Stock Price Response to Earnings News in India: Investors' Learning Behaviour under Uncertainty

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Abstract

This research paper examines the association of inter-temporal variation in stock price response to quarterly earnings surprise in India with relevant indicators of changes in fundamental conditions. Earnings response coefficients are higher during periods when the economic conditions indicate lower systematic risk and higher growth prospects, consistent with asset pricing theory. However, there are differing asymmetric effects of good and bad earnings news depending upon recent market and macro-economic conditions, especially for stocks associated with greater information uncertainty. We conclude that the evidence from earnings response supports predictions of rational models of investors' learning behaviour under uncertainty.

Keywords: *Earnings response coefficients, information uncertainty, stock prices, emerging markets*

1. Introduction

In this research paper, we examine the influence of changing macro-economic conditions on stock market reaction to quarterly earnings news for a sample of actively traded stocks in India. We test two hypotheses in this paper. First, the earnings response coefficient (ERC, the elasticity of stock price return to earnings surprise) should increase directly with improving economic growth prospects and decline in interest rates. We call this equity valuation effect, since the equity valuation models equate fair value of a stock directly with future cash flows and inversely with discount rates. Extending the present value equation, and assuming that the earnings process has persistence, it can be analytically established that the earnings response coefficient would be an increasing function of the expected growth opportunities and a decreasing function of the discount rate (Collins and Kothari 1989).

Second, we expect that the effect of changes in market conditions should result in asymmetric earnings response due to investors' learning process depending upon whether the new earnings information is consistent or inconsistent with the market trends. When market conditions improve, the response would be greater for firms announcing bad earnings news but lesser for firms announcing good earnings news, and vice versa when market conditions worsen. We call this learning effect hypothesis, and it can be explained using rational models of learning under uncertainty, for example, the regime-shift model of Veronesi (1999) or the model of learning under parametric uncertainty of Lewellen and Shanken (2002).

Collins and Kothari (1989) empirically validated that the earnings response coefficients are positively associated with rising earnings growth and earnings persistence, but decline with increase in the risk free rate. Johnson (1999) confirmed the direct relationship of earnings response with business cycles.

Conrad, Cornell and Landsman (2002) empirically validated the regime shift effect, which is based on investors' learning behaviour, for the US market. In the same paper, the authors showed that market response to bad earnings news is greater under relatively good market conditions, and conversely, the market response to good earnings news is greater under relatively bad market conditions, the relative conditions being defined by comparing the current conditions with the average over the past 12 months.

However, the learning effect has not been tested so far in an emerging market context and this paper is the first to examine whether the investor response to earnings news in India is associated with time variation due to changing valuation, and also whether there is evidence of investors' learning behaviour under uncertainty.

In order to test the two hypotheses for the Indian market, we identify seven relevant proxies based on previous research that establish the relationship between stock returns and business cycle indicators. The selected variables include growth in the index of industrial production, revision in economic growth forecasts, short term Treasury Bill rates, term structure of interest rates and three price multiples - the price to earnings ratio, the price to dividend ratio and the price to book value ratio. Previous research has established the relationship of stock prices with the index of industrial production (Pethe and Karnik 2000) and interest rates (Panda 2008) in India.

As summary measures, we build an index of market conditions (COND) using average standardized values of these proxies and an index of relative market conditions (RCOND) using average cyclical changes in these proxy measures.

We find clear evidence of equity valuation effect. The monthly ERCs based on cross-sectional regressions

have a statistically significant correlation across proxies of market conditions and a Pearson's product moment correlation of 0.51 with COND. In regressions using larger sample of pooled data, we find that the ERCs under strong COND are nearly four times as high as those under weak COND in the case of both good and bad earnings news, consistent with the equity valuation effect.

We also test the learning effect with changing market conditions, and our conclusions support the regime shift model. Analysing the effect of conditions relative to the average of the previous 12 months, using RCOND index, which is derived from the COND index, we find that ERCs in case of bad news under improving relative conditions are more than four times as high as when conditions are worsening, but the difference is statistically insignificant in the case of good news due to the offsetting effect of rise in the discount rate, consistent with the predictions of the regime shift model.

The learning effect is expected to be higher for firms where information flow is constrained. Consequently, we also test the effect of relative market conditions across firms by characteristics such as size, analyst coverage and stock return volatility. We find that the learning effect indeed becomes stronger in the case of stocks which are smaller, have lower analyst coverage, and have more volatile returns.

2. Literature Review

The linkage of macro-economic conditions with asset pricing is well-established in literature. Empirical asset pricing models can be formed using a number of macro-economic indicators that are related either to aggregate growth in cash flows or to discount rates (Chen, Roll and Ross 1986).

