Review of Recent Research on Improving Earnings Forecasts and Evaluating Accounting-based Estimates of the Expected Rate of Return on Equity Capital

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Abstract

We extend Easton's (2007) review of the literature on accounting-based estimates of the expected rate of return on equity capital, which we refer to as the ERR. We begin by reiterating the reasons why accounting-based estimates are used. Next, we briefly review the recent literature that focuses on improving forecasts of expected earnings by either: (1) removing predictable errors from analysts' forecasts of earnings or (2) developing cross-sectional regression-based estimates of earnings using prior-period financial data. In the remainder of our review we discuss a recent debate on methods for evaluating estimates of the ERR. We highlight the key points in the debate so that the reader will find it easier to form an independent view of the relative merits of the proposed methods.

1. Why Use an Accounting-based Estimates of the Expected Rate of Return?

The answer to this question is straightforward: there is no reliable alternative estimate. Users of accounting-based estimates of the expected rate of return on equity capital, ERR, are making two implicit assumptions.[1] The first implicit assumption, which we refer to as IA1, is that neither firm- nor portfolio-level realized returns are a reliable measure of expected returns. The second implicit assumption, which we refer to as IA2, is that the factors that determine expected returns are unknown and/or that they cannot be estimated reliably. If the user is not making these assumptions, there is no need to use an accounting-based estimate. Rather, either realized returns or an estimate taken from an asset pricing model may be used.

1.1 IA1: Realized Returns are not Reliable Measures of Expected Returns

Users of accounting-based estimates of the ERR are implicitly assuming that: (1) firm-level realized returns are not a reliable measure of expected returns and/or (2) for their sample, it is infeasible to obtain reliable estimates of the ERR via temporal or cross-sectional averaging of firm-level returns. For example, a researcher may be interested in a small sample of firms with a short trading history, in which case cross-sectional and temporal averaging may be infeasible.[2] On the other hand, if the requisite data are available, accounting-based estimates of the ERR may be obtained for each firm in the sample.

IA1 is not an unreasonable assumption/conclusion. For instance, since Black, Jensen and Scholes (1972) and Fama and MacBeth (1973) it has been the norm in empirical asset pricing to use portfolio-level returns (e.g., value weighted averaging) instead of firm-level

[1] We refer to "users" of accounting-based proxies because much of our discussion is pertinent to people outside of academia.

[2] Alternatively, the researcher may have a long time-series of realized returns for each firm in the sample but may be concerned that the moments of the distribution are not stationary.

returns. But, portfolio-level returns are also suspect. For example, in his presidential address to the American Finance Association, Elton (1999) (p. 1199) states: ‘‘*The use of average realized returns as a proxy for expected returns relies on a belief that information surprises tend to cancel out over the period of a study and realized returns are therefore an unbiased measure of expected returns. However, I believe there is ample evidence that this belief is misplaced.*’’ We discuss this issue further in section 3 of this review.

1.2 IA2: Risk Factors are either Unknown or cannot be Reliably Estimated

This assumption is not controversial. On the contrary, the lack of consensus regarding the manner in which economic agents make risk-return trade-offs is well documented (e.g., chapter 20 of Cochrane (2001) and chapters six and seven of Campbell, Lo and MacKinley (1997) review the issues). While the four-factor model inspired by Fama and French (1993) and Carhart (1997) has become *de rigueur*, it is controversial; and, it is not based on a well-accepted theory of capital market equilibrium. Moreover, three of the four factors (i.e., size, book-to-market, and momentum) originally appeared in the literature under the guise of anomalies. These factors were later designated as risk factors purely on the basis of their ability to explain variation in returns.[3] For example, when discussing momentum in chapter 20 of his text Cochrane (2001) makes the following statement (p. 446). "*Momentum stocks move together, as do value and small stocks so a ‘momentum factor’ works to ‘explain’ momentum portfolio returns. This is so obviously ad-hoc (i.e. an APT factor that will only explain returns of portfolios organized on the same characteristic*

[3] The size, book-to-market and momentum effects were introduced by Banz (1981), Rosenberg, Reid and Lanstein (1985), and Jegadeesh and Titman (1993), respectively. Moreover, there is considerable evidence supporting the notion that the returns to these strategies are anomalous. For example, Lakonishok, Shleifer, and Vishny (1992), LaPorta et al. (1997) and Piotroski (2000)) provide evidence on the book-to-market effect.

as the factor) that nobody wants to add it as a risk factor." Nonetheless, momentum is now commonly included as a factor in empirical asset-pricing tests.

In addition, estimates of the ERR taken from factor models do not appear to be reliable. Evidence of this is provided by Fama and French (1997) who evaluate annual, industry-level estimates of the ERR and show that the temporal standard error is more than three percent for estimates based on the capital-asset pricing model and the three-factor model of Fama and French (1993). Hence, in the abstract to their paper they conclude that: "*Estimates of cost of equity for industries are imprecise. ... Estimates of the cost of equity for firms and projects are surely even less precise.*"

1.3 Summary

Implicit in the use of accounting-based estimates of the ERR is the assumption that alternative methods of estimating the ERR are infeasible. While this assumption is reasonable, its veracity is not the central issue. Rather, the central issue is that it is logically inconsistent to use an accounting-based estimate and then to proceed as if either IA1 or IA2 is invalid. Why? If one of these assumptions is invalid, a reliable ERR estimate may be obtained from either realized returns or a factor model. However, if this is possible, the reliability of accounting-based estimates is a moot point.

2. Improving Forecasts of Earnings

2.1 Models Based on Earnings Levels versus Models Based on Earnings Changes

Extant methods of estimating the implied expected rate of return using current market prices and earnings forecasts fall naturally into two groups: those based on forecasts of earnings levels and those based on forecasts of earnings changes. These methods are described in detail in numerous papers (e.g., Easton (2007) provides a comprehensive description and critique).[4] We do not repeat the details here; rather, we briefly describe the underlying models. We draw the distinction between methods based on earnings levels and those based on earnings changes because methods designed to improve earnings forecasts are more effective in the former than in the latter.[5]

2.1.1 Methods Based on Forecasts of Earnings Levels

The residual income valuation, RIV, model (generally based on a version of Claus and Thomas (2001) or Gebhardt et al. (2001)) is the most commonly-used earnings-levels-based model. Per the RIV model the ERR is the number that causes equity market value to equal the sum of: (1) equity book value and (2) the present value of expected future residual income. Residual income is estimated as expected earnings less the product of the ERR and beginning equity book value. Another earnings-levels-based model is described in Easton and Monahan (2005). In this model, the ERR is the rate that equates equity market value to the present value of multi-period forecasts of cum-dividend earnings levels.

2.1.2 Methods based on Forecasts of Earnings Changes

The models based on forecasts of earnings changes are based on the abnormal earnings growth, AEGV, model. Per the AEGV model, the ERR is the number that causes equity market value to equal the sum of: (1) capitalized expected earnings in year t+1 and (2) the present value of capitalized abnormal earnings growth, AEG, subsequent to year

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[4] Although Easton (2007) has a publication date of 2007, it reviews the literature through 2009.

[5] The reason for this is two-fold: (1) the focus of extant research and (2) empirical properties. First, as discussed in this section 2.2, extant research typically focuses either on forecasting annual earnings *levels* for a several years—i.e., t+1 through t+h—or adjusting analysts' forecasts of earnings *levels* for years t+1 through t+h. Second, regarding the empirical issue, extant models typically generate forecasts of (adjustments to) earnings (analysts' forecasts of earnings) for year t+1 that are very similar to forecasts of (adjustments to) earnings (analysts' forecasts of earnings) for year t+h. Hence, the implied forecast of the *change* in earnings (adjustment to the *change* in analysts' forecasts of earnings) obtained from these models is essentially random noise.

t+1. AEG in year t equals the difference between: (1) the expected change in earnings in year t+1 and (2) the ERR multiplied by the difference between earnings in year t and dividends in year t. For example, per the *PEG* model, which is critiqued by Easton (2004), the ERR equals the square root of the ratio of the expected change in earnings in year t+1 divided by equity market value in year t. (Easton and Monahan (2005) discuss the other AEGV models used in the literature.)

