Testing Value Relevance of Accounting Earnings: Theory and Method

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Abstract

Relevance of accounting earnings for market value of companies has been subject to numerous empirical studies. Findings of these studies generally support the hypothesis of value relevance in developed countries. Recently a growing number of papers focus on the usefulness of accounting information in transition and emerging countries. These studies adopt value relevance methodology to test for the association between accounting earnings reported by stock companies, and the value of their equity. A positive result of the test serves as proof of the quality of accounting standards, accounting practice and the local stock market. This paper investigates the theory behind value relevance tests and the methodological issues of applying such tests to emerging economies. The aim of the paper is to create methodological guidelines for future research in this area.

Keywords: value relevance, accounting earnings, equity valuation

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1. Introduction

Value relevance research has come a long way since Ball and Brown published their first paper on the usefulness of accounting earnings (Ball & Brown, 1968). This first paper was motivated by will to test a common conviction of contemporary researchers that accounting was nothing more than a ritual: accounting numbers lacked meaning and were of little use to investors (2002). Incidentally, the paper was rejected by editors of *The Accounting Review*, who argued it was not an "accounting" paper (Brown, 1989). The study of Ball and Brown laid foundations for what is now a popular method of accounting research. Various types of value relevance tests are used to investigate issues such as predicting stock returns (Setiono & Strong, 1998), or significance of alternative accounting methods (Auer, 1996; Biddle & Lindahl, 1982) and standards (Bartov, Goldberg, & Kim, 2005).

Although most value relevance studies have been carried out using data from richest countries, the number of papers devoted to emerging countries is steadily increasing. In contrast to studies of richest countries, which deal with all aspects of accounting theory, researchers from emerging countries tend to focus on the differences and similarities between their countries and the developed ones. Value relevance studies of emerging countries usually have two goals. The first is to test, whether accounting earnings are relevant for equity valuation in the local stock market. The second aim is to compare the results of the test with results obtained by previous researchers of rich countries and draw conclusions about the state of the local economy. In both cases value relevance is treated as proof of the quality and usefulness of accounting numbers.

Reliance on value relevance as an indicator of comparative quality of accounting earnings necessitates the use of a unified, robust methodology. Presently, research results are often incomparable, because the method varies from study to study. For example, studies of the Chinese market provide different conclusions depending on the choice of method. In an event study, Abdel-Khalik et al. (1999) find value relevance only in the A-share market, contrary to their expectations. This study was repeated in 2004, but this time using a price regression (Samia & Zhou, 2004). Results show value relevance in both the A and B segments of the Shanghai Stock Exchange, with the B segment scoring higher. How does one interpret the discrepancy, when the two studies used different study designs?

The aim of this paper is to create a set of methodological guidelines for value relevance research in transition and emerging countries. The following sections discusses the theory behind value relevance tests. It is argued that available theory lacks explanatory power; hence it does not

allow inferences about low quality of accounting numbers (when test results are negative). In the second part of the paper, technical methodological issues of study design and results interpretation are discussed: (1) event study vs. return regression, (2) model specification, (3) sampling period, (4) measuring unexpected earnings and (5) abnormal returns, and finally (6) methods of comparing results across markets.

2. Value Relevance Theory

Value relevance research was dominated by empirical considerations from its very beginning. Ball and Brown (1968), who were the first to attempt a value relevance test, do not make any reference to theory. Their study was motivated by their disagreement with a common opinion, at the time, that accounting "income numbers cannot be defined substantively, that they lack meaning and are therefore of doubtful utility" (Ball & P. Brown, 1968, p. 154). In their paper, they compare abnormal stock returns of firms with positive and negative unexpected incomes. Their results clearly show that stock returns are associated with earnings. Research which followed continued to take an empirical perspective on the problem of value relevance. Different econometric methods were used, but there was still no comprehensive theory behind the tests. This lack of theory has a significant impact on value relevance tests of emerging markets: it does not allow researchers to draw negative conclusions. Without a theory to explain the link between accounting numbers and stock returns we cannot determine, if low value relevance is a result of market inefficiency, low quality of accounting practice or some other factor. The discussion below outlines what theoretical background does exist and where methodological problems lie.