Macro-economic linkages can also be extended to the earnings response context (Collins and Kothari 1989). The authors use the equity valuation equation to analytically establish the relationship between abnormal stock returns and unexpected earnings. The earnings response coefficient in their equation is a function of the firm's earnings growth persistence, the firm's earnings growth prospects, risk free rate and systematic risks. They also validate these relationships empirically for US stocks.

The same analysis of relating earnings response is extended to business cycles (Johnson 1999). In her framework, the relationship of ERC with future cash flows is through macro-economic growth and not just firm-specific growth. The author also empirically confirms the relationship of ERCs with business cycle stages and macro-economic proxies of discount rates.

The equity valuation effect, as discussed in the previous section, pertains to the influence of market conditions on ERCs through discount rates and economic growth prospects. However, when market conditions change, investors have to change their assessment of discount rates and future cash flows. Under the rational expectations framework, and given complete information, investors conduct this reassessment instantaneously. This framework essentially assumes the presence of some informed investors who know the true valuation process and are able to perfectly arbitrage away any profit making opportunities.

However, even if the investors are assumed to be rational, they may face parametric uncertainty because of incomplete information. Further, if we presume that the investors are vulnerable to cognitive biases, their reassessment of stock values may be described more appropriately by models that incorporate the effect of such biases.

In such a case, the learning process of investors may be described by alternative models, which could be either

rational or behavioural. For instance, Conrad et al. (2002) use the regime shifting model (Veronesi 1999) and behavioural model of investor behaviour based on conservatism and overconfidence (Barberis, Shleifer and Vishny 1998) to explain the asymmetric response to good and bad news depending upon the direction of change in market conditions. The authors argue that investors tend to extrapolate recent trends due to behavioural biases, such as representativeness. However, the investor behaviour on the arrival of unexpected news can be explained using the rational regime shift model.

The regime shift model (Veronesi 1999) predicts that the effect of bad earnings news under perceived strong conditions would be more than that estimated by the present value model and that of good earnings news under perceived weak conditions would be lesser than the present value estimate. This is because when investors believe that conditions are good but are surprised by bad news, they not only change their expectations of future cash flows but also require a higher discount rate to compensate for the perceived uncertainty regarding the true state of the market. The arrival of good news under improved conditions however has only a marginal impact on abnormal returns, since investors do not need to change their cash flow or discount rate expectations. Conversely, good news during bad times also increases investor uncertainty and therefore expected discount rate; however, expected cash flows also increase, partly offsetting this effect. Again, arrival of bad news during bad times does not surprise the investors and results in a marginal impact.

Therefore, the unexpected arrival of bad earnings news when market conditions have a positive trend, results in the double impact of downward revisions in expected cash flows and upward revision in discount rate due to heightened uncertainty. On the other hand, the arrival of good news under worsening market conditions results in upward revision in expected cash flows but also in the discount rate due to increased uncertainty. Since these effects are mutually offsetting, the asymmetric response between good and bad earnings news will be lesser when market conditions worsen than when they improve.

The apparent extrapolation of recent market conditions and revised inference based on firm-specific news can also be supported by other models. For example, the model of learning under parametric uncertainty (Lewellen and Shanken 2002) is built on the assumption that investors apply new learning to update prior beliefs, but that they do not know the true means and variances of firms' cash flows (in contrast to the frequentist or econometrician-investor assumed in the rational expectation framework). Extending this model, we can argue that investors' prior beliefs are influenced significantly by recent economic trends, but they update their beliefs on the arrival of firm-specific earnings news. However, like Conrad et al., we build our hypothesis using the regime shift model (rather than Lewellen and Shanken's model) because it provides more specific predictions in the context of asymmetric response to earnings news.

A common thread among alternative models of rational learning behaviour of investors (Veronesi 1999, Lewellen and Shanken 2002, and Brav and Heaton 2002) is that they are based on the premise that investors face parametric uncertainty regarding future cash flows and discount rates. Intuitively, we would therefore expect that delayed learning response would be more apparent for firms which are characterised by a greater degree of uncertainty regarding their expected cash flows. This can be tested in the cross-sectional context using data across firms which differ in terms of the level of uncertainty associated with their cash flows.

3. Sample and Data

The analysis of firms' earnings announcements cover 200 large actively traded stocks that constituted the S&P BSE 200 index and cumulatively accounted for 76 per cent of the market capitalisation of the Bombay Stock Exchange at the end of March 2015.

The event window is the six-year period between April 2009 and March 2015. The sample covers 23 quarters of announcements starting from the first quarter of 2009-10 to the third quarter of 2014-15. This effectively provides 4,373 data points of firm-quarters. The earnings data has been sourced from Capitaline database, while the stock returns were estimated using prices, bonus, splits and dividends data from the website of the Bombay Stock Exchange (BSE), www.bseindia.com. The earnings announcement dates are also taken from the website of Bombay Stock Exchange.