2.2 Improving data on Forecasts of Earnings

Two quite different approaches have been taken to improving the data used as earnings forecasts: (1) removing predictable errors from analysts' forecasts and (2) developing forecasts from cross-sectional models.

2.2.1 Removing Predictable Errors

Two recent papers, Larocque (2013) and Mohanram and Gode (2013), estimate and then adjust for predictable errors in analysts' earnings forecasts. Both papers estimate predictable errors via a regression (using data that are available as of year t) of analysts' forecast errors on variables that they argue are predictors of these errors. Larocque's predictor variables are lagged forecast errors, lagged abnormal stock returns, lagged equity market value, and the abnormal return between the forecast date and the earnings announcement date. Mohanram and Gode (2013) use lagged accruals; lagged sales growth; the lagged analysts' forecast of long-term earnings growth; lagged change in property, plant and equipment; lagged change in other total assets; lagged stock returns; and the revision in analysts' forecasts of earnings over the prior year. Each paper then uses its respective predictors and the estimated regression coefficients to predict the error in analysts' forecasts of year t+1 and year t+2 earnings. Both methods are effective in removing errors in forecasts of earnings levels but, not surprisingly, they are less effective in removing errors in forecasts of earnings changes. Moreover, an obvious limitation of these methods is that they are only applicable to firms that are covered by analysts.

2.2.2 Using Mechanical Models to Forecast Earnings

Hou, van Dijk and Zhang (2012) (HVZ hereafter) extend the model in Fama and French (2002) to obtain forecasts of earnings for the next two years. HVZ's model is based on a regression of year t earnings on lagged financial statement data. Their claim that they provide improved earnings forecasts and, therefore, improved estimates of the ERR is valid inasmuch as they provide forecasts for a wider set of observations (i.e., beyond the subset of observations for which researchers have access to analysts' forecasts). However, they do not compare forecast for which there is both an analyst forecast and a forecast from their regression-based model and, it seems probable that the analysts' forecasts (and the analyst based estimates of the ERR) are superior for these firms. It is also important to note that for a large portion of the observations, forecasts of earnings levels and, particularly, forecasts of earnings changes from the method in HVZ will be negative. Hence, these forecasts are unusable in estimating the ERR. Furthermore, it is important to note that two papers (Gerakos and Gramacy (2013) and Mohanram and Li (2014)) show that the earnings forecast errors from the HVZ model are quite similar to errors obtained from a random walk model, which casts considerable doubt on whether HVZ's model should be used.

3. Evaluating Estimates of the ERR

In this section and the next section we clarify several key issues related to the use and evaluation of accounting-based estimates of the ERR. The impetus for our comments is four-fold. First, and foremost, the ERR is an important construct for practitioners, policy-makers, and academics. It is, however, unobservable and, thus, estimates are used as empirical proxies. In light of this fact, the properties and construct validity of various estimates should be carefully examined and understood.

Second, accounting-based estimates of the ERR are becoming commonplace in both the accounting and finance research literatures. There is, however, conflicting empirical evidence regarding their reliability and research that evaluates these estimates is often described as controversial. We believe that the root of the controversy is not well understood or at least poorly articulated. An aim of this paper is to clarify the issues and, thereby, resolve the controversy. We explain that the approach adopted by Botosan and Plumlee (2005) (BP hereafter), which is one of the two competing evaluation approaches, is logically inconsistent with a key, implicit assumption that motivates the use of accounting-based estimates. It follows that their approach cannot yield meaningful inferences.

Third, we revisit and elaborate on an earlier paper Easton and Monahan (2005) (EM hereafter), in which we developed and implemented an alternative approach to the one used by BP. This approach integrates the implicit assumptions that motivate the use of accounting-based estimates. Hence, we argue that, relative to BP's approach, EM's approach is a more appropriate way of evaluating the reliability of accounting-based estimates of the ERR. Of course, it behoves us to elaborate on our approach so that others may draw their own conclusions about its merits and shortcomings.

Finally, in a more recent paper, Botosan, Plumlee and Wen (2011) (BPW hereafter) assert that the empirical results in EM are (p. 1119) *"... attributable to an omitted variable* *bias arising from a lack of adequate controls for new information.*" We disagree with this statement and we explain why it is incorrect.

In this section, we first provide a brief overview of the "controversy." Next, we discuss BP's approach. Finally, we describe the approach used by EM. In section four, we explain why criticisms made by BPW of research design choices made by EM are unwarranted.

3.1. Overview

Presently there are two empirical approaches for evaluating the reliability of accounting-based estimates of the ERR: (1) the approach described in BP and (2) the approach developed and described in EM. These approaches rely on different methodologies and, to some extent, generate different results, possibly leading to the label, "controversial."

We believe the controversy regarding differences in the empirical results is minimal (at best) for two, related reasons. First, while BP infer that certain estimates are reliable for their sample of firms, EM also find that certain (different) estimates are reliable for nontrivial subsets of the sample they study. We believe this fact is often overlooked and that many are under the impression that EM conclude that accounting-based estimates are never reliable. They do not. For example, see the abstract on p. 501; discussions on p. 503 and pp. 526-531; and, results in Panel C of Table 9 of EM.

Second, we believe that the reliability, or lack thereof, of a particular proxy is likely sample specific. Hence, the results in BP and EM are less relevant than the relative merits of their methodologies. In particular, we believe that interested researchers should: (1)

focus on deciding which methodology is most appropriate and (2) use that methodology to evaluate the accounting-based estimates that they estimate for their sample.

Thus, we believe the heart of the controversy relates to methodological differences. Moreover, as we explain below, these methodological differences are rooted in different implicit assumptions made by BP and EM. BP implicitly assume that the factors that determine expected returns are known and that these factors can be reliably measured. As discussed in section 1.2, there are two problems with this assumption. First, it is not supported by the data or by extant theory. Second and, more importantly, it is logically inconsistent with the motivations underlying the use of accounting-based estimates of the ERR. That is, if the risk factors are known and can be reliably measured, why not simply use them instead of potentially unreliable accounting-based estimates?

EM, on the other hand, base their approach on the assumption that realized returns are biased and noisy measures of expected returns. This assumption is one of the primary motivations underlying the use of accounting-based estimates. Hence, EM's methodology is logically consistent with the underlying research question.

Finally, we note an important caveat. We argue that EM's approach is the best extant approach. That said we recognize that all empirical approaches have limitations and rely on assumptions. We conclude that EM's approach has less limitations and relies on less restrictive assumptions than the approach adopted by BP.

3.2. Discussion of Botosan and Plumlee (2005)

BP regress accounting-based estimates of the ERR on estimates of firm-specific variables (e.g., estimated CAPM beta, equity market value, book-to-market, etc.). They use two criteria to evaluate reliability. First, they consider the sign and statistical significance of the regression coefficients. For example, a reliable proxy is one that has a positive association with estimated CAPM beta. Second, they consider r-squares: higher r-squares imply greater reliability.

Our primary concern with BP's research design is that it is logically inconsistent with the underlying research question. In particular, as discussed in section 1.2, an implicit assumption (i.e., IA2) underlying the use of accounting-based estimates is that the risk factors are unknown and/or that they cannot be reliably estimated. The fact that BP evaluate the relation between accounting-based estimates and potential risk factors suggests that they believe IA2 is false. If they do not, the motivation for their tests and the interpretation of their results is unclear. If the factors that BP use to evaluate the reliability of accounting-based estimates are not the "true" risk factors, what exactly do we learn from BP's tests? Stated another way, it is illogical to evaluate the reliability of one proxy by comparing it to another set of proxies that may also be unreliable.