The first tests of value relevance were, of course, based on capital market theories prevalent at the time. For example, Ball and Brown assumed that the Efficient Market Hypothesis is maintained (P. Brown, 1989). This allowed them to calculate information value of accounting earnings (an approach which was not followed upon). They were probably aware of the Modigliani-Miller propositions, which explicitly connect firm value with its expected income (Modigliani & Miller, 1958). Recall, that Proposition One states:

$$V_j = S_j + D_j = E(x_j)/\rho_k$$

where V_j stands for firm j value, is S_j the value of its stock, D_j is the value of its debt, $E(x_j)$ is its expected return on assets, and ρ_k is the capitalisation rate for all companies in its risk class. It is thus apparent that the return on a share of stock will be equal to the return on assets less interest expense. Notice however, that Modigliani-Miller propositions use expected return, not actual return. Actual

return, which is reported in financial statements, influences stock return only indirectly – through its impact on expected earnings.

Market efficiency, the attribute of Modigliani-Miller's ideal world, is a significant concern in capital market studies. In emerging and transition economies market institutions are not well developed, which often entails market inefficiency. The question is, whether market efficiency is necessary for value relevance studies to produce reliable results. Aboody et al. (2002) argue that semi-strong market efficiency is necessary, if economic inferences are to be unbiased. However, in emerging country studies the goal is only to determine if accounting earnings are at all relevant. Even if a market is not efficient, investors and their decisions can be significantly affected by earnings information.

Efficient Market Hypothesis notwithstanding, testing value relevance requires a market where investors are free in making their decisions and where investors' decisions affect prices. Otherwise, even if accounting numbers are of highest quality, they will not have an impact on stock returns. In other words, stock prices must reflect the preferences of market participants (Abdel-Khalik, Kie Ann Wong, & Wu, 1999). Thus, the stock market must be free from manipulation by the authorities, or other people of power. Moreover, restrictions on trading must not be too strict or subject to authorities' discretion. Examples of such restrictions include setting a narrow limit on daily price fluctuations and freezing trading.

In an inefficient market preferences of investors are not reflected in prices, so accounting numbers which influence these decisions are not relevant for stock value. However, the existence of an efficient market does not necessarily imply value relevance. Accounting earnings may still be of doubtful quality: accounting methods may not be well defined, manipulation may be commonplace, internal and external controls non-existent. In such a case, rational investors will not base their decisions on accounting information. This is what value relevance tests in emerging economies are supposed to test for.

Consider, on the other hand, an emerging market where accounting information is of good quality, and the market is efficient. Let us assume, that value relevance is low, contrary to expectations. If this is indeed the case, a test of value relevance will produce a negative result; and the researcher will conclude that accounting numbers are of low quality. However, she would be wrong to draw such a conclusion without further evidence. Low value relevance can be caused by other factors that lead to relatively low importance of accounting earnings information. For example, there can be simply other information about future returns, so significant that it

overshadows accounting earnings. The negative result of value relevance test only proves, that accounting earnings do not provide significant information to investors – it does not provide any information about the causes.

The possibility of finding low value relevance even when accounting numbers are of high quality becomes apparent when one analyses even the simplest equity valuation model. According to any finance textbook stock prices are a reflection of investors' expectations about future gains from holding a share of stock. In a single-period setting this can be expressed as:

$$P_t = \frac{E(P_{t+1}) + E(D_{t+1})}{1 + R_t} \tag{1}$$

where P stands for price, D for dividend and R for the discount rate. From the single-period formula, we can infer that observed accounting earnings will affect the current valuation of stock either through expected dividends, or expected capital gains. However, expectations about capital gains are formed on the basis of other factors too: e.g. stock-market trends and expected growth of the company in the future. When the number of periods is infinite, the formula becomes the classic discounted dividends valuation model:

$$P_t = \sum_{\tau=1}^{\infty} \frac{E_t(D_{t+\tau})}{(1+R)^{\tau}} \tag{2}$$

This valuation model implies, that observed accounting earnings at time t will be relevant for valuation only to the extent to which they contain information about future dividends. Obviously, accounting earnings have limited usefulness in predicting future dividends, because they reflect mostly the effects of past transactions (Kothari & Sloan, 1992).

