An Empirical Study on Relationship between Price Earnings Ratio and Stock Value with Reference to BSE and NSE

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Abstract

This research paper is an attempt to analyze the impact of two specific internal factors EPS and DPS on Stock Price. The research, "An Empirical Study on Relationship between Price Earnings Ratio and Stock Value with Reference to BSE and NSE" has been carried out for the time period of 1 January 2013 to 18 June 2021 (8 years and 6 months) financial years of NSE and BSE. The cause-and-effect relationship was checked by regression model using EViews7. Since, the time series data was employed, stationarity of the data was checked in order to avoid spurious regression. The results show one cointegration relationships between price and P/E ratio and NSE closing price, NSE P/E ratio and NSE yield and BSE P/E ratio and BSE Yield another side no cointegration equation between price and BSE P/E ratio and BSE Closing price. It is possible to estimate the relation between price and P/E ratio for BSE indexes using the VECM. Since the other NSE do not show a cointegration relation, we can estimate the relation between these variables using the VAR model. VECM and VAR result indicates that subsequent yields are not impacted by P/E ratio.

Key Word – Price Earnings Ratio, Stock Valuation, BSE and NSE

INTRODUCTION

Does a high price-earnings quantitative relation indicate high or low future earnings growth? Will a high P/E ratio indicate higher or lower future stock prices? How a tendency to investigate the relation between P/E ratios, mensuration worth by price, and consequent worth, likewise as P/E ratios and consequent earnings yield of Indian markets as measured by two relative different indexes: Bombay Stock Exchange (BSE) and

National Stock Exchange (NSE). Our goal is to find out whether or not the P/E ratios drive future earnings or future costs. To gauge the relation between P/E ratios and stock values, 1st we to have a tendency to check for cointegration between P/E ratios and also the yield/earnings, and between P/E ratios and worth levels for every index. If no cointegration is found, we have a tendency to use a vector autoregression (VAR) model, and if cointegration is found, then we have a tendency to use a vector error correction (VECM) model to check the relation between the variables. If there's any relation between P/E ratio and price index or yield on these indexes, we have a tendency to check for twin relation through VAR/VECM analysis employing a creator methodology. This determination may well be vital in explaining whether or not P/E ratios are helpful as a valuation measure. Variety of authors have self-addressed the relation between P/E ratios and earnings or costs. We have to differentiate our study from various analysis of world markets besides the U.S. markets. These models can facilitate U.S. validate earlier results on the relation between P/E ratios and earnings.

LITERATURE REVIEW

Author	**Finding and their view**
Basu [1977]	Portfolios formed with stocks with low P/E ratios outperform portfolios formed by stocks with high P/E ratios.
Shen [2000]	Historically very high P/E ratios have been followed by low short- and long-term returns.
Trevino and Robertson [2002]	The relation between current P/E ratios and subsequent stock returns, and find that current P/E ratios have no correlation with subsequent short-term average returns (short-term defined as three years). They further point out that investing in higher P/E ratio stocks leads to lower long-term returns for holding periods of five years or more. They also report that even though long-term average stock returns are lower after periods of high P/E ratios, average stock returns are still higher than average returns on Treasury bonds and Treasury bills.

Campbell and Shiller [1988, 1989]	The future dividends can be forecasted by the moving average of earnings. They also find that P/E ratios are powerful predictors of long-term stock returns.
Campbell and Shiller [1998 to 2001]	Analyzing historical data, they find that higher P/E ratios are followed by lower growth. On the basis of very high P/E ratios that future stock prices will drop significantly. They conclude that P/E ratios and dividend price ratios are poor predictors of fixture dividend growth, future earnings growth, or prices. Instead, these ratios are good predictors of future stock price changes.
Fama and French [1989]	Dividend yields at the beginning of a period predict a significant proportion of four-year returns, but are not good predictors of short-term return.
Fisher and Statman [2000]	They investigated the relation between P/E ratios and dividend yields and fixture returns. They conclude that P/E ratios and dividend yields are not good indicators of future stock prices, especially when we look at returns over short periods (one to two years). P/E ratios and dividend yields provide much better forecasts when they are used to estimate stock returns over longer periods of time (ten years).
Danielson and Dowdell [2001]	They use a "return-stages model" to quantify the expectations facing a firm in the case of P/B and P/E ratios. They show that the P/E ratio is related to a firm's future operating performance. They explain differing performance for different firms by dividing firms into four groups.
Bierman [2002]	He recognizes that the P/E ratio is very important and widely used, but it sometimes needs to be adjusted to reflect some special circumstances like extraordinary liabilities and extra cash.
Ramcharran [2004]	The P/E ratio is not better than price-to-book value ratios in explaining equity returns in 21 emerging markets.