Although we believe our primary concern is quite valid, we anticipate at least two counter-arguments. We refer to these as: (1) the evidence by analogy argument and (2) the proof is in the pudding argument. In the following sub-sections, we elaborate on these arguments and we explain our thoughts regarding their merits. We anticipate these arguments because we have heard them during academic workshops and/or during private conversations. These arguments also serve as a rhetorical device: by discussing them, we are able to clarify our concerns about BP's approach.

3.2.1 The Evidence by Analogy Argument

A potential argument for BP's approach is: “We know the true factor model and estimation of the risk factors is feasible for many (i.e., normal) firms but not all firms.” For instance, some firms have short trading histories or have recently experienced major structural changes (e.g., large acquisitions). For these firms accounting-based estimates are the only alternative. However, since these accounting-based estimates may be unreliable, they must be evaluated. The researcher does this by analogy. The relation between an accounting-based estimate and the risk factors is evaluated for normal firms. If the relation between the accounting-based estimate and the risk factors accords with the theory then, by analogy, the accounting-based estimate is also assumed to be reliable for the sample of “abnormal” firms.

This argument is unconvincing for two reasons. First, IA2 is not controversial; rather, there is no consensus regarding the identity of the true factor model and estimates of the factors presently used in empirical finance are fraught with error. Second, accounting-based proxies are often used to evaluate samples of firms that are arguably "normal" and, thus, researchers are not acting as if they believe the evidence by analogy argument.

3.2.2 The Proof is in the Pudding Argument

Another argument for BP's approach is as follows: “Although the economic meaning of the firm-level variables used by BP is unclear, they work—i.e., the proof is in the pudding.” In particular, some of the variables considered by BP (e.g., book-to-market and size) explain variation in average realized returns. Hence, they appear to explain variation in expected returns. Whether this variation is fully attributable to differences in risk is irrelevant. We believe this argument has some merit; it is, however, subject to several important caveats. We first describe the merits and then we provide caveats.

We agree with one part of the proof is in the pudding argument: whether an estimate of the ERR reflects risk or mis-pricing, is not the central issue. Rather, the central issue is whether a particular estimate is a reliable measure of expected return. In fact, an estimate that only reflects risk is imperfect if expected returns are also a function of non-risk factors. Why? If this is the case, we cannot use the estimate to draw unbiased inferences about the nature of expected returns. For example, tests based on it cannot reject a null hypothesis of market efficiency even if the null is false.

There are at least three important caveats regarding the proof is in the pudding argument. First, appearances can be deceiving. Lewellen, Nagel and Shanken (2010) provide evidence that the positive associations between a number of factors and portfolio-level realized returns are purely attributable to research design flaws and that once these flaws are eliminated, the associations disappear. In addition, as discussed in chapters five and six of Campbell, Lo and MacKinlay (1997), data-snooping bias and sample-selection bias are always potential concerns when testing factor models.

Second, whether some of the variables considered by BP "work" is debatable—i.e., i.e., the "proof in the pudding" is either weak or non-existent. BP include in their set of firm-level variables capital asset pricing model, CAPM, beta, a leverage measure, a measure of expected future earnings growth, and an information-risk measure. There is, however, little or no evidence that these variables are risk proxies. For example, there is little empirical evidence that supports a positive association between CAPM beta and returns. Bhandari (1988), Johnson (2004), Nielson (2006), George and Hwang (2010), Ipplolito, Steri and Tebaldi (2011), and Caskey, Hughes and Liu (2012) show that, despite well-known analytical results in Modigliani and Miller (1958), there is a *negative* relation between leverage and returns. LaPorta's (1996) evidence regarding earnings growth is based on a small sample and, thus, while interesting, it is not authoritative. Finally, there is an ongoing debate regarding the pricing of information risk and the evidence is mixed. For example, consider accruals quality. Francis, LaFond, Olsson and Schipper (2004) conclude that it is a priced factor. On the other hand, Core, Guay and Verdi (2008) provide evidence that this conclusion is unwarranted.[6]

Finally, the proof in the pudding argument is insular as it prevents us from "stepping outside the model." Dissatisfaction with factor models is one of the primary motivations for using accounting-based estimates. However, if we choose to evaluate accounting-based estimates by relating them to different factors, we cannot completely avoid the problems associated with using and testing factor models.

3.2.3 Summary

BP's approach is logically inconsistent with a key implicit assumption underlying the use of accounting-based proxies and it follows that their tests cannot generate meaningful inferences about the reliability of these proxies. Furthermore, because some of the factors that BP consider have little or no empirical or theoretical support, the potential for spurious inferences is considerable. This is not an idle concern. For example, consider the study by McInnis (2010). He shows that past evidence of a positive relation between earnings volatility and an estimate of the implied expected rate of return derived from Value Line data (i.e., the estimate BP refer to as r_{DIV}) is spurious. He demonstrates that earnings volatility and analyst optimism about long-term earnings growth are positively

[6] BPW conduct similar tests as BP; however, BPW also evaluate the: (1) risk-free rate, rf, (2) log of equity market value, LMKVL; and, (3) log of the book-to-price ratio, LBP. Including rf as an independent variable is unorthodox given that BPW claim to estimate cross-sectional regressions and for a true cross-section—i.e., a set of observations that are temporally aligned—there is no variation in the risk-free rate. BPW avoid this issue by estimating separate regressions for each year in which they pool observations from different months. Nonetheless, eight of the thirteen accounting-based proxies that BPW evaluate do not have a statistically significant association with rf. Regarding LMKVL and LBP, we know of no *equilibrium* model of agents' risk-return tradeoffs that implies that these two characteristics are risk factors. Hence, as discussed in section1.2, the interpretation of these two variables is unclear.

related. However, r_{DIV} is increasing in expected long-term earnings growth. Consequently, the positive relation between r_{DIV} and earnings volatility is mechanical and it does not imply that investors demand higher compensation for holding stocks with higher earnings volatility.

3.3. Discussion of Easton and Monahan (2005)

In this section we discuss the two-step approach developed by EM; and, we articulate some frequently asked questions about each step.

3.3.1 EM's First Step

In the first step of their analyses EM estimate regressions of realized returns on accounting-based estimates of the ERR and news proxies. A potential concern with this approach is that it appears logically inconsistent with IA1. This concern is unwarranted. Rather, EM developed their research design with the express purpose of dealing with the implications of IA1 head-on. In particular, EM develop measures of the information shocks (i.e., news proxies) that cause realized returns to differ from expected returns and they include these news proxies in their regressions as control variables.

It is important to note that EM's approach is not *ad hoc*. Rather, it is motivated by analytical results presented in Vuolteenaho (2002) who demonstrates that realized return can be decomposed in the following manner:

$$
\begin{aligned}
r_{i,t} &\approx E_{t-1}\left[r_{i,t}\right] + \left[\sum_{j=0}^{\infty} \rho^{j} \times \Delta E_{t}\left[roe_{i,t+j}\right]\right] - \left[\sum_{j=1}^{\infty} \rho^{j} \times \Delta E_{t}\left[r_{i,t+j}\right]\right] \\
&= E_{t-1}\left[r_{i,t}\right] + CN_{i,t} - RN_{i,t}
\end{aligned}
\tag{1}
$$

In equation (1): $r_{i,t}$ is the natural log of one plus stock return for firm i at time t; $E_t[\cdot]$ is the expectation operator conditional on information available at time t; ρ is a positive number that is slightly smaller than one; $\Delta E_t[\cdot]$ equals $(E_t[\cdot] - E_{t-1}[\cdot])$; and, $roe_{i,t}$ is the natural log of one plus time *t* accounting return on equity for firm *i*. $CN_{i,t}$ and $RN_{i,t}$ are referred to as cash flow news and return news.