Ohlson (1995) developed a model of the relationship between earnings and equity valuation, which builds on the discounted dividends model in equation (2) and explicitly factors into it abnormal earnings and other market information. He defines abnormal earnings as the difference between actual return and the risk-free rate[1]:

$$x_t^a \equiv x_t - R * BV_{t-1} \ , \tag{3}$$

where x_t stands for accounting earnings, R is the risk-free rate, and BV_{t-1} is the beginning-of-period book value. If one combines this with the clean surplus rule, by which changes in book value are equal to earnings less dividend payout, the dividend at time t equals:

1 Ohlson assumes risk neutrality, and thus uses the risk-free rate for discounting cash flows.

$$d_t = x_t^a - BV_t + (1+R)\,BV_{t-1} \tag{4}$$

By substituting equation 4 into equation 2, Ohlson formulates the abnormal earnings valuation formula, in which current equity value is determined by expected future earnings above the risk-free rate:

$$P_t = BV_t + \sum_{\tau=1}^{\infty} (1+R)^{-\tau} E_t(x_{t+\tau}^a) \tag{5}$$

This formula implies, that there may be a relationship between equity value and current abnormal earnings if current abnormal earnings are indicative of future abnormal earnings. It is not much different from the discounted dividend model in this respect. The real contribution of Ohlson's model is in developing a valuation relationship which rests on the assumptions that abnormal earnings are type one autoregressive and their expected value is influenced by "other information"[2]. Ohlson includes "other information" in the model, assuming it also to be autoregressive. When these assumptions are combined, expected earnings can be expressed as:

$$E_t(x_{t+1}) = R * BV_t + \omega x_t^a + \nu_t\,, \tag{6}$$

where v_t stands for other information. Notice that this is the first equation that explicitly links current earnings with future earnings. Ohlson further develops his model into the following valuation formula:

$$P_t = BV_t + \alpha_1 x_t^a + \alpha_2 \nu_t\,, \tag{7}$$

where

$$\alpha_1 = \omega/(1+R-\omega) \geq 0$$
$$\alpha_2 = (1+R)/(1+R-\omega)(1+R-\gamma) > 0$$

and ω is the autocorrelation coefficient of abnormal earnings, γ is the autocorrelation coefficient of other information. Ohlson's valuation model explicitly links equity value with current abnormal earnings and currently available other information. Moreover, it can be reformulated, by substituting equation 3 into equation 7, which yields a linear equity valuation model:

$$P_t = BV_t + \alpha_1 x_t + \alpha_1 R\,BV_{t-1} + \alpha_2 \nu_t \tag{8}$$

The advantage of Ohlson's model is that it readily lends itself further reformulation. For example, the risk neutrality assumption can be lifted (Gode & Ohlson, 2004), earnings can be

2 Ohlson (1995) proposes a expected abnormal earnings to follow $E(x_{t+1}^a) = \omega x_t^a + \nu_t + \varepsilon_{1,t+1}$, where other information is expressed as $E(\nu_{t+1}) = \gamma \nu_t + \varepsilon_{2,t+1}$, and $\omega, \gamma \in (0,1)$.

disaggregated, as can book value and other information (Jing Liu & Ohlson, 2000). However, the model is not well formulated for empirical testing. The main methodological problem is of course modelling of "other information", which for all we know, can have a more significant impact on valuation than accounting earnings (Hope & Kang, 2005). Ohlson (2001) argues that this is indeed the case, although there is no empirical proof yet.

