

Value Relevance and Persistence of Earnings Components: The Case of CNX Infrastructure Index

Abstract

This empirical study examines the persistency and predictive ability of earning components (accruals and cash flows) and their respective role in equity valuation in Indian Infrastructure sector for a period of 8 years (2004-2011). The empirical research, with the background setting of the models developed by Ohlson (1995, 1999), uses Panel data analysis to provide evidence of the value relevance of abnormal earnings and book value in explaining market value of equity in Indian Infrastructure sector. The study, however, fails to provide any evidence regarding incremental value relevance of accruals or cash flows over and above abnormal earnings and book value in explaining market value of equity. The findings suggest that abnormal earnings and cash flow component of earning show stationary autoregressive process.

Keywords: Value relevance, CNX Infrastructure, Earning Components, Persistence, Equity Value

Introduction

The basic purpose of published accounting financial statements is to provide relevant information to investors so as to enable them arrive at right valuation of assets. This objective is achieved by understanding the association between asset prices and underlying financial statement information popularly known as value relevance studies. According to Barth, Beaver and Landsman value relevance is defined in the extant literature as the "association between accounting amount and security market variables". Value relevance research, which is one of the branches of capital market research, has always been an area of academic interest given the need and desire to understand right valuation of assets. As a consequence, a number of empirical research have originated over the years, particularly in developed countries (US, UK) attempting to test their value relevance association. Most of the studies conducted, despite producing varied results, have confirmed the association between accounting variables and equity market values.

Objectives of the study

Although a number of empirical research have originated over the years on value relevance of accounting variables and their role in equity market valuation in developed countries there has been a lacunae regarding the same in emerging markets particularly India. This study attempts to fill this gap by providing empirical evidence on accounting variables that help explain equity stock prices in India.

Based on models developed by Ohlson (1995, 1999), this study as a main theme, investigates the predictive ability of accounting variables, namely abnormal earning, book value, accruals and cash flow over a period of time and their respective role in equity valuation in Indian scenario. The study attempts to empirically test the persistence of various earnings components and their ability to predict market value by pooling cross sectional data on abnormal earnings, book values, accruals and cash flows for a period of 8 years on CNX Infrastructure Index.

Literature Review

Capital market research has attracted considerable academic research over the past three decades with particular attention being ascribed to understanding the relationship between relationship accounting numbers and equity market value also popularly known as value relevance research. According to Barth, Beaver & Landsman (2001), value relevance research examines the statistical association between accounting information (e.g., book values, accrual flow measures, cash flow measures, and thereof derived constructs such as financial ratios and multiples) and equity market variables (typically stock prices or stock returns). In the early era, Ball & Brown (1968) and Beaver (1968) in their seminal research provides compelling evidence regarding presence of association and information content in earnings announcements by conducting event and association studies. The next three decades in capital market research were concentrated on abnormal returns and accounting disclosure issues. In early 1990's, value relevance literature again began to gain interest through seminal work of Ohlson (1995) and Penman (1989, 1998) who developed valuation models to base company valuation directly on accounting numbers. Ohlson (1999) developed a residual income valuation model (RIM), which modeled firm value as a function of book value of equity and present value of abnormal earnings. Beyond 1990's the literature indicates a number of value relevance various studies using different forms of Ohlson's model. The various studies, performed in different markets, although indicates conflicting results as to whether there is an increasing or decreasing trend in the value relevance of accounting data, none of the studies disprove that a relationship exists.

The Ohlson (1995) model

Ohlson (1995) model basically expresses the market value of equity as sum total of book value of existing assets, adjusted for abnormal earnings and other information that modifies the prediction of future profitability. In his work, Ohlson (1995) has considered the discount rate as risk neutral or risk free. In Ohlson (1995) model, one of the assumptions made is that of persistency or autocorrelation of abnormal earnings. Ohlson assumes that abnormal earnings follow a first-degree autoregressive process AR (1). The model also assumes that there is another variable (other information) which impacts forecasting of future abnormal earnings.

The Ohlson (1999) model

Ohlson (1999) which is an extension of Ohlson (1995) model develops a concept of transitory earnings and contrasts the source of earnings to "core" (or recurring) earnings. His study shows that any two of the following three attributes of transitory earnings imply the third: i) forecasting irrelevance

with respect to next-period aggregate earnings, (ii) value irrelevance, and (iii) unpredictability. The paper makes the case that the current dirty surplus items make sense, especially if one expands the valuation perspective to also allow for agency considerations.