The interpretation of equation (1) is straightforward: realized return and expected return are equal when investors do not revise their expectations about future earnings or future discount rates. However, if investors' expectations change, realized and expected return are not equal. If investors become more optimistic (pessimistic) about future cash flows, time *t* realized return will be greater (less) than expected *ceteris paribus*. On the other hand, if future discount rates are revised upwards (downwards), time *t* realized return will be lower (higher) than expected *ceteris paribus*. These results follow directly from a present value model that Vuolteenaho (2002) derives from two tautologies.

EM exploit the fact that, as shown in equation (1), the coefficients on true expected return (i.e., $E_{t-1}[r_{i,t}]$), true cash flow news (i.e., $CN_{i,t}$), and the product of negative one and true return news (i.e., $-1 \times RN_{i,t}$) are all equal to one. Hence, for each accounting-based estimate that they evaluate, EM estimate the regression shown in equation (2) below and they compare the estimated coefficient on each accounting-based estimate.

$$r_{i,t} = \alpha_0 + \alpha_1 \times ERR\_P_{i,t} + \alpha_2 \times CN\_P_{i,t} + \alpha_3 \times \left(-1 \times RN\_P_{i,t}\right) + \varepsilon_{i,t} \quad (2)$$

In equation (2): $ERR\_P_{i,t}$ is an accounting-based estimate of the expected rate of return; $CN\_P_{i,t}$ is a cash flow news proxy; $RN\_P_{i,t}$ is a return news proxy; α_0 through α_3 are estimated regression coefficients; and, $\varepsilon_{i,t}$ is an error term. $ERR\_P_{i,t}$ is calculated using data available at time *t-1* whereas the news proxies are based on data available at time *t*. The reason for this is that $ERR\_P_{i,t}$ represents the time *t-1* expectation whereas the news proxies relate to changes in expectations occurring during time *t*.

It is important to note that estimates of α_1 taken from equation (2) are affected by measurement error in the news proxies. Hence, EM do not base their conclusions about reliability solely on evidence take from the equation (2). Rather, in the second step of their approach EM develop a method that allows them to evaluate accounting-based estimates of ERR even when the news proxies are measured with error. Before discussing this section step, we address a frequently asked question about the first step of EM's approach: "*Why is it necessary to control for news? If the market is efficient, shouldn't the expected value of the news that arrives at time t+1 be zero on average and shouldn't the news arriving at time t+1 be uncorrelated with expectations formed at time t? Hence, isn't the inclusion of* $CN\_P_{i,t}$ *and* $RN\_P_{i,t}$ *unnecessary?*"

To understand why it is necessary to control for news, it is important to note that market efficiency is an *ex ante* concept with respect to information. It implies that the marginal investor is rational and, thus, at time *t*: (1) the expected value of news arriving at time *t+1* is zero and (2) the expected correlation between the news arriving at time *t+1* and expectations formed at time *t* is zero. However, market efficiency does not imply that there is no news or that *ex post* there is no correlation between the news arriving at time *t+1* and expectations formed at time *t*. In other words, market efficiency does not imply that the marginal investor is clairvoyant.

This argument for the inclusion of the news proxies often leads to a follow-up question: "*True, but for large panels of data, isn't the average value of the news equal to zero?*" The empirical evidence suggests that the answer to this question is, again, no. There is mounting evidence that, even with large panels of historical data, information shocks do not cancel out across sample observations. Furthermore, if the average news is zero for a particular sample, average realized returns are an acceptable proxy for expected returns and, thus, the reliability of accounting-based estimates of the implied expected rate of return is a moot point.

In addition, and more importantly, the evidence suggests that the average correlation between time *t+1* information shocks and time *t* expectations is also non-zero. For example, Fama and French (2002) provide evidence that persistent downward revisions in the expected market risk premium (i.e., discount rate shocks) occurred during the post-war era; and, this phenomenon caused the contemporaneous realized equity premium to exceed expectations (i.e., lower expected rates of return imply higher prices and, consequently, higher realized rates of return). These discount rate shocks did not affect all stocks equally. Rather, stocks with high loadings on the market risk factor exhibited both: (1) higher expected returns at time *t* and (2) the largest reaction to the discount rate shock occurring at time *t+1*. This implies a negative correlation between return news and expected returns. Hence, to avoid drawing spurious inferences attributable to correlated omitted variables bias, EM include a return news proxy in their regressions.

Second, it is also important to note that the return decomposition developed by Vuolteenaho (2002) and used by EM is based on two tautologies. This implies that EM do not assume, and do not need to assume, market efficiency. Unfortunately, there appears to be some confusion in the literature about this fact. For example, Lee (2010) writes the following on p. 746 of his review of Easton (2007).

> "*In the Vuolteenaho (2002) framework, which was adopted by Easton and Monahan (2005), stock returns are decomposed into innovations in cash flows or discount rates. But what if a substantial portion of each period's returns is due to ''exogenous liquidity shocks'' (or in the vernacular of behavioral finance,*

‘‘changes in investor sentiment’’) that represents neither cash flow news nor discount rate news? I think it is useful to consider a setting in which noise in price plays a more prominent role. In such a setting, the Easton and Monahan (2005) approach might not reduce measurement errors appreciably. Indeed, we would need to think more carefully about the proper benchmarks for evaluating the quality of ICC estimates."

The correct reply to Lee's comment is straightforward: Vuolteenaho's (2002) model does allow for "noise" in prices. Specifically, to derive the return decomposition, Vuolteenaho (2002) makes no assumptions about the manner in which investors form expectations, the nature of the information available, or the underlying market clearing process. Rather, the decomposition holds regardless of whether investors: (1) experience irrational mood swings in which they go from being wildly optimistic to being hopeless pessimistic; (2) throw caution to the wind on one day and scorn all types of risk the next; and/or (3) exhibit blissful ignorance on some days and are hyper vigilant on others; etc.

3.3.2 EM’s Second Step

As discussed above, EM's approach is a logical extension of the implicit assumptions that motivate the use of accounting-based *ERR* proxies. In particular, EM model the news components that cause realized returns to differ from expected returns. Hence, their approach is designed with the express purpose of dealing with IA1. Moreover, their approach is based on analytical results that are derived from tautologies. Consequently, users of EM's approach are not put in the untenable position of having to defend *ad hoc* factors or unproven theories.

That said, like all empirical approaches, the first step in EM's approach has limitations. To understand these limitations and the importance of the second step of EM’s approach it is important to note that expectations embedded in prices regarding future discount rates and future accounting numbers are unobservable. This implies that all accounting-based estimates of the ERR as well as all cash flow and return news proxies are measured with error. A well-known result in econometrics (e.g., Rao (1973), pp. 280-284 of chapter 9 of Greene (1993)) is that when all of the variables in a multiple regression are measured with error, the estimated coefficients are biased and the sign of the bias is unknown. This is true even if the measurement error in each variable is random (i.e., the measurement error is not correlated with the true values of the remaining variables or their measurement errors).

In light of the effect that measurement error has on the estimates of α_1 taken from equation (2), EM develop a second step in which they compare measurement error variances. To do this, EM rely on another, well-known result in econometrics (e.g., Garber and Klepper (1980) and Barth (1991)). Specifically, when the linear relation between the dependent variable (i.e., realized return) and the true independent variables (i.e., the true ERR, true cash flow news, and true return news) is known, we can infer the variance of the measurement error in each separate proxy variable. This result is quite pertinent in EM's research setting because, per equation (1), the coefficients on the true ERR, true cash flow news, and the product of negative one and true return news are equal to one. This is the motivation for the measurement error analyses, which are central to EM’s approach (see pp. 506-507 and Appendix B). Since conversations with numerous colleagues lead us to believe that EM do not describe them well, we elaborate on them. We do this by posing and answering four frequently asked questions.