Neither classic finance theory, nor Ohlson's valuation model allow researchers to draw useful conclusions from negative results of value relevance tests. In both cases, low value relevance can be explained by a number of different factors ranging from market inefficiency to increased importance of "other information". Therefore, a negative test result demands explanation that goes beyond the statement of low usefulness of accounting numbers. It requires an analysis of other significant information sources and their relative importance, as well as an investigation into the state of market institutions, and the condition of accounting regulation and practice. Since all of these variables are not included in the valuation model, other than as a part of the "other information" aggregate, we do not have a method of testing such hypotheses directly.

3. Methodological Issues

Testing for value relevance in emerging economies can be performed with any of a number of empirical model specifications. While the previous section presented a discussion of issues pertaining to deficient theoretical foundations of value-relevance tests, this section presents common methodological problems which occur when researchers attempt the tests. The discussion below is focused on practical issues of study design and statistical methods. It examines models and methods which are most common in value-relevance research.

Event Study vs. Return Regression

There are two alternative approaches to empirical tests of value relevance. The first one, event study, was used in the classic Ball and Brown (1968) article. Event studies are designed to detect the influence of new information around the earnings announcement date. They look for excess returns correlated with the change of accounting earnings in a time window preceding the announcement and after earnings information is released[3]. Ball and Brown (1968) found that companies with positive abnormal earnings had significantly higher abnormal returns in months leading up to the announcement, but returns did not increase after the announcement. They concluded that up to 90% of earnings information is correctly anticipated by the market before

3 For a detailed review of event study methodology see Griffin and Zmijewski (1987).

announcement, which should be no surprise: investors collect information about important events, which influence earnings, all through the year.

Return regressions test for correlation between contemporaneous returns and accounting earnings: they use a linear valuation formula for either the price, return, or abnormal return. The great advantage of return regressions is that they allow additional variables to be included in the regression equation (components of earnings, cash flow, assets, sales and dummy variables for various other factors). However, it is important to remember that return regressions do not test for causality (Kothari, 2001). This is a result of low explanatory power of accounting theory, which was discussed in the first part of this paper. Despite these problems, return regressions are more common in value relevance research than event studies – probably because of greater flexibility, relative ease of estimation and their alignment with valuation formulae.

General Model Specification

The following sections discuss in detail one form of return regressions: the unexpected returns model. Testing for value relevance using abnormal returns and abnormal earnings is a method superior to either price or simple return regressions: by abstracting from market-wide trends, abnormal returns are specifically focused on information provided by earnings disclosure. Abnormal return regressions (Ball & P. Brown, 1968; Easton, Harris, & Ohlson, 1992; Kothari & Sloan, 1992) take the following linear form:

$$UR_{it} = \alpha_0 + \alpha_2 UEY_{it} + \varepsilon_{it}\,, \tag{9}$$

where UR_{it} stands for unexpected returns inclusive of dividends, and UEY_{it} stands for unexpected earnings yield. Because unexpected earnings yield is equal to abnormal earnings per share scaled by beginning of period share price, the scaling variable is the same for both the independent and the dependent variable. It follows that if more variables, like size or elements of earnings, are included in the equation, they should be also calculated on a per share basis and scaled by share price. This way scale effects of changes in the number of shares or book value per share are removed from the regression. Otherwise, the correlation coefficient estimates would be biased (S. Brown, Kin Lo, & Lys, 1999).

Sampling Interval and Date

Unexpected returns regression tests for the correlation between contemporaneous abnormal returns and abnormal earnings. This implies that both variables have to be sampled over the same period: usually a year. Since earnings information disclosed in a financial statement pertains to a

specific period, it is logical to use the reporting period as the sampling interval. On the other hand, earnings information is not available immediately at the end of the reporting period: there is always a delay of 2-3 months before an audited annual report is announced. The announcement date is not a problem in event studies, which analyse the variance of stock returns around that specific date. But in return regressions, a choice has to be made: align sampling date with the end of reporting period, or move the sampling date to announcement date.