Research Methodology and Hypothesis

Research Design

To develop a hypothesis for studying whether various earning components with respect to valuation has statistically significant predictive ability of the market value, we use a generalized version of Ohlson (1999) model which comprises of following four equations:

$$X_{t+1}^a = \omega_{11} X_t^a + \omega_{12} x_{2t} + \omega_{13} BV_t + \epsilon_{1t+1} \quad (1)$$

$$x_{2t+1} = \omega_{22} x_{2t} + \omega_{23} BV_t + \epsilon_{2t+1} \quad (2)$$

$$BV_{t+1} = \omega_{33} BV_t + \epsilon_{3t+1} \quad (3)$$

$$MV_t = BV_t + \alpha_1 X_t^a + \alpha_2 x_{2t} + u_t \quad (4)$$

where x_t^a is abnormal earnings defined as earnings less a normal return on equity book value. x_2 in above model implies transitory earnings (the model applies to any component of earnings and can be either accruals or cash flows). MV_t and BV_t are market value of equity and book value of equity respectively at time t. ω_{11} implies persistence of abnormal earnings; ω_{12} is the incremental effect of accruals or cash flows on abnormal earnings; ω_{13} is the incremental effect of lagged book value of equity on abnormal earnings; ω_{22} implies persistence of accruals or cash flows, ω_{23} is the effect of lagged book value of equity on accruals or cash flows; ω_{33} signifies persistence of book value of equity; α_1 is the incremental effect of abnormal earnings on market value of equity and α_2 is incremental effect of accruals or cash flows on market value of equity.

H1 - Abnormal earnings follow an autoregressive process Accrual and cash flow components of earnings help in forecasting future abnormal earnings incremental to abnormal earnings and book value

Abnormal earnings are said to be transitory if $\omega_{11} = 0$. If abnormal earnings are not entirely transitory, then higher the ω_{11} , the more predictable is the abnormal earning component. Thus if abnormal earnings is positively autocorrelated, $\omega_{11} > 0$. Thus our null hypothesis is $\omega_{11} = 0$. Although Ohlson (1999) models x_2 as transitory earnings, the model can be applied to any component of earnings. In our model, x_2 is either accruals or cash flows from operation.

I2 - Accrual and cash flow components of earnings follow an autoregressive process

Equation 2 in Ohlson generalized model describes the autocorrelation or persistence of that particular earning component. Earnings are said to be transitory if $\omega_{22} = 0$. If earning components are not entirely transitory, then higher the ω_{22} , the more predictable is the earning component. Thus if accruals and cash flows are positively autocorrelated, $\omega_{22} > 0$ for each component. Thus our null hypothesis is $\omega_{22} = 0$.

I3 - Accrual and Cash flow component of earnings enhances explanatory power for Market value of the equity incremental to abnormal earning and book value

Equation (4) is the valuation equation based on the information dynamics in equations (1) through (3). α_2 is the valuation multiple on x_2 i.e., accruals or cash flows. Similar to the interpretation of ω_{12} in equation (1), α_2 reflects the incremental effect on valuation from knowing x_2 . If both earnings components have the same relation with equity value, α_2 will equal zero, and thus knowing that component of earnings will not help in explaining equity value. Thus we test the null hypothesis that $\alpha_2 = 0$.

Research Method - Panel Data Regression Estimation

The study uses Panel data regression model which takes into effect both cross sectional and time variations. The study uses unbalanced panel data set since data is not available for all firms for all years. Within Panel data analysis, the study uses two way fixed effect model which allows for both cross sectional and temporal variations. The method allows intercept to vary both across firms and in time.