Table 1
Sample Description

Year	Observations
2009-10	544
2010-11	744
2011-12	762
2012-13	775
2013-14	781
2014-15	767
Total	**4373**

For analysing aggregate stock market conditions, we compile the data from the SEBI Handbook of Statistics and the monthly SEBI Bulletin published by the Securities and Exchange Board of India (SEBI) on its website, www.sebi.gov.in. The economic data related to economic forecasts and interest rates are sourced from the website of the Reserve Bank of India, www.RBI.org, while data related to macro-economic series including index of industrial production ((IIP), gross domestic product (GDP), and wholesale price inflation (WPI) are obtained from the website of Ministry of Statistics and Programme Implementation, India, www.mospi.nic.in.

4. Methodology

The methodology to study the equity valuation and learning effects on earnings response involves multivariate regression based on a pooled sample of quarterly earnings announcements. Our basic model, following Collins and Kothari (1989), measures the earnings response coefficient as the elasticity of abnormal stock returns to unexpected earnings. However, we modify the basic earnings response model by adding interaction terms that incorporate the effect of market conditions and changes in market conditions on ERC to study the equity valuation effect and learning effect, respectively, on earnings response.

We choose the indicators that represent market conditions based on Chen, Roll and Ross (1986), while we motivate the hypothesis of a relationship between these indicators and earnings response based on the findings of Collins and Kothari (1989).

Our empirical analysis of learning effect is based on the theoretical regime shift model of Veronesi (1999). In Veronesi's regime shift model, investors are uncertain about the stock valuation parameters, including future cash flows, as well as the discount rate. Learning occurs by means of Bayesian updating, wherein investors observe recent trends in dividends as information signals indicating a switch between low expected dividend growth and high expected dividend growth regime. In our adaptation of Veronesi's model, instead of dividend trends, investors observe the recent trends in economic indicators and index multiples, and use these to adjust their posterior probabilities regarding the current regime prior to the earnings season.

As earnings are announced during the earnings season, investors revise these probabilities for each stock, more significantly in the case of stocks where the sign of unexpected earnings contradicts the underlying regime expectation. When in a high growth regime (good times), the earnings surprise is negative, investors not only revise their future earnings expectations downwards, the increased uncertainty caused by the contradiction between prior expectation and the new signal also results in higher return expectation and therefore, discount rates, assuming that investors are risk averse. However, in a low growth regime (bad times), positive earnings surprise results in an upward shift in future earnings expectation, but this is offset by a higher discount rate resulting from increased uncertainty because of a contradictory signal. Hence, the learning effect results in apparent asymmetric behaviour wherein investors appear to react strongly to bad earnings news during good times but not to good earnings news during bad times.

Though our empirical test of learning effect is motivated by Veronesi's model, we use changes in market conditions instead of trends in dividends as the signal used by investors to adjust their posterior probabilities. We justify the primacy of market-wide information rather than firm-specific information, based on prior research (Morck, Yeung and Yu, 2000) that finds that stock prices in emerging markets incorporate market-level information more than firm-specific information.

5. Empirical Model

5.1 Unexpected earnings

The basic model of earnings response we have used can be represented by the following equation:

$$AR = a + b1\,UE + b2\,Size + e \quad (1)$$

In the above equation, AR stands for the abnormal return upon earnings announcement, UE for unexpected earnings and Size is a control variable. The coefficient of UE, b1 in the above equation, is the earnings response coefficient. Size is estimated as the log of market capitalisation of each firm at the end of the previous month.

For the purpose of this study, AR is measured as the difference between stock returns and equally-weighted returns of the benchmark size decile for the stock. AR is arithmetically cumulated over a two-day period including the announcement date and the next trading day, represented as AR[0,1]. This is done to take into account imprecise time of release of earnings information, or its late release towards the end of the trading period on the announcement date. We also observe that maximum volatility in AR occurs during these two days. UE is measured as follows:

$$UE = X_t - E(X_t)/P_t \quad (2)$$

In the above equation, X_t is the actual earnings per share and $E(X_t)$ is the forecasted earnings per share, further divided by the share price 6 days before the announcement date, in order to standardise the UE, so as to make it comparable across firms and events. For estimating E(X), we use a simple measure based on rolling seasonal random walk model. Thus,

$$UE = (X_t - X_{t-4})/P_t \quad (3)$$

Where X_{t-4} is the earnings per share in the corresponding quarter of the previous year.

We also estimate and compare two other more sophisticated measures, one based on a time series model (Foster 1977), and the second, based on analyst estimates. We find that the analyst estimates provide the most accurate measure based on root mean squared errors and mean absolute errors, but are however, least correlated with actual market response (abnormal returns on announcement) among the three measures. The Foster's time series model has

correlation with market response which is comparable to the seasonal random walk estimate, but has only marginally better accuracy. Hence, we select the rolling seasonal random walk process as our measure for UE, despite lower accuracy, due to its simplicity and better representation of the investors' reaction.