If sampling date is aligned with the end of the reporting period, the regression tests for correlation between two variables measured over the same period. If the sampling date is moved to announcement date, the test is for correlation between variables measured over two different, only partly overlapping periods: reporting year for earnings, and announcement-to-announcement year for returns. Consequently, the variance in returns caused by events after the end of reporting period will not be reflected in the earnings variable; regression coefficients will be biased towards zero. Incidentally Easton, Harris and Ohlson (1992) show that regression coefficients increase with the length of sampling period: r-squared doubles when the periods is increased from five to ten years. One of the reasons for higher relevance over long periods is that the delay between end of reporting period and announcement becomes less significant. For example, if there is an average delay of three months, this constitutes a quarter of a year, but only a 2.5% of a ten year period.

Another argument for using the end-of-period date, rather than announcement date, is that most earnings information is already known before the announcement of audited annual statement. Information from the first three quarters is already known. Most external and internal events which could have influenced earnings are also known by that time. Accounting data for the fourth quarter is known before announcement of annual report. Although no empirical tests have been performed, it seems likely that the relative value of incremental information of past annual earnings available after the end of a reporting period is lower than the noise of information about next period's earnings, which is discounted by the market.

Measuring Unexpected Earnings

Abnormal earnings are the difference between earnings expected by investors and the actual amount of profit. What investors expect is, of course, not directly observable, so proxies have to be used instead. Notice, that no matter what proxy we use, it will be still only an approximation of the actual expectations – it will measure expectations with an error. The measurement error will then have an impact on estimation results, producing biased coefficient estimates (Griffin & Zmijewski, 1987). Thus, attempts should be made to select proxies with minimum measurement error.

The simplest way to measure unexpected earnings is to assume that investors expect earnings to remain unchanged. Then, the measure of abnormal earnings will be simply their first difference. Another approach was suggested by Ohlson (1995), who defined abnormal earnings as earnings above the risk-free rate of return. He used the risk-free rate, because he assumed stock to be risk neutral. If we lift this assumption a risk premium will have to be added on top of the risk-free rate; Ohlson suggests using either the cost of capital or average market return on equity as a measure of expected return. Most empirical studies use a different approach, which can be traced back to Ball and Brown (1968) again: investors form expectations about a firm's future earnings by assuming it will follow the market in the way it did before. Unexpected earnings are then measured by residuals from regressing a firm's earnings yield on mean earnings yield in the period:

$$EY_{it} = \alpha_i + \beta_i \bar{EY}_t + UEY_{it} , \qquad (10)$$

where UEY_{it} is the residual, unexpected earnings yield of firm i in period t. This approach assumes, that investors can form accurate predictions about average earnings in the market, and use this information to estimate earnings of each firm. It is also assumed that a firm's earnings follow the market in the same way from year to year – which may be questioned in unstable, emerging economies. Instability of regression coefficients raises a question of the sample on which to estimate the coefficients. Although in theory it should be done on a holdout period preceding the test period, if the sample is short one has to estimate the coefficients within the test sample. When the sample length allows at least a short holdout period, coefficients can be estimated separately for each year, using information from all preceding years. This way the coefficients will adjust to changes in the market and the expectations regression will be estimated on a sample of increasing length.

The final method of measuring unexpected earnings is to use actual forecasts: either from a forecasting model, or from historical market analysts' reports. A forecasting model has to be estimated only on data from periods preceding the test period, which again raises the problem of sample length. The most common approach to forecasting earnings is to use a random walk model for annual data or a seasonal random walk for quarterly earnings. Different specifications of the random walk model are discussed by Griffin and Zmijewski (1987).

Measuring Abnormal Returns

Measurement of abnormal returns is subject to the same problems as the measurement of abnormal earnings discussed above. Abnormal returns are defined as the difference between

expected returns and their actual value: $R_{it} - E(R_{it})$. Alternative measures of abnormal returns are well discussed by Strong (1992). The model used most often in extant value relevance research is called the Market Model. Under this model firm's returns are expected to follow a market index:

$$R_{it} = \alpha_i + \beta_i R_{mt} + UR_{it} \,, \tag{11}$$

where R_{it} is the return on a share of stock of firm i, R_{mt} is the return on a market index and UR_{it} is the estimation residual: unexpected returns. The estimation of regression coefficients should be carried out on a holdout sample, or possibly recalculated again for each period, as is the case with abnormal earnings discussed above. In practice, coefficients are often estimated within the test sample.

