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EARNINGS AS AN EXPLANATORY VARIABLE FOR RETURNS: A NOTE

by

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1. *Introduction*

Easton and Harris (1991) [herein EH], in a recent article, "investigate whether the level of earnings divided by price at the beginning of the stock return period is relevant for evaluating earnings/returns associations" [p. 19]. As stated by EH, the contribution of their study stems from their variable of interest, which is not the earnings-to-price ratio based on contemporaneous (past) earnings and contemporaneous (past) price which has dominated earlier studies. Despite their excellent empirical work, unfortunately, their theorising is somewhat *ad hoc* and they admit that for certain aspects of their theorising "we provide a more heuristic analysis" [footnote, p. 8]. It is the purpose of this paper to provide a derivation of the relationship between the level of earnings divided by the beginning of period stock price and stock returns, using the well known and widely accepted Gordon growth model of stock valuation originally attributed to Gordon and Shapiro (1956), and the behavioural dividend model originally developed and tested by Lintner (1959). The model derived provides alternative interpretations of the parameters of the empirical model estimated by EH, and suggests that one of the variables and the fundamental model estimated by EH is mis-specified.

2. *A Relation Between Earnings and Returns Based On the Gordon Growth Model and Lintner Dividend Model*

Gordon's growth model which describes the valuation of a firm whose dividends can be conceptualised as a stream of constantly growing payments, is given by:

$$P_{t-1} = \frac{D_t}{r - g} \tag{1}$$

where:

P_{t-1} = The stock price in period t-1

D_t = the dividend paid in period t

r = the shareholders required rate of return, a capital asset pricing model interpretation of r is the *expected return* on a stock

g = the constant growth rate in the dividends of the company

Re-arranging the growth model (1) for r, the expected return on a stock gives:

$$r = g + \frac{D_t}{P_{t-1}} \tag{2}$$

However D_t can be defined as:

$$D_t = D_{t-1} + \Delta D_t \tag{3}$$

which can be substituted into (2) to yield:

$$r = g + \frac{D_{t-1} + \Delta D_t}{P_{t-1}} \tag{4}$$

Lintner (1959) provides a time series behavioural dividend model which describes ΔD_t as a function of earnings as follows:

$$\Delta D_t = a + b[\rho EPS_t - D_{t-1}] \tag{5}$$

where EPS is the earnings per share, and all other variables are as defined above. The parameter ρ represent the desired dividend payout, whilst b represents the coefficient of adjustment, or the proportion of the desired increase in dividends actually paid out. Lintners model can be substituted into (4) above and rearranged to yield:

$$r = g + a\frac{1}{P_{t-1}} + (1-b)\frac{D_{t-1}}{P_{t-1}} + b\rho\frac{EPS_t}{P_{t-1}} \tag{6}$$

In the original Lintner model a, b, and ρ were constants. If it is assumed that g is a constant[1], then the empirical version of (6) is:

$$r = \alpha_0 + \alpha_1\frac{1}{P_{t-1}} + \alpha_2\frac{D_{t-1}}{P_{t-1}} + \alpha_3\frac{EPS_t}{P_{t-1}} + \varepsilon_t \tag{7}$$

Thus, a linear time series relationship has been derived from the 2 traditional models describing the relationship between expected returns (r), the inverse of the price of the lagged stock price ($\frac{1}{P_{t-1}}$), the lagged dividend yield ($\frac{D_{t-1}}{P_{t-1}}$) and the contemporaneous level of earnings divided by the beginning of period price ($\frac{EPS_t}{P_{t-1}}$) which was the variable examined by EH.

The two models used to derive the relationship above are consistent with each other. Gordon's growth model merely implies that given an estimate of the dividend paid at time t, and that the subsequent dividends paid by a firm can be *equivalently represented* as a stream of growing dividends, then the stock price is determined by the relationship in (1) [2]. Lintners dividend model provides a means by which the dividend at time t can be estimated.

Whilst the dividend discount model underlying Gordons growth model "has become generally accepted as a stock price model" [Brigham and Gordon, 168, footnote 3], the

Linter model has been subject to testing in a US context by Fama and Babiak (1968) and Watts (1973). The primary assumption underlying the growth model is constant dividend growth which may be untenable for some firms. However, for a great number of stocks, the assumption is valid. Further, the theoretical model derived does not rely on *actual* dividend growth but on *implied* dividend growth [see footnote 2]. These conjectures suggest that the primary relationships underlying the derived empirical version of the model above (7), exist within the data used by EH, which in turn suggests that the model estimated by EH is to some extent mis-specified. The next section turns to an analysis of the implications of this mis-specification, and an interpretation of the estimated parameters in light of the model derived above.