We study the impact of P/E ratios on index prices and index yields to determine whether they have any influence on subsequent prices and returns. We use VAR and VECM analysis to study the impact

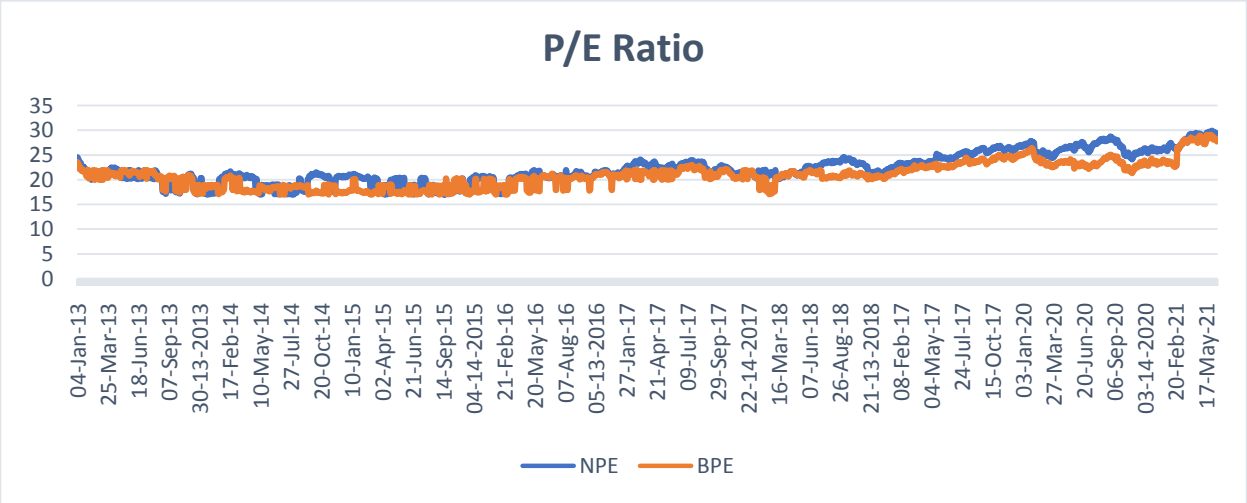
DATA DESCRIPTION

Daily data obtained from NSE and BSE website covering the period from 1 January 2013 to 18 June 2021. For the two indexes study the P/E ratio, index value, and daily yield on the index for the last 8 years and 6 months. Unlike most previous researchers, who have used annual data and monthly data, we have used daily data, as we believe many investors have investment horizons of a few months rather than years. Furthermore, daily data provide more robust results.

METHODOLOGY

It is widely believed that mean reversion theory is accurate. That is, very high or very low P/E ratios will revert to the historical average. High P/E ratios should indicate that returns will Decline. Also, during periods of low P/E ratios, either earnings should increase or prices should fall. Economic theory predicts that earnings should increase, and stock prices not fall as stock prices follow a random walk. Exhibit 1 gives the historical P/E ratios for the NSE and BSE. It can be seen that all four indexes exhibit mean reversion behavior.

EXHIBIT 1 P/E Ratios for NSE and BSE



UNIT ROOT TEST

Augmented Dickey-Fuller Unit Root Test

H0: δ=0 (unit root exists or data are non-stationary)

H1: δ≠0 (unit root does not exist or the data are stationary) Decision rule:

If t* > ADF critical value, ==> accept null hypothesis and conclude that unit root exists.

If t* < ADF critical value, ==> reject null hypothesis, conclude that unit root does not exist.

Table 2A: AugmentedDickey – Fuller Unit Root Test

Level, Trend and Intercept							
	ADF	1% level	5% level	10% level	P- Value	Null Hypothesis	Normality / Non-Normality
BCP	-3.43203	-3.96243	-3.41196	-3.12788	0.04740	Rejected	Normality
BPE	-4.27327	-3.96243	-3.41196	-3.12788	0.00350	Rejected	Normality
BYI	-42.36645	-3.96243	-3.41196	-3.12788	0.00000	Rejected	Normality
NCP	-3.64629	-3.96243	-3.41196	-3.12788	0.02630	Rejected	Normality
NPE	-4.38330	-3.96243	-3.41196	-3.12788	0.00230	Rejected	Normality
NYI	-42.24855	-3.96243	-3.41196	-3.12788	0.00000	Rejected	Normality

(Source: prepared by the researcher)

Phillips Perron Unit Root Test

If z>z=0.05 where z=0.05 is the critical value of the test, then we "accept" H_0, i.e., that the series has a unit root. If there are unit roots, the series is not stationary. Accordingly, if the pp-value of z (t) is not significant, the series is not stationary. If z≤z0.05 then we reject the null hypothesis H_0 that the series has a unit root. If there are no unit roots, then we conclude the series is stationary.