FAQ 1: why are measurement error ***variances*** pertinent?

Measurement error is less problematic if it is constant across observations. If a particular proxy contains the same amount of measurement error for every sample observation, the proxy variable will be an accurate measure of relative differences.

Moreover, relative differences are often the issue of concern (e.g., estimated regression slope coefficients relate purely to variation across observations). However, if the measurement error varies across observations, the proxy variable will not be a reliable indicator of relative differences; and, as the measurement error variance increases, the reliability of the proxy falls. Hence, measurement error variances are the relevant issue and, thus, EM compare measurement error variances.

FAQ 2: why are some of the modified noise variables estimated by EM negative?

EM use modified noise variables to infer measurement error variances. The estimated values of some of these noise variables are negative, which seems odd given variances cannot be less than zero. However, as shown in equation (5) of EM, these modified noise variables are equal to the measurement error variance less four, unobservable covariances. Hence, depending on the relative values of the measurement error variance and these covariances, the modified noise variable may be negative.

FAQ 3: are EM comparing variances or covariances?

The answer to FAQ 2 often raises a concern that differences in noise variables are attributable to differences in the covariances rather than the measurement error variances. This is unlikely for two reasons. First, two of the covariance terms are only a function of true values and, thus, these covariances do not lead to differences across estimates. Second, the remaining two covariances are a function of the true values of the news proxies and the measurement error in the ERR estimate. While these can vary across estimates of the ERR, it is difficult to believe that: (1) errors in the researcher's ability to measure expectations at time *t* are correlated with revisions in true expectations occurring during time *t+1* and (2) even if this correlation is non-zero, there is no reason to believe its magnitude differs across estimates.

<u>FAQ 4: do the noise variables provide information about reliability on an absolute scale?</u>

No, they do not. The noise variables only serve as relative rankings. However, given that many research questions relate to relative differences, this is not too disconcerting. Moreover, there are ways of ameliorating ambiguity associated with making relative comparisons. For example, if a researcher wants to avoid the problem of "picking the best of a bad lot" he can compare his estimate of the expected rate of return to one (or more) "straw men." For instance, EM use r_{pe}, which is based on restrictive assumptions about future earnings growth, as a straw man.

To summarize. The first step of EM's approach has limitations. These limitations are attributable to the fact that all of the proxy variables included in EM's regressions, which are shown in equation (2), are measured with error. In the second step of their approach EM circumvent these limitations by comparing measurement error variances. These comparisons allow EM to rank accounting-based estimates of the ERR in terms of their relative reliability: for a particular sample of firms, the most reliable proxy is the one with the lowest measurement error variance.

4. Criticisms Made by Botosan, Plumlee and Wen (2011) of Easton and Monahan (2005)

Before responding to BPW's criticisms, it is important to note that BPW do not criticize the use of equation (2) *per se*. Rather, they take issue with the news proxies used by EM and they are especially critical of EM's return news proxy (i.e., $RN\_P_{i,t}$). Hence, we begin by elaborating on EM's return news proxy and then we explain and respond to BPW's specific criticisms. We do not elaborate further on the second step of EM's approach because it is neither mentioned nor criticised by BPW.

4.1 EM's Return News Proxy

EM measure return news in the following manner (see pp. 512-513 of EM):

$$RN\_P_{i,t} = \frac{\rho}{1-\rho} \times \left(ERR\_P_{i,t+1} - ERR\_P_{i,t}\right) \tag{3}$$

Hence, EM's time t return news proxy is a function of the time $t+1$ change in the accounting-based estimate of the ERR. This implies that there is a different return news measure for each accounting-based estimate, which makes sense: the same phenomena that determine risk levels also determine risk changes (i.e., levels and changes are inextricably linked).

In addition to being intuitive, EM's return news proxy follows directly from equation (1) and the nature of the accounting-based valuation models underlying the estimates of the ERR evaluated by EM (and BPW). To illustrate why this is true we state three facts. To our knowledge these facts are not in dispute.

Fact 1: return news is a function of the change in the expected discount rate

As shown in equation (1) above, $RN_{i,t}$ is a function of the difference between expectations formed at time t and expectations formed at time $t-1$ *(i.e.,* $\Delta E_t[\cdot]$

$= (E_t[\cdot] - E_{t-1}[\cdot]))$. Hence, $RN_{i,t}$ is a function of $(E_t[r_{i,t+1}] - E_{t-1}[r_{i,t+1}])$. However, EM's proxy relates to $(E_t[r_{i,t+1}] - E_{t-1}[r_{i,t}])$ not $(E_t[r_{i,t+1}] - E_{t-1}[r_{i,t+1}])$. In words, EM do **not** compare the time t expected return for year t+1 to the time t-1 expected return for **year t+1**. Rather, they compare the time t expected return for year t+1 to the time t-1 expected return for **year t**. This appears to be a mistake. However, it is not a mistake because of fact two.

Fact 2: for the accounting-based estimates evaluated by EM, $E_{t-1}[r_{i,t+1}] = E_{t-1}[r_{i,t}]$

The reason for this is that the accounting-based estimates of the ERR evaluated by EM (and BPW) are equivalent to internal rates of return. Consequently, EM (and BPW) are implicitly assuming that the expected rate of return is constant over the forecast horizon (i.e., $E_{t-1}[r_{i,t+j}] = E_{t-1}[r_{i,t}]$ for all j). Hence, the fact that EM use $(E_t[r_{i,t+1}] - E_{t-1}[r_{i,t}])$ instead of $(E_t[r_{i,t+1}] - E_{t-1}[r_{i,t+1}])$ is correct because, for the accounting-based estimates that EM (and BPW) evaluate, these two expressions are equivalent.

It is important to note that fact 2 does not imply that the expectation of $r_{i,t+j}$ formed in year $t-1$ equals the expectation of $r_{i,t+j}$ formed in year t (i.e., $E_{t-1}[r_{i,t+j}] \neq E_t[r_{i,t+j}]$). Investors can revise their expectations (e.g., they may become more risk averse, they can decide the firm has become riskier, etc.) but when they do they are assumed to revise the discount rate used for each period in the forecast horizon by the same amount. This leads to fact three:

Fact 3: for the accounting-based estimates evaluated by EM, $\Delta E_t[r_{i,t+1}] = \Delta E_t[r_{i,t+j}]$ for all j

This is equivalent to saying that the discount rate follows a random walk or that changes in the discount rate are permanent. When we combine fact three with facts one and two, we obtain at the following set of equalities:

$$
\begin{aligned}
RN_{i,t} &= \left[\sum_{j=1}^{\infty}\rho^{j}\times\Delta E_{t}\left[r_{i,t+1}\right]\right]=\left[\sum_{j=1}^{\infty}\rho^{j}\times\left(E_{t}\left[r_{i,t+1}\right]-E_{t-1}\left[r_{i,t}\right]\right)\right] \\
&= \rho\times\left(E_{t}\left[r_{i,t+1}\right]-E_{t-1}\left[r_{i,t}\right]\right)\times\left(1+\sum_{j=1}^{\infty}\rho^{j}\right)=\frac{\rho}{1-\rho}\times\left(E_{t}\left[r_{i,t+1}\right]-E_{t-1}\left[r_{i,t}\right]\right)
\end{aligned} \tag{4}
$$

Ergo, EM's return news proxy.

The above is compelling. A critic arguing against EM's return news proxy must explain the problem with using a proxy that follows directly from equation (1), which is tautological, and the properties of the accounting-based estimates evaluated by EM. Colloquially speaking, the critic must argue with the math. In addition, the critic must derive a suitable substitute proxy that is not *ad hoc*.[7] Again, colloquially speaking, it takes a model to beat a model.

