, we note that \( \lambda \) is a function both of the economic rate of reversion alluded to earlier that is in part due to barriers to entry and of the accounting system itself. Writing this joint effect as a product we have

\[
\lambda = \lambda_a \lambda_e
\]

where \( \lambda_a \) is the reversion parameter that is a function solely of the accounting filter and \( \lambda_e \) is the reversion parameter that is a function of the economic system. Substituting back into (9) we have

\[
\begin{align*}
rt &= \lambda_a \lambda_e u_t + (1 - \lambda_a \lambda_e) r_{ot} + u_t \\
&= \lambda_a \lambda_e u_t + \lambda_a (1 - \lambda_e) r_{ot} + (1 - \lambda_a) r_{ot} + u_t
\end{align*}
\]

or

\[
rt = \lambda_a \lambda_e u_t + \lambda_a (1 - \lambda_e) r_{ot} + (1 - \lambda_a) r_{ot} + u_t
\]

If \( \lambda_e = 1 \) i.e., if there are no barriers to entry we have

\[
rt = \lambda_a \lambda_e u_t + (1 - \lambda_a) r_{ot} + u_t
\]

Thus slow reversion remains but it is solely due to the accounting system. On the other hand, if \( \lambda_e = 0 \), i.e. if there is a perfect monopoly and constant prices, then

\[
rt = r_{ot} + u_t
\]

which implies that no reversion occurs at all. This corresponds with the theory adduced in this paper which suggests that the accounting system is a filter. A steady economic rate implies no change in the input vector and hence no change in the output vector.

**Discussion**

These proposed models of accounting earnings are not unlike those proposed in the literature to date. Since the rate of reversion is a function of book life, one expects it to be slow and \( \lambda_t \), therefore, to be small. As a result, a fairly reasonable approximation would be the model

\[
rt = r_{ot} + u_t
\]
If $r_{ot}^e$ is essentially equal to prior year's rate, one has a random walk model. In general, though, one would expect to find an auto-regressive model with a parameter close, but not equal to one.

In other words, the random-walk or submartingale model observed in the empirical literature is consistent with the model of earnings proposed here. In addition, we now have a theoretical explanation of why we might see the empirical phenomena that we do, without reliance on the nature of the exogenous disturbance. Furthermore, the theory suggests that the autoregressive coefficients encountered might be predictable in size and in sign.

In other words, the theory adduced in this paper suggests that while the generating process underlying accounting rates of return might be similar across all firms, the parameters of this process can be expected to vary across firms and in a predictable manner. On the other hand, it is apparent from the earlier discussion that the rate of reversion induced by the accounting system will be a function of the turnover of the assets of the firm. This, in turn, is related to the book life of the assets of the firm which suggests that the rate of reversion will be very slow. Equivalently, the reversion coefficient will be very small so that for predictive purposes a completely general model might indeed be adequate. Again, this corresponds with the findings in the literature to date.

Turning the discussion on its head, we can write $r_t$ completely in terms of economic rates. If we continue to assume, for simplicity sake, that $r_{ot}^e$ is essentially equal to the prior year's rate, we may rewrite (13) as

$$r_t - \theta r_{t-1} = \lambda_a \mu_t + u_t$$

...(14)

where

$$\theta = 1 - \lambda_a$$

Using a lag operator, we can rewrite this as
In other words, the observed rate might be viewed as a weighted sum of past ex ante economic rates. This makes perfectly good sense, since we know that the books of a firm reflect a series of investment decisions over the life of the firm that presumably reflected the economic rate ruling at the time.

This may be combined with Beaver's (1970) insights into the process generating earnings. Recall that he suggested that the present rate was an average of past disturbances about an overall mean. The suggestion here is that it is an average of past ex ante economic rates. If these rates follow a mean reverting process, then with

\[ u_t = \mu + \omega_t \]

we have

\[ r_t = \lambda a \sum_{s=0}^{\infty} \theta^s \mu + \lambda a \sum_{s=0}^{\infty} \theta^s (u_{t-s} + \omega_{t-s}) \]  \( \cdots (16) \)

Since the first term on the right is a constant, this model and the model in equation (2) are quite likely to be observationally equivalent given the types of statistical tests performed by Beaver and Lookabill.

In short, the arguments of this paper provide us with a theoretical model that is broadly consistent with the empirical findings in the accounting literature. In other words, accounting rates of return seem to behave as if the multiple filters that make up the accounting system were transforming the revenue and expense streams in such a way as to create a slow reversion phenomenon. This is not wholly unexpected since the theory corresponds with what common sense might suggest. All that this paper has done is to add some more substance to what one might ordinarily expect. Possibly its most compelling conclusion is that to understand the behavior of streams of accounting
earnings numbers one must analyze both the behavior of the underlying streams of economic events and the behavior of the accounting system itself.

To conclude then, this paper makes no pretense to have provided a complete and final model of the behavior of accounting rates of return; however, it is hoped that this is a first step towards such model and that it will stimulate further research and more sophisticated models to undergird the important empirical work being done in this area. Only as theory and empirical work interact will we gain a full understanding of the forces driving accounting earnings.
Selected Bibliography


Figure 1

\[ t = 1 \]
Figure 2

\[ R_t \]

\[ t \]
Figure 3
Figure 4
The following papers are currently available in the Edwin L. Cox School of Business Working Paper Series.

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