The pp-value of z (t) being significant would lead us to conclude that the series is stationary.

Table 2 B: Phillips Perron Unit Root Test

Level, Trend and Intercept							
	PP	1% level	5% level	10% level	P- Value	Null Hypothesis	Normality / Non-Normality

BCP	-3.40049	-3.96243	-3.41196	-3.12788	0.05150	Accepted	Non- Normality
BPE	-4.12351	-3.96243	-3.41196	-3.12788	0.00590	Rejected	Normality
BYI	-42.25639	-3.96243	-3.41196	-3.12788	0.00000	Rejected	Normality
NCP	-3.60284	-3.96243	-3.41196	-3.12788	0.02980	Rejected	Normality
NPE	-4.44471	-3.96243	-3.41196	-3.12788	0.00180	Rejected	Normality
NYI	-42.13534	-3.96243	-3.41196	-3.12788	0.00000	Rejected	Normality

(Source: prepared by the researcher)

Table 2A and 2B provide the result. The test is conducted for, intercept with trend, since the analysis with trend increases the risk of not rejecting the unit root hypothesis when it does not pertain. The results in table 2A and 2B show the presence of unit roots and non-stationarity. The unit root in series suggests that a cointegrating relation between the series may exist, which implies that linear combinations of non-stationary time series can be stationary. The ADF and P&P tests outened above on the residuals from a so-called cointegrating regression are tests for cointegration.

CORRELATION

Table 3 Correlation

	NPE	*NCP*	*NYI*	*BPE*	*BCP*	*BYI*
NPE	1.00000					
NCP	0.94709	1.00000				
NYI	0.02826	0.02809	1.00000			
BPE	0.95400	0.88304	0.03227	1.00000		
BCP	0.94341	0.99869	0.02798	0.87913	1.00000	
BYI	0.03007	0.03039	0.99450	0.03484	0.03050	1.00000

(Source: prepared by the researcher)

With the help of correlation, it has been found that there is strong relationship NSE P/E ratio, NSE Closing price, BSE P/E ratio and BSE Closing price. It was also found strong relationship with NSE Closing and BSE P/E ratio. There exists strong connection with BSE Yield and NSE yield, BSE P/E ratio and BSE Closing Price.

REGRESSION

Table 4 A Subsequent Price Regressed on P/E ratio

Index	Alpha	Beta	T- statistic	P - Value	R2
BSE	-15266.286	2024.117	-31.16646	0.00000	0.77277

NSE	-4623.032	571.066	-49.69569	0.00000	0.89692

(Source: prepared by the researcher)

Table 4 B Subsequent Yield Regressed on P/E ratio

Index	Alpha	Beta	T- statistic	P - Value	R2
BSE	-0.195	0.011	-1.33813	0.181	0.00074
NSE	0.008	0.008	-1.01812	0.30874	0.00032

(Source: prepared by the researcher)

Now we must conduct further tests to determine whether there is any relationship between the P/E ratio and earnings yield or prices themselves. To evaluate the relation between the P/E ratio and subsequent yields or prices (index values), beginning-of-month P/E ratios are regressed against the prices and yields of the period. The regression model is:

Yield or Price = α + β (P/E) + £

Where, exhibits 4A and 4B show the results of regression with subsequent price and subsequent yield as the dependent variable; P/E ratio is the independent variable. It can be seen that the regressions are robust. There is a positive relation between price and P/E ratios and a negative relation between P/E ratios and yield, indicating that subsequent prices increase and yields decline as the P/E ratio rises.

AUTOCORRELATION:

H_0: The residuals follow a Normal distribution

H_a: The residuals do not follow a Normal distribution

As the computed p-value is lower than the significance level alpha=0.05, one should reject the null hypothesis H_0, and accept the alternative hypothesis H_a.