Second, we are not arguing that the manner in which EM measure return news is correct for all accounting-based estimates of the ERR. Fact 2 is true for all of the

[7] BPW suggest that researchers control for return news by including in equation (2) the contemporaneous change in: (1) the risk-free rate and (2) a firm-year-specific estimate of CAPM beta. We have a number of concerns about this approach. Including the change in the risk-free rate in equation (2) is odd for two reasons. First, by definition, the risk-free rate has nothing to do with risk. However, most of the researchers we are familiar with use accounting-based estimates of the implied expected rate of return to evaluate whether a particular phenomenon (e.g., disclosure quality) is a priced risk factor. Second, the change in the risk-free rate is a cross-sectional constant and the relation between realized returns and the change in the risk-free rate is constant (i.e., it is not a function of the factor loadings). Hence, a straightforward way of controlling for changes in the risk-free rate is to estimate *true* cross-sectional regressions and exclude the change in the risk-free rate from the model. Suggesting the use of the change in CAPM beta is also odd given that it requires BPW to make implicit assumptions that are dubious and inconsistent with some of their other assumptions. First, BPW are implicitly assuming that the return on the market portfolio is the only priced risk factor. There is, however, an ongoing debate regarding the nature of the "true" factor model. Moreover, the assumption that market risk is the only relevant factor is clearly inconsistent with other assumptions made by BPW. In particular, on p. 1088, BPW rely on Ross' (1976) arbitrage pricing theory to motivate use of other risk factors. Second, BPW are implicitly assuming that they can develop reliable, firm-year-specific measures of beta. Extant evidence suggests, however, that this is not possible. Third, BPW are implicitly assuming that market participants never revise their expectations of the equity premium. This is a strong assumption; and, even though it is a cross-sectional constant, the change in the expected equity premium leads to cross-sectional variation in realized returns. This is attributable to the fact that the relation between realized stock return and the change in the expected equity premium is a function of the firm-specific factor loading on the expected equity premium. Finally, BPW are implicitly assuming that accounting-based proxies are irrelevant, which is inconsistent with the basic motivation for their study. If the CAPM is descriptive and beta can be measured well, the reliability of accounting-based proxies is a moot issue. Rather, we can simply use estimates based on the CAPM.

accounting-based models analysed in BP, BPW, EM and most extant studies.[8] However, in a more general model, the discount rate may vary over the forecast horizon. Hence, if an empirical technique for imputing discount rates that vary over the forecast horizon is developed, EM's return news proxy will have to be modified. This does not imply that EM's approach is flawed. It is the correct approach for the accounting-based estimates they study.

4.2 Botosan, Plumlee and Wen's (2011) Criticisms of Easton and Monahan's (2005) Return News Proxy

Notwithstanding the compelling nature of the discussion above, we respond to BPW's specific concerns so that we may further clarify the issues and let the reader decide. In order to create a basis for discussion, we provide an excerpt from BPW. Please note that we modify their text in three ways. First, we substitute our notation for BPW's notation. We do this to avoid confusion. Second, we use the original equation numbers from BPW; however, to avoid confusion, we precede each equation number with the letters BPW—e.g., we refer to equation (6) of BPW as BPW6. Finally, we use bold font to highlight certain passages or equation numbers. We do this so that we can refer to these passages in our response—i.e., "regarding the second highlighted passage…" With these clarifications in mind, we restate the relevant passage of text, which is taken from pages 1116-1117 of BPW.

> *ERRs vary across approaches as different cash flow, CF, assumptions arise from different terminal-value assumptions. Nevertheless, by construction, all ERR ~ f(CF,P), and therefore, all ΔERR ~ f(ΔCF,ΔP).*

[8] Claus and Thomas (2001) is the exception that proves the rule in the sense that, while they allow the risk-free rate to vary over the forecast horizon, they maintain the assumption that equity premium is constant over the forecast horizon.

The theoretical specification of the realized return model (i.e., equation (2)) is shown below for convenience.

$$r_{i,t} = E_{t-1}\left[r_{i,t}\right] + CN_{i,t} - RN_{i,t} \qquad \textit{(BPW6)}$$

Empirically, $r_{i,t}$ ~ f(ΔP) and $CN_{i,t}$ ~ f(ΔCF). In EM's empirical specification $RN_{i,t}$ = ΔERR ~ f(ΔCF,ΔP). Consequently, the model EM estimate can be described by the following set of relationships:

$$f\left(\Delta P\right) = E_{t-1}\left[r_{i,t}\right] + f\left(\Delta CF\right) - f\left(\Delta CF, \Delta P\right) \qquad \textit{(BPW7)}$$

EM's proxy for expected return news (ΔERR) is by construction a function of ΔCF and ΔP, which are also included in the model as dependent and explanatory variables, respectively. Stated another way, solving (7) for $E_{t-1}[r_{i,t}]$ yields:

$$E_{t-1}\left[r_{i,t}\right] = f\left(\Delta CF\right) - f\left(\Delta CF\right) + f\left(\Delta P\right) - f\left(\Delta P\right) \qquad \textbf{(BPW8)}$$

The right hand side of (BPW8) implies a product that is close to zero. *Expected return is not likely to explain realized returns under this empirical specification. Thus, while it is theoretically defensible to use the change in true $E_{t-1}[r_{i,t}]$ to capture expected return news, it is empirically problematic to use the change in an $E_{t-1}[r_{i,t}]$ proxy measured via an implied cost of capital approach for this purpose.* ***The resulting provoked circularity in the empirical model provides no role for $E_{t-1}[r_{i,t}]$ to contribute to the explanation of $r_{i,t}$, and as a result, any ICC estimate included in the model to proxy for $E_{t-1}[r_{i,t}]$ will be statistically insignificant, regardless of the validity, or lack thereof, of the ERR estimate employed.***

Frankly, it is not exactly clear to us what BPW are concerned about. Are they arguing that there is a mechanical relation between EM's return news proxy and the dependent variable; consequently, the remaining variables in the regression will have no explanatory power? Are they arguing that there is severe multicollinearity? Are they concerned that EM misinterpret the coefficient on the ERR proxy because the ERR proxy is also a component of the return news proxy? Is it some combination of these issues? Given the ambiguity, we suggest several different interpretations of BPW's statements, and then we explain why each of these are misplaced—i.e., there is no problem with the return news proxies used by EM.

4.2.1 Interpretation 1: Mechanical relation between the $R\_NEWS_{i,t}$ and $r_{i,t}$

In the first passage that we highlight BPW state "*EM's proxy for expected return news (ΔERR) is by construction a function of ΔCF and ΔP, which are also included in the model as dependent and explanatory variables, respectively.* ***.*** *Stated another way, solving (7) for $E_{t-1}[r_{i,t}]$ yields:* $E_{t-1}[r_{i,t}] = f(\Delta CF) - f(\Delta CF) + f(\Delta P) - f(\Delta P)$ *(BPW8).*"

One interpretation of this passage is that BPW are concerned that there is a mechanical relation between EM's return news proxies and realized return, which is the dependent variable in (2). This, in turn, implies that the remaining regressors will have no relation with realized return.

Is the above concern valid? The short answer is no. There is no mechanical relation. Rather, EM's return news proxy measures the extent to which the valuation numerator (e.g., expected earnings) grew at a different rate than price. If expected earnings grew faster (slower) than price, $RN_{i,t}$ is positive (negative). This makes perfect sense. If investors become more optimistic (pessimistic) about future earnings but price decreases (increases), investors must be discounting future earnings at a higher (lower) rate - i.e., the discount rate must have increased (decreased).

To clarify this point, we assume, in the interest of simplicity, that the researcher is using an accounting-based model in which price equals expected forward earnings-per-share divided by the expected cost of capital. That is, $P_{t-1} = E_{t-1}[eps_t]/E_{t-1}[r_t]$, which implies $ERR\_P_t = E_{t-1}[eps_t]/P_{t-1}$. We do this for purposes of exposition but without loss of generality.