The study introduces two Linear Information Models, LIM1 and LIM2 for each earnings component separately (accruals and cash flows) using seemingly unrelated regression and permitting regression errors to be correlated across equations. The two systems of equations are:

LIM1: Accrual system

$$NI_{it}^a = \omega_{10,i} + \omega_{11}NI_{it-1}^a + \omega_{12}ACC_{it-1} + \omega_{13}BV_{it-1} + \varepsilon_{1it} \quad (1a)$$

$$ACC_{it} = \omega_{20,i} + \omega_{22}ACC_{it-1} + \omega_{23}BV_{it-1} + \varepsilon_{2it} \quad (2a)$$

$$BV_{it} = \omega_{30,i} + \omega_{33}BV_{it-1} + \varepsilon_{3it} \quad (3a)$$

$$MV_{it} = i_{0,i} + i_1BV_{it} + \alpha_1NI_{it}^a + \alpha_2ACC_{it} + u_{it} \quad (4a)$$

LIM2: Cash flow system

$$NI_{it}^a = \omega_{10,i} + \omega_{11}NI_{it-1}^a + \omega_{12}CFO_{it-1} + \omega_{13}BV_{it-1} + \varepsilon_{1it} \quad (1b)$$

$$CFO_{it} = \omega_{20,i} + \omega_{22}CFO_{it-1} + \omega_{23}BV_{it-1} + \varepsilon_{2it} \quad (2b)$$

$$BV_{it} = \omega_{30,i} + \omega_{33}BV_{it-1} + \varepsilon_{3it} \quad (3b)$$

$$MV_{it} = i_{0,i} + i_1BV_{it} + \alpha_1NI_{it}^a + \alpha_2CFO_{it} + u_{it} \quad (4b)$$

Abnormal earnings, NI_{it}^a equals $NI_{it} - rBV_{it}$, where BV is equity book value and net income, NI, is income before extraordinary items and discontinued operations. To calculate abnormal earnings, r (risk free rate) has been set $\sim 8\%$. During the years under study, the 10 year G sec rate (government security) has hovered between 5% and 9%. The 10 year Government security rate can be taken as long term risk free rate for the study conducted as it represents the sum of long term inflation and real rates in the economy. Net accruals, ACC, is the difference between net income and cash from operations, CFO, i.e. $ACC = NI - CFO$. MV is the market value for firm i at year end t and ε is residual for firm at year end.

Data and Sample

Source of Data

The underlying index of the empirical study is CNX Infrastructure Index, which represent approximately 75 percent of the free float market capitalization of the stocks forming part of infrastructure sector universe in India. CNX Infrastructure index includes top 25 companies from Telecom, Power, Port, Roads, Air, Railways, Shipping and other utility services. The CNX Infrastructure index has a base date of Jan 1, 2004 and a base value of 100. To construct the data sample historical data has been taken from Ace equity (Accord Fintech) database.

Time Period of Study

The period of study is based on 8 year sample from 2004 to 2011. A year for the purpose of sample classification starts from April of the year concerned and ends in March of the following year. For example, the 2004 sample starts from April 1, 2003 and ends at March 31, 2004.

Selection Criteria

For a firm to qualify for inclusion in the sample, following criteria was laid down:

- The firm must be a constituent of CNX infrastructure index
- The firm must have (at the end of the fiscal year) all required data including, but not limited to, book values, price, earnings and cash flows in the Ace equity (Accord Fintech) database. Cases with missing data were eliminated.

c) Non surviving firms were eliminated from the dataset.

Empirical Results

Descriptive Statistics

Table 1 reports the characteristics for each of the variables used in this study. Panel A provides the descriptive statistics for the variables used in the models. Panel A reveals that, on average, the market value of equity exceeds the book value of equity, indicating that equity book value alone is insufficient to explain equity market value in India. The mean value of abnormal earnings (NI_a) is 12.81 with the standard deviation 21.09. Cash flows from operations (CFO) have a mean value of 23.52 with a standard deviation of 27.94 and a median of 14.51. Panel A also reveals that, on median/mean basis, accruals are negative (or marginally positive) and cash flows are positive. This is consistent with depreciation expense being included in accruals but capital expenditures being included in investing cash flows. Also cash flow from operations (CFO) has a larger standard deviation than accruals.

Panel B shows the correlation matrix for the set of independent variables. Abnormal Earnings (NI_a) are significantly positively correlated with cash flow from operations (CFO). Cash flow from operations is significantly positively correlated with book value per share. On the other hand, accruals are significantly negatively correlated with operating cash flow. The correlation coefficient between CFO and ACC is -0.41.