There is an inherent pessimistic bias in our rolling seasonal random walk model since it assumes no growth; this was evident because UE was positive for around two-third of the observations. To mitigate this bias, we define good earnings news observations as those that constitute the highest one-third in terms of UE and record positive earnings surprise. Similarly, we define bad earnings news observations as those that constitute the lowest one-third in terms of UE and record negative earnings surprise. We ignore the middle one-third observations sorted by US.

In order to separately estimate the earnings response to good and bad news, we modify equation (1) as follows:

$$AR = a + b1\,BadUE + b2\,GoodUE + b3\,Size + e \quad (4)$$

In the above equation, BadUE is estimated as UE multiplied by a dummy variable Bad which takes the value of 1 in case of good earnings news observation and 0 otherwise. Similarly GoodUE is estimated as UE multiplied by Good which takes a value of 1 in case of good news and 0 otherwise.

To test the effects of equity market conditions, and conditions relative to recent trends, we identify proxy measures and construct the indices COND, its derivative RCOND respectively. We estimate ERCs b1 and b2 from equation (4) under alternative levels of COND and RCOND.

Alternatively, we use values of COND and RCOND directly as interaction terms by modifying equation (4) as follows:

$$AR = a + b1BadUE + b2\ GoodUE + b3BadUE*I + b4GoodUE*I + b5\,Size + e \quad (5)$$

In the above equation, "I" stands for interaction term and represents COND or RCOND as continuous variables.

5.2 Identification of proxies of equity market conditions

We use seven proxy variables to define the equity market level and relative level. These include the three price multiples and four business cycle indicators. The estimates for the multiples, price to earnings (PE), price to dividend (PD) and price to book value (PB), are taken as trailing 12 months multiple of Nifty 50 stocks as provided on the website of NSE. The four business cycle indicators include growth in industrial production (IIPG), revision in economic forecasts (REV), yield on 91-day Treasury bill (TB) and term structure of interest rate (TERM).

Since IIP growth figures are available with a two month lag, we estimate the current IIP growth figures assuming that two months moving average provides the best estimate for one month forward IIP growth. REV is based on the change in next year's economic growth forecast in the most recent RBI's survey of economic forecasters compared to the previous survey. TB is the cut-off yield of each month's last auction of 91-day Treasury bills. TERM is estimated as the difference between the yields on 10-year Government securities and 91 day Treasury bills.

We also create summary measures from these categories by giving equal weights to the individual variables within each category of price multiples and business cycle indicators. We assign a negative sign to TB due to its inverse relationship with other business cycle indicators. We then combine all the proxy variables into one index of equity market conditions

COND by giving equal weightage to the multiples and to the economic categories.

Thus:

COND = 0.500 VAL + 0.500 ECO

VAL = 0.333 PE + 0.333 PD + 0.333 PB

ECO = 0.25 IIPG + 0.25 REV – 0.25 TB + 0.25 TERM

Hence,

COND = 0.167 PE + 0.167 PD + 0.167 PB + 0.125 IIPG + 0.125 REV – 0.125 TB + 0.125 TERM (6)

Table 2 provides the correlation matrix between the proxy indicators of equity market conditions. The correlations are statistically significant but moderate on an average, which shows that no variable is redundant.

Table 2

Correlations between Indicators of Equity Market Conditions

	PE	PD	PB	IIPG	REV	TB	TERM
PE							
PD	0.84						
PB	0.47	0.57					
IIPG	0.10	0.27	0.70				
REV	0.25	0.28	0.37	0.34			
TB	0.12	-0.03	-0.10	-0.20	-0.32		
TERM	0.07	0.26	0.15	0.17	0.36	-0.92	
COND	0.65	0.78	0.77	0.60	0.62	-0.47	0.59

PE: Price to earnings ratio ; PE: Price to dividend ratio ; PB: Price to book value ratio; IIPG: Growth in index of industrial production; REV: Revision in annual economic growth forecast; TB: Yield on 91 day T-Bill; TERM: Difference in yield between 10 year G-Sec and 1 year T-Bill

Note: Shaded cells denote statistically significant correlations

We also derive for each proxy variable a measure of relative condition by subtracting past 12 months moving average value. Similarly, we estimate a summary measure RCOND for relative market condition as follows:

$RCOND_t = COND_t - 1/12 \sum_{t-12}^{t-1} COND$ (7)

Thus, we define changes in market conditions in terms of comparing the recent month with the past 12-month average as in Conrad et al. (2002). However, whereas relative P/E level is used as the proxy variable in Conrad et al. (2002), we repeat the tests using the relative values of multiple alternative proxies of market conditions as well as the RCOND index.

Table 3 shows the correlation matrix between relative values of the proxy variables. As in the case of the primary variable, most of the correlations are statistically significant.