Table 5 A: Autocorrelation and Heteroscedasticity Price Regressed on P/E Ratio: Durbin Watson and White Test

Index	DW	White Test n*R2	P-Value	AC and Het
BSE	0.021334	92.29211	0.00000	Accept
NSE	0.011975	97.82024	0.00000	Accept

(Source: prepared by the researcher)

Table 5 B: Autocorrelation and Heteroscedasticity Yield Regressed on P/E Ratio: Durbin Watson and White Test				
Index	DW	White Test n*R2	P-Value	AC and Het
BSE	1.98073	28.09003	0.00000	Accept
NSE	1.995075	43.77104	0.00000	Accept

(Source: prepared by the researcher)

These regression results reaffirm mean reversion theory, but must be checked for autocorrelation and heteroscedasticity. We use the Durbin-Watson statistic and the White test for this purpose. Exhibits 5A and 5B give results for the Durbin-Watson statistic and the White test for regressions with the P/E ratio as the independent variable and subsequent price and yield the dependent variables. From the two exhibits it can be seen that autocorrelation is present in all four regressions and heteroscedasticity is present everywhere.

JOHANSEN COINTEGRATION TESTS

From the above table Johansen Cointegration Test Model helps to discover whether there is dependence between the variables. There are two null hypotheses considered in the Johansen Cointegration Test Model, first being the null hypothesis which indicates there are no cointegrating vectors among the variables i.e., there is no cointegration among the variables and second being the at most 1 hypothesis which indicates less than 1 cointegrating vectors among the variables. The test was run at a significance level of 5%, which implies that if the probability is less than 5%, it will result in the rejection of the null hypothesis.

Table 6 A: Price Regress on P/E							
		Eigenvalue	Trace Statistic	Max-Eigen Statistic	Critical Value	Prob.**	Cointegration/ No Cointegration
BSE	None *	0.0059	12.52553	12.36103	15.49471	0.1334	No Cointegration
	At most 1 *	7.87E-05	0.164503	0.164503	3.841466	0.685	

NSE	None *	0.009016	19.3899	18.91906	15.49471	0.0123	Cointegration
	At most 1 *	0.000225	0.470845	0.470845	3.841466	0.4926	

(Source: prepared by the researcher)

Table 6 B: Yield Regress on P/E							
		Eigenvalue	Trace Statistic	Max-Eigen Statistic	Critical Value	Prob.**	Cointegration/ No Cointegration
BSE	None *	0.200441	467.9949	467.2984	15.49471	0.0001	Cointegration
	At most 1 *	0.000333	0.696479	0.696479	3.841466	0.404	
NSE	None *	0.009016	19.3899	18.91906	15.49471	0.0123	Cointegration
	At most 1 *	0.000225	0.470845	0.470845	3.841466	0.4926	

(Source: prepared by the researcher)

One test for cointegration involves a methodology developed by Johansen [1988,1991], which enables testing for the presence of more than one cointegrating vector. Table 6A and 6B provides the results of Johansen's cointegration test. The results show one cointegrating relationships between price and P/E ratio and NSE closing price, NSE P/E ratio and NSE yield and BSE P/E ratio and BSE Yield another side no cointegrating equation between price and BSE P/E ratio and BSE Closing price. Therefore, it is possible to estimate the relation between price and P/E ratio for these two indexes using the VECM. Since the other variables do not show a cointegrating relation, we can estimate the relation between these variables using the VAR model.

TABLE 7: VECM AND VAR RESULTS WITH PRICE AND P/E RATIOS

VECM			**VAR**		
NSE			**BSE**		
	NCP	NPE		BCP	BPE

D (NCP (-1))	0.0494	0.0002	BCP (-1)	1.1034	0.0001
	-0.0559	-0.0002*		-0.0361*	0.0000*
	[0.88245]	[0.99019]		[30.5730]	[2.82805]
D (NCP (-2))	-0.0110	0.0000	BCP (-2)	-0.1000	-0.0001
	-0.0560	-0.0002*		-0.0361*	0.0000*
	[-0.19572]	[-0.25811]		[-2.77202]	[-2.67076]
D (NPE (-1))	10.7135	0.0213	BPE (-1)	-33.6221	0.9113
	-18.1937	-0.0558		-33.3991	-0.0362*
	[0.58886]	[0.38134]		[-1.00668]	[25.2098]
D (NPE (-2))	1.3262	0.0041	BPE (-2)	25.0669	0.0738
	-18.1945	-0.0558		-33.3363	-0.0361*
	[0.07289]	[0.07308]		[0.75194]	[2.04601]
C	2.5699	0.0019	C	94.2917	0.1436
	-1.5452	-0.0047*		-43.0068	-0.0466*
	[1.66323]	[0.39897]		[2.19248]	[3.08417]

*Significant at a minimum of 5%. (Source: prepared by the researcher)

It is possible to estimate the relation between price and P/E ratio for BSE indexes using the VECM. Since the other NSE do not show a cointegrating relation, we can estimate the relation between these variables using the VAR model.