**Table 1: Descriptive Statistics
(Sample of 740 Observations, 2004-2011)**

Panel A: Descriptive Statistics

Description	Variable	Mean	Median	Std dev
Market value	MV	636.5	314.72	796.03
Book Value	BV	152.7	98.29	134.61
Cash Flow	CFO	23.52	14.51	27.94
Abnormal earnings	NI ^a	12.81	5.68	21.09
Accruals	ACC	0.83	-1.40	17.87

Panel B: Correlation Matrix Between Variables

VARIABLES	Price	BV	CFO	NI	ACC
Price	1.00				
BV	0.46	1.00			
CFO	0.56	0.65	1.00		
NI ^a	0.59	0.50	0.69	1.00	
ACC	0.08	0.08	-0.41	0.28	1.00

Results of Panel Data Estimation

Abnormal Earnings Equation

Table 2, panels A and B, presents regression summary statistics corresponding to the abnormal earnings equations (1a) and (1b) under LIM1 and LIM 2 for all firms (based on Panel data regression). The coefficient estimates, t statistics, and adjusted R² values are presented each panel of Table 2 and in all subsequent tables.

With regards to our first research hypothesis, the results (panel A) reveals that coefficient on lagged abnormal earnings, ω_{11} , is positive and significant for the dataset (0.72). The regression results implies that abnormal earnings follow autoregressive process, as such abnormal earnings of a particular year is positively related to one year lagged abnormal earnings in a statistically significant manner.

Panel A shows that on average, accruals are not incremental informative regarding future abnormal earnings. Thus we reject forecasting relevance of accruals, i.e., we accept the null hypothesis that $\omega_{12} = 0$. This implies that inclusion of one year lagged accrual as a variable does not help in forecasting future abnormal earnings incremental to abnormal earnings and book value.

Panel B reveals inference consistent with those of accruals in panel A. Panel B reveals that cash flows are also not significantly incremental informative regarding forecasting future abnormal earnings. Thus we reject forecasting relevance of cash flows also, i.e., we accept the null hypothesis that $\omega_{12} = 0$. Panel B also reveals that persistence of abnormal earnings is significant and positive (0.75). Also the coefficient of abnormal earnings is lower in case of cash flows compared to that of accruals.

Finally, the coefficient on lagged book value, ω_{13} , is not significant both in case of accruals and cash flows thereby suggesting its incremental informative irrelevance in explaining current period abnormal earnings.

Table 2: Summary statistics from Panel Data Regressions of abnormal earnings on lagged abnormal earnings and accruals or cash flows

Panel A: Accruals: $NI_{it}^a = \omega_{10,i} + \omega_{11}NI_{it-1}^a + \omega_{12}ACC_{it-1} + \omega_{13}BV_{it-1} + \varepsilon_{1it}$

Dependent Variable: NI_{it}^a

Method: Panel Least Squares

White heteroskedasticity-consistent standard errors & covariance

R-squared: 73%

Variable	Coefficient	t-Statistic	Prob.
-1	0.7247	3.0182**	0.0041
-1	0.0919	0.6214	0.5374
-1	0.0026	0.1869	0.8525

**Significant at 5% level

Panel B: Cash Flows: $NI_{it}^a = \omega_{10,i} + \omega_{11}NI_{it-1}^a + \omega_{12}CFO_{it-1} + \omega_{13}BV_{it-1} + \varepsilon_{1it}$

Dependent Variable: NI_{it}^a

Method: Panel Least Squares

White heteroskedasticity-consistent standard errors & covariance

R-squared: 72%

Variable	Coefficient	t-Statistic	Prob.
NI_{it}^a	0.7524	2.5534**	0.0140
CFO_{it-1}	0.0040	0.0308	0.9755
BV_{it-1}	0.0021	0.1630	0.8712

**Significant at 5% level

Accruals and Cash flows Autoregression results

Table 3, panels A and B, presents regression summary statistics corresponding to the earnings components autoregression equations (2a) and (2b) for all firms.

With regards to our second research hypothesis, the results in Table 3 (Panel A) reveals that for accruals, ω_{22} , autoregressive process is not stationary for the empirical dataset. The regression results imply that the accruals does not follow autoregressive process; as such accrual of a particular year is not related to one year lagged accrual in a statistically significant manner. The estimated coefficient on lagged accrual,

ω_{22} , is positive (0.348) but insignificant (1.322). Thus we accept the null hypothesis that $\omega_{22} = 0$ in case of LIM1.