Table 3
Correlations between Indicators of Relative Conditions

	PE	PD	PB	IIPG	REV	TB	TERM
PE							
PD	0.88						
PB	0.86	0.88					
IIPG	0.29	0.42	0.42				
REV	0.46	0.55	0.44	0.20			
TB	-0.15	-0.14	0.03	0.24	-0.17		
TERM	0.22	0.28	0.11	-0.11	0.30	-0.87	
RCOND	0.87	0.92	0.83	0.43	0.65	-0.39	0.52

PE: Price to earnings ratio ; PE: Price to dividend ratio ; PB: Price to book value ratio; IIPG: Growth in index of industrial production; Rev: Revision in annual economic growth forecast; TB: Yield on 91 day T-Bill; TERM: Difference in yield between 10 year G-Sec and 1 year T-Bill

Note: All the values are estimated by subtracting the 12 month moving average from the primary variable. Shaded cells denote statistically significant correlations.

We expect COND to co-vary with the cyclical component of stock index and RCOND to co-vary with index returns. Figure 1 shows COND and RCOND against the detrended values of the Nifty50 stock index. COND has a correlation of 0.86 with Nifty 50 index during the sample period (April 2009 to March 2015), while RCOND has a statistically significant correlation of 0.32 with Nifty 50 returns.

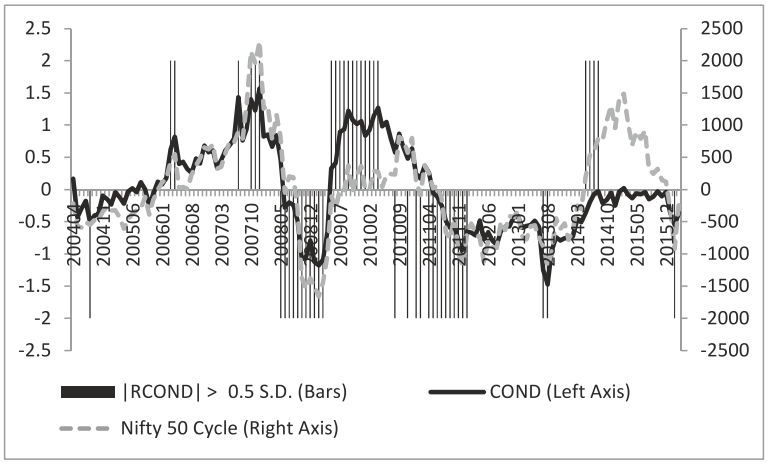

Figure 1. Cycle of Nifty 50 with COND and RCOND indices

To analyse differences in behaviour at extreme and middle values, we also run the tests using COND and RCOND as categorical variables with three levels. For example, we sort all the months in the sample period by descending magnitude of COND and label the top one-third of the months as periods with strong market conditions, the middle one-third as normal market conditions and the bottom one-third as weak market conditions. Similarly, the three RCOND categories are labelled as stronger, same and weaker relative conditions.

6. Results

6.1 Equity Valuation Effect

In order to analyse the trend in average earnings response coefficient, we estimate equation (1) cross-sectionally across earnings announcement during each month. As most of the announcements are

concentrated in the first two months of each quarter, we drop the third month in each quarter. After dropping all the months which have inadequate number of cross-sectional observations, we have 44 cross-sectional estimates of the ERCs.

The monthly trend in ERCs is then compared with COND as shown in Figure 2. From the chart, the month-wise ERCs seem to be significantly correlated with COND. This is confirmed by estimating the correlation coefficients. The Pearson correlation coefficient between monthly ERCs and COND was 0.51, which is highly significant (t stats = 3.82, $p < 0.01$). The results are encouraging despite the limited number of monthly observations, and we confirm the results with further regressions using pooled sample which have higher power due to expanded sample size.

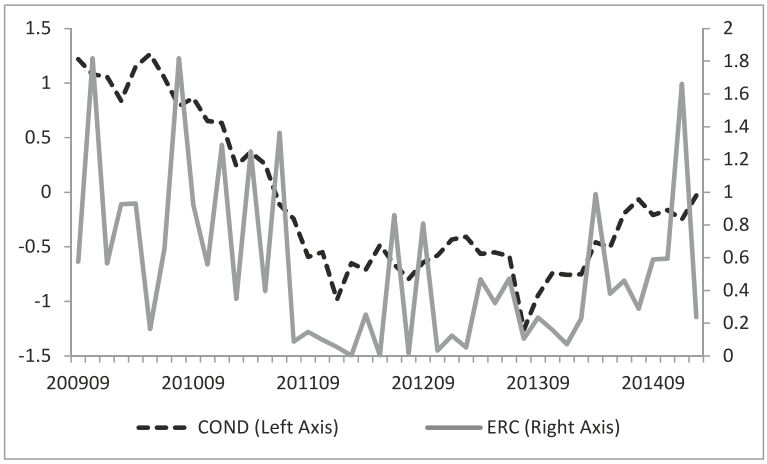

Figure 2.Trend in monthly ERCs with market conditions

We run pooled sample regressions using equations (4) under alternative conditions, by using the three COND levels. We further run the regressions using the continuous variable COND directly in equation (5) as an interaction term.