Comparing Results Across Markets

The ultimate goal of value relevance research in developing countries is the comparison of value relevance with results from other, especially more developed markets. Of course, for a comparison to be valid, value relevance tests have to be performed using the same, or at least very similar methodology. In the perfect situation one would compare estimation results of the same abnormal returns model on two different samples. There are then two sets of numbers one can compare: earnings coefficients and correlation coefficients (r-squared).

The earnings coefficient provides information about the strength with which abnormal returns react to unexpected earnings. Whether the correlation is stronger or weaker is beside the point here: one does not expect accounting earnings to actually explain all variations of market prices. We would however, expect a firm that has unexpected earnings equal to zero to have no unexpected returns on its stock. This implies estimation intercept of zero. Moreover, we would expect unexpected returns to increase by as much as unexpected earnings increase. This in turn implies an earnings coefficient equal to one. Thus the first test for the strength of value relevance is to test two hypotheses using a standard t-test: intercept equal zero, and the earnings coefficient equal one.

When a comparison of regression coefficients between two markets is needed, one should combine the two samples in one regression model. The two samples need to come from the same period, of course. Dummy variables can be used to distinguish between samples: companies from different samples are assigned value one on their respective dummy variable, while all other companies are assigned value zero. For two markets, regression equation (9) takes the form:

$$UR_{it} = \alpha_0 + \alpha_1 UEY_{it} + \beta_0 D_i + \beta_1 D_i * UEY_{it} + \varepsilon_{it} \,, \tag{12}$$

where D_i is the dummy variable for the second of two markets[4]. To test for the difference in

4 The number of dummy variables has to be smaller than the number of markets in order to avoid multicolinearity.

coefficients one needs to test the null hypothesis β_0, $\beta_1 = 0$. A one sided t-test should be used to determine whether β_1 is positive, provided we expect the second market to have higher value-relevance. If there are more markets, a tests for the equality of coefficients can be performed[5]. The same method can be used for comparing value relevance across periods. Dummy variables are then created for specific periods rather than markets.

The approach described above provides strongest evidence of the difference in value relevance between two markets, but it can only be used if the researcher acquires data from two markets. More often papers test only one market and then compare results with previous research performed in another market. In this case, the only option is to calculate confidence intervals for both sets of results and compare them, or to perform a t-test to check if coefficient in one market is equal to the coefficient value in the other.

Correlation coefficient (R^2) is often used as the indication of value-relevance, and its differences are interpreted as proof of higher or lower value relevance. The practice of using the correlation coefficient instead of confidence intervals for parameters stems from the belief in R^2 as the main, and sometimes only, measure of the strength of correlation. However, as was discussed above, tests for value relevance should not look for perfect fit between earnings and returns. Moreover, tests for difference of correlation coefficients are not well developed. The only test that compares two models used in accounting literature is Vuong (1989) model selection test. However, test was developed for selecting between alternative model functions, not for comparing correlation strength between two samples. Moreover, it does not allow comparison with extant results.

4. Conclusion

This paper discusses the theory and methodology of value relevance tests. It focuses especially on tests of emerging economies. The discussion section shows that value relevance lack a supporting theory, which would allow inferences about the quality of accounting numbers. The methodology section outlines methods for performing tests with the use of abnormal returns regression. Guidelines are presented for model formulation, sampling and proxies for variables. Finally, statistical methods for the comparison of value relevance across markets are discussed.

Therefore, one market serves as the reference base and is not assigned a dummy.

5 To test for equality of coefficients apply the test for a linear combination of coefficients (e.g. $\beta_1 = \beta_2$ implies $\beta_1 - \beta_2 = 0$).

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