Panel B reveals inference inconsistent with those of accruals in Panel A. Panel B reveals that for cash flows, ω_{22} , autoregressive process is stationary for the empirical dataset. The regression results implies that the cash flows follow autoregressive process, as such cash flow of a particular year is positively related to one year lagged cash flow and book value of equity in a statistically significant manner. The estimated coefficient on lagged cash flow, ω_{22} , is positive (0.379) and significant (2.84). Thus we reject the null hypothesis that $\omega_{22} = 0$ in case of LIM 2.

Table 3: Summary statistics from Panel Data first order autoregression of Accruals and Cash Flows

Panel A: $ACC_{it} = \omega_{20,i} + \omega_{22}ACC_{it-1} + \omega_{23}BV_{it-1} + \varepsilon_{2it}$

Dependent Variable: ACC_{it}

Method: Panel Least Squares

White heteroskedasticity-consistent standard errors & covariance

R-squared: 29%

Variable	Coefficient	t-Statistic	Prob.
ACC_{it-1}	0.3482	1.3226	0.1924
BV_{it-1}	0.0101	0.4606	0.6472

$$\text{Panel B: } CFO_{it} = \omega_{20i} + \omega_{22}CFO_{it-1} + \omega_{23}BV_{it-1} + \varepsilon_{2it}$$

Dependent Variable: CFO_{it}

Method: Panel Least Squares

White heteroskedasticity-consistent standard errors & covariance

R-squared: 58%

Variable	Coefficient	t-Statistic	Prob.
CFO_{it-1}	0.3797	2.844**	0.0061
BV_{it-1}	0.0736	3.382**	0.0015

**Significant at 5% level

Market Value Equations

Table 4, panels A and B, presents regression summary statistics corresponding to the valuation equations (4a) and (4b) for all firms.

We address our third hypothesis by estimating the relation between equity market value and book value, abnormal earnings, and the earnings component. Regarding the third hypothesis, Table 4, panel A, reveals that coefficient on abnormal earnings, (α_1) and book value (i_1) are positive and significant i.e. they have significant explanatory power in their relation with market value. Panel A also reveals that α_2 , the coefficient on accruals, is not significantly different from zero for all firms. This implies that accrual component of earnings

does not enhance explanatory power for market value of the equity incremental to abnormal earnings and book value in Indian Infrastructure sector.

Panel B reveals inference consistent with those in Panel A. Panel B reveals that for LIM 2, coefficient on abnormal earnings and book value are positive and statistically significant. However α_2 , the coefficient on cash flows, is not significantly different from zero for all firms. This indicates that the cash flow component of earnings is not incrementally valuation relevant. We therefore accept the null hypothesis that $\alpha_2 = 0$. This implies that cash flow component of earnings does not enhance explanatory power for market value of the equity incremental to abnormal earnings and book value.

Table 4: Summary statistics from Panel Data Regressions of market value of equity on book value, abnormal earnings and earnings component

$$\text{Panel A: } MV_{it} = i_{0,i} + i_1BV_{it} + \alpha_1NI_{it}^a + \alpha_2ACC_{it} + u_{it}$$

Dependent Variable: MV_{it}

Method: Panel Least Squares

White heteroskedasticity-consistent standard errors & covariance

R-squared: 90 %

Variable	Coefficient	t-Statistic	Prob.
BV_{it}	1.5172	4.225**	0.0001
NI_{it}^a	20.1045	9.832**	0.0000
ACC_{it}	-2.3669	-0.9890	0.3279

**Significant at 5% level

$$\text{Panel B: } MV_{it} = i_{0,i} + i_1BV_{it} + \alpha_1NI_{it}^a + \alpha_2CFO_{it} + u_{it}$$

Dependent Variable: MV_{it}

Method: Panel Least Squares

White heteroskedasticity-consistent standard errors & covariance

R-squared: 89 %

Variable	Coefficient	t-Statistic	Prob.
BV_{it}	1.3839	3.273**	0.0020
NI_{it}^a	17.9167	4.606**	0.0000
CFO_{it}	2.0128	0.7967	0.4298

**Significant at 5% level

Summary and Concluding Remarks

This study attempts to investigate the predictive ability of accounting variables, namely abnormal earnings, book value, accruals and cash flow over a period of time and their respective role in equity valuation in Indian infrastructure index with the background setting of the models developed by Ohlson (1999). The study uses Panel data regression methodology on CNX Infrastructure Index to carry out the empirical test.