Table 7 using the VECM and VAR results for the relation between price levels and P/E ratio. VECM is conducted for the relation between price and P/E for the NSE, and VAR is conducted for the BSE. For each index, the VAR or VECM is run using both the price and the P/E as dependent variables in the VAR system of equations, although we are interested more in the subsequent price as the dependent variable. From table 6 it can be seen that -when price is the dependent series for the NSE, the coefficients of one lags is positive and another second lag is negative but are significant only for lag (—2). That is, if the P/E goes up, then in two months' time prices will go up. Prices will go up for the other lagged months as well, but not significantly.

From the VAR conducted for BSE we can see negative index coefficients for BSE for lags (-2) and positive coefficients for lags (-1). The only significant coefficient, however, is for P/E (-1), which indicates that subsequent prices rise in response to the P/E ratio. A similar result is

obtained for the BSE, but this time P/E (-2) is significant and negative, indicating that in the case of the BSE, price may go down in response to the P/E ratio.

TABLE 8: VECM RESULTS WITH YIELD AND P/E RATIOS

	BSE		NSE	
	BYI	BPE	NYI	NPE
D (Yield (-1))	0.0392	-0.0077	0.0472	0.0123
	-0.0398	-0.0105	-0.0587	-0.0132
	[0.98532]	[-0.73704]	[0.80540]	[0.92940]
D (Yield (-2))	0.0269	0.0052	0.0269	0.0054
	-0.0219	-0.0058	-0.0219	-0.0049
	[1.22935]	[0.91096]	[1.23031]	[1.09237]
D (P/E ratio (-1))	-0.0518	-0.0799	0.0954	0.0270
	-0.1331	-0.0349	-0.2446	-0.0551
	[-0.38970]	[-2.28600]	[0.38989]	[0.48885]
D (P/E ratio (-2))	0.0186	-0.1104	0.0555	0.0201
	-0.1329	-0.0349	-0.2447	-0.0552
	[0.13994]	[-3.16389]	[0.22677]	[0.36497]
C	0.0005	0.0026	0.0000	0.0022
	-0.0207	-0.0054	-0.0210	-0.0047
	[0.02224]	[0.48655]	[0.00019]	[0.46015]

(Source: prepared by the researcher)

Table 8 gives results for the VECM analysis for P/E ratios and subsequent yields. Cointegration is found for NSE and BSE indexes, and error correction was needed. For the BSE and NSE series, when yield is the dependent variable, the lagged coefficients of P/E (-1) and (-2) are positive. This result indicates that subsequent yields are not impacted by P/E ratio.

SUMMARY AND CONCLUSION

Our objective has been to determine whether the P/E ratio impacts subsequent prices or yields of Indian two major indexes NSE and BSE Index, VECM and VAR methods are used to explore the relation.

Initially test the series for unit roots (Augmented Dickey-Fuller Unit Root Test, Phillips Perron Unit Root Test) we cannot reject the presence of unit roots, and the series are non-stationary.

Further test simple ordinary least squares regression is run, with yield or price as the dependent variable and P/E ratio as the independent variable. The regression results are robust and conform to mean reversion theory; that is, it is found that subsequent prices increase with high P/E ratios and subsequent yields decline with high P/E ratios. But simple regression analysis may have problems. Therefore, we test the data for autocorrelation and heteroscedasticity, and find that autocorrelation is present in all series and heteroscedasticity in NSE and BSE. We then use Johansen's technique to test whether there is cointegration, and find it only in the price of the NSE and P/E and Yield of BSE and P/E and Yield of NSE and P/E. For the other Price of BSE and BSE P/E, there is no evidence of cointegration. Therefore, VECM is used for these three series and VAR for the BSE Price series. Results for the P/E ratio and subsequent prices show that prices rise in response to P/E ratio but not as much as would be suggested by the regression analysis, as only one of the four lags is positive and significant for all four indexes (and the rest are not). Results for P/E ratio and subsequent yield show there is no significant relation between yield and P/E ratio. In conclusion, we find that subsequent prices will increase and subsequent yields will decline in response to an increase in the P/E ratio. When adjustments for autocorrelation, heteroscedasticity, unit roots, and non-stationarity are made, however, P/E ratios may not have as much of an impact on prices as initially expected, and they have no impact whatsoever on subsequent yields.

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