3. *A Comparison with the EH model and Implications*

The fundamental cross sectional model estimated by EH was:

$$R_{jt} = \alpha_{to} + \alpha_{t1}[A_{jt}/P_{jt-1}] + \varepsilon_{jt}^{1}$$

where A_{jt}/P_{jt-1} was the earnings-to-price ratio, and R_{jt} represents *total* stock returns. The derived equation suggests a time series relationship for firms between the included variables and the returns on a stock. The parameters of the empirical version of the equation derived are determined by g, a, b, and ρ all of which measure various aspects of *one particular firms* dividend policy, and there is considerable evidence which suggests that these parameters vary from firm to firm [Fama and Babiak (1968) for example, report cross sectional distributions in parameter estimates]. Since EH estimate cross sectional regressions, this presents problems for the interpretation of the parameters estimated, and econometric theory suggests that such parameters estimated are not 'efficient' and may be biased [Koutsoyiannis, 1988, p. 405].

The model derived above also suggests that r_t (expected stock returns), and not R_{jt} (total stock returns) is the relevant dependant variable influenced by the earnings-to-price ratio of interest. The difference between the two within a CAPM framework is the unexpected component of stock returns. Consistent with the derived model, when EH attempt to use the earnings-to-price ratio to explain abnormal returns, the variable diminishes in significance, indeed being insignificant in explaining abnormal returns for 7 of the 19 years in which they estimate their model.

EHs' use of total returns can be construed as introducing error in the measurement of the dependent variable, which may have had an upward bias on the standard errors of estimated coefficients [Gujarati, 1988, p. 416], and thus a downward bias on the t value of the coefficients of the independent variables, as well as reducing the R^2 value. Fortunately, this did not seem to influence the significance of the coefficients of the estimated model, although the R^2 values estimated are quite small [EH, Table 1]. This analysis suggests the explanatory power of the model could be improved by using systematic returns estimated with the two parameter version of the capital asset pricing model.

EH state that "the presence of an intercept terms is not implied by the (their) theoretical relations that underpin these regressions ... the omitted variables that may explain security returns ... may have, on average, a nonzero effect implying nonzero intercept terms [p. 25]. The model derived suggests that the intercept term estimated may in fact be a measure of g, the average cross sectional implied growth rate in dividends paid. The estimated parameter α_{t1}, with respect to the derived equation, represents the product of the payout ratio and the coefficient of adjustment. Although *a priori* this is expected to be less than 1, for 7 of the 19 years analysed by EH the coefficient estimated is greater than 1. However, interestingly enough, the significance of the variable seems to be generally lower in these instances. The omission of the variables discussed below may also provide an explanation as to why the coefficients are overstated.

The model estimated as compared to the model derived suggests two omitted variables whose effect would filter through to the residuals of the estimated equation as follows:

$$\varepsilon_{jt}^{1} = \alpha_1 \frac{1}{P_{t-1}} + \alpha_2 \frac{D_{t-1}}{P_{t-1}} + \varepsilon_t$$

Interestingly enough, in their footnote 6, EH suggest that their derivation also may suggest that the second omitted variable ($\frac{D_{t-1}}{P_{t-1}}$), is relevant. However in the same footnote they exclude it "for practical purposes, suggesting that the cross sectional variation in the variable is small and would have little effect on the results.
Despite this, it would be expected that the included variable ($\frac{EPS_t}{P_{t-1}}$) is positively correlated with the first of the omitted variables ($\frac{1}{P_{t-1}}$), since a larger price decreases $\frac{1}{P_{t-1}}$ and $\frac{EPS_t}{P_{t-1}}$. Such a relationship suggests that the coefficients α_{t1} in the model estimated by EH may be overstated [Gujarati, 1988, p. 403].

4. *Summary and Conclusions*

The analysis above derives a relationship using two traditional finance theories, between the ratio of current accounting earnings to the beginning-of-period stock price and stock returns. The derived relationship suggests a number of implications for a recent empirical study by Easton and Harris (1991) which was one of the first to look at this form of earnings-to-price variable. The derived model suggests that the conclusions using the model estimated by Easton and Harris are potentially limited for three reasons. Firstly, because it is cross sectional and a time series relationship exists whose parameters are not constant across firms. Secondly, by the use of total return to stockholders as the dependant variable, as the derived model suggests that only the systematic component of such returns is explained by the independent variable. Finally, the model suggests at least two other omitted variables which may also have limited the results. It was suggested that the inclusion of these three considerations in the analysis would improve the estimated explanatory power of the variable of interest, the ratio of the contemporaneous level of earnings to the lagged stock price.

FOOTNOTES

[1] It is conceded however that *g* may change over time with investor expectations. This would not alter the conclusions of the analysis which follows.

[2] Thus even though the *actual* dividends do not grow at a constant rate, if the stream of dividends stemming from a stock can be *hypothetically represented* as a stream of dividends growing at a constant rate g, then the model is still valid provided that g is not estimated from historical data. This interpretation is consistent with the suggested use of the model which follows, which leaves g to be estimated from a regression equation.

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