The results of the study finds that:

- 1) abnormal earnings follow autoregressive process, as such abnormal earnings of a particular year is positively related to one year lagged abnormal earnings in a statistically significant manner.
- 2) accruals and cash flows are not incremental informative regarding future abnormal earnings i.e. inclusion of one year lagged earnings component (accruals or cash flow) as a variable does not help in forecasting future abnormal earnings incremental to abnormal earnings and book value.
- 3) accrual component of earnings does not follow autoregressive process whereas cash flow component of earnings show autoregression i.e. current cash flow is important for predicting future cash flow.
- 4) abnormal earnings and book value have significant explanatory power in their relation with market value.
- 5) both earnings components (accruals or cash flows) are value irrelevant in relation to market value i.e. accruals or cash flow component of earnings does not enhance explanatory power for market value of the equity incremental to abnormal earnings and book value.

Limitation of study

The study includes all firms that have been continually listed throughout the period 2004-2011. Since only surviving firms are included, the study does suffer from survivorship bias. Also, the study does not take into account other variables, which may influence the market equity value. Such variables are considered to be outside the scope of this research and are reflected in error terms of respective models.

References

Ball, R., and Brown, P. (1968), "An Empirical Evaluation of Accounting Income Numbers," *Journal of Accounting Research*, 6 (Autumn), pp. 159-78.

- Beaver, W., (1968), "The Information Content of Annual Earnings Announcements", *Journal of Accounting Research*, 6 (Supplement), pp. 67-92.
- Barth, M. E., Beaver, W. H., Hand J. R. M., and Landsman, W. R. (1999), "Accruals, Cash flows and Equity Values," *Review of Accounting Studies*, Vol. 3, pp. 205-229.
- Barth, M. E., W. H. Beaver, and W. R. Landsman, (2001), "The relevance of the value relevance literature for accounting standard setting: Another view," *Journal of Accounting and Economics*, Vol. 31, pp. 77-104.
- Barth, M.E., Beaver, W.H., Hand, J.M., and Landsman, W.R. (2005), "Accruals, Accounting-Based Valuation Models and the Prediction of Equity Values" *Journal of Accounting, Auditing and Finance*, Vol. 20, pp. 311-345.
- Dechow, P. M., A.P. Hutton, and R.G. Sloan (1999), "An Empirical Assessment of the Residual Income Valuation Model," *Journal of Accounting and Economics*, 26, pp. 1-34.
- Feltham, G.A., and Ohlson, J.A. (1995), "Valuation and Clean Surplus Accounting for Operating, Financial Activities," *Contemporary Accounting Research*, 11, pp. 689-732.
- Feltham, G. A. and Ohlson, J.A. (1996), "Uncertainty Resolution and the Theory of Depreciation Measurement," *Journal of Accounting Research*, 34, pp. 209-234.
- Gordon, M., 1962. *The Investment, Financing, and Valuation of the Corporation*. Irwin, Homewood, IL.
- Modigliani, F., Miller, M. H., "The Cost of Capital, Corporation Finance, and the Theory of Investment," *American Economic Review*, 48, pp. 261-297 (1958).
- Ohlson, J. (1995). *Earnings, Book Values and Dividends in Equity Valuation*," *Contemporary Accounting Research*, 11(2): pp. 661-687.
- Ohlson, J. (1999), "On Transitory Earnings." *Review of accounting studies*, Vol. 4, pp. 145-162.
- Ohlson, J. (2001), "Earnings, Book Values, and Dividends in Equity Valuation: "An empirical perspective," *Contemporary Accounting Research*, Volume 18, pp. 107-120.
- Penman, S. H. and Sougiannis, T. D. (1998), "A comparison of dividend, cash flow, and earnings approaches to equity valuation," *Contemporary Accounting Research*, 15: 343-383.
- Rees, W.P. 1997 "The Impact of Dividends, Debt and Investment on Valuation Models," *Journal of Business Finance and Accounting*, Vol. 24: pp. 1111-1140.
- Sloan, R. G., (1996), "Do stock prices fully reflect information in accruals and cash flows about future earnings," *The Accounting Review*, Vol. 71, pp. 289-315.