Recall that equation (1) relates to logged variables; hence, the ERR estimate based on price to expected forward earnings is defined as follows.

$$\begin{aligned} ERR\_P_t &= \ln\left(1+\frac{E_{t-1}[eps_t]}{P_{t-1}}\right) = \ln\left(\frac{P_{t-1}+E_{t-1}[eps_t]}{P_{t-1}}\right) \\ &= \ln\left(P_{t-1}+E_{t-1}[eps_t]\right) - \ln\left(P_{t-1}\right) \end{aligned} \tag{5}$$

Combining equation (5) and equation (4) and ignoring the capitalization factor (i.e., $\rho/(1-\rho)$), we obtain the following return news proxy.

$$\begin{aligned} RN\_P_t &= ERR\_P_{t+1} - ERR\_P_t \\ &= \{\ln(P_t + E_t[eps_{t+1}]) - \ln(P_t)\} - \{\ln(P_{t-1} + E_{t-1}[eps_t]) - \ln(P_{t-1})\} \\ &= \{\ln(P_t + E_t[eps_{t+1}]) - \ln(P_{t-1} + E_{t-1}[eps_t])\} - \{\ln(P_t) - \ln(P_{t-1})\} \\ &= \ln\left(\frac{P_t + E_t[eps_{t+1}]}{P_{t-1} + E_{t-1}[eps_t]}\right) - \ln\left(\frac{P_t}{P_{t-1}}\right) \end{aligned} \tag{6}$$

Hence, the return news proxy equals the difference between two (continuously compounded) growth rates: (1) the growth rate in $(P_{t-1}+E_{t-1}(eps_t))$ and (2) the growth rate in P_{t-1}.

Equation (6) implies that if expected earnings grew at the same rate as price, the expected discount rate did not change (i.e., $RN_{i,t} = 0$). However, if expected earnings grew faster than price, the expected discount rate must have risen (i.e., $RN_{i,t} > 0$). On the other hand, if expected earnings grew slower than price, the expected discount rate must have fallen (i.e., $RN_{i,t} < 0$). It follows that the return news proxy captures the portion of the unexpected price change that is not attributable to changes in expectations about future earnings. This makes perfect sense: price in this model is a function of expected earnings and the expected discount rate and it follows that unexpected price changes are a function of changes in expectations about future earnings and future discount rates.

On inspection of equation (6) the question may come to mind: "*If you look at (6) you see that* $ln(P_t/P_{t-1})$*, which is essentially realized return at time t, shows up in the equation. Doesn't this lead to a mechanical bias?*" Again, the answer is no. Further inspection of equation (6) reveals that price-growth is, essentially, added and subtracted. What drives the equation is the extent to which earnings growth differs from price growth.

Regarding a potential mechanical relation, BPW state that "*[t]he right hand side of (BPW8) implies a product that is close to zero.*" This statement implies that $\{r_{i,t}-(CF_{i,t}-RN_{i,t})\}$, which we refer to as $RET\_LESS\_NEWS_{i,t}$, is approximately equal to zero. Hence, after controlling for the news proxies, there remains no variation in $r_{i,t}$ to explain. Consequently, the ERR proxy cannot have any explanatory power. Is this a valid point? Again, the short answer is no. The logic underlying our answer is provided below.

Equation (BPW8) does *not* follow from equation (BPW7). In particular, $RN_{i,t} \sim f(\Delta CF, \Delta P) \neq f(\Delta CF) - f(\Delta P)$. Rather, as shown in equation (6), $RN_{i,t}$ is a nonlinear function of ΔCF and ΔP. Hence, the conclusion that, after controlling for return news, $RET\_LESS\_NEWS_{i,t}$ is mathematically equal (or approximately equal) to zero is incorrect.

A potential rebuttal to the above is that "*Sure, $RET\_LESS\_NEWS_{i,t}$ isn't mathematically equal to zero but it is the empirical properties of $RET\_LESS\_NEWS_{i,t}$ that matter.*" This is a fair comment. However, descriptive statistics in Table 2 of EM show that, depending on the ERR proxy considered, the mean of $RET\_LESS\_NEWS_{i,t}$ is between 0.046 and 0.176.[9] These are nontrivial amounts given that, as shown in Table 2 of EM, the mean of $r_{i,t}$ is 0.096.

4.2.2 *Interpretation 2: Extreme multicollinearity*

An alternative interpretation of the first two highlighted passages is that EM's results are attributable to extreme multicollinearity. Specifically, there may be an approximate linear relation between the ERR proxies EM evaluate and the variables EM use to measure news. Consequently, EM's regressions are inefficient and the standard errors are so large that it is impossible to reject the null of no association.

Although it is notoriously difficult to rule out multicollinearity when there are more than two regressors (Kennedy (1992)), we are sceptical that multicollinearity is an issue. We have three reasons. First, as shown in Table 3 of EM, the correlations between the three regressors in equation (2) are not high. Regarding the different ERR proxies and the cash flow news proxy, the correlation with the highest absolute value is 0.148. The highest absolute value of the correlations between the ERR proxies (cash flow news proxy) and the return news proxies is 0.414 (0.126). Moreover, the ERR proxies that have relatively high

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[9] To make these calculations we refer to the means shown in Table 2 of EM. First, for each ERR proxy we subtract the mean of $\hat{rn}_{i,t}$ from the mean of $\hat{cn}_{i,t}$ to obtain the mean of total news. Next, to obtain the mean of $RET\_LESS\_NEWS_{i,t}$, we subtract the mean of the total news from $r_{i,t}$. Note that because $\hat{rn}_{i,t}$ varies across ERR proxies, $RET\_LESS\_NEWS_{i,t}$ also varies across ERR proxies. In particular, The mean of $RET\_LESS\_NEWS_{i,t}$ for the different ERR proxies are: r_{pe} 0.176, r_{peg} 0.095, r_{mpeg} 0.100, r_{gm} 0.075, $r_{\Delta agr}$ 0.099, r_{ct} 0.046, and r_{gls} 0.129.

correlations with one news proxy do not have relatively high correlations with the other news proxy. For example, the ERR proxy with the highest correlation in absolute value with the return news proxy, $r_{\Delta agr}$: (1) has the third (out of seven) lowest correlation in absolute value with the cash flow news proxy (0.129) and (2) has an associated return news proxy which has the lowest correlation in absolute value with the cash flow news proxy (0.018).

Second, if there is an approximate linear relation between a particular ERR proxy and the cash flow news and return news proxies, each of the news proxies has an approximate linear relation with the ERR proxy and the remaining news proxy. Consequently, all of the estimated coefficients in equation (2) will be insignificant—i.e., they will each be affected by multicollinearity. As shown in Table 4 of EM, this is not true. Rather, all seven of the estimated coefficients on $CN\_P_{i,t}$ and $RN\_P_{i,t}$ have the predicted sign and are significantly different from zero.

Finally, multicollinearity is a data problem and a well-known solution is to obtain more data (e.g., Kennedy (1992)). Consequently, for a particular sample of data, multicollinearity will be more severe for regressions estimated on partitions of the sample because these partitions contain less observations. However, as shown in EM, the opposite is true. In particular, EM partition their sample into thirds, and then estimate equation (2) on each separate partition. As shown in Panel C of Table 9 of EM, the estimated coefficients on two of the ERR proxies that EM consider (r_{mpeg} and r_{gm}) are positive for one of these partitions; and, the estimated coefficient on the ERR proxy r_{ct} is positive for two of these partitions.