Table 4 shows the results using COND both as continuous and categorical variable. The interaction terms with COND are statistically significant for both good and bad news. The ERCs increase as market conditions improve, being nearly 4 times as high when market conditions are strong as when they are weak in the case of both bad and good earnings news. The differences are also statistically significant in both the cases.

Table 4

Effect of Equity Market Conditions on Earnings Response

	Continuous: COND Interaction		Categorical: COND Scenarios			
	Base Coef.	Interaction	Strong	Normal	Weak	Strong - Weak
Intercept	0.010		0.010	0.001	0.012	-0.002
t-stat	*3.13* **		*1.96* ~	*0.08*	*2.38* *	*-0.26*
Size	-0.002		-0.002	-0.001	-0.003	0.000
t-stat	*-3.61* **		*-2.31* *	*-0.47*	*-2.60* **	*0.14*
BadUE	0.323	0.285	0.471	0.365	0.125	0.346
t-stat	*6.42* **	*4.26* **	*3.84* **	*3.12* **	*3.23* **	*2.69* **
GoodUE	0.295	0.168	0.502	0.422	0.125	0.377
t-stat	*6.65* **	*3.63* **	*5.30* **	*3.11* **	*3.16* **	*3.67* **
Observations (n)	2913		971	515	1427	
Adj R-square	0.037		0.054	0.040	0.019	
F-statistic	*23.57* **		*19.55* **	*8.19* **	*10.05* **	

** p < 0.01; * p < 0.05; ~ p < 0.10

We also validate the results individually for each of the four proxy variables of market conditions, by using each variable in turn in the interaction term in place of COND. The results, shown in Table 5, confirm the equity valuation effect, wherein ERCs increase with indicators of economic growth prospects and decrease with indicators of systematic risk. We therefore expect ERCs to rise with higher values of all the indicators except TB, with which the relationship is inverse.

Table 5

Effect of Equity Market Conditions on Earnings Response by Proxy

	BadUE		GoodUE	
	Coefficient	t-stat	Coefficient	t-stat
PE	0.255	4.32 **	0.220	3.97 **
PD	0.255	4.51 **	0.190	3.83 **
PB	0.426	4.17 **	0.390	4.17 **
IIPG	0.074	1.04	0.096	1.78 ~
REV	0.214	5.31 **	0.111	2.35 *
TB[1]	-0.101	-2.37 *	-0.076	-3.15 **
TERM	0.085	2.13	0.065	3.27 **

** p < 0.01; * p < 0.05; ~ p < 0.10

[1] Inverse relationship with COND

6.2 Learning Effect

In order to analyse the learning effect, we conduct regressions testing the relation between stock returns around announcements with earnings surprises under changing market conditions. As in the case of valuation effect, we first conduct monthly cross-sectional regressions to obtain monthly ERCs. However, this time we test equation (4) which has separate variables

for good and bad earnings news, because we are interested in testing for asymmetric effects by sign of earnings surprise. After dropping the months with insufficient observations, we are left with 42 data points. We correlate the coefficients of good and bad UE with RCOND. The Pearson's correlation coefficient is 0.30 for bad UE and -0.28 for good UE, both of which are significant only at p<0.10. The signs of the coefficients are as hypothesised and we test the results with a pooled sample across firms and quarters in order to increase the power of the tests.

We conduct regressions using Equation (4) with RCOND (continuous variable) in the interaction term and Equation (5) with RCOND (categorical variable) in three interaction terms corresponding to relatively stronger, same and weaker conditions.

The results are provided in Table 6. The results confirm the predictions of asymmetric behaviour for good versus bad earnings news. Thus, when relatively stronger market conditions are followed by bad earnings news, the effect is significantly greater than under relatively weaker conditions. However, when earnings news is good, the difference is not statistically significant.

Table 6
Effect of Changes in Equity Market Conditions on Earnings Response

	Continuous: RCOND Interaction		Categorical: RCOND Scenarios			
	Base	Interaction	Stronger	Same	Weaker	Stronger-Weaker
Intercept	0.011		0.009	0.006	0.019	-0.010
t-stat	*3.46* **		*1.82* ~	*0.99*	*3.24* **	*-1.26*
Size	-0.003		-0.002	-0.001	-0.004	0.002
t-stat	*-3.84* **		*-2.26* *	*-1.13*	*-3.24* **	*0.99*
BadUE	0.200	0.237	0.433	0.129	0.106	0.327
t-stat	*5.64* **	*4.03* **	*5.44* **	*2.65* **	*1.62*	*3.17* **
GoodUE	0.208	0.073	0.295	0.128	0.193	0.102
t-stat	*5.86* **	*1.70* ~	*4.39* **	*1.93* ~	*3.59* **	*1.18*
Observations (n)	2913		1128	873	912	
Adj R-square	0.033		0.050	0.014	0.025	
F-statistic	*20.83* **		*20.60* **	*5.05* **	*8.63* **	

** $p < 0.01$; * $p < 0.05$; ~ $p < 0.10$

We also validate the prediction that the learning effect would be more apparent for firms that have greater information uncertainty. We expect firms that are smaller, which have lower analyst coverage and greater idiosyncratic return volatility to be associated with greater information uncertainty.

We also expect the learning effect to be more apparent in case of firms that announce results early (first month after the quarter-ending) than those that announce results later (second or third month after the quarter-ending), even though we may associate the former with better timeliness of information disclosure. This is because in case of late-announcers, the investors have the chance of revising their expectations based on the trends in aggregate and

sectoral earnings, once these become evident from the results of the early-announcers. For example, investors may be surprised by earnings of the first information technology company which announces its results. However, if there are common trends across the earnings of all the information technology companies, investors would be progressively less surprised as more information technology companies announce their results.

The results of observations divided by size, analyst coverage, idiosyncratic volatility and announcement timing are presented in Table 7. The results show that for companies associated with greater information uncertainty or delay, the effects of surprise are stronger in the case of both bad and good earnings news.

The results of the effect of change in each proxy variable of market conditions are presented in Table 8. For bad earnings news, the results are significant for five out of the seven proxies in the case of small cap stocks (except in the case of TB and TERM). Though, the results under good earnings news are not statistically significant in the case of individual proxies (except in the case of IIP growth), the signs of the coefficients are always consistent with the learning effect in the case of small stocks, but not in the case of large cap stocks.

This can be explained by the greater parametric uncertainty associated with small cap stocks, whereas the degree of uncertainty is not high enough in the case of large cap stocks for the learning effect to become apparent.

Table 7

Effect of Changes in Market Conditions on Earnings Response: Cross-sectional Variations

	Continuous: RCOND Interaction		Categorical: RCOND Scenarios			
	Base	Interaction	Stronger	Same	Weaker	Stronger-Weaker
Small Cap Firms						
BadUE	0.267	0.185	0.461	0.260	0.061	0.400
t-stat	*5.06* **	*2.93* **	*4.81* **	*3.14* **	*0.62*	*2.91* **
GoodUE	0.647	-0.343	0.312	0.488	1.250	-0.938
t-stat	*6.79* **	*-3.61* **	*3.36* **	*3.22* **	*5.14* **	*-3.60* **
Large Cap Firms						
BadUE	0.075	0.098	0.348	0.030	0.040	0.308
t-stat	*1.57*	*1.32*	*2.37* *	*0.50*	*0.46*	*1.80* ~
GoodUE	0.144	0.033	0.263	0.033	0.140	0.123
t-stat	*3.37* **	*0.68*	*2.75* **	*0.47*	*2.69* **	*1.13*
Low Analyst Coverage						
BadUE	0.328	0.198	0.573	0.290	0.114	0.459
t-stat	*5.86* **	*2.93* **	*5.31* **	*3.35* **	*1.15*	*3.12* **
GoodUE	0.655	-0.308	0.349	0.491	1.285	-0.936
t-stat	*7.11* **	*-3.20* **	*3.44* **	*3.40* **	*5.66* **	*-3.76* **
High Analyst Coverage						
BadUE	0.047	0.084	0.202	0.018	0.026	0.175
t-stat	*0.97*	*1.11*	*1.52*	*0.31*	*0.27*	*1.06*
GoodUE	0.116	0.021	0.238	0.014	0.121	0.116
t-stat	*2.60* **	*0.41*	*2.41* *	*0.19*	*2.14* *	*1.02*