4.2.3 Misinterpretation of the Estimated Coefficient on ERR Proxies

A final possibility is that because the return news proxy is a function of the ERR proxy, EM misinterpret the coefficient on $ERR\_P_{i,t}$ in equation (2). Specifically, because equation (2) can be rearranged to arrive at equation (7), which is shown below, the correct test for determining the reliability of a particular expected return proxy is to compare A_1 instead of α_1 to one. This is incorrect, however.

$$\begin{aligned} r_{i,t} &= \alpha_0 + \left(\alpha_1 + \alpha_3 \times \frac{\rho}{1-\rho}\right) \times ERR\_P_{i,t} + \alpha_2 \times CN\_P_{i,t} \\ &\quad + \alpha_3 \times \left(-\frac{\rho}{1-\rho} \times ERR\_P_{i,t+1}\right) + \varepsilon_{i,t} \\ &= \alpha_0 + A_1 \times ERR\_P_{i,t} + \alpha_2 \times CN\_P_{i,t} + \alpha_3 \times \left(-\frac{\rho}{1-\rho} \times ERR\_P_{i,t+1}\right) + \varepsilon_{i,t} \end{aligned} \tag{7}$$

To understand why A_1 should not be compared to one (which is the correct benchmark for α_1 as well as α_2 and α_3) it is important to note that A_1 equals $\{\alpha_1 + \alpha_3 \times \rho/(1-\rho)\}$. Hence, assuming ρ equals 0.95, the correct benchmark for A_1 is $\{1 + 1 \times \rho/(1-\rho)\} = 1/(1-\rho) = 20$.

Another way of saying this is that, if a researcher estimates equation (2), the correct benchmark for α_1 is 1. However, if the researcher wants to fully isolate the relation between $r_{i,t}$ and $ERR\_P_{i,t}$ she can rearrange equation (2) and arrive at equation (7). Doing so is mathematically equivalent to estimating equation (7), not equation (2). Hence, she needs to use the benchmark for A_1 that is implied by equation (7). This benchmark is 20 (assuming $\rho = 0.95$) not one.

In the table below, we show the values of A_1 implied by the estimates of α_1 and α_3 taken from Table 10 of BPW. When solving for A_1 we assume ρ equals 0.95; hence, $A1 = \{\alpha_1 + \alpha_3 \times (0.95/(1-0.95)\}$. All of the estimates of A_1 are much less than 20.

	α_1	α_3	A_1	Implied ρ*
r_{DIV}	-0.29	0.04	0.47	3.91
r_{PEG}	-0.43	0.07	0.90	2.86
r_{MPEG}	-0.31	0.03	0.26	3.85
r_{GM}	-0.39	0.03	0.18	3.31
r_{CT}	0.76	0.11	2.85	-0.37
r_{GLS}	0.46	0.18	3.88	-1.93

There are two potential criticisms of the above. First, the benchmark of 20 is ambiguous because ρ is not known with certainty. One way to determine whether this criticism is valid is to take the values of α_1 and α_3 pertaining to a particular proxy and solve for the value of $\rho*$ that sets $\{1 + 1\times\rho*/(1-\rho*)\}$ equal to $\{\alpha_1 + \alpha_3\times\rho*/(1-\rho*)\}$ (i.e., $\rho* = (1-\alpha_1)/(\alpha_3-\alpha_1)$).[10] If the implied $\rho*$ for a particular proxy is plausible, we can argue that the proxy is reliable. However, as shown above, all of the implied values of $\rho*$ are outside the interval containing zero and one, which is the interval that the true value of ρ must fall within. Hence, all of the implied values of $\rho*$ are implausible.

The second criticism is that A_1 and the implied value of ρ* are functions of both α_1 and α_3. Hence, the fact that they take on implausible values may be attributable to measurement error in the return news proxy not the ERR proxy. For example, BPW's estimate of α_1 on r_{CT} is a statistically significant 0.76. However, the estimate of α_3 taken

[10] This approach has a clear limitation: as α_1 and α_3 approach one, ρ* approaches $\pm\infty$.

from the same regression is 0.11. This is a fair comment and it further reinforces the problem with using evidence from equation (2) as the sole basis for evaluating the ERR proxies. In particular, as discussed in section three, if one or more of the regressors in equation (2) are measured with error, all the estimated coefficients obtained from equation (2) are biased—i.e., the bias is interdependent. Hence, the second step of EM's approach is key as it allows the researcher to isolate and evaluate the measurement error in the ERR proxies.

4.2.4 Additional Comments

Finally, it is important to note that the empirical evidence in EM (and BPW) is also inconsistent with BPW's argument. If there is a mechanical relation between $RN_{i,t}$ and $r_{i,t}$, we should observe three empirical results. First, as BPW point out in the second passage of text that we highlight: "*The resulting provoked circularity in the empirical model provides no role for $E_{t-1}[r_{i,t}]$ to contribute to the explanation of $r_{i,t}$, and as a result, any ICC estimate included in the model to proxy for $E_{t-1}[r_{i,t}]$ will be statistically insignificant, regardless of the validity, or lack thereof, of the ERR estimate employed.*" We agree with this statement in the sense that if there is a mechanical relation, it should be ever-present. Consequently, neither EM nor BPW should ever document a positive relation between realized return and any ERR proxy after controlling for news in the manner prescribed by EM. They do, however. As discussed above, in Panel C of their Table 9, EM show that two (i.e., r_{MPEG} and r_{GM}) of the accounting-based estimates they evaluate are reliable for one-third of the sample and one (i.e., r_{CT}) is reliable for two-thirds of the sample. Moreover, as discussed above, in their Table 10, BPW document a significant, positive relation between realized return and r_{CT} even after they use the news proxies suggested by EM.

Second, a mechanical relation between $RN_{i,t}$ and $r_{i,t}$ (severe multicollinearity between the regressors) should also destroy the relation between $CN\_P_{i,t}$ (both news proxies) and $r_{i,t}$. This does not happen, however. Rather, as shown in Table 4 of EM, there is a consistent, positive, statistically significant relation between EM's news proxies and realized returns. Finally, if there is a mechanical relation between $RN\_P_{i,t}$ and $r_{i,t}$, the r-squares taken from EM's regressions should be high. They are not. As shown in Table 4 of EM, the highest r-square is 0.30, which is much lower than what we expect to observe if one of the independent variables is "*by construction*" a function of the dependent variable.

4.3 Summary

EM's approach is a logical extension of the implicit assumptions that motivate the use of accounting-based ERR proxies. In particular, EM model the news components that cause realized returns to differ from expected returns; hence, their approach is designed with the express purpose of dealing with IA1. Moreover, their approach is based on analytical results that are derived from tautologies. Hence, users of EM's approach are not put in the untenable position of having to defend ad hoc factors or unproven theories. Finally, the news proxies EM use follow directly from the underlying analytical model and the properties of the accounting-based proxies EM evaluate; hence, criticisms made by BPW are baseless.

5. Conclusion

The expected rate of return on equity capital is a key construct. It is, however, unobservable. Hence, practitioners, policy-makers, and academics often use accounting-based proxies. This choice is made because: (1) the true factors that drive expected returns are unknown and/or cannot be measured reliably and (2) realized returns are biased and noisy. As a result, there has been considerable effort focussed on developing accounting based estimates of the expected rate of return and, more recently, on improving the forecasts of accounting earnings on which these estimates are based.

While accounting-based estimates of the expected rate of return are potentially useful, users cannot simply assume they are reliable. Rather, before an estimate is used its reliability/validity must be evaluated. The results of this evaluation will be more persuasive when the methodology is logically consistent with the reasons underlying the use of the accounting-based estimates. EM develops such a methodology. First, they base their analyses on a rigorous analytical model of the bias and noise in realized returns. Second, their news proxies follow directly from this model and the nature of the accounting-based estimates they evaluate. Finally, they exploit the properties of the analytical model to derive an econometric approach for comparing the measurement error variances of different accounting-based estimates.

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