	Continuous: RCOND Interaction		Categorical: RCOND Scenarios			
	Base	Interaction	Stronger	Same	Weaker	Stronger-Weaker
Low Idiosyncratic Volatility						
BadUE	0.164	0.184	0.360	0.130	0.005	0.355
t-stat	*3.46* **	*3.19* **	*3.89* **	*1.79* ~	*0.06*	*2.84* **
GoodUE	0.365	-0.091	0.339	0.204	0.622	-0.283
t-stat	*5.69* **	*-1.29*	*4.08* **	*2.09* *	*4.15* **	*-1.65* ~
High Idiosyncratic Volatility						
BadUE	0.228	0.143	0.750	0.126	0.262	0.488
t-stat	*4.20* **	*1.57*	*4.25* **	*1.95* ~	*2.36* *	*2.34* *
GoodUE	0.117	0.004	0.162	0.048	0.121	0.042
t-stat	*2.25* *	*0.07*	*1.35*	*0.55*	*2.23* *	*0.31*
Early Announcers						
BadUE	0.305	0.763	0.543	0.381	0.048	0.495
t-stat	*3.76* **	*6.62* **	*3.50* **	*2.29* *	*0.46*	*2.66* **
GoodUE	0.186	-0.328	0.343	0.893	1.263	-0.920
t-stat	*2.20* *	*-3.09* **	*3.31* **	*3.41* **	*5.08* **	*-3.42* **
Late Announcers						
BadUE	0.147	0.184	0.371	0.095	0.087	0.284
t-stat	*3.76* **	*3.17* **	*4.05* **	*1.88* ~	*1.02*	*2.27* *
GoodUE	0.139	0.005	0.254	0.069	0.143	0.110
t-stat	*3.44* **	*0.12*	*2.91* **	*1.03*	*2.65* **	*1.08*

** p < 0.01; * p < 0.05; ~ p < 0.10

Table 8

Effect of Change in Equity Market Conditions on Earnings Response by Proxy

	Small Cap Stocks				Large Cap Stocks			
	BadUE		GoodUE		BadUE		GoodUE	
	Coef	*t-stat*	Coef	*t-stat*	Coef	*t-stat*	Coef	*t-stat*
PE	0.184	*2.71* **	-0.070	*-0.83*	0.152	*2.25* *	0.128	*2.20* *
PD	0.218	*3.34* **	-0.066	*-0.86*	0.094	*1.57*	0.071	*1.21*
PB	0.358	*3.42* **	-0.204	*-1.39*	0.199	*1.87* ~	0.185	*2.09* *
IIPG	0.222	*2.85* **	-0.128	*-2.08* *	0.142	*2.11* *	0.054	*1.04*
Rev	0.138	*2.59* **	-0.064	*-0.87*	0.166	*3.03* **	0.006	*0.10*
TB[1]	-0.086	*-1.43*	0.110	*1.68* ~	0.047	*0.77*	-0.014	*-0.60*
TERM	0.025	*0.46*	-0.069	*-1.14*	-0.018	*-0.31*	0.018	*0.87*

** p < 0.01; * p < 0.05; ~ p < 0.10

[1] Inverse relationship with RCOND

7. Discussion

Our results indicate clear evidence of equity valuation effect in investors' response to earnings announcements. The earnings response coefficients are much higher under strong market conditions than under weak market conditions due to the double impact of rising growth prospects and falling discount rates. These findings are consistent with Collins and Kothari (1989) and Johnson (1999).

Secondly, we find evidence of delayed learning. ERCs for stocks associated with negative earnings surprises are much higher when relative market conditions are improving than when they are worsening. The influence of relative conditions is not significant in the case of stocks with positive earnings surprise. These findings are consistent with the regime shift model of Veronesi (1999) and are similar to those of Conrad et al. (2002).

Our approach and findings however differ from other empirical research on asymmetric stock price response to earnings news that is motivated by behavioural models. For example, Skinner and Sloan (2002) base their empirical research of investors' earnings response using the behavioural argument of naive optimism for growth stocks, as proposed by Lakonishok, Shleifer and Vishny (1994). They find large and asymmetric response to negative earnings surprises, especially in the case of growth stocks. The results of our paper do not suggest a significant difference in the coefficients of good and bad unexpected earnings in general, although we do not test the results separately for growth and value stocks.

Mian and Sankaraguruswamy (2012) extend the argument of Baker and Wurgler (2007) that periods of high sentiment are associated with optimistic valuations and periods of low sentiment are associated with pessimistic valuation to earnings response. They test and establish that the earnings response coefficients in the case of good news events are higher when sentiment is high than when sentiment is low, while the coefficients for bad news events are higher when sentiment is low than when sentiment is high. We, however, do not examine the role of investor sentiment in this research, focussing instead on the role of rational learning.

A limitation of our research is that while we assume and test the validity of a simple learning model, we do not analyse the behavioural foundations of this model. Behavioural factors would not be relevant if we could assume that the investor is subject to information constraints, but behaves rationally given the limited information. However, since the assumption of limited information appears restrictive, if not unrealistic, there is a need to question whether the investor's selective use of information (only recent economic and market-wide information in our model) is because of limited attention (as described in Hirshleifer and Teoh, 2003), or because of recency bias, or some other behavioural bias. This can be an agenda for future research.

8. Conclusion

In this paper, we validate the equity valuation effect and the learning effect for time series variations in the earnings response coefficients of actively traded stocks in India. We confirm the predictions of theories of investor learning under parametric uncertainty. The time series variation in elasticity of stock returns to earnings surprises is therefore not only a function of growth prospects and systematic risks as predicted by classical finance, but also depends on the learning behaviour